



“Summary of article by Herman Daly: The Economic Growth Debate: What Some Economists Have Learned but Many Have Not” in Frontier Issues in Economic Thought, Volume 1: A Survey of Ecological Economics. Island Press: Washington DC, 1995. pp. 125-128

**Social Science Library: Frontier Thinking in Sustainable Development and Human Well-being**

## **“Summary of article by Herman E. Daly: The Economic Growth Debate: What Some Economists Have Learned but Many Have Not”**

It is important to differentiate between the terms "growth" and "development." Growth is a "quantitative increase in the scale of the physical dimensions of the economy; i.e., the rate of flow of matter and energy through the economy (from environment as raw material and back to the environment as waste), and the stock of human bodies and artifacts."(323) Development is the "qualitative improvement in the structure, design, and composition of physical stocks and flows, that result from greater knowledge, both of technique and of purpose."(323) An economy can experience development without growth; just as the ecosystem has developed but not actually grown, so can an economy.

On a finite earth there are biophysical and ethicosocial limits to the growth of aggregate output, but there may not be any limits to development. Neoclassical economics assumes, however, that it is biophysically possible and socioethically desirable for aggregate output to grow. This paper discusses the biophysical and socioethical limits to growth, and the associated welfare losses when these limits are reached.

### **Biophysical Limits**

The economy is a subsystem of a larger, finite ecosystem in which low-entropy raw materials are extracted and high-entropy waste is absorbed. The growth of the subsystem is limited by the size of the overall ecosystem, by the amount of low-entropy raw materials available, by the ability of the larger system to absorb high-entropy waste, and by "the intricate ecological connections which are more easily disrupted as the scale of the economic subsystem grows relative to the total ecosystem."(324) These biophysical limits are interrelated. The finite nature of the larger subsystem would not be an issue if everything could be recycled; however, entropy makes complete recycling impossible. If sinks for high-entropy waste and sources of low-entropy raw materials were infinite, then there would not be an entropy problem; however, "the fact that both are finite, plus the entropy law, means that the ordered structures of the economic subsystem are maintained at the expense of creating a more than offsetting amount of disorder in the rest of the system."(324)

Time and space must also be counted as finite and limited. Tasks or processes (e.g., production, consumption, resource regeneration and recycling) that can be completed in one time frame may be impossible in another. Linder has shown that the relative price of time in terms of goods has increased because the productivity of labor time has also increased. We then assume that the

marginal return on non-work time should equal the higher productivity of work time, but the congestion of time that results may cause a total welfare decline even as economic welfare increases.

In former peasant economies the primary source of low entropy was the sun, but modern economies rely on terrestrial ecosystems. However, dependence on energy supplied through terrestrial ecosystems "interferes with the life support services rendered to the economy by other species and by natural biogeochemical cycles"(324-325) and should therefore be counted as a cost to growth. This reliance on terrestrial ecosystems has resulted in both the "drawdown" of mineral stocks and the "takeover" of the habitats of other species, as suggested by W. Catton. In fact, present growth is based on drawdown.

The laws of thermodynamics are central to the concept of biophysical limits on economic growth. The First Law of Thermodynamics, which states that matter can not be created or destroyed, has been respected in modern economics, as production functions are required to respect this materials balance constraint. However, the Second Law (the entropy law) is not widely understood. "The rearrangement of matter is the central physical fact about the economic process,"(326) and the capacity to rearrange this matter has been termed low entropy, which is easier to rearrange than high entropy. The Second Law of Thermodynamics shows that low entropy is transformed to high entropy during economic rearrangement. Economists have applied their notions of the circular flow of money to flows of matter and energy, but this is incorrect, as the Second Law indicates that the flow of matter/energy is linear. Low entropy is extracted, used, and goes back to the environment as high-entropy pollution.

It is becoming evident that we are approaching these biophysical limits. The Global 2000 report to the President of the United States stated that by the end of the next century we will be approaching a population of 30 billion people, which is estimated to be close to the maximum carrying capacity on the earth. In addition, the per capita production of forests, fisheries, etc., has peaked and even begun to decline. Finally, as a result of the takeover of the habitats of other species, the total number of species is predicted to decrease twenty percent by the year 2000.

### **Ethicosocial Limits**

Independent of whether or not biophysical limits have been reached, there are four socioethical reasons why growth may not be desirable. They are:

**1) Limits to Drawdown:** We have a moral obligation to future generations that should limit present growth. Future generations will not have access to the minerals and biological gene pools that are used up by present generations. The basic needs of the present should always come first, but luxuries of the present generation should not. Future generations cannot act in present markets, so our present economic actions should show a moral concern for the future.

Talbot Page has outlined individualistic and collective expressions of these moral concerns for the future. Individualistic concern for the future has been expressed by the discount rate, where present individuals consider the welfare of future generations. Collective concern is manifest in an empathy for future generations similar to the Rawlsian concept of a "veil of ignorance." In

this approach, fairness is achieved because the generation making a choice does not know where in the temporal sequence it lies. The collective concern approach protects future generations more effectively than the individualistic approach (using the discount rate) because the latter is still only limited by the preferences of the present generation.

It has been difficult for humans to include future generations within our moral horizon because we tend to lose the concept of "ours" after great grandchildren. Beyond this, future people are seen as a social product rather than an individual one, and responsibility for them must be effected through collective action. In the end, "present claims should dominate future claims only up to some level of resource use that is sufficient for a good life for a population that is sustainable at that level."(329)

2) **Limits to Takeover:** Economic growth requires more space for more stocks of more people and artifacts, and for more sources of raw materials and more sinks to absorb waste. However, it is evident that other species have instrumental value to our economy, and these species need space. On a finite planet the needs for space present an instrumental limit to the amount of takeover. Another limit to takeover comes from the intrinsic value of these other species, regarded as sentient beings whose own "utility" should be accounted for. These claims of intrinsic worth should represent a limit of some kind, although this limit is difficult to calculate. The limits to drawdown are also relevant here because takeover of habitat and extinction are irreversible acts - i.e., a drawdown - and thus represent a cost to future generations.

3) **Limits from the Self-Canceling Effects of Aggregate Growth:** Aggregate economic growth may not always mean an increase in social welfare. The Easterlin Paradox questions the supposition that there is a positive correlation between income and happiness: "a larger percentage of rich people rated themselves as 'very happy' than did poor people - just as everyone would expect. But for different countries with very different income levels the differences in reported happiness are small."(331)

In view of this, there are four cases that illustrate the self-canceling effects of aggregate growth. First, happiness is a function of relative income, but everyone's relative income cannot increase; aggregate growth therefore has a self-canceling effect. Secondly, happiness is often a response to a temporary adjustment to a higher income; unhappiness may then be the reverse. Third, as we become goods-rich, we also become time-poor because of the increasing productivity of labor time, so we are less able to afford time-intensive activities. Finally, it has been shown that as growth increases, satisfaction from work decreases. "The implication of these self-canceling effects is that growth is less important for human welfare than we have heretofore thought."(333)

4) **Depletion of Moral Capital as a Limit to Growth:** Adam Smith argued that in addition to the restraining hand of competition, individuals in pursuit of their own self-interest would not harm the community because of restraints on behavior derived from shared morals, religion, custom and education. However, this is contrary to or forgotten in the modern concept of growth. The idea that a type of economic action should not be carried out because of moral constraints is considered "subversive." Theists E.J. Mishan and C.S. Lewis pointed out that our pursuit of the advancement of science has left these moral considerations out of the supply side, to the extent that "scientific materialism and cultural relativism actively undercut belief in a

transcendental basis for ethical value, which undercuts moral consensus, which undercuts the minimum moral restraint on self-interest presupposed by Adam Smith and most of his followers."(334) In addition, as Mishan has pointed out, common morality has become fragmented, so it is difficult to argue in favor of underlying morals, and they are therefore scrapped. On the demand side, "the glorification of self-interest and the pursuit of 'infinite wants' leads to a weakening of moral distinctions between luxury and necessity."(335) Moreover, moral constraints on demand are inconvenient in an economy based on growth, so the growth economy leads to the erosion of the very values upon which it is based.