1. Ecological economics: prospects for integration and interdisciplinarity

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This book sets out to pursue three aims as presented in the three ‘dimensions’ of the volume. The first presents a selection of works that review and challenge the nature of ecological economics as an interdisciplinary or integrative field, probing into what ecological economics is and could be. The second aim is to present methods and approaches for integration, to suggest what could be done. Finally, more specific applications are presented in the third dimension to further ground the discussion. In each case, we aim to push outside the normal square of ecological economics by including perspectives from elsewhere than economics and ecology (loosely defined), including from other integrative fields – *interdisciplines* – that deal with sustainability problems. In dealing with ecological economics in this way, broader issues of integration and interdisciplinarity inevitably arise. In this chapter we look forward to see how these insights can be integrated into a better and more interdisciplinary ecological economics.

For many, it is axiomatic that sustainability – the broad subject matter of ecological economics – requires non-traditional modes of research and analysis; that is, integrative or interdisciplinary approaches. The principle of policy integration – ecological, social and economic – is central to all expressions of sustainability before and after the 1992 Rio Declaration formally set out that challenge. Along with pervasive uncertainty, complexity, difficult temporal scales and the increasingly realized criticality of ecological processes, policy integration has proved hugely difficult for existing, individual disciplines wielding their specialized tool kits. In addition to its scientific aims of understanding the human-environment system, ecological economics was constructed as a response on the policy level, as set out in a foundation definition:

Ecological Economics addresses the relationships between ecosystems and economic systems in the broadest sense. These relationships are the locus of many of our most pressing current problems (i.e. sustainability, acid rain, global warming,

species extinction, wealth distribution) but they are not well covered by any existing discipline. Environmental and resource economics, as it is currently practiced, covers only the application of neo-classical economics to environmental and resource problems. Ecology, as it is currently practiced, sometimes deals with human impacts on ecosystems, but the more common tendency is to stick to 'natural' systems. *Ecological Economics* aims to extend these modest areas of overlap. It will include neo-classical environmental economics and ecological impact studies as subsets, but will also encourage new ways to think about the linkages between ecological and economic systems (Costanza 1989).

There are other definitions, but this one captures the overall flavour and intent of most others and contains themes with which this book is concerned. Integration or interdisciplinarity is a central aim of ecological economics, given the claimed failure of single discipline approaches. So is the relevance of the enterprise to significant policy problems such as those cited. The inclusiveness of the terms 'economics' and 'ecology' is vague and remains unclear – probably intentionally so. The most generous use of these two terms is as shorthand for a whole range of relevant social and natural sciences, which invites the question of what other disciplines have purchase on sustainability problems. If read more specifically as referring to those two disciplines alone, the question of the role of other disciplines arises.

With that in mind, we can briefly consider the direction ecological economics has taken since then. While only a partial indicator of a discipline (or inter-discipline), what gets published can give some guide, and so the content of ecological economics can be reflected in that of its main journal. Costanza and King (1999) reviewed the first 10 years of *Ecological Economics*, and reminded us of the intended characteristics of the journal: transdisciplinarity; discussion rather than confrontation; conceptual pluralism; and a focus on problems. The first observation from their review is the growth of the field, as represented by a 1989–99 increase in papers published from less than 20 to over 100 per year. The journal publishes articles in sections entitled: 'Commentary, Methods (formerly Ideological and Methodological Options), and Analysis'. The vast bulk of papers in more recent years were classified as 'analysis' or 'commentary'. Interestingly for this book, papers on 'methods' have remained static in numbers over time, but proportionally now represent a very small fraction. As to who publishes in *Ecological Economics*, economists dominate strongly, with biologists and ecologists the next largest, but relatively small, disciplinary group. Among the smaller groups of contributors are social sciences other than economics and natural sciences other than biology/ecology. The humanities do not feature in this breakdown. The source of papers is, with very minor exceptions, the rich, developed world, and in particular North America. Papers with multiple authors representing different disciplines – used in the review as a surrogate for interdisciplinarity – make up one-fifth of the total.

There are a great many positive features to the growth and nature of ecological economics over the past decade; indeed, the world would be intellectually poorer in its understanding of sustainability in its absence. But taking a critical view of the indicators just cited, we can highlight the shortcomings in the ecological economics enterprise relative to its stated aims – insufficient interdisciplinarity, domination by economists from the rich world, not enough ecology and certainly little of other disciplines, and little theory or method. That may seem overly harsh, but the value of constructive criticism is to identify where things can be moved forward. The contributions in this book present strategies to address such shortcomings and this chapter distils some broader points from those contributions.

However, before turning to the themes that emerge from this book, we should return to an important starting assumption – is interdisciplinarity and integrative scholarship universally accepted as required for progressing sustainability, even if not well understood operationally? Most ecological economists think so, but it is not clear that others do as well. Perusal of a few key documents and reviews from the time of the 1992 Earth Summit in Rio de Janeiro and more recently in the lead up to the 2002 World Summit on Sustainable Development in Johannesburg suggests that interdisciplinarity is not so firmly on the agenda (OECD 2001; see UN 1992; UN Economic and Social Council 2001, 2002; UN Environment Programme 2002). Agenda 21 at chapter 35.9(a) issues a minimal instruction (UN 1992), but none of the other documents cited above explicitly state such a need even when discussing science, information and education, although to those so inclined there are some strong implicit suggestions. Most of what is said about research and education is either recognizably disciplinary, or about the better application and distribution of existing skills and capacities rather than the development of new foundational perspectives. So perhaps the integrative imperative is not as widely recognized as we might think. On top of that, integrative enterprises – interdisciplines – like ecological economics are still tiny, apostate even, and not highly influential against traditional disciplinary trajectories. Not only do the theory and practice of integration require development; the very need for it requires selling. In fact, the two tasks are linked, as nothing is more convincing of an approach or method than a solution offered.

This perusal of recent documents reveals a significant issue for those promoting integration. On the eve of the World Summit, *Nature* discussed the role of ‘science’ in sustainable development (Clarke 2002). This emphasized that the main game was better use of existing knowledge and, especially, delivery of existing disciplinary capabilities to poorer countries. The argument that much could be achieved in this way is convincing. When integration was mentioned, the need for local scale projects was highlighted, and the meta-issue of interdisciplinary research and integrative methods hardly rated. Such

views suggest that broader integrative work in ecological economics – and in the other interdisciplines discussed below – has not made a great impact. This invites clarity as to the claims of the need for integrative relative to disciplinary research and applications.

Obviously enough, integration and interdisciplinarity are needed when other (disciplinary) approaches fail. Yet it is not evident that the demarcation between when interdisciplinarity might or might not be needed is always well understood. However, it must be if scarce resources are to be targeted well in the face of the need for more disciplinary efforts and the existence of norms and incentives in research institutions that still overwhelmingly favour traditional disciplines. Otherwise, being ‘interdisciplinary’ becomes only a fashionable password at workshops or, worse still, diversion therapy for failures to apply existing disciplinary knowledge. Establishing the justification for integrative approaches in specific contexts – extending the general admonishment – is necessary.

Clarity as to what ‘interdisciplinary’ means is needed to support that justification. Often, the distinction is made between multi- and interdisciplinary, with the former being purely *additive* and containing no potential for transformation of the contributing discipline. An environmental assessment with separate segments on different aspects typifies such an approach. Multidisciplinary approaches are often claimed to be insufficient for some sustainability problems, as the inadequacies of existing disciplines are not addressed. Simply putting together techniques without questioning their basis may be and probably will be insufficient.

Interdisciplinarity hence has the defining feature of *transformative potential*, where the particular theoretical assumptions and ‘epistemological commitments’ of participating disciplines are explicitly open to questioning (for a discussion, see Schoenberger 2001). Ecological economics certainly has the aim of transforming the operating assumptions of neoclassical economics, although whether an agenda exists to fundamentally alter the ecological sciences is less clear. A further characteristic of interdisciplinarity for sustainability should be, given the human-natural system interaction that defines the problem, that integration across the natural and social science divide (and arguably the humanities as well) will be especially sought after. Taking that and transformative potential as the hallmarks, interdisciplinary endeavours may consist of two or more disciplines, one or more people, a practical, theoretical or methodological problem, and an endless variety of styles of inquiry.

In this context, to contribute to the broader debate of what ecological economics is or what it might/should be and to indicate some new and emerging methodological approaches, this book presents a selection of contributions that range across disciplinary standpoints and from the general to the more specific. The intent is not to be prescriptive or comprehensive or even

representative. A diverse range of perspectives is gathered, to engender debate as much to suggest particular ways forward, although individual chapters do serve the latter end. The following discussion identifies some of the themes that emerge in the book, organized through the three ‘dimensions’ of challenges, reorientations and approaches.

DIMENSIONS OF INTEGRATION AND INTERDISCIPLINARITY

In the first dimension of the book some big challenges are presented. It would seem that the criticisms of key features of neoclassical economics are sharper and deeper than ever. Proops opens the book in Chapter 2 with six arenas of inquiry for ecological economics in the twenty-first century, and it is not a modest menu. The stress is on the conceptual and the theoretical, on the basis that there is too much reliance still in ecological economics on theoretical underpinnings from neoclassical economics that are, he says, inadequate in many ways. Proops’ recommendations would take ecological economics into the realms of the teleological, epistemological and phenomenological, where conceptualization and argument loom larger than numbers – an unfamiliar terrain for many practitioners. In Chapter 3 Norgaard emphasizes the normative element in all intellectual endeavours, and the henceforth necessary recognition of ‘preanalytic visions’ that structure the discourse and practice of knowledge-based (epistemic) communities. Familiarity with terminology and methods of another discipline is not sufficient for sustained engagement, which requires a deeper conceptual and theoretical understanding as well.

The normative element, or even simply recognition of the subjectivity inherent in choice of topic and research path, goes beyond *what* we seek to do and questions more deeply *why and how* we do it. The exploratory frame of inquiry discussed by van Kerkhoff in Chapter 4 places the position of the researcher-as-agent more prominently in the enterprise than would be familiar (or perhaps comfortable) to either economists or ecologists. Later in the book, Barnett et al. (Chapter 5) focus on the ‘critical element’ introduced to thinking about sustainability by some social sciences other than economics, and the largely (but not only) positive potential to sharpen reflexivity in interdisciplinary interactions. Exploratory and critical approaches offer an alternative to more traditional and deterministic modes of inquiry with attractive potential in the face of the complexity and uncertainty that characterizes sustainability problems. The multiple strategies recommended by an exploratory approach invite the mix-and-match of new and existing approaches and methods, some of which are reviewed and presented in the third dimension of the book.

The first dimension opens ecological economics to more than just economics and ecology, even if those are broadly construed, with some strong suggestions of new pathways. The second dimension of the book takes us further down that path, offering reorientations and openings to other disciplines and interdisciplinary endeavours. Barnett et al. review the genealogies and current features of some other, notable interdisciplines that engage with sustainability, some of which predate and overlap with ecological economics. Indeed, the comment has been made that ‘ecological economics is, in my view, another name for human ecology’ (Martinez-Alier 1999: 112). Alongside these mostly recent integrative fields, Barnett et al. review the potential contribution of the longest standing ‘interdisciplinary discipline’ – geography, reminding us that existing capacities may be overlooked in the rush to construct new approaches. Negotiating overlaps and possibilities for mutual learning across the increasing array of interdisciplines hovering about sustainability should occur more than it does. Barnett et al.’s ‘essential elements of interdisciplinarity’ at the very least make good discussion points. They cite a pithy definition of ecological economics by Common (1996: 7, emphasis added) as:

an economics that takes what we think we know about our biophysical circumstances, and about *human psychology*, seriously – which standard neoclassical economics, including the sub-disciplines of environmental and resource economics, does not do.

This potential contribution of psychology is addressed in the following Chapters 6 and 7 by Knetsch and Lea, respectively. Whether understood as analogues or quite distinct enterprises, economic psychology and behavioural economics provide fresh insights into how individuals and groups behave in relation to sustainability dilemmas, and can inform policy interventions that seek to change unsustainable behaviours. Such insights are important, as public policy is one of many disciplines that have yet to comprehend and respond adequately to sustainability. Dovers in Chapter 8 describes the policy processes in a manner relevant to sustainability, showing the large range of potential contributing disciplines required to make sense of the complex, multiple and connected stages of the policy process. A policy orientation, it is argued, provides one entry into problem framing for integrative approaches to sustainability. Given that ‘economics’, seemingly narrowly defined, dominates the social science side of ecological economics, and that ecology, in its nature, has little purchase on policy, the contribution of other policy-oriented disciplines and their very different insights is an important question.

The policy orientation invites the third, more operational dimension of the book – frameworks, methods and applications capable of providing better purchase on at least aspects of the challenge of integration for sustainability. Within boundaries recognizable to most ecological *economists*, van der Heide

et al. in Chapter 9 offer a sophisticated review of methods and approaches in view of their suitability for nature (that is sustainability) policy as opposed to narrower environmental policy. Some of these are familiar, others less so – cost-benefit analysis (CBA), safe minimum standards (SMS), integrated spatial modelling and Weitzman's ranking criterion for biodiversity. They discuss the strengths and weaknesses of each. They note that the SMS approach presents a lower barrier to resource exploitation than the much more widely expressed precautionary principle. That raises an interesting question of hierarchies and choice among approaches. Is SMS better viewed as one way of applying the more generic policy principle, the precautionary principle, or as an alternative? This begs the question of the array of other approaches that can inform policy- and decision-making in the face of uncertainty – quantitative or qualitative risk assessment, deliberative methods, performance assurance bonds, adaptive management and so on (for a discussion, see Dovers et al. 2001). If multiple theoretical approaches, methods and policy instruments are required for sustainability, as is generally proposed, then the question of filling the 'tool-kit' of diverse approaches, and of the choice of approach in specific contexts, will arise often. Choice and combination demand an understanding of the nature of different theoretical, methodological and policy options.

In Chapter 10, Stern takes an empirical approach to modelling relationships between technological change, economic production and the environment. This is a stochastic implementation of the insight that, from an ecological economic perspective, change in the quality of the environment and resources is the same as change in technologies created by humans. It can be contrasted to many extant approaches that treat technologies in theoretical, or deterministic and linear ways. We must clearly take stochasticity in human and environmental systems seriously in order to say useful things about sustainability. Wasson in Chapter 11 draws on systems thinking and associated ideas of stocks and flows from both economics (that is materials balance) and from non-ecological natural sciences to propose a general style of inquiry with interdisciplinary potential. The discussion of just how widely congruent concepts and methods dealing with stocks and flows recur across seemingly distant disciplines and professional domains is striking. This suggests we might do well to seek other conceptual common grounds to advance interdisciplinary communication, and perhaps lay the ground for further development of integrative methods.

Finally, in Chapter 12, Courville sets out two approaches to exploring trade and sustainability that take us further in applying a systems' perspective. As she notes, traditional approaches are weak on the social and ecological aspects of trade, and the integrative report card and integrative flows analysis evidence an ability to both describe complex systems and to support policy deliberation. This kind of conceptualization and detailed analysis certainly goes a long way

in addressing the vision of ecological economics set out at the start of this chapter, whether that particular work is seen to fall under the rubric of ecological economics, political or economic geography, development studies or human ecology.

PROSPECTS AND OPPORTUNITIES

So to future prospects, which remain delightfully open. The future of ecological economics seems strong, with the subject matter – sustainability – hardly about to go away and the interdiscipline not lacking in participants and material for study. However, the contributions in this book illustrate that, against the chosen problem set of sustainability, ecological economics has shortcomings, many of them inevitable or understandable. How important these shortcomings are depends on our view of what ecological economics is now and should be in future.

There are disciplines not well represented in ecological economics currently, but clearly relevant to the problems being tackled: some are more obvious, like psychology, others less so but just as critical, like law and natural sciences other than ecology. Connections with other interdisciplines are less than they might be, and the fault for that lies with the others as well. In particular, some useful contributions might be made through connection with environmental history, an equally active and rapidly growing field, and from the critical perspective of fields such as political ecology. Such connections could enhance ecological economics' time depth and understanding of human agency. Finally, an apparent lack of methodological development in ecological economics, and elsewhere, is an issue, but the contributions here suggest that there is a range of viable options in addition to the many others not surveyed here. Yet methodological development between disciplines arguably needs to be preceded by greater conceptual understanding of other perspectives, even between economists and ecologists.

That brings us to two points not explored here, but key to such common conceptual understanding. The first is the position of ecology in ecological economics, where it exists as a junior partner. Ecology is a diverse, young discipline where theory and method are constantly contested (for example Dovers et al. 2001; Peters 1991). The ecology represented in ecological economics is a partial subset of the discipline – mainly various brands of ecosystem theory. For an economist to connect with one individual or a like-minded group of ecologists and assume that they have achieved coverage of that discipline is as mistaken as an ecologist presuming that all economists think the same. It is a common error to presume homogeneity in other disciplines, even while recognizing the multiple fractures in an individual's own.

The choice of interdisciplinary collaborator is a crucial one, as that will influence, if not determine, the framing of the research problem, the theory, methods and data used, and ultimately the findings of research or the content of education.

The second is the matter of where researchers and practitioners gain such conceptual understanding. To date most have been introduced to ecological economics after completion of their formal education. Neither undergraduate nor postgraduate education in ecological economics has received much attention, but can be argued as a most crucial activity for determining the future of the enterprise. The theory and practice of *interdisciplinary* education, postgraduate research and research supervision for sustainability requires ongoing attention to make it the art and craft, and key area of professional practice, that it should be. What ecological economics becomes in the longer term will be determined by the thinking of present and future students.

Should ecological economics be understood as the emerging big ‘science of sustainability’, as a more narrowly defined interdiscipline, or, as viewed by non-mainstream economists, as a new paradigm within economics, or finally, as viewed by most mainstream economists, as just another field within neoclassical economics? It is apparent that there is support for and belief in all four options within the ecological economics ‘community’. At this stage, just over a decade on, to make that choice would be premature – ecological economics should not have to decide now, or even soon, what it wants to be when it grows up. Though we would certainly argue against the fourth alternative. Economics and ecology took much longer to crystallize, and ecology in particular is not yet stable even after a century. We think that single-discipline approaches are inadequate but have no guarantee that still-emerging interdisciplinary ones will work either, or which ones will prove the most effective. Ecological economics is at present only one of a number of integrative enterprises attending sustainability problems, and the nature and scale of those problems justify and demand a diversity of approaches. For now, ecological economics would do best to remain diverse and evolving, and to seek additional perspective outside of its existing catchment.

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