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Economic sustainability: what should it be?

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Abstract

Many speak of 'economic sustainability' but few define what they mean. On a finite world with biophysical limits, what should it mean? Firstly, it must be based on ecological reality and limits. It must acknowledge human dependence on nature and the environmental crisis caused by ignoring this. It must move past denial of our problems, as you don't solve problems you deny exist. The paper analyses the underlying assumptions of neoclassical economics, and their failing to be based on ecological reality. It then considers what economic sustainability should be and considers immediate first steps, and the path to first a green economy and then a steady state economy.

Keywords

steady state economy, growthism, neoclassical economics, growthmania, green economy, economic sustainability

Introduction

What should 'economic sustainability' mean? *Oikonomia* = 'management of a household' or economics. At its simplest, the economy is how we organise things in our society, how we produce food and materials, trade them, and swap skills. It is the study of how humans make their living, how they satisfy their needs and desires (Common and Stagl, 2005). The economy was thus meant to serve society. 'Good' economics should be good management of the home we study with ecology. This is how ecological economics sees things. However, this is not the case for mainstream economics. Modern neoclassical economics is fraught with issues of worldview, ideology, assumptions, ignorance of ecological reality, and denial. The 'growth economy' is also arguably the largest 'elephant in the room' (Zerubavel, 2006) that most of us still refuse to see. Perhaps the greatest denial regarding the major problems underlying the environmental crisis is that around the growth economy, eclipsing even climate change denial (Washington and Cook, 2011). There are also deep ethical questions that need to be discussed.

Humanity faces an environmental crisis (MEA, 2005), and have exceeded at least three planetary boundaries (Rockstrom et al, 2009). A major (but often unacknowledged) driver behind this is the growth economy promoted by neoclassical economics (Daly 1991). It has become the 'given truth' of our times, what Ellul (1975) has called the 'chief sacred' in society. This is true even in many academic, media and environmental circles. This paper deals the problems of the dominant neoclassical economic synthesis and considers solutions such as the steady state economy. There are of course other schools of economic thought (Foxon et al, 2012) not discussed due to space limits. There has also been extensive discussion of the 'service' economy in academia, but here I will observe only that a service economy cannot be completely decoupled from energy and material use, and hence the impacts of growth (Daly, 2012).

Since the 1980s the general embrace of neoclassical economics has led to increasing inequalities of wealth and more frequent and severe booms and crashes. Sukhdev (2010) sees the root cause of biodiversity loss as being our dominant economic model, which:

... promotes and rewards more versus better consumption, private versus public wealth creation, human-made capital versus natural capital. This is the 'triple whammy' of self-reinforcing biases that leads us to uphold and promote an economic model in which we tend to extract without fear of limits, consume without awareness of consequences and produce without responsibility for third party costs, the so-called 'externalities' of business.

The underlying assumptions of neoclassical economics

Neoclassical economics doesn't concern itself with long-term economic sustainability, while ecological economists do, as should society. There are assumptions that neoclassical economics makes about how the world 'works' that should be examined if we are to reach economic sustainability (Washington, 2015 in publication). These include:

- 1) Strongly *anthropocentrism*. Nature is seen as 'just a resource' to be used to provide the greatest 'utility' to the greatest number of people. Land becomes merely 'resources' and 'natural capital'. Such an approach does not consider the limits or tipping points of ecosystems.
- 2) The idea that the *free market* will control all that is needed, that the 'invisible hand' will regulate things for human benefit (Daly, 1991). This is a 'given truth' that has become almost a religion (Daly, 2008). Stiglitz (2002) noted the invisible hand was invisible because 'it is not there'. Market failures of various kinds mean that actual market outcomes are not efficient. Achieving efficiency does not guarantee equity, between either those alive at one point in time, or different points in time (Stiglitz, 2012).

- 3) The idea that the economy can *grow forever* in terms of continually rising GDP, which increased 25-fold over the last century (Dietz and O'Neill, 2013). Daly (1991) notes that 'economic growth is the most universally accepted goal in the world and that: 'Capitalists, communists, fascists and socialists all want economic growth and strive to maximise it'.
- 4) The *refusal to accept any biophysical limits to growth*, for when classical economics was developed, limits were distant (Daly, 1991). One caveat needs to be added here, in that Thomas Malthus was one classical economist who *did* understand that population growth would run up against limits regarding what the world could supply. However, neoclassical economics today mostly continues to fail to acknowledge any limits on a finite Earth. Daly (1991) notes that three inter-related conditions: finitude, entropy, and complex ecological interdependence - combine to provide the biophysical limits to growth.
- 5) A *circular theory of production* causing consumption that causes production in a never-ending cycle. Daly (1991) notes that real production and consumption are in 'no way circular'. The growth economy sees outputs returned as fresh inputs and Daly notes ironically this requires we 'discover the secret of perpetual motion'. An economy is not an isolated system, it is part of (and relies on) the biosphere. 'Money fetishism' is the idea that money flows in an isolated circle, and thus so can commodities. This is a classic 'fallacy of misplaced concreteness' (Daly, 1991).

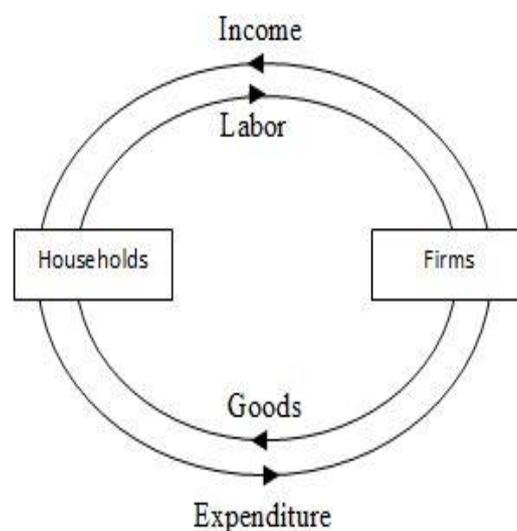


Figure 1 The assumed 'circular flow' of production and consumption in the neoclassical economy, after Daly (1991).

- 6) Neoclassical economics *ignores the Second Law of Thermodynamics* and fails to consider 'entropy' as a key feature of economics and reality. Georgescu- Roegen (1971) and Daly (1991) detail this. Thermodynamics shows that we do not create or destroy anything in a physical sense, we merely transform or rearrange it. The inevitable cost of arranging greater order in one part of the system (the human economy) is to create disorder elsewhere - nature (Daly, 1991). 'Entropy' is a measure of the disorder in a closed system. In thermodynamics, low entropy quantities (usable energy, raw materials) move to high entropy quantities (waste heat and wastes). Entropy is the basic physical coordinate of scarcity. Were it not for entropy, we could burn the same gallon of petrol over and over, and our capital stock would never wear out.
- 7) Environmental damage is *merely an 'externality'*. The spillover effects of market transactions have been named 'externalities'. Externalities are costs or benefits arising from an economic activity that affect somebody other than the people engaged in it, and are not reflected fully in prices. Environmental damage is known as a 'negative externality', considered something external to the economic model. An externality is thus seen as being worth only peripheral attention (Daly and Cobb, 1994). This is a key part of what has led to the environmental crisis. Of course, environmental crises can still occur even where externalities are 'internalised' (incorporated into market accounting). Foxon et al (2012) point out this approach is inadequate for climate change and biodiversity loss. However, attempting to internalise such costs is a better approach than ignoring them.
- 8) All forms of *capital can be substituted*, thus human capital can be substituted for natural capital (weak sustainability) (Solow, 1974)

The above assumptions have been detailed individually by others, principally Herman Daly (Daly, 1991; Daly and Cobb 1994), though rarely collated together as shown here. They show the fundamental challenge we face to reach any meaningful economic sustainability. Looking at them from the viewpoint of environmental science, the above assumptions are quite bizarre and untenable. However, they underpin the reigning neoclassical economic synthesis to this day.

The Steady State Economy instead of 'growthmania'

The 'steady state' economy was developed as a non-growth alternative to endless growth. Nicholas Georgescu-Roegen wrote 'The Entropy Law and the Economic Process' in 1971. He was followed by his student, Herman Daly, who coined the term the 'steady state' economy in 1973.

The key points of the steady state economy (Daly, 1991) are:

- 1) Constant population (at an ecologically sustainable level)
- 2) Constant low level of *throughput* in materials and energy.

'Throughput' is the entropic physical flow of matter-energy from nature's source through the human economy and back to nature's sinks. Neither population nor artefacts can continue to grow forever. What is held constant is capital stock in the broad sense: capital goods, consumer goods and human population. What is not held constant is growth in our culture, knowledge, and ethics. If the world is a finite, complex system that evolved using a fixed rate of flow of solar energy, then any economy that seeks indefinite expansion of its stocks and energy use will sooner or later hit limits. This is logically trivial, a truism, but it is not trivial psychologically or politically (Daly, 1991). Czech (2000, 2013), Victor (2008), Jackson (2009), Heinberg (2011) and Dietz and O'Neill (2013) and have continued to develop this theme. The steady state economy is deduced from first principles regarding physical laws and ecological limits.

The vision of neoclassical economics is that the economy is an isolated system in which exchange value circulates between firms and households. In neoclassical economics it doesn't matter how big the economy is relative to the environment or if it impacts disastrously. This contrasts to reality, where a linear flow of energy and materials moves from low entropy (usable energy, rich resources) to high entropy (heat and waste) (Daly, 1991). For the steady state economy however, the vision is that the economy is an open subsystem of a finite and non-growing ecosystem. The economy lives by importing low-entropy matter-energy (raw materials) and exporting high entropy matter-energy (waste).

'The Limits to Growth' (Meadows et al, 1972) was fiercely attacked in 1972 because it challenged the fundamental myth of modern society: *unlimited growth*. Hubbert (1993) argues that during the last two centuries we have known nothing but exponential growth and have evolved an 'exponential growth culture', dependent on the continuance of exponential growth for its stability. This culture is 'incapable of reckoning with problems of non-growth' (Daly and Cobb, 1994). Daly (1991) argues that economic growth is unrealistically held to be:

... the cure for poverty, unemployment, debt repayment, inflation, balance of payment deficits, the population explosion, crime, divorce and drug addiction.

Thus economic growth is seen as the panacea for everything. Daly (1991) notes that the verb 'to grow' has become twisted. We have forgotten its original meaning: to spring up and 'develop to maturity'. The original notion included maturity, beyond which accumulation gives way to maintenance. 'Growthmania' is not counting the costs of growth. Society today takes the real costs of increasing GNP (as measured by expenditures incurred to protect ourselves from the unwanted side effects of

production) and adds these expenditures to GDP, rather than subtract them. We thus count real costs as benefits, and this is 'hypergrowthmania' (Daly, 1991).

One fascinating historical note is that none of the key classical and neoclassical economists (such as Smith, Mill and Keynes) thought an economy could grow *forever* (Dietz and O'Neill, 2013). They all spoke of a growth period, after which the economy levels off. Mill (1859) thought a stationary state of capital was a 'considerable improvement on our present condition'. Once we have gone beyond the optimum, and marginal costs exceed marginal benefits, growth will make us worse off. We have then reached 'uneconomic' growth (Daly, 2008). However, our experience of diminished well-being will be blamed on 'product scarcity'. The neoclassical response will then be to advocate increased growth to fix this. In the real world of ecological limits, this will make us even less well off, and will lead to advocacy of *even more growth*. As Daly (1991) notes: 'The faster we run, the behinder we get'. Daly argues that environment degradation today is largely a disease induced by economic physicians who treat the sickness of unlimited wants by prescribing unlimited production.

It should be made clear that the steady state economy is not the same as the 'green economy' promoted by UNEP (2011) and the Rio+20 Summit in 2012. Interestingly, was brought out by UNEP without any reference to the steady state economy that had been discussed since the early 1970s . UNEP (2011) defines the green economy as 'low carbon, resource efficient and socially inclusive'. However, it remains a growth economy, stating 'the greening of economies is not generally a drag on growth but rather a new engine of growth'. The need to stabilise population is also not addressed. Regarding resource use, a central challenge was seen to 'decouple growth absolutely from material and energy intensity'. However, almost all economic production requires the transformation of raw materials (Costanza et al, 2013), so it is highly unlikely that economic growth could be absolutely decoupled. Indeed Victor (2008) details that there has been modest decoupling which has been overwhelmed by continuing growth. UNEP's green economy does some necessary things (low carbon and material use) but is not sufficient to achieve sustainable human well-being (Costanza et al, 2013).

The ethics of economics

Given that economic sustainability is part of sustainability overall, there is also the question of worldview and ethics as to how we might reach 'economic sustainability'. Is there an ethics of economics? Rolston (2012) notes that if neoclassical economics is the driver we will seek for our society, then it will result in 'maximum harvests in a bioindustrial world', as the current economic model is extractive in nature, and commodifies the land. Unless the underlying growth paradigm and its supporting values are altered, 'all the technical prowess and manipulative cleverness in the world' will not solve our problems, and in fact will make them worse (Daly, 1991). Daly (2008) concludes that in the end, neoclassical economics is religion. Daly

(1991) suggests that society *could* accept the eventual destruction of life-support capacity as the price we must pay for 'freedom from restriction of individual rights to grow'. However, he observes:

It is widely believed by persons of diverse religions that there is something fundamentally wrong in treating the Earth as if it were a business in liquidation.

Originally, economics started as a branch of moral philosophy (e.g. Smith, 1759), and ethics was at least as important as analytic content. However, economic theory became more and more top heavy with layer upon layer of abstruse mathematical modelling, erected above the shallow concrete foundation of fact (Daly, 1991). Economics reduced ethics to the level of personal tastes. Individuals set their own priorities, and economics became simply the 'mechanics of utility and self-interest'. It thus divorced itself from ethics. The big problems of overpopulation and overconsumption 'have no technical fixes but only difficult moral solutions' (Daly, 1991). The steady state economy is seen to threaten 'Big Science' and high technology, for it argues all things are not in fact possible through technology. For these reasons the steady state economy is resisted by orthodox economists. It is also resisted by techno-centrists and Cornucopians (Daly, 1991). The ethical dimensions of dealing with the growth economy are thus enormous. We can no longer afford to let economics remain an 'ethics-free' zone.

What *should* economic sustainability mean?

Sukhdev (2013) argues there is 'emerging consensus among governments and business leaders that all is not well with the market-centric economic model that dominates today'. Economic sustainability in a finite world cannot be about endless economic growth. It must be an economy that is sustainable over the long-term. This means not damaging the ecosystem services that underpin our society (Washington, 2013). Economic sustainability thus cannot mean 'business as usual' along the neoclassical model. It requires returning the economy to being a *servant* of society, not its master. It means questioning and abandoning most of the assumptions that underlie the neoclassical economic synthesis. That means moving to a steady state economy. Arguably ethically it means *degrowth* in the developed world (Latouche, 2010), with some further growth in the developing world (Daly, 2012), where the final overall per capital resource use for everyone is lower. This might be at a level similar to what Australia had around 1960 (Lowe, 2005). The reason for the distinction is due to the need to balance equity and reduce poverty. There is likely a need for growth in the developing world to meet 'basic needs' and pull people out of poverty. Growth in the over-developed world by contrast is not about this (Dietz and O'Neill, 2013).

A new model of the economy would clearly be based on the goal of 'sustainable well-being'. A new model would acknowledge the importance of ecological sustainability,

social fairness, and real economic efficiency (Costanza et al, 2013). It would use measures of progress such as the Genuine Progress Indicator or GPI (not the GDP). The GPI is designed to take fuller account of the health of a nation's economy by incorporating environmental and social factors which are not measured by GDP. With 26 indicators, the GPI consolidates critical economic, environmental and social factors into a single framework in order to give a more accurate picture of the progress (or setbacks) we have made (GPI, 2014). Indicators include resource depletion, pollution, and ecosystem loss.

Can we have a global economy that is not growing in material terms, but that is sustainable and provides a high quality of life for people? Costanza et al (2013) argue the answer is yes, and list examples from past societies and current initiatives (e.g. Transition Towns, the Global Eco Village Network). Integrated modelling studies, such as World3 (used in 'Limits to Growth', Meadows et al 2004), GUMBO, LowGrow (Victor, 2008), and Turner (2011) also suggest economic sustainability via a no growth economy *is* achievable (Costanza et al, 2013). The idea that we can change our economic system to ecological economics and a steady state economy is thus not a 'utopian fantasy'. On the contrary, it is the neoclassical 'business as usual' that is the true fantasy (Costanza et al, 2013).

One of the key arguments against a steady state economy is usually that we just *have* to continue growth to 'create jobs'. This was not always the case. Domar noted that there was hardly a trace of interest in economic growth as a policy objective in the official or professional literature of western countries *before 1950* (quoted in Arndt, 1978). There is in fact no 'given truth' what we must have growth to have jobs. Nor should there have been, for rapid growth economies have not in fact brought full employment. For example, there were more Canadians with incomes less than the 'Low Income Cut Off' (LICO) in 2005 than in 1980, despite real Canadian GDP having grown by 99.5% (Victor 2008). Economic growth in Canada since 1980 has not eliminated unemployment or poverty, rather the distributions of income and wealth have become more unequal. Growth has also exacerbated environment problems (Victor 2008). Victor (2008) notes it is possible to develop scenarios for a 30-year time horizon for Canada where full employment prevails, poverty is eliminated, people have more leisure, greenhouse gases are drastically reduced, and the level of government indebtedness declines in the context of a low, and ultimately no, economic growth.

How do we move to a steady state economy? Many people agree that on a finite planet endless growth is impossible. However, they don't know 'what to do', and fear it equates to a failed growth economy, though Daly (2008) points out they are different as night and day. A key task is to tackle the two key underlying aspects - overpopulation and overconsumption.

Solutions to overpopulation and overconsumption

A huge amount is written on overpopulation. In summary, it can be tackled by nine strategies (Engelman, 2012):

- i. Assure access to contraceptives.
- ii. Guarantee education through secondary school for all (with particular focus on girls).
- iii. Eradicate gender bias from laws, economic opportunity, health and culture.
- iv. Offer age-appropriate sexuality education for all.
- v. End all policies that reward parents financially, based on their number of children.
- vi. Integrate teaching about population, environment and development into all school curricula.
- vii. Put full pricing on environment costs and impacts.
- viii. Adjust to population ageing, rather than trying to delay it through government programs aimed at boosting birth rates.
- ix. Convince leaders to commit to ending population growth through the exercise of human rights and human development.

The fact that such strategies can work is attested to by the fact that Iran was able to halve its population growth rate from 1987 to 1994 (Brown, 2011). Population Media (www.populationmedia.org) has also had great success through education in many nations.

Overconsumption is more difficult. The consumer ethic is actually a purposeful social construct (Assadourian, 2010). Following World War II, the US was 'blessed' with great industrial capacity, and large numbers of under-employed workers (returned soldiers). To take advantage of this abundant labour, and break people out of their wartime habit of thriftiness, industry organized to legitimise profligate consumption, to make it a 'spiritual activity' (Rees, 2008). In fact, people resisted the throwaway society when it was first promulgated, as they believed in thriftiness. Three sectors aided the spread of consumerism: the car industry, fast food industry, and the pet industry (Assadourian, 2013). Assadourian (2010) suggests three goals to tackle consumerism. First, consumption that undermines well-being has to be discouraged. Second, we need to replace private consumption of goods with *public* consumption of services (e.g. libraries, public transport). Third, necessary goods must be designed to last and be 'cradle to cradle' recyclable. Wilkinson and Pickett (2010) point out that if we improve *equality of income* in our societies, then consumer

pressure will decline. To break free of consumerism, we will need to use all our social institutions: business, media, marketing, government, education, social movements, and social traditions (Assadourian, 2013).

Is there an alternative to the consumer society, while still keeping a decent quality of life? In 1960 Cuba was blockaded by the US and exports dropped by 75%. It had to adapt to severe shortages of oil, medicine and food, but now serves as an example of a country that has thrived on limited fossil fuels. It has low per capita income, yet in quality of life it excels. It has maintained its human services programs, free education, old age support, basic nutrition and free health care. The WWF Living Planet Report rated Cuba in 2006 as the only country to have genuine sustainable development (Murphy and Morgan, 2013). The message is clear, humanity can do well in a resource-constrained world if it learns from Cuba's example (Murphy and Morgan, 2013).

Immediate first steps towards a steady state economy

There are many things we can do *immediately* to move towards true economic sustainability. Some key ones are listed here:

- Move (over two decades) to a low carbon and material use economy, as recommended by UNEP (2011) and the WGBU (2011). This would be through appropriate technologies such as renewable energy, energy conservation (REN21, 2013) and sustainable building (Godfaurd et al, 2005). Various analyses have shown this is perfectly feasible and economic (Diesendorf, 2014).
- *Tax-shifting*, by taxing the 'bads' that degrade ecosystem services. This includes carbon pricing as a key process to control climate change, but a landfill tax has also been proposed (Brown, 2011). Taxes are an effective tool for internalising negative externalities into market prices and for improving income distribution (Costanza et al, 2013).
- *Subsidy-shifting*, especially taking the \$10 billion subsidies in Australia for fossil fuels (Elliston et al, 2013) and transferring them to renewable energy industry, or the \$700 billion worldwide given to damaging activities, (Brown, 2011).
- *Control of resource use*, both non-renewable and renewable. For non-renewable resources a depletion quota has been suggested (Daly, 1991) or a 'severance tax' at the mine-mouth or well-head (Daly, 2008). For non-renewable resources, proper holistic pricing of ecosystem services will also reduce overuse (Kumar, 2010). Daly (1990) lists three rules we should apply to help define the sustainable limits to material and energy throughput.

- *Dematerialisation* of the economy, and the highest possible decoupling of the economy from resource use. The developed countries should aim to move to Factor 5 (use only 20% of energy and resources, von Weizsacker et al, 2009).
- Cooperatives, 'not-for-profit' corporations, and credit unions as alternatives to 'profit above all else' corporations (Heinberg, 2011). An example is Mondragon in Spain (which employs 83,000 people).
- Banks should be required to move to a *100% reserve requirement*, and make their money by financial intermediation and service charges, rather than lending at interest money they 'create out of nothing' (Daly, 2008).
- A *Tobin Tax on financial transactions* (e.g. 1%) (Daly, 2008). This will deter rapid speculative finance transfers that exacerbate the debt crisis.
- An Advertising Tax (Daly, 2008) as well as a ban on outdoor advertising such as Sao Paulo introduced in 2007 (Sukhdev, 2013).
- Limits on *income inequality*, by way of setting both the *minimum and maximum incomes* in society. Daly (2008) notes that universities and the military manage with a factor of 10-20 as the upper limit, which seems equitable.

It is time for economics to serve society and accept limits and ecological realities. An ecologically sustainable biosphere has to be ranked higher than an endlessly increasing GDP. True economic sustainability will live within limits. It will be a steady state economy that is not based on endlessly growing numbers of people and resource use. Many may argue that the steady state economy is 'politically impossible'. It is true that it faces strong resistance, but increasingly, viable alternatives are being presented. There is another way, and it is the task of true 'economic sustainability' to assist this transformation (Dietz and O'Neill, 2013), where the politically impossible will become the politically inevitable.

Biography

Dr Haydn Washington is an environmental scientist who has worked in the areas of plant ecology, sustainability, wilderness, climate change denial, human dependence on nature and geodiversity. He is author of the books 'Climate Change Denial: Heads in the Sand' (2011) and 'Human Dependence on Nature' (2013), with a forthcoming book in 2015 'Demystifying Sustainability: Towards Real Solutions'. He is Visiting Fellow at the Institute of Environmental Studies at UNSW, and also Co-Director of CASSE in NSW.

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The economic sustainability of lignocellulosic biorefineries can be significantly improved by co-producing added value chemicals together with common biofuels like ethanol. In this work a techno-economic analysis of a multiproduct biorefinery was carried out by means of process simulations, cost and profitability analysis. Alternative process flowsheets including the co-production of xylitol or furfural from C5 sugars deriving from biomass hydrolysis were assessed and compared with the ethanol base case. It should be noted that financial assessment is different from economic assessment, in terms of the type of revenues and expenses considered (e.g., incentives, subsidies, and taxes would not be considered in economic assessment). Read full chapter. Purchase book.