Sustainable Development and Sustainable Growth: Conceptual Plain or Points on a Conceptual Plain?

John P. Ulhoi & Henning Madsen
The Aarhus School of Business
Fuglesangs Allé 4, DK-8210 Aarhus V, DENMARK
Phone: +45-89486459 - Fax: +45-86157629
Email: john.ulhoi@org.hha.dk; hem@hha.dk

Abstract

The world's natural resources are being battered on all fronts. Human activities which consume such resources need to be reconsidered in a way which will allow the regenerative capacity of these assets to function. In view of the potential danger of the concept of sustainable development (SD) becoming an empty catch-phrase of contemporary environmentalism, a thorough analysis and discussion of the concept is therefore required. A distinction is made between sustainable growth and sustainable development. In the general debate sustainable growth is often used by politicians and developers as synonym for sustainable development. It is argued, however, that this is either a misunderstanding based on a superficial knowledge about the meaning of the sustainability concept or simply that it is cynically used to make the traditional growth philosophy more 'digestible' in an age of increasing environmental concern. Except from the concept of industrial ecology, present environmental responses from industry bear little resemblance with a basic systems approach to the concept of sustainability. A systems approach, as in constrast to a reductionist approach, holds promises for paving the way for an ecologically and economically more sustainable development.

1. Introduction

The world's natural resources are presently under increasing pressure. Soil erosion, desertification, acid rain, the extinction of species, and the greenhouse effect have all contributed to the present deterioration of environmental systems. Economic production influences the environment in many ways, through the consumption of energy and natural, often non– renewable resources, and the production of pollution, toxic wastes, etc. In response, a variety of measures have recently been undertaken by various actors ranging from the public/political domain (such as environmental regulations and agreements) to self-regulatory measures (such as industry's voluntary agreements to improve its environmental performance. In one concept, the driving force behind this development has been the growing importance of environmentalism in the developed economies.

Environmentalism, has a long history, dating back to the latter part of the 19th century when Victorian aesthetes, idealists and philanthropists, in the wake of the reckless activities of the industrial modernisation, began to ask questions about the long term

impact of such transformation. The oldest environmental groups have been traced back to the last decades of the 19th century in England and North America (McCormick, 1989). However, not until the second part of the 20th century the basis was laid down on which present environmentalism is nested - or more specifically during the early 1960s and 1970s. The book "Silent Spring" (Carson, 1962) which called the attention to the implications of the increasing use of pesticides and the publication "The Tragedy of the Commons" (Hardin, 1968) exposing the human preference for self-interest maximisation can be seen as some of the first pioneering publications which fed into the emerging environmental awareness. Two events from the early 1970s in particular - the Club of Rome's report "Limits to Growth" in 1972, and the UN Conference on the Human Environment in Stockholm in 1972 - deserves explicit mentioning as they can be seen as important milestones in the development of international environmental policy (regulation). In the 1980s, the introduction of the concept of "Development Without Destruction" (Tolba, 1982), "The Global Possible" (Repetto, 1985), and, last but not least, the report of the World Commission on Environment and Development, "Our Common Future" (1987), shed light on the role of market forces in the development process and the role of poverty and overpopulation in natural resource degradation by introducing the concept of sustainable development.

These publications, which emphasised the need to recognise and build on common interests, were all based on the premise that natural systems (i.e. ecological systems) and human-made systems (i.e. economic systems) cannot be seen and handled separately, but must be addressed in an integrated way and must be understood in a close systems perspective. They further stressed (not without opposition) that present environmental problems require a new type of development process which harnessed the benefits of economic growth without the damaging consequences which growth can have on the environment. In contrast to the early years of the limits-to-growth movement, therefore, the important issues were seen as the uneven spatial distribution and exponential growth of the population relative to the carrying capacity and insufficient and/or irrational use of natural resources (Turner, 1988).

The evolution of environmentalism has been categorised into various phases. Perhaps the first was the Neo-Malthusian phase, i.e. the phase that included the first international meetings concerning environmental problems (McCormick, 1989). Others have categorised this phase as the 'protection-movement' (Milbrath, 1989). A more profound epistemological change in orientation sets in during the transition to what has also been called 'The New Environmentalism' which according to Pepper (1985) characterises today's enviromnentalism. The latter, however, is far from being homogeneous. Instead, there are immanent internal tensions between so-called 'radicals' and 'moderates' which, among other things, have given way to labels such as 'deep greens' and 'light/grey-greens', respectively (Milbrath, 1989).

It has been argued that environmentalism challenges almost every essential feature of the development of Western economies and their underlying motifs, desires and performance of their institutions (O'Riordan, 1976) and that it can be understood as an attitude of mind and a certain code of behaviour as an ideology, a social movement as well as a political activity (O'Riordan, 1981).

According to the latter, environmentalism is about conviction that a better mode of existence is possible, and that a sense of collective happiness can infuse individual

self-interest so that belief in the communal good will overcome a fear of personal sacrifice. Cotgrove (1982) has suggested to maintain a distinction between traditional and radical environmentalism. The development of the latter, however, points to the necessity of implementing more fundamental social changes as it can be seen in strong opposition to the unrestricted activities of capitalism. Radical environmentalism argues for seeing environmental depletion in the light of political ideologies.

The radical part of the environmental movement has persistently challenged established material and economic goals, and it has suggested to assign higher priority to the realisation of non-material values, to social relations and community and to interparticipative decision processes.

The paper is organised as follows. Section two provides an exhaustive discussion of different interpretations of sustainability leading to an identification of the critical dimensions of the concept. Section three tries to answer the question posed in the title of the paper. Section four discusses the holistical concept of sustainability in the light of present reductionistic responses from industry to environmental issues. The reductionist - wholeness discussion is addressed in secrtion five leading to the suggestion of adopting a systems perspective. Section six leads to the conclusion of the paper. In section seven implications of the proposal are addressed.

2. The concept of sustainable development/sustainability

Sustainable development defined as "*...development* that meets the *need* of the present without compromising the ability of *future generations* to meet their own needs" by The World Commission on Environment and Development (WCED, 1987:43; italizing added) is universally thourght of as a 'good thing' nobody seems to be against. This definition, however, have given rise to various interpretations as the precise meaning of the concept of sustainability is yet to be agreed upon. It has, as pointed out by Serafy (1992), proved difficult to define unambiguously. Before the concepts and its inbuilt conflicts and dimensions are explored in more depth a priliminary assessment of the underlying values and significant differencies from traditional conceptions of development.

Firstly, the term used for the change-aspect is *development* and not growth, which can be interpreted as a move away from "growth-as-usual" and there is an explicit recognition, that protection of the environment and promotion of economic development cannot be treated separately (a wholistic dimension). Next the term *need* is used as opposed to demand (known from tradittional economical growth theory) which also indicate a recognition of a change away from purely quantitative growth aspect of change on the one hand as weel as a recognition that there might be needs to be met which are not reflected by the same power in the global demand (a social dimension). The explicit focus on present as well as *future* generations reflect a concern for the intragenerarional as well intergenerational perspective on the one hand and a mainly ethnocentric focus in orientation (an equity dimension). This is probably the part in the definition, which really adds some new dimensions in the development debate, which in the past has been strongly biased towards the present.

Before going more deeply into the concept of sustainability, it can be noted that it is intrinsically linked to other environment-related concepts - such as the assimilative and the carrying capacity of Nature. The former describes Nature's ability to absorb the physical (including man-made) effects it is exposed to, while the latter describes Nature's overall capacity to survive over time without the collapse of ecological systems. Alternatively, it can be defined as the maximum load an environment can permanently support (Milbrath, 1989) without reducing its ability to support future generations (Catton, 1987). In essence, therefore, the two concepts of carrying capacity and assimilative capacity together constitute the basic meaning of ecological sustainability. However, merging economic and ecological sustainability - as in the Brundtlandian Report - gives rise to conflicting interests.

Most definitions of sustainable development are phrased in general, qualitative terms, and include such things as economic growth, the equal distribution of wealth within and between generations (Repetto, 1985; WCED, 1987; Catton, 1987), supply of resources (Pearce, 1988), environmental quality (Braat & Steetskamp, 1991), an eco-eco co- evolutionary development trajectory (Norgaard, 1985). Several definitions more or less explicitly address the complexity of eco-eco sustainability, recognise that SD has natural as well as structural origins (O'Riordan, 1988, 1993; Huiting, 1990; Goodland et al., 1992; ILO; 1992) often with particular focus on the question of equity and the Third World (Bartelmus, 1986; Redclift, 1987; Tolba, 1987). The objectives included most often in published definitions are: survival (e.g. Daly, 1974), satisfaction of needs (WCED, 1987) and welfare (WCED, 1987; Constanza, 1989), policies of equality and justice (Repetto, 1985; O'Riordan, 1988), and changes in values (Milbrath, 1989; O'Riordan, 1988; Goodland et al., 1992, Stead & Stead, 1992).

Pearce (1988) defines SD in simple terms as: (i) development subject to a set of constraints which fix resource harvest rates at levels no higher than managed or natural regeneration rates, and (ii) the use of the environment as a waste sink based on waste disposal rates that do not exceed rates of (natural or managed) assimilation by the ecosystem in question. SD, it has been argued, cannot be realised without a change in human activities, and this can only be achieved by: (i) adopting specific environment-saving measures for production and consumption, and (ii) directly changing production and consumption patterns (Huiting, 1990).

Welford (1996) points stresses the importance of three closely connected dimensions that needs to be addressed in concert: (i) the environmental dimension, i.e. that the environment must be recognised as an integrated part of the economic process and not treated as a free good; (ii) equity, i.e. how to handle the huge inequalities in the present access to and consumption of resources between the West and the Third World not last in the light of their increasing demand to achieve the same standard of living; and (iii) futurity, i.e. the recognition, that it is not accpetable a priori to erode the possibility for future generations to meets their future demand.

Repetto (1985) sees SD as a goal which rejects policies and practices that support current living standards by depleting the productive base, including natural resources, leaving future generations with poorer prospects than our own. In other

words, decisions taken now should not damage prospects for maintaining or improving living standards in the future.

Three conservation rules for realising a sustainable use of natural assets has been suggested (Turner, 1988): (i) maintenance of the regenerative capacity of renewable resources, and an avoidance of excessive pollution which could threaten biospherical waste assimilation capacities and life support systems; (ii) the guidance of technological change to ensure the substitution, wherever possible, of renewable resources by non-renewable resources; and (iii) the formulation of a phasing policy for the use of non-renewable resources.

O'Riordan (1988) argues for maintaining a distinction between sustainable use and sustainability, where the former has been typically seen as an alternative growth and planning concept Here, sustainability is seen in a much broader sense, embracing ethical norms pertaining to the survival of life forms, the rights of future generations, and institutions responsible for ensuring that such rights are fully taken into account in policies and actions.

Goodland et al. (1992) refer to the four elements of sustainability - poverty, population, technology, and lifestyle - but leave it to others to suggest how the political will can be summoned for the painful changes necessary. The Brundtlandian concept of SD, they argue, has elicited two opposing reactions. One is to revert to a definition of SD as growth as usual, albeit at a slower rate. The other is to define SD as development without growth in throughput over and above the environmental carrying capacity. The WCED report, according to this observation, seems to be torn between these two directions.

Redclift, (1987) stresses the need to define SD in terms of the structural change in natural and man-made capital stock (including human capital and technological capabilities) which ensures at least a minimum rate of growth in the long run. Apart from the biophysical and socioeconomic dimensions of nature's carrying capacity, the concept of a cultural carrying capacity has also been suggested, underlining the fact that the carrying capacity and the standard of living are irreversibly related (Hardin, 1991). The higher the standard of living, the fewer the number of people who can enjoy it if the biophysical carrying capacity is to be kept intact.

The Brundtlandian report (WCED, 1987) itself stresses a variety of dimensions (ranging from needs, values, interests, growth, overpopulation and poverty, through the revival of economic growth/development, international trade and legislation, to energy use and technological development) and goals (equality, redistribution, population stabilisation, ecological preservation, the revival of economic growth and an expansion of the resource base).

Much of the SD litterature, apart from presenting similar or different interpretations of the concepts also offers normative alternatives to the growt-as-usual paradigm, trying to envisioning the sustainable society (see, e.g. Proops, 1989; Daly and Cobb) and corporation (Davis, 1991) often with implicit or explicit reference to earlier observes such as for example Schumacher (1973)

Van den Bergh (1996) points at two important ethical concerns that needs to be addressed. One related to the anthropocentric objective of intergenerational justice and the other is the ecocentric perspective of biodiversity which is reflected in the report. Such objective can be critised for being obstructive towards development and therefore possible socially costly, especially in developing countries.

The inheent uncertainty over the actual meaning of sustainability, however, has not reduced the popularity of the concept. In fact it could be cynically argued along the lines of Bell and Morse (1999) that it is precisely the inherent flexibility that explains why the concept has gain so much popularity.

3. Sustainable Growth vs sustainable development: two different points on a conceptual plain

As pointed out by Schumacher (1979), the success of the industrial society is based on at least two dangerous illusions, namely that unlimited growth is possible in a finite world and that science can be used to solve fundamentally social problems. The possibility of exponential growth through technical mastery over nature has been central to Western thinking for centuries.

Accpeting the Laws of Thermodynamics, it seems reasonable to conclude that even the greenest or cleanest technologies will require the input of low entropy energy. At best, this strategy will just win a little more time. In a geological time frame, this is hardly worth talking about. The question remains, therefore: Is there any other way to increase the amount of time we have left before all low entropy energy is converted to high entropy energy? An affirmative answer is only possible if we are ready to accept the consequences. This is where the Brundtlandian concept of sustainability, which relates environmental problems to population growth and existing socioeconomic structures, comes in. Accepting this means accepting the need for stable population growth, environmental and intergenerational security, and a redistribution of wealth.

Human beings are part of a biosphere that they have had no part in creating. This biosphere is supported by a complex set of ecosystems governed by natural laws, which man is both subject to and cannot re-invent. Human beings have, however, had a hand in creating what may be called the econsphere, a ‘sphere’ of relatively recent date which cannot be explained solely by nature. The biosphere, it is generally accepted, can be destroyed but never overruled. The biosphere sustains itself through a set of complex mechanisms which are still not fully understood. The 'econsphere', on the other hand, although created by human beings, is not the result of a deliberate ‘plan’, but of a dynamic and chaotic process of local actions and increases in knowledge, which spread and interact in ways that no individual or group can predict or control. During the process of co-development between the revolutionary human-made sphere (the econsphere) and the evolutionary natural sphere (the biosphere), the former has gradually seized the initiative in terms of speed of development, and this has enabled man to transgress the carrying capacity of nature (assimilation) without violating its underlying rules (the physical laws).

The biosphere and the econsphere can be seen as systems for the transportation of materials. But while the former is close to being a perfect system of recycling, the opposite seems to be true for the latter. Most materials run through the system in an

inherently quick and dissipative way, in which materials are quickly degraded, dispersed and lost, typically in the course of a single use (Ayres, 1989).

Up to now, technology has been developed for the sole purpose of increasing economic and social standards, with little or no regard for its potential negative impact on the environment (e.g. exhaustion of non-renewable resources, extinction of species, eutrophication, acidification, ozone-depletion, etc.). Today, however, an increasing amount of irrefutable scientific evidence is forcing us to accept that we cannot continue along the same trajectory of development as we have since the beginning of the industrial revolution.

In relation to the discussion of sustainable development, it is less the adjective 'sustainable' as the attached substantive that is important, i.e. whether it is used in front of the substantive 'developmen't or the substantive 'growth'. In other words the main confusion relates to replacing development with growth and thus overlooking the fact that sustainable growth is an undisputable contradiction. Nothing physical can grow indefinately.The total amount of energy of an isolated system remains constant; nothing is gained or nothing is lost - only transformed or qualitative changed (The First Law of Thermodynamics - The Law of Consumption of Mass and Energy) during its going from low entropy (an indicator of the quantity of useful energy) to a high entrophy, i.e an non-usable form (The Second Law of Thermodynamics or just the Entropy Law). Put differently low entropy represents the genuine source and root of economic scarcity and the Entropy Law is the ultimative ruler of the whole economic process.

If there is to be a developement which to the higest extent possible demonstrates an intelligent 'entropy-management', which is the most undisputable boundary for a sustainable development focus must not be directed away from some of the present structural trends which maintians a highly unsustainable development, such as for example the increasing globalisation of Western industrial and consumtional affluence culture on the expenspense of a former local-community-based culture. This sems incompatible with the 'act-local-part' of the WCED definition of sustainable behaviour, self-determinism as well as individual empowerment needed to move development towards a less unsustainable trajectory. As pointed out by Welford (1995), it is only through the real commitment within all individuals in the households as well as in the work place, that we can begin to make any substantial progress towards a sustainable development.

Although part of the SD concept (the environmental part) to some extent can be internalised by the manufacturer issues such as for example loss of biodiversity, birth control, protection of indegineous people, stands, if purely left to the market-mechanism, a high risk of being overheard. Regulation, in other words will remain have a distinct role to play in a future more sustainable world.

The economy, a subsystem of the finite, non–growing Earth, must eventually adapt to a similar pattern of development. Alternatively, we could say that physical inputs must cease growing, whereas the value of outputs may continue to increase, subject only to the prevailing level of technological development. Of course, if the physical input is limited, then, according to the Law of Conservation of Mass and Energy, so is the physical output. This is equivalent to saying that quantitative growth in throughput is not permitted, but qualitative improvement in services rendered can

develop with new technology. Quantitative growth, as argued by Goodland (1992), is not the way to reach sustainability. Society cannot "grow" its way into sustainability – the best it can hope for, if it succeeds in changing the present trajectory, is the possibility of developing our way to sustainability. In this context, it is important to realise that this does not necessarily have to be any causal relationship between wealth and welbeing since the latter, apart from a certain amount of "quantitative" input, also requires some qualitative dimensions.

4. Industry's response(s) to the environmental degradation

The dominating response from industry has been to develop methods (such as for example life cycle assessment; environmental review) and systems (such as for example integrated environmental management systems) whereby which industry can improve environmental and economic efficiency while at the same time document the improvements by measuring flows (in the form of environmental reports). Where the inherent logics of most of the present approaches, such as for example the environmental management systems (EMS) approach undertaken by industry are based on fast incremental cycles of improvement, sustainability will take a long time to achieve (Wheeler, 1993; Welford, 1994). Moreover, EMSs are primarily about processes and measurements of physical flows (i.e. quantitative issues) whereas sustainability is also about qualitative issues such as for example human values, social and economic justices, intergenerationality, etc. What is probably more problematic, however, is that the EMS approach is rooted in a reductionist approach, i.e. based on the belief that problems are always best handled (by experts) by isolating them from the environment and by studying them as discrete phenomena among many similar discrete phenomena.

Nevertheless, the approach needed is a radical one and not a piecemeal one (the approaches undertaken to date) and such a radical approach can only be changed via culture shift and a re-examination of the dominant ideology surrounding environmental management strategies. Tinkering with commonly accepted approaches such as systems based management detached from any re-evaluation of underlying values, hidden agendas, or any attempt at trapping the root of the problem, however, are not likely to lead us to a sustainable society.

As noted by Durning (1992) there is in fact little evidence that there actually is any significant correlation between high levels of consumption and individual happiness. It might therefore be necessary, as suggested by Goodland (1992), to distinguish between growth–as–usual and development they are based on different paradigms (Daly, 1990). Growth–as–usual leads to an increase in the accretion of materials, whereas development implies the realisation of potentials, to bring something to a fuller, greater, or better state. When something grows as usual, it usually gets quantitatively larger; when it de–velops, on the other hand, it gets qualitatively better, or at least different. Quantitative growth and qualitative improvement follow different laws. Our planet develops over time without growing.

The key concept of sustainable development requires a new approach to business and we have seen little evidence of a radical paradigm shift either in the EU eco-management and audit scheme or the ISO14001 standards. Indeed it has been argued that current approaches are sub-optimal and inappropriate but that they are still likely

to be perceived by many to be the cure to all our environmental problems related to industry. In consequences, they tend to be adopted widely because they seem to fit so nicely with the dominant ideology of production and consumption, which unfortunately so eagerly are pursuing materialism, i.e.quantitative growth instead of qualitative development.

An interesting and more holistic (as compared to the tradtional industry responses) concept from the area of environmental management is industrial ecology deserves mentioning in this context. The idea behind IE is that companies through collaboration should be able to minimize the external wasteload (Frosch, 1992; Graedel & Allenby, 1995). IE applies natures principle of organizing to an organizational setting, thereby integrating the industrial system in the natural system (Frosch & Gallopoulos, 1989).

The industrial ecosystem concept is based on an analogy with natural ecosystems. Natural ecosystems are interacting and interdependent systems of organisms of varying degree of complexity which live off each other, either consuming each other or each other's waste (Frosch, 1992). Accordingly, the system evolves in such a way that any available source of material or energy will be used by at least one of the participating organisms in the system.

5. From a predominantly reuctionists (atomistic) approach towards a wholeness approach (holism)- a systems approach

Indeed trends towards eco-modernism stress objectivity, scientific measurement, technological determinism and eco-efficiency. The standard answer of the eco-modernists is to link the environment with the economy, linking the greening of industry with market forces. Yet sustainability and quality of life just as inextricably connected as sustainability and commerce. And to ignore this is to shut off many centuries of accumulated wisdom about the environment. Modernity with its inhenrent reliance on scientific achievements, however, has tended to exchange/mistake knowledge to wisdom, wealth to welfare, fashion to values, changes to continuity, growth to development, materialism to happiness, etc.

Qualitative aspects of human consciousness have nevertheless been progressively and systematically relegated to the domain of the subjective, private, individual or even subconscious. To a modern society exclusively based on scientific achievements, they are not perceived as having direct relevance to society. They have become a set of values subjugated by the individual's profit maximisation, the free market and the laws of supply and demand. They are secondary to the values of welfare, security, comfort, welfare, education, health and happiness.

In order to move towards a sustainable future the present approach environment in sterile scientific terms (with a more minor social dimension sometimes added) must be supplemented by approaches whic, recognise, appreciate and enjoy the qualitative dimensions of the environment and life. Of course, it is important to reduce pollution, plant trees, clean the rivers, maintain biodiversity, adopt cleaner technologies, and so on. However, much more fundamental change is required if the destructive tendencies of the modern world is to be reversed.

Orthodox scientism, i.e. the fundamental believe, that the only way to really understand the natural world is by reducing its complxity by dividing it into far smaller and /or simpler parts often using a number of reductionistic assumptions about it. Not that it is argued, that such an approach in some isolated incidence may be a feasible approch to understand what is happening under fully controlled laboratory settings. But adopting this logics onto problems of high complexity and connectivity, such as for example in the case of accounting for the phenomenon of 'green house effect' represents a form of not very constructive form of hybris.

The theoretical assumption, that planet earth is based on the fundamental principle of self-interrelated self-contained systems is perhaps most persistantly argued by the James Lovelock in his Gaia hypothesis (Lovelock, 1979), i.e. that the earth is a self-regulated system of tightly coupled subsystems. Taken to its most fundamental interpretation, it could be argues, this is what is the essential logics of sustainable development

6. Conclusion and implications

This paper concludes, that the meaning of sustainability is far from being plain. When used as an adjective in front of development and growth, it means very different things. Despite the immanent conflicts, the concept of sustainability still is an interesting and useful concept as it fundamentally acknowledges the inherent inseparability of natural systems and human-made systems. It further invites to adopt a systems perspective, which opensd up for new and different analyses.

The appeal of a holistic approach is that is allow for addressing and analysing complex problems such as environmental and socio-economic problems and their interrelated physical and social subsystems by exclusively focussing on unities and connectivity. The problem - or challenge - of such an approach, however, is that the analysis becomes increasingly difficult.

As argued by Senge et al. (1994) focussing on wholeness direct the focus towards away from things towards relationships or away from 'atoms' towards systems.

A responsible and pro-active approach to the environment requires new and radical approaches to doing business. This will include the need for increasing not decreasing legislation which industry itself should be campaigning for in order to protect notions of competition and ensure a level playing field.

Rethinking business strategy and actions along the lines of sustainable development does require a change in corporate cultures and it therefore opens up new opportunities to reassess other aspects of business. Issues that need also to be addressed in line with environmental demands include worker participation, democracy in the workplace, the treatment of women and minority groups, animal testing, public accountability and full disclousure, and the impact on developing nations and indigenous populations. Indeed, these issues should not be seen as separate entities but as part of a new overarching paradigm to doing business ethically and holistically. Moreover, the very power which endorses a piecemeal approach to environmental improvement is the same power which continues to deny or restrict

rights to workers and to less developed nations. Many of these issues will necessarily challenge the very foundations of the system which we too often see as immovable and will therefore be opposed by vested interests. Nevertheless, such ideas are achievable and indeed fundamental to global economic, social and environmental security.

The fundamental logics of the systems perspective moves the focus of attention way from 'isolated' aretefacts and events towards processes and relationships. This in turn has some important implications. Firstly, systems are identified from the environment by defining their boundaries. Differently put, boundaries have to be explicitly defined by the stakeholders. Perhaps the most profound implications from applying a holistic systems approach in environmental research is to recognise, that the researcher (as observer) cannot not be perceived as decontextualised from the the phenomenon under study. This is what has been called a transition from first order cybernetics to second order cybernetics (Bell & Morse, 1999). In other parts of the sociel sciences the same phenomena has been argued under the label of social constructivism.

Secondly, systems are normally not static (as are artefacts), but change over time. In consequence, the researcher cannot apply tools development for static situations. Thirdly, systems are to be expected to seek systems specific purposes (optima). Social and natural systems, as convincingly argued by Maturana & Varela? , exert in various degree a capacity of self-making and self-renewal (autopoiesis). This in turn has important implications for how far society can move towards sustainability as there will always exists differences between specific purposes of various social systems and the relative congruence to the purposes of natural systems.

The hard reality is that human beings consume too much, in environmentally unfriendly ways, thus creating a demand for products which companies are willing to supply. Consumptions, have been detached from the common resource base and it has predominantly been discussed in relation to economic systems, i.e. from its fundamental role and impact on ecological systems. In addition, companies pursuing this environmental detrimental trajectory are at the same time trying to convince consumers to buy even more using the hidden message that consumption and materialism will make us happy. This exponential growth of consumption and production is rapidly eating up the planet on which we live while at the same time depriving humans their capacity of experiencing fundamental and simple happiness from engaging in meaningful social relationships. The roots of any solutions aimed at achieving sustainable development therefore lie more in tackling human conciousness than in adjusting management systems.

References

Barbier, E. B. (1989). The Contribution of Environmental and Resource Economics to an Economics of Sustainable Development. *Development and Change, 20,* pp. 429-59.

Bartelmus, P. (1986) Environment and Development. Boston, MA: Allen and Unwin

Bartelmus, P. (1994) Environment, Growth and Development. The Concepts and Strategies of Sustainability. London: Routledge.

Bell, S. & M orse, S. (1999) *Sustainability Indicators. Measuring the Immeasurable.* London: Earthscan Publications.

Blowers, A. Ed. (1993) Planning for a Sustainable Environment. A Report to the Town and County Planning Association. London: Earthscan Publications, Ltd.

Braat, L. C. & Steetskamp, I., (1991). Ecological-Economic Analysis for regional Sustainable Development. In *Ecological Economics: The Science and Management of Sustainability.* N.Y.: Columbia University Press.

Callenbach, E. F., Capra, F. & Marburg, S., 1990, *The Elmwood Guide for Eco-Auditing and Ecological Conscious Management.* Berkely, CA: The Elmwood Institute.

Carson, R, 1962, *Silent Spring.* Boston, MA: Houghton Mifflin.

Catton, Jr.W. R. (1987). The World's Most Polymorphic Species: Carrying Capacity Transgressed Two Ways. *BioScience, 37(6),* pp. 413-419.

Clayton, A. M. H. & Radcliffe, N. J. (1996) Sustainability. A Systems Approach. London: Earthscan Publications, Ltd.

Christensen, P. P. (1989). Historical Roots for Ecological Economics - Biophysical Versus Allocative Approaches. *Ecological Economics, 1,* pp. 17-37.

COM (1992) Proposal for a Resolution of the Council of the European Communities on a Community Programme of Policy and Action in Relation to the Environment and Sustainable Development, 23 Final 27/3/92, Laxenbourg.

Constanza, R. (1989) What is Ecological Economics. *Ecological Economics, 1,* pp. 1 - 7.

Daly, H.E. (1989), *For the Common Good: Redirecting the Econmy Toward Community, the Environment, and a Sustainable Future.* Boston, MA: Beacon Press.

Davis, J. (1991) *Greening Business. Managing for Sustainable Development.* Oxford, UK: Basil Blackwell.

Durning, A. T. (1992) Asking How Much is Enough. The Consumer Society and the Future of the Earth.

Faber, M., Manstetten, R. & Proops, J., Eds. (1996) *Ecological Economics. Concepts and Methods.* Cheltenham,UK: Edward Elgar.

Lovelock, J (1979) Gaia. Oxford: Oxford University Press

Garlauskas, A.B. (1975), Conceptual Framework of Environmental Management. *Journal of Environmental Management, 3,* pp. 185-203.

Goodland, R., 1992, The Case That the World has Reached Limits. More Precisely That Current Throughput Growth in Global Economy Cannot Be Sustained. In Goodland, R., Daly, H., Serafy, S. E. & Droste, B. v., Eds., 1992, *Environmentally Sustainable Development: Building on Brundtland.* Paris: UNESCO.

Faber, M., Niemas, H. & Stephan, G. (1987), *Entropy, Environment and Resources.* Berlin: Springer Verlag.

Goodland, R., Daly, H., Serafy, S. E. & Droste, B. v., Eds., (1992) *Environmentally Sustainable Development: Building on Brundtland.* Paris: UNESCO.

Hardin, G. (1968). The Tragedy of the Commons. *Science, 162,* pp. 1243-48.

Hardin, G., (1991). Paramount Posisitions in Ecological Economics. In *Ecological Economics: The Science and Management of Sustainability.* N.Y.: Columbia University Press.

Heaton, G. , Repetto, R. & Sobin, S., (1991). *Transforming Technology: An Agenda for environmental Sustainable Growth in the 21st Century.* Washington D.C.: World Resource Institute.

Hueting, R. (1990). The Brundtland Report: A Matter of Conflicting Goals. *Ecological Economics, 2,* pp. 109-117.

McCormick, J. S. (1989). *The Global Environmental Movement.* Bloomington: Indiana University Press.

Milbrath, L.W., (1989). *Envisioning a Sustainable Society.* Albany: State University of New York Press.

Nelson,R & Winter, S. (1982).

Norgaard, R. B. (1985), Environmental Economics: An Evolutionary Critique and a Plea for Pluralism. *Journal of Environmental Economics and Management, 12,* pp. 382-394.

O'Riordan, T. (1988). The Politics of Sustainability. In R. K. Turner (Ed).(1988). *Sustainable Environmental Development. Principles and Practice.* London: Belhaven Press.

O'Riordan, T. (1993) The Politics of Sustainability. In Turner, R. K., Ed. (1993) Sustainable Environmental Economics and Management. Principles and Practice. London: BElhaven Press.

Pearce, D. W. (1988), Sustainable Development. *Futures,20,* pp., 598-605.

Proops, J.L.R. (1989) Ecological Economics: Rationale and Problem Areas. *Ecological Economics, 1,* pp. 59-76.

Pearce, D. & Markandya, A., (1989). Marginal Opportunity Cost as a Planning Concept in Natural resource Planning. In: Schramm, G. & Warford, J.J., Eds., 1989, *Environmental Management and Economic Development.* Baltimore: John Hopkins University Press.

Pearce, D. (1993) *Blueprint 3. Measuring Sustainable Development.* London: Earthscan Publications, Ltd.

Repetto, R, Ed. (1985). *The Global Possible. Resources, Development, and the New Century.* New Haven: Yale University Press.

Redclift, M. (1987). *Sustainable Development: Exploring the Contradictions.* London: Methuen.

Schumacher, E. F. (1973). Small is Beautiful. A Study of Economics as if People Mattered. Essex: The Anchor Press Ltd.

Schumacher, E. F. (1979). *Good Work.* London: Jonathan Cape.

Senge, P., Ross, R., Roberts, C. Smith, B., & Kleiner, A. (1994) *The Fifth Discipline Fieldbook: Strategies and Tool s for Building a Learning Organization*. London: Nicholas Brealey

Serafy, S. E., (1992). Sustainability, Income Measurement and Growth. In Goodland, R., Daly, H., Serafy, S. E. & Droste, B. v., Eds., 1992, *Environmentally Sustainable Development: Building on Brundtland.* Paris: UNESCO.

Tolba, M. K. (1982). *Development Without Destruction: Evolving Environmental Perceptions.* Dublin: Tycooly Publishing Ltd.

Turner, R. K. (ed).(1988). *Sustainable Environmental Development. Principles and Practice.* London: Belhaven Press.

Turner, R. K., Ed. (1993) Sustainable Environmental Economics and Management. Principles and Practice. London: BElhaven Press.

van den Bergh, J.C.J.M. (1996) *Ecological Economics and Sustainable Development. Theory, Methods and Applications.* Cheltenham, UK: Edward Elgar.

Welford, R. (1995) *Environment Strategy and Sustainable Development. The Corporate Challenge for the 21st Century.* London: Routledge.

Welford, R. Ed. (1996) *Corporate Environmental Management and Strategies.* London: Earthscan.

Welford, R. & Starkey, R. Eds. (1996) *The Earthscan Reader in Business and the Environment.* London: Earthscan.

Welford, R. (1996) Breaking the Link Between Quality and Environment: Auditing for Sustainbility and Life Cycle Assessment. I R. Welford & R. Starkey, Eds. (1996) *The Earthscan Reader in Business and the Environment.* London: Earthscan.

World Commission on Environment and Development, (1987). *Our Common Future,* Oxford: Oxford University Press.