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# 1 Environment and sustainability

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## 1. Introduction

Many central concerns of social economics, such as embeddedness, plural values and social justice, are highly pertinent to environment and sustainability. Somewhat paradoxically, there has been relatively little research on environment and sustainability in the core social-economics research community. But this is not to say that social-economics research on the environment and sustainability does not exist. This research has just been mostly carried out by scholars identifying themselves with ecological economics or political ecology. Our chapter sets this scholarship in its broader context and examines in some detail some of its core research strands.

In what follows, we will first briefly discuss how we understand social economics, how it has related to the emerging agenda of research on the environment, and how that research has become institutionalized. We will then examine in somewhat greater detail two areas of environmental research where social economics plays a significant role: the research on institutional sources of environmental problems; and the research on monetary valuation and environmental decision making. We conclude the chapter with a brief assessment of the likely future agenda for social-economic research on environment and sustainability.

## 2. What do we mean by social economics?

Social economics is a more heterogeneous and less integrated academic enterprise than mainstream economics because its practitioners have found their intellectual homes from various heterodox economic traditions, from disciplines other than economics, and from various interdisciplinary research traditions such as ecological economics and political ecology. This means that social economics may mean different things to its different practitioners. Nevertheless, there are some common denominators that most social economists share.

Perhaps most fundamentally, social economists do not see individuals as isolated agents who pursue solely their utility, as in mainstream economics. Social economists emphasize that individuals are interdependent and embedded in a multitude of social groups and networks (Davis, 2003, p. 120). For this reason, the behavior of individuals is importantly informed by moral concerns other than self-interested utility maximization

(O'Boyle, 2005). Social economists also acknowledge that institutions play an important role in economic and social life.

For some social economists, it is the shared moral concerns that underlie and give rise to institutions in the society, while others see that their origin lies in social conflicts and their resolution. The former view highlights that the economy and the institutions that constitute and underpin markets rest in part on moral foundations, just as Adam Smith argued in his *Theory of Moral Sentiments* (see Samuels, 1973). That is, markets function only to the extent that they are socially embedded, and their operation is supported by morals such as honesty, trustworthiness and equity. The other way round, market and other institutions embody and operationalize particular values that give differential weight to different interests in the society (Samuels, 1977). Utilitarian values, which are often used to promote markets and other institutions emulating market logic, have no priority over other values, which may entail a different role and scope for markets. For social economists, the task is to make transparent the value basis of public policies and decisions, and to clarify their differential impacts on differently situated individuals and groups (Dugger, 1977; Samuels, 1977). In essence, equity and social justice are far more central to social economics than they are to mainstream economics.

These core common denominators of social economics are complemented by other tenets that social economists share. The emphasis on a broad range of values invites us to acknowledge their incommensurability and plurality (Wilber, 2004; Paavola, 2001). This in turn calls for the appreciation of conflicts of values and interests as a central and constructive feature of social and economic life. Conflicts facilitate the clarification of values and drive social change – which is frequently understood as an evolutionary process characterized by cumulative causation, path-dependency and lock-ins. Social economists also acknowledge that scholarship is always informed by values and cannot be value-free (Dugger, 1977).

In light of the most-cited articles in *Review of Social Economy* since 1970, social economics has focused on crime, employment, income determination and distribution, financial markets and methodology. Environment and sustainability are not important empirical areas of social-economic research despite their increased social significance. Only a handful of articles (Georgescu-Roegen, 1977; Gowdy, 1981; Daly, 1985; Martinez-Alier, 1995; Norgaard, 1995; Gowdy and Mesner, 1998) focusing on the environment are among the 50 most-cited articles published in the *Review of Social Economy* after 1970. In what follows, we shall look more closely at the emergence of the environmental research agenda to clarify by whom, where and how the social-economic research on the environment and sustainability is carried out.

### 3. The environment on the agenda

The environment, as we today understand the term, appeared in public discourse in the 1960s when Rachel Carson's *Silent Spring* (1962) pointed to the alarming impacts of pesticides, and a social movement opposing nuclear fallout and waste disposal was born. Environmental movements emerged first in the USA and then in other industrialized countries, and the first steps towards the regulation of pollution were also taken. Concerns for the scarcity of resources also increased in the 1960s and in the early 1970s because of population growth in developing countries and economic growth in developed countries. Attention to the scarcity of resources increased particularly with the publication of *The Limits to Growth* (Meadows et al., 1972). Shortly afterwards, the first oil crisis focused the public's attention on energy.

The environment and energy have persisted on the political agenda since the 1970s but their significance has varied from time to time. The first wave of interest in environmental issues subsided somewhat in the late 1970s, but there was a new upturn in the late 1980s when the Brundtland Report (WCED, 1987) increased interest in global environmental problems and popularized the concept of sustainability. This second wave of interest in environmental issues was characterized by the optimistic win-win perspective of ecological modernization (e.g. Cohen, 1997), and it lasted until the late 1990s backlash. A third wave of interest in the environment emerged in the mid-2000s, focused in particular on climate change (e.g. Stern, 2007).

The new environmental challenges invited social-scientific responses and several strands of research emerged. Research on the exploitation and inter-temporal allocation of natural resources had existed since the emergence of land economics in the early twentieth century to address issues related to the use (and non-use) of agricultural and other land. Mainstream economics had relatively little to say about land use because it treated land as fully substitutable by man-made capital and considered all resources to be in full use. Land economics explored land-use decisions of practical and policy relevance empirically (see Salter, 1942). In the new situation of the 1960s, land economics had already moved closer to mainstream economics as a result of internal debates, and expanded its area of research to encompass the newly emerging environmental issues (Castle, 1965).

A new strand of research on the recreational use of the natural environment also emerged in the 1960s (e.g. Clawson and Knetsch, 1963). The increased pollution in turn led to the revival of Pigou's externality concept and the emergence of environmental economics as the study of the economic system's allocative failures, and private property rights,

environmental taxes and tradable permits as their potential remedies. These three strands of economics roughly correspond with the three roles that mainstream economics attributes to the environment: resources for production; assimilative capacity for absorbing pollution and waste; and direct utility from the enjoyment of environmental amenities. These three strands of environmental research are bound together by their shared welfare-economic theoretical framework.

Two heterodox strategies for environmental research also emerged. The first strategy focuses on the relationship between the economy and the environment, whereas the second examines the causation of environmental problems and possible remedies for them. The two strategies can be combined – and many scholars have indeed done so – but this is not imperative. The distinction has some bearing on the heterodox research on the environment that has emerged to date and that is likely to emerge in the future.

The first strategy – based on the biophysical conception of the economy – was adopted by a small group of economists who were concerned about the scope of environmental problems. They first applied this conception to the economy in the 1960s (Ayres and Kneese, 1969; Boulding, 1966; Daly, 1968; Georgescu-Roegen, 1971). Their starting point was that the economy is embedded in the environment and that it is thus subject to physical laws such as the conservation of mass and increasing entropy. For them, this implied that the economy and economic activities can be studied not only in economic terms, but also in biophysical terms – as flows of energy and matter subject to entropy in a metabolic system.

The biophysical perspective highlights that externalities are not exceptional, but pervasive and persistent phenomena, as production and consumption always generate waste. When the economy grows in physical terms and takes up more space, the risk of serious environmental destruction increases. Ultimately, economic activities can threaten the life-support systems on which human life (and life in general) depends. In principle, economic growth does not need to entail physical growth: technological change and substitution of natural resources by man-made capital can reduce material intensity and thus the adverse impacts of economic growth on the environment. However, experience shows that this is difficult to achieve. Human appropriation of biomass is estimated to have reached 24 percent of the potential terrestrial net primary production – that is, the net amount of carbon assimilated in a given period by vegetation (Haberl et al., 2007). Another study has found that humanity would now need 1.3 earths to sustain its consumption (Wackernagel et al., 2002). The biophysical perspective also highlights an important ethical dilemma: distributional problems and the problem of population growth cannot

be solved by economic growth alone. The welfare-economic emphasis on efficient allocation must be complemented by attention to scale and distribution (Daly, 1992).

Whereas the first heterodox research strategy emphasizes the embeddedness of the economy in the environment (ecological embeddedness), the second one emphasizes the embeddedness of the economy in social and cultural institutions (social embeddedness). The latter social-economic strategy is critical of the basic assumptions of welfare economics and tries to develop alternatives to conventional environmental and natural-resource economics. Welfare economics concentrates on short-term, static explanations of environmental problems in narrow economic terms, such as the lack of private property rights and market failures at a given point in time, which leave environmental goods and bads unpriced.

In contrast, the social-economic perspective considers that environmental problems are constructed by irreversible and path-dependent historical processes where social, economic and cultural aspects are all relevant. These processes frequently involve conflicts (Martinez-Alier, 1995; Paavola, 2007), which are obscured by the welfare-economic focus on static efficiency and optimality. The implication of this is that the aims of environmental policies should not be construed narrowly in terms of economic efficiency alone: effectiveness in delivering other goals such as environmental preservation or public health is also important, and so are procedural issues such as inclusion, participation and conformance with the ideals of deliberative democracy. The social-economic research strategy understands that the three pillars of sustainable development are ecological, economic and social sustainability. This means that environmental problems require much wider institutional responses than establishing private property rights and getting the prices right.

#### **4. Institutionalization of social-economic environmental studies**

Environmental social economics emerged in the late 1960s but the contributors were few at first. The Association for Social Economics (ASE) and the Association for Evolutionary Economics (AFEE) had sessions on the environment in the 1970s and 1980s, and their journals *Review of Social Economy* and *Journal of Economic Issues* published some articles on the environment. James Swaney (e.g. 1987, 1990) and Peter Söderbaum (e.g. 1982, 1987) were key scholars who kept the environment on the agenda in the *Journal of Economic Issues*, and Douglas Booth (e.g. 1990, 1995) had a similar role in the *Review of Social Economy*. The *International Journal of Social Economics* has also published articles on the environment since the mid-1970s.

The second wave of interest in the environment emerged in the late

1980s when new academic associations dedicated to the environment were established. One of these was the International Society for Ecological Economics (ISEE), which adopted the biophysical perspective on the economy as a core tenet. ISEE founders had heterogeneous backgrounds in systems ecology, energy modeling, biophysical economics and environmental economics. Among the founders were also people such as Joan Martinez-Alier, who had a social-economic background. In the years following the founding of the ISEE, the society attracted a large number of social economists, particularly in Europe (the development of modern ecological economics is outlined in Røpke, 2004, 2005).

In the 1990s, the heightened interest in the environment was reflected in many social-economic associations and journals. In addition to those mentioned already, the European Association for Evolutionary Political Economy (EAEPE) and the Society for the Advancement of Social Economics (SASE) featured the environment at their conferences. Social-economic study of environmental innovation took off and was published in journals such as *Research Policy* and *Futures*. New journals such as *Ecological Economics* and *Environmental Values* were also established. This process has continued during the third wave of environmental interest with the emergence of journals such as *Environmental Policy and Governance*, *Ecosystem Services* and *Environmental Innovation and Societal Transitions*.

However, most social economists have focused on economic crises, unemployment and other social problems, changes of capitalism and globalization. The environment has continued to be an issue of minor importance for them. This was one reason why social economists interested in the environment joined associations such as the ISEE and its regional societies, which were dedicated to the environment. As a result, the social-economic associations have struggled to maintain a critical mass of environmental research. It is illustrative that there were many contributions on the environment in *Review of Social Economy* in the mid-1990s, nearly all of them written by scholars from the ecological-economics community. More recently, *Cambridge Journal of Economics* has published environmentally oriented articles, again written by scholars from the ecological economics community. This suggests that, although the environment has not had a high priority in social-economics associations, their journals are important outlets for social-economic research on the environment.

It is noteworthy that social-economic research on the environment is not strongly institutionalized in the ISEE despite the fact that many social economists have joined it. The diverse ISEE has a broad agenda, and social-economic research easily disappears among studies of ecological or mainstream economic bent. The environment lives on in ASE and

EAEPE as an issue of a lower profile. Thus social-economic research on the environment takes place in a wide variety of associations and publications – including those related to other special fields such as feminist economics, development studies, political ecology and innovation studies. However, it has not become institutionalized in any one core organization; nor is it published in any one main outlet. We now move on to discuss in greater detail two key substantive areas of social-economic research on the environment.

### **5. The causation of environmental problems**

Social-economic researchers are not satisfied with the neoclassical reasoning on the causation of environmental problems. They have presented both critiques as well as alternative explanations in several areas of research, but it is difficult to pinpoint a single or dominant social-economic approach to environmental problems. Partly for this reason, we will give several examples of social-economic contributions on the causation of environmental problems.

K. William Kapp provided an early critique of the externality concept in the 1950s and developed his reasoning further in the following decades (Kapp, 1950, 1970; for an overview, see Swaney and Evers, 1989). Kapp used the term social costs ‘to refer to all those harmful consequences and damages which third persons or the community sustain as a result of the productive process, and for which private entrepreneurs are not easily held accountable’ (Kapp, 1950, p. 14). This may appear similar to the conventional notion of externality, but Kapp used the term social costs to emphasize that they are systemic and pervasive, and not exceptional. Contrary to the neoclassical conception of exogenous institutional structures, Kapp argues that the market system creates new institutions and technologies that in turn give rise to social costs because in a market system firms have an incentive to reduce their costs at the expense of workers, the environment or the community at large. This cost-shifting is enabled by unequal power relations and institutional structures, and these structures are in turn reinforced by the cost-shifting. This is an instance of cumulative causation – a concept that Kapp adopted from Myrdal (Myrdal, 1957). Joan Martinez-Alier (2009) has more recently advanced the concept of ‘ecological distribution conflicts’ to address conflicts over cost-shifting.

Kapp had little success in advancing his views although he tried to communicate with the neoclassical orthodoxy. However, his ideas are echoed in contemporary social-economic work. For instance, a session was devoted to Kapp’s legacy at the 2007 conference of the European Society for Ecological Economics (ESEE). Kapp’s dialectical reasoning resonates with Richard Norgaard’s co-evolutionary perspective (Norgaard, 1994).

Norgaard proposes a co-evolutionary approach to environmental history to explain how the environment co-evolves with social systems, cultural beliefs and values, knowledge and technologies. The various entities of the overall system put selective pressure on the development of the other entities, and the outcome of the selective processes is highly unpredictable. Norgaard also applies the co-evolutionary perspective to processes that unfold in the shorter time frame of decades, such as the co-evolution of pests, pesticides, politics, policy, the pesticide industry and integrated pest management. Norgaard's approach highlights the necessity of a broad social and ecological perspective and empirical studies of a long time frame to uncover how path-dependency shapes environmental problems. That is, for him, the static approach of neoclassical economics – considering externalities at a given point in time – must be replaced by a dynamic perspective.

A broad, historically sensitive social-economic approach is also important for debates on the tragedy of the commons (Hardin, 1968) and on the conservation of biodiversity and natural resources. The pioneering works of Bromley and Cernea (1989), Ostrom (1990) and Runge (1986) gave rise to a general agreement that it is open access to resources that leads to their overexploitation, not their common ownership. Open-access resources are owned by nobody and are used on a first come, first served basis, so there is no incentive for anybody to restrain their use. Mainstream economists usually consider privatization or the establishment of private property rights to resources a solution. Social economists emphasize that common property – under which resources belong to a community that maintains institutional arrangements for their ownership and management in order to avoid overexploitation – is an alternative to both open access and private property (Gowdy, 1994; Paavola, 2007; Swaney, 1990; Tisdell, 1991). Paavola (2007, 2008, 2011) has argued that regulatory environmental policies and multilateral environmental agreements can be understood as examples of collective ownership akin to common property, which govern the use and conservation of large environmental resources such as the climate system and biodiversity.

Social economists have also demonstrated how many cases of overexploitation have been the result of the privatization of common property resources. Joan Martinez-Alier (1991) refers to these as the 'tragedies of the enclosure'. Privatization and the subsequent emergence of the market economy disrupt social patterns that have customarily emphasized social equity, and replace them with wide social disparities. Social economists see that privatization and extension of markets are particularly devastating to local biological resources because they do not conform with the assumptions of the neoclassical theory. Market decisions about these resources



do not take into account the co-evolution of different species, the risk of destroying keystone species, the irreversibility of decisions and the agents' fundamental lack of information. For these reasons, social control of markets is needed to prevent loss of biodiversity (Gowdy, 1994, ch. 4).

As indicated earlier in the chapter, ecological economists emphasize that environmental problems should not be seen only as problems of allocation, but first and foremost as problems of scale and distribution. When discussing the causation of environmental problems, they thus focus on the driving forces behind material growth and unequal power relations that enable the rich to increase their standard of living at the expense of the poor and the environment. An important research topic is, for instance, the unequal exchange between and within nations. Older Marxian theories of unequal exchange in terms of labor value have been replaced by theories conceptualizing exchange in terms of energy, materials and land. These studies demonstrate how transfers from developing countries are a precondition for increasing consumption in rich countries (Andersson and Lindroth, 2001; Giljum and Eisenmenger, 2004; Hornborg et al., 2007; Muradian and Martinez-Alier, 2001). Schor (2005) highlights how unequal power relations lie behind the provision of cheap apparel, electronics and other goods in the globalized economy.

Social-economic studies of environmental disruption caused by production and consumption abandon the neoclassical assumptions of exogenous preferences and technology. For example, consumer demands are shaped by social, cultural and material structures and changes that are endogenous to the social-economic system – examples of them include competitive advertising and product development, changing labor market institutions, urban development and gender relations (Røpke, 1999; Sachs, 1992; Schor, 1995). More sustainable consumption can hardly be achieved by relying on individual consumer choice without changing the social conditions for choice, and this requires collective decision making (Paavola, 2001). Since the mid-2000s, a practice theory approach to studies on consumption and environment has gained ground. Here consumption is seen as an aspect of social practices that are meaningful to people in their everyday life, and the focus on individual choice is replaced by a focus on the stability and change of social practices. This approach emphasizes even more the need for collective intervention to promote sustainability (Seyfang and Paavola, 2008; Røpke, 2009; Shove et al., 2012). In the same vein, technological change is embedded in and endogenous to the social-economic system, and the development of more sustainable technologies requires regulatory intervention (Elzen et al., 2004). It is also increasingly acknowledged that everyday practices and consumption develop in an interplay with systems of provision and that

sustainability transitions require systemic perspectives (Southerton et al., 2004). However, scholars tend to relate more to the communities working with more specific and limited issues than the development of an overall social-economic framework for environmental research.

## **6. Monetary valuation and environmental decision making**

Monetary valuation of the environment is the largest area of research in mainstream environmental economics and, partly for this reason, it is an equally important area of work for those who do not adhere to this research strategy. For mainstream environmental economics, the purpose of monetary valuation is to determine empirical demand curves for non-marketed environmental goods and bads, so that the contribution of changes in their quality or quantity to consumer surplus and social welfare can be determined empirically. The rationale of this is in turn provided by the normative view that the environment should be protected if and only to the extent that it is economically efficient to do so: that is, as long as environmental protection improves social welfare and does not detract from it. This view ties monetary valuation intimately to cost–benefit analysis (CBA) as a supplier of benefit and cost information.

Social-economic research on environmental valuation and decision making has several strands. The first of these has sought to establish the inconsistency and invalidity of the premises of and arguments for monetary valuation in mainstream environmental economics. The second strand of research has sought to justify, develop and apply deliberative and participatory processes as procedural alternatives to CBA for environmental decision making. The third strand of research has developed several variants of multi-criteria analysis (MCA) for use as alternatives to CBA in environmental decision making. In what follows, each of these strands of literature will be discussed and outlined in some detail.

There are several starting points for criticism of monetary valuation of the environment. One of them is the assumption of full commensurability of agents' values and goals, which is central to mainstream environmental economics: it establishes utility as the common denominator for the satisfaction of different preferences. Although preference utilitarianism embraces ordinalist notions of utility, in CBA money is used as a proxy for utility – a practice that transforms an ordinal conception to a cardinal one. As a result, all choice situations are understood to be instances of utility maximization, and further satisfaction of environmental preferences entails having to trade off satisfaction with some other preferences. In the light of this assumption, the effect of satisfying environmental preferences can be measured in terms of utility changes and ultimately in pecuniary terms. Moreover, the utilitarian underpinnings of mainstream

economic analysis suggest that the effect should be measured, so that its welfare contribution and thus desirability can be verified.

Social economists disagree with the commensurability assumption, arguing that values and goals are incommensurable and only weakly comparable (Martinez-Alier et al., 1998; Paavola and Adger, 2005). Weak comparability means that agents can compare and rank alternatives and choose between them, but that there is no algorithmic method for doing so in an optimizing way. Different decisions belong to different domains where different rationalities prevail (Vatn, 2005), and some of them do not support optimization or maximization. In this light, issues such as consumption and the environment could be considered to belong to different spheres of rationality, between which calculated trade-offs are not made (Vatn, 2000).

Another line of criticism has focused on the lack of rationale for attributing monetary value to the environment. Building on the works of Schmid (1967), Samuels (1972) and Bromley (1989), social economists have argued that CBA compares situations characterized by different sets of property rights. For example, a CBA of mitigating the emissions of greenhouse gases compares the *status quo* set of property rights to a hypothetical situation where rights to emit greenhouse gases have been curtailed. The two situations generate different price vectors because property rights – the claims to income streams – differ. Both situations may and are indeed likely to generate Pareto-optimal equilibria and allocative outcomes, but they remain incomparable because of their different assignments of initial entitlements and distributions of income and wealth (Vatn and Bromley, 1994). This is typical of all environmental policy choices: they are not questions of efficiency but rather those of distribution and equity. Therefore monetary valuation of changes in the quantity and quality of the environment cannot provide guidance for decisions on them.

The reasoning on choices between alternative entitlement structures can also be extended directly to monetary valuation. Willingness to pay (WTP) or willingness to accept compensation (WTA) determinations, on which all monetary valuation methods are either implicitly or explicitly based, entail different hypothetical assignments of property rights that both deviate from the *status quo* and would entail different price vectors. For this reason, the meaning and indeed the usefulness of results of monetary valuation research remain ambiguous (Vatn and Bromley, 1994). To sum it up, for social economists, monetary valuation of the environment is based on shaky foundations and cannot provide the guidance it is purported to give (Spash, 2000). The further two strands of social-economic research have sought to develop alternatives to the monetary valuation of the environment.

The second strand of research in social economics on environmental valuation and decision making has examined democratic and participatory processes as alternatives to CBA (see Gregory and Wellman, 2001; van den Hove, 2000; Wilson and Howarth, 2002). This research is informed by a view according to which public environmental decisions are ultimately about what values should be decisive, and according to which such decisions are not and cannot be based on pre-existing preferences for different values (see Sagoff, 1998). In essence, the process of environmental decision making is one of learning, value clarification and preference formation. In pluralist democracies, such processes are best organized on the basis of public participation because this solution ensures the identification of the best reasons and justifications for the chosen courses of action (see Bromley and Paavola, 2002; Bromley, 2006). Different forms and strategies of participation are examined in the literature (Wesselink et al., 2011). Perhaps the most interesting cases are those where conventional economic studies and participation studies take place in the same setting in parallel or sequentially (see Clark et al., 2000; Kenyon and Nevin, 2001).

The third strand of research has developed multi-criteria analysis (MCA) as an alternative to CBA (see Munda, 2004). The literature developing or using MCA is broad, ranging from studies that are quite close to the CBA literature in spirit to others that approach the spirit of the literature on public participation. The more conventional takes on the MCA can be based, for example, on Herbert Simon's arguments on satisficing behavior (Simon, 1955, 1986). For Simon (1955, p. 109), agents may have multiple goals, which they seek to satisfy, rather than to maximize (see Paavola and Adger, 2005). In this sense, MCA could be seen as implementing an alternative, multi-goal view of choice behavior, while otherwise retaining the algorithmic and aggregating strategy of the CBA. In MCA, the performance of alternatives to be compared is just measured in terms of a number of performance criteria. Ranking of alternatives can then proceed either by attributing weights to the indicators for commensuration and aggregation (e.g. Joubert et al., 1997), or by using dominance comparisons and ranking across the non-commensurated performance measures (Gamboa and Munda, 2007).

The other end of the spectrum in the literature on MCA is more in line with the key concerns of social economics, and in particular with the literature on public participation. Participatory MCA can involve key interested or affected groups in the identification and development of alternatives, identification of key performance criteria, measurement of the performance of alternatives, or/and in the ranking of alternatives on the basis of measured performance (see, e.g., Cook and Proctor, 2007). Participatory MCA is often used to provide a science/policy interface

between scholars and those vested with a decision-making authority over the addressed issue (van den Hove, 2000, 2007). The science/public interfacing is attempted less often. However, when a broad range of affected and interested parties is involved (see Clark et al., 2000; Dougill et al., 2006), the distinction between science/policy and science/public interfaces becomes blurred and the participatory MCA becomes transformed into a broader participatory or action research strategy.

### **7. Conclusions: towards socio-ecological economics?**

Our assessment of past social-economic research on the environment is that it points towards a new program of research that we prefer to call socio-ecological economics (see also Jacobs, 1996; Spash, 2011). This program of research encompasses both the broad heterodox research strategies: the one based on the biophysical conception of the economy; and the one seeking a refined and nuanced understanding of the causes of environmental problems that is sensitive to issues of power, conflict and institutions. We do not expect all future research to embrace the whole width of the research agenda, which recognizes both ecological and social embeddedness, although some of the research will no doubt do so. The tensions between orientations is a potential source of vitality for the research (Norgaard, 1989).

The research agenda of socio-ecological economics has wide applicability to contemporary environmental problems. Sustainable consumption has emerged as an area of research where conventional notions of consumer sovereignty are increasingly challenged, and there is a policy-driven need to understand consumer behavior in a far more nuanced way in its everyday context. This is increasingly important, as it is difficult to resolve global environmental problems without changes in the scale and patterns of consumption. Here social economists are making a real contribution, for example by focusing on the systems of provision and the way in which they constrain and facilitate individual choice far beyond what is acknowledged in the mainstream models of consumer behavior. Some take a step further and replace the focus on individual behavior and choice with a practice perspective where the formation of shared social practices is the central topic of enquiry (see Shove, 2010; Shove et al., 2012).

There is also substantial scope for research making use of the biophysical understanding of the links between the economy and the environment. This model can provide the basis for integrating and mobilizing concepts such as physical limits, social justice and constrained economic optimization to make better sense of issues of emerging importance such as climate change. From this viewpoint, global atmospheric sinks, just like many other environmental resources, have uncertain but clearly limited physical

capacity to deliver services. Their sustainable management as global commons will call for consideration of justice in the use of these sinks, and both adherence to physical limits and attainment of justice will ultimately be a matter of crafting and enforcing a set of appropriate institutional arrangements for the purpose.

Finally, the economic crisis has highlighted a need for a new kind of social-economic research on the environment that draws from the wider concerns of social economics. Societies have to cope with environmental crises to do with climate, biodiversity, scarcity of land and water, as well as with economic and social crises such as increasing inequality and increasingly unequal levels of development, unemployment, dysfunctional financial systems and unsustainable levels of debt. It is necessary to develop an ecological macroeconomics to formulate coordinated responses to these multiple crises. There are signs that such ecological macroeconomics could already be emerging in debates on steady-state economy, de-growth and institutional changes related to the labor market, financial sector and other issues central to sustainability transitions (see Jackson, 2009; for overview see also Kallis et al., 2012). These sustainability transitions are not only about changing provision systems for energy, mobility, food and so on: they are also fundamentally about changing distribution systems, that is, who gets access to what.

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