

'Sustainability' in ecological economics, ecology and livelihoods: a review

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Abstract: This article reviews the work of several sets of researchers prominent in current debates over how sustainability might be interpreted and achieved. The notion of 'sustainable development' has reached a conceptual dead-end. Geographers may offer more effective investigations and critiques of socioecological transformations by instead focusing on 'sustainability' and its application to multiple dimensions of human and nonhuman processes. Such a move within geography demands critical engagement with ongoing debates in ecological economics, the ecological sciences and social applications of sustainability. Geographers are well positioned to address crucial gaps in these fields of inquiry and to propel debates over sustainability in several fruitful directions.

Key words: ecological economics, ecology, sustainability, sustainable development, sustainable livelihoods.

I Introduction

Debates over 'sustainability' and 'sustainable development', fueled by increased global concern over environmental degradation and widespread failure of conventional development models to spur 'modernization' in third-world societies throughout the 1970s and 1980s, have expanded in recent years to embrace a multitude of theoretical perspectives and policy applications. At the core of these debates lies the dilemma of how to reconcile human social and economic activities with the long-term resilience, vulnerability and regenerative capacity of the local–global continuum of ecological systems. In crafting responses to this quandary, analysts of sustainability are beginning to contend with additional questions such as how to clarify the relationship among power, economic processes and ecological transformation; how to formulate sensitive

environmental policy given imperfect ecological knowledge; and how to approach sustainability within the context of multiple interpretations of its goals and implementation strategies.

This article surveys and reviews the work of several sets of researchers prominent in current debates over how sustainability might be interpreted and achieved.¹ These researchers represent fields as diverse as ecological economics, the ecological sciences and a broad array of social sciences. Such work is assuming greater levels of influence in the policies and programs of development agencies at international and national levels. The intent of this survey is to reveal the broad contours of debates over sustainability, paying attention to the conceptual and practice-orientated perspectives of different streams of work. The survey itself cannot pretend to be comprehensive; the literature on sustainability is extraordinarily broad and dynamic.² Throughout the survey I employ arguments linked to the human–environment tradition within geography and a host of transdisciplinary subfields with geographic leanings (e.g., cultural ecology, political ecology, political economy of the environment) to interrogate debates over sustainability. However, geographers have not taken full advantage of the attributes that might place them at the center of these debates. Greater contributions from a broadly defined 'human–environment geography' could strengthen and expand debates over sustainability in several ways.

II Unraveling sustainability

Concern over 'sustainability' – as applied to development, to societies, to livelihoods and to a host of additional social, economic and ecological activities – has emerged as a major trope within the past two decades.³ Certain critical trends in the production of knowledge point to a partial explanation for its advent as discursive filter. The first and perhaps most visible trend is a growing awareness of the scale and rapidity of ecological transformations induced by the human species, occurring in nearly every region of the planet. There is an increasing amount of compelling evidence that the local–global continuum of ecological systems is deteriorating in terms of its internal integrity and ability to support the human species (Turner and Clark, 1990; Vitousek *et al.*, 1997).⁴ A second, more ideological trend, is related to the production of knowledge; namely, the further 'repackaging' of development planning and discourse to present a green facade in the face of business-as-usual exploitation of people and resources (Willers, 1994; Adams, 1995b; Escobar, 1995b). 'Sustainable development' appears as the logical extension of efforts to reproduce development in a form more palatable to both the people being 'developed' and the international-level and national-level institutions attempting to reconcile semantically economic growth and ecological transformation as part of their development missions. A third trend is the increasing visibility of interdisciplinary research⁵ and the recognition that significant social and environmental problems confronting societies are multicausal and demand attention from multiple disciplines (O'Riordan, 1993). Sustainability as a general frame of reference may facilitate this process by helping to break down traditional dualisms in the sciences (Jamieson, 1998). As a potential interdisciplinary topic par excellence, the concept overlaps with recent calls for re-engagements with 'scientific' and 'local' forms of knowledge (Murdoch and Clark, 1994), 'postnormal science' (Funtowicz and Ravetz,

1993) and 'symmetrical' approaches to the study of human and nonhuman entities (Murdoch, 1997).

Current debates over sustainability resonate uncomfortably between calls for consensus around single definitions that would ostensibly lead to concrete actions (Carpenter, 1994) and assertions that it is perhaps best to abandon the concept altogether by reason of its vacuity and malleability (Lélé, 1991). The explosion of policy-orientated work within the natural and social sciences, concentrated on connotations of sustainability as applied to specific developmental projects, stands in stark contrast to the neglect of the notion's theoretical underpinnings. This neglect is reflected in the remarkable range of *ad hoc* interpretations and practices applied to the concept of sustainability. It 'is about meeting human needs, or maintaining economic growth or conserving natural capital, or about all three' (Redclift, 1991: 37). As a result, many researchers at the cusp of the human–environment interface have begun to question the usefulness of sustainability (and more specifically 'sustainable development') as a way to think about social and ecological problems and to organize responses to environment and development dilemmas. Is sustainability merely the latest in a long line of intellectual and political novelties designed to capture the essence of development and its consequences in as simplistic terms as possible? Or does it contain real conceptual value and present serious challenges to preconceived notions of how humans can and should interact with increasingly impaired ecological systems?

This article argues there are both conceptual and practical rationales for de-linking the hitherto interwoven ideas of 'sustainable development' and 'sustainability', and that such an uncoupling will go some way toward clarifying specific applications of these concepts in what are often very muddled debates. Critics of sustainable development charge that the concept's ambiguous theoretical basis, its inattention to the structural forces that result in environmental problems, and its focus on achieving consensus among fractious social groups disable effective implementation (Redclift, 1987; Lélé, 1991; Frazier, 1997) and may lead to disastrous ecological consequences (Willers, 1994). By contrast, more and more researchers are examining 'sustainability' through conceptual lenses that effectively divorce it from its problematic partner 'development' and broach new modes of inquiry (Reed and Slaymaker, 1993: 725; Callicott and Mumford, 1997). Several geographers have contributed in salient ways to these debates. These include interrogating the concept as it is applied within state-initiated development projects and programs (Adams, 1990; Munton, 1997), employing sustainability as a measure of performance in specific agriculture-based industries (Drummond, 1996; Le Heron and Roche, 1996), and using sustainability as a starting point to develop comprehensive frameworks for analyzing development initiatives (Owens, 1994; Goldman, 1995). Despite these and other works, there is still reason to echo Wilbanks' (1994) lament that geographers are assuming a secondary role in debates that are perhaps ideally suited to their research interests, field experiences and disciplinary traditions. Similarly, it is worth reiterating Peet and Watts' (1996) call for more penetrating analyses of sustainable development projects in all their guises.

While other surveys within human geography have dealt with somewhat similar conceptual territory (Wescoat, 1993; Whatmore, 1993; Cutter, 1994),⁶ none have made sustainability the cornerstone of analysis. In addition, while several reviews of sustainability and sustainable development have been undertaken by geographers (Brookfield, 1991; Adams, 1995a; O'Riordan and Voisey, 1997) and nongeographers (Lélé, 1991;

Barrow, 1995; Luke, 1995; Sunderlin, 1995; Frazier, 1997) alike, none to my knowledge has attempted to situate geography in relation to the debates occurring in other fields. Adams (1995b: 370), primarily addressing sustainable development, has pursued the geography-orientated implications of these debates furthest. If we accept the assertion there is currently a 'far richer range of debates within the discipline' of relevance to discussions on people and environment, then geographers are uniquely equipped with 'the theoretical and empirical tools . . . to both enter and lead pragmatic debates about sustainable development,' and should seize this opportunity in their research and writing. Complementary to Adams' proposed direction, one of the aims of this work is to expose geography to salient debates in other fields that resonate strongly with geography's human-environment tradition and, in turn, demonstrate ways in which geographic work might enrich deliberations over sustainability.

I first offer expanded justifications for examining 'sustainable development' and 'sustainability' as separate entities. Next I review and discuss how sustainability is addressed within three overlapping yet distinct fields of inquiry: ecological economics; ecological science; and sustainable livelihoods. I sketch the main conceptual offerings and practical applications of each approach followed by some critical reflections. All three fields transcend the limitations of focusing solely on sustainable development. I conclude with an argument for renewed vigor within geography directed at the concept of sustainability. To the extent that geography is and should be concerned with policy processes *and* social movements centered on how present and future generations of humans respond to ecological transformations, the relative paucity of geographic work on sustainability represents a missed opportunity. Geographers are already on several potentially fruitful research tacks which would help redress this conceptual deficit.

III 'Sustainable development' *contra* 'sustainability'

The evolution of 'sustainable development' as discourse and practice in the recent history of development institutions and broader society has been well covered (Adams, 1995b; Clark, 1995; Dryzek, 1997: 123-36) and need not be regurgitated here. Despite its prevalence, I argue that 'sustainable development' has reached a conceptual and political dead-end. Geographers seeking to add their voices to policy *and* social action arenas may instead offer more effective investigations and critiques of socioecological transformations through exploration of 'sustainability' and its application to multiple human and nonhuman domains. However, the idea of 'sustainable development', due to its overarching discursive influence in national and international policy circles, will remain a necessary foil for critical analysis.⁷

Within elite institutional contexts, the consensus interpretation of sustainable development focuses on maintaining ecosystem services (e.g., natural resources, air and water quality) at levels and states that allow future generations access to the same accouterments of development (e.g., economic growth, affluent lifestyles) as current societies in a way that does not compromise the needs of the present. The discussion rarely transcends abstract notions of 'needs', 'generations' and 'global environment' to confront more intractable, untidy questions at the intersection of ecological degradation and social justice. Given the conceptual and programmatic baggage of 'development' along with the numerous socioecological abuses attending its enactment throughout

the third world (Sachs, 1992; Norgaard, 1994; Escobar, 1995a; Porter, 1995; Watts, 1993; 1995; Peet and Watts, 1996), recasting this set of activities as 'sustainable' and declaring it the new paradigm for human interaction with the environment is rife with conceptual, political and ethical dilemmas. In its mainstream guise, 'sustainable development' privileges global environmental problems and institutions, perceives poverty rather than poverty-producing conditions as the root cause of environmental degradation, reproduces economistic and developmentalist biases, and advances a highly reductive interpretation of environment as static 'resource' (Escobar, 1996: 48–54). Thus, the potential of 'sustainable development' as rallying cry for social actions outside the spheres of state and market is almost defunct.

Both 'sustainable development' and 'sustainability' are at root normative concepts, describing visions of how human activities and ecological processes might be reconciled for the 'good' of both. Yet these visions are frequently at odds depending on the social group advocating a particular path. The advantage of 'sustainability' lies in how researchers invoking it must reference it against specific geographic, temporal and socioecological contexts. This context-specificity forces the crucial questions: what exactly is being sustained, at what scale, by and for whom, and using what institutional mechanisms?

For example, 'sustainability' is increasingly being applied to specific socioecological processes – e.g., urbanization, ecosystem management and agricultural practices – and in ways that refine the general concept such as discussions of 'weak' versus 'strong' sustainability (Turner, 1993; Jamieson, 1998). These extensions of the discussion encompass insights from ecological economics, the natural sciences, alternative development practices and an eclectic collection of theoretical perspectives that examine the underlying social bases of unsustainable modes of resource use. The challenge to researchers and practitioners is to uncover innovative responses to sustainability dilemmas when sifting through multiple interpretations, and to determine which interpretations might be applicable within particular spatial and temporal contexts.

While the ability of 'sustainable development' to serve as instrument for a transformative politics of environment and development is severely curtailed, this path may still be open to context-specific notions of sustainability. It is a 'more complex and less manageable concept' (Adams, 1995b: 371) that has not yet suffered the same degree of co-optation by solidifying into a unilinear, mainstream interpretation. This may allow it to serve as focal point for creative liaisons among academics, citizen's groups, non-governmental organizations (NGOs) and social action networks seeking to contest socioecologically deleterious policy initiatives. Rather than listening to politicians and state officials intone the sustainable development mantra and reacting, diverse actors might instead use as starting point the fact that sustainability is simultaneously an ideological stance, a point of convergence for political struggles, and a measure of performance for development activities. The first aspect can be converted to vision and political action based on affinity, the second to an organizing tool and the third to a means of holding public-private development projects accountable.

Yet how are these aspects of sustainability being applied? The following sections highlight: 1) the field of ecological economics which has spearheaded a general critique of some of the main precepts of conventional economic theory; 2) an emerging debate within the natural sciences over the applicability of ecological research and ecological theory to societal questions concerning sustainability; and 3) the concept of sustainable

livelihoods. My intent is to give some conceptual flavor and points of contention unfolding within different disciplinary approaches to sustainability.

IV Ecological economics and sustainability

To do full justice to the range of thinking encapsulated by ecological economics in the present space is untenable. However, its adoption of sustainability as guiding principle and its impact on policy-makers (the extent of which has yet to be adequately surveyed) warrant some critical examination of representative works. Perhaps the most salient contribution of ecological economics is its challenge to many of the fundamental precepts of neoclassical economic theory.⁸ In the view advocated by ecological economists, an economy is a 'one-way entropic throughput of energy and materials' as opposed to the neoclassical view of a circular flow of exchange value without any explicit links to the biophysical world (Martinez-Alier, 1994: 23). The neoclassical perspective's 'fallacy of misplaced concreteness' has led to lessons 'drawn about the real world by deduction from abstractions' (Daly and Cobb, 1989: 35) involving oversimplified accounts of social behavior. It has also contributed to the undervaluing of ecological services and a failure to account for several crucial ecological variables such as the depletion of thermodynamic sources and the interdependence of energy, material structures and biophysical processes (Christensen, 1991: 85).

The central aim of ecological economics (the self-proclaimed 'science and management' of sustainability) involves describing the relationship between 'dynamic human economic systems and larger dynamic, but normally slower-changing ecological systems' (Costanza *et al.*, 1991: 8–9). In its normative sense, this relationship envisions a socioecological context wherein '(1) human life can continue indefinitely, (2) human individuals can flourish, and (3) human cultures can develop; but in which effects of human activities remain within bounds, so as not to destroy the diversity, complexity, and function of the ecological life support system' (1991: 8–9). With few variants, the themes implicit in this definition – intergenerational equity, meeting basic human needs and integrating concern for ecological processes into economic calculations – have remained the fundamental building blocks of ecological economics.

The notion of intergenerational equity challenges some of the central assumptions of conventional economic thinking (privileging of efficiency criteria over other parameters, unchanging consumer preferences over time, near-infinite substitutability between natural and human-made capital) (Norgaard, 1992; Norton *et al.*, 1998). As a result of ecological economists' efforts 'to understand how to approach growth policy in a way that would not impoverish the future' (Bromley, 1998: 231–32), some time-tested tools of economics have come under fire. For example, the idea of intergenerational equity confronts the use of discount rates in economic analyses by recognizing that 'a positive discount rate means that effectively no weight is given to resource use or welfare beyond a generation hence' (Norgaard and Howarth, 1991: 89). Making intergenerational equity a primary goal also carries salient normative implications. One path towards operationalizing sustainability is a constructed social order consisting of an 'intertemporal contract' (between current and future generations) based on the precepts of regency (sound environmental decision-making by current persons) and social bequests (entities passed on to future generations) (Bromley, 1998: 236–38).

Ecological economists' dialog on intergenerational equity is abetted by arguments for *intragenerational* equity and meeting the basic needs of current human societies. One manifestation of this concern is Goodland and Daly's (1995) call for a clear distinction between economic *growth* (construed as an unsustainable, ever-increasing intensification of resource use) and economic *development* (seen as a reduction in resource throughput while reshaping consumer preferences toward sustainable outputs). Along these lines, reforming economic processes and reducing the socioeconomic ills associated with uneven development (at global and national scales) would entail a shift away from neoliberal visions of global economic integration to a focus on domestic production to develop internal markets (Daly, 1994). There is also an emerging challenge to how mainstream environmental and resource economics treat the environment–poverty nexus. The assumption that only rich countries exhibit environmental awareness ignores an 'environmentalism of the poor' which seeks to maintain access to communal resources under threat from state development programs and market processes (Martinez-Alier, 1995).

Another broad thrust in ecological economics is the argument that operationalizing sustainability demands redirecting economic and environmental policies to ensure a nondepleting stock of natural capital (Ekins, 1992). Environmental valuation has emerged as the primary method of accomplishing such a transition by inserting awareness over ecological entities (species, ecosystems) and services (air and water quality) into the calculus of economic well-being. Costanza (1991: 334) advocates a 'biophysical basis for value' that argues societal values should be based on the degree to which a particular evolutionary product (resource) is organized in terms of availability for human use. Carrying this argument to its logical conclusion, one interdisciplinary team of researchers uses valuation techniques to place the total value of the planet's ecosystem goods in the neighborhood of US\$33 trillion per year (Costanza *et al.*, 1997). A similar logic could be applied to the value of 'sustaining services' (how inputs are generated, how wastes are absorbed and how raw materials are transformed) within the overall production process (O'Hara, 1997). In addition to environmental valuation, ecological economists offer several related policy recommendations aimed primarily at governmental and multilateral development institutions. These include reform of national accounting systems to include natural capital in economic calculations; green taxes on ecologically harmful economic activities linked to lower taxes on labor and income; investment strategies to maintain natural capital at current levels; and endorsement of the 'precautionary principle' (ensuring that policy decisions err on the side of maintaining ecological integrity in the face of highly uncertain environmental knowledge) as central tenet of environmental policy (Pearce, 1992; Daly, 1994).

A significant amount of recent research has also been devoted to developing sustainability indicators that might provide specific measures of key socioecological trends and to communicate these to policy-makers and the general public (Ayres, 1996; Azar *et al.*, 1996; Smith, 1996). The hope is that such information might contribute to critical reforms in national economic policy and imbue societies with a 'sustainability ethic'. Speaking to this point, Martinez-Alier (1987: 234–42) interprets the recent interest in sustainability as a type of ecological socialism heralding a broad-based political movement based on a populist ethic and the redistribution of benefits arising from the utilization of natural resources.

Such pronouncements may be premature. Critics aligned with radical political

economy perspectives argue that ecological economics, while serving an important role by promoting more realistic appraisals of the value of ecosystem structures and functions, ultimately provides only a partial challenge to neoclassical economics. Virtually 'none of it has examined the underlying social commitments which determine the way in which we use the environment' (Redclift, 1994: 18). The increased use of economic mechanisms (valuation, resource markets) owes less to 'real motive forces' than to the 'pragmatism and expediency' of political institutions willing to divest themselves of the fiscal responsibility for environmental regulation (Rees, 1992: 387–88). The idea of environmental valuation has generated considerable controversy. Martin O'Connor (1994: 144, emphasis in original) perceives the pricing of an environmental amenity as a 'semiotic conquest' whereby a partially separated realm of ecological relations becomes wholly congruent with 'the *dominant representation* of the overall capitalist system activity'. This conversion of ecological entity to natural capital places it on par with other forms of capital, increasing the likelihood of resource liquidation as a potential trade-off for a commodity or activity with a momentarily higher use value. Yet critics of valuation must walk a careful line between, on one hand, eschewing monetary valuation of nature and remaining irrelevant in political debates, or, on the other, reducing complex ecological processes and richly realized meanings to the crude language of money (Harvey, 1996: 156).

Attacks on sustainable development have arisen from the economic right as well. Beckerman (1996) disparages the entire sustainability project and, by implication, ecological economics as either morally distasteful (forced to choose between 'generations' when current people are suffering hardships) or redundant (the implication being that 'development' is by definition sustainable). Under this conception, questions of intergenerational equity are reduced to maintaining intact capital and constant levels of per capita consumption. 'Sustainability' is a purely technical matter, devoid of normative character, and ecological economists who expend undue attention on the broader implications of sustainable development are simply misguided (1996: 157–60).

While some critics mistakenly conflate ecological economics with earlier manifestations such as resource/environmental economics and attack valuation in like terms, the warnings are still worth heeding within an international development policy context that increasingly favors market mechanisms for the resolution of environmental degradation and subsequent resource conflicts (Rees, 1992; Webber, 1994). What does not appear in much of ecological economics is a clearer understanding of how differences among sectors of a given society – whether mediated through gender, class, age, race and/or ethnicity – affect the chances for achieving the kind of policy instruments and economic mechanisms described as crucial for sustainable human–environment relations.⁹ Similarly, much of ecological economics is embedded within studies of industrialized societies with little leeway for addressing the vastly different historical trajectories and geographic contexts of third-world societies. Perhaps even more alarming is the tendency to overplay the 'economic' in relation to the 'ecological'. With rare exceptions, ecological economists appear inattentive to the ways in which socially defined resources are components of complex, highly dynamic biophysical systems. These systems' resilience may depend on entities and processes far removed from human economies. For example, even those elements considered redundant and easily subject to substitution by human-made 'products' may be crucial

to the overall functioning of an ecological system and the reliability of the system in terms of providing ecological services (Naeem, 1998).

Despite these caveats, the most formidable versions of ecological economics focus squarely on reform of economic concepts as applied in developmental contexts that contribute directly to harmful ecological outcomes. Ecological economists are thus able, using economists' own dialect, to undermine many of the central assumptions of structural adjustment programs and neoliberal ideologies that advocate a 'spontaneous order' model of society where 'timeless and universal beneficence' emanates from 'unfettered market processes' (Bromley, 1998: 237). Despite reform attempts, it is difficult to decipher their impact on the broader discipline of economics. A recent exchange between ecological economists and some of their more lauded colleagues from the neoclassical economic mainstream laid bare the large gaps between the two perspectives. At the heart of the debate was the issue of substitutability, or the capacity to replace so-called 'natural' capital (in the form of both exhaustible and renewable 'resources') with human-made capital within the production process. Ecological economists argue there are no viable substitutes for many environmental resources and that capital and resources are best viewed as complements in the production process (Daly, 1997). The neoclassicists counter that ecological economists tend to confuse the uses of complements and substitutes (Solow, 1997) and fail to understand the speculative character of analytical models within economics (e.g., some models utilize a near-infinite time horizon) (Stiglitz, 1997). Beyond the substance of the debates themselves, these exchanges make clear that ecological questions are still considered beyond the purview of most economic research and instruction (Common, 1997).

Despite this lack of influence on their parent discipline, ecological economists have shaped debates over sustainability in significant ways. Many researchers in the field have to some degree abandoned 'sustainable development' as a concept worthy of rigorous research and intellectual discussion, and instead concentrated their efforts on using 'sustainability' analyses to interrogate traditional economic approaches to environmental problems. Its focus as a field has remained squarely on *economic* sustainability as related to ecological processes, alternately refining and expanding traditional economic concepts and mechanisms to reflect a longer-term vision of human influence and dependence on dynamic ecological systems.

V Sustaining ecologies: ecological theory and resource management

Debates over sustainability within ecology, conservation biology and related disciplines have assumed a new prominence and urgency in recent years. Natural scientists are being invited in increasing numbers to inform policy-makers on the subject of ecological sustainability (Lélé and Norgaard, 1996). In addition, several international environmental groups (based largely in the USA) have for decades sought to influence environmental policy in the third world based on specific conceptions of how ecological systems are sustained over time, irrespective of existing environmental politics within third-world societies (Athanasίου, 1996: 211–18). This increasing public involvement in sustainability debates on the part of natural scientists is concurrent with a fundamental rethinking of ecological theory occurring over the past 25 years (McIntosh, 1987; Pickett *et al.*, 1997). This 'new' ecology has in turn informed strategies of resource management

that challenge conventional institutional arrangements and traditional management strategies in both third and first-world contexts.

The so-called 'new' ecology or 'new paradigm in ecology'¹⁰ stresses notions of non-linearity and dynamic equilibria with reference to ecosystem change over more traditional ecological ideas and theories such as homeostasis, set carrying capacities and the diversity–stability relationship (Botkin, 1990; Sprugel, 1991; Kay and Schneider, 1995). The emergence of this reformulated ecology, emerging primarily in the 1970s and 1980s, is rooted in conceptual shifts in two subfields: 1) community ecology – where discovery of 'the complexity, diversity, and difficulty of specification of the objects of study and the lack of regularities' within ecological communities led to the abandonment of 'the grail of a unified theoretical ecology' (McIntosh, 1987: 331); and 2) ecosystems ecology – wherein researchers increasingly adopted an evolutionary perspective on ecosystem change (Pickett *et al.*, 1997). Indeed, recent conceptual exchanges between ecology and evolutionary biology have contributed to a model of ecological change that stresses hierarchical relations between processes at different scales, spatial and temporal discontinuities within ecosystems and the role of historical events in influencing ecosystem dynamics (Colwell, 1985; Levin, 1992; Wu and Loucks, 1995). The sum total of this paradigmatic turbulence is a portrait of ecological systems that is far less clear than previous ecological theory had suggested. Ecologists attempting to relate theoretical models to actual biological populations now regularly grapple with the embeddedness of species within larger, more complex ecological communities (Schaffer, 1985: 93). Conversely, if the larger ecological system constitutes the primary unit of analysis, researchers may be faced with chaotic behavior wherein predictions of ecological dynamics over the long term are impossible, even when initial conditions of the system are fairly well described (Hastings *et al.*, 1993).

The practical applications of this emergent image of nature as an extraordinarily complex mosaic of hierarchically nested systems governed by nonlinear dynamics are only beginning to be broached. Many of the insights of the 'new' ecology have found their way into reconfigurations of resource management strategies and of how agendas promoting ecological sustainability may be put into practice. Holling (1986; 1995) has long championed a model of ecosystem change that stresses a cycle of ecosystem functions.¹¹ These functions (exploitation, conservation, creative destruction and renewal) become the dominant characteristic of an ecosystem at different times (Holling, 1995: 20–23). This has profound implications for how ecosystems are understood in that questions of hierarchy, complexity, resiliency and stability are more or less dependent on the current function of the ecosystem in question. Efforts to sustain ecosystem processes must account for variability and the changing characteristics of ecosystems themselves, *and* for how management activities and more general social activities tend to 'lock in' ecosystems at different phases in the cycle of functions. Holling utilizes this model of ecosystem change to criticize conventional 'command and control' approaches to resource management and to develop the idea of 'adaptive ecosystem management' (Holling and Meffe, 1996). The fundamental goal of this new approach is to 'retain critical types and ranges of natural variation in ecosystems' (1996: 334). This demands concomitant changes in resource management institutions so as to reflect scientific uncertainty and mirror the variability and nonlinear dynamics of the ecological systems under their charge (Gunderson *et al.*, 1995). More recent movements in this vein aim to link fundamental notions of adaptive management (e.g., uncertainty,

surprise) to social science research on 'cultural capital' and 'common-pool' resources (Holling *et al.*, 1998).

Another set of urgent questions within ecology revolves around the role of biological diversity¹² in determining the trajectories of certain ecological processes (e.g., ecosystem responses to climate change) and, conversely, how ecological and physical processes condition biological diversity (Lubchenco *et al.*, 1991: 401). The conservation of biodiversity has assumed a pivotal position within research and policy agendas throughout the world. Numerous authors perceive the maintenance of biological diversity as fundamental to any notion of sustainability or sustainable development (Rubenstein, 1993). Conservation biologists argue that biodiversity is a key component of ecosystem resilience (i.e., the capacity to respond to different levels of disturbance) (Holling *et al.*, 1995), wields significant influence over the manner in which specific ecosystems respond to human-induced stresses (Risser, 1995), and is thus a vital component in any ecologically meaningful policy agendas (Angermeier and Karr, 1994).

As conceptual constructs, both adaptive ecosystem management and biodiversity are subjects of considerable disagreement within ecology (Christensen *et al.*, 1996); but it is through their roles in policy formulation and influence over actual human practices that even more intractable problems arise. It remains unclear to what extent Holling's adaptive ecosystem management can avoid the pitfalls of 'environmental managerialism', typified by resource management techniques grounded in a positivist philosophy such as land-use planning and environmental impact assessment. Flaws of these approaches include: artificial separation of environmental impacts from social and economic ones; discounting of environmental considerations until after development objectives are in place; neglect of distributional consequences of market forces combined with development activities; and relegation of the context of environmental degradation to secondary status (Redclift, 1988: 643–45). Stanley (1995) argues the underlying assumptions of ecosystem management – that science can ascertain how ecosystems function, that the sociopolitical milieu will support management aims to protect ecological functions, that politically expedient resource degradation can be curtailed, and that appropriate technologies to manage ecosystems exist or can be generated – are tenuous at best. Insights of the new paradigm in ecology (e.g., nonlinearity) reinforcing the uncertainty of scientific knowledge and its predictive capabilities call into question any human attempts to 'manage' ecological systems.

Science-orientated policy agendas centered on biodiversity also raise thorny questions regarding the translation of ecological knowledge into effective policy and management. For example, there is little recognition among natural scientists of the deeply social and political character of the idea of 'biodiversity' (Guyer and Richards, 1996). The 'multi-stranded character of human strategies for the management of biodiversity (as one among many types of biodiversity) and the multiplicity of ways in which those types of diversity are conceptualised' are frequently 'lumped together' within scientific agendas (1996: 2–3). Such omissions are particularly glaring when questions arise regarding the most appropriate policy and management mechanisms – strict preservation, restoration through local practices or some combination – for sustaining different species (1996: 6–7).

Similar oversights regarding the problematic nature of the science-to-policy pathway plague the Sustainable Biosphere Initiative (SBI), a comprehensive research agenda and

call for advocacy developed by the Ecological Society of America (Lubchenco *et al.*, 1991). According to the SBI, coalitions of ecologists, other scientists, the media, NGOs, policy-makers and resource managers will be able to communicate ecological information to decision-makers and thus create more ecologically sensitive and flexible environmental policy. This information is to be arrived at through rigorous ecological research and disseminated through educational efforts. The assumption that translation of ecological information into effective environmental decision-making is simply a case of 'getting the ecology right' undermines much of the SBI project. To illustrate, the SBI asserts that to be 'useful to decision-makers, ecological information must be both accessible and relevant to their mandates and responsibilities' (Lubchenco *et al.*, 1991: 404). However, the 'mandates and responsibilities' of decision-making bodies can vary widely according to criteria far removed from ecological sustainability. There is no guarantee that, even in the face of relatively complete and compelling evidence of the detrimental ecological impacts of a particular project or policy, decision-makers will incorporate this knowledge into their calculus of policy formulation. Understanding why this might be so involves a more far more detailed examination of power relations and how political and economic forces interact to stymie well intentioned recommendations (McNeely, 1992).

The assumption of scientific consensus, the basis for 'useful' ecological information in the policy sphere, is also highly problematic. Recent deliberations within ecology on this subject were fueled by a brief article that appeared in the journal *Science*. The authors argue that the 'many plans for sustainable use or sustainable development that are founded upon scientific information and consensus' are ignorant of the 'history of resource exploitation and misunderstanding of the possibility of achieving scientific consensus concerning resources and the environment' (Ludwig *et al.*, 1993: 547). Drawing on examples of spectacular collapses in two marine fisheries, the authors claim that scientific consensus is impossible concerning how to sustain exploited systems and that resource management policies must include human motivations in their calculus or sustainable human-environment relationships will continue to be an illusory objective. The lesson is that ecological theory is also a site of contestation. Do these examples imply ecological theory is irrelevant to debates over sustainability? Hardly, but ecological research, along with any other scientific undertaking, is embedded in larger systems of societal practices and values and thus subject to the same political-economic forces that subsume and warp other policy initiatives.¹³

Using 'ecological sustainability' as a policy and management guideline, while certainly problematic, is certainly preferable to a notion of 'sustainable development' wherein ecological concepts and their applications are mere afterthoughts. The former can be linked in concrete ways to more theoretically rich concepts such as adaptive management, biodiversity, ecological integrity, resilience and so on.¹⁴ The latter already represents nothing if not anathema and contradiction to many ecological scientists (Frazier, 1997). This further illustrates the main argument of the article. 'Sustainability', depending on its use and specificity, may be more adaptable in its application to human-environment relations than 'sustainable development', which despite its vacuity still connotes elitism, a policy orientation and a prioritization of economic growth over other social goals. Furthermore, if we accept the premises of a majority of ecological economists and ecological scientists that sustainable societies are predicated on the continued functioning of the ecosphere, and I argue we should, a thoroughly

debated notion of ecological sustainability should be coupled to discussions of social sustainability and the dialectics of social and ecological change. The idea of 'sustainable livelihoods' represents a step in this direction, one that may be particularly relevant to a majority of third-world inhabitants due to its over-riding emphasis on how people actually live in and interact with local environments.

VI Sustainable livelihoods

An explicit focus on the livelihoods of different societies' marginalized peoples offers a much needed palliative to the more ethereal, national-level discussions typical of sustainable development discourses. The broad goal of Chambers and Conway (1992), focusing on third-world rural regions, is to offer a practical methodology for assessing sustainability within the context of specific development scenarios.¹⁵ While admitting the occasional crudeness of their model, the authors develop a framework centered around the concept of sustainable livelihoods (SLs). A sustainable livelihood is one 'which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide . . . opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term' (Chambers and Conway, 1992: 7–8).

The first stage of the SLs model is an assumption that sustainability can only be analyzed with reference to an individual household's livelihood patterns and what constitutes 'a living' under specific environmental and socioeconomic circumstances. The second building block of the framework focuses on sustainability, which consists of both environmental ('the external impacts of livelihoods on other livelihoods') and social ('their internal capacity to withstand outside pressures') aspects. Environmental sustainability stresses the impacts that efforts to sustain livelihoods have on local ecologies, and how these impacts affect both the tangible and intangible assets of other people whose livelihoods, in one way or another, depend on those same local ecologies. Social sustainability, by contrast, refers to the ability of a human unit to achieve an 'adequate and decent livelihood' within a particular socioeconomic context (e.g., a rural village), and is made up of both reactive (coping with stresses) and proactive (adapting and creating) dimensions (Chambers and Conway, 1992: 12–14). Conceived in this fashion, the two components overlap to a significant degree and may be complementary or contradictory depending on people's specific actions. The third part of the SLs model emphasizes how to translate the abstract concepts of livelihoods and sustainability into practical actions. An initial step concerns 'valuing future livelihoods' (1992: 23); however, the authors are silent on the details of community decision-making that might bring about such a change. A perhaps more workable move involves enhancing livelihood intensity. The notion of livelihood intensity involves, initially, determining the capacity of poor rural communities to diversify resource uses and restore degraded land. In addition, operationalizing livelihood intensity demands recognizing the importance of nonfarm activities and the benefits of local circulation of goods and services (1992: 23–25).

Carrying the practical implications of the SLs model a step further, livelihood intensity may also be a useful criterion in assessing development projects and programs. An SLs-based metric could be used to appraise the impact of various

economic activities (e.g., logging, agro-industries) in terms of their impacts on livelihoods (Chambers, 1992: 226). Such a measure is the basis for the idea of net sustainable livelihoods, defined as 'the number of environmentally and socially sustainable livelihoods that provide an adequate living in a context less their negative effects on the benefits and sustainability of the totality of livelihoods elsewhere' (Chambers and Conway, 1992: 26). The authors assert that precise measures of sustainability under such a framework are impractical, and advocate the use of suggestive indicators of environmental and social sustainability coupled with analysis of the trends in these indicators. Salient indicators of environmental sustainability include soil erosion, deforestation and salinization. Trends that might indicate the negative effects of livelihood activities or a development project on other livelihoods include migration, indeterminate rights and access to land and ecologically detrimental nonfarm employment activities. Conversely, trends and indicators relevant to social sustainability include educational level and type, adequate health care and appropriate skills to attain a sustainable livelihood.

While the goal of operationalizing the concept of sustainability in its broadest sense may be a well intentioned fantasy (Norgaard, 1994: 19–20), the smaller scale at which sustainable livelihoods are cast allows at least a partial fleshing out of sustainability in practice. There are examples of the SLs framework being applied at other spatial scales. Izac and Swift (1994: 122) identify the 'community of the village agroecosystem' as the appropriate 'social and spatial unit of analysis' in sub-Saharan Africa for assessing sustainability, but make allowances for sustainability analyses directed at other spatial scales. These include the supraregional, regional, village/catchment, farming and cropping system levels, which are assumed to operate in hierarchical fashion where the dynamics of the larger system constrain and control the dynamics of subsystems.¹⁶

The SLs framework is thus far the most detailed discussion of how the abstract notion of sustainability might be operationalized in the context of the actual lives of people within third-world societies. This in itself takes the discussion far beyond the typical platitudes of sustainable development. Despite this advance, weaknesses in the SLs framework become evident at several points. These junctures include: identification of factors beyond (national and global political economies) and below (households, families) the community scale of analysis that are crucial in determining livelihood strategies; the related question of how power relationships that influence ecological sustainability are mediated through gender, class, ethnicity and other aspects of identity; the issue of the role of the state (both local and central) in obstructing or facilitating SLs; and how a more thorough integration of ecological science with social action might facilitate the long-term sustainability of livelihoods. In addition, many of the themes exhibit populist leanings without awareness of the dangers of essentialism and the potential disjuncture between local efforts and broader social movements (Peet and Watts, 1996: 25–27). Pragmatic aims notwithstanding, the individuals and communities forming much of the focus within SLs remain idealized and abstract.

In spite of these misgivings, perhaps the most important implication of SLs-based analyses is that assessing sustainability is possible, at least within the contours of its own epistemological and methodological frames of reference. However, the ability to make use of such research hinges on observing what people actually do in their struggles to carve out livelihoods. A focus on sustainable livelihoods is perhaps most powerful when it transcends day-to-day livelihood strategies and includes analysis of

communities undertaking environmental action to defend their access to and control over critical resources (Friedmann and Rangan, 1993). Indeed, the notion of sustainable livelihoods is a good example of how alternative strategies can challenge the dominant assumptions of development, in this case by prioritizing human needs and poverty alleviation (Adams, 1990: 201). It also moves debates over sustainability quite some distance from 'sustainable development' by centering the discussion on the actual strategies people employ to attain and protect livelihoods rather than on 'national' development strategies far removed from people's lived experiences.

VII Sustainability debates and human geography

As the preceding review and discussion make clear, there are compelling grounds for the claim that the theoretical underpinnings and pragmatic uses of sustainability are achieving increasing levels of sophistication within diverse fields. Ecological economics is challenging much of the ensconced wisdom of conventional economic theory and practice. Similarly, a novel paradigm and set of conceptual tools emerging from ecology are generating resource management strategies that problematize traditional methods of managing nature. Researchers in both fields are striving to insert a kind of 'sustainability thinking' into environmental policy at national and international levels. However, these efforts are hampered by questionable operational tools (e.g., resource markets, environmental valuation) in the case of ecological economics, and somewhat naive portrayals of how scientific knowledge is inserted into broader societal contexts in the case of the ecological sciences. This latter shortcoming is particularly apparent in efforts to influence environmental policy (e.g., the Sustainable Biosphere Initiative) that assume a politically neutral and unproblematic transfer of academic knowledge into policy apparatuses. In a different vein, exponents of the sustainable livelihoods framework are delineating concrete strategies for ways to make sustainability more relevant to the daily experiences of third-world communities. These would benefit from a broadening-out of analytical emphasis (e.g., the village or 'local community') to address social forces operating at larger spatial scales that may inhibit implementation of its precepts. All three strands of sustainability charted here have effectively departed from simplistic formulations of 'mainstream' sustainable development, yet leave considerable space for elaboration of their core ideas and investigation of their normative implications. Geographers are well positioned to take advantage of these gaps, but will need to address sustainability in a more forthright way.

There is no definitive nexus of discussion on sustainability within geography, nor is one intuitively necessary. Still, given the rancorous debates, official silences, volumes of policy reports and torrent of journal articles about sustainability within the past 15 years, a reasonable question for this journal might be – whither geography in these debates? I describe two possible responses, one sympathetic and one critical, to this basic question. These in turn provide the basis for brief examples of how geographical research – drawing on the strengths of geography's diversity of human–environment traditions – can buttress the ideas and claims of the strands of sustainability described previously.

1 'Sustainability' in human–environment geography

My sympathetic response to geographers' consistent absence from the sustainability bandwagon is that much of what goes on under the rubric of 'sustainability' has been and is being carried out by geographers of multiple stripes. All that is lacking is the ubiquitous label 'sustainable' or 'sustainability'. Geographers *are* contributing in salient ways to debates over sustainability, but are not as explicit in their focus on sustainability as researchers engaged with ecological economics, adaptive ecosystem management and sustainable livelihoods. In particular, geographers examining human–environment interactions through the analytical frames of nature–society relations and a broadly construed political ecology stand to reorientate debates over sustainability in several ways.

First, writers aligning themselves with the 'postmodern' or 'cultural' turn in human geography are addressing nature–society relations in ways that interrogate sustainability discourses and projects.¹⁷ There is a substantial and growing literature reviewing geographical and related work on diverse representations of the concept of nature, its social construction and the theoretical and political implications of culturally filtered understandings of nature (Castree, 1995; Demeritt, 1994; 1996; Gandy, 1996; Olwig, 1996; Gerber, 1997; Castree and Braun, 1998; Mathewson, 1998). At the risk of oversimplifying, the central focus of much of this work is on how *ideas* of nature are constantly reformulated, signified and used by different social agents to, on one hand, bolster claims of knowledge and power over other agents and attendant ecosystems or, on the other, defend access to and control over resources in the face of others' knowledge and power claims. For example, Willems-Braun (1997) traces the lingering and considerable effects of colonial discourses of 'nature' in the context of recent public debates and controversies over deforestation in British Columbia. To the extent that sustainability discourses presume to address a consensual, unproblematic conception of 'nature' – or interpret 'nature' solely from a rational scientific discourse focused on ecological interactions and 'resources' (as is the case with much of the work in the three strains reviewed above) – 'nature–society' geographers may deliver historically richer accounts of the ways that power loci latch on to ideas of 'nature', and hence 'sustainability', and influence social struggles and debates over the environment.

Secondly, geographers working in a broadly defined political ecology – ranging along a continuum that includes political-economic analyses, more ecology-orientated research and creative mixtures of the two¹⁸ – may be particularly adept at transcending some of the intractable tensions within sustainability debates. On one side of this spectrum, political-economic analyses of environmental transformation suggest that much of 'sustainability talk' is really about preserving a specific social order and the privileges of those who wield power most widely and effectively within that order (Harvey, 1996: 148). If the broader social order and economic context, capitalism itself, consists of an unsustainable set of practices (O'Connor, J., 1994), social or ecological 'pockets' of sustainability will be futile in the long run. These broader contexts and the social processes they represent help generate a 'politicized environment' wherein state development programs, economic decisions, environmental management and social movements must negotiate both political and ecological dynamics (Bryant and Bailey, 1997: 27–47). In the case of certain regions of China, state advocacy of the decollectivization and deregulation of agriculture has encouraged producers to undertake

socioeconomically risky and ecologically deleterious livelihood strategies (Muldavin, 1998). A more nuanced, theoretically enriched notion of the state figures prominently in the writings of other geographers. The history of environmental change and degradation in the forests of Burma cannot be understood without examining the central role of specific state agencies and the strictures they placed on access to forest resources by nonstate actors (Bryant, 1997). Similarly, environmental disputes over sustaining forest resources in north-central India are frequently contingent on how the state exercises property rights over or controls access to (an analytically and practically important distinction) these resources (Rangan, 1997).

Indeed, a telling shortcoming of the sustainability-orientated disciplines reviewed earlier has been their inability or refusal to grapple with the structural dimensions of human–environment relations (e.g., how states ‘work’ to regulate the environment, how economies are organized to exploit resources). However, recent calls to use the insights of political ecology, for instance from contributors to ecological economics (M’Gonigle, 1999), to interrogate the basic assumptions of sustainability thinking in these fields are reason for cautious optimism. Such a move may allow ecological economists, ecological scientists and analysts of the sustainable livelihoods school to expand their interpretations and prescriptions beyond a narrowly construed pragmatic approach to sustainability.

Residing closer to the ecological pole of the political–ecology continuum, there is a slate of recent work in human–environment geography – identified in terms of ‘environmental geography’ (Zimmerer, 1996: 15–25) or ‘hybrid research’ (Batterbury *et al.*, 1997) – that attempts to combine ecological theory and scientific understandings of environmental change with methodologies that capture how third-world communities experience and interpret environmental degradation. The results are historicized, ecologically informed explanations of socioecological transformations that provide a basis for, among other things, critiques of national development strategies and socioeconomically sensitive conservation approaches. For example, research that explicitly involves integrated analysis of both social and biophysical elements of a given development project or process can generate more effective strategies for addressing intractable environmental problems, such as those related to rapid land-use changes (Thomas and Sporton, 1997). The inclusion of local knowledges of specific landscapes might help reframe conventional environmental wisdoms related to livestock–deforestation relationships (Brower and Dennis, 1998) and the cause–effect chains of soil erosion (Forsyth, 1996; Preston *et al.*, 1997).

Some human–environment geographers have more overtly called attention to ‘sustainability’ as concept and policy directive and begun to situate their research in broader debates. For instance, community and resource-use sustainability among the indigenous pastoralists of northern Pakistan hinges on the relationship between the symbolic meanings attached to ecological resources and the instrumental uses of those resources (Butz, 1996). In South America, the presence of ‘islands of sustainability’ in the Andes demonstrates how some rural communities engage in fairly intensive forms of resource use in ways that are ecologically sustainable and socially inclusive (Bebbington, 1997). In general, work in cultural ecology adds significant degrees of refinement to the sustainable livelihoods framework by placing greater emphasis on humans as ecological agents and the role of cultural constructs in guiding human–environment interactions.¹⁹ Fairhead and Leach (1996) examine the evolution

of human–environment relations in a complex landscape of forest and savanna in West Africa. They demonstrate convincingly that the central conundrum of the region, ostensibly the encroachment of the savanna and concomitant deforestation, has since the initial erroneous judgments of French colonial policy-makers been founded on faulty interpretations of how human communities interact with ecosystems. Rather than prime contributors to forest loss, villages of the region are sites of multiple activities that have generated islands of forest amongst the savanna, islands which were previously thought to be vestiges of more expansive forested areas. In both the cultural ecology and political ecology traditions within human geography, there is a willingness to engage with social relations (in theory and practice), largely absent from sustainability debates in other fields, that so often underlie ecological deterioration.

Other geographers centrally concerned with sustainability are examining 'transformed environments' (Kates *et al.*, 1990) with the aim of developing a sophisticated and integrated approach to human–environment inter-relations. An apt example is the work of Kasperson *et al.* (1995) on 'environmentally critical regions' in comparative perspective. Within this project, environmental sustainability is embedded within a broader explanatory framework of environmental transformation that emphasizes fragility, sensitivity, resilience and vulnerability as key components of regional human–environment systems (e.g., the Amazon Basin, the Aral Sea, the Basin of Mexico). 'Sustainability' adds a crucial temporal component and refers to the structuring of human–environment relationships in ways 'that the environment can support the continuation of human-use systems, the level of human well-being, and the preservation of options for future generations over long time periods' (Kasperson *et al.*, 1995: 25). Thus, a 'sustainable' region falls at one end of a spectrum that describes regions as 'impoverished', 'endangered' and, finally, 'critical' (1995: 29). The critical regions project also recognizes the need to disaggregate the dynamics of environmental change within different regions and to clarify, for example, the well-being of different social groups and the societal responses to change at different spatial scales and by different management entities (1995: 30–32). Again, sustainability under this conception demands levels of contextuality and integration of social and natural-scientific knowledge rarely demonstrated in other approaches. Furthermore, sustainability is only one, albeit crucial, element among others within a larger conceptual environment that seeks to analyze the material transformations of regional landscapes, a difficult (as the authors freely admit) yet urgent task that identifies those regions where rapid intervention is necessary.

Finally, as argued in previous sections, ecological economics, the ecological sciences and the sustainable livelihoods framework tend to side step the power discrepancies embedded within social relations (e.g., among and within states, social actors, communities and households) which lie at the heart of many environment and development dilemmas. Conversely, human–environment geographers are exploring questions of power from several angles: how local environmental authorities mediate environmental conflicts through the use of paternalistic power relations (Solecki, 1996); how socioecological transformations in developmental contexts and the discourses that surround them are gendered in myriad ways (Carney, 1996; Wangari *et al.*, 1996; Schroeder, 1997);²⁰ and how systemic characteristics of state regulatory agencies contribute to the inequitable distribution of critical resources such as urban water supply (Swyngedouw, 1995). As further illustration, Cocklin and Blunden (1998)

delineate how 'sustainable management' of water is socially constructed by diverse social agents in the context of an irrigation project in Aotearoa/New Zealand, highlighting the state's use of legal apparatuses to enforce a regulatory framework that is being challenged by indigenous Maori actors who question the current framework's distribution of control over water. Other state-centered studies argue for a careful unpacking of government-trumpeted 'co-management' schemes among indigenous communities, local state agencies and central governments (Reed, 1995); more nuanced descriptions of the sources of institutional power and the pathways it follows allowing the state to exercise control over resource-use decisions (Robbins, 1998); and analyses of the contradictory functions of the state (e.g., economic growth versus public health) with regard to water resource management and responses to water pollution (Jackson, 1992).

2 Why not 'sustainability'?

Turning now to my critical response, geography's relative inattention to sustainability may derive in part from pre-existing and long-standing schisms within the discipline. The human-physical divide and its consequences (and possibilities) for study of the human-environment nexus, from within a variety of geographical perspectives, are well documented (Mikesell, 1974; London Group, 1983; Kates, 1987; Knight, 1992). Within human geography, the gaps between a quantitative space-society focus and more qualitative nature-society approach have held sway for decades, although a rapprochement may be taking place (Hanson, 1999). Another rift is highlighted by Porter's (1990: 1) still pertinent query over 'why radical geographers who have embraced social theory have an incompletely developed theory of environment and why those working in cultural ecology have been so slow to embrace and exploit the possibilities within social theory'. Human geographers at the forefront of incorporating new ecological knowledge into research on environmental change²¹ have less adequately responded to the challenges of social theory. Radical geographers, for their part, have plumbed the waters of social theory, or at least certain strains of social theory, yet have shied from ecological concepts that imply treatment of environmental contexts in complex ways. Thus some of the resistance to entering the fray over sustainability – which demands a melding of ecological and social thought – arguably stems from incomplete discussions within geography itself.²²

A second aspect of my critical response directs attention to the failure (or resistance) of much of academic geography to engage the policy-making processes which so frequently serve as filters for discourses of 'sustainable development' and 'sustainability'. A disenchantment with policy-making and governmental decision-makers is understandable given the slow pace of institutional change and the long history of social and environmental abuses in the third world carried out under the auspices of states and intergovernmental organizations. Radical geographers may react with distaste at the prospect of interaction with the very agents they perceive as heavily implicated in the reproduction of environmental degradation and social inequity. For others it is simply a matter of opportunity cost. The energy and time demanded of those entering policy arenas – whether to governmental committees, international development institutions, or local-level planning and resource management issues –

and being effective within those arenas come at the expense of other responsibilities.

Yet the dire character of socioecological transformations occurring at an ever more rapid pace in the third world and elsewhere requires some action. It may be incumbent for geographers seeking to 'make a difference' to engage in at least a 'provocative pragmatism' when it comes to applied research and 'how and what to transform and to which ends' (Emel, 1991: 389). Engagement with policy arenas need not require turning in one's radical or social theory credentials. For example, case studies of sustainable development 'in practice' in the UK demonstrate how critical policy analysis might help transcend the rhetoric of sustainability and proceed to concrete social actions for sustainable human–environment relationships (Owens, 1994; Munton, 1997; O'Riordan and Voisey, 1997). Yet a reasonable question at this point might be whether or not geographers, even those so inclined, are able to make their presence felt within more politically influential academic circles. Geographers' reactive posture toward movements in higher education and seeming inability effectively to promote the discipline's strengths in nature–society research have inhibited any movement beyond the lower rungs of the disciplinary ladder (Turner, 1989), although there are signs this may be changing (Turner, 1997; Liverman, 1999). This is particularly unfortunate in light of the fields and debates reviewed here (ecological economics, ecological sciences and sustainable livelihoods), all of which engage more deliberately with the policy-making process, yet lag behind, as I believe the above overview amply demonstrates, geographical work in comprehensively integrating social and ecological spheres of knowledge. The point is not that greater collective power within academic circles will magically confer 'prestige' upon geography and a voice in policy agendas, but that current sociopolitical conditions mean elite policy-makers tend to listen more closely to elite (and relatively noncontroversial) academics. It is within and around these rarefied forums where many debates over sustainability tend to reside.

VIII Conclusion

At times the various fields of human geography seem littered with the remains of unfinished projects, cast aside as the discipline's creative intellects constantly engage the new and the different. The human–environment project is far from finished and, whether we approve or not, sustainability has become its dominant trope. What I have tried to emphasize in the previous section is the breadth and specific character of work in human–environment geography that can and should represent prominent themes in debates over sustainability. With regard to the sustainability explosion as a whole, my argument might be best summarized as a plea to be mindful of the multiplicity of meanings and uses to which 'sustainability' is attached, a task that geographers are readily able to assume due to a long and diverse tradition of human–environment thinking. There is still much of value in the concept. At the very least, it forces us to think about what the future might look like. While for many it is not a very pleasant view, it remains a crucial task for geographers and nongeographers alike.

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Notes

1. Although I examine several works directed at first-world (northern) audiences, the article focuses primarily on sustainability as applied by researchers and policy-makers in third-world contexts. This is due, in part, to my own experiences and inclinations and to the third-world orientation of the historically linked ideas of 'sustainability' and 'development'. Obviously, the challenges of constructing sustainable environment-society relations lie before all peoples.

2. Writing on sustainability abounds. The academic debate, initially centered around the disciplines of ecology and economics, has exploded in recent years to include researchers in land-use planning, urban planning, gender studies, agricultural economics, sociology, geography, environmental history, political science, public affairs, philosophy and a host of disciplinary subgroups. Journals as diverse as *Ambio*, *Annual Review of Ecology and Systematics*, *Ecological Applications*, *Estics*, *Finance and Development*, *Futures*, *Society and Natural Resources*, *The Ecologist*, *Third World Planning Review* and *World Development* have in recent years devoted entire issues to sustainability. Sustainability may indeed be 'with us for all time' (O'Riordan, 1993: 37).

3. Most observers credit the *World conservation strategy* (IUCN/UNEP/WWF, 1980) for coining the term 'sustainable development' although earlier incarnations exist in, for example, the Cocoyoc Declaration of 1974 (O'Riordan, 1993). With publication of the World Commission on Environment and Development's *Our common future* and its frequently cited definition of what sustainability entails ('development that meets the needs of the present without compromising the means of future generations to meet their own needs') (WCED, 1987: 43), sustainable development became a central part of orthodox development discourse and a prime focus of debates over environment and development.

4. Characterizing current transformations of ecosystems as 'deterioration' is in itself a value-laden interpretation. To the extent that these transformations reduce livelihood security, spur social disruption and threaten ecological functions vital to human societies, I believe current transformations are decidedly negative. A less anthropocentric outlook would also point out the wholesale destruction of habitats and concomitant extinction of species attending a human-dominated biosphere.

5. See Klein (1996) for a useful history and analysis of interdisciplinarity.

6. See Park (1995) for a review of sustainable development geared toward physical geography. Much of what might be termed 'sustainability thinking' in human geography can be gleaned from the

'environmental management' series in *Progress in Human Geography* summarized by Mathewson (1998: 115–16).

7. See Munton (1997: 150) for this type of investigation. Munton seeks accountability on the part of the British state in its use of the sustainable development trope. Rather than jettison the concept altogether, he argues that 'it is more constructive to nourish the "staying power"' of sustainable development due to the 'urgent need to widen support at the local level'. Other authors also place faith in reformation of the sustainable development concept. Noting the revolutionary institutional changes that must accompany a transition to any semblance of a sustainable society, O'Riordan and Voisey (1997: 9–10) advocate a polyvalent definition of sustainable development that intertwines 'different strands' of the discourse to generate 'new institutional arrangements'.

8. Although its codification into a separate field of inquiry has occurred quite recently, the use of an ecological-economic perspective is not without precedents. Martinez-Alier (1987) describes a litany of thinkers over the past century that have assumed an ecological perspective in their analyses of economic phenomena.

9. Gale (1998) makes a similar observation regarding the 'blind spot' of ecological economics when it comes to questions of power relations.

10. McIntosh (1987: 327) wryly observes that ecology 'has been through a number of "new" ecologies that in their turn became "old" ecologies . . . '.

11. Ecological scientists employ 'functions' not in any teleological sense, but to connote 'workings' or 'processes' inherent to ecosystems.

12. The concept of biodiversity represents more than simply the number of species within a given ecosystem, but includes an array of organizational levels (genes, individuals, populations, landscapes) (Risser, 1995).

13. While its ramifications go far beyond the scope of the present work, the debate over population, consumption and sustainability is another relevant example. Numerous articles in the ecological journals posit population growth as *the* driving force in environmental deterioration worldwide (see Meffe *et al.* (1993) for a particularly polemical argument), effectively ignoring over almost 25 years of salient critiques of neo-Malthusian concepts (Harvey, 1974; Murdoch, 1980; Williams, 1995).

14. See Noss (1995) for discussion of a framework for operationalizing ecological integrity, and hence ecological sustainability, in a way that is sensitive to biophysical processes occurring at several spatial scales.

15. While the authors target their analysis on rural third-world populations, the framework is – with some necessary adjustments – applicable to both urban third-world and industrialized-society contexts. For, example, Pezzoli (1993) delineates a case study of environmental action among low-income communities in Mexico City using sustainable livelihoods as a conceptual starting point.

16. Crumley (1994: 12–13) advocates use of the concept of 'heterarchy' as more appropriate to scales of social organization because of its insistence that scales are not necessarily ranked according to area of coverage; smaller-scale processes can have profound effects on larger-scale processes.

17. See Barnett (1998) for discussion of the full range of diverse and complex set of arguments subsumed under the phrase 'cultural turn'. I raise the implications of what I term 'nature–society relations' only briefly. A detailed exposition of this challenging field of inquiry is beyond the scope of my present arguments. Some of this work already exists in the form of cogent reviews of what the 'postmodern turn' implies for how human geographers might rethink nature–society relations (see, in particular, Gandy (1996) and Gerber (1997)). Further, as much as I am convinced of its current interest among human geographers of diverse intellectual persuasions, I am not entirely persuaded of the dominance of the 'cultural turn' in human geography's engagement with human–environment relations, a claim made from some quarters. It is one among several ways that human geography might contribute to innovative interpretations of sustainability and engage with the debates highlighted within ecological economics, the ecological sciences and approaches to sustainable livelihoods.

18. This continuum should not be interpreted as easily traversible. It encompasses several distinct epistemological stances and methodological orientations (e.g., critical realism, pragmatism, Marxist social ecology) whose differences are far from being ironed out, although recent articles have explored

the implications of these differences for human geography and broached something of a middle ground (e.g., Emel, 1991; Proctor, 1998; Brown, 1999). Zimmerer (1996: 178) summarizes the political-ecology spectrum thus: 'Political ecology has adopted a dual set of epistemologies: on one hand it has used ecological concepts to understand the environmental impacts of human activities, while on the other hand human organization of those activities, their dynamics, and their origins have been primarily the prerogative of the political economy perspective.'

19. I here do serious injustice to the work of cultural ecologists within geography, who arguably have placed concerns over the sustainability of human-environment relations at the center of their work for decades (Zimmerer, 1996: 167-71). My aim is to examine a broader cross-section of human-environment geography.

20. Some of the most trenchant critiques of 'sustainable development' have emerged from a variety of feminist perspectives that examine the multiple intersections of gender, environment, power and development within debates over sustainability. See edited volumes by Shiva (1993), Harcourt (1994) and Rocheleau *et al.* (1996) for salient examples.

21. See Zimmerer (1994) for a cogent historical overview of this work, and Simmons (1995) for a somewhat different perspective on 'green geography'.

22. Proctor (1998) sees a way forward for geographers wishing to span these divides by drawing on the relative conceptual strengths of conceptual realism and pragmatism.

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