

Sustainable development: environmental limits and the limits of economics

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Introduction

Our Common Future, better known as the Brundtland Report, is one of the most influential books of the past twenty years. This publication put the concept of sustainable development on the United Nations agenda as well as on the public policy agenda of virtually every nation in the world.

Two other books have had substantial impact on the integration of economics and ecology and promotion of intra and intergenerational equity. *A Blueprint for a Green Economy* (1989), prepared for the Government of The United Kingdom by Pearce and his colleagues, focuses on the extension of neo-classical economics incorporating environmental matters into economic decision-making.

The other book, *For the Common Good* (1989), by economist Herman Daly and theologian John Cobb, while accepting the value of market principles, calls for a reconstruction of the paradigm 'that both clarifies the excellence of its past work and sets it in a larger context' (p 19). The 'larger context' is a vision of an economic order which is 'just, participatory, and sustainable' - an economy which serves the community.

It is likely that history will come to regard these books as a turning point in the evolution of public policy. No longer will it be possible to argue that there are not environmental-economic interdependencies and no longer will important decisions pertaining to the use of the environment be taken without at least some consideration of their impacts far into the future. The concept of scarcity has been extended to oceans and the atmosphere (the global commons), to rivers and streams, the air above our cities, and to the remaining wilderness.

This new perspective brings an enormous challenge for economists, social scientists, ecologists, and philosophers. The evolution of the concept of sustainable development within economics has come a long and circuitous route. A few historical snapshots illustrate this.

Views from the past

In 1776 Adam Smith argued that economies have their own laws of motion and that through the 'invisible hand' of the market and fundamental laws of behaviour they are capable of indefinite improvement. Heilbroner

(1980:57) summarised this perspective: 'Adam Smith's world went slowly, quite willingly, and more or less inevitably, to Valhalla.'

A few years later in 1798, Reverend Thomas Malthus published *An essay on the principle of population as it affects the future improvement of society*. His basic thesis was that the human prospect was 'meagre, dreary, and chilling'. There was a tendency, Malthus argued, for population to outstrip all possible means of subsistence. Ricardo, best known for his development of the theory of rent (*Principles of Political Economy*, 1817), was in agreement with Malthus on the population issue, but on little else, and argued that the margin of cultivation would be continually pushed out on to poorer and poorer soils.

The industrial revolution and the laissez-faire capitalism of the early 19th century were to spawn ideas and social movements which, to some extent, can be considered precursors to their modern counterparts. The historical roots of present day concerns with distributional and equity issues are readily traced to the thinkers and activists of this era.

J S Mill gave the world a more compassionate economic and social order than that suggested by the laissez-faire capitalism of the 19th century. Mill showed that distribution was separate from production; that society could determine how it wanted to distribute the goods the economy produced rather than being a mechanistic function of the economy, and that through education and social policies a better world was possible. The mixed economies of today owe much to Mill.

There is one other work of the last century which deserves mention. It is *The theory of the leisure class*, published in 1899. The author, Thorstein Veblen, was according to Heilbroner, 'the last man who knew everything'. His ability to span disciplines is prerequisite to formulating sustainable development policies. Since Veblen's time this has become much more difficult as a consequence of the explosion of knowledge and separation of intellectual pursuits into narrow disciplines. Via biting satire, Veblen exposed the 'conspicuous consumption' of the new rich. Some would argue that a 'demonstration effect' has permeated through to all levels of society and that modern consumerism has much to do with conspicuous consumption.

These ideas illustrate that the modern concept of sustainable development can be traced back to a much earlier period, although not specifically addressing the modern economics-ecology interface. Economists must now turn to the development of natural resources and environmental economics.

Milestones In sustainable development

There is no one point in time which marks the start of environmental economics. In 1920 Piquou suggested that individuals had 'defective telescopic faculty' - and that government intervention might be needed to give adequate weight to the welfare of future generations. He also suggested that effects such as pollution, which are not included in market transactions, required measures which equate social and private costs and benefits.

In 1936, legislation by the US Congress - the US Flood Control Act of 1936 - enunciated the principle of comparing the costs and benefits of development proposals. It was not until 20 years later that a number of economic publications suggested fairly clear cost-benefit criteria for water resource projects (see Eckstein, 1958; McKean, 1958; Krutilla and Eckstein, 1958).

Of similar significance was the publication in 1954 of Scott Gordon's seminal work *The economic theory of a common property resource: the fishery*. This led to the development of fisheries economics and, very importantly, to bio-economics. The latter is to date the most ambitious - and some might argue, successful - attempt to integrate economics and biology. The essential message in Scott Gordon's work was that open access to a common property resource would lead to over-use in both an ecological and economic sense.

The fact that many environmental effects of development projects were not measured in the cost-benefit studies of the 1960s led to the formulation of a new tool: the environmental impact assessment.

Environmental impact assessment literature of this era defined 'environment' very broadly and emphasised cumulative, induced, irreversible and long-term impacts. A systems approach to identifying and measuring impacts was needed. A major contribution in developing a systems approach is that of Hufschmidt *et al* (1983). In *Environment, natural systems and development: an economic valuation guide*, they argue that to consider economic growth and environmental quality as alternatives is misleading:

'Deforestation and the resulting soil erosion undermine the agricultural base of an economy and reduce long-term growth prospects. Pollution of coastal waters can destroy commercial fisheries and can also check economic growth. Air pollution affects human health with a resultant loss in productive effort as well as direct welfare losses to individuals.

Even when deterioration of environmental quality does not lead to reduced capacity to produce conventional goods and services, natural-systems services that are consumed directly, such as recreation, are affected and the objective of development - improved human welfare - is undermined. For these reasons, it is of utmost importance that the effects on natural systems of development projects and programs be carefully analyzed. Such analysis is not a luxury, but must become an essential part of project formulation and evaluation if protection is to be provided to the natural-resource base that sustains human welfare' (Hufschmidt *et al*, 1983:1-2).

Defining sustainable development

Our Common Future maintains that the needs of the present generation should be met without compromising the ability of future generations to meet their own needs. The Chairman of the Commission, Gro Harlem Brundtland, (quoted in Pearce *et al*, 1989:174-5) has expanded on the concept:

'There are many dimensions to sustainability. First, it requires an elimination of poverty and deprivation. Second, it requires the conservation and enhancement of the resource base which alone can ensure that the elimination of the poverty is permanent. Third, it requires a broadening of the concept of development so that it covers not only economic growth but also social and cultural development. Fourth, and most important, it requires the unification of economics and ecology in decision-making at all levels'.

Our Common Future addresses these dimensions. Pearce *et al* give most attention to the unification of economics and ecology. Daly and Cobb primarily focus on broadening the concept of development.

The work of Brundtland and Pearce *et al* suggest that the ethical principle entailed in sustainable development is the Rawlsian principle, based on the notion that justice is equated with a bias in resource allocation to the least advantaged. As Pearce *et al* (1990:14) state:

'Such a rule could emerge from a constitution drawn up by individuals brought together under a 'veil of ignorance' about where in society they would be allocated. Risk aversion dictates that the constitution-makers would avoid disadvantaging certain groups for fear that they themselves would be allocated to those groups. The intergenerational variant of the Rawls outcome simply extends the veil of ignorance to the intertemporal context in which each generation is ignorant of the time period to which it will be allocated'.

Tisdell (1990) argues:

'However, once one adopts Rawls' principle one must not only apply it between generations but also within them for it also implies that a similar degree of equality is just between existing individuals. In particular it would seem to imply on a global scale that much larger income transfers should be made from developed to less developed nations than those now or likely to take place in the foreseeable future'.

Other economists have suggested somewhat different ethical principles for the attainment of sustainable development. Daly and Cobb suggest that the basic goal is to ensure the survival of the human species for as long as it is compatible with God's will. Georgescu-Roegen (1976) also focuses on long term survival of the human species. He bases his prescription for sustainable development on the inexorable workings of the entropy law. He suggests the best prospect for long term human survival is to reduce population to a level which can be supported by the use of renewable resources alone. Tisdell (1990), in commenting on this work, asks whether Georgescu-Roegen has taken the concept of sustainability to extremes and poses a number of questions regarding the application of the Rawlsian theory of justice:

'Should only human beings count ... in determining what is just? If we could have been born as any other individual could we not have been born as any other living thing, say an animal of some type? ... Could ... an Australian be born an Indian? What difference does it make to the application of Rawls' theory if one believes in reincarnation as do the Buddhists and Hindus?'

It would seem that defining sustainable development is an ethical issue and in practical terms acceptance of the concept is a political matter. What is clear, notwithstanding the differences indicated above, is that the fundamental ethical principle adopted is intergenerational equity.

Intragenerational equity

Brundtland deals with intragenerational equity at some length. This is understandable if north-south issues permeate much of the sustainable development debate. More fundamentally, the report makes the link between poverty, population growth and environmental degradation. The very poor, under-developed nations are 'locked-in' to continued over-utilization of their soils, pollution of their over-crowded cities and population growth. According to Brundtland, there must be a reform of international trading practices. In particular, protectionism in industrialised countries must be dismantled, because this depresses international prices of

products which are important export earners for many developing countries.

Brundtland looks forward to a 'sustainable world economy' in which free world trade is a prerequisite, as is economic growth (within ecological limits):

'If large parts of the developing world are to avert economic, social, and environmental catastrophes, it is essential that global economic growth be revitalised. In practical terms, this means more rapid economic growth in both industrial and developing countries, lower interest rates, greater technology transfer, and significantly larger capital flows, both concessional and commercial...

The Commission's overall assessment is that the international economy must speed up world growth while respecting the environmental constraints' (1987:89).

Brundtland's argument for economic development is:

'Economic development generates resources that can be used to improve education and health. These improvements, along with associated social changes, reduce both fertility and mortality rates. On the other hand, high rates of population growth that eat into surpluses available for economic and social development can hinder improvements in education and health' (1987:96).

Brundtland also calls for the removal of price distortions and the implementation of land reforms within developing nations. Attention is drawn to government policies which subsidise food in cities and result in migration from rural areas.

In their book *Sustainable development: economics and environment in the Third World*, Pearce *et al* (1990) address the intragenerational issues in more formal economic terms. They prescribe minimum conditions for sustainable development based on the 'constancy of the natural capital stock'. This concept requires elaboration. A broad view is that the total value of all capital stocks, man-made and natural, be held constant. Crucial to this view is perfect substitutability between man-made and natural capital. Pearce *et al* argue that a constant capital stock 'is likely to serve the goal of intragenerational fairness - ie justice to the socially disadvantaged both within any one country and between countries at a given point in time'. This they argue is clearly the case in the poor countries, but less obvious for the developed countries.

Daly and Cobb also concern themselves with the particular aspects of intragenerational equity in the context of sustainable development but they do much more. Their book is about fairness. They, like J S Mill,

reiterate that an economically efficient allocation does not imply a just distribution. Daly and Cobb state:

'Historical conditions of property ownership are major determinants of income distribution and have little to do with either efficiency or justice. These two values can conflict, and the market does not automatically resolve this conflict. This is recognised by economists today, but there still exists a residual feeling from the heyday of marginal productivity theory ... that the market rewards everyone in close proportion to his or her contribution to the total product. It is simply incorrect ...' (1989:59).

These authors recognise the need for incentives if the market is to function. They are strong supporters of the market and explicitly argue against centralised economic planning. They do not resolve the question of what is a just distribution, nor what the rewards have to be for a market to function. They ultimately rely on Christian notions of fairness.

Intergenerational equity

Constant capital

Fundamental to unravelling the constant capital issue is a better scientific understanding of the role natural capital (soils, forests, water, etc) as a factor of production, and as a direct consumption good (for those who directly use natural ecosystems for recreation, or value them for their intrinsic attributes).

Natural capital differs from man-made capital in that the latter can be increased or decreased at will while the former can be decreased but not increased. Pearce *et al* suggest that 'natural and man-made capital are substitutes only to a limited extent'. The issue of substitutability is only part of the story once natural and man-made capital are viewed as complements. This view runs throughout the Brundtland Report. We ought not think in terms of a dichotomy between economic development and environmental protection; sustainable development suggests we can have both, within limits.

Discounting

There is probably no more poorly understood or contentious issue than that of discounting the future. Non-economists are likely to blame economists for inventing the concept. This is not the case. Economists are observing the behaviour of individuals, who, for a variety of reasons, in their *economic* behaviour tend to favour the present rather than the future.

'It may not be too unfair to suggest that previous models of the development process have tended to assume that the "future will look after itself", whereas the sustainable development approach acknowledges that the ability of the future to do this can be seriously

impaired by action taken now. In this sense, sustainable development does not give *greater* weight to the future than other development approaches: it simply points out that the *factual* assumption that future generations *would* be able to choose as freely as a current generation is not likely to be correct' (Pearce *et al*, 1990:19).

There is no correct discount rate:

The issues are complex, involving philosophical and economic considerations that cannot be simplified without danger of trivialization. However, they ... lie at the centre of the intellectual debate on the balance between the needs of present and future generations ... What value the discount rate should take has been the subject of much debate among economists ... the two basic candidates are the *consumption rate of interest*, which is based on the rate of time preference and the *opportunity cost of capital*, which is based on the marginal productivity of capital. In the simplest of economies ... the levels of savings and investment would adjust, so that the two rates are equal ... But real world economies are more complex ... and the two rates diverge, with the opportunity cost of capital being ... higher ... there is no generally agreed way of deterring the discount rate' (op cit, 23-25).

Box 1 presents in summary form the rationale for discounting, and arguments for and against.

Disregarding a fairly important point - that we do not know what the correct discount rate is - the conventional wisdom within economics is not to adjust the discount rate. Once we recognise that project appraisal is not intended to address intergenerational equity issues, we can put aside the unresolvable debate on discounting and look for practical rules.

Over the years, many economists have suggested that environmental constraints be applied to development projects and that these should over-ride the discounting rule. Ciriacy-Wantrup (1952) has argued for safe minimum standards since 1952. Bishop (1978), and Pearce *et al* (1989, 1990) have argued for environmental constraints and defining the rights of future generations and using these to circumscribe cost-benefit analysis. Once again we have to turn to ethics.

The market and sustainable development

I have referred, in the main, to three major works which are changing the public policy agenda in ways that few other intellectual offerings have in recent decades. None however are suggesting a radical departure from the prevailing ethical underpinnings of modern society.

Box 1: The rationale for discounting - arguments for and against

<i>Arguments for:</i>	<i>Arguments against:</i>
<p>Pure time preference</p> <p>Individuals are impatient and prefer the present to the future</p> <p>Society is the sum of individuals, therefore society prefers the present to the future</p> <p>People's preferences should count (the neo-classical ethical principle)</p>	<p>Individual time preference is not necessarily consistent with lifetime welfare maximisation</p> <p>Discounting, because of impatience, is irrational(a)</p> <p>What individuals want is not necessarily what society should want (rejection of the individualistic liberal value judgement)</p> <p>Individuals make decisions in two contexts, private and social (social/community decisions are altruistic and consider future generations)</p> <p>It is a satisfaction of wants as they arise that matters: tomorrow's satisfaction matters, not today's assessment of tomorrow's satisfaction(b)</p>
<p>Risk and uncertainty</p> <p>A benefit or cost is valued less the more uncertain its occurrence(c)</p> <p>Uncertainty increases with time</p> <p>Risk that an individual will not be alive to benefit in the future</p> <p>There is uncertainty about future preferences</p>	<p>Individuals are mortal, society is not</p> <p>Social decisions are less risky than private decisions</p> <p>Preferences for food, shelter, water and energy are certain(d)</p>
<p>Diminishing marginal utility of consumption</p> <p>In a growing economy, consumption increases over time and people are better off (the more one has in the future, the less one is likely to sacrifice today to obtain even more in the future)</p>	<p>Only applicable if real consumption per capita can be reliably expected to increase (not necessarily the case)</p> <p>Constraints prevent individuals from acting in a 'normal' way (the poor have no choice but to focus on tomorrow's meal)</p>
<p>Opportunity cost of capital</p> <p>Capital is productive (investing a \$1 now will lead to \$1 plus in a year's time)</p>	<p>If the cost of environmental degradation was internalised, productivity growth might be negative (this suggests negative discount rates)</p>

Notes:

(a) This perspective has a long history in economic thought (ie Jevons, 1871; Bohm-Bawerk, 1884; Ramsey, 1929; Pigou, 1932).

(b) Goodin, 1986.

(c) This has been argued since Bentham, 1789.

(d) Barry, 1977.

Source: Adapted from Pearce et al (1989 and 1990) and Daly and Cobb (1989).

The most radical of the contributions is that of Daly and Cobb. Nevertheless, how radical is a call to return to Christian ethics! They are firmly wedded to the principles of the market, as opposed to central planning, but find fault with the real world workings of market capitalism and do not favour complete *laissez-faire*.

They argue that there is a tendency for the market 'to erode its own requirements' and suggest three ways in which this occurs: a tendency for monopoly power to increase over time; the markets' inability to deal effectively with externalities and public goods; and its effect in depleting moral capital. Only by focusing on this aspect of their work does one fully appreciate their charter for a new society.

'Somewhat analogous to the tendency of the market to erode its own competitive foundations is the corrosive effect of individualistic self-interest on the containing moral context of the community. However much driven by self-interest, the market still depends absolutely on a community that shares such values as honesty, freedom, initiative, thrift, and other virtues whose authority will not long withstand the reduction to the level of personal tastes that is explicit in the positivist, individualistic philosophy of value on which modern economic theory is based. If all value derives only from satisfaction of individual wants, then there is nothing left over on the basis of which self-interested, individualistic want satisfaction can be restrained. Depletion of moral capital may be more costly than depletion of physical capital, as Fred Hirsch has argued in *The social limits to growth* (1976). The market does not accumulate moral capital; it depletes it. Consequently, the market depends on the community to regenerate moral capital, just as it depends on the biosphere to regenerate natural capital.

Unfortunately, the market as a category of economic thought abstracts from the community and the biosphere. As a result these issues do not gain attention within the discipline of economics. Yet in the real world, failure to respect the limits of both social and biophysical community is the greatest threat to a market society' (Daly and Cobb, 1989:50-51).

To work towards sustainable development has implications for how economic well-being is measured in a market economy. The first point to note is that it is *economic*, as opposed to *financial*, results which are of concern. The two can differ, and the difference causes confusion. Financial measures result from profit and loss statements of firms or individuals and these reflect a range of influences (such as existing taxes/subsidies, depreciation rules, interest rates, etc) which can differ

from the economist's optimum. Spillover effects, both negative and positive, do not enter into the calculus. Economists need to adjust for all such influences.

The second issue is that the existing technique for measuring and reporting on changes in economic well-being, Gross National Product (GNP), does not do this adequately. This issue is discussed in both Pearce *et al* and Daly and Cobb in some detail. The main areas of measurement error are: the inclusion of the costs of pollution abatement by households as gains; unmitigated environmental degradation is not subtracted; and depreciation of natural capital is not subtracted.

Incorporating sustainable development into standard decision-making poses problems additional to discounting. The setting of a constraint on depletion and degradation of the stock of natural capital could mean that few projects would be feasible.

The solution, as suggested by Pearce *et al* (1990:127-8), is that at the program level there should be some projects that enhance the natural environment to compensate for those 'that harm it'. The overall result should be zero damage. The practicalities of implementing this compensating project approach require further consideration. The achievement of sustainability is even more complex where the project is the exploitation of non-renewable resources. It is obvious that this type of project would not be permitted if we imposed a constraint which did not allow depletion; furthermore, it is impractical to argue for no depletion. The solution is to use some of the profits for investments which bring continued sustainable income for society. This is, of course, easier said than done.

Conclusion

In attempting to integrate economics, ecology and equity considerations, there are limits to what the discipline of economics can achieve. At the highest level the fundamental issues of intra and intergenerational equity are beyond the realms of economics. They are ethical issues, the resolution of which will depend on community acceptance of principles developed by informed debate.

In the not too distant past economists were philosophers and many had an understanding of how economics related to the natural world. Issues we discuss today under the heading of sustainable development were foremost in the minds of some of these thinkers in an era when the explosion of knowledge had not occurred and the disciplines had not split. Today, an immediate task is to build links, and importantly, an understanding between those practising in the relevant disciplines.

Allow me to conclude by summarising what sustainable development is *not*. My sources for these views are the three major works I have referred to.

First, sustainable development is not anti-growth. In fact, Brundtland calls for growth within the ultimate constraints of the environment. Pearce *et al* (1990) argue that, contrary to the old-fashioned view that there was a dichotomy, societies can achieve both growth and environmental objectives - up to a limit. All three works argue for a qualitative change in growth. In this regard they are not at odds with the founders of neo-classical welfare economics who defined economic efficiency very broadly, some arguing there is no economic efficiency without explicit incorporation of distribution. Daly and Cobb (1989) take this perspective further, based on a particular ethical stance. It is conceivable that similar conclusions could be drawn by others holding radically different ethical positions.

Second, sustainable development is not anti-market. It recognises the ability of the market to gather and sort out an enormous amount of information. It recognises the incentive system of profit and consumer satisfaction maximisation can work for the common good. All three sources have concerns, some quite serious, about the actual workings of the market. They call for the market to be perfected - by internalising externalities, such as pollution, by correcting for monopoly power, and by eliminating government interventions which do not correct market failure and may in fact exacerbate it. Either explicitly or implicitly there is a call to address the distributional consequences of market-determined allocation of income. This raises the question of how this is to be done. What principles should apply? These are, of course, not new questions.

What sustainable development does is make society face age old questions of political and economic philosophy. Maybe, just maybe, we can make progress. To succeed we will need to rekindle an interest - not only by political and community leaders, but within the world community - in ethics.

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References

- Bishop, R., 'Endangered species and uncertainty: the economics of a safe minimum standard', *American Journal of Agricultural Economics* 60, 1978, pp 10-18.
- Ciriacy-Wantrup, S V, *Resource Conservation Economics and Policies*, University of California Press, Berkeley, 1952.
- Daly, H and J Cobb, *For the common good*, Beacon Press, Boston, 1989.
- Dasgupta, A K and D W Pearce, *Cost-benefit analysis*, Macmillan, London, 1972.
- Eckstein, O, *Water resource development*, Harvard University Press, 1958,
- Gordon, H S, The economic theory of a common property resource: the fishery', *Journal of Political Economy* 62, pp 124-142.
- Hufschmidt, M, James, D, Meister, A, Bower, B and J Dixon, *Environment, natural systems and development*, The Johns Hopkins University Press, Baltimore, 1983.
- Krutilla, J V and O Eckstein, 'Multiple purpose river development', *Studies in applied economic analysis*, The Johns Hopkins University Press, Baltimore, 1958.
- McKean, R N, *Efficiency in government through systems analysis*, Wiley, 1958.
- Pearce, D, Barbier, E, and A Markandya, *Sustainable development: economics and environment in the Third World*, Edgar Elagar, Aldershot, 1990.
- Pearce, D, Markandya A and E Barbier, *Blueprint for a green economy*, Earthscan, London, 1989.
- Rawls, J R, *A theory of justice*, Harvard University Press, Cambridge, Mass, 1972.
- Tisdell, C, *The nature of sustainability and of sustainable development*, Discussion Paper No 48, Department of Economics, University of Queensland, 1990.
- World Commission on Environment and Development, *Our common future*, Oxford University Press, Oxford, 1987.
- Georgescu-Roegen, N, *Energy and economic myths: institutional and analytical economic essays*, Pergamon, New York, 1976.