No Limits? Sustainability, Development, Technology and the Chimera of Endless Growth

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ABSTRACT

This paper discusses the 'limits to growth' debate. The conception of development as economic growth is critiqued and other, more human-centred, definitions are introduced. The concept of entropy is used to demonstrate fundamental flaws to the idea of limitless growth, and the possibility of technological solutions is discussed at length and found to be wanting. The paper therefore makes the case for radical ecological economics, predicated on alternative understandings of development which necessarily privilege sustainability over economic growth. In order that the abandonment of limitless growth is equitable and does not entail poverty and hardship, it is suggested that this should be accompanied by a redistribution of capital, and entrenchment of democracy in localised form.

KEYWORDS: Sustainability, development, technology, ecologism, resources.

INTRODUCTION

Development is, along with the environment, one of the great moral issues of our time. In a world with such gross disparities in material wealth, there is a clear moral imperative to improve the position of the most disadvantaged. In traditional liberal economics, development means improvement of the general material wellbeing through economic growth. However, contrary to the assumptions of classical liberal economics, the environment which we inhabit places physical limits upon our economic activity.

In this paper I shall examine arguments surrounding debate on limits to growth, with particular regard to the ideas of Herman Daly. As the sustainability of development obviously depends upon how we define it, I shall first outline alternative conceptions of development and sustainability, before proceeding to a description of the 'limits to growth' thesis. This will then be contrasted with the mainstream assertion that growth can be adapted to sustainability to demonstrate the idea of unlimited growth as illusory, and that development predicated along these lines is far from sustainable. As such, the limits to economic growth present a fundamental challenge, not only to the economic order in the developed world, but also to the traditional paradigms of development for the global south, and to capitalism in general. From there I shall examine proposed solutions which set out how we can strive for sustainable economics based around the alternative conceptions of development.

WHAT CONSTITUTES DEVELOPMENT AND SUSTAINABILITY?

While development has traditionally been equated with economic growth, the critiques of ecological economists insist that it is essentially a process about and involving humans, and one which requires defining in terms of human betterment. The inherent dichotomy in the terminology of developed and developing countries portrays energy-intensive industrialism as the natural end-point of a linear process of modernisation (Redclift, 1994). Alternative perspectives refute both this crass linearity and the desirability of such an end.

Daly (1992a) draws the distinction between quantitative growth of the economy with qualitative improvement in people's lives (i.e. development). In a similar vein Elkins (1993: 95-96) contrasts the growth of production with growth in environmental resources and growth in welfare and human utility, with the latter approximating to development. He points out that although economic growth is presumed to improve welfare in liberal economics, negative feedback in various spheres (i.e. pollution) can actually shrink environmental resources and consequently welfare. Pearce *et al.* (1991) describe development in terms of its effects: advances in utility; the preservation of existing freedoms or the creation of new ones; and increases in self-respect and self-esteem.

It is in this distinction that one may see where the tensions arise between sustainability and development as growth. In ecological economics the economic system, which is the entire referent object of classical economics, is seen as a subsystem within the wider ecosystem. It derives benefits from the wider system, taking resources from the ecosystem and relying on natural processes to dispose of waste output (Meadows *et al.*, 2004: 51-54). These inputs and outputs are the externalities of classical economics, and are not marketised (or in some cases are incompletely marketised), yet cannot be taken for granted, as overuse can disrupt or diminish their utility.

It is worth noting that perfect internalising of all economic externalities might theoretically create market mechanisms which could address environmental problems (Daly, 1992b: 36), but in practice this is not possible. An example of an incompletely marketised resource could be logging rights which give the owner access to the lumber from a certain area of land. However there are no corresponding market mechanisms to account for the long-terms benefits of undisturbed virgin forest, economic or otherwise, or to regulate the clean air, suitable soil and weather which allow forests to grow. Also, the long time lag in the onset of most environmental problems means that market mechanisms encourage short-term over-exploitation (Meadows *et al.*, 2004: 157-162).

In the current context, then, sustainability refers to sustaining these environmental externalities, maintaining 'natural capital' by Daly's formulation (1992b). It can also cover sustainability within the economic system, preventing economic bottlenecks, ensuring re-investment and training and so on. While these are clearly important considerations for policymakers, the challenges presented by physical limits to growth are of an entirely different order of magnitude, and as such this paper will only consider the former meaning of sustainability.

A glance at policy documents emphasises how counting natural capital as simply one of many factors to be managed in economic growth, rather than the source from which economic activity is derived, can lead to erroneous conclusions about the long term sustainability of growth. The Brundtland report, an early UN foray into the topic of sustainable development, envisaged the adaptation of technology and society alongside the necessary element of a growing economy in order to achieve sustainability (*Our Common Future*, 1987: 49). Until 2005, one of the four pillars of the UK government's sustainability policy was to secure 'high and stable' economic growth, and current UK development policy speaks confidently of 'decoupling environmental degradation from economic growth' (*Securing the Future*, 2005: 18). Neither does the output of the high-profile UN initiatives on the environment address the contradictions between sustainability and economic growth. Agenda 21, the document finalised at the Rio 'Earth Summit', calls for 'further liberalization and expansion of world trade' as a prerequisite for sustainable development (*Agenda 21,* 1992), and the declaration from its successor, the Johannesburg Summit on Sustainable Development, speaks of economic development and environmental protection as 'interdependent and mutually reinforcing' (*Johannesburg Declaration*, 2002). As I shall demonstrate, these formulations are essentially contradictory.

LIMITS TO GROWTH & CRITICISMS

The idea of limits to growth is central to green thinking. At its core is the contention that a way of life which is not aware of the benefits it derives from the wider ecosystem, in terms of resources and as a repository of waste, and does not wish to use these wisely, is both wrong and eventually self-defeating. The earth is a closed system, with a limited flow of energy into it from the Sun, therefore we cannot perpetually ignore the source of our economic inputs (i.e. raw materials), or the fate of our economic outputs (waste) (Balding, 1992: 27). The fact that these resources and the 'sinks' into which our waste become subsumed, are both finite, that there are limits to what we can take from the ecosystem and what we can dump back into it, means that economic growth cannot continue indefinitely (Daly, 1992b).

Having limits to growth implies that the idea of obtaining a western standard of living for all, the traditional goal of development, is illusionary. Through ecological footprint analysis, scholars attempt to quantify the amount of natural capital (i.e. sinks and resources) used in various processes. It is therefore possible to quantify the proportion of the Earth's resources to sustain a particular lifestyle, and to show that such a standard of living for all is unattainable (Wackernagel and Rees, 1997).

The radical implications of limits to growth have meant that it has been fiercely resisted. The pervading criticism is that its prescriptions are unrealistic (Pearce, 1993). In this reading, the system of liberal capitalism is so pervasively ingrained into our political culture, and the need for environmental change is so pressing, that to pursue such root-and-branch change is quixotic and misguided (Porrittt, 2005). There is an impression that green thought is on some level masochistic (Prugh *et al.*, 2000), and that the 'neo-Malthusian' concern with controlling population is as sinister as Malthus's original ideas, which were derided as being inhuman and essentially 'anti-people' (Redclift, 1994).

Indeed, at an initial glance, possibilities present themselves to square the circle of continual economic growth and material limits, and the reason why some critics ascribe the limits to growth argument to some pathology within green thought rather than logic can clearly be seen (Pearce, 1993: 4). What is to prevent an economy growing, but at the same time developing technologically in such a way as to use fewer resources (or exploit alternative resources) and to pollute less, as envisaged in Brundtland? Surely then material limits on the economy would not be a fundamental block to continued economic growth?

TECHNOLOGICAL SOLUTIONS?

The concept of entropy categorically precludes the idea of limitless growth. Entropy is described by the second law of thermodynamics as the propensity of heat always to travel from a hot body to a cooler one. Although this may not immediately seem relevant to our purposes, what is being observed whenever an object cools is the nature of energy to disperse inexorably across the universe: *everything* is in transition from order, heat and usefulness towards coldness and disorder. Much is made in the literature on limits to growth to emphasise the fundamentality of entropy; apparently Einstein considered the laws of thermodynamics the laws of physics that were least likely to be disproved (Daly, 1992a: 24).

In terms of entropy, all technological and biological processes must therefore involve the dispersal of energy. In general, human technological advances and all biological processes involve the localised reversal of entropy through harnessing larger entropic processes: creating ordered objects or concentrating energy by diverting part of a larger release of energy (such as burning something, the depletion of chemical energy or sunlight). As such, while we can re-use materials and energy (and there is a massive scope for us to do so compared to the profligate wastage of our present lifestyle), we cannot buck the trend, and somehow utilise more energy than that which flows into our closed system from the Sun, nor can we devise circular industrial processes with perfect recycling of materials: there will always be a loss of energy. While technology may give us the ability to derive energy from other sources, and there may be other stored resources which we can utilise in the short term, any attempt to live beyond our means in terms of energy merely defers the inevitable; the second law of thermodynamics states that we cannot simply manufacture it out of wishful thinking.

This would seem to present a possibility of limits to growth only at some distant point in the future, but Daly (1992a: 21) insists that we should also consider that all our technological processes exist on an entropy gradient and that the end results of our industrial processes are necessarily high entropy outputs. While this may seem contentious, and a good deal less intuitive, there is some justification for it. Many persistent pollutants will require much work (both in terms of energy and in the human sense) to be rendered harmless, or will have to be left to natural processes to break down, themselves dependent on the finite entropic flow of energy from the sun. In several of the World3 scenarios (the ecosystem model used in ‘Limits to Growth’ to discern the necessary conditions for sustainability), it is the diversion of capital to counteract the effects of these pollutants which eventually causes industrial decline and population collapse (Meadows *et al.*, 2004: 168-174)

While early work on environmental limits to growth often focused on resource depletion, global warming – the most pressing environmental issue of our time – means that it is the strain on the carrying capacity of the atmosphere which presents the most pressing problem, rather than the scarcity of energy. Paul and Anne Ehrlich (1990), calculate the technological advancements required to produce an extremely conservative cut in CO_2 emissions of 50% by 2050, with the projected rise in world population and a modest growth rate translating to a 2-3% rise in consumption. This would require a decrease in the environmental impact of each unit of consumption of 93%; a fantastical amount.

If we look at the specifics of current predictions on climate change, keeping the Erlich figures for consumption and population growth (which would represent a drop in the rate of population growth from the Erlich predictions), but inserting an up-to-date target for the reduction of CO_2 of 80% from today's levels (Stern, 2006), the requirement rises to a reduction per unit of consumption of 97.5%. [1] European car manufacturers made on average a reduction of only 11% in fuel efficiency over the 8 years between 1997 and 2005, [2] rather than the 15% required by these figures, despite having undertaken to manage much larger reductions in order to avoid regulation (Rincon, 2006). It stands to reason that future improvements in efficiency will obey the laws of diminishing returns and initial gains in any efficiency drive will be the largest, to be followed by increasingly more marginal reductions. Although other energy technologies may emerge around which we can structure our economy, the imperative of growth dictates that new pollutants from these processes will be released in ever increasing amounts.

Ultimately technological improvement is not driven merely by the providential force of the market, but the complex interplay of knowledge and other social factors. The idea that human ingenuity will continually be able to deliver technological improvements which sufficiently reduce our environmental impact is a teleological fallacy, belonging more in the realm of science fiction than serious academia. Despite this, it remains a tenet of mainstream economic thought that price signals and market mechanisms can drive technological improvements at the rate required by the market (Clark, 1991).

This is the irreconcilable core of the contradiction between sustainability and development as economic growth, and the ramifications are vast. Our entire industrialised society is configured to work around invested capital's ability to grow with the economy, and it is difficult to imagine what would be involved in any transformation. One can easily see how green thought became dismissible as relentlessly negative. In such a society, any fall in the rate of economic growth has far reaching negative consequences; as Pearce (1993: 4) points out, in our current economic system, limiting growth implies unemployment and poverty. However, unemployment and poverty are not the unavoidable result of reduced economic activity: in a capitalist economy it is the lack of access to capital which necessitates the individual drive for work and thus for continual economic growth.

TOWARDS SUSTAINABILITY

There is general agreement in the literature as to the outline of a sustainable economics. Renewable resources should not be used at a rate faster than they naturally replenish, there should be a bias against using non-renewable resources, and at the very least they should be utilised in a way which facilitates the transition to a renewable resource, with all waste being restricted to a level that does not destabilise natural processes (Prugh *et al.*, 2000; Elkins, 1993: 93). These prescriptions are not very different from those of environmentalist scholars who reject the limits to growth (Pearce *et al.*, 1991), though without a more thorough examination of the contradictions in their position, it is likely that these prescriptions would result in 'recession' and the consequent political pressure for a reduction in environmental restrictions for the good of the economy.

What is needed instead is a 'steady-state' economics, judged by the throughput of materials: the resources taken in and the waste put out at the ends of the industrial process, with a view towards reducing this as much as possible (though by the second law there will always be some throughput) (Daly, 1992a; Balding, 1992). One major conclusion of admitting physical limits to growth is that issues of income and wealth disparity cannot be left to be resolved eventually by aggregate growth across the economy. Instead, what is required is action to tackle income disparity, both across and between countries (Daly 1992b; Elkins, 1993: 96). As poverty and hardship in a contracting economy are caused by a lack of capital, then to ensure that this economic adjustment is politically acceptable, and fair enough to be sustainable, access to capital needs to be evenly distributed across the populace. This will ensure that economies in the developed world – where overconsumption is systemically ingrained – can contract, and capital in the underdeveloped world can be reinvested so as to entrench environmentally sustainable development (Elkins, 1993).

While operating from the paradigm of traditional economics this might appear to be a recipe for the end of progress and human development, it is worth returning to our multiple definitions of development. An economy with minimised throughput would no more remain at the same stage of development, than human ingenuity would dry up without a growing economy to stimulate it. There is no reason at all why currency circulation should not increase at times in a steady-state economy, it is just that this would not be a systemic necessity, nor the benchmark criteria for judging the health of the economy (Daly, 1992a: 244).

Although in exchange economies up to a certain level of development quality of life tends to correlate closely to quantitative economic position, the relationship is not true for all levels of economic advancement. In a society which is sufficiently technologically advanced that basic needs can be secured easily, decreased economic activity is a bequeathal of leisure time, rather than a drop in quality of life. The steady state economy would in no way hamper the qualitative improvement in welfare, only place limits in quantitative throughput.

Of course, talk of massive income redistribution and economic transition is all very well on paper, but historically implementation of alternative economic models do not have a comforting history. It is for this reason that green prescriptions for new economics have focussed on the idea of localism (Hines, 2000: 27-36; Prugh *et al.*, 2000). Compared to large-scale capitalism, the benefits include less damaging environmental impacts, greater possibility for control of the economy and for it being made to work for the benefit of local people (Hines, 2000). There is also less propensity for the concentration of wealth – capital would recirculate around the community, rather than accumulating in a few large companies.

Whether such fundamental change could be delivered by existing political structures seems doubtful. As previously noted, most international attempts to address environmental sustainability are wedded to fallacious liberal assumptions about the possibilities for unlimited growth, and to drive such colossal change through institutions with the democratic deficit and hegemonic tendencies of current global governance structures would be to invite resistance. For such change to be politically sustainable it would need to be democratically accountable on the local scale through bottom-up structures (Hines, 2000; Prugh *et al.*, 2000), and global politics would need to be conducted on a basis of parity. With such radical solutions it is possible to endow society with institutions able to adapt to, and implement, the changes necessary for environmental sustainability. There is no ignoring that the changes necessary are unprecedented in terms of scale, but neither can it be denied that without intentional change the environmental effects of industrialisation will force changes on a similar scale but with significantly more devastating consequences.

CONCLUSION

In conclusion, development as economic growth is not sustainable. Both absolute and secondary limits exist which prevent the possibility of continual economic growth, and mean that as growth continues to be pursued it will generate environmental problems and insecurity for future generations. Persistent belief in a model of development which equates to economic growth contributes to this, and under closer examination reveals itself to be prefaced on assumptions which cannot be justified.

Alternatives have been identified which allow for human society to progress in a sustainable fashion. A transition to steady-state economics in the North and the transfer of capital and wealth to the South, both implemented by locally accountable democratic structures, has the potential to create sustainable societies and allow those societies to develop both technologically and in terms of human welfare. Though this calls for a project of radical change larger in scope than any attempted before, both the magnitude of the threat of unchecked environmental change, and the scale of potential benefits, make the case for it hard to dispute.

NOTES

[1] Put simply this calculation amounts to changing one of the multipliers of the final fraction from 1/2 to 1/5, changing the final fraction from 1/16 to 1/40, or 0.025. The equation used is I=PCT, where I=environmental impact, P=population, C=per capita consumption and T=the unit in which we are interested-environmental impact per unit of consumption.

[2] This is the mean reduction percentage reduction achieved by manufacturers over this period.

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