



## Cassandra's curse: how "The Limits to Growth" was demonized

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Cassandra's story is very old: she was cursed that she would always tell the truth and never be believed. But it is also a very modern story and, perhaps, the quintessential Cassandras of our age are the group of scientists who prepared and published in 1972 the book titled "The Limits to Growth". With its scenarios of civilization collapse, the book shocked the world perhaps more than Cassandra had shocked her fellow Trojan citizens when she had predicted the fall of their city to the Achaeans. Just as Cassandra was not believed, so it was for the "Limits to Growth" which, today, is still widely seen as a thoroughly flawed study, wrong all along. This opinion is based only on lies and distortions but, apparently, Cassandra's curse is still alive and well in our times.



*Above: image from an Athenian red vase from 5th century BC: Cassandra falls victim of the usual destiny of those who tell inconvenient truths.*

The first book of the "The Limits to Growth" series was published in 1972 by a group of researchers of the Massachusetts Institute of Technology: Dennis Meadows, Donella Meadows, Jorgen Randers and William Behrens III. The book reported the results of a study commissioned by a group of intellectuals who had formed the "Club of Rome" a few years before. It examined the evolution of the whole world's economy by means of a mathematical model based on "system dynamics", a method that had been developed earlier on by Jay W. Forrester. Using computers, a novelty for the time, the LTG world model could keep track of a large number of variables and of their interactions as the system changed with time. The authors developed a number of scenarios

for the world's future in various assumptions. They found that, unless specific measures were taken, the world's economy tended to collapse at some time in 21st century. The collapse was caused by a combination of resource depletion, overpopulation, and growing pollution (this last element we would see today as related to global warming).

In 1972, the LTG study arrived in a world that had known more than two decades of unabated growth after the end of the Second World War. It was a time of optimism and faith in technological progress that, perhaps, had never been so strong in the history of humankind. With nuclear power on the rise, with no hint that mineral resources were scarce, with population growing fast, it seemed that the limits to growth, if such a thing existed, were so far away in the future that there was no reason to worry. In any case, even if these limits were closer than generally believed, didn't we have technology to save us? With nuclear energy on the rise, a car in every garage, the Moon just conquered in 1968, the world seemed to be all set for a shiny future. Against that general feeling, the results of LTG were a shock.

There is a legend lingering around the LTG report that says that it was laughed off as an obvious quackery immediately after it was published. It is not true. The study was debated and criticized, as it is normal for a new theory or idea. But it raised enormous interest and millions of copies were sold. Evidently, despite the general optimism of the time, the study had given visibility to a feeling that wasn't often expressed but that was in everybody's minds. Can we really grow forever? And if we can't, for how long can growth last? The LTG study provided an answer to these questions; not a pleasant one, but an answer nevertheless.

The LTG study had everything that was needed to become a major advance in science. It came from a prestigious institution, the MIT; it was sponsored by a group of brilliant and influential intellectuals, the Club of Rome; it used the most modern and advanced computation techniques and, finally, the events that were taking place a few years after publication, the great oil crisis of the 1970s, seemed to confirm the vision of the authors. Yet, the study failed in generating a robust current of academic research and, a couple of decades after the publication, the general opinion about it had completely changed. Far from being considered the scientific revolution of the century, in the 1990s LTG had become everyone's laughing stock. Little more than the rumination of a group of eccentric (and probably slightly feeble-minded) professors who had really thought that the end of the world was near. In short, Chicken Little with a computer.

The reversal of fortunes of LTG was gradual and involved a debate that lasted for decades. At first, critics reacted with little more than a series of statements of disbelief which carried little weight. There were a few early papers carrying more in-depth criticism, notably by William Nordhaus (1973) and by a group of researchers of the university of Sussex that went under the name of the "Sussex Group" (Cole 1973). Both studies raised a number of interesting points but failed in their attempt of demonstrating that the LTG study was flawed in its basic assumptions.

Already these early papers by Nordhaus and by the Sussex group showed an acrimonious streak that became common in the debate from the side of the critics. Political criticism, personal attacks and insults against the LTG authors, and in general a rather rude attitude. For instance, the editor of the journal that had published Nordhaus' 1973 paper refused to published Forrester's response to it. With time, the debate veered more and more on the political side. In 1997, the Italian economist Giorgio Nebbia, noted that the reaction against the LTG study had arrived from at least four different fronts. One was from those who saw the book as a threat to the growth of their businesses and industries. A second set was that of professional economists, who saw LTG as a threat to their dominance in advising on economic matters. The Catholic world provided further ammunition for the critics, being piqued at the suggestion that overpopulation was one of the major causes of the problems. Then, the political left in the Western World saw the LTG study as a scam of the ruling class, designed to trick workers into believing that the proletarian paradise was not a practical goal. And this by Nebbia is a clearly incomplete list; forgetting religious fundamentalists, the political right, the believers in infinite growth, politicians seeking for easy

All together, these groups formed a formidable coalition that guaranteed a strong reaction against LTG. This reaction eventually succeeded in demolishing the study in the eyes of the majority of the public and of specialists at the same time. This demolition was greatly helped by a factor that initially had bolstered the credibility of the study: the world oil crisis of the 1970s

The crisis had peaked in 1979 but, in the years that followed, oil started flowing abundantly from the North Sea and from Saudi Arabia. With oil prices plummeting down, it seemed to many that the crisis had been nothing but a scam; the failed attempt of a group of fanatic sheiks of dominating the world using oil as a weapon. Oil, it seemed, was, and had always been, plentiful and was destined to remain so forever. With the collapse of the Soviet Union and the "New Economy" appearing, all worries seemed to be over. History had ended and all what we needed to do was to relax and enjoy the fruits that our high technology would provide for us.

At this point, a perverse effect started to act on people's minds. In the late 1980s, all what was remembered of the LTG book, published almost two decades before, was that it had predicted some kind of catastrophe at some moment in the future. If the world oil crisis had been that catastrophe, as it had seemed to many, the fact that it was over was the refutation of the same prediction. This factor had a major effect on people's perception of the LTG study.

The change in attitudes was gradual and spanned a number of years, however we can locate a specific date and an author for the actual turning point, the switch that changed LTG from a respectable, if debatable, study to everybody's laughing stock. It happened in 1989 when Ronald Bailey, science editor of the Forbes magazine, published a sneering attack (Bailey 1989) against Jay Forrester, the father of system dynamics. The attack was also directed against the LTG book which Bailey said was, "as wrong-headed as it is possible to be". To prove his point Bailey revived an observation that had already been made in 1972 by a group of economists on the "New York Times" (Passel 1972). Bailey said that:

"Limits to Growth" predicted that at 1972 rates of growth the world would run out of gold by 1981, mercury by 1985, tin by 1987, zinc by 1990, petroleum by 1992, copper, lead and natural gas by 1993.

In 1993 Bailey reiterated his accusations in the book titled "Ecoscam." This time, he could state that *none* of the predictions of the 1972 LTG study had turned out to be correct.

Of course, Bailey's accusations are just plain wrong. What he had done was extracting a fragment of the LTG text and criticizing it out of context. In table 4 of the second chapter of the book, he had found a row of data (column 2) for the duration, expressed in years, of some mineral resources. He had presented these data as the only "predictions" that the study had made and he had based his criticism on that, totally ignoring the rest of the book.

Reducing a book of more than a hundred pages to a few numbers is not the only fault of Bailey's criticism. The fact is that none of the numbers he had selected was a prediction and nowhere in the book it was stated that these numbers were supposed to be read as such. Table 4 was there only to illustrate the effect of a hypothetical continued exponential growth on the exploitation of mineral resources. Even without bothering to read the whole book, the text of chapter 2 clearly stated that continued exponential growth was not to be expected. The rest of the book, then, showed various scenarios of economic collapse that in no case took place before the first decades of 21st century.

It would have taken little effort to debunk Bailey's claims. But it seemed that, despite the millions

of copies sold, all the LTG books had ended in the garbage bin. Or, perhaps, browsing one's shelves was considered too much of an effort to be worth doing in a moment when, with the new economy starting to run, there were better things to do. Whatever the case, Bailey's criticism had success and it started behaving with all the characteristics of what we call today "urban legends." We all know how persistent urban legends can be, no matter how silly they are. At the time of Bailey's article and book, the internet as we know it didn't exist yet, but word of mouth and the press were sufficient to spread and multiply the legend of the "wrong predictions" of the LTG study.

Just to give an example, let's see how Bailey's text even reached the serious scientific literature. In 1993, William Nordhaus had published a paper titled "Lethal Models" which was meant as an answer to the second edition of LTG, published in 1992. Despite the title, a little aggressive to say the least, it was a serious study. In it, Nordhaus criticized the 1992 LTG study, but also corrected some of the most glaring mistakes of his first study on the subject (Nordhaus 1973). However, the paper was accompanied by a series of texts by various authors grouped under the title of "Comments and Discussion". A better definition of that section would have been "feeding frenzy" as criticism of this distinguished group of academic economists clearly went out of control. Among these texts, we find one by Robert Stavins, an economist from Harvard University, where we can read that:

If we check today to see how the Limits I predictions have turned out, we learn that (according to their estimates) gold, silver, mercury, zinc, and lead should be thoroughly exhausted, with natural gas running out within the next eight years. Of course, this has not happened.

That, obviously, is taken straight from Bailey. Apparently, the excitement of a "Limits-bashing" session had led Stavins to forget that it is the duty of a serious scientist to check the reliability of the sources that he or she cites. Unfortunately, with this paper the legend of the "wrong predictions" of LTG was even enshrined in a serious academic journal.

With the 1990s, and in particular with the development of the internet, we can say that the dam gave way and a true flood of criticism swamped LTG and its authors. One after the other, scientists, journalists, and whoever felt entitled to discuss the subject, started repeating the same line over and over: the LTG study had predicted a catastrophe that didn't take place and therefore the whole idea was wrong.

After a while the concept of the "wrong predictions" became so widespread that it wasn't any more necessary to state in detail what these wrong predictions were. At some point, it became politically incorrect even to declare that LTG might have been, after all, not so wrong as some people thought. The criticism could also become aggressive and I can cite at least one internet page where you can read that the authors of the LTG book should be killed, cut to pieces, and their organs sent to organ banks. Hopefully, that was meant as a joke (perhaps). Today, we can use Google to find Bailey's legend repeated on the internet literally thousands of times in various forms, with minimal variations. In hundreds of cases, it is exactly the same, cut and pasted as it is; in others it is just slightly modified.

At this point, we may ask ourselves whether this wave of slander had arisen by itself, as the result of the normal mechanism of human legends, or it had been somehow masterminded by someone, the result of what we call nowadays "viral marketing". Can we think of a conspiracy organized against the LTG group, or against their sponsors, the Club of Rome?

The question is not unreasonable since the LTG authors were accused in all seriousness by ostensibly respectable researchers to be themselves the acting branch of an evil conspiracy

The Oil Drum: Europe | Cassandra\'s curse: how "The Limits to Growth" was <http://www.theoil Drum.com/node/3551> organized by the oil multinationals in order to enslave most of humankind and create "a kind of fanatical dictatorship" (Golub and Townsend, 1977). Could it be that the LTG group were victims, rather than perpetrators, of a conspiracy?

On this point we can seek an analogy with the case of Rachel Carson, well known for her book "Silent Spring" of 1962 in which she criticized the overuse of DDT and other pesticides. Also Carson's book was strongly criticized and demonized. Kimm Groshong has reviewed the story and she tells us in her 2002 study that:

The minutes from a meeting of the Manufacturing Chemists' Association, Inc. on May 8, 1962, demonstrate this curious stance. Discussing the matter of what was printed in Carson's serialization in the New Yorker, the official notes read: "The Association has the matter under serious consideration, and a meeting of the Public Relations Committee has been scheduled on August 10 to discuss measures which should be taken to bring the matter back to proper perspective in the eyes of the public."

Whether we can call that a "conspiracy" is open to discussion, but clearly there was an organized effort on the part of the chemical industry against Rachel Carson's ideas. By analogy, we could think that, in some smoke filled room, representatives of the world's industry had gathered to decide what measures to take against the LTG study in order to "bring the matter back to proper perspective in the eyes of the public"

We can't rule out that something like that took place, but it seems unlikely. Surely, think tanks and political groups financed studies that were likely to arrive to conclusions differing from those of LTG. But the demolition of the LTG ideas seems to have been mainly a spontaneous process, probably helped, but not directly caused, by economic interests. The 1989 article by Ronald Bailey was no more than a catalyst for something that, most likely, would have taken place anyway. It was the result of the tendency of our minds to believe what we want to believe and to disbelieve what we don't want to believe.

Now, in the early years of 21st century the general attitude towards LTG seems to be changing again. The war, after all, is won by those who win the last battle and the LTG ideas are becoming again popular. One of the first cases of reappraisal has been that of Matthew Simmons (2000), expert on crude oil resources. It seems that the "peak oil movement" has been instrumental in bringing back to attention the LTG study. Indeed, oil depletion can be seen as a subset of the world model used in the study (Bardi 2008).

Climate studies have also brought back the limits of resources to attention; in this case intended as the limited capability of the atmosphere to absorb the products of human activities. In this field, the LTG study can be seen as having taken the right approach from the beginning; modeling for the first time the interaction of the environment with the human industrial and agricultural system.

But it is not at all obvious that a certain view of the world, one that takes into account the finite amount of resources, is going to become prevalent, or even just respectable. Consider that, in the 1980s - 1990s, a decade of lull in oil prices was enough to convince everyone that all worries about resource depletion were akin to the substance that male bovines produce from their rear end. Now, imagine that for some reasons the world's average temperatures were to stabilize, or even slightly go down, for some years. Or imagine that oil prices were to stabilize or go down for some years. That wouldn't change anything to the concepts of global warming and peak oil, which deal both with long term changes. But it would be sufficient to unleash a smear wave similar to that which engulfed LTG. It could easily do the same damage to the efforts against global warming and oil depletion.

Prophets of doom, nowadays, are not stoned to death, at least not usually. Demolishing ideas that we don't like is done in a rather subtler manner. The success of the smear campaign against the LTG ideas shows the power of propaganda and of urban legends in shaping the public perception of the world, exploiting our innate tendency of rejecting bad news. Because of these tendencies, the world has chosen to ignore the warning of impending collapse that came from the LTG study. In so doing, we have lost more than 30 years. Now, there are signs that we may be starting to heed the warning, but it may be too late and we may still be doing too little. Cassandra's curse may still be upon us.

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