1. Introduction

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Environmental management has risen from being the task of technical natural resource specialists to being the concern of everyone on the planet. This has led to a rapid expansion in the range of jobs dealing with environmental issues. Not only are ecologists, conservationists, hunters, farmers and fishers involved; we now also have professionals in social science fields such as environmental economics, law and politics. Previously a topic that was dominated by the application and interpretation of technical measures such as species diversity and population growth rates, environmental management is now being debated in terms such as property rights and market trading. Sometimes the technical and social aspects make uneasy bedfellows: for example, ecologically minded conservationists can find themselves at loggerheads with human rights lawyers seeking equitable access to protected areas for indigenous peoples. In this book we aim to provide overviews and specific examples of case studies and techniques that are used in environmental management from the local level to international environmental regimes.

The recognition of a division between technical and social fields of study is not new. In 1959 the scientist, administrator and novelist C.P. Snow gave a lecture in Cambridge entitled ‘The Two Cultures and the Scientific Revolution’. This focused on the idea that the ‘intellectual life of the whole of western society is increasingly split into two groups’, literary intellectuals and scientists (Snow, 1998). The ‘Two Cultures’ theme was taken up again nine years later in another famous paper, ‘The Tragedy of the Commons’, written by the biologist Garrett Hardin (Hardin, 1968). In this paper, Hardin addressed the classic academic divide between social and natural sciences. He described the gulf thus:

An implicit and almost universal assumption of discussions published in professional and semi-popular scientific journals is that the problem under discussion has a technical solution. A technical solution may be defined as one that requires a change only in the techniques of the natural sciences, demanding little or nothing in the way of change in human values or ideas of morality. The class of ‘no technical solution problems’ has members . . . They think that farming the seas or developing new strains of wheat will solve the problem – technologically. I try to show here that the solution they seek cannot be found. (Hardin, 1968, p. 1243)
The point of Hardin’s paper is that technical solutions alone cannot solve environmental management problems. The environment does not exist in isolation from human society or the economic systems that operate within society. The environment both defines, and is shaped by, the activities of human beings. In the past, however, there has been a tendency amongst environmental managers to try to implement technical natural-science-based solutions to environmental problems without any attempt to understand the socioeconomic dynamics that underlie the context within which such technical solutions are applied. This has often resulted in misaligned management objectives and ultimately management failure.

Leach and Mearns’ (1996) study of the fuel wood shortage in Africa in the 1980s provides a good example of this (Ockwell and Rydin, 2006). The fuel wood shortage was perceived by most environmental managers as the result of a wood supply gap. In other words, demand for fuel wood exceeded supply and the technical solution was simple – plant more trees. Unfortunately, this tree planting approach failed to address the problem of the fuel wood shortage for the many African people whose livelihoods were affected. It emerged later that the problem was not a simple issue of a lack of supply, but a far more complex problem related to the nature of ownership and use of trees as a source of fuel in Africa. Following the broad-scale failure of the tree planting policy to address the fuel wood shortage, social scientists working together with natural scientists later demonstrated that the basic assumptions that define the idea of a supply gap ignore more subtle issues such as the fact that most fuel wood comes from clearing wood for agriculture or from lopping branches valued for fruit and shade. From the perspective of people affected by the fuel wood shortage there was not one simple problem of a lack of supply, but many more complex socioeconomic problems associated with command over trees and their products to meet a wide range of basic needs. This highlights the need to attend to a range of socioeconomic issues in environmental management, such as the nature of property rights regimes, local cultural practices and the subjective, often conflicting, understanding of different resource users (Ockwell, 2008).

The constructive outcomes of natural and social scientists working together to solve environmental management problems have led to an increasing awareness of the need for interdisciplinary approaches to environmental management. This requires managers to combine insights from both the natural and social sciences in order to ensure sustainable outcomes. In an attempt to help current and future managers to understand how they might complement their natural science approaches with insights from the social sciences, this *Handbook of Environmental Management* contains a range of case studies that demonstrate the complementary
application of different social science techniques in combination with ecological management thinking.

Tom Brooks et al. (Chapter 2) highlight the importance of an awareness of how conservation funding is spent. Allocation of money essentially represents a key way in which human beings interact with the environment. The approach taken to prioritizing which areas benefit from the $6bn spent annually on conservation has obvious consequences for global biodiversity. In their chapter, a shorter version of which was originally published in the journal *Science*, Brooks et al. present a comprehensive review of the concepts, methods, results, impacts and challenges of approaches to nine templates of global biodiversity priorities that have been proposed by biodiversity conservation organizations over the last decade. Their review is rooted within the theoretical irreplaceability/vulnerability framework of systematic conservation planning. This chapter makes an important contribution to improving understanding of these prioritization approaches, which in turn makes it possible to orient more efficient allocations of geographically flexible conservation funding.

Neil Burgess et al. (Chapter 3) discuss people versus environment and people and environment policies in the context of wildlife conservation as a divide between those promoting ‘fortress conservation’ and those promoting ‘people-focused conservation’. In their chapter they argue that for environmental managers involved with implementing conservation projects on the ground in the developing world, these polarized views often represent impractical extremes. Furthermore, for people living in rural areas of developing countries, the divide between ‘development’ and ‘conservation’ is also often quite artificial. Burgess et al. highlight a third approach to environmental management that falls between the two extremes. Projects that take this middle ground approach are known as Integrated Conservation and Development Projects (ICDPs). The authors present a detailed analysis of the successes and failures of ICDPs over the years and develop some practical ecological, social and economic criteria by which ICDPs might be assessed. They then provide a practical example of how to apply such criteria by using them to analyse the successes and failures of two ICDPs with which they have had personal involvement. By combining ecological criteria with social and economic criteria, the authors’ analysis enables them to make a series of practical management recommendations for making the ICDP model more effective in achieving conservation at the same time as sustaining and improving the lives of the people that live in these areas.

Management efforts to maintain biodiversity do not need to be focused solely on protected areas. Economically productive landscapes contain many of the world’s species, and many protected areas now regarded
as wilderness were formerly managed for livestock, hunting or extensive agriculture. Tom van Rensburg and Greig Mill (Chapter 4) take a functional approach to the ecology of biodiversity conservation with an emphasis on disturbance. With rising human population leading to ever-increasing demand for food and other natural products, policies that offer incentives for combining biodiversity conservation with other productive management objectives will become ever more important in the future.

The move away from protection to production has resulted in new laws that shift the focus of management from central government control of natural resources such as forests, towards community involvement in management with corresponding changes in access and utilization. Bhim Adhikari (Chapter 5) demonstrates the role that social institutions play in the management of common pool resources (CPRs – natural resources that are communally owned and managed). Drawing on the new institutional economics literature, Adhikari shows how an understanding of the nature of social institutions is vital if environmental managers are to be successful in intervening in the management of CPRs. This includes a need to understand the property rights determining the nature of resource ownership as well as any unwritten social ‘contracts’ that permit members of the community to access and use the resource. When CPRs begin to be degraded, it is often as a result of external pressures that erode the social institutions that have traditionally governed resource management regimes. Management interventions that fail to understand these traditional institutions and the way in which they have been disrupted are unlikely to be successful in restoring natural resource use to a sustainable pattern.

David Ockwell and Yvonne Rydin (Chapter 6) explore the idea of policy discourses in theoretical and methodological terms. They provide a practical example of how environmental managers might formally approach the analysis of the hidden assumptions, values and beliefs that often underpin dominant framings of environmental problems (for example, the fuel wood supply gap mentioned above) and expose them to more critical scrutiny. These dominant framings often prevent more sustainable, alternative policy solutions from gaining policy influence. Exposing them to critical scrutiny is one way in which to demonstrate the policy relevance of alternative knowledge. Ockwell and Rydin focus on the now well-established field of ‘discourse analysis’. They introduce some of the core theoretical principles behind different approaches to discourse analysis before demonstrating the methodological and practical implications of these different approaches via their application to a case study of fire management in Cape York, northern Australia. Their chapter provides a practical example of ‘how to do discourse analysis’. At the same
time it clearly highlights the insights that environmental managers might derive by using discourse analysis to better understand the hidden assumptions that lie behind different management options.

Differing discourses are not only found in approaches to the management of specific resources or areas of land, but also in much higher-level policy. Sofia Frantzi (Chapter 7) reviews different perspectives on international environmental regime effectiveness using the Mediterranean Action Plan (MAP) as an example. Originally conceived by an ‘epistemic community’ of scientists as a means of combating pollution in the Mediterranean Sea, the MAP can also be regarded as a tool that enables Mediterranean countries to come together for negotiation, with the technical management goal of pollution reduction being subsidiary to the objective of more general political cooperation. This insight is fundamental to understanding why scientists often become frustrated with policy-makers when the science findings they are trying to promote take a back seat to considerations of trade and security, which are the main drivers of national interests.

Staying in the marine environment, but with a local rather than international focus, Fiona Gell (Chapter 8) provides a detailed demonstration of how understanding the economics behind natural resource use can lead to a better understanding of how to ensure that resource use is sustainable. Gell looks at the economics of a seagrass fishery in the Quirimba Archipelago, northern Mozambique. Through an in-depth analysis of the socioeconomic dynamics of the people who rely on the fishery for their livelihoods, Gell makes an informed set of management recommendations for the long-term sustainable management of the fishery.

Claire Quinn and David Ockwell (Chapter 9) highlight an issue common to many of the chapters in this handbook – that environmental management for sustainable development needs to protect the environment at the same time as protecting and developing the livelihoods of those people who depend on it. This is particularly important for some of the world’s poorest people whose livelihoods are often most dependent on natural resources. Using the case study of semi-arid Tanzania, Quinn and Ockwell highlight the reciprocal relationship that exists between the environment and society. They then demonstrate how the paradigms that define environmental managers’ and policy-makers’ conceptions of ecological and social problems are integral to defining the policy discourses that shape the choice of management solutions. The authors provide a clear example of how the traditional emphasis on the ecologically centred ‘equilibrium theory’ led to a view of pastoralism as responsible for environmental degradation in semi-arid regions of sub-Saharan Africa. In contrast, the alternative, more recently emerging ecological paradigm
based on ‘non-equilibrium theory’ lends itself to a new perspective that sees pastoralists and other indigenous populations as being an integral part of the environment. Most importantly, Quinn and Ockwell show that these different ecological and social paradigms have fundamental implications for the policy discourses that are adopted and that define appropriate management strategies. Equilibrium theory was fundamental to the policy discourse of people versus environment that has traditionally defined colonial-influenced approaches to environmental management in Africa. Non-equilibrium theory, on the other hand, supports a policy discourse of people and environment, which sees the appropriate management response to be inclusive of indigenous people and their knowledge. Quinn and Ockwell’s central argument is that if the ecological paradigms that underpin policy discourses fail to recognize the reciprocal link between the environment and society, the resulting management solutions can only protect the environment at the expense of the livelihoods of poor people, thus failing to achieve sustainable development.

The two following chapters by Vanessa Pérez-Cirera (Chapter 10) and Deborah Kirby (Chapter 11) provide differing methodological perspectives on the semi-arid environment discussed by Quinn and Ockwell. Pérez-Cirera explores the application of game theory whereas Kirby illustrates the use of production function economics. Together, these chapters provide detailed examples of the potential for different approaches to environmental decision-making.

The scale of environmental management changes to the macroeconomic considerations of economic growth and the environment in Chapter 12 by Dalia El-Demellawy. Whilst environmental riches are associated with either a complete absence of economic activity in pristine wilderness, or low-level hunter-gatherer economies, it is perhaps wealthier countries that can afford to have both the technological benefits of development and sustainable environmental policies. Intermediate economies are characterized by natural resource exploitation and pollution. This observation is formalized in the ‘environmental Kuznet’s curve’, which suggests that there is an inverted ‘U’-shaped curve of environmental degradation associated with development. If this is the case, then the macroeconomic environmental management solution is to enhance economic development to the point where the whole planet is enjoying environmental sustainability. However, as explained by El-Demellawy, reality is a bit more complicated.

The final chapter by Mahesh Poudyal and Jon Lovett (Chapter 13) deals with a controversial issue that has created an environmental management conundrum. Scientists are agreed that the release of greenhouse gases by modern economic activity, in particular the burning of fossil fuels, has resulted in global warming. The environmental effects of global warming
are predicted to be enormous, changing the whole ecology of the planet. A technical solution is to replace fossil fuel with renewable resources such as biofuel derived from agricultural crops. Policy-makers in Europe can see a wide range of benefits from this move: meeting commitments under the Kyoto Protocol, improved security of fuel supplies, enhanced European integration through agricultural subsidies to new European partners and a strong market for biofuels from developing countries, which can help meet the Millennium Development Goals. Set against these potential benefits are environmentally negative changes in land use such as the destruction of tropical rainforest for biofuel crops and the introduction of large-scale mono-cultures. The future will reveal if ‘second generation’ biofuels from wood products are the answer, or if biofuels offer a false dawn for maintaining our fuel dependence in light of global warming.

Each of the chapters in this handbook provides practical examples of the ways in which insights from the social sciences can complement knowledge from the natural sciences to make environmental management more effective. Sustainable development presents the dual challenge of maintaining environmental quality whilst improving the livelihoods of the people who rely on natural resources. In the past, implementation of environmental management has been hampered by a tendency to rely on technical solutions without understanding the socioeconomic context within which these technical solutions were applied. The complementary application of different social science techniques in combination with ecology-based management thinking, as demonstrated in this handbook, provides practical solutions to overcoming this problem. Such an interdisciplinary approach to environmental management, working across the social and natural sciences, is integral to developing effective management solutions and achieving sustainable development.

References