From a 'Sociology of Nature' to Environmental Sociology: Beyond Social Construction[1]

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ABSTRACT: This paper aims to provide some theoretical starting points for constructing a social science approach to environmental issues which goes beyond narrower forms of constructivism without dismissing the importance of interpretative sociology. An ecological understanding of society is compared with the notion of structuration and integrated into the concept of coevolution in order to shed light on the dynamic nature of socioenvironmental relations and move beyond the constructivist/realist dualism.

KEYWORDS: Coevolution, social construction, socioenvironmental relations, structuration

INTRODUCTION

In a recent paper, Macnaghten and Urry (1995) view sociology (and, by implication, other more qualitative social sciences) as the victim of its own need to demarcate 'social' territory from the natural sciences. Redclift and Benton (1994) have similarly argued that the nineteenth century inheritance had demarcated a social domain, and form of interpretation, distinct from the theoretical traditions of positivism, on the one hand, and evolutionary models, on the other.

> The all-pervasive influence of biological thinking at that time was countered ... by an insistence on human distinctiveness... Culture, meaning, consciousness, and intentional agency differentiated the human from the animal... [T]he opposition between nature and culture ... undercut what were widely seen as the unacceptable moral and political implications of biological determinism. (Redclift and Benton, 1994: 3)

This has left discussion of 'the environment' in a rather ambivalent position: on the one hand it is as much a cultural product as any other, but on the other hand,

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the rejection of biological determinism and evolutionary theories has distanced sociological analysis from nature. Macnaghten and Urry feel that this distancing of social science from nature has resulted in a response to '…impacts and implications of environmental problems, which have been initially and accurately described by the natural scientists – a kind of "Biology First" model'. In their view '...instrumentalist disciplines have been favoured, while there is little evidence of an emerging contribution from sociology to problems of global environmental change' (1995: 204).

This paper offers a way out of the impasse between the narrower forms of constructivism, to which some sociology seems prone, and the more objectivist (or realist) approaches to environmental problems which frequently play down the contributions of a more humanistic interpretative sociology. The ideas of co-evolution and structuration, derived from Norgaard (1984) and Giddens (1984) respectively, are suggested as offering very promising conceptual devices for overcoming the constructivist/realist dualism.

By developing these ideas we suggest that the material foundations of human interaction with the environment are afforded credit, without compromising a more reflexive account of human consciousness, and one which recognises the importance of human agency.

Currently, the technocist supremacy of most environmental research provides examples of the challenge to our approach. To take one example: of the forty-eight research projects recently approved under the *Human Dimensions of Global Environmental Change* component of the European Commission's Fourth Framework Programme, only a handful are not technocentric and managerialist in nature. The dominant concerns reflected in most environmental research programmes in Europe today, are those favoured by the 'instrumentalist disciplines' (economics, planning, geography, management and information sciences). They can be identified in notions such as 'ecological modernisation', 'life cycle analysis', 'integrated environmental assessment', 'environmental accounting' and the 'analysis of climate regimes'. These phrases are devoid of both cultural reference and historical context.

It is not difficult to provide a social constructionist analysis of these policy agendas themselves, and such an analysis would be interesting. According to Hannigan (1995), sociological interest in environmental problems concerns the *way issues are problematised* and the *social authority of different claims about the environment*. In a trenchant defence of the constructionist agenda he writes:

> ... environmental problems do not materialise by themselves; rather they must be 'constructed' by individuals or organisations who define pollution or some other objective condition as worrisome and seek to do something about it. *In this regard, environmental problems are not very different from other social problems such as child abuse, homelessness, juvenile crime or AIDS.* From a sociological point of view, the chief task here is to understand why certain conditions come to be perceived as

> problematic, and how those who register their 'claim' command political attention in their quest to do something positive. (1995: 2, emphasis added)

Hannigan goes on to complain about the condition to which sociologists are reduced by the critical distance they practice in their research, saying, '...unfortunately, sociologists far too often end up as "underlabourers" in this endeavour, being viewed as supporting actors in a cast dominated by natural scientists and environmental policy-makers' (Hannigan, 1995: 2). But, if sociologists feel excluded by the policy/research agenda, a problem posed by both Hannigan and Macnaghten and Urry, to what extent is this a problem of their own making?

Lutzenhiser (1994), in an interesting account from a rather different perspective, argues that 'supporting actors' show a remarkable penchant for taking centre stage in their own productions:

> Just as natural science approaches tend to exclude human behaviour, so ... sociological perspectives tend to exclude the physical and environmental from their accounts of social change... [J]ust as traditional sociological self-understandings are uneasy with 'technical' and 'biological' topics, we can now add emergent interpretivist perspectives that *see natural environments largely as social constructions – nature as a potentially important social variable risks becoming mere nature as socially variable*. (1994: 71, emphasis added)

Lutzenhiser comments that there is nothing to prevent social scientists taking up issues surrounding environmental change, and making them their own, rather than being driven more or less passively by the natural science research agenda. There are some useful examples of this beginning to happen, and many more in which the gauntlet has been thrown down, if not yet picked up (Fischer-Kowalski 1994, Martinez-Alier 1987, Daly 1992, Ayres and Simonis 1994).

The limitations of the social constructionist approach are also clear to some anthropologists. Tim Ingold (1992) subjects theories based on cultural representations to careful scrutiny. '[I]t is supposed that persons can neither know nor act upon their environments directly, but only indirectly through the medium of their cultural representations. This supposition rests upon a cognitivist account of perception whose roots lie deep in the western dualist world view' (1992: 40). Referring to the strong tradition of ecological anthropology, represented by Geertz, Steward and others, Ingold notes that, 'as meaning-making animals, humans impose their symbolically constituted designs upon the external world. If all meaning is thus culturally constructed, then the environment on which it is imposed must originally be *empty of significance*' (1992: 3, emphasis added). He goes on to suggest that 'cultural construction of the environment *is not so much a prelude to practical action as an (optional) epilogue*' (Ingold 1992: 52, emphasis added). The point is that human activity is dependent on the existence of the environment, and acts upon it. There is no initial process through which culture filters sense data from the environment. Like Marx, Ingold is arguing for

the materiality of environmental experience, without which culture itself cannot exist.

Finally, let us turn to environmental history, itself a fast-growing field of knowledge and interpretation, which one might expect to be most susceptible to social constructionist thinking (Redclift 1995).

> Concepts of nature are always cultural statements. This may not strike Europeans as much of an insight, for Europe's landscape is so much of a blend. But in the new worlds – 'new' at least to Europeans – the distinction appeared much clearer ... Hence the fond conceit of primeval nature untrammelled by human associations which could later find expression in a reverence for wilderness. (Beinart and Coates 1995: 3)

It is interesting that Beinart and Coates do not leave the matter there, in the constructionist waiting-room, so to speak. They go on to argue that the 'context for ecological interactions has increasingly been set by humanity. *We may not determine how or what a lion eats, but we certainly can regulate where the lion feeds*' (1995: 3, emphasis added).

This view represents a recognition that the environment is not merely represented through social construction, in language or symbolically. It is also the creation of human activity, human behaviour affects the *environment*, leading us to consider *not only the claims that are made against nature, but also the material transformation of nature*.

In one sense all discussion of sustainability, including environmental sustainability (Goodland 1995), is socially constructed. Ecological principles themselves are part of science, and science in turn is part of human culture. The idea of environmental sustainability is part of the social construction of modern science. In this sense our treatment of constructivist approaches might appear rather narrow. However, in focusing upon the limitations of a constructivist stance we are deliberately setting out to distance ourselves from a variety of sociological positions ('strong' and 'weak' constructivism) with the objective of clarifying the essence of the constructivist case.

In another sense, though, recent debates about sustainability, and sustainable development, have come to reflect more specific intellectual and political concerns. As the policy agenda has served to incorporate the idea of sustainable development into the mainstream, so the idea of social construction has been invoked, to distance the analysis of environmental problems from the problems themselves. There are clear advantages in such an approach: it draws on well established sociological perspectives; it can enable social scientists to distance themselves from the material world as an object of enquiry; and it does not require familiarity with scientific evidence or models. At the same time, social construction alone may be unequal to the challenge presented by sustainability, at the very moment when it could be most useful.

BEYOND THE BOUNDS OF SOCIAL CONSTRUCTION

Much of the argument hitherto has been concerned with the limitations which social constructionism places on the explanatory possibilities of environmental social science. Nevertheless, in expressing our concern about the restricted agenda of constructivist sociology we would not wish to move to the alternative extreme of biological determinism. We suggest a more balanced view of the relationship between society and its underlying material or natural conditions. We must move beyond the position where nature is viewed as *either* the material conditions of our existence, *or* as no more than a set of culturally generated symbols. We must begin to accept nature as both.

Binary oppositions characterise much social science: constructivist/objectivist; relativist/realist; cognative/material; subject/object; authoritative resources/allocative resources. They represent duality as well as dualisms, the point being that each side of the equation implies the other, the existence of one demands the presence of the other. If there were no physical environment, we would not be able to construct it socially and social construction has two clearly distinguishable elements. We are both materially and symbolically creative and destructive; we refashion our environments physically *as well as* cognitively.

The debate between realists and relativists has a long history in the field of environmental sociology in the United States of America. While it might be argued that the approaches represented by Dunlap and Buttel are developed in a rather more sophisticated form in the European discourse, we turn our attention to the U.S. debate due to its explicit focus on environmental sociology. Advocates of the realist position such as Catton and Dunlap (Catton and Dunlap 1978a, 1978b, 1980, Dunlap and Catton 1979 and 1994) are uneasy with the relativism and constructivism of many European and American scholars (Buttel 1987, 1993 and 1994, Beck 1992, Wynne 1994, Yearly 1994, Buttel, Hawkins and Power, 1990 and Buttel and Taylor, 1992) for a number of reasons.

Like us, they are concerned that, in concentrating its efforts on the analysis of competing claims concerning the validity of environmental change, sociology should not abdicate responsibility for analysing the human dimensions of environmental change to those with little expertise in the field of social behaviour. They suggest that modest but growing shifts in funding from 'production science' to 'impact science' (Schnaiberg, 1980) support the 'reality' of environmental change despite the challenges to this perspective issuing from vested interests. Be this as it may, they are highly critical of the extreme relativist position, which they maintain 'proves inherently conservative: if all truth claims have validity, then there is no basis for endorsing some over others, and thus no basis for becoming proactive' (Dunlap and Catton, 1994: 22).

They also emphasise the fact that the act of deconstruction does not render the environment any less real. In one sense everything *is* socially constructed and there is no pre-social moment. At the same time, however, we can neither gain

biological sustenance from, nor be physically injured by, disembodied social constructions.

Those adopting the constructivist approach are also critical of the realists, however. Their worries concern the lack of analysis of 'how environmental knowledge is appropriated, "constructed", and deployed' by different stakeholders in the environmental debate. As Buttel (1994: 5) puts it, '[t]hat environmental knowledge is not simply a mirror of the natural world is an important sociological observation'.

Thus, while in the spirit of relativism we need to acknowledge the provisional nature of our models and be prepared to accept that they may not provide a good reflection of what 'reality' is actually like (Simmons, 1993), we must nonetheless engage with the material conditions of our existence if we are to assess human impact on biophysical environments and the way in which environments and environmental change condition the structure and development of society. This paper seeks to relate this concern for the material conditions of our existence to the *impasse* created by constructionism.

As human beings we are 'unavoidably organically embodied and ecologically embedded' (Benton in Redclift and Benton 1994: 41) such that our intellectual needs coevolve with our physical needs. At the same time, however, we are uniquely equipped to regulate and refashion the environment in ways that make it more suited to our requirements. Thus, there is no single way in which we, as human beings, relate to external nature. Acceptance of the complex, interactive character of social and environmental change, means that simple distinctions between 'social' and 'natural' soon become untenable. The difficulty in making a distinction is illustrated if we consider that society, including social constructionism, can itself be approached from an ecological perspective.

SOCIETY AND ENVIRONMENT IN ECOLOGICAL PERSPECTIVE

The field of ecology encompasses two broad areas of interest. The first identifies and models the relationships between various physical and biological elements of given ecosystems; this is systems ecology. The second, evolutionary ecology, focuses attention on processes of change. So long as we remain cognisant of the distinctiveness of the human species, both bodies of knowledge can provide us with useful metaphors for constructing a framework which will enable us to engage in the environmental debate and, by pointing to some underlying similarities between socio-cultural and biologically determinist perspectives, move beyond the wider forms of constructivism alluded to above.

There are many definitions of ecosystems, Gliessman (1990: 5) refers to them as systems of 'relations between living organisms and their environment, delimited by arbitrarily chosen boundaries, which in space and time appear to maintain a steady yet dynamic equilibrium'. The relationships between organ-

isms may take a variety of forms ranging from outright competition (territorial disputes and predator/prey relationships for example) to various forms of cooperation (as displayed between individuals of social species and also between different species – certain species of ant 'farm' and protect particular aphid species, for example).

Recent research on agriculture and agrarian development (Altieri 1987, Conway 1985 and 1987, Gliessman, 1990, Woodgate, 1992 *inter alia*) has made extensive use of the concept of 'agroecosystem' to denote the difference between natural ecosystems and those that have been modified for the production of food, fibre and other agricultural products. The agroecosystem represents the productive interface between nature and society and, as such, provides the operational context within which to analyse the various factors which condition agricultural activities and agrarian societies. They also serve as objects of analysis because their characteristics result from human manipulation of natural ecosystems (Woodgate 1992). Equally, we might talk of urban ecosystems or industrial ecosystems and use such constructs to investigate societal impact on the environment and environmental impacts on society.

Once an ecosystem has been transformed by human activities it is assigned functions relating to the fulfilment of human needs concerning places to live and work, the supply of raw materials and the assimilation of wastes.[2] Whether a farmer's field or a town centre shopping precinct, the maintenance of transformed systems requires that many ecological processes are overlaid and regulated by socioeconomic processes of production, subsidy, control and marketing. As Conway (1987: 96) puts it, '[r]ecognisable goals become apparent that are sought through human social and economic co-operation and competition'. This gives the boundaries of transformed systems obvious socioeconomic dimensions.

Thus, once an ecosystem is transformed by human agency, the original equilibrium and resilience are altered and replaced by something which reflects a combination of ecological and socioeconomic constraints and opportunities.

> The challenge... then, is to find a research approach that consciously reflects the nature of [productive activities] as the coevolution between culture and environment, both in the past and the present. The concept of the agroecosystem can (and should) be expanded, restricted, or altered as a response to the dynamic relationships between human cultures and their physical, biological, and social environments. An understanding of this relationship provides a framework in which inputs, outputs, and sustainable production processes can be maintained. (Gliessman, 1990: 8)

The value of approaches which acknowledge the transformative power of human intervention is illustrated by studies of 'industrial metabolism', which highlight the extent to which human economic activities alter natural flows of energy and materials while, at the same time, underlining many of the similarities between 'natural' and human systems.

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INDUSTRIAL METABOLISM AND SOCIETY

The United Nations University programme on the *Human and Policy Dimensions of Global Change* has led to the recent publication of *Industrial Metabolism: restructuring for sustainable development*, a volume edited by Robert Ayres and Udo Simonis. The notion of 'industrial metabolism' refers to 'the set of physico-chemical transformations that convert raw materials (biomass, fuels, minerals, metals) into manufactured products and structures (i.e. 'goods') and wastes' (Ayres and Simonis, 1994: ix). It extends the ecological analogy and provides concepts with which to furnish the framework and analyse the environmental impact of our getting and spending activities.

In this context, Husar (1994) spells out the need to identify the key players and driving forces behind industrial metabolism. According to Husar, the cycling of materials in natural ecosystems is achieved by various organisms acting as producers, consumers and decomposers or recyclers. Within such ecosystems most materials are transferred directly from producers to recyclers (plants to bacteria); only a small proportion of the matter is mobilised via consumers (animals). In turn, the recycling agents pass most of the materials back to the producers for re-use. Thus, in terms of material flows, natural ecosystems can be described as 'closed' systems.

In the transformed systems of modern society, on the other hand, the flow of materials is mainly from producers to consumers and thence to the external environment; there are very few human recyclers. The industrial system is largely 'open', with only a small fraction of production resulting from recycled inputs.

Further, we can note that, in nature, very little energy is consumed in transporting materials between producers, consumers and recyclers. They exist in close proximity, which also enables reasonably fast mutual adjustment if the system is disturbed. The reverse is true of modern society, where consumers of industrial products want to be physically separated from the producers; especially since industrial production processes are often decidedly unpleasant!

Although the industrial metabolism model fails to address the spatial redistribution of materials in this initial format, Husar elaborates what he calls the 'environmental spheres analogue' – atmosphere, hydrosphere, lithosphere and biosphere – which allows the closing of the system by accounting for the flow and fate of matter regardless of location or medium of transfer. This helps us to think of the chemical form and location of any substance at any time. Together, models like these allow us to analyse data, such as those published by the UK Department of the Environment (1996), in terms of the key players and driving forces behind environmental change.

Allen (1994: 79) suggests that the basic reductionist perspective of traditional science is 'inappropriate for understanding the emergence and evolution of living systems and has therefore tended to alienate us from nature'. His own

understanding of evolution is that of a non-linear, and thus inherently unpredictable, process.

Over time, nature throws up a multiplicity of variations in both the physical and the biological elements of ecosystems; like human beings, ecosystems are always 'inventive'. However, when complex, non-linear systems are modelled, their structure only changes at certain moments in time: evolution is characterised by phases of apparent stability and others of rapid change. This suggests that change in biological systems occurs as a result of new or non-average patterns of behaviour encountering some form of positive feedback, that leads to their amplification and self-reinforcement.

Paradoxically, when conventional, mechanical, linear models are employed in predicting the future, the very factors that are important in creating that future, the variations around the norm, are ignored. 'The organising principle that underlies sustainable systems is the presence, the maintenance, and the production of microscopic diversity in the system! ... *Ecological structure results from the working of the evolutionary process, and this in turn results from the nature of ecological structure*' (Allen, 1994: 86, emphasis added). This explanation of the relationship between ecological structure and natural evolution seems to echo Giddens' understanding of the link between social structures and change, when he states that social '...structures are both the medium and the outcome of the practices that constitute the system' (Giddens, 1979: 69). In this respect the similarities between 'natural' and human systems appear at least as important as the differences.

Giddens concept of 'structuration' (c.f. Giddens 1984) can be further illuminated by recourse to the concept of 'possibility space', which Allen employs in his explication of what he calls the 'ecological structuring of human activity'. Possibility space represents a multidimentional physical and cognitive space in which there is potential for new options and technologies to arise. It is 'explored' when human individual and group activity is influenced by new knowledge and ideas or information and perceptions concerning the behaviour of others and the nature of environments.

Allen writes that '[i]n the real world, competitors, allies, clients, technologies, raw materials, costs, and skills all change. Any group or firm that fixed its behaviour would sooner or later be eliminated, having no adaptive or learning capacity with which to respond'. The structure of human societies can thus best be understood as a '*temporary balance between exploration and constraint*' (Allen 1994: 89, emphasis added). Here, Allen's ecological understanding of structure reflects Giddens' (1979) assertion that structures both enable and constrain human agency. Ingold (1992) is referring to a similar model when he argues that 'the dialectics of the interface between persons and environment should be understood in terms of a dichotomy between effectivities and affordances – *between the action capabilities of subjects and the possibilities for action offered by objects*' (Ingold 1992: 51-52, emphasis added).

When an element within a system does change, it is not necessarily 'good' for the system as a whole, it only requires the presence of positive feedback mechanisms in its immediate vicinity. A corollary of this observation is the notion that as systems (whether social or natural) become larger and more complex, so the emphasis of adaptation switches from changes that succeed in dealing with the external world to those that respond to internal conditions. In modern society we are confronted by, and respond to, 'natures' constructed (both physically and cognitively) by other social actors, more often than to 'natures' which we experience reflexively, and at first hand.

This understanding of the development of complex systems might also account for the experience of human alienation from nature: as economy, society and social constructions of nature become more complex, we lose sight of, and our affinity with, the external world. This suggests that culture might have as much to do with isolation from external change agents as it has with adaptation to local conditions. For example, our response to the threat posed by nuclear installations is not on the basis of our direct experience of it, but of the way this threat is constructed socially. The development of modern industrial society, especially during most of the twentieth century, has been conditioned more by the social than the natural context. Nevertheless, as ever more frequent 'environmental crises' clearly imply, it is unlikely that we can ever escape the influence of our external environment for more than a brief historical moment. It is our contention that not only do social and natural systems have much in common, but some of their characteristics (variation, uncertainty and 'chaos') are important elements in a more complete understanding of our relationships with the environment.

THE COEVOLUTION OF SOCIAL AND ENVIRONMENTAL SYSTEMS

O'Riordan and Turner (1983) suggest that environmental destructiveness is not an innate human characteristic but a product of the nature of an economy and its pattern of social relations, coupled with stresses created either by changing socioenvironmental relationships or interaction with new ideologies, for example when one culture comes into contact with another. Burch (in O'Riordan and Turner, 1983: 303-304) argues that '[l]inked to the fact that nature and history play their own games of change, which compel adaptation by man, is the fact that man is not recently an ecological modifier'. He also asserts that the lessons to be learnt from the 'ecological failures of ancient civilisations ... are society specific and not species specific'. He suggests that by using broad stretches of time scale we might see something like major cycles of natural change which compel significant changes in human social systems and, vice versa, major changes in social systems which precipitate major changes in natural ecosystems.

This idea gains theoretical clarity when viewed from the perspective of Richard Norgaard's (1984) concept of 'coevolution'. Norgaard's work empha-

sises how people's '...activities modify the ecosystem and how the ecosystem's responses provide cause for subsequent individual action and social organisation'. The conceptualisation of resources as occurring within natural systems is an important key to understanding nature/society relationships. From this stand-point it is possible to focus on the idea that specific production relations not only exist between different groups within specific societies, but also between the social system and the natural system; what we might call socioenvironmental relations (Woodgate, 1992). In addition, the complexity of urban, industrial societies adds new dimensions to the 'resource' issue – such as those of lifestyles, consumption and the 'identity' conveyed by possessions (Redclift 1996). As we have already noted, the transition from natural ecosystems to anthropogenically transformed systems involves the transfer of certain physical maintenance and feedback functions from the ecosystem to the social system. It also involves a refashioning of the meanings attached to, and the use to which, material objects are put, and their role in global systems of market exchange. (Redclift 1996).

Over time, coevolution between society and nature has resulted, not only in increasingly complex socioenvironmental relations but also in more sophisticated social organisation. The increasing complexity of social structures lengthens the chain of connection between society and nature so that the sustainability of highly developed societies becomes dependent not only on the maintenance of linkages between society and nature but also those between social actors and institutions. Limitations of space prevent the further development of this line of argument. However, it might be summarised by saying that sustainability as a policy goal (rather than as a characteristic of some ecological systems) means maintaining the links between the individuals and institutions which condition the natural, economic and policy environments. It is these environments, which provide the backdrop to social action and that influence both the development of social choices and environmental possibilities and constraints.

We have already noted some obvious links between this ecological model and Giddensian social theory. Figure 1 presents a simple heuristic device which represents coevolution as feedback between nature and society; 'an interactive synthesis of both natural and social mechanisms of change' (Woodgate, 1992: 87). We should remind ourselves at this point that, just as we have discussed the notion that evolution occurs both as the result of numerous small changes over time, or in sudden intense episodes, so structuration and coevolution occur both gradually over time (reform) and in relatively short and intense episodes (revolution). Equally, structuration and coevolutionary episodes, just like processes of evolution, are often place-based: they occur in specific locales. Thus the coevolutionary 'pressure' experienced by society can vary in intensity and derives both from changes in nature and from interfacing with other actors responding to change perceived within their own social 'spaces'.

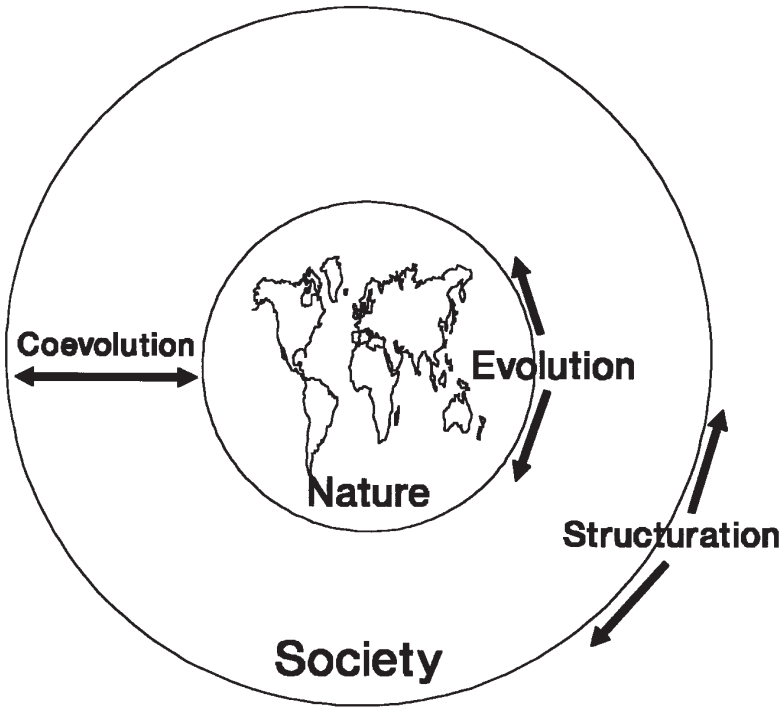

FIGURE 1. Coevolution between nature and society. Source: Woodgate, 1992: 86.

THE ENVIRONMENT AND SOCIAL 'SPACES'

In order to conceptualise the constructivist aspects of coevolution we can draw upon, amongst others, the actor-oriented approach developed by Norman Long and colleagues (Long and Long, 1992). Long et al. suggest that, in the field of development sociology,

> an actor oriented approach requires a full analysis of the ways in which different social actors manage and interpret [different] elements in their life-worlds, an understanding of the organising, strategic and interpretative elements involved and a deconstruction of conventional notions of planned intervention. *Rather than viewing intervention as the implementation of a plan for action, it should be visualised as an ongoing transformational process in which different actor interests and struggles are located.* Integral to this type of approach are two other crucial aspects: an understanding of the processes by which knowledge is negotiated and jointly created through various types of social encounter, and an understanding of the power dynamics involved. (Long et al., 1992: 9, emphasis added)

In our judgement this approach need not be divorced from the environmental system itself, but represents a serious imbalance, most marked in sociology, in the way that the environment is primarily viewed through the lens of social consciousness, at some cost to an understanding of the links between ecology and culture.

In this paper it is suggested that the ecological and social systems within which individual livelihoods are situated are understood differently by various individuals and institutions (women and men, households, government agencies, industry, etc.) that are involved in the quest for 'development'. The social spaces or life-worlds created and experienced by each of these different actors are characterised by specific sets of material and symbolic social relations, which define their structures, and can be located in terms of time-space boundaries. When actors from different social spaces interface, the meaning and value of livelihood elements (whether social or natural) and activities must be negotiated in order that a shared understanding of the particular scenario can be achieved. This involves processes of knowledge transfer, and transformation, and thus the social construction and reconstruction of socioenvironmental spaces.

We can incorporate an actor-oriented analysis within the coevolutionary framework, and investigate the similarities and contrasts between the meanings and values that are attached to social and environmental phenomena by different individuals within various social spaces. In this way we might improve our understanding of the reasons why so many policy interventions fail adequately to address the social and environmental difficulties experienced by those whom they seek to assist. In this way, as Figure 2 seeks to portray, we have attempted to incorporate the insights to be gained from constructivism within the coevolutionary model.

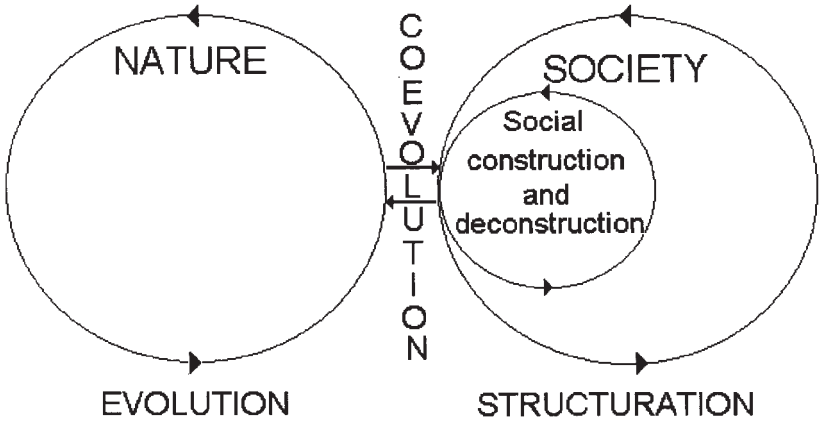

FIGURE 2. Coevolution and social construction.

The model that we have outlined remains a provisional construct of socioenvironmental dynamics, which rests on the acknowledgement of both environmental and social system adaptation. Having emphasised the material aspects of human existence, we can now outline what we consider to be some of the more important concerns of the environmental sociology agenda.

MODERNITY FROM A COEVOLUTIONARY PERSPECTIVE

Let us take our model of coevolution then and use it to examine the process of modernisation. Figure 3 portrays a stylised model of energy and material flows in the industrialisation process. The model indicates that development is constrained by energy availability. The ultimate source of energy is the sun, which produces immediately available energy in the form of radiation, wind and the water cycle, and stored energy in the form of plant biomass. This stored energy may either be consumed directly, in the form of food and fuel or, over time, may be concentrated in the form of fossil hydrocarbons. In total, however, there exists a finite amount of incoming solar radiation.

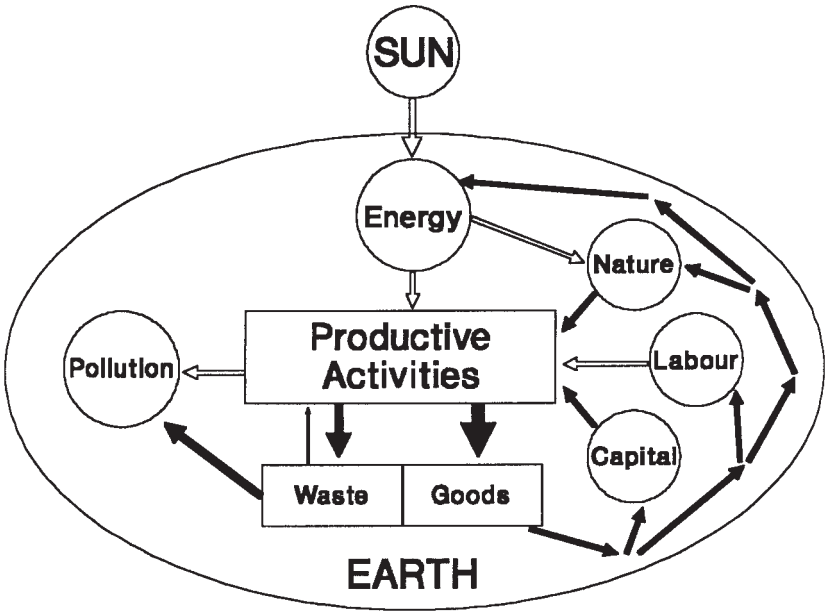

FIGURE 3. Energy and materials in the industrialisation process. Adapted from IUCN, WWF & UNEP, 1991.

The key element in the resourcing of industrial society has been the use of fossil fuels. In this sense what Norgaard (1994) terms 'hydrocarbon society' represents one of the building blocks of modernity itself. If we consider the industrial development process from its roots in the scientific revolution, we can also conceive of the way in which medieval cosmology was gradually overturned to make way for a mechanistic model of nature, the elements and mechanisms of which could be understood and mastered by science.

The initial harnessing of steam power, the invention of the internal combustion engine and the realisation of their productive potential, led to accelerated exploration, extraction and refinement of fossil hydrocarbons, as highly concentrated fuels to power the process of industrial development. And yet this historical contingency – which lies at the very heart of much sociological thinking about urban, industrial society – has rarely been problematised by sociology itself. It has been left to social and cultural critics like Raymond Williams (1981) and Edward Said (1993) to explore.

Over the course of the nineteenth and twentieth centuries these stock resources were developed (and thereby, of course, depleted) in preference to renewable sources of energy such as wind and water. It was not only particular sources of energy which received preferential attention in the course of industrial development, however: the destination of material goods produced by industry was also tightly focused. Fossil fuels were used to power industries which produced capital goods (technology) which, in turn, required more fossil fuels to power them and produce more capital goods, thus creating a spiralling demand for energy. In short, industrial society has one of its most important bases in fuels which, in terms of human time spans, are strictly limited in supply (Redclift and Woodgate in Redclift and Benton, 1994).

Returning to the model in Figure 3, we can trace the energy pathway from the sun to available energy on the earth to be utilised in productive activities. Production combines nature, labour and capital in the production process to produce material goods with associated material waste. Under the industrial model of development, while waste material and energy contribute to pollution, the cost of which is borne by both nature and society, material goods (the intentional products of industry) are channelled into the reproduction of capital and the reinforcement of technocratic ideology. This is undertaken through investment in scientific and technological education, while the maintenance of natural services and products is virtually ignored (Redclift and Woodgate, 1993).

From this perspective, it is suggested that industrial development, based on non-renewable fossil energy, the degradation of natural systems, and the destruction of both cultural and biodiversity, represents a coevolutionary *cul-de-sac*. Hydrocarbon society appropriates, substitutes, devalues and ultimately destroys nature. Since the Industrial Revolution in the eighteenth century, social development has been based on unsustainable technologies and energy sources.

Population growth and material consumption have developed within this context while, at the same time, providing positive feedback to the development of industrialism.

We have attempted to link this ecological understanding with more mainstream sociological thought and shown that, in this sense, the human condition bears comparison with that of other species. In examining links between nature and society we acknowledge that structure arises out of agency as well as providing its context (what Giddens calls the 'duality of structure'). This same idea relates closely to Allen's ecological model of the evolution of human activity, especially when we introduce the notion of unintended consequences of human action and the idea that they lead us into what Grove-White has called 'blind commitments' (cited in Redclift and Woodgate, 1993).

According to Grove-White, blind commitments are a central characteristic of modern, complex societies. The concept refers to the notion that industrial society has become embedded in large-scale technological commitments without any explicit assessment of their social or environmental implications or recourse to public decision-making regarding adoption: a process of 'technology as legislation'. The speed and nature of the social and environmental changes which result from these blind commitments are 'more and more rapid and, for the first time in human history, inescapable ... Some of the most decisive and encompassing features of contemporary existence arise in these ways and, for the most part, we simply have to defer to them' (cited in Redclift and Woodgate, 1993, Unit 15, p.3). But, if the human condition is so similar to that of other species, how can we explore wider human commitments and their environmental implications in the future?

The answer is simple, evolution in natural systems occurs over long time periods with many local catastrophes and extinctions. The power we have tapped in our hydrocarbon society has allowed us temporary but insufficient respite from the exigencies of the ultimate realities of, not only blind, but unsustainable social commitments. These have resulted in the development of an industrial metabolism that accounts for the majority of the planetary mobilisation of the major nutrients (with the possible exception of nitrogen) and also for the majority of toxic, heavy metals (Ayres in Ayres and Simonis, 1994).

Allen comments that, 'what mankind must do now is to attempt to substitute reflection and anticipation for the actual experience of catastrophe. ... Instead of regarding human progress as following some steady path towards a better quality of life [, culture and] ... relationship with the natural world, we see ... change driven by the *values of an internal game*, ... lead[ing] to the emergence of an artificial world, cut off from nature and yet of course embedded within it, and therefore potentially ripe for environmental catastrophe' (Allen 1994: 93-94, emphasis added). Where is the specifically sociological contribution to resolving these problems?

EXTRICATING HUMAN PURPOSES FROM THE ECOLOGICAL CRISIS: SUSTAINABILITY AND SOCIAL ACTION

The attempt to break the log-jam imposed by the nature/culture dichotomy which we analysed above, is shared by Giddens in his analysis of power, which in turn forms part of his theory of structuration (Giddens 1984). Giddens distinguishes between two kinds of 'resource', which constitute structures of domination: allocative and authoritative resources (see Figure 4).

Allocative Resources	*Authoritative Resources*
1 Material features of the environment (raw materials, material power sources).	1 Organisation of social time-space (temporal-spatial constitution of paths and regions).
2 Means of material production /reproduction (instruments of production, technology).	2 Production/reproduction of the body (organisation and relation of human beings in mutual asso ciation).
3 Produced goods (artefacts created by the interaction of 1 and 2).	3 Organisation of life chances (constitution of chances of self-development & self- expression).

Figure 4. Allocative & Authoritative Resources (Giddens 1984: 258).

Giddens notes that 'any co-ordination of social systems across time and space necessarily involves a definite combination of these two types of resources' (Giddens 1984: 259). The interest in Giddens' analysis for the current argument lies in the way he associates the organisation of space-time, including life chances and social reproduction, with the material means through which it is achieved. He points out that human history is not 'like a sequence of enlargements of the forces of production', in a crude version of Marxism (Giddens 1984: 260). But, at the same time, neither is human history merely a series of representations, of cultural perceptions. Because we can experience the environment as a cultural product, almost a 'virtual reality', does not mean that we cannot experience it in other ways.

If, as Giddens proposes, it is the 'combination' of both allocative and authoritative resources which matters, and we are persuaded that the material (allocative) does not drive the organisation of social time and space (authoritative resources), then how do we explain the problem posed by environmental

sustainability – that authoritative resources may place the physical environment in jeopardy?

To answer this question we need to recognise that the bounds of sustainability are also set by our models. In societies that are characterised by scarce resources it is the existence of material limits that receives most attention. But the current concern with sustainability takes us beyond traditional conceptions of physical limits for a number of reasons:

1 Many environmental problems today – including an increasing number in developing and newly-industrialising countries – are 'externality' problems. They arise from the consequences of exploiting resources, rather than their shortage.

2 In addition, today the maintenance and conservation of global sinks is at least as important as the management of resources. As in the case of resource management, sink capacities raise both intra- and inter-generational distributive issues; the former often in an acute form.

3 Global economies, and the patterns of consumption that are linked to them, create value in new ways. For example, as well as value being created through the exploitation of material resources, today it is also created through command over information systems and bio-engineering.

The right-hand side of Giddens' diagram (authoritative resources) not only provides the structure for material exploitation, it also comes to assume the parameters of social and political sustainability. For example, global travel and recreation influence the way in which social time-space is organised (the first point in Giddens' model). Similarly *in vitro* fertilisation and changing views of parenting seem likely to alter responsibilities to future generations (influencing Giddens' second point). In the face of major shifts in the relationship between individuals and their environment, a two-way process is revealed which takes us beyond social and cultural constructions of something 'out there', removed from human consciousness. The nature/culture dichotomy breaks down completely.

However, the bounds of sustainability are set by the 'real world', as well as our models. The approach we have constructed in the foregoing sections acknowledges the importance of both. The concept of coevolution gives prominence to the relationship between material conditions and the way we view them, as well as to the changes in socioenvironmental relationships over time. The example of industrial metabolism begins with the throughput of energy and materials in human production systems, taking the first two Laws of Thermodynamics as a point of departure. The more we enquire into the metabolic effect of human activities, the more we require an understanding of the social processes which underpin metabolism. The work of Ayres and Simonis *et al.* (1994) on industrial metabolism underlines the need to incorporate fully the social factors that drive human production and consumption. We have sought to show that the

model of industrial metabolism provides an interesting basis upon which to build a more thorough social examination of the institutionalised processes (authoritative resources) which both maintain and legitimate the conversion of energy and materials in society. We are not arguing that the complexity of real life can be reduced to physical inputs and outputs, but that any account of changing cultural contexts could usefully incorporate changes in material, as well as cultural, systems. We can now return to the discussion with which we commenced this paper: the saliency of social construction as an approach to environmental problems.

REALITIES OF CONCERN AND SUSTAINABILITY

To what extent has social constructionism accommodated to the idea that sustainability represents an intellectual, as well as a political challenge? At this point we would like to return to the paper by Macnaghten and Urry. Most of the first half of their paper is devoted to showing that nature was constructed in North America and Western Europe in a way which has served to facilitate its exploitation, and subject it to the market economy. They conclude this section in the following way:

> While there exists a role for sociological research to explore further the social dimensions of current appeals to the natural, *there are other contributions sociology can provide to current 'environmental' debates. These also arise from how the 'social' and the 'natural' are being reconstructed in contemporary societies.* (Macnaghten and Urry 1995: 208 emphasis added)

This quote accurately reflects the authors' intentions in their paper, which is to refashion the constructionist approach, rather than to revise it radically. Four areas are suggested as ones in which the role of sociology can be taken forward: a sociology of environmental knowledges; reading 'natures' sociologically; a sociology of environmental 'damage' and environmentalism and society.

Each of these areas reflects existing work, in sociology and related disciplines. For example, a 'sociology of environmental knowledges' is concerned with epistemic communities, 'reading natures sociologically' with postmodern discourse theory, 'a sociology of environmental damage' refers to consumer backlash to the industrial food system, and 'environmentalism and society' seems to be suggested as a way of developing the social movements literature.

None of these 'contributions' marks a departure from existing methods of social construction. Macnaghten and Urry do not indicate what we are expected to do with the knowledge, or recognition, of what appears to be 'natural'. What do these contributions offer in terms of the transformation of the social commitments which make sustainability so elusive – the habits of 'getting and spending' which drive much environmental change? The contributions sociology can

provide to current environmental debate, seem to be confined to deconstructing the 'environmental' and the 'natural'. Beyond social construction, they seem to be saying, **is** social deconstruction. In this paper we have sought to navigate a way out of this *impasse*. In doing so we have attempted to redress an existing imbalance in the social science literature. We acknowledge that we have not engaged with every important aspect of social construction, but are firm in our belief that acceptance of environmental understanding as a matter of social assumptions need not lead to a counsel of despair. What we are trying to do is to provide a starting point for moving beyond the deconstruction of different environmental knowledges, towards a more integrated body of theory that acknowledges the importance of both social and natural influences in conditioning the character and dynamics of socioenvironmental relations.

NOTES

[1] An earlier, and rather different draft of this paper was presented at the ESRC Seminar *Environmental Sustainability and Social Justice*, held at the University of Keele, February 23, 1996. The authors would like to thank the organiser of the conference, Andy Dobson, and participants for their comments at that time.

[2] From the constructivist perspective, of course, untransformed ecosystems can fulfil human needs such as a desire for aesthetic appreciation of 'wilderness', even when the places are never visited.

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