

The Real Message of *The Limits to Growth*

A Plea for Forward-Looking Global Policy

It remains an open question whether economic growth without growing physical impact is feasible. It is possible in principle, but has not yet been observed in practice. The Limits to Growth did not seek to resolve this question, and the authors were split in their views on whether full decoupling can be

realized. But they did agree that global society ought to reduce its ecological footprint per unit of consumption, and much more important, start doing so in time to avoid global overshoot.

They also agreed that the task would be greatly simplified if human society moved away from its fascination with growth.

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40 years ago, the Club of Rome published the report *The Limits to Growth*. In our focus, *Jorgen Randers*, one of the authors, reflects on the book's message – and whether it has stood the test of time. *Michael Thompson* then discusses the influence of the report. Outlining perspectives for a post-growth society, *Irmi Seidl* and *Angelika Zahrt* explore the societal dependence on economic growth that prevents policy-making within the limits to growth. Finally, *Graham Turner* provides evidence that the LtG standard run scenario aligns well with real-world developments.

The book *The Limits to Growth* (Meadows et al. 1972) has been discussed aggressively for decades. Still it is not commonly known what this research report really did say when it was first published in March 1972. Many believe that *The Limits to Growth* (LtG) forecast the end of the world before the year 2000, using a big mathematical model of the world system. Others believe that LtG was a neo-Malthusian projection of population collapse in the 21st century, caused by global shortages of natural resources including oil and agricultural land. Others again think that it proved that economic growth cannot continue forever on a finite planet (see, e.g., Bardi 2008).

Very few seem to know that LtG was a scenario analysis of twelve possible futures from 1972 to 2100. And that the main scientific conclusion of the study was that delays in global decision making would cause the human economy to overshoot planetary limits before the growth in the human ecological footprint slowed. Once in unsustainable territory, human society would be forced to reduce its rate of resource use and its rate of emissions.

This contraction could only happen in two ways: either through “managed decline” organized by humanity, or through “collapse” induced by nature or the market. The only thing that could not happen was for world society to remain forever in unsustainable territory, using more of nature every year than nature produces during that year.

Irrespective of what it really said, “growth will come to an end” was the imprecise summary that stuck with the book. This was unfortunate, because most believed that LtG spoke about “economic” growth, while it really spoke about growth in “the human ecological footprint” – an important distinction, because LtG opened for endless economic growth (in economic value) as long as that growth is not associated with growing physical impacts (e.g., in resource use or pollution output).

What Was the Original Message of *The Limits to Growth*?

LtG presented three formal conclusions in 1972 (Meadows et al. 1972, p. 23). In the following, the conclusions are rephrased in the form of six statements deliberately using language that did not exist in 1972 – concepts and words which have evolved since, partly as a consequence of the intellectual dispute around the message of LtG.

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The human ecological footprint grew rapidly from 1900 to 1972.

This increase is based on growth in population size and growth in the environmental impact per person. Growth has continued since 1972, in spite of the hope of many readers of *LtG* that societal advance would stabilize the global population or reduce the footprint per person. But the footprint has continued to grow, and since the mid-1990s we have had the statistical apparatus to follow the growth in quantitative terms.¹ The good news is that the footprint per person has levelled off and even declined in some countries. But the total human footprint is still being pushed up by increases in population and consumption.

The human ecological footprint cannot continue to grow at the rate seen from 1900 to 1972, for more than a hundred years from 1972.

Planet Earth is physically limited and in fact rather small relative to human activity. Humanity cannot – in the long run – use more physical resources and generate more emissions every year than nature is capable of supplying in that year. It is important to note that *LtG* used the words “growth” or “physical growth” instead of the modern, more precise, words “growth in ecological footprint” or “growth in environmental impact”. The latter did not enter the literature until decades after the publication of *LtG*. *LtG*’s unfortunate choice of words led to decades of unnecessary public controversy, because most readers interpreted the word “growth” as identical to economic growth or growth in GDP (gross domestic product), and argued against *LtG*’s message on this mistaken basis.

Furthermore, many critics believe that technology is capable of solving any resource crisis or scarcity, by bringing forth substitutes for any resource – in time and without temporary decline in human well-being. To some extent they have been right so far, although some view the recent increases in energy prices as a warning that the next generation of energy sources will only come on line after a temporary period of lower standard of living caused by high energy costs.

It is possible, and even likely, that the human ecological footprint will overshoot the sustainable limits of Planet Earth.

Overshoot is possible due to the significant delays in global decision making. When a limit starts approaching, society will initially spend time discussing its reality – and will continue expanding while debating. Ultimately, debate will give way for decisions to slow down, but meanwhile growth will have continued and brought the human footprint into unsustainable territory. In other words: It will take time (decades?) to observe and agree that current global activity exceeds the long-term carrying capacity of the planet. It will take time for national and global institutions to pass the necessary legislation to stop overexploitation of the world’s resources and ecosystems. And it will take time to repair the damage caused during overshoot, and heal the damage caused to ecosystems. In sum, this means that growth in the footprint is unlikely to be stopped until *after* the sustainable level has been exceeded. Overshoot will not occur for all resources at the same time, but through individual long-drawn stories (e. g., the blue whale, Indian tigers).

The message of “overshoot caused by decision delays” was not picked up by the *LtG* readership. This is not surprising, because in 1972 – when the human ecological footprint was around one half of today’s – it was seen as rather inconceivable that global society would allow itself to grow beyond the sustainable carrying capacity of the globe. By now we know better. The human demand on the biosphere exceeds the global biocapacity by at least one third. Global greenhouse gases are emitted at twice the rate of absorption in the world’s forests and oceans. Most global fisheries were overfished.

Once sustainable limits have been overshoot, contraction is unavoidable.

LtG said that the human ecological footprint cannot remain in unsustainable territory for very long. Humanity will have to move back into sustainable territory. Either through “managed decline” to sustainable levels of activity, or through “collapse” to the same levels, caused by the unmitigated work of “nature” or “the market”. An example of the former would be to limit the annual catch of fish to the sustainable catch through legislation and planned scrapping of fishing vessels and gear. An example of the latter would be the elimination of fishing communities because there is no more fish.

The world has not yet experienced large scale environmental collapse. But there have been some instances of local overshoot, followed by contraction. The most famous case of managed decline was the effort to eliminate ozone-destroying chemicals through the Montreal protocol in 1987, upon discovery of thinning of the ozone layer in the Antarctica. The situation is hopeful, although the ozone layer is still damaged. The most famous example of collapse was that one in the Newfoundland cod fisheries after 1992. Here the situation is less hopeful: after two decades without fishing, the fish stock has not yet recovered.

Some argue that contraction – forced or planned – is nothing but a normal element in the process of economic growth and thus nothing to worry about. In this view overshoot and contraction are simply processes of one resource being replaced by another. Or more generally: one technology simply giving way to another. This view can be defended if the transition is smooth – i. e., without temporary decline in human income or human well-being. Or if the overshoot and contraction only occurs in one geography (like the Newfoundland cod). But if contraction were to occur in all global localities at the same time, it would be less benign. Possible candidates to cause global contraction are lack of conventional oil or an excess of carbon dioxide. In such cases it is possible that the transition to a new “solution” will involve a temporary period of declining human well-being – and hence feel more like literal overshoot and collapse – before a solution is in place.

Overshoot can be avoided through forward-looking global policy.

In response to the challenge formed by the first four messages, *LtG* intoned an optimistic answer: the challenge of overshoot

¹ See www.footprintnetwork.com.

from decision delay is real, but easily solvable if human society decided to act. Forward-looking policy can prevent humanity from overshooting planetary limits. Eleven of the twelve scenarios in *LtG* explored various solutions to the challenge of overshoot. The final scenario – global equilibrium – showed how it could be done, at least in principle. Translated into practical policies, this meant legislation to keep forest removals below the sustainable cut or greenhouse gas emissions below the amount that can be absorbed by forests and oceans. This action should be supported by general dissemination of education, health and contraception; and more equal distribution.

LtG concluded that forward-looking policy can solve the problem, but warned that technological measures will not suffice. A truly sustainable global solution will require a combination of technological advance and behaviour change. In the years since 1972, much discussion has taken place (in- and outside the United Nations) in order to solve the problem through coordinated global action. The *Millennium Development Goals* are probably the most concrete description of the challenge, and some progress can be measured. But these goals do not mention the danger of overshoot.

It is important to act as soon as possible, that is, in 1975. Finally, *LtG* said that it was important to start early, in order to achieve a smooth transition to a sustainable world. This point was illustrated by scenario 12, which showed that the same global policies that did solve the problem – in the model world – when implemented in 1975, did *not* suffice when implemented 25 years later, in 2000.²

Today we know that no real action to forestall overshoot was put in place – in the real world – in 1975. Nor was any main effort under way in 2000. Moreover, the new statistical measures indicate that humanity has already overshoot. There seems to be only one way out: contraction, and ideally, planned contraction.

How Was the Message Received?

The message of *LtG* led to an acrimonious public debate over the ensuing decades. A few enthusiasts viewed the book as the litany for a new ecological era, but most people saw it as a threat to the cherished ways of the present. There were many reasons for the scepticism, then as now:

- many believe that continued economic growth is the only feasible solution to the three legitimate human needs of higher income, enough employment, and old age security for all;
- many believe that technological advance will solve all resource and pollution problems (ahead of time);
- many do not appreciate the difference between economic growth (growth in GDP) and growth in the ecological footprint, and believe that the former requires the latter;
- many poor view any interference with the engine of economic growth as an attempt by the rich to keep the poor down, and
- only few had really considered that the ultimate human desire is for increased well-being and not for economic growth.

The scientific message of *LtG* got lost in the turmoil of the popular debate. Global society is likely to overshoot, said *LtG*, and then be forced to decline or collapse – because of significant reaction delays in the global economy. These are the lags in the perception and localization of global limits, the significant institutional delays involved in (democratic) decision making, and the biophysical lags between implementation of remedial action and the improvement of the ecosystem. The real message was apparently never picked up by anyone, neither critic or fan.

Has the Message Stood the Test of Time?

So what has happened since the publication of *LtG* in 1972? In short, the real world has followed the business-as-usual scenario in *LtG*.³ This means that the real world has followed the main trends for the first 40 years of the scenario period (1970 to 2100). This means that the global population and economy have continued to grow more or less as expected in 1970 (and represented in the model world scenarios). According to the best estimates of today, the world moved into aggregate overshoot in the mid-1980s. This is most commonly accepted when related to the issue of greenhouse gas emissions, but other dimensions of human activity have also moved into unsustainable territory. But as contraction does not occur in the model system until around 2020, historical comparison up to 2010 does not give much guidance about the veracity of the contraction part of the *LtG* business as usual scenario. By 2030, we will have a much clearer answer to that question.

But the public debate since 1972 has proven the utility of some of the *LtG* concepts, e. g., “limits”, “physical growth”, “equilibrium” – although they have been renamed “planetary limitations”, “ecological footprint”, and “sustainability”. These are now common and helpful words in the academic and political debate. Less prominence has been gained by other concepts like “exponential growth” (means growth at constant doubling time), “decision delays”, “overshoot” and “collapse”.

We have not yet had a final resolution of the main challenge to the idea of “limits” – namely the idea of the technological fix. Many thoughtful observers oppose the idea that the world is finite – even in the physical interpretation. They believe instead that technology will be able to remove the planetary limits faster than we approach them. In other words: technological advance will continue to push back limits or increase the carrying capacity of the planet, so to speak expanding the size of the earth in the process. For this group, *LtG* will only be proven right once there

² This conclusion is supported by new scenarios made in 2002 using an updated version of the *LtG* computer model. It requires rather ambitious assumptions to create a sustainable world starting from real world conditions in 2002 (see Meadows et al. 2004).

³ This scenario was called *World Model Standard Run*. It would have been called *business as usual* in modern scenario analysis, because it sought to portray the future assuming there would be no change in established policy. For a thorough analysis, see Turner (2008).



is a significant collapse, caused by environmental limitations not being solved fast enough. These technological optimists believe in fact that global society will systematically make sufficient proactive investment in new technology to continue to move back the limits faster than they appear. There is an interesting test of this view developing around the issue of “peak oil”. The global economy may be failing in its effort to find a cheap substitute before it is forced to shift out of conventional oil. Another test of whether society will find a solution in time, relates to the climate issue. Here it proves difficult to put in place the necessary legislation to lower global greenhouse gas emissions to sustainable rates. It has taken decades to move from the *United Nations Framework Convention on Climate Change (UNFCCC)* in 1992, via the Kyoto protocol in 1997, to the current efforts – so far unsuccessful – to agree on an extension beyond 2012.⁴ Meanwhile emissions are growing.

The Relevance for Today

First, *LtG* points to the urgent need to develop “one planet living”. If humanity wants to become sustainable, it is a fact that humanity must organize its ways in a manner which fits within the physical limitations of Planet Earth. *LtG* reminds us that “one planet living” is a condition for sustainability. This should become the new ethic and the basis for human behaviour.

Second, there is need for contraction of the human ecological footprint. The most urgent candidate is the planned reduction in global climate gas emissions, but planned decline in water intensity and population size would also be of great help for the well-being of humanity in the longer term.

Third, we have to avoid further decision delays in the global effort to stop growth in, and actually start reduction of, the human ecological footprint. The most obvious need is for clear willingness to act now, even if the benefits won't be reliably observable before a generation hence. Humanity must agree on investment in new climate-friendly solutions before they are commercially profitable.

Fourth, limits appear surprisingly fast if growth is exponential. Exponential growth is characterized by a constant doubling time. If water lilies on a pond double every day and fill the pond in 30 days, the pond will be half full on the 29th day. The transition from a seemingly empty world of three billion people in 1960 to a full world of six billion in 2010 occurred within a generation, although people have been around for thirty thousand generations.

Fifth, *LtG* points to the need for a solution to the three fundamental and legitimate problems poverty, unemployment, and old age insecurity that underlie the global fascination with growth. These problems must be solved in a way which is compatible with

planned reduction of the human ecological footprint. Most likely this will ultimately require equitable allocation of finite global resources on a per capita basis.

Sixth, at the deepest level, *LtG* reminds us that the ultimate goal is well-being, not growth. Economic growth evolved as a tool to increase human consumption and well-being. Population growth is a result of the human success in improving its material standard of living. If continuation of these types of growth no longer increases human well-being, the logical move is to drop physical growth and seek well-being.

Reflection

LtG appeared at a time when human belief in the power of technology was at an all-time high. There seemed to be no challenge that could not be overcome through application of human ingenuity and effort in the form of economic growth based on continuing technological advance. In this perspective, its main message was unbelievable and unacceptable, since it could be paraphrased as follows: global politics in the first third of the 21st century will be dominated by global resource and pollution constraints. *LtG* warned that in the 2010 to 2030 period some resources would become scarce or expensive while environmental damage would become increasingly visible. And importantly, all of this in spite of continuing technological advance. *LtG* warned that resource and pollution problems would occur because the world is physically finite – and actually quite small compared to the human footprint in the 21st century. The problems would start regionally, and gradually embrace the world – unless corrective action was taken immediately. Man was no longer omnipotent.

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⁴ In my book *2052 – A Global Forecast for the Next Forty Years* (Randers 2012) I argue that humanity will not react in time.

