



# Book Limits to Growth

## The 30-Year Update

Donella Meadows, Jorgen Randers and Dennis Meadows  
Earthscan, 2004  
First Edition:2004

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## Recommendation

This book is neither easy nor pleasant reading. However, it is not the purely pessimistic voice of doom or the rabid environmentalist tract that many reviews described when the first edition came out 30 years ago. Rather, it is a sort of cross between a primer on budgeting and the warning a doctor might give to an overweight smoker. A good budget rests on a few simple assumptions: Resources are limited; you must plan for the future; and if you overspend now, you'll run short later. A doctor's report would say, "You may not have symptoms now, but your habits will eventually cause your body to break down." Donella Meadows, Jorgen Randers and Dennis Meadows present such a warning to all of human civilization. They analyze resource consumption, economic distribution, population growth and pollution. Their sobering conclusions amount to an attempt to start humanity on the road to a more equitable, sustainable society. The effort required to read this book comes in part from the writing, which varies drastically in style, tone and organizational choices, and in part from the innate challenges of the material. That said, *BooksInShort* recommends it to anyone who wishes to plan realistically for the future, whether you're a CEO who wants to do sustainable business, a national leader who wants to create thriving human institutions, a community member concerned about local pollution, or a parent who does not want his or her children to grow up in a wasteland.

## Take-Aways

- Growth is not the same as progress.
- Growth has limits.
- Humanity has overstressed the environment, to the point where it may never recover.
- If the human race does not radically change its path, it will produce massive, irreversible ecological disaster.
- Even the natural resources that are not running out are becoming more expensive and more difficult to access.
- All systems have feedback mechanisms that take time to work. Humanity is just now seeing the results of the feedback mechanisms in the natural world.
- One factor contributing to likely ecological breakdown is that short-term economic planning looks only at the near future.
- Human economic planning is also local: It looks only at the results close at hand.
- Change is not only necessary but possible.
- Society must learn to become sustainable.

## Summary

### The Consequences of “Overshoot”

Humanity is in a condition of overshoot. Overshoot happens all the time in daily life, whenever you accidentally go beyond physical limitations: Standing up too fast, you lose your balance. Driving recklessly on an icy road, you slide past a red light. Whether on the personal or global level, the same three causes contribute to overshoot:

1. “Growth, acceleration [and] rapid change” stress the system.
2. Pushed beyond its natural limits, the system can't remain intact.
3. Delays in perceiving the problem may lengthen response time in reacting to or stopping the overshoot.

“The idea that there might be limits to growth is for many people impossible to imagine. Limits are politically unmentionable and economically unthinkable.”

The most obvious signs of overshoot in today’s world are exploding population and massive pollution. Civilization’s addiction to growth is the underlying cause of both. Nearly everyone associates growth with progress. That may be true of individual wealth, but it is not the case with systems, which have inherent limits. Although some people warn that society must take action and correct the situation, knowing does not necessarily imply doing. Perhaps humanity will change its ways and create a sustainable civilization; perhaps it will suffer a terrible crash.

## The Rich Get Richer

A construction crew builds one mile of road per week. The road’s growth is “linear” – it increases by the same amount during each time period. In contrast, human population growth is “exponential.” In 1650, the population grew at 0.3% annually. In 240 years, it doubled. In 1900, population was growing at 0.7% to 0.8% annually, a rate at which it would double every 100 years. In 1965, the growth rate reached 2% per year, a rate at which population would double every 36 years. Fortunately, the growth rate slowed because of a phenomenon called “demographic transition,” which occurs roughly two generations after a region industrializes. Yet, even though population is now growing more slowly than it did during the 1960s, it is still growing, and earth’s resources are still limited.

“The Earth is finite. Growth of anything physical, including the human population and its cars and houses and factories, cannot continue forever.”

Economic growth both causes and is affected by population growth. For much of recent history, the economy has been expanding exponentially and faster than population, in a positive cycle of growth and reinvestment. Abundant resources have fueled population increases.

All people do not benefit equally from the good economy. Those who are already privileged receive the most benefits, in what systems theory calls a “success to the successful” feedback loop. The result is a growing gap between rich and poor. Few of the world’s riches ever reach the very poor, resulting in pockets of extreme suffering and starvation. Although in theory the economy produces enough to feed everyone, the current system of distribution does not allow it.

“To reach sustainability, humanity must increase the consumption levels of the world’s poor, while at the same time reducing humanity’s total ecological footprint.”

At some point, both the population and the economy will reach their limits, and both will stop growing. This will happen whether or not the economy shifts to a postindustrial model, because even an information-based economy requires physical computers to store and process data. So, humanity must figure out how to manage material goods, where to direct the growth that still occurs, what the new socioeconomic system should look like and how much suffering it can tolerate.

## What Limits Growth?

The Earth’s supply of energy or raw materials does not limit growth. Most resources still exist in abundance. The problem is rather that getting to them is becoming more expensive. When the cost of extracting resources exceeds the returns, the economy will begin to contract.

“There is substantial consensus that petroleum is the most limited of the important fossil fuels, and its global production will reach a maximum during the first half of this century.”

However, humans are exhausting and misusing these three categories of resources, thereby curbing economic growth:

1. **“Renewable resources”** – These include living material, such as forests and fish; nonliving material, such as water; and combinations of the two, such as soil. Humans are overusing these resources. Increased food production has depleted the soil. Increased population has depleted water supplies. Food production is reaching a plateau. To feed a rising population, people will have to farm land that is less arable, resulting in higher costs and lower returns. Farmers can make some accommodations, such as more efficient irrigation and pumping groundwater to make up for rainfall shortages, although groundwater, too, has limits.
2. **“Nonrenewable resources”** – While estimates differ somewhat, most experts predict that petroleum production will peak during the first half of the twenty-first century, yet the global demand will continue to rise even after that. Although this situation will stress the system, it will drive the economy in the right direction by increasing incentives for efficiency and conservation. Similarly, as key industrial materials such as copper and nickel become scarce, industries will learn to get by with less and to recycle.
3. **“Pollution and waste”** – Civilization has recognized the dangers of some pollutants and reduced them: The levels of cesium-137 in cow’s milk, lead in children’s blood and DDT in herring have all plummeted in the last 20 to 40 years. However, it has failed to address several other kinds of pollution, such as the more than “65,000 industrial chemicals...in regular commercial use.” Chlorofluorocarbons (CFCs) have damaged the planet’s ozone layer, and carbon dioxide is contributing to the greenhouse effect and climate change.

“A sustainable society would be interested in qualitative development, not physical expansion. It would use material growth as a considered tool, not a perpetual mandate.”

Solving the problems of pollution and depleted resources will act as a brake on economic growth. Right now, humanity is like a person dipping into capital, rather than living on interest. That may work for a while, but eventually, you’re bankrupt.

## Restoring the Ozone Layer

Change is possible. The story of the ozone layer offers a promising example. In 1974, scientists realized that the chlorine atoms in CFCs could damage the ozone layer. International scientific investigations, including a British Antarctic Survey in 1984, “measured a 40 percent decrease in ozone in the stratosphere over their survey site.” Although industry and governments initially put up resistance and denied the problem, after complex negotiations, nations signed the Protocol on Substances that Deplete the Ozone Layer in 1987. Enforcing the protocol, including blocking “CFC smuggling,” has been difficult, and ongoing monitoring is still necessary. However, the protocol shows that humanity can pull together and shift from destruction to sustainability.

## The Market Is Not the Answer

Many economists believe that market forces will produce negative feedback loops that will increase the price of scarce materials, forcing smart entrepreneurs to step in and invent substitutes. Or, they imagine that if pricing changes to include social costs such as pollution, manufacturers will have an incentive to develop more efficient, cleaner processes. In fact, sometimes such feedback loops do correct overshoot problems, at least partially. However, technology or markets are not sufficient solutions, for these reasons:

- Closing the information loop takes time: The damaging effects of a process may not become evident for years or even decades.
- Rich people or regions can displace the negative effects of development onto others, dumping pollutants into poor neighborhoods, for example.
- Governments may reward businesses for pushing natural systems too far, as it did in the case of ocean fishing.

## So When Is the World Ending?

If civilization is in overshoot and on the brink of environmental collapse, how long has humanity got? The short answer is “Who knows?” Creating predictive models of global technological civilization is tremendously complex. The answers such models provide vary, depending on the assumptions on which you base them, about the ecology’s carrying capacity, future technological developments, and which changes humans will make and when. For example, if you assume, in a dream scenario, that economic growth has no physical limits, you come up with a world population that grows to about nine billion before leveling off through demographic transition in 2080 and an economy that produces 30 times as much as it did in 2000. If you assume that current policies will not change, you see a drop in standard of living during the first few decades of the twenty-first century, increasing pollution, and massive global poisoning and erratic shocks to the system by the end of the century. However, if society takes steps to limit population and pollution, the world will experience a smoother, less painful transition.

## The Sustainable Society

The planet’s natural systems are sending clear signals indicating that humans must change their ways. People have three choices about what to do:

1. **Denial** – Not really a solution, although it may feel good for a little while.
2. **“Technical or economic fixes”** – For example, comprehensive recycling programs and replenishment of renewable resources, such as forests. Unfortunately, while these virtuous programs may work in the short term, they are only temporary solutions.
3. **“Work on the underlying causes”** – In other words, change the whole system, its underlying structures and its assumptions about the nature of the world. Humanity must transform its “norms, goals, expectations, pressures, incentives and costs” – the factors that have created the positive feedback loops that have pushed society into overshoot.

“Sustainability, sufficiency and equity require structural change; they require a revolution, not in the political sense...but in the more profound sense of the agricultural or industrial revolutions.”

Rather than pursuing growth for its own sake, society will learn to evaluate each new technology in terms of its sustainability. The higher the population and the level of waste technology produces, the harder bringing civilization into balance will become. A sustainable society has these characteristics:

- It uses renewable resources only as fast as it can regenerate them, and uses nonrenewable resources only at the rate at which it can develop “renewable substitutes.”
- It emits pollution only at a rate and level that the environment can tolerate.
- It allows great variation in culture, but insists on feedback loops that accurately communicate information about the ecological costs of all choices.
- It responds quickly to damage to a natural system.
- Its planning horizon is long.
- It addresses problems such as poverty, unemployment and “unmet physical needs.”

“Lies distort the information stream. A system cannot function well if its information streams are corrupted by lies.”

Individuals can bring this new society into being in many ways. As an individual, you can take corrective actions such as conserving energy and recycling, but those are only stepping stones. Here’s how to make a broader contribution:

- **“Visioning”** – Imagine what a sustainable society would look like. How would you make sure everyone has enough? How can you bring the economy into ecological balance?
- **Networking** – Networks can spread the word to their members that political and media messages proclaiming that everything is fine and no change is necessary are false. They can also show them that warnings aren’t predictions of doom but rather guides for action.
- **Learning** – No one knows exactly what the future holds or what a sustainable society looks like. Nature can be a model, but finding the particular forms of sustainable societies will require study – and love, so people learn to support one another and help society survive the looming crisis.

## About the Authors

**Donella Meadows** founded the Sustainability Institute. **Jorgen Randers** is president emeritus of the Norwegian School of Management. **Dennis Meadows** is director of the Institute for Policy and Social Science Research at the University of New Hampshire.

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