Another reason why a steady-state economy will not be a capitalist economy

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The best known advocate of a steady-state economy, Herman Daly (2008), believes that such an economy could still be a capitalist economy. Richard Smith (2010) argues that a capitalist economy must by nature be a growth economy, but Daly and similar theorists see it as a matter of choice. As Smith says, according to Daly and others, "… growth is seen to be entirely subjective, optional, not built into capitalist economies. So it can be dispensed with, exorcised, and capitalism can carry on in something like 'stasis'." Similarly Tim Jackson has a vision of a steady-state economy that is a "flourishing capitalism", although functioning "… at a less frantic pace…".

Smith's case that a steady-state economy cannot be a capitalist economy focuses on the nature of the market system. Smith discusses Daly's enthusiastic acceptance of the market, stating that Daly's vision of a Steady-State Economy is based "…on impeccably respectable premises: private property, the free market, opposition to welfare bureaucracies and centralized control". Smith insists that as long as the economy is driven by market forces it will have a growth imperative. "'Grow or die' is a law of survival in the marketplace. …the growth imperative is a virtual a law of nature, built into any conceivable capitalism. Corporations have no choice but to seek to grow."

This line of argument, centring on the intrinsic nature of a market system, is persuasive, but although Smith's commentary was made two years after the article he discusses it does not deal with the counter-argument Daly raised briefly in his 2008 statement. This is the possibility that technical advance will enable increasing dollar value to be got out of a stable amount of material and ecological inputs to the economy, thereby making it possible for sales and GDP to go on increasing. Daly says, "… the value of total production may still increase without growth in physical throughput – as a result of qualitative development. Investment in quality improvement may yield a value increase out of which interest could be paid."

Daly's use of the term "qualitative" here seems to stand for basically a "tech-fix" claim; i.e., that as time goes by technical advance will improve the efficiency of resource use and reduce environmental impacts. This will enable more product, or better or higher quality/value items, to be derived from a stable flow of physical and biological resources, thereby allowing sales and GDP to go on increasing even though it is a steady-state economy with respect to ecological sustainability.

This is the issue that the following critique addresses. It will be argued that the main problem in Daly's position is to do with the *scope* for growth that technical advance is likely to make possible.

Daly does recognise that this issue of magnitude is crucial, although he does not explore it. He says, "…the productivity of capital would surely be less … 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…" The central point made via the extensive evidence quoted below is that this scope is very likely to be so extremely limited as to ensure that the economy would cease to be capitalist.

The central "decoupling" claim

The essential issue here is the widely assumed "decoupling" claim; i.e., that economic growth can be separated from growth in inputs to the economy, thereby enabling continued increase in production, consumption, economic turnover and "living standards" without running into serious resource and environmental problems. This assumption is built into the general "Tech-fix" view. The most enthusiastic elaboration of this is to be found in the recent emergence of Edomodernism". (See Blomqvist, et al., 2015.)

The term "relative decoupling" refers to growth in need for inputs that is less or slower than growth in GDP but still positive, while "absolute decoupling" refers to growth of GDP with no increase in inputs, or a fall. Believers in Tech-fix tend not to realise that if global resource demands and ecological impacts are to be brought down to sustainable levels there must be enormous and extremely implausible absolute decoupling. This is the first of the two main points detailed below. The second is that all the evidence found in this review contradicts the notion that significant decoupling is occurring, and no evidence has been found to support it.

How much decoupling would be needed?

This question requires brief attention to the general nature and magnitude of the limits to growth problem. The 10-15% of the world's people living in regions such as North America, Australia and Europe have per capita levels of resource use that are around 20 times the average for the poorest half of people. How likely is it that all the 9.7 billion people expected by 2050 could rise to the present rich world level of resource use?

If they did live as rich world people do then world annual resource production and consumption, and ecological damage, would be approaching 6 times as great as at present. Yet present resource use and environmental impacts are far beyond sustainable levels.

The World Wildlife Fund's "Footprint" analysis (WWF, 2014) yields the estimate that it takes about 8 ha of productive land to provide water, energy settlement area and food for one person living in Australia. So if 9 billion people were to live as we do we would need about 72 billion ha of productive land. But *that is about 9 times all the available productive land on the planet.*

However the foregoing argument has only been that *the present* levels of production and consumption are quite unsustainable. Yet we are determined to increase present living standards and levels of output and consumption, as much as possible and without any end in sight. In other words, the supreme national goal is economic growth. Few seem to grasp the implications.

If rich countries have a 3% p.a. increase in economic activity until 2050 then their output, resource use and environmental impact will be approaching four times as great as it is now, and doubling every 23 years thereafter. If by 2050 all the expected 9.7 billion people expected to be living on earth had risen to the "living standards" we in rich countries would then have given 3% economic growth, then total world output, resource, use and environmental impact would be approaching *15 times* as great as they are now.

According to the WWF's Footprint index (2014) sustainable levels have already been exceeded by 50%. This indicates that the above 1/15 reduction factor is too low and that if 9.7 billion were to live sustainably on the levels of consumption rich countries expect in 2050 then per capita impacts would have to be reduced to 1/23 of their present rich world levels.

These multiples should be the focal point in discussions of sustainability. Grasping the magnitude of the present overshoot is the crucial beginning point for the analysis of the global situation and the nature of a sustainable and just alternative society.

The evidence on decoupling

If resource use was to be reduced to 1/15th (or 1/23rd) of present levels by 2050, the annual reduction rate would have to be over 9% p.a. (or 14% p.a.) The amount used would have to halve every approximately 4.5 years (or 3 years.) These would be extraordinarily rapid rates of *absolute* decoupling. That is materials and energy use would have to be falling at three or four times the typical rate of increase in GDP. Does the historical and present decoupling achievement suggest that these kinds of rates could be achieved?

Notes on about 30 studies and estimates of decoupling rates for the economy in general, and for specific industries and resource uses, are available at The Simpler Way (TSW): *Decoupling: The issue and evidence*. These all document very low or negligible rates at best, and some that are negative. Consider the following examples drawn from that collection.

Wiedmann et al. (2014) show that when materials embodied in imports are taken into account rich countries have not improved their resource productivity in recent years. They say "…for the past two decades global amounts of iron ore and bauxite extractions have risen faster than global GDP." "… resource productivity…has fallen in developed nations." "There has been no improvement whatsoever with respect to improving the economic efficiency of metal ore use."

In another study Wiedmann et al. (2015) report on an input-output study of 186 nations. They find that a 10% increase in GDP is accompanied by a 6% increase in materials use. The study takes into account "upstream" materials use, i.e., in production and transport and infrastructures needed to produce materials. This use is large… 40% of global raw materials extracted goes into producing goods to be exported. i.e., far more than the 10 Gt of goods traded.

Their main finding is that, "No decoupling has taken place over the past two decades for this group of developed countries. …pressure on natural resources does not relent as most of the human population becomes wealthier."

Giljum et al. (2014, p. 324) report only a 0.9% p.a. improvement in the dollar value extracted from the world use of each unit of minerals between 1980 and 2009, and no improvement over the 10 years before the GFC. "…not even a relative decoupling was achieved on the global level". They note that the figures would have been worse had the production of much rich world consumption not been outsourced to the Third World. Their Fig. 2, shows that over the period 1980 to 2009 the rate at which the world decoupled materials use from GDP growth was only one third of that which would have achieved an "absolute" decoupling, i.e., growth of GDP without any increase in materials use.

Diederan's account (2009) of the productivity of minerals discovery effort is even more pessimistic. Between 1980 and 2008 the annual major deposit discovery rate fell from 13 to less than 1, while discovery expenditure went from about $1.5 billion p.a. to $7 billion p.a., meaning the productivity of expenditure fell by a factor that is in the vicinity of around 100, which is an annual decline of around 40% p.a. Recent petroleum figures are similar; in the last decade or so discovery expenditure more or less trebled but the discovery rate has not increased.

A study by Schandl et al. (2015) contained the following statements, "there is a very high coupling of energy use to economic growth, meaning that an increase in GDP drives a proportional increase in energy use." (They say the EIA, 2012, agrees.) "Our results show that while relative decoupling can be achieved in some scenarios, none would lead to an absolute reduction in energy or materials footprint." In all three of their scenarios "energy use continues to be strongly coupled with economic activity..."

The Australian Bureau of Agricultural Economics (ABARE, 2008) reports that the energy efficiency of the nation's energy-intensive industries is likely to improve by only 0.5% p.a. in future, and of non-energy-intensive industries by 0.2% p.a. This means they expect that it would take 140 years for the energy efficiency of the intensive industries to double the amount of value they derive from a unit of energy.

Alexander (2014) concludes his review of decoupling with respect to environmental impacts by saying, "decades of extraordinary technological development have resulted in increased, not reduced, environmental impacts". Smil (2014) concludes that even in the richest countries absolute dematerialization is not taking place.

The FAO reports a case where decoupling has been negative, i.e., growth has been accompanied by disproportionate increase in input. Cereal production since 1960 has multiplied by 3.4, but nitrogen application multiplied by 8.3 (FAOSTAT Database, Undated, Fig 2.9.) Similarly, Alvarez found that for Europe, Spain and the US GDP increased 74% in 20 years, but materials use actually increased 85% (Latouche, 2014).

The IEA (2008) finds that there was little change in energy use per unit produced for cement production (p 34.) The index for paper improved from 80 to 92 (Fig 3.5 p. 32), and aluminium went from c.16 kWh/kg to 15 over the period, but the future potential for further reduction was said to be limited. There was little improvement for cars, and slow improvement for electricity production.

Tverberg (2015) says,

> "In recent years, we have heard statements indicating that it is possible to decouple GDP growth from energy growth. I have been looking at the

> relationship between world GDP and world energy use and am becoming increasingly skeptical that such a decoupling is really possible."

Tverberg's plot for the growth of energy and GWP shows parallel paths, with energy a little lower. That is, energy is not shown to fall away much from the GDP growth line.

> "Prior to 2000, world real GDP (based on USDA Economic Research Institute data) was indeed growing faster than energy use, as measured by BP Statistical Data. Between 1980 and 2000, world real GDP growth averaged a little under 3% per year, and world energy growth averaged a little under 2% per year, so GDP growth increased about 1% more per year than energy use. However since 2000 energy use has grown approximately as fast as world real GDP – increases for both have averaged about 2.5% per year growth."

Figure 10a for energy intensities for the world, shows little improvement since 1980. Fig 11 shows a drop from index 258 to 225, and a flat trend since 2000.

Krausmann et al. (2009) say that most of the global reduction in the conventional measure of material intensity was due to the declining intensity of biomass use, while the intensity of minerals use actually increased. Energy intensity declined by 0.68% per year, and materials intensity by 1% per year. (p. 10.) That is, energy needed per unit of GDP would take 106 years to halve.

Australian petroleum products consumption increased from 27,902 million litres in 1970 to 52,095 Ml in 2010, an approximately 1.75% p.a. exponential rate of growth. In the same period GDP increased at 2.5%-3% p.a. (Again around the 0.6 ratio.) At this rate by 2050 petroleum consumption would be about 87% higher than now.

The energy needed to produce 1 kg of steel in the US fell 13% between 2000 and 2014, i.e., at an average 0.9% p.a., meaning that it would take more than 80 years to halve (World Steel Association, 2016). At 3% p.a. growth economic output would be about 12 times as large by then, so total steel use could be expected to be in the vicinity of six times as large as at present.

Similar conclusions re stagnant or declining materials use productivity etc. are arrived at by Aadrianse, (1997), Dettrich et al., (2014), Schutz, Bringezu and Moll, (2004), Warr, (2004), Berndt, (1990), Schandl and West, (2012).

The significance of EROI

This is one of the most important issues relevant to the tech-fix and decoupling claims. The Energy Return On Invested (EROI) energy for overall energy production/supply is falling. The world EROI for the production of oil and gas has declined from 30:1 in 1995 to about 18:1 in 2006 (Hall, Lambert, and Balogh, 2014; see also Nafez, 2016; Murphy, 2010). Values for the new fossil fuel sources such as via fracking are low. For tar sands and oil shale they are around 4 and 7. Values for renewables are also low; wind is best with an estimate around 18, biomass ethanol is c. 4 at best and biomass diesel about 2. The figure for PV is controversial, usually claimed to be 8 but some argue 2-3 (Prieto and Hall, 2013; Palmer, 2013; Weisbach et al., 2013). The decline in the general EROI figure represents a "negative decoupling" for energy over time, i.e., technical advance has not been able to prevent the amount of energy produced per unit of effort from *decreasing*.

A caution re the "energy intensity" measure

The above figures might seem to be contradicted by the often quoted "energy intensity" index. This typically shows that the amount of energy used in rich world economies per unit of GDP has been in decline, suggesting that decupling is occurring. However this is misleading as there two important factors that these figures do not take into account.

The index does not include the large and increasing amounts of energy and materials imported into a country in the form of produced goods as energy intensive operations such as manufacturing is shifted to the Third World. With respect to materials they only refer to what is now labelled "Domestic Materials Consumption" whereas what matters is the "Total Materials Consumption" or "Material Footprint" of a nation which are indices including materials used to produce imports (for instance, Wiedmann, et al., 2015). Thus Cloete (2015) says,

> "it … appears that the outsourcing of energy intensive labour to developing nations (and buying back the goods with dollars created out of thin air) is the primary cause of US energy intensity reductions."

Secondly, over recent decades there has been considerable "fuel switching", i.e., moving to forms of energy which are of "higher quality" and enable more work per unit. For instance a unit of energy in the form of gas enables more value to be created than a unit in the form of coal, because gas is more easily transported, switched on and off, or transferred from one function to another. This enables more productive work to take place per MJ. Cleveland et al. (1984) and Kaufmann (2004) document the trend and argue that its effect is considerable.

A caution re the GDP measure

Another factor tending to make the decoupling achievement look better than it is involves the changing constituents of GDP. Over recent decades there has been a marked increase in the proportion of rich nation GDP that is made up of "financial" services. In some years this sector has made about 40% of corporate profits. However much of the relevant "production" in this sector takes the form of nothing more than key strokes moving electrons around. A great deal of it is wild speculation, providing risky loans and making computer driven micro-second switches in "investments". Apart from the negligible or negative social value these operations often create, they deliver large increases in income to banks, screen jockeys, speculators, consultants and fund managers, and these add into GDP figures. Thus the numerator in indices of productivity and decoupling is significantly inflated helping to improve those indices when in fact there has been little or no improvement in the efficiency with which anything of social value is being produced.

When output per worker in the production of substantial goods and services such as food and vehicles, or aged care, is considered quite different conclusions are arrived at. For instance Kowalski (2011) reports that between 1960 and 2010 world cereal production increased 250%, but nitrogen fertilizer use in cereal production increased 750%. This aligns with the above evidence on steeply falling productivity of various inputs for ores and energy. It is therefore important to keep in mind that when analysing productivity, the "energy intensity" of an economy, and decoupling indices which involve the GDP will be significantly misleading.

To summarise

The above evidence indicates that very little relative decoupling is being achieved let alone absolute decoupling. In a number of cases the best estimated decoupling rates indicate that as GDP rises 1% materials or energy used rise 0.6%. This would mean that by 2050 normal 3% p.a. GDP growth would have multiplied it by more than 3, and that materials use would be 1.8 times as large as it is now. This is obviously far from keeping materials demand from increasing as GDP increases, let alone dramatically reducing it as is needed.

In other words, *none of the evidence quoted above or in the longer collection provides significant support for the decoupling thesis or the general tech fix faith with respect to demand for energy, materials or environmental impact.*

This would seem to be the main factor responsible for the poor performance of "productivity" indices in recent years. The measure commonly taken regards labour and capital as the crucial factors but it is now being realised that the role of energy inputs has been overlooked. For instance over the last half century agricultural productivity measured in terms of yields per ha or per worker have risen dramatically, but these have been mostly due to even greater increases in the amount of energy being poured into food supply, on the farm, in the production of machinery, in the transport, pesticide, fertilizer, irrigation, packaging and marketing sectors, and in getting the food from the supermarket to the kitchen, and then dealing with food wastes and packaging. Less than 2% of the US workforce is now on farms, but agriculture accounts for around 17% of all energy used (not including several of the factors listed above.) Similarly the "Green Revolution" has depended largely on ways that involve greater energy use.

Ayres, et al. (2013), Ayres, Ayres and Warr (2002) and Ayres and Vouroudis (2013) are among those beginning to stress the significance of energy in productivity, and pointing to the likelihood of increased energy problems in future and thus further decline in productivity. Murillo-Zamorano, (2005, p. 72) says "…our results show a clear relationship between energy consumption and productivity growth." Berndt (1990) finds that technical advance accounts for only half the efficiency gains in US electricity generation.

These findings mean that it is not even possible to attribute to sheer technical advance most of the generally slight improvements in productivity that were being achieved before the recent down turn, because many or most were due to increased energy inputs.

Implications for a steady-state economy

If there is negligible decoupling and if productivity gains are slight and due largely to greater use of energy, this means that over time technical advance is not getting significantly more dollar value out of a given amount of material and energy inputs. But Daly's case that a steady-state economy can remain capitalist depends entirely on the assumption that there is considerable scope for technical advance to enable productivity gains and decoupling, and for this to continue indefinitely. If the foregoing numbers are more or less sound, the scope is very low, and likely to diminish. Daly does not seem to grasp how severely this would limit the opportunities for capital investment.

Consider the volume of production, business turnover and capital investment that would be involved in a steady-state economy functioning on something like 10% of the present GDP of a rich world economy. The amount of factories and infrastructures needed would be about 10% of the present amount, and the only outlets for capital investment would be a) in maintenance of the amount, that is in dealing with depreciation or switching to a different mix, and b) taking advantage of those very limited technical advances enabling more value to be got out of the stable and hugely reduced volume of material and energy inputs.

Well-designed plant in an economy acutely conscious of resource scarcity might average a 75 year lifetime (e.g., small and large buildings made from earth can last hundreds of years). In a severely constrained energy situation it is likely that the presently very low and probably deteriorating productivity figures would remain around negligible at best. It is not plausible that these conditions could support a capitalist class of any significance, because the scope for deriving income from the investment of capital would be a very small fraction of the present amount. Capital could in principle still be privately owned, yielding a very small income to a very small capitalist class, but it is not plausible that a society sensible enough to embrace a steady-state economy would tolerate this.

A steady-state economy is not enough

It should be evident from the above discussion that it is not sufficient merely to take a steady-state economy as the goal. When the seriousness of the limits to growth is understood, as the above multiples make clear, it is obvious that a sustainable and just society must have embraced large scale *de-growth*. That is, it must be based on per capita resource use rates that are a small fraction of those typical of rich countries today; it must in other words be some kind of Simpler Way. (For the detail see *TSW: The Alternative*.)

Only if the basic settlement form is a small scale, highly self-sufficient, self governing and primarily collectivist local economy, can the resource and ecological effects be dramatically reduced. The main concern of The Simpler Way project is to show that this vision is workable, easily achieved if it is opted for, the only way to defuse global problems, and capable of greatly improving the quality of life even of people living in the richest countries.

The chances of it being achieved are at present negligible, but that is not central here; the question is given the global predicament does any other option make sense.

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