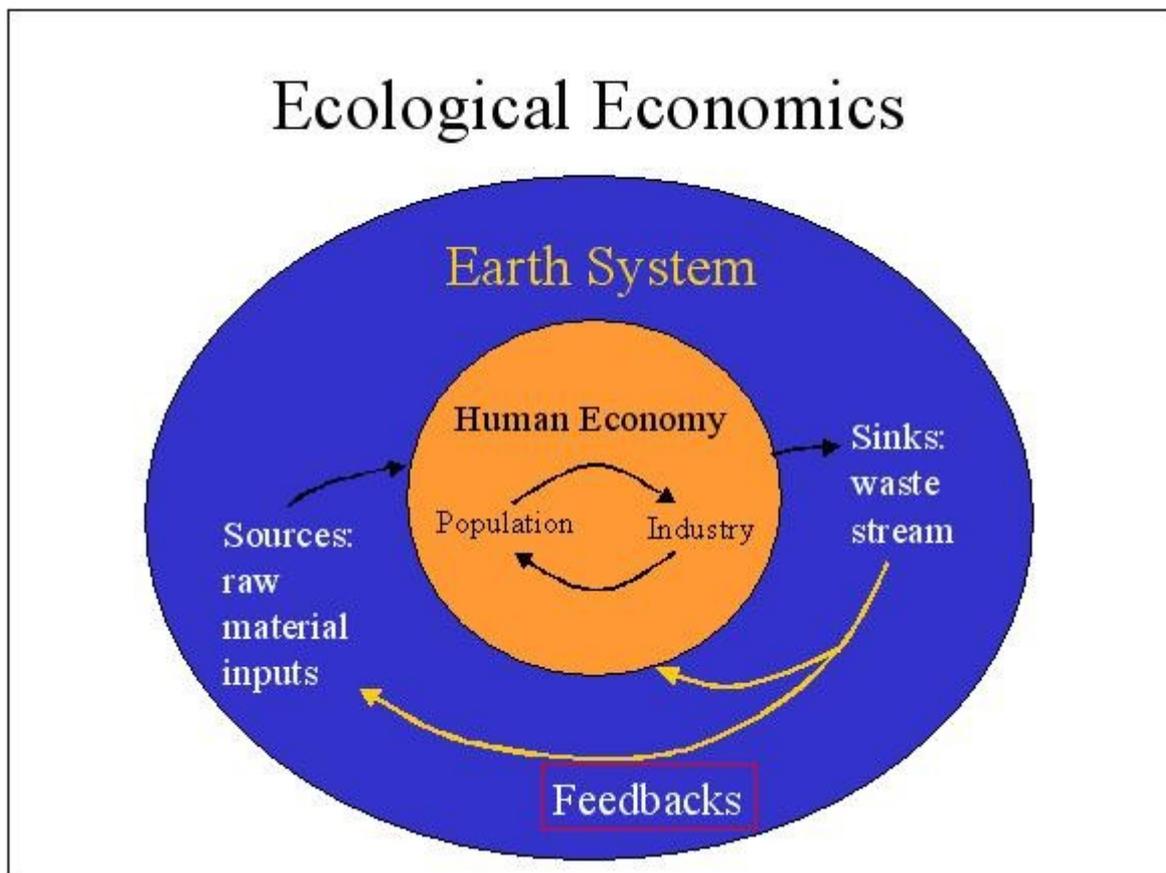


A Steady-State Economy

Herman E. Daly

(Editors note: underlined words are in original; bold, italicized, hyperlinks and images added)

A failed growth economy and a **steady-state economy** are not the same thing; they are the very different alternatives we face. The Earth as a whole is approximately a steady state. Neither the surface nor the mass of the earth is growing or shrinking; the inflow of radiant energy to the Earth is equal to the outflow; and material imports from space are roughly equal to exports (both negligible). None of this means that the earth is static—a great deal of qualitative change can happen inside a steady state, and certainly has happened on Earth. The most important change in recent times has been the enormous growth of one subsystem of the Earth, namely the economy, relative to the total system, the ecosphere. This huge shift from an “empty” to a “full” world is truly **“something new under the sun”** as historian J. R. McNeil calls it in his book of that title. The closer the economy approaches the scale of the whole Earth the more it will have to conform to the physical behavior mode of the Earth. That behavior mode is a steady state—a system that permits qualitative development but not aggregate quantitative growth. Growth is more of the same stuff; development is the same amount of better stuff (or at least different stuff). The remaining natural world no longer is able to provide the sources and sinks for the metabolic throughput necessary to sustain the existing oversized economy—much less a growing one.



Economists have focused too much on the economy's circulatory system and have neglected to study its digestive tract. **Throughput** growth means pushing more of the same food through an ever larger digestive tract; development means eating better food and digesting it more thoroughly. Clearly the economy must conform to the rules of a steady state—seek qualitative development, but stop aggregate quantitative growth. GDP increase conflates these two very different things.

We have lived for **200 years in a growth economy**. That makes it hard to imagine what a steady-state economy (SSE) would be like, even though for most of our history mankind has lived in an economy in which annual growth was negligible. Some think a SSE would mean freezing in the dark under communist tyranny. Some say that huge improvements in technology (energy efficiency, recycling) are so easy that it will make the adjustment both profitable and fun.

Regardless of whether it will be hard or easy we have to attempt a SSE because we cannot continue growing, and in fact so-called “economic” growth already has become **uneconomic**. The growth economy is failing. In other words, the quantitative expansion of the economic subsystem increases environmental and social costs faster than production benefits, making us poorer not richer, at least in high consumption countries. Given the laws of **diminishing marginal utility** and increasing **marginal costs** this should not have been unexpected. And even new technology sometimes makes it worse. For example, **tetraethyl lead** provided the benefit of reducing engine knock, but at the cost spreading a toxic heavy metal into the biosphere; **chlorofluorocarbons** gave us the benefit of a nontoxic propellant and refrigerant, but at the cost of creating a hole in the ozone layer and a resulting increase in ultraviolet radiation. It is hard to know for sure that growth now increases costs faster than benefits since we do not bother to separate costs from benefits in our national accounts. Instead we lump them together as “activity” in the calculation of GDP.

Ecological economists have offered empirical evidence that growth is already **uneconomic** in high consumption countries (see ISEW, GPI, **Ecological Footprint, Happy Planet Index**). Since neoclassical economists are unable to demonstrate that growth, either in throughput or GDP, is currently making us better off rather than worse off, it is blind arrogance on their part to continue preaching aggregate growth as the solution to our problems. Yes, most of our problems (poverty, unemployment, environmental degradation) would be easier to solve if we were richer-- that is not the issue. The issue is: Does growth in GDP any longer really make us richer? Or is it now making us poorer?



For poor countries GDP growth still increases welfare, at least if reasonably distributed. The question is, What is the best thing for rich countries to do to help the poor countries? The World Bank's answer is that the rich should continue to grow as rapidly as possible to provide markets for the poor and to accumulate capital to invest in poor countries. The steady state answer is that the rich should reduce their throughput growth to free up resources and ecological space for use by the poor, while focusing their domestic efforts on development, technical and social improvements, that can be freely shared with poor countries.

The classical steady state takes the biophysical dimensions— population and capital stock (all durable producer and consumer goods)— as given and adapts technology and tastes to these objective conditions. The neoclassical “steady state” (proportional growth of capital stock and population) takes tastes and technology as given and adapts by growth in biophysical dimensions, since it considers wants as unlimited, and technology as powerful enough to make the world effectively infinite. At a more profound level the classical view is that man is a creature who must ultimately adapt to the limits (finitude, entropy, ecological interdependence) of the Creation of which he is a part. The neoclassical view is that man, the creator, will surpass all limits and remake Creation to suit his subjective individualistic preferences, which are considered the root of all value. In the end economics is religion.

Accepting the necessity of a SSE, along with John Stuart Mill and the other classical economists, let us imagine what it might look like. First a caution—a steady-state economy is not a failed growth economy. An airplane is designed for forward motion. If it tries to hover it crashes. It is not fruitful to conceive of a helicopter as an airplane that fails to move forward. It is a different thing designed to hover. Likewise a SSE is not designed to grow.

Following Mill we might define a SSE as an economy with constant population and constant stock of capital, maintained by a low rate of throughput that is within the regenerative and assimilative capacities of the ecosystem. This means low birth equal to low death rates, and low production equal to low depreciation rates. Low throughput means high life expectancy for people and high durability for goods. Alternatively, and more operationally, we might define the SSE in terms of a constant flow of throughput at a sustainable (low) level, with population and capital stock free to adjust to whatever size can be maintained by the constant throughput that begins with depletion of low-entropy resources and ends with pollution by high-entropy wastes.

How could we limit throughput, and thus indirectly limit stocks of capital and people in a SSE? Since depletion is spatially more concentrated than pollution the main controls should be at the depletion or input end. Raising resource prices at the depletion end will indirectly limit pollution, and force greater efficiency at all upstream stages of production. A cap-auction-trade system for depletion of basic resources, especially fossil fuels, could accomplish a lot, as could ecological tax reform, about which more later.

If we must stop aggregate growth because it is uneconomic, then how do we deal with poverty in the SSE? The simple answer is by redistribution—by limits to the range of permissible inequality, by a minimum income and a maximum income. What is the proper range of inequality—one that rewards real differences and contributions rather than just multiplying privilege? Plato thought it was a factor of four. Universities, civil services and the military seem to manage with a factor of ten to twenty. In the US corporate sector it is over 500. As a first step could we not try to lower the overall range to a factor of, say, one hundred? Remember, we are no longer

trying to provide massive incentives to stimulate (uneconomic) growth! Also, since we are not trying to stimulate aggregate growth, we no longer need to spend billions on advertising. Instead of treating advertising as a tax-deductible cost of production we should tax it heavily as a public nuisance. If economists really believe that the consumer is sovereign then she should be obeyed rather than manipulated, cajoled, badgered, and lied to.

Free trade would not be feasible for a SSE, since its producers would necessarily count many costs to the environment and the future that foreign firms located in growth economies are allowed to ignore. The foreign firms would win in competition, not because they were more efficient, but simply because they did not pay the cost of sustainability. Regulated international trade under rules that compensated for these differences (compensating tariffs) could exist, as could “free trade” among nations that were equally committed to sustainability in their domestic cost accounting. One might expect the IMF, the World Bank, and the WTO to be working toward such regulations. Instead they vigorously push both free trade and free capital mobility (i.e., deregulation of international commerce). Protecting an efficient national policy of cost internalization is very different from protecting an inefficient firm.

The case for guaranteed mutual benefit in international trade, and hence the reason for leaving it “free”, is based on Ricardo’s **comparative advantage** argument. A country is supposed to produce the goods that it can produce more cheaply relative to other goods, than is the case in other countries. By specializing according to their comparative advantage both trading partners gain, regardless of absolute costs (one country could produce all goods more cheaply, but it would still benefit by specializing in what it produced relatively more cheaply and trading for other goods). This is logical, but like all logical arguments comparative advantage is based on premises. The key premise is that while capital (and other factors) moves freely between industries within a nation, it does not move between nations. If capital could move abroad it would have no reason to be content with a mere comparative advantage at home, but would seek absolute advantage—the absolutely lowest cost of production anywhere in the world. Why not? With free trade the product could be sold anywhere in the world, including the nation the capital just left. While there are certainly global gains from trade under absolute advantage there is no guarantee of mutual benefit. Some countries could lose.



Now comes the problem. The IMF preaches free trade based on comparative advantage, and has done so for a long time. More recently the IMF has started preaching the gospel of globalization, which, in addition to free trade, means free capital mobility internationally—exactly what comparative advantage forbids! When confronted with this contradiction the IMF waves its hands, suggests that you might be a xenophobe, and changes the subject.

The IMF-WB-WTO (*Washington Consensus*) contradict themselves in service to the interests of transnational corporations. International capital mobility, coupled with free trade, allows corporations to escape from national regulation in the public interest, playing one nation off against another. **Since there is no global government they are in effect uncontrolled. The nearest thing we have to a global government (IMF-WB-WTO) has shown no interest in regulating transnational capital for the common good.** Their goal is to help these corporations grow, because growth is presumed good for all—end of story. If the IMF wanted to limit international capital mobility to keep the world safe for comparative advantage, there are several things they could do. They could promote minimum residence times for foreign investment to limit capital flight and speculation, and they could propose a small tax on all foreign exchange transactions (Tobin tax). Most of all they could revive Keynes' proposal for an international multilateral clearing union that would directly penalize persistent imbalances in current account (both deficit and surplus), and thereby indirectly promote balance in the compensating capital account, reducing international capital movements.

One problem for the SSE already raised by the demographic transition to a non growing population is that it necessarily results in an increase in the average age of the population—more retirees relative to workers. Adjustment requires either higher taxes, older retirement age, or reduced retirement pensions. The system is hardly in “crisis”, but these adjustments are surely needed to achieve sustainability. For many

countries net immigration has become a larger source of population growth than natural increase. Immigration may temporarily ease the age structure problem, but the steady-state population requires that births plus in-migrants equal deaths plus out-migrants. It is hard to say which is more politically incorrect, birth limits or immigration limits? Many prefer denial of arithmetic to facing either one.

The SSE will also require a “demographic transition” in populations of products towards longer-lived, more durable goods, maintained by lower rates of throughput. A population of 1000 cars that last 10 years requires new production of 100 cars per year. If more durable cars are made to last 20 years then we need new production of only 50 cars per year. To see the latter as an improvement requires a change in perspective from emphasizing production as a benefit to emphasizing production as a cost of maintenance. Consider that if we can maintain 1000 cars and the transportation services thereof by replacing only 50 cars per year rather than 100 we are surely better off—the same capital stock yielding the same service with half the throughput. Yet the idea that production is a maintenance cost to be minimized is strange to most economists. Shifting taxes from value added to throughput would promote this minimizing effort. One adaptation in this direction is the service contract that leases the service of equipment (ranging from carpets to copying machines), which the lessor/owner maintains, reclaims, and recycles at the end of its useful life.

Although the main thrust of reforms for the SSE is to bring newly scarce and truly rival natural capital and services under the market discipline, we should not overlook the opposite problem, namely, freeing truly non rival goods from their artificial enclosure by the market. There are some goods that are by nature **non-rival**, and should be freed from illegitimate enclosure by the price system. I refer especially to knowledge. Knowledge, unlike throughput, is not divided in the sharing, but multiplied. Once knowledge exists, the opportunity cost of sharing it is zero and its allocative price should be zero. International development aid should more and more take the form of freely and actively shared knowledge, along with small grants, and less and less the form of large interest-bearing loans. Sharing knowledge costs little, does not create unrepayable debts, and it increases the productivity of the truly rival and scarce factors of production. Existing knowledge is the most important input to the production of new knowledge, and keeping it artificially scarce and expensive is perverse. Patent monopolies (aka “intellectual property rights”) should be given for fewer “inventions”, and for fewer years.

What would happen to the interest rate in a SSE? Would it not fall to zero without growth? Not likely, because capital would still be scarce, there would still be a positive time preference, and the value of total production may still increase without growth in physical throughput—as a result of qualitative development. Investment in qualitative improvement may yield a value increase out of which interest could be paid. However, the productivity of capital would surely be less without throughput growth, so one would expect low interest rates in a SSE, though not a zero rate.

Would it be possible to have qualitative improvement (e.g. increasing efficiency) forever, resulting in GDP growth forever? GDP would become ever less material-intensive. Environmentalists would be happy because throughput is not growing; economists would be happy because GDP is growing. I think this should be pushed as far as it will go, but how far is that likely to be? Consider that sectors of the economy generally thought to be more qualitative, such as information technology, turn out on closer inspection to have a substantial physical base, including a number of toxic metals.

Also, if expansion is to be mainly for the sake of the poor it must be comprised of goods the poor need—clothing, shelter, and food on the plate, not ten thousand recipes on the Internet. In addition, as a larger proportion of GDP becomes less material-intensive, the terms of trade between more and less material-intensive goods will move against the less material-intensive, limiting incentive to produce them. Even providers of information services spend most of their income on cars, houses, and trips, rather than the immaterial product of other symbol manipulators. Can a SSE maintain full employment? A tough question, but in fairness one must also ask if full employment is achievable in a growth economy driven by free trade, off-shoring practices, easy immigration of cheap labor, and widespread automation? In a SSE maintenance and repair become more important. Being more labor intensive than new production and relatively protected from off-shoring, these services may provide more employment. Yet a more radical rethinking of how people earn income may be required. **If automation and off-shoring of jobs increase profits but not wages, then the principle of distributing income through jobs becomes less tenable.** A practical solution (in addition to slowing automation and off-shoring) may be to have wider participation in the ownership of businesses, so that individuals earn income through their share of the business instead of through fulltime employment. Also the gains from technical progress should be taken in the form of more leisure rather than more production—a long expected but under-realized possibility.

What sort of tax system would best fit a SSE? Ecological tax reform, already mentioned, suggests shifting the tax base away from value added (income earned by labor and capital), and on to “that to which value is added”, namely the throughput flow, preferably at the depletion end (at the mine-mouth or well-head, the point of “severance” from the ground). Many states have severance taxes. Taxing the origin and narrowest point in the throughput flow induces more efficient resource use in production as well as consumption, and facilitates monitoring and collection.

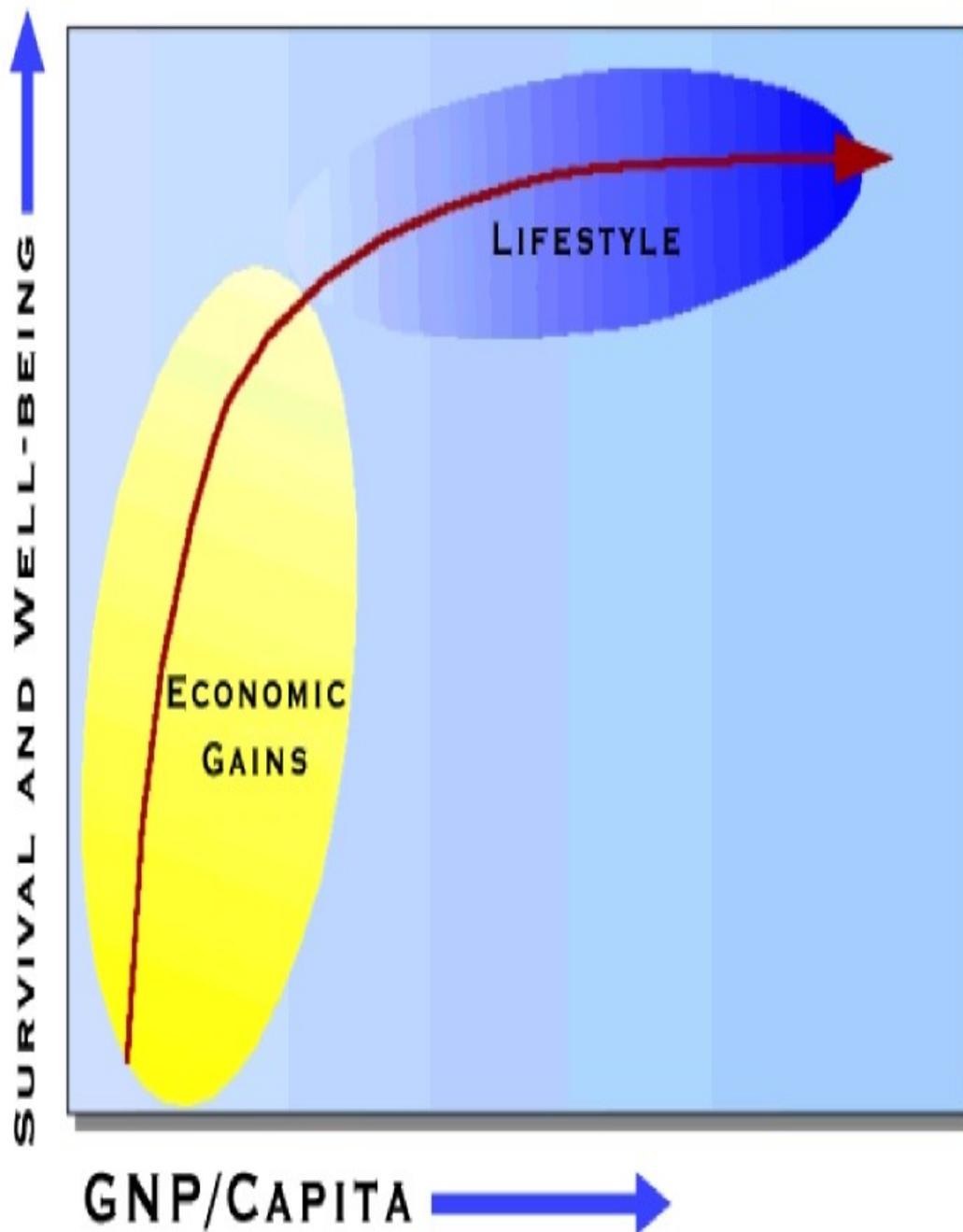
Taxing what we want less of (depletion and pollution), and ceasing to tax what we want more of (income, value added) would seem reasonable—as the bumper sticker puts it, “tax bads, not goods”. The shift could be revenue neutral and gradual. Begin for example by forgoing \$x revenue from the worst income tax we have. Simultaneously collect \$x from the best resource severance tax we could devise. Next period get rid of the second worst income tax, and substitute the second best resource tax, etc. Such a policy would raise resource prices and induce efficiency in resource use. The regressivity of such a consumption tax could be offset by spending the proceeds progressively, by the limited range of inequality already mentioned, and by the fact that the mafia and other former income tax cheaters would have to pay it. Cap-auction–trade systems will also increase government revenue, and auction revenue can be distributed progressively.

Could a SSE support the enormous superstructure of finance built around future growth expectations? Probably not, since interest rates and growth rates would be low. Investment would be mainly for replacement and qualitative improvement. There would likely be a healthy shrinkage of the enormous pyramid of debt that is precariously balanced atop the real economy, threatening to crash. Additionally the SSE could benefit from a move away from our fractional reserve banking system toward 100% reserve requirements.

One hundred percent reserves would put our money supply back under the control of the government rather than the private banking sector. Money would be a true public utility, rather than the by-product of commercial lending and borrowing in pursuit of

growth. Under the existing fractional reserve system the money supply expands during a boom, and contracts during a slump, reinforcing the cyclical tendency of the economy. The profit (seigniorage) from creating (at negligible cost) and being the first to spend new money and receive its full exchange value, would accrue to the public rather than the private sector. The reserve requirement, something the Central Bank manipulates anyway, could be raised from current very low levels gradually to 100%. **Commercial banks would make their income by financial intermediation (lending savers' money for them) as well as by service charges on checking accounts, rather than by lending at interest money they create out of nothing.** Lending only money that has actually been saved by someone reestablishes the classical balance between abstinence and investment. This extra discipline in lending and borrowing likely would prevent such debacles as the current "sub-prime mortgage" crisis. 100% reserves would both stabilize the economy and slow down the Ponzi-like credit leveraging.

A SSE should not have a system of national income accounts, GDP, in which nothing is ever subtracted. Ideally we should have two accounts, one that measures the benefits of physical growth in scale, and one that measures the costs of that growth. Our policy should be to stop growing where marginal costs equal marginal benefits. Or if we want to maintain the single national income concept we should adopt Nobel laureate economist J. R. Hicks' concept of income, namely, the maximum amount that a community can consume in a year, and still be able to produce and consume the same amount next year. **In other words, income is the maximum that can be consumed while keeping productive capacity (capital) intact. Any consumption of capital, manmade or natural, must be subtracted in the calculation of income.** Also we must stop the asymmetry of adding to GDP the production of anti-bads without first having subtracted the generation of the bads that made the anti-bads necessary. Note that Hicks' conception of income is sustainable by definition. National accounts in a sustainable economy should try to approximate Hicksian income and abandon GDP. Correcting GDP to measure income is less ambitious than converting it into a measure of welfare, discussed earlier.



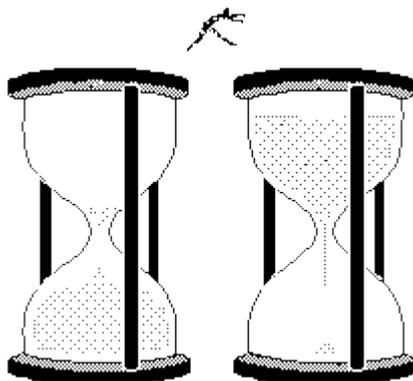
Source: R. Inglehart, 1997

The logic of the SSE is reinforced by the recent finding of economists and psychologists that the correlation between absolute income and happiness extends only **up to some threshold of "sufficiency," and beyond that point only relative income influences self-evaluated happiness.** This result seems to hold both for cross-section data (comparing rich to poor countries at a given date), and for time series (comparing a single country before and after significant growth in income). **Growth cannot increase everyone's relative income.** The welfare gain of people whose relative income increases as a result of further growth would be offset by the loss of others

whose relative income falls. And if everyone's income increases proportionally, no one's relative income would rise and no one would feel happier. **Growth becomes like an arms race in which the two sides cancel each other's gains.** A happy corollary is that for societies that have reached sufficiency, moving to a SSE may cost little in terms of forgone happiness. The "political impossibility" of a SSE may be less than it previously appeared.

Nevertheless it is one thing to imagine the possibility of a SSE, but something else to chart a transition thereto from a failed growth economy. Can one transform an airplane into a helicopter without first landing, or perhaps crashing? In order even to take such a task seriously one has to realize that the growth economy is heading for a big crash. Whether the measures suggested above are sufficient to convert the growth airplane to a steady-state helicopter is hard to say, but I do think they are probably necessary, and at a minimum would be useful guides for reconstruction after the crash. They also may prove capable of being applied gradually in mid air. For example, a cap-auction-trade system could begin with a generous cap followed by a gradual pre-announced schedule of tightening. The limits to income inequality could begin far apart, and be gradually tightened. Ecological tax reform could substitute at first only the worst value added taxes by the best throughput taxes, as mentioned earlier. Compensatory tariffs to protect national costinternalization policies could be imposed and raised gradually. Reserve requirements for banks could be raised gradually to one hundred percent. Patent monopolies could be gradually reduced and knowledge gradually restored to its proper status as a non rival good. Downsizing of the IMF-WTO from a servant of global integration in the interests of transnational capitalist growth to something closer to Keynes' nationbased multilateral clearing union for international payments—this would be more difficult to do gradually. But nations may begin individually to withdraw from these institutions as it becomes more evident that they have abandoned the federated internationalist nature of their Bretton Woods Charter in favor of an economically integrated globalist vision of capital-dominated growth, and are as yet incapable of conceiving the possibility, much less recognizing the reality, of uneconomic growth.

While these transitional policies will appear radical to many, it is worth remembering that, in addition to being amenable to gradual application, they are based on the conservative institutions of private property and decentralized market allocation. They simply recognize that private property loses its legitimacy if too unequally distributed, and that markets lose their legitimacy if prices do not tell the whole truth about costs. In addition, the macro-economy becomes an absurdity if its scale is structurally required to grow beyond the biophysical limits of the Earth. And well before that radical physical limit we are encountering the conservative economic limit in which extra costs of growth become greater than the extra benefits.



Ten Point Policy Summary

1. **Cap-auction-trade systems for basic resources.** Cap limits to biophysical scale according to source or sink constraint, whichever is more stringent. Auction captures scarcity rents for equitable redistribution. Trade allows efficient allocation to highest uses.
2. **Ecological tax reform**—shift tax base from value added (labor and capital) and on to “that to which value is added”, namely the entropic throughput of resources extracted from nature (depletion), through the economy, and back to nature (pollution). Internalizes external costs as well as raises revenue more equitably. Prices the scarce but previously unpriced contribution of nature.
3. **Limit the range of inequality in income distribution**—a minimum income and a maximum income. Without aggregate growth poverty reduction requires redistribution. Complete equality is unfair; unlimited inequality is unfair. Seek fair limits to inequality.
4. **Free up the length of the working day, week, and year**—allow greater option for leisure or personal work. Full-time external employment for all is hard to provide without growth.
5. **Re-regulate international commerce**—move away from free trade, free capital mobility and globalization, adopt compensating tariffs to protect efficient national policies of cost internalization from standards-lowering competition from other countries.
6. **Downgrade the IMF-WB-WTO** to something like Keynes’ plan for a multilateral payments clearing union, charging penalty rates on surplus as well as deficit balances—seek balance on current account, avoid large capital transfers and foreign debts.
7. **Move to 100% reserve requirements** instead of fractional reserve banking. Put control of money supply and seigniorage in hands of the government rather than private banks.
8. **Enclose the remaining commons of rival natural capital in public trusts**, and price it, while freeing from private enclosure and prices the non rival commonwealth of knowledge and information. Stop treating the scarce as if it were non scarce, and the non scarce as if it were scarce.
9. **Stabilize population.** Work toward a balance in which births plus immigrants equals deaths plus out-migrants.
10. **Reform national accounts**—separate GDP into a cost account and a benefits account. Compare them at the margin, stop growing when marginal costs equal marginal benefits. Never add the two accounts.

Herman E. Daly
School of Public Policy
University of Maryland
College Park MD 20742 USA