Reaffirming the Limits: A Critique of Beckerman's "Small is Stupid" and Simon's "The State of Humanity"

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For many years Beckerman and Simon have been among the best known and most influential critics of the limits to growth analysis of the global situation. However their claims have been subject to little searching critical analysis. This paper focuses on fundamental mistakes in their treatment of resources scarcity and argues for the validity of the basic limits to growth thesis. Implications for social change are briefly indicated.

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Beckerman's recent book, *Small Is Stupid* (Beckerman, 1995), restates and furthers his position with a confidence indicated by its title. His basic conclusions are that there should be no conflict between economic growth and preserving the environment and that we can and should continue to pursue growth. Indeed making growth our goal is necessary to solve environmental and social problems. "In the long run, economic growth is the surest and probably the only route to a general improvement in the quality of the environment." (Beckerman, 1995, p. 20) He rejects the claim made by "dark green" analysts (Such as Gordon and Suzuki, 1990, Ehrlich, Ehrlich and Holdren, 1977, Trainer, 1985, 1995a, 1998) that environmental, Third World and other global problems cannot be solved without radical change in lifestyles and systems. We do not "...need to abandon our basic assumptions, or change our modes of thought and vocabularies or accept different cultural values." (Beckerman, 1995, p. 20)

Simon's introduction and concluding statement to his recent 614 page collection *The State of Humanity* claim that human welfare will improve without any threat from resource scarcity or environmental damage. Simon says "...we can confidently face the future without worrying about threats to the end of civilisation from 'over consumption' or raw materials shortages that technology is unable to deal with." (Simon, 1996, p. 657)

Both books are subject to a number of fundamental criticisms. The most important of these is their failure to deal adequately with the issue of mineral and energy resource scarcity, given that their core concern is to refute the claim that we will encounter resource and ecological limits in the near future.

Resource Scarcity

Beckerman devotes a chapter to minerals and fuels, and concludes that "There is no danger for us running out of finite resources." (Beckerman, 1995, p. 172), and that "The finite resources argument is flawed in every respect." (Beckerman, 1995, p. 65) Simon's conclusion is that resources are becoming less scarce and will continue to do so. "The costs of natural resources will be lower than at present." (Simon, 1996, p. 645)

Beckerman emphasises correctly that despite large increases in production and consumption over past decades reserves of minerals and fuels have increased. (Beckerman, 1995, p. 63) He points out that if items become more scarce their prices rise and this makes it economic to mine poorer grade ores, to move to substitutes and to improve technology. In other words, he criticises environmentalists for failing to recognise feedback mechanisms whereby increasing scarcity can prompt action which reduces scarcity. He points to the inexhaustible quantities of minerals that make up the crust of the earth and that exist in sea water. Brief references to these themes are taken to establish the conclusion that we have no good reason to be concerned about future scarcity of minerals and fuels.

Simon's case is even more superficial. It follows the logic explicit in all his previous arguments against the limits position; i.e., he draws firm conclusions about the future from trends evident in the past. (See Simon, 1995, p. 1) However the appropriate logic in the discussion of possible global futures is to examine the system under discussion to determine whether it has features which indicate that its future will or will not be like its past. The basic case against Simon is that when we consider the global resource, ecological and social situation we can indeed see many reasons why past trends are highly unlikely to continue.

Simon's inspection of the past record with respect to resource availability indicates a long term and continuing decline in prices, which he equates with scarcity. He simply asserts this will continue. However some have argued that recent evidence points to a flattening and possible rise in long term price indicators of scarcity in the 1980s. (Hall and Hall, 1984.) Weiszacker and Lovins state that resource prices have risen in the 1990s (1997, p. 199) and that prices for beef, pork, poultry and especially fish have been rising since the mid 1970s. (1997, p. 235)

More importantly, Simon gives no attention to the reasons why price trends can be seriously misleading indicators of real scarcity. As will be explained below, there are impressive reasons for believing that liquid fuels will become very scarce in as little as two decades. No hint of these reasons can be found in the examination of past trends in the price of petroleum and gas. Similarly, trends in the price of tropical timbers give no indication of the high probability that by 2030 these resources will not be on sale because all tropical forests will have been logged by then. Obviously prices primarily reflect current economic supply and demand conditions and are in general subject to no influence by long term future changes likely in the geological, biological and ecological conditions which are the basic determinants of the existence and availability of natural resources.

Also, no book makes any reference to the essential distinction between reserves and resources. This disqualifies them from being able to offer a significant comment on whether or not there are limits to growth deriving from the scarcity of resources. Both books are merely confined to a discussion of reserves. As elementary texts on minerals and fuels make clear (Kesler,1994, Hall, Cleveland and Kaufman, 1986), reserve figures refer only to quantities known to exist, whereas resource figures are estimates of the total quantities that exist within the earth, given various assumptions regarding grade and cost. For example, according to the Unites States Geological Survey (Erikson, 1973), world lead reserves are 540,000 tons, while world resources are 550 million tons.

When Meadows et al. , published the *Limits to Growth* (1972) they had accessd only to reserve figures. Since that date estimates of mineral resources have become available. For petroleum approximately 50 estimates have been published. (Campbell, 1995) Although mineral estimates in particular are imprecise, these figures now enable a meaningful discussion of the probability that resource limits will confront industrial consumer society in the near future.

Before indicating the conclusions that an analysis of resource estimates supports, it is necessary to clarify some basic points about resource geology. It cannot be assumed that, as the high grade ores are depleted, we can move smoothly to lower grade ores if we are prepared to pay higher prices, and eventually have access to the inexhaustible quantities that exist in the rocks of the crust. To make such an assumption is to overlook a number of geological constraints. The fundamental determinants of scarcity are set by geology and not by economics defined in terms of monetary costs and benefits. The overwhelming determinant of human access to minerals is their crustal abundances and the consequent quantities that have become concentrated into ore bodies by natural processes over long periods of time. Only a very small proportion of the quantity of a mineral in the crust, between .01% and .001%, has been concentrated into ores. (Gordon and Skinner, 1987) It is virtually certain that we will never derive minerals from other than these ores, because of the large quantities of energy that would be required to derive minerals from crustal rock. Consequently at least 99.99% of the minerals in the crust will remain inaccessible. This is due firstly to the fact that ore grades presently being mined are mostly far above crustal concentrations. For example, for copper the crustal abundance is .0024% (Erikson, 1973, p. 21), whereas copper ores being mined today are around .5% copper. Therefore, to derive 1 kg of copper from crustal rocks would involve mining 200 times as much material as that must be processed today.

Secondly, minerals in crustal rocks exist as isolated atoms and much energy is required to separate these from their surrounding matrix. Minerals in ores are not in this form and can more easily be released in masses of atoms, by grinding. Thirdly, minerals in crustal rocks are mostly bound into silicates whereas minerals in ores tend to be in oxides and sulphides which can be processed at much lower energy cost. As Gordon and Skinner (1987, p. 27) have explained, there is a "mineralogical barrier" between the ores and crustal rocks which determines that the energy required to derive a mineral from crustal rocks will be at least 10 and possibly 100 times as great as it would be required to derive it from the poorest ores. To derive copper from crustal rocks would take 100 times as much energy per kg of copper as it takes to work the average copper ore processed in the US today. (See Gordon and Skinner, 1987, p. 59)

Another geological factor limiting potential access to minerals concerns the probable distribution of ore grades. Beckerman assumes without discussion that as grades decrease down to the extremely low grade of crustal rock quantities of the mineral contained in them smoothly increase. This assumption has been readily adopted by economists following the publication of Lasky's conclusion that there is such a distribution for porphyry copper deposits. (Lasky, 1950.) However as Lasky himself notes, generalising this grade-tonnage relation to other minerals is unwarranted. According to Gordon and Skinner's analysis, Lasky's relation is true of only the 5 abundant minerals and for the rest there is a "two hump" distribution. That is, if we use lower and lower grade ores, a point will be reached where we have exhausted all the ores that have been created by nature; and after that, we will find no ores at any lower grade, until we approach the range of grades typical of crustal rock. (Gordon and Skinner, 1987, p. 39.)

These factors indicate that human access to most minerals will be confined to the small proportions that have been concentrated into ores, especially in view of the energy costs involved. (It will be explained below that energy is one of the resources most subject to concerns about limits.) The environmental impacts of mining vastly increased volumes would also be major considerations.

The United States Geological Survey (Erikson, 1973) has published figures for estimated potentially recoverable resources within the top 1 km of the earth's crust. For copper, the figure is 2.2 billion tons. In other words, in view of the preceding theoretical discussion, this is the total amount copper avail able in all continental ore deposits, of any grade and at any location. In their detailed study of copper Gordon and Skinner (1987) extrapolate these figures to the top 4.6 km of the crust. (See below)

The next question is what proportion of the material existing in ore deposits we are likely to be able to access and process. The limiting factors here are a) what is the probability of discovering deposits? b) can the deposit be accessed (many will be under oceans, cities, lakes, and polar ice? c) is the grade of ore in the deposit rich enough to process in view of the energy costs? d) is the quantity at the site sufficient to warrant mine construction? (There would probably have to be at least $1 million worth of recoverable mineral at a site before it was worth mine construction. Unfortunately, the distribution of ore deposits according to grade is 'log normal,' meaning that most are small. (Gordon and Skinner, 1987, p. 39) Combining these factors suggests that, at best, we are not likely to access more than 10% of the minerals in the top 4.6 km of the earth's crust. These quantities can be referred to as "probably recoverable resources."

If we take 11 billion as the number of people likely to be living on earth soon after 2060 (United Nations Department of International and Economic affairs, 1992), and if each of these people had the present rich world per capita mineral consumption, then "probably recoverable resources" (as defined above) of more than one-third of the most commonly used 28 mineral items would be totally exhausted in about 30-40 years. (Trainer, 1985, p. 56-57) Even if the percentage of ores that can be recovered is assumed to be 30% rather than 10%, then potentially recoverable resources for one quarter of the items would have been totally exhausted in about 40 years.

Energy Resources

When attention is focused on energy resources, a more disturbing conclusion is arrived at than of minerals. If the most common estimates of potentially recoverable coal (2000 billion tonnes assumed), oil, shale oil, gas, and uranium (via burner reactors) are combined, the sum of these energy sources would be exhausted by about 2040 if use was increased towards the level required for 11 billion people to have present rich world per capita energy consumption by 2060. Although coal in the crust might be total 7 times the figure assumed here, a number of estimates of the potentially recoverable quantity are under 1000 billion tonnes. (Trainer, 1985, Chapter 4) The shale oil figure assumed (200 billion tonnes of coal equivalent) is generous given the environmental problems associated with this source. The oil figure (314 billion tonnes of coal equivalent) is somewhat higher than the trend line for recent estimates. (Campbell, 1995.)

To pool energy sources as in the above analysis gives a misleadingly optimistic impression. When attention is focused on the most crucial energy forms even more serious limits become evident. The energy source on which industrial-affluent societies are most dependent is liquid fuel. Recent estimates by Petroconsultants support alarming conclusions about the world's future supplies of petroleum. (Campbell,1995, Ivanhoe, 1996) They conclude that world supply is likely to peak before 2010 and to be down to half this level by 2025. Supply by 2050 is likely to be one-thirtieth of the quantity that would be necessary to give all people then expected on earth the present rich world per capita oil consumption. The world is now using 23 billion barrels a year while discovering only 6 billion barrels a year. Campbell claims that resort to unconventional petroleum sources such as tar sands and oil shales will not solve the problem. He expects a large and permanent rise in price when the supply peak is reached.

These conclusions do not derive from new or different estimates of potentially recoverable oil resources. There is considerable agreement among many recent estimates on a figure of between 1750 and 2200 billion barrels. Even if the highest estimate is taken little difference, it is made to the probable supply curve peak. Similalr conclusions regarding the petroleum situation have been argued by Gever et al. (1991), Fleay (1995), and Hall, Cleveland, and Kaufman (1986).

It is important to note that economic processes, such as changers in prices, are irrelevant in this area. Increasing prices for oil will make no difference to supply if it takes more energy to supply a barrel than the barrel contains (which Gever et al. expect will be the situation in the US within a decade.) Regardless of how much anyone is prepared to pay, it will not pay in energy terms to supply the barrel (except where we might be prepared to use energy in some other form, such as coal, to produce much less energy in the form of oil.)

Beckerman and Simon make no reference to any of these points. Whereas they conclude that there will not be any problem of energy supply, the analyses of Campbell (1995), Gever et al. (1991) and Fleay (1995) point to what appears to be the inevitable occurrence of very serious problems within two decades. Simon says, however, "Concerning energy, in general there is no reason to believe that the supply of energy is finite, or that the price of energy will not continue its long-run decrease forever." (Simon, 1996, p. 11) Without supporting discussion Goeller (on whose analysis Simon 's conclusions are based) says, "As natural gas, oil and coal resources become depleted. It will become possible to use tar sands, oil shales, possibly organic soils and ultimately carbon from limestone and hydrogen from water electrolysis as resources." (Goeller, 1995, p. 319-320)

In conclusion, the discussions of the mineral fuel resource situation given by both Beckerman and Simon are brief and superficial and make no reference to any of the crucial considerations outlined above. Both exhibit the common mistake made by economists; they fail to grasp that although economic factors can make some difference; the ultimate availability of resources is basically determined by geological; biological and energy cost factors and has relatively little to do with economics defined in terms of dollar costs.

Thus, whereas Beckerman and Simon both assert that there is no problem of mineral and fuel scarcity that this domain poses no threat to economic growth; an analysis of geological theory and evidence indicates that minerals and fuels are actually very likely to set serious and urgent limits. Indeed if the foregoing analysis is valid there is no possibility of all the world's people living at anything like the levels of typical per capita resource use of the rich countries. These living standards are only possible for a privileged few for a short historical period, and evidence on resource limits indicates that the energy-affluent way of life enjoyed in rich countries is very likely to run into extremely serious problems in the next two to three decades.

Food and Agriculture

Simon's conclusions about food are based on Avery's Chapter where it is stated "There is no indication that the potential yield gains have been used up in the 1980s." Avery's graph of steadily rising world cereal output only plots points at 10 year intervals. The annual figures plotted in the Worldwatch institute's The *State of the World* (Brown, 1995, p 11, 1996) show that there has been no clear increase in the 1990s. The Institute's publications stress that the average rate of increase in the world grain harvest has fallen for the last three decades, and that carry over stocks of grain are now at a record low.

Great optimism is expressed by Simon regarding potential fish catch. It is claimed that this might actually be quadrupled. However, FAO figures seem to show that in the last three years the catch has stagnated (Brown, 1995, p. 15). When the rapidly increasing fishing effort is taken into account, evident in the rise in the number and tonnage of vessels and the energy consumed, rapidly diminishing returns for fishing are apparent. (Trainer, 1985) Weber says all 15 major world fisheries are at or beyond capacity and the catch is falling in 13 of these fisheries. (Weber, 1994) The UN FAO says "...fishing at current rates cannot be sustained." (Dixen, 1966, p. 16)

The Worldwatch Institute's publications provide considerable evidence of a slowing and plateauing in several agricultural and biological indices, such as world grain yields, grainland area, total cropland under cultivation, per capita meat, wool and timber production, world irrigated land, and yields from leading experimental farms. World fertiliser consumption has fallen (Brown, 1996, p. 9), indicating that the capacity of soils to respond to increased fertiliser application has peaked. In recent decades increase in world food production has been due to increases in yields; there has been no significant increase in land area farmed. US fertilizer use is now plateauing as increasing use is not increasing yields. These are disturbing signs, given that we are now only feeding about 1 billion people adequately and we will probably soon have to cope with 11 billion.

Strangely missing from the 80 pages and 8 chapters on food is any significant reference to trends in prices, given that Simon's general method is to take price trends as settling questions to do with scarcity. Simon's introduction claims food prices have fallen. (Simon, 1995, p 11-13) However the Worldwatch Institute says food prices are rising, especially for fish. (Brown, 1995, p. 15, 16)

Growth and the Environment

Simon rightly points the considerable uncertainty surrounding estimates of the species loss rate, but he does not deal satisfactorily with the likelihood that as higher proportions of ecosystems become degraded large and accelerating losses will occur. For instance, it is possible that by 2030 there will be none of the species-rich tropical forest left in a satisfactory condition. His discussion of the forests acknowledges does not dwell on the significance of the approximately 15.4 million ha of tropical forest lost per year. He does recognise that the rate has risen from .6% p. a. to .8% p. a. in a decade, (Simon, 1995, p. 342) but any concerns seem to be smoothed away by reference to Simon's crucial indicator, viz. price. No increase in the price of timber was apparent between 1950 and 1980, so there is nothing to worry about.

Beckerman's argument is that not only is growth compatible with environmental values, but it is the only or at least the best way to solve environmental problems. His main argument seems to be that the richer countries are the less environmental problems they have or cause. This is a version of the general "Kuznets curve" thesis; i.e., that poor countries increase their level of environmental impact as they develop, but in time when they become rich impact falls. (Simon 1995, p. 40) Even if this thesis is generally valid it does not follow that the ways of the richest countries are ecologically sustainable, and there are many reasons for concluding that they are not.

One reason why rich countries might seem to have less environmental impact (and resource demand) is that they have exported their most environmentally destructive industries. Many of the problems in the Third World, especially ecological problems such as loss of forests and depletion of soils and urban pollution, are due to industries which produce almost entirely for the benefit of the rich countries. Thus much of the steel and many of the consumer products available in rich world supermarkets are produced in highly polluting plants located in the Third World. Much of the food in those supermarkets is grown on Third World land. Most of the logs from the diminishing rainforests go to the rich countries. Conventional development has made much of the Third World into part of the rich world's economy, since those are now the fields and factories and power stations from which rich world living standards are to a significant degree derived.

Were it not for the fact that much Third World productive capacity is geared to rich world demand much of the environmental damage in the Third

World would not be occurring. People who overgraze fragile lands and cut trees down would be much less inclined to do so if the rich countries were not taking most of the world's fuel, and taking the produce from land that local people should be farming. Similarly, a major factor feeding into Third World ecological destruction, especially forest loss and mining impacts on the environment is the pressure to export more commodities that is generated by foreign debt.

Thus the apparent Kuznets U curve is at least partly due to the fact that much of the environmental impact generated by the rich world occurs in the Third World from which so much of the rich world's wealth is drawn.

However the fundamental point here is that the global ecological problem is primarily due to the sheer volume of producing and consuming going on. It takes vast quantities of resources to provide the lifestyles taken for granted in a rich country, e.g., about 20 tonnes of new materials for each American every year. (U.S. Bureau of Mines, 1980) To produce a tonne of materials can involve the moving of 15 tonnes of soil and water, all involving further chains of energy, exhaust materials and environmental costs. (The "Rucksack" concept; see Schmidt-Bleek, 1994, Weiszacker and Lovins, 1997) In almost all major areas it is clear that the taking of resources from the environment and the associated dumping of wastes back into the environment are causing serious and increasing rates of damage. A substantial literature seems to be pointing to trends that are clearly unsustainable regarding forests, grasslands, coral reefs, plant and animal species, oceans, soils, water and the atmosphere. As has been noted above, the Worldwatch Institute's evidence seems to indicate that many of the important indices of biological and agricultural productivity are tapering towards plateaus, or alrealdy falling. It is highly implausible that these already disturbing trends will not continue to increase if commitment to economic growth remains, irrespective of advances in technology regarding the resource efficiency of production. (See below)

Beckerman's failure to recognise that environmental problems and limits cannot be meaningfully discussed in terms of monetary cost is revealed by his statement that in the US economy the sector most likely to be affected by the greenhouse problem is agriculture but this only accounts for a mere 3% of GNP. (Beckerman, 1995, p. 91) He is correct in pointing out that the US could easily cope with a 3% reduction in GNP, but the US economy could not cope at all if that small reduction was due to the elimination of food production! Obviously the dollar value gives no indication of the real value involved here. Thus we see the central flaw in much of what is being said under the heading of "ecological economics", the impossibility of taking into account or representing ecological values, especially the integrity of the planet's life support systems, in terms of dollar values.

Another impressive line of argument in support of the limits to growth position, to which neither Beckerman nor Simon make reference, is given by the recent emergence of "Footprint" analysis. Wachernagel and Rees (1996) estimate that the way of life typical of people in rich world cities requires 4-5 ha of productive land to provide water, food, and settlement space and to take up the carbon dioxide released by energy use. If the present world population were to live as rich world people do about 26 billion ha of productive land would be needed. However that is more than 3 times the area of all the productive land on the planet. For a world of 11 billion people to live as we do the multiple would be 7. Again there would seem to be no possibility of all people rising to anything like the living standards we take for granted in rich countries today.

But what about advances inpollution control?

Beckerman and Simon criticise environmentalists for not taking into account the capacity of humans to develop better technology, especially better pollution control and energy conservation strategies. Certainly these factors will make a difference to the magnitude of the problems described above. But it is not plausible that they will make sufficient difference while any commitment to economic growth and raising "living standards" remains .

Let us assume that total world output is increasing at 3% p. a., and the associated environmental impact and energy use are therefore also increasing at 3% p. a. If at a point in time technical advance reduced these two factors by 1/3 but output continued to increase at 3% p. a., then it would only be 15 years before they were both back up to the level they were at before the reduction, and they would double every 23 years after that. If in 70 years time the environmental impact or the energy use was to be no higher than now (which is too high), then impact or energy use per $ of output would have to be cut to 1/8 of their present level (and 1/16 only 23 years later, etc.). For there to be no increase in impact in a world of 11 billon living in 2060 as we in presently rich countries would then be living given 3% growth, the fraction would have to be 1/110 (See below). In other words it is extremely likely that plausible reductions will soon be overwhelmed if there is commitment to any significant rate of growth in total economic output.

What about change to service and information industries?

It is often assumed that growth can go on safely because it will be mostly in the service and information areas rather than those to do with manufacturing or commodities. More importantly, it is a mistake to assume that service industries do not account for significant energy use. In fact they take 27% of all energy used in Australia. Some are highly energy intensive, such as transport and tourism. Others deal with energy intensive goods, such as retailing, insurance and advertising. It is not plausible that the global economy can grow by a factor of 8 or more in 70 years without significant increases in the present levels of energy and resource use.

Now Consider the Multiples

The foregoing analysis has indicated the reasons for concluding that the present aggregate and per capita levels of production and consumption in rich countries are far higher than are sustainable and are far higher than all people could have. Yet the fundamental and supreme goal in these, and all other countries is economic growth; it is to increase levels of production and consumption, constantly and without any end in sight. Simon and Beckerman emphatically assert the possibility and the desirability of continued, limitless economic growth. Neither gives attention to the extremely difficult implications regarding resource and environmental problems that any commitment to growth quickly leads to, which are made clear by the following magnitudes.

If the world economy grows at 3% p. a. then by 2060 total world economic output would be 8 times as great as it is now. For a 4% growth rate the multiple would be 16. Let a us assume a) that by 2060 we have 11 billion people, b) that from now until then the rich countries average 3% growth (which the resent record shows is far from sufficient to solve problems of unemployment and debt), and c) that by 2060 all the world's people will have become as affluent as we in rich countries will be then. Total world economic output would then be about 110 times as great as it is now. Even if we assume that the Third World will only rise to the present rich world living standard the multiple would still be 20. (Simon believes that in 100 years all people will be at or above rich world living standards. Simon, 1995, p. 642)

If we were to assume that by 2070 technical advance would be able to reduce the present ecological impact per dollar of production by a factor of 10, total impact would still be 11 times the present grossly unsustainable level.

In other words, any commitment to growth implies enormous increases in the present world volume of production and consumption in coming decades, when there are impressive reasons for concluding that the present levels are unsustainable. Neither Beckerman nor Simon see any problem here.

Growth and the quality of life

Both authors reassert the fundamental assumption of conventional economics that growth improves welfare or the quality of life. Beckerman's reasoning is to do with improvements this century in health, pollution, security for the aged, hours of work, work conditions, holidays, and freedom to travel.

Douthwaite's detailed study The Growth Illusion, (Douthwaite, 1992) comes to the opposite conclusion on most if not all of these claims. There is considerable reason to believe that since the peak reached in the 1970s most indices of welfare or the quality of life in rich countries have fallen. This seems clear regarding hours of work, and real income for the majority of workers. In fact 80% of American workers have suffered a 20% fall in the purchasing power of their incomes since 1980. (Thurow, 1996) In coming years the race towards the globalisation of the economy is likely to rapidly accelerate the deterioration in working conditions, in rich and poor countries. During the 1980s the Australian economy averaged 3.2% p. a. growth but unemployment more than doubled, inequality rose markedly, homelessness increased, the rural debt and the foreign debt multiplied by 10. (Trainer, 1995b, Chapter 4) Clearly many problems of social cohesion and breakdown have accelerated in the last two decades, especially in the richest societies.

It seems that all reported measures of the experienced quality of life have either not increased or have deteriorated, and continue to support Easterlin's conclusion that the experienced quality of life in rich countries does not increase with increases in the GNP. (Easterlin, 1976) More recent evidence on Genuine Progress Indicators from a number of countries provides impressive evidence that the that quality of life is deteriorating. (Eckersley, 1997)

Third World Development

Simon gives virtually no attention to the rich world/poor world question. His confident implicit assumption is that the Third World will develop fairly rapidly, to reach rich world living standards within the next 100 years. Beckerman does give considerable space to this topic, based on the common assumption that economic growth is crucial in order to solve the Third World's problems. (Beckerman, 1995, p. 19, 24) He endorses the dominant conventional development theory and practice, whereby development is usually identified with economic growth.

There is now an extensive and increasing literature putting a general critical position on conventional development theory and practice. (See for example Trainer, 1989, 1995a, 1995b) Following is only a summary statement of some of the main points that can be made against Beckerman.

When development is conceived in terms of doing what will most increase the amount of production for sale, i.e., in terms of business turnover, the result is almost entirely inappropriate development. A great deal of development results, but it is mostly development of factories and plantations and tourist hotels that will benefit the rich in the Third World, the contractors, the exporters, the transnational corporations and the consumers in rich countries. A glance at almost any Third World nation or region shows that only a minute proportion of the benefit generated by conventional market-determined development goes to those in most need. Conventional development not only results in development in the interests of the rich, it has a powerful tendency to take from the poor the productive capacity they once had. (Goldsmith 1992, 1997)

The rationale for conventional development driven by the quest for growth within free enterprise markets can only be in terms of the eventual trickle down benefits that it is assumed will eventually find their way to those in most need. It should not need to be explained that very little ever trickles down. Some benefits do and there is no doubt that average Third World infant mortality and life expectancy rates have increased considerably in recent decades, but the adequacy of a development strategy should be judged primarily by how well and how quickly it solves the most urgent problems, i.e., by how well it meets the most serious needs of the world's poorest people. One sentence in the 1996 Human Development Report would seem to provide all the information we need to settle this question; the poorest 1. 6 billion people on earth are now poorer than they were 15 years ago, despite the fact that in that period Third World economies achieved a remarkable 6% p. a. growth rate and therefore more than doubled their income. (U.N., 1966, p. 1)

The critical development literature argues that in the Third World more clearly than anywhere else, growth is the problem. When the goal of development is to facilitate those initiatives that will do most to increase production for sale, exports and investment opportunities, the existing productive resources will flow into the most profitable ventures, which are always ventures that provide for those with most effective demand, i.e., the rich. Not only will most of the available resources be taken by the rich countries (with one quarter of the world's population they are consuming four fifths of its resource output), even more importantly the industries developed will not attend to the most urgent needs. There is a rapidly increasing recognition of the failure of the conventional approach to development, and the impossibility of solving the Third World's problems in an economy driven by market forces, growth and the profit motive. Unfortunately the conventional economic mind can not conceive of any other way, and this is clearly true of Beckerman (See for example, Beckerman, 1995, p. 19, 24)

Needless to say the inadequate analyses of resource limits given by Beckerman and by Simon render them incapable of recognising that for the Third World development, conventionality defined, is totally impossible. If the analysis of mineral, energy and biological resources outlined above is more or less valid, then there is no possibility of the Third World rising to anything like the present rich world's living stands or levels of industrialisation or production and consumption.

What is the solution?

Both of these books fail to argue convincingly against the basic limits to growth claim that the affluent, industrialised and growth-obsessed way of life characteristic of the rich countries and aspired to by the rest is quite unsustainable. Over the last two decades a considerable literature on the very different form a sustainable society must take has emerged, and more recently a Global Ecovillage Movement has come into existence whereby many small communities are attempting to develop the required new economies.

The four basic principles embodied in this movement are, materially simple lifestyles, high levels of local economic and social self-sufficiency, much more cooperative ways, and an entirely different economy, one not driven by profit, market relations or growth, i.e., it must be a zero-growth or steady-state economy. A detailed summary of ideas and projects underway within the Global Ecovillage Movement are given in The Conserver Society (Trainer, 1995a) and Towards A Sustainable Economy (Trainer, 1995b). Beckerman would probably find all this to be not only naive and utopian, but distasteful and regressive and contrary to everything the term "progress" means to the conventional economist. The two central themes argued in The Conserver Society are that given the limits to growth analysis we have no choice but to attempt a transition to the alternative path the book sketches, whether we like it or not, because a sustainable society cannot be defined except in terms of these four principles, and secondly that to make such a transition would be to progress to a higher quality of life than most experience now in the richest countries.

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