

throughput—the flow beginning with raw material inputs, followed by their conversion into commodities, and finally into waste outputs—be within the regenerative and absorptive capacities of the ecosystem. The whole idea of sustainable development is that the economic subsystem must not grow beyond the scale at which it can be permanently sustained or supported by the containing ecosystem.

There is much confusion about what, precisely, is supposed to grow as GNP grows. Many people speak of the “dematerialization of the economy” and the possibility that GNP can grow forever without encountering physical limits, because it is measured in value units rather than in physical units. Perhaps the best example of this is the development of computers—newer generations use less matter and energy to perform more complicated operations. The value of services increases, but the matter and energy required for those services diminishes. In this book such qualitative improvement in the state of the arts is referred to as “development”; increasing the number of computers, of whatever vintage, is referred to as “growth.” GNP accounting does not distinguish growth from development—both lead to an increase in the GNP, an increase in the value of annual goods and services, and are counted as “economic growth.” But conflating qualitative improvement and quantitative increase in the same value index leads to much confusion.

GNP will be looked at more closely in Part 3, on national accounts. For now it must at least be said that although GNP is not a simple physical magnitude, it is nevertheless, a value-based *index* of an aggregate of goods and services which *are* physical. Aggregation by prices into a value index does not annihilate physical dimensions. In fact, in calculating *real* GNP, economic statisticians go to great lengths to eliminate changes that are not due to increase in physical units of output. Value is $P \times Q$ and the price index, P , is held constant so that changes in value will reflect only changes in the quantity index, Q , which are physical. Even services represent the service of *somebody* or *something* for some time period, and consequently have a physical dimension.

To the extent that “dematerialization” is just an extravagant term for increasing resource productivity (reducing the throughput intensity of service) then by all means we should push it as far as we can. Much excellent work is done by people who use the term in this restricted sense (at the Wuppertal Institute in Germany, for instance). But the notion that we can save the “growth forever” paradigm by dematerializing the economy, or “decoupling” it from resources, or substituting information for resources, is fantasy. We can surely eat lower on the food chain, but we cannot eat recipes!

But one really does not have to argue that point. We can simply distinguish growth (quantitative expansion) from development (qualitative improvement), and urge ourselves to develop as much as possible, while ceasing to grow, once the regenerative and absorptive capacities of the ecosystem are reached (sus-

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CONSUMPTION

$$\frac{\text{Service}}{\text{Throughput}} = \frac{\text{Service}}{\text{Stock}} \times \frac{\text{Stock}}{\text{Throughput}}$$

Stocks of man-made capital are at the center of analysis. On the one hand it is the stock that yields service; on the other it is the stock that is regrettably consumed and consequently requires maintenance by new production, which in turn requires new throughput and new sacrifices of natural capital with consequent reductions of the service of natural capital. We can define *growth* as increase in throughput, holding the two right-hand ratios constant. Service thus increases in proportion to throughput as a result of growth. *Development* can be defined as an increase in service from increases in the two right-hand efficiency ratios, holding throughput constant. "Economic growth," growth in GNP, is a conflation of these two processes: (1) growth (physical increase) and (2) development (qualitative improvements that allow more stock maintenance per unit of throughput, and more service per unit of stock). Since physical growth is limited by physical laws, while qualitative development is not, or at least not in the same way, it is imperative to separate these two very different things. Failure to make this distinction is what has made "sustainable development" so hard to define. With the distinction, it is easy to define sustainable development as "development without growth—without growth in throughput beyond environmental regenerative and absorptive capacities."⁶ So far the politicians and economists are so wedded to growth that they insist that economic growth is itself the main characteristic of sustainable development, and therefore speak in muddled terms like "sustainable growth" (as, for example, the President's Council on Environmental Quality has done).

If we accept that it is the stock of capital that yields service (capital in Irving Fisher's sense, including the stock of consumer goods as well as producer goods), then we still must ask, How much extra welfare do we get from extra man-made capital stock, say in the United States at the present time? How much extra cost in terms of sacrificed service of natural capital is required by the transformation of more natural capital into man-made capital? We do not have good measures of costs and benefits of aggregate growth, so we must rely on common sense plus those preliminary measures that we do have, such as the Index of Sustainable Economic Welfare (ISEW), which certainly suggests that growth in GNP in the United States has passed the optimum in terms of welfare (Daly and Cobb 1994; Cobb and Cobb, 1994). A similar conclusion was reached by Jackson and Marks (1994), who constructed an ISEW for England.

Conclusion

What are the policy consequences of the issues discussed in this chapter for North/South cooperation in economic development and in sharing the "global economic pie"? Consider two views.

in which government tries to carry out policy for the good of its citizens—then right prices should *not* reflect the preferences and scarcities of other nations. Right prices *should* differ between national communities. Such differences traditionally have provided the whole reason for international trade in goods.

Development, Not Growth

To summarize, it has been argued that the first two goals of adjustment (right prices and price level stability) are necessary to the sustainable development era. It has been shown that the third element of adjustment, free trade, must be abandoned because it is in conflict with (a) the first two goals of adjustment that have been retained, (b) goals that were downplayed by adjustment (just distribution) but critical for sustainable development, and (c) the goal that was totally ignored by adjustment, but is the principal goal of sustainable development, namely a scale of the economic subsystem that is within the carrying capacity of the ecosystem. It remains to try to spell out a bit more the positive vision of sustainable development.

As already indicated, the basic vision underlying sustainable development is that of the economy as a physical subsystem of the ecosystem. A subsystem cannot grow beyond the scale of the total system of which it is a part. If the total system provides services that the subsystem cannot provide for itself, then the subsystem must avoid impinging on the parent system to an extent and in ways that would impair its ability to provide those services. The scale of the economy must remain below the capacity of the ecosystem sustainably to supply services such as photosynthesis, pollination, purification of air and water, maintenance of climate, filtering of excessive ultraviolet radiation, recycling of wastes, etc. Adjustment in the service of growth has pushed us beyond a sustainable scale.

To maintain the present scale of population and per capita consumption we are consuming natural capital and counting it as income. The effort to overcome poverty by further growth in scale of throughput is self-defeating once we have reached the point where growth in scale increases environmental costs faster than it increases production benefits. Beyond this point, which we have, in all likelihood, already passed, further growth makes us poorer, not richer. The alternative is to stop growth in scale, and seek to overcome poverty by redistribution and qualitative improvement in efficiency of resource use, rather than further quantitative increase in the resource throughput. A policy of limiting throughput will automatically redirect energies toward increasing the efficiency with which it is used. If technology can easily and greatly increase efficiency, then the transition could be relatively painless. If not, it will be more difficult. In either case it remains necessary. The basic policy is the same whether one is a technological optimist or pessimist.

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In an effort to avoid facing these realities, those wedded to the adjustment paradigm have come up with one more adjustment which they contradictorily call sustainable *growth*.

Much confusion is generated by using the term “sustainable growth” as a synonym for sustainable *development*. Respect for the dictionary would lead us to reserve the word “growth” for quantitative increase in physical size by assimilation or accretion of materials. “Development” refers to qualitative change, realization of potentialities, transition to a fuller or better state. The two processes are distinct—sometimes linked, sometimes not. For example, a child grows and develops simultaneously; a snowball or a cancer grows without developing; the planet Earth develops without growing. Economies frequently grow and develop at the same time but can do either separately. But since the economy is a subsystem of a finite and non-growing ecosystem, then as growth leads it to incorporate an ever larger fraction of the total system into itself, its behavior must more and more approximate the behavior of the total system, which is development without growth. It is precisely the recognition that growth in scale ultimately becomes impossible—and already costs more than it is worth—that gives rise to the urgency of the concept of sustainable development. Sustainable development is development without growth in the scale of the economy beyond some point that is within biospheric carrying capacity.

Many believe that the present scale is beyond long-term carrying capacity and that sustainable growth in its initial phase will require a period of negative growth. Even if one is a technological optimist and believes that development in the productivity of the resource throughput can increase faster than the volume of the throughput needs to diminish, this is still very radical. The term “sustainable growth” aims to deny this radical transformation, and to suggest that growth is still the number one goal, that growth just needs to be a bit more environmentally friendly. Sustainable *growth* is just one more adjustment to the standard view. Sustainable *development* is an alternative to the standard growth ideology and is incompatible with it.

Sustainable development, development without growth, does not imply the end of economics—if anything, economics becomes even more important. But it is a subtle and complex economics of maintenance, qualitative improvement, sharing, frugality, and adaptation to natural limits. It is an economics of better, not bigger.