

COVER PAGE

Why do society and academia ignore the ‘Scientists Warning to Humanity’ on population?

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Abstract

There is increasing evidence that humans are not living sustainably. There are three major drivers of the unsustainable approach: population, consumption and the growth economy. There is widespread denial about these issues, but they clearly need to be addressed if we are to achieve any of the possible sustainable futures. The first and second versions of the ‘World Scientists Warning to Humanity’ both highlight the problem of increasing human population, as do the IPCC and IPBES reports. However, all have been largely ignored. The size of an ecologically-sustainable global population is considered, taking into account the implications of increasing per capita consumption. The paper then discusses the reasons why society and academia largely ignore overpopulation. The claim that discussing overpopulation is ‘anti-human’ is refuted. Causal Layered Analysis is used to examine why society ignores data that do not fit with its myths and metaphors, and how such denial is leading society towards collapse. Non-coercive solutions are then considered to reach an ecologically-sustainable human population.

Key Words: Scientists Warning to Humanity; population; Causal Layered Analysis; denial; overshoot; collapse

Introduction

The Second World Scientists Warning to Humanity (Ripple et al., 2017) has now been signed by 21,000 scientists. It states:

We are jeopardizing our future by not reining in our intense but geographically uneven material consumption and by not perceiving continued rapid population growth as a primary driver behind many ecological and even societal threats.

This warning by 21,000 scientists is based on the real world data of the environmental crisis, which show that society is in ‘overshoot’, and these have been known for decades (e.g. Catton, 1982). Indeed, this was the Second Warning, the first was in 1992, and Ripple et al., (2017) note about the First Warning:

The scientists pleaded that we stabilize the human population, describing how our large numbers—swelled by another 2 billion people since 1992, a 35 percent increase—exert stresses on Earth that can overwhelm other efforts to realize a sustainable future.

Yet society, and much of academia, continue to ignore or deny the impact of population (Kopnina & Washington, 2016). We suggest society should ask itself a key question: ‘Will there ever be an upper limit to human numbers and human consumption?’. A popular alternative seems to be to deny such difficult issues and maintain a trajectory towards societal and ecosystem collapse (Wijkman & Rockstrom, 2012; Washington, 2019). However, Hulme (2009) notes that if there is a ‘safe’ level of greenhouse gases to avoid runaway climate change, then is there not also a desirable world population?

We discuss here the tendency in academia to *avoid* the topics of overpopulation, overconsumption and the endless growth economy. However, these are the three key drivers of *unsustainability* (Washington, 2015; Rees, 2019). Ignoring them is irrational, *not* in humanity's best interests, nor those of the amazing diversity of life we share this planet with. Other key science documents have reached the same conclusion regarding the drivers of unsustainability. The IPCC 'Climate Change 2014' Synthesis report (2014, p. 5) noted:

Globally, economic and population growth continued to be the most important drivers of increases in CO₂ emissions from fossil fuel combustion.

The IPBES (2019) extinction report similarly notes: 'Key indirect drivers include increased population and per capita consumption' and also stated:

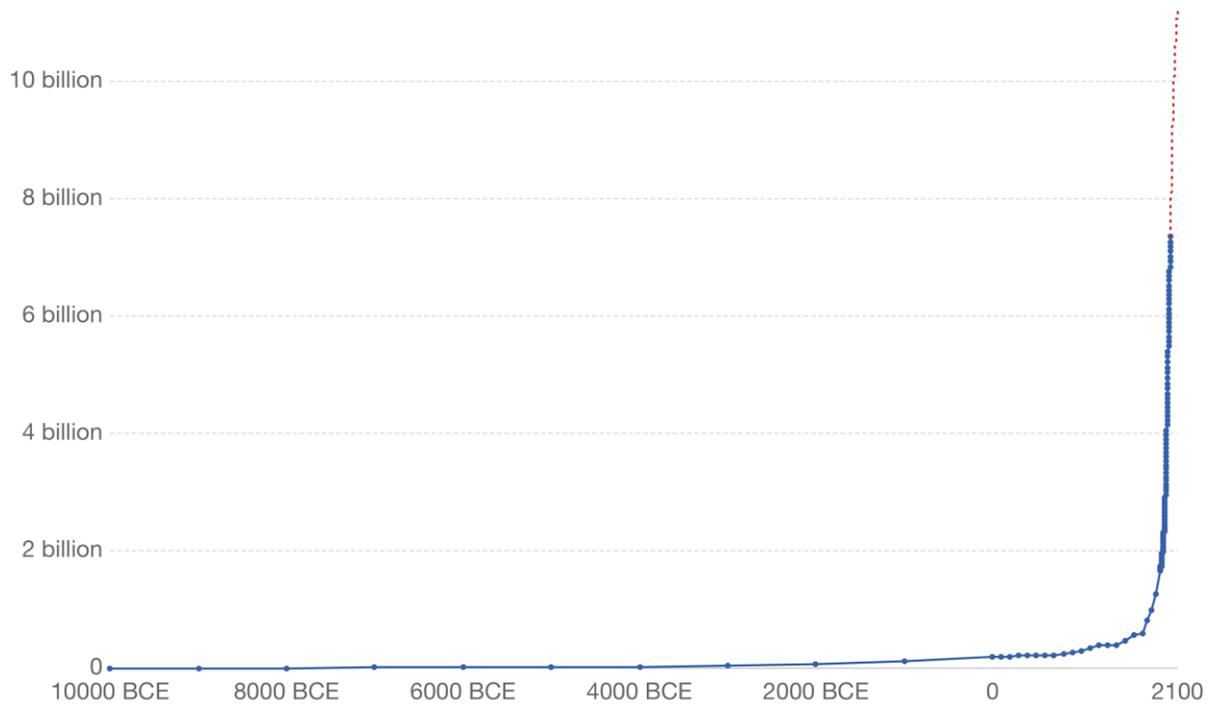
... a key element of more sustainable future policies is the evolution of global financial and economic systems to build a global sustainable economy, steering away from the current limited paradigm of economic growth.

Despite these reports accepting that overpopulation, overconsumption and the growth economy are key problems for society, there is remarkably little discussion about this in society or academia. It seems to be 'taboo' politically to question population growth, increasing consumption or the growth economy. Collectively, the public, governments and much of academia have been shying away from these issues for decades (Cafaro & Crist, 2012; Kopnina & Washington, 2016).

Environmental data show the unsustainability of human overpopulation

Unsustainable population growth pushes the world beyond its carrying capacity (Catton, 1982), being the number of people an area can support sustainably and indefinitely. The world is finite, and we know that human numbers have grown exponentially so that they are now far larger than ever before in history (see Figure 1). Our global population is more than 7.7 billion people. Despite declining global Total Fertility Rates (TFRs), population momentum is projected to cause global population to rise to 9.8 billion by 2050 and 11.2 billion by 2100 (UNDESA, 2017). The idea sometimes put forward that the population explosion is ‘over’ (often stated by the media and by some scholars) is clearly mistaken (as discussed by Campbell, 2012). However, it is also worth pointing out that some biologists challenge the UNDESA (2017) projections, arguing that future population may well be even *larger* than that projected (Gerland et al, 2014; Collins & Page, 2019). The full ramifications of overpopulation are well shown in the ‘Human Overpopulation Atlas’ by Abegao (2018).

World Population over the last 12,000 years and UN projection until 2100



Source: World Population over 12000 years - various sources (2016), Medium Projection - UN Population Division (2015 revision)
OurWorldInData.org/world-population-growth/ • CC BY-SA

Figure 1 World Population growth over time (Source: <https://ourworldindata.org/world-population-growth>)

The world is in ecological overshoot, with massive extinction underway (IPBES, 2019), as shown by all environmental indicators. This is as a result of our current global population of 7.7 billion people. Adding another 2.1 billion by 2050, and 3.5 by 2100, would cause extensive impact, major clearing of native vegetation (to produce food), major escalation of greenhouse gas production, major ecosystem collapse, and an even greater mass extinction (Crist, Mora and Engelman, 2017). The key problem is that the world is overpopulated in terms of what is ecologically sustainable. This is true globally, as well as for the many countries that have exceeded ecological limits. This is clearly shown by the Global Ecological Footprint of 1.7 Earths (GFN, 2019), by the Living Planet Index (WWF, 2018) having declined by 60% since

1970, and by an extinction rate 10,000 times the natural rate in the fossil record (Chivian & Bernstein, 2009). One million species (at least) are now threatened by extinction (IPBES, 2019). Biodiversity experts such as E.O. Wilson (2003) suggest we could lose half (or even two thirds, Raven et al., 2011) of the world's species by the year 2100 (or possibly earlier, Chivian & Bernstein 2009). A key contribution to this is an increasing human population.

In 1968 Paul Ehrlich published 'The Population Bomb', which alerted the world to the dangers of exponentially growing population. He was later part of coining the entity (Ehrlich, Ehrlich & Holdren, 1977):

$$\text{Environmental Impact} = \text{Population} \times \text{Affluence} \times \text{Technology}$$

Or 'I = PAT'. Our impact on the Earth is thus the number of people times their affluence (per capita consumption of resources) times the technology we use (Washington, 2013). We accept that *historically* most of the impact from pollution and carbon emissions has come from the consumers in the developed world (Monbiot, 2009). However, the developing world is rapidly catching up. If this is done using traditional carbon-polluting industry (as it mostly still is), then the result will be steeply accelerating global carbon emissions, resource consumption, and increasing pollution. Indeed, this is already happening. The technology used to 'catch up' will thus be a critical factor, as will the question of whether the developing world seeks to catch up to the incredibly wasteful American level. However, improving technology, or curbing affluence, can only reduce our impact so far. The sheer number of consumers matters as much as the fact that many are now consuming more (Washington, 2015). A big population has a big impact, especially as the developing world expands its economy. Despite a 30% increase in resource efficiency, global resource use has expanded by 50% over 30 years (Flavin, 2010). This is

mainly due to the increasing affluence of the large populations in the developing world. This is why China is now the world's biggest carbon polluter, while India now ranks third (after the US at number two) (UCS, 2018). Accordingly, society needs to target *all three components* of I = PAT if we seek to reduce human impact: reducing population, limiting affluence and cleaning technology. These are key tasks any meaningful interpretation of 'becoming sustainable' should address (Washington, 2015). Ignoring any one part of I = PAT (population, affluence or technology) will constitute a major obstacle to an ecologically sustainable future.

Population exacerbates all other environmental problems. Overpopulation also means cutting more forest for farmland, over-farming land so that it erodes, killing more 'bush meat' (wild animals) for food, and over-fishing the rivers and seas (Washington, 2015). It means burning more fossil fuels, or clearing and burning more forest as a way of fueling 'development'. Many scholars write of the need for a 'smaller ecological footprint', but as Dietz and O'Neill (2013, p. 78) point out: 'we need smaller footprints, but we also need fewer feet'. Butler (2012) notes that both climate change and the extinction crisis are merely *symptoms* of ecological overshoot by an obese humanity. Gerlagh et al., (2018) note that from 1990 to 2017 the increase in GHG emissions is one-fourth attributable to the growth of emissions per person, whereas *three-fourths* are due to population growth. Rees (2019, p. 132) argues that all our environmental problems are: 'symptoms of a singular phenomenon, *gross human ecological dysfunction*'. And yet despite all this, talking about overpopulation remains controversial.

What is an ecologically sustainable global population?

What might an ecologically sustainable population number for the Earth be? It is remarkable that this question receives little discussion today in academia. Crist (2012) points out that this question should really be what is the number (and at what level of consumption) that can live on Earth without turning it into a human colony founded on the genocide of the nonhuman. Biocapacity data suggest that if we made no change at all to consumption patterns, we could currently sustain a population of 4 to 5 billion (Washington, 2013; Engleman, 2013). However, this would not work if every one of those lived at the US standard, where the Earth could sustain a quarter of today's population, or 1.75 billion people (Assadourian, 2013). If we were to move to the European standard of consumption it has been argued it would be 2 billion (WPB, n.d.). If everybody on Earth shared a modest standard of living, midway between the richest and the poorest, that figure might be around 3 billion (PM, 2010). The world is clearly already *overpopulated* in regard to being ecologically sustainable. We cannot live in 'Harmony with Nature' as the UN programme speaks of (<http://www.harmonywithnature.un.org/>) when our numbers are degrading the world's life support systems and causing ecocide – ecological genocide (Washington, 2019). It is also worth considering that human actions have already degraded the ability of the Earth to support people. This is made clear by the Millennium Ecosystem Assessment (MEA, 2005) which stated that 60% of ecosystem services were degrading or being used unsustainably. Hence Paul Ehrlich (2013) commented he once thought an ecologically-sustainable world population was 2 billion, but given the ecocide society has caused, he now thinks it more likely to be 1 billion. More recently he has been quoted as saying it is 1.5 billion (Carrington, 2018).

If population and affluence were to continue to increase as projected, by 2050 food production would have to increase by 70% according to a FAO report, but it also noted that 25% of the

world's productive land is degraded, while water is becoming increasingly scarce and polluted (both above and below ground) (FAO, 2011). It is difficult to see how it is possible in the future to adequately feed 9 or 11 billion people, given the many accelerating and interconnected environmental problems that food production now faces (Brown, 2012). Production could be boosted by degrading the majority of our remaining natural areas and biodiversity to increase cropland by a fifth (Erb et al., 2009). This would cause massive negative impacts on nature (Crist, Mora & Engelman, 2017). Engelman (2012) argued in 2012 we could stabilise world population at 8 billion if we applied the humane (non-coercive) strategies suggested later. Society however did not act at that time, so Engelman (2016) more recently suggested we could halt population growth before mid-century at a level below 9 billion. It remains difficult to see how that population could be sustainably supported.

Why is overpopulation such a difficult policy issue?

In practice, many governments actually try to boost their population growth by pro-child policies in order to boost their economic and political advantage over their less populous neighbours (Kopnina & Washington, 2016). In some countries, population growth is seen favorably, as politicians and economists assume that a larger population stimulates economic growth, both in terms of markets and consumers (The Economist, 2012a, 2012b; Blowfield, 2013). In the recent decade, population growth has become a polarised issue in sustainability discourse (Kopnina & Washington, 2016), with debates ranging from ambiguity, to open hostility, toward 'blaming' overpopulation. Polarisation into the 'guilty' high-consumption Westerners and 'poor victims' in developing countries (who are portrayed as not being able to help having many children, and

who have a much smaller carbon footprint due to their poverty, Kopnina & Washington, 2016) leads several scholars to claim population action is 'racist' or socially unfair (e.g. White, 1994; Hartmann, 2004; Robbins, 2012; Fletcher et al., 2014). Illustrating this anti-population control sentiment, White (1994) blames green politics for what he categorises as vilifying population growth.

Why do otherwise 'green' and environmentally-thoughtful people continue to ignore this key issue? Few things seem to create such controversy in society as suggesting we should 'limit human numbers'. Into it comes issues such as religion, racism, social and ecological justice, equity, and poverty (Washington 2015; Kopnina & Washington 2016). The problem is that questioning population growth cuts at the heart of the received wisdom of a million years of human evolution, where 'more' people was always seen as being better (Washington, 1991). 'More' meant we could gather more food, cut down more forest to grow food, hunt more animals, defend ourselves better (Washington, 1991). 'More people' as a concept (until the last 100 years) has always been seen as a 'good thing' for society (Washington, 2015). After all, people love babies, so it goes against the grain to say we should have fewer of them. Collins (2010) believes that at the core of the population problem is a 'conflict of rights' - the right of the individual to reproduce, and the right of other species to continue to exist. It is thus difficult for us to understand that now 'more' is no longer better, but is leading us towards collapse (Rees, 2019). Ehrlich (2017) notes:

The more people there are, the more products of nature they demand to meet their needs and wants: timber, seafood, meat, gas, oil, metal ores, rare earths and rare animals to eat or to use for medicinal purposes. Human demands cause both habitat destruction and

outright extermination of wildlife. So when you watch the expansion of the human enterprise; when you see buildings springing up; when you settle down to dinner at home or in a restaurant; you are observing (and often participating in) the sixth mass extinction.

There is also the question of religious discouragement of birth control methods (e.g. the Catholic Church). Add to that the fundamental desire of governments to have more citizens and greater power. Population ecologist Meyerson (see Hartmann et al., 2008) explains:

Conservatives are often against sex education, contraception and abortion and they like growth – both in population and in the economy. Liberals usually support individual human rights above all else and fear the coercion label and therefore avoid discussion of population growth and stabilisation. The combination is a tragic stalemate that leads to more population growth.

History shows a worrying decline in discussion of overpopulation by the UN and other government bodies (Campbell, 2012). In 1994 the UN ‘Cairo’ conference stopped talking about ‘family planning’ and instead spoke only of ‘women’s reproductive health’ (funding for family planning then dropped worldwide). At that time population control became something of a taboo word, as it was portrayed as infringing on ‘women’s rights’. There is also the key problem that the political Left – and much of the environment movement – have failed to face up to overpopulation as a key issue, either ignoring it or denying its essential importance (Crist, 2012; Kopnina & Washington 2016). Many in the Left have referred to the past short-lived and unsuccessful forced sterilisation program in India, suggesting (erroneously) that most family planning was coercive (Kopnina & Washington, 2016). In fact family planning is about *giving women the choice* as to when to use their ‘right’ to have children. In fact, if family planning and

contraceptives were made universally available, the evidence is that population would stabilise and then start to decline (Engelman, 2012). Another problem has been a common (if not universal) trend in feminism and the political Left to argue against population control, claiming it is coercive (Beck & Kolankiewicz, 2001), though this may be starting to change (Weeden & Palomba, 2012).

Recently, the linking of population and sustainability have become controversial. Policy documents issued by the United Nation's 'Sustainable Development Goals' (SDGs) do not seriously address population issues (Kopnina & Washington, 2016). At the UN Conference on Sustainable Development in 2012, the key problem discussed was a concern with agricultural productivity, and the necessity to provide food for a growing population. There was no consideration of the possibility of stabilizing and subsequently reducing population. More recently, the idea of 'planetary boundaries' (Rockstrom et al., 2009; Steffen et al., 2015) also did not consider 'population' explicitly, even though it directly impacts negatively on *all* of the nine boundaries listed. It is worth noting also that a book on a new ecological economic model, 'Doughnut Economics' (Raworth, 2017), mentions population a few times, but then dismisses it as an issue, stating that population growth rates are declining (which is largely true outside Africa). It fails to note however that overall population is *still on the rise* due to population momentum, an ongoing reason why the world has overshoot four planetary boundaries. The recent Living Planet Index (WWF, 2018) emphasized the need to curb consumption, but marginalized population as a key driver of unsustainability. Some 'degrowth' advocates also argue that overpopulation is not a key issue (e.g. Kallis, 2018). Derer (2018) notes: 'Nowadays there is almost a complete silence about overpopulation, both in the media and academia'.

Population growth is shunned in ‘politically correct’ academic circles (Smail, 2003, 2016), with critics arguing that we do not have a global overpopulation issue, but a global issue of too many people enjoying the highly privileged and exploitative Western lifestyle. Such critics argue that population growth is being used as a scapegoat by rich over-consuming elites (e.g. Fletcher, 2014). In this critique, those who link population to sustainability are branded neo-Malthusian, racist, or misanthropic. The ethical question posed is that the global ‘North’ or ‘West’ should not tell people in the ‘South’ that they should have fewer children, opening a Pandora’s box of potential accusations (Kopnina & Washington, 2016).

The argument that ‘population growth is not a problem’ remains simplistic, dividing people into the bad (rich, Western) consumers and the innocent (poor, non-Western) developing world. In fact, such oversimplification argues that environmental impact is unrealistically divorced from the number of people (Kopnina & Washington, 2016). Simplistic divisions also tend to underplay the impact of the growth of the middle classes in developing countries, and the environmental impact of the increasing population in poor countries (MEA, 2005). The claim that the problem is just ‘in the North’ (i.e. the developed world) ignores the fact that the developing world is rapidly increasing its consumption (Washington, 2015). Yet the world’s planetary boundaries (thresholds) are already exceeded on four levels (climate change, nitrate pollution, phosphorus pollution, and species extinction) and are close to exceeding thresholds for other boundaries (Rockstrom et al., 2009). Accordingly, we argue that civilization cannot afford to maintain a delusion that overpopulation is a non-issue.

Is talking about overpopulation anti-human?

The Discovery Institute video ‘The war on humans’ argues that any argument against population growth is anti-human (DI, 2014). This is expanded on in the book by the same name (White, 2014). They claim that anti-human activists want to reduce the human population by 90%. Clearly, they believe talking about overpopulation comes from a hatred of humanity (as discussed in Kopnina & Washington 2016). However, no serious evidence to support this is presented. Environmental scientists and scholars who point out the danger of overpopulation do so for two key reasons. The first is that this is causing ecocide and the extinction of life on Earth. The second is that the first reason is likely to lead to famine and war, and the major loss of human population. The loss of nonhuman life via massive extinction is we believe a tragedy. The loss of human life due to pushing ecosystems into collapse (including agro-ecosystems) would equally be a tragedy. Thus, talking about overpopulation is not anti-human but *pro-human*. Population activism seeks to avoid mega-death (both human and nonhuman). Similarly, it wishes to avoid a situation where international conflict and war are increased. The ‘anti-human’ claim thus has no evidence or logic to support it. Breaking the denial dam about overpopulation is thus one of the most pro-human (as well as pro-nature) things any of us can do to reach an ecologically (and socially) sustainable future (Washington, 2019).

Any discussion of balance, harmony, or planetary and human healing (Washington, 2019) becomes impossible if population-control advocates are pejoratively branded as ‘rabid environmentalists’, ‘misanthropes’, ‘racists’, or even betrayers of the human race (discussed by Kopnina & Washington, 2016). Not only is such branding counter-productive, it reduces the very

possibility of finding solutions to ensure a secure future for all the generations of tomorrow (human *and* nonhuman).

‘Causal Layered Analysis’ and denial

The scientific evidence showing there are ‘limits to growth’ is clear, but denial is still widespread. The technique of ‘Causal Layered Analysis’ (Inayatullah, 1998) scrutinizes discussion at four levels: litany, social causes, discourse or world view, and myth/metaphor. Analysing discussion of the issue of population growth in this way shows that denial arises from the conflict between the evidence and the myths or metaphors widely held by decision-makers. Faced with evidence which is inconsistent with their myths and metaphors, they reject the evidence and revert to simplistic assertions at the litany level. This is a fundamental obstacle to recognizing the extremely serious problems being caused by continuing growth in both population and resource use (Daly, 1991).

It was shown by the first global systems models in the early 1970s that there are limits to the scale of resource use and productive economic activity that the natural systems of the planet can accommodate (Meadows et al., 1972). However, forty years later most decision-makers still behave as if limitless growth is possible. The ‘standard world model’ of ‘The Limits to Growth’ study, based on extrapolating the growth trends that existed in 1970, projected economic and ecological decline in the early to middle decades of this century. Recent comparisons with forty years of data show that the global community is still on that gloomy trajectory (Turner, 2012). The 1972 report explicitly pointed out that the growth trends were not inevitable and explored an alternative scenario, showing it to be possible to stabilize population and consumption at levels that could be sustained into the distant future (Meadows et al., 1972).

Despite detailed explanations of the environmental emergency we face (e.g. MEA, 2005; Wijkman & Rockstrom, 2012), decision-makers at the national and global level still behave as if the problem caused by growth in human population and consumption can either be safely ignored or, even more improbably, solved by more of the growth which is causing the difficulty (Daly, 1991). For those who believe that political decision-makers are ‘rational actors’, the continued denial of scientific analysis appears irrational. Causal Layered Analysis provides a logical explanation.

In terms of the components of CLA being: litany; social causes; worldview; and myths and metaphors, we consider these below. Most political discussion is at the litany level, oversimplified and superficial. Politicians assert that “growth is good” or, in words actually used by a former Prime Minister of Australia in referring to population, “the more the better”. Some analysis does go deeper and look at social causes, occasionally even offering practical solutions that treat the disease rather than its superficial symptoms. Some analysis also does consider the issue of worldview or paradigm (e.g. Curry, 2011; Rolston, 2012; Reidy, 2016; Washington et al., 2017; Kopnina et al., 2018), largely pointing to the dominance of anthropocentrism and neoliberalism in both society and academia. However, many branches of academia (and Western society in general) fail to consider *their own* worldview and ethics (Washington, 2018a).

Causal Layered Analysis provides insight into the reason people find it difficult to accept truths that should be unarguable, because denial is an understandable response when the truths are in fundamental conflict with the myths or metaphors people hold (Inayatullah, 2004). When those myths or metaphors are so widespread as to constitute the underlying ethos of society, continued denial is the norm. Almost all public discourse ignores the myths or metaphors underlying the discussion: what Inayatullah (2004, p. 13) has called ‘the unconscious dimensions of the

problem'. In those terms, some obvious deep-seated myths underpin our civilisation. One is the notion that 'progress is inevitable', seeing growth as the hallmark of progress and the bringer of wealth and happiness. Challenging the myth of growth is tantamount to heresy. The very title of the report 'The Limits to Growth' might have been chosen to provoke the response it received: shock, disbelief, and vituperative attacks that belittled the intelligence of the authors and questioned their motivation (Lowe, 2005). The real world is complicated and growth brings benefits and problems, but the deep-seated belief in growth means that the benefits are applauded - while the problems are usually ignored.

A second underlying metaphor is the notion that we are not citizens but 'consumers'; in a morally-deficient and spiritually-bankrupt society, we are urged to find fulfillment in consumption (Tacey, 2000). This is an extraordinary metaphor: the individual as 'stomach'. We don't use resources, we consume them. This is not seen as a weakness, a pardonable foible, but almost a social and economic duty: consume and take comfort in the fact that you are helping the economy to grow. As an extreme example of this approach, as the Twin Towers crumbled after the terrorist attacks of September 11 2001, shocked US citizens were urged to go shopping. Experts lament any decline in new car sales or spending on tourism, as if these were indicators of social decay - rather than probably representing rational choices about using scarce resources. Raskin has argued that consumerism has been one of the triad of dominant values for the last century, along with 'domination of nature' and individualism (Raskin, 2006).

A third underlying myth is that natural systems exist solely for our benefit, so we are free to exploit them in any way (e.g. Curry 2011; Rolston, 2012). The concept of domination of nature is arguably a logical extension of the Enlightenment (Raskin, 2006) and the emerging body of scientific understanding that has allowed humans to transform the world dramatically, and

enabled unprecedented material comfort for billions of people. It is expressed in triumphalist slogans such as ‘Earth yields to the dominion of man’ as well as in hubristic notions such as ‘environmental management’, implying we have the knowledge and the wisdom to control natural systems for our benefit. Raskin (2006) argues that the metaphor of domination of nature now needs to be replaced by the concept of *ecological sensitivity*, recognising that natural systems have critical limits, and accepting the responsibility to live within those limits.

Analysis of recent political discourse shows an unwavering belief in the benefits of growth. Politicians almost universally support all of the key drivers of unsustainable futures: growing population, increasing consumption and economies predicated on endless growth (Lowe, 2015). The power of the belief in the benefits of growth was illustrated when a senior editor of ‘The Australian’ newspaper was on a media panel at a conference attended by one of the authors. Paul Kelly asserted that it was common knowledge that population growth is good for the economy. In the discussion period, an expert pointed out that he had conducted a detailed analysis of the data for OECD countries and found no correlation at all between the rate of population growth and the usual measures of economic well-being, such as Gross Domestic Product per capita. The editor looked puzzled, confessed that he had not seen the OECD data, but said the conclusion did not make sense to him, and he was sure it would not make sense to the people he consulted on these issues. Faced with the uncomfortable choice between his myth and the real world data, he chose to reject the numbers and cling to his myth. He still advocates the litany of the benefits of population growth (Kelly, 2000, 2018), undaunted by the reality of local calculations that show the cost of infrastructure for each additional Australian to be about a quarter of a million dollars (O’Sullivan, 2018). In similar terms, those who believe in the myth of unlimited growth often

respond by attacking the messenger (O'Connor & Lines, 2008) or developing arguments of Jesuitical ingenuity to justify their position (Brown et al., 2012).

Denial leading towards Collapse?

Diamond (2005) argued in his landmark study that societies inevitably expand until they reach limits of some kind: food, water, mineral resources, relations with neighbouring societies. Whether the society then fails or survives, he said, depends on whether they are able to adapt to the new situation. History shows that some societies (such as the Mayan civilisation, the Tigris-Euphrates settlements, the Viking settlement in Greenland facing the Little Ice Age, and Easter Island) essentially continued to do what they had always done, despite the impending crisis, and pushed on to inevitable collapse. Diamond cites other examples, such as other Pacific island states, medieval Japan and Iceland (which faced similar problems as the Greenland settlement), where the problem prompted changes in social or economic arrangements to meet the new reality - and the society survived. His book is sub-titled 'How societies choose to fail or survive' because he argues that any society can *choose* whether to adapt to new realities or ignore them until it is too late to adapt. The critical issue is whether societies are able to adapt to the new reality (in this case the real world data shown by the 'Scientists Warning' that overpopulation and overconsumption are fundamentally unsustainable). Diamond (2005) argues that this question is determined by the values of the society, setting limits on the scale of change which is acceptable; where survival would require change to deeply embedded values, it is a less likely option than persisting in the old ways, despite their predictably tragic outcome.

Causal Layered Analysis supports Diamond's theory that societies collapse when they are unable to adapt to changing circumstances, providing a causal explanation: while responding by change appears a more rational approach than marching bravely to inevitable collapse, that apparently irrational behaviour can reflect the way underlying metaphors prevent a concerted response. This is a very uncomfortable conclusion for our present civilisation, since it is reasonable to conclude that our underlying myths and metaphors are certainly a very serious obstacle to meeting the challenges we now face. They could very well prove insurmountable. Hence we need to break the denial dam which makes it impossible to question population growth and increasing consumption (Washington, 2015).

Solutions

Campbell (2012, p. 52) concludes we can break the spiral of silence about overpopulation by showing that it: 1) Makes it impossible for the poor to escape poverty and ecological degradation; 2) High fertility is not due to women's desire to have more children; 3) Fertility can decline when women are given freedom to control their fertility via family planning. Kopnina and Washington (2016, p. 139) conclude:

We believe that addressing population is not a condemnation of the poor or an excusal of the rich. Nor is this a call for coerced population control or a perpetuation of social inequality. Rather, this is a call for recognition that there are many common factors, contributing to global poverty, inequality, and environmental destruction, and that population growth exacerbates all of these.

They note that the first step is to accept that we (collectively) have a major problem. Then we need to abandon denial, and discuss and immediately implement solutions. Engelman (2016) explains that overpopulation can be tackled by nine *humane* (non-coercive) strategies to stabilize population:

1. Assure universal access to a range of safe and effective contraceptive options and family planning services for both sexes.
2. Guarantee education through secondary school for all, with a particular focus on girls.
3. Eradicate gender bias from law, economic opportunity, health, and culture.
4. Offer age-appropriate sexuality education for all students.
5. End all policies that reward parents financially if they are based on the number of their children.
6. Integrate teaching about population, environment, and development relationships into school curricula at multiple levels.
7. Put prices on environmental costs and impacts.
8. Adjust to population aging rather than trying to delay it through governmental incentives or programs aimed at boosting childbearing.
9. Convince leaders to commit to ending population growth through the exercise of human rights and human development.

In regard to Africa, Bello-Schünemann et al. (2018, p. 128) note that extremely rapid population growth is likely to compound poverty and lack of economic opportunities. They then argue (p. 129) that reducing fertility rates via improved secondary education for girls, targeted family planning and better access to contraceptives would ‘lead to an earlier onset of, as well as a larger,

demographic dividend'. In regard to family planning, Engelman and Johnson (2019, p. 1) conclude:

Barriers to family planning are the physical, financial, educational, social, religious, personal or legal obstacles which prevent women and girls from accessing contraception. Barriers to family planning are not only relevant to those who are passionate about improving health, gender equality, empowerment and economic development, but also to those who are passionate about the conservation of biodiversity, the environment and sustainability.

The strategies suggested by Engelman (2016) do actually work. Using similar strategies, Iran was able to halve its population growth rate from 1987 to 1994 (Brown, 2011). More generally, the birth-rate declines when women are educated, financially secure and in control of their reproductive behavior. In advancing knowledge-based societies such as Singapore, conventional economists now express concern about the birth-rate being lower than they would like, based on their traditional view that population growth is desirable economically. The Population Media Center (PMC, n.d.) continues to successfully educate about strategies to reduce fertility levels. Using such humane strategies, we could reduce global population to 6 billion by the end of the century and to a sustainable 2–3 billion by the end of the following century (Staples & Cafaro, 2012). Crist, Mora and Engelman (2017, p. 264) conclude:

The size of the human population is not the only variable stressing Earth. But it is a powerful force that is also eminently amenable to change, if the international political

will can be mustered. Scientific willingness to engage with this issue will contribute to raising public awareness and helping to shift policies. In our efforts to halt the extinction crisis and to bequeath a biodiverse planet to future generations, willingness to marshal the resources and deploy proven tactics to address the population question is crucial.

Conclusion

We are faced with three major drivers of unsustainability – overpopulation, overconsumption and the endless growth economy. Clearly, talking about any of these is not easy, as society is in denial of all of them (Washington, 2018b). Nevertheless, to reach a meaningful ‘sustainability’ we believe society does have to engage in dialogue about *all of them*. The denial of human overpopulation is a major problem for both nature and humanity. We must see and act on all the ‘elephants in the room’ (Zerubavel, 2006), and that means that overpopulation can no longer be ignored or denied. Overpopulation and overconsumption are entwined, and must be solved concurrently. Causal Layered Analysis shows why society finds it so hard to accept the reality of the data that the ‘Scientists Warning’ so clearly demonstrates. However, while much of society and academia continue to ignore overpopulation as a key driver of unsustainability, any chance of being able to solve the environmental crisis will remain vanishingly small. The ‘Scientists Warning to Humanity’ shows that society’s current path of overpopulation and overconsumption is fundamentally unsustainable. This warning needs to be accepted and acted on.

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