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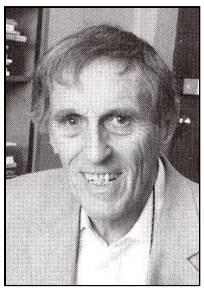

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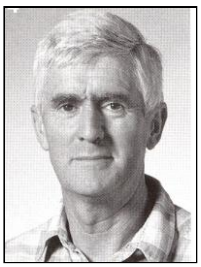

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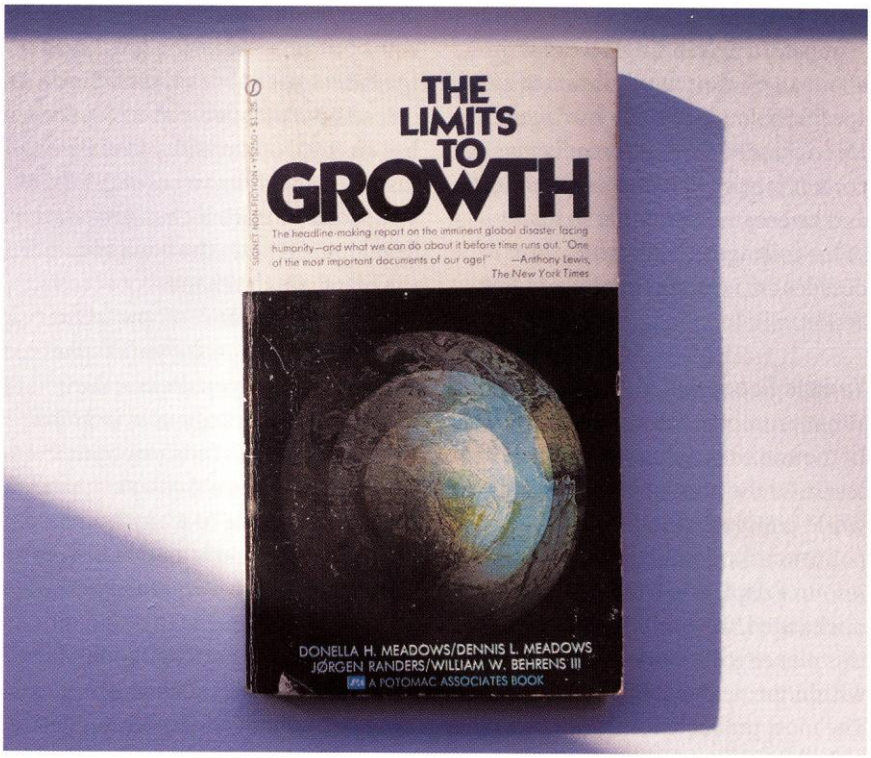
The History of *The Limits to Growth*

Jørgen Stig Nørgård, John Peet, and Kristín Vala Ragnarsdóttir

Introduction

A pioneering report, *The Limits to Growth*, published in 1972, marked a turning point in thinking about the environment, selling some 30 million copies in 30 languages.[1] The two-year study behind the report took place at the Massachusetts Institute of Technology at the request of the Club of Rome, an international group of distinguished business people, state officials, and scientists founded by Aurelio Peccei, a former Fiat executive and president of Olivetti. Their concerns about the consequences of unrestrained growth in global population, resource consumption, and pollution led them to contact Jay W. Forrester, a professor in management at MIT, who had developed a method for analyzing the behavior of complex systems by means of simple simulation models. Forrester accepted the challenge and assembled a team of young experts, headed by Dennis Meadows. Meadows and his team constructed a model, known as World3, to keep track of the development of the study's central parameters and their interactions. *The Limits to Growth* (*LtG*) was based on analyses found in the project's more detailed report.[2] Coauthored by Dennis Meadows, his biophysicist wife, Donella Meadows, the Norwegian management expert Jørgen Randers, and William Behrens III, it was designed to disseminate the group's findings to the broader public. The authors remained involved with the issues raised by *LtG* in the following decades, and Donella Meadows in particular was highly engaged, as well as being the most optimistic of the original authors, until her death in 2001.



Marc Fader/*Solutions*

A 1972 paperback of *The Limits to Growth*

The report's argument that the biosphere has a limited ability to absorb human population growth, production, pollution, and economic growth in general stirred considerable debate. Over the ensuing decades, however, a cohort of critics managed to derail the debate, apparently because they simply could not imagine that two centuries of impressive growth in Western economic production and consumption could ever run into any limits.

The renewed interest in problems such as global warming and economic crisis suggests that it is time to revive the derailed discussion about economic growth and the environment and to reconsider future development. In re-examining the analysis and central arguments of *LtG*, we have found that its approach remains useful and that its conclusions are still surprisingly valid.

Most environmentalists are familiar with the arguments made in *LtG*, but unfortunately the report has been largely dismissed by critics as a doomsday prophecy that has not held up to scrutiny.

Matthew R. Simmons, president of the world's largest investment company specializing in energy, Simmons and Company International,

read the book a few years ago, after hearing about the controversy. To his surprise he discovered that the criticisms had little to do with the content of the book. "After reading '*The Limits to Growth*', I was amazed," he wrote in 2000. "There was not one sentence or even a single word written about an oil shortage or limits to any specific resource, by the year 2000."[3] He concluded that *LtG* broadly gives a correct picture of world development, and he became upset that so many of his colleagues had wasted three decades criticizing it instead of taking action.

Various Scenarios of *LtG* Analyses

What prompted the attack on *LtG*? In the book's conclusion, the authors assert: "If the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years. The most probable result will be a rather sudden and uncontrollable decline in both population and industrial capacity."[4]

Aided and abetted by a drama-hungry media, this *one* scenario was seized upon by critics who sought to dismiss the book as another in a long line of hysterical doomsday prophecies. For example, many critics argued that the book did not give enough credence to human ingenuity and adaptability, which could prevent the collapse forecast in its model.[5] In addition, many economists claimed that the market mechanism, by adjusting prices accordingly, would lead to substitutions for scarce resources and would prompt inventors and entrepreneurs to develop various technological solutions, thereby preventing a collapse.[6] These critics focused on *LtG*'s most dire warnings, ignoring some of the authors' more optimistic and constructive scenarios, such as the following: "It is possible to alter these growth trends and to establish a condition of ecological and economic stability that is sustainable far into the future. The state of global equilibrium could be designed so that the basic material needs of each person on earth are satisfied and each person has an equal opportunity to realize his individual human potential."[7] The sooner mankind changes its development path, the book concludes, the better are the chances of success.

Usually, research on the future consists of attempts to *predict* what will actually happen. Hence, the scenario methodology used in *LtG* of presenting *various* future options from which societies could choose appeared incomprehensible to many readers, who therefore paid attention only to the disastrous growth scenario. The message of the book is to point out the importance of changing course before causing irreversible damage to the environment and its life-support systems for billions of people. One of the authors of *LtG*, the futurist Jørgen Randers, has recently discussed the probability of such a collapse due to "the unfortunate combination of global decision delays and self-reinforcing feedback in the climate system."[8]

LtG should be given credit for emphasizing early on the interconnections and feedback between various sectors and trends. Today we see, for example, how our fast depletion of fossil fuel resources is directly contributing to climate change problems.

Derailing the Debate

How was it possible to derail the *LtG* debate to the extent that the book and its message were essentially ignored (or, arguably, covered up) for decades?

One reason is that a book that hints at the necessity of curbing economic growth is very unwelcome to those who have a large stake in the status quo. This applies at the financial level, where *LtG* challenges many commercial interests in growth; at the political level, where governments fear dwindling tax revenue for public spending; and among professional mainstream economists, who instinctively resist a change in the paradigm of eternal growth and who have rarely addressed the question of how to plan for a steady-state economy in an orderly way.

A common pattern among *LtG*'s critics has been to erroneously charge that it predicted oil would run out before the year 2000 and then to write off the book by pointing out that this scenario did not actually happen.[9]

Among the most vigorous critics of *LtG* have been radical free-market economist Julian Simon and futurist Herman Kahn, who charged that the *LtG* models had "been damned as foolishness or fraud by every serious economic critic."[10] As proof, they cited Nobel laureate in economics Gunnar Myrdal. Myrdal's critique, however, turns out to be quite modest and not directed at the results of *LtG* but rather at its methodology. For instance, Myrdal wrote that the authors' "use of mathematical equations and a huge computer" contributed little, if anything, to their scientific validity; the same conclusions could have been reached by "hard simple thinking" and an awareness "of the limitations of what we know."[11] The authors of *LtG* might have agreed with Myrdal,[12] but it is worth noting that prior to *LtG*'s appearance very few people had engaged in this sort of "hard simple thinking." In fact, Myrdal himself was skeptical of the growth-at-all-costs, GDP-obsessed approach of radical free-market economists such

as Simon, arguing, for example, that this perspective neglected the value of supposedly nonproductive activities like leisure time.[13]

Continued growth is for many not an issue for debate; it is an indispensable condition of economic life. But there are many holes in their argument. Firstly, we have only just entered the century in which *LtG*'s growth scenario drama is supposed to unfold. None of the book's scenarios suggested that we would encounter significant difficulty before the period 2010–2030.

Secondly, out of all of the possibilities described in *LtG*, the actual global development trends observed so far have been in generally good agreement with the growth scenario, which assumed no major changes in the physical, economic, or social relationships (until the model later indicates collapse).[14,15]

Thirdly, we are already observing some imminent crises on the horizon, which in their global character remind us uncomfortably of *LtG*'s growth scenario. At least one type of pollution, the atmospheric concentration of CO_2, is now recognized as a serious threat to the earth's climate.[16] Similarly, experts foresee the supply of oil peaking within a decade.[17,18,19] The *LtG* computer model does not explicitly deal with CO_2 pollution or with oil consumption, but the development trends for these two parameters closely resemble trends for *total* pollution and *total* resource depletion in *LtG*'s growth scenario. So do many other environmental problems that we face today, including the increased levels of toxic substances in the oceans and in groundwater, the depletion of ocean fish stocks, and deforestation.

A different reason why *LtG* has been shelved for so long could be that the temporary peak in international oil prices that occurred after the OPEC-induced crises of the 1970s was soon followed by lower prices, suggesting that the outcomes outlined by *LtG* were easily corrected after a few years, courtesy of the marketplace. It was therefore tempting for those so inclined to conclude that apparently there were no physical limits to anything of relevance to economic growth. Hence the report was judged to be untrustworthy, although its modelling approach did not even consider this sort of short-term (primarily political) oscillation.

The fact that a relatively small part of the world has for a couple of centuries experienced exponential growth in material production and consumption is often used to argue that this trend can continue globally forever. This view conveniently ignores that most of humanity's tenure on earth has been accompanied by essentially zero growth.

Development without Growth

Regrettably, the media did not devote much attention to *LtG*'s optimistic and interesting sketches of an achievable and sustainable global *development*, as opposed to continuous and unsustainable economic growth.[20] It is possible to have development both with and without growth, as illustrated by how a person's physical growth stops during the late teenage years while nonphysical development continues. Similarly, a society can continue to develop after growth stops. Once a society has "grown up," so to speak, "those pursuits that many people would list as the most desirable and satisfying activities of man—education, art, music, religion, basic scientific research, athletics, and social interactions—could flourish."[21] A community without growth can be just as dynamic as our current growth economy, in that some branches decline and collapse while others sprout and grow within the limited framework that is always present in any overall economy—just like a centuries-old rainforest can have plenty of individual growth and decay while the whole remains stable.

What have Western societies been doing in the thirty-five years since the appearance of *LtG* and similar warnings from the same period?[22,23] When it comes to taking serious action, little has been done to reach a sustainable form of development, with the exception of some modest technical adjustments. On the other factors, such as population, consumption, and production, the political steps taken have generally been in the opposite direction from sustainability, and they have more than offset any benefits of technical progress. The result is that global environmental pressure, as for example indicated by humanity's ecological footprint,[24] is today much worse. And there are few signs of significant action toward changing this trend.

Better Global Distribution

Even though World3, the system-dynamics computer model behind the *LtG* assessment, handles the world as a whole, poor as well as rich, the authors explicitly stressed that the distribution of wealth and consumption plays a crucial role in real development. Until now, growth has not, as often promised, been used to reduce inequalities but rather to sustain a substantial gap between rich and poor, without having to deal with too much social unrest. By arguing that the economic cake cannot grow infinitely, *LtG* added moral legitimacy to those demanding more equality, both within nations and globally.

Globally, demand for more equality will imply that the slowdown or reduction in material consumption,

which *LtG* recommends, has to start in the affluent countries. Halving the *global* environmental pressure would, for instance, require that affluent countries reduce their level of resource exploitation to only about one-tenth of the present level.[25] Arguments that Western countries need to have growth for the sake of the poor countries are revealed as empty rhetoric. It is the other way around. The affluent countries must hold back in order to ensure environmental space for those that need growth.[26]

One of the largest political fears concerning a steady-state society is unemployment combined with stagnating consumption. The obvious solution to ensuring jobs for all those capable of working would be to reduce work time by, for example, 20 percent instead of firing one-fifth of the work force. In 1935 the philosopher Bertrand Russell described the practice of firing employees to solve the problem of excess workers in the following manner: "In this way it is ensured that the unavoidable leisure shall cause misery all around instead of being a universal source of happiness. Can anything more insane be imagined?"[27] In spite of this, increasing unemployment by firing some people remains the established solution, together with efforts to increase consumption and production, which add to global environmental pressure.

The Limits to Growth as Part of a Solution

It would be unjust to describe all economists as unconditional supporters of eternal economic expansion. Throughout history economists have commonly considered growth as a temporary phase in the development of society.[28,29] But in the wake of World War II, growth—as defined by the new concept of Gross Domestic Product—became the unquestioned goal of politicians. Apart from a few ecologically oriented economic thinkers,[30,31] the majority of postwar economists viewed themselves as the prime and indispensable technicians of GDP maximization.

The recent renewed interest in the environment and economic development gives hope for a solution. Although it has not yet led to new action, this shift in thinking has triggered a few analyses that recognize possible limits to growth and hence point toward solutions along the lines suggested in *LtG*. The following examples illustrate this hope.

A recent UK government committee indicates an emerging political willingness to at least challenge the growth paradigm as reflected in the title of the committee's report: *Prosperity without Growth?* The report "questions whether ever-rising incomes for the already-rich are an appropriate goal for policy in a world constrained by ecological limits."[32]

Joseph Stiglitz, a Nobel Prize winner in economics who had at first rejected *LtG*'s ideas about resource shortages, now recognizes that present trends in the world economy are unsustainable.[33] Stiglitz, along with another Nobel laureate in economics, Amartya Sen, headed a commission convened by French president Nicolas Sarkozy to investigate alternative measures of social progress to GDP. One of their key messages is that "the time is ripe for our measurement system to shift emphasis from measuring economic production to measuring people's well-being."[34] In their critique of societies' overreliance on GDP, Stiglitz and Sen are implicitly agreeing with *LtG*'s analysis.

Finally, as a sign of renewed recognition of the limits to growth, 28 scientists have identified nine *planetary boundaries* within which human activities can operate safely. The scientists estimate that humanity has already transgressed three of these boundaries, namely those for climate change, biodiversity loss, and changes to the global nitrogen cycle.[35]

A sustainable future is not a matter of technology alone, partly because of the rebound effect.[36] It must build on new ways to live and organize societies, for instance recognizing that today "corporations have even less incentive than individuals to keep the Commons in order; in fact they have a (legal) clear line of responsibility to their shareholders alone and have continuously resisted government and international efforts to regulate the Commons."[37] This is referring to G. Hardin's classical paper on the problems of sharing the limited capacity of the Commons.[38] Elinor Ostrom won the 2009 Nobel Prize in Economics for her analysis of economic governance, and especially of the commons, that understands this conundrum. She shared the prize with Oliver A. Williamson, who was lauded for his analysis of economic governance, especially in regard to the boundaries of the modern corporation.[39] Both study how individuals can work together and share scarce resources, an ethos shared by the authors of *LtG*.[40]

The notion of a globalized world and calls for the continued deregulation of markets must be replaced by the firm democratic regulation of each economy, based on the best available scientific, technological, social, and moral and ethical information. The need for this has been reinforced by the recent financial crisis. In many researchers' opinions, a change of this nature will be better for both environmental and human well-being.

Governments wanting to undertake serious preparations for a transition toward a sustainable steady-state

economy can, fortunately, draw on the many economists already experienced in the field. And it would be a pity in the process to discard the wisdom in the 1972 *LtG* and its later versions.[41] Clearly, the book has withstood the test of time and, indeed, has only become more relevant. S

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