Sustainable Development: Remembering the future

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The concept of sustainability, meeting this generation's needs without compromising the ability of future generations from meeting theirs, is very much en vogue. *Claire Thornhill distinguishes between growth and development and discusses the biophysical and ethico-social limits to growth. She discusses how best to divide exhaustible resources intergenerationally and how to preserve the environment. She concludes that a greater focus must be placed on the generations still to come.*

Introduction

'Simply put, growth is quantitative increase in physical dimensions; development is qualitative improvement in non-physical characteristics. An economy can therefore develop without growing, just as the planet Earth has developed (evolved) without growing.' (Daly, 'The economic growth debate.')

While the term 'growth' can be used to mean increases in physical production, consumption, and the stock of human and capital, 'development,' on the other hand, can refer to improvements in the standards and quality of what is produced, consumed, and of the physical stock. In standard neo-classical economic theory, growth is an important goal. In practice also, governments also usually use physical growth as a proxy for welfare, leaving out of the calculations the costs to the environment of this growth, and the damage to future prospects.

Sustainable development is the phrase now used to emphasise the aim for development instead of growth. There are many definitions, but generally it can be said to involve maximising the net benefits of economic development, subject to maintaining the services and quality of natural resources over time. Sustainability is principally an equity issue rather than an efficiency issue and puts particular stress on the need not to overexploit the world's resources, in view of the fact that future generations also have a right to their use and enjoyment.

Why is it, then, that some economists choose sustainable development over growth as an aim for society? The argument is that, given only finite resources on Earth, there must be some limits to physical growth. From classical economists like Malthus in the nineteenth century, to twenty-first century economists such as Richard Douthwaite, the claim that the planet's resources cannot sustain continuous growth of population and economy indefinitely has often been made. Put simply, the argument is that 'anyone who believes exponential growth can go on forever in a finite world is either a madman or an economist' (Kenneth Boulding in Douthwaite, 1990).

Limits to growth

Since Kenneth Boulding's article of 1966, 'The economics of the coming spaceship Earth', discussion of the limits to growth has based much of its reasoning on the first two laws of thermodynamics. The first law of thermodynamics states that matter, like energy, can neither be created nor be destroyed. As more matter is extracted by the production process, more waste is generated which must be returned to the environment, as the law states that its matter-energy content cannot be destroyed. The second law of thermodynamic states that in a closed system, the use of matter energy causes a one way flow from low entropy resources to high entropy resources; from order to disorder. As an energy resource is used, the amount of work that that energy can do is diminished. The major implication of this law is that energy cannot be recycled in such a way that we get back all the capacity of the original energy source to do useful work, since the act of using the original low-entropy resource means some of its energy is lost as heat (Hanley *et al.*, 1997).

Neo-classical economics is based on the assumption that the economy is far from the limits of desirable growth. However, some economists, like Herman Daly, argue that in reality, there are limits to the resources of the environment and consumer wants and that we are operating very close to these limits. This being the case, we are unable to assume that an increase in economic welfare causes a corresponding increase in total welfare, as the negative externalities might more than outweigh the material gain. While development is not limited by the same constraints, Daly pinpoints two general classes of limits to growth, namely biophysical and ethico-social.

Briefly, biophysical limits to growth can be based on the view of the economy as 'an open subsystem of a larger, but finite ecosystem' (Daly, 2001). Because the economy is part of the ecosystem, it cannot grow larger than it. Because of the second law of thermodynamics, matter and energy cannot just keep on flowing around in an isolated system. There are outlets of energy, as well as inlets from the sun. Daly (*ibid.*) sees instead, a 'one-way, linear entropic flow (throughput) from the environment (depletion) through the economy (production and depreciation), back to the environment (pollution).'

Even if the biophysical limits to growth are not recognised, ethico-social limits still apply. Ethico-social limits to the desirability of growth are bound up with our moral duty to future generations, the possibility of driving species to extinction, the negative externalities that too much growth can have and the moral degradation that a glorification of self-interest can have on society.

Douthwaite, a strong opponent to current attitudes to growth, illustrates one particular limit to the desirability of growth. Douthwaite cites a survey by the British Social Science Research Council, which revealed when the survey was carried out over 25 years ago, 71% of British people already considered non-materialistic aspects of life, such as their family situation, as most important to their 'quality of life' (Douthwaite, 1990). It is perhaps possible, then, that consumer wants for material goods can be satiated and that developed countries are near to some ethico-social limits to the desirability of growth. However, this result is not relevant to the populations of developing countries, where material needs are of a much more fundamental kind. There, some of the ethico-social limits to the desirability of growth may still be distant.

Distributing exhaustible resources

Once economists accept that limits to growth do exist, a plan for sustainable development is necessary. There are a number of different approaches, often referred to as rules, involved in managing sustainability. The Hartwick-Solow approach to sustainability rules is based on Hartwick's assertion in a 1977 paper that as long as the stock of capital did not decline over time, non-declining consumption was also possible (Hanley *et al.*, 1997). His approach requires the application of Hotelling's rule, which states that the price of an exhaustible resource must grow at a rate equal to the rate of interest, both along an efficient extraction path and in a competitive resource industry equilibrium, for resources to deplete at a socially optimal rate. Hartwick argues that the stock of capital could be held constant by reinvesting all Hotelling rents from non-renewable resource extraction into manmade capital. Thus, for example, as the stock of coal depletes, the stock of manmade capital increases as a replacement.

For Hartwick's rule to hold, two very strong assumptions must be made. Firstly, it is assumed that the aggregate final production function is a Cobb-Douglas, and secondly, that manmade and natural resources are perfect substitutes for one another. As well as pointing out that the natural environment has value beyond its role as an input to the production process, critics of Hartwick's sustainability rule have focussed on the strength of his assumptions.

The London school takes a different approach to sustainable development (for example Pearse and Turner, 1990). Here it is acknowledged that there is a degree of substitutability between manmade and natural capital but that many natural resources supply non-substitutable services to the economy. Pearce and Turner (1990) focus on the question of depleting exhaustible resources, and include the assimilative capacity of the environment as another renewable resource. As exhaustible resources are depleted, their reduced stock should be compensated for by increases in renewable resources, as the substitutability between exhaustible resources such as fossil fuels and renewable resources such as solar energy is recognised. They also note that because efficiency is growing as a consequence of technological improvements, advanced economies may need less energy to produce an extra unit of GDP than they did in the past.

Population growth, however, may more than offset the positive effects of increased efficiency and technological development. Even without this consideration, technological progress as a means to offset depleting resources has its caveats. Firstly, new technology is not necessarily less polluting. When the focus on developing new technology is geared towards making it more efficient or attractive to consumers, the positive effect it sometimes has on pollution is incidental. Although communication by email is less polluting than communication involving vehicles, the latest polystyrene coffee-cup might represent an improvement in heat retaining ability rather than in pollution abatement. Secondly, there is nothing to prove that man can improve technology indefinitely.

The question of how much of the natural capital stock should be maintained for future generations is complicated by the difficulty in quantifying natural resources. The difficulty in aggregating unpolluted lakes with acres of forest, or oceans with whales, could be overcome however, by dividing the natural stock into sections and maintaining a certain level from each section. If this does prove to be a viable way to aggregate resources, the London school suggests that reduction in the level of natural resources below some constraint value should be prevented. Instead of advocating the current level of natural resources as a target, the use of 'shadow projects' has been suggested. The policies would add to the stock of natural resources, to exactly offset falls to a collected group of projects that they are shadowing.

Environmental degradation

Another approach to sustainability is that of safe minimum standards. This assumes that society is unsure about the true costs that environmental degradation will have on the future. Deciding to conserve a resource is the risk-minimising approach and thus, this analysis shifts the burden of proof from those who wish to conserve to those who wish to exploit. The safe minimum standard rule states that reductions in the natural capital stock below the safe minimum standard identified for each component of this stock should be prevented, unless the social opportunity costs of doing so are unacceptably large (Hanley *et al.*, 1997). The approach however, presents problems as the minimum standards have only been worked out in flora and fauna. In addition, what constitutes 'an unacceptably large' social opportunity cost is open to argument.

Daly has also identified 'operational principles' for sustainable development. Firstly, all harvest levels should be set less than or equal to the population growth rate for some predetermined population size. Regarding pollution, for degradable pollutants, assimilative capacities for receiving ecosystems should be established. For cumulative pollutants, the discharge should be set close to zero. To maintain the stock of resources, receipts from non-renewable resources extraction should be divided into an income stream and an investment stream. The investment stream should be invested in renewable substitutes (for example, biomass for oil) such that, by the time periods when the non-renewable resource reaches the end of its economic extension, an identical level of consumption is available from the renewable substitute to what was available form the non-renewable resource at the start of the depletion programme. Only the income stream should be available for consumption (Hanley *et al.*, 1997). Criticism levelled at Daly's rules for sustainability is that they may be very difficult to apply as the assimilative capacity of the environment, for example or the possible size of the investment stream would be very hard to calculate.

Conclusion

The key to sustainable development is its focus on intergenerational equity. Putting an economic value on all the environmental externalities in the economy, for example, would certainly cause greater intratemporal efficiency, but would not satisfy that "sustainable development [be] a requirement to our generation to manage the resource base such that the average quality of life we ensure ourselves can potentially be shared by all future generations" (Asheim, 1991: in Hanley *et al.*, 1997). Thus the theories of sustainability rules outlined above are all concerned with the management of natural resources or whether manmade resources are a suitable substitute. The varying approaches to this problem highlight the many issues of scientific uncertainty and difficulties in valuing environmental resources. The common goal however, is to take the rights of future generations into account when formulating economic policy. As the late David Brower, founder of Friends of the Earth put it: 'We do not inherit the world from our fathers, we are stealing it from our children.'

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