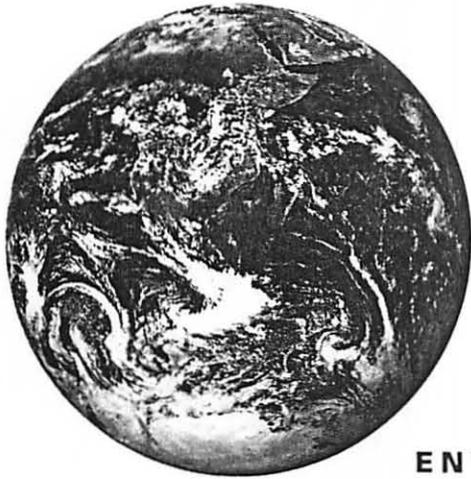


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# BEYOND

CONFRONTING GLOBAL COLLAPSE



# THE

ENVISIONING A SUSTAINABLE FUTURE

# LIMITS

*Sequel to the international bestseller* THE LIMITS TO GROWTH

DONELLA H MEADOWS, DENNIS L MEADOWS, JØRGEN RANDERS

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Front cover design by DeFrancis Studio, Norwich, Vermont  
Cover photo courtesy of NASA

ISBN 0-930031-62-8



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# ACKNOWLEDGMENTS

## Inspiration

This book is dedicated to:

- Aurelio Peccei, founder of The Club of Rome. His profound concern for the world and his faith in humanity inspired us and many others to care about and address the prospects for the long-term future.
- Jay W. Forrester, Professor Emeritus of the Sloan School of Management at MIT and our teacher. He designed the prototype of the computer model we have used in this book, and his systems insights have helped us to understand the behaviors of economic and environmental systems.

## Administration

Critical to the preparation of this book were the following people, to whom we extend our heartfelt gratitude:

## *Beyond the Limits*

- Ian and Margo Baldwin of Chelsea Green Publishing Company for taking this project on and for devoting their own energies and the resources of their company so unstintingly toward its completion;
- Angele Cook of the University of New Hampshire and Anita Brown and Mardi McGregor of Dartmouth College for providing constant and cheerful logistical support;
- Lew Feldstein and the New Hampshire Charitable Trust, for supporting creation of a policy research center in New Hampshire.
- Suzanne MacDonald for hosting extended writing sessions at her house and for sustaining and encouraging exhausted writers;
- Peter Matson of Sterling Lord Literistic for unsnarling this work from the old *Limits* and moving it forward to publication;
- Marie and Engelke Randers for loaning their husband and father for many weeks to a project across the ocean;
- The residents of Foundation Farm, for keeping the home fires burning while one of their farmers was busy with a book;
- James Hornig for creating an environment at Dartmouth College that gave us the material and intellectual support necessary to research and prepare this book;
- Barry Richmond and Steve Peterson of High Performance Systems, Inc. for the STELLA II© software that has made the World3 model so much more accessible than it was twenty years ago.
- Readers and commenters including: William W. Behrens III, Allen Boorstein, Hartmut Bossel, Lester Brown, Chester Cooper, Herman Daly, Joan Davis, Judy Gabriel, Jay Harris, John Harte, James Hornig, Nathan Keyfitz, Niels Meyer, Don Michael, Mario Molina, Russell Peterson, Aromar Revi, John Sterman, and Steve Viederman. We have not been able to please them all in every detail, but their comments were frank, thought-provoking, and helpful. Their quick and energetic responses despite very busy schedules testify to their commitment to resolving the issues raised in this book.

### **Donation**

Funding for the preparation of *Beyond the Limits* was provided by the

## Acknowledgments

Pew Scholars Program, Jane and Allen Boorstein, Jay Harris, and William Welsh.

### Perspiration

The team that did the research, ran the computer model, created the graphics, and wrote this book consisted of:

- Dr. Bert de Vries, National Institute of Public Health and Environmental Protection (RIVM), the Netherlands;
- Thomas Fiddaman, Institute for Policy and Social Science Research, University of New Hampshire, USA;
- Dr. Dennis Meadows, Institute for Policy and Social Science Research, University of New Hampshire, USA;
- Dr. Donella H. Meadows, Environmental Studies Program, Dartmouth College, USA;
- Dr. Jørgen Randers, Chairman, S. Sejersted Bodtker & Co. AS, Norway;
- Diana Wright, Environmental Studies Program, Dartmouth College, USA.

The original project that produced the World3 computer model and *The Limits to Growth* took place in the System Dynamics Group of the Sloan School of Management at the Massachusetts Institute of Technology. It was commissioned by The Club of Rome and funded by the Volkswagen Foundation. The team consisted of:

Dr. Alison A. Anderson (USA)	Dr. Jay M. Anderson (USA)
Ilyas Bayar (Turkey)	Dr. William W. Behrens III (USA)
Farhad Hakimzadeh (Iran)	Dr. Steffen Harbordt (Germany)
Judith A. Machen (USA)	Dr. Dennis L. Meadows (USA)
Dr. Donella H. Meadows (USA)	Dr. Peter Milling (Germany)
Nirmala S. Murthy (India)	Dr. Roger F. Naill (USA)
Dr. Jørgen Randers (Norway)	Stephen Schantzis (USA)
Dr. John A. Seeger (USA)	Marilyn Williams (USA)
Dr. Erich K. O. Zahn (Germany)	

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## FOREWORD

**W**e all can learn some lessons from this book, especially we economists. We can learn about the background against which economic processes are developing and about the space in which they take place, our planet Earth. That background, that space, is large in comparison to the problems economists usually deal with, but it is finite, and everything economic has to be done on, in, or around it.

Two things are unlimited: the number of generations we should feel responsible for and our inventiveness. The first provides us with a challenge: to feed and provide for not only the present but all future generations from the earth's finite flow of natural resources. The second, our inventiveness, may create ideas and policies that will contribute to meeting that challenge.

Our responsibility to all generations extends especially to those now living on poor continents or in the poorest quarters of cities on all continents. In the present and the future it extends to more than ensur-

## Foreword

ing food and material provisions; it also extends to keeping the environment clean.

The time is past when incomes are becoming unequal globally. But at the present rate it would still take far too long for them to become equal: five centuries. Whether the highest present incomes can be maintained is very doubtful. Market economies are obviously in need of some intervention in order to provide public goods, to avoid too much inequality, and to approach sustainability.

It is the great merit of *Beyond the Limits* that it shows us where and when we may reach the frontiers of the possible and thus clarifies the conditions under which sustainable development, a clean environment, and equitable incomes can be organized. It shows that there are exciting possibilities, and that they are limited, more so than some economists think. It reveals that the possible average sustainable income level is lower today than twenty years ago. That is the consequence of our failure to understand the limits to the use of natural resources. And the book also shows us where human creativity has improved our prospects, as in energy efficiency, resource recycling, and increases in the average length of human life.

As economists we must be grateful to these authors for showing us where the present path of human development threatens to exceed the limits, and for illustrating the contributions economics and other disciplines must make to meet the great human challenge of avoiding war, famine, disease, and pollution, and of building a sustainable future.

Jan Tinbergen

*Nobel Laureate, Economics*

## PREFACE

**T**wenty years ago we wrote a book called *The Limits to Growth*.<sup>1</sup> It described the prospects for growth in the human population and the global economy during the coming century. In it we raised questions such as: What will happen if growth in the world's population continues unchecked? What will be the environmental consequences if economic growth continues at its current pace? What can be done to ensure a human economy that provides sufficiently for all and that also fits within the physical limits of the Earth?

We had been commissioned to examine these questions by The Club of Rome, an international group of distinguished businessmen, statesmen, and scientists. They asked us to undertake a two-year study at the Massachusetts Institute of Technology to investigate the long-term causes and consequences of growth in population, industrial capital, food production, resource consumption, and pollution. To keep track of these interacting entities and to project their possible paths into the future we created a computer model called World3.<sup>2</sup>

The results of our study were described for the general public<sup>3</sup> in

## Preface

*The Limits to Growth*. That book created a furor. The combination of the computer, MIT, and The Club of Rome pronouncing upon humanity's future had an irresistible dramatic appeal. Newspaper headlines announced:

A COMPUTER LOOKS AHEAD AND SHUDDERS  
STUDY SEES DISASTER BY YEAR 2100  
SCIENTISTS WARN OF GLOBAL CATASTROPHE.<sup>4</sup>

Our book was debated by parliaments and scientific societies. One major oil company sponsored a series of advertisements criticizing it; another set up an annual prize for the best studies expanding upon it. *The Limits to Growth* inspired some high praise, many thoughtful reviews, and a flurry of attacks from the left, the right, and the middle of mainstream economics.

The book was interpreted by many as a prediction of doom, but it was not a prediction at all. It was not about a preordained future. It was about a choice. It contained a warning, to be sure, but also a message of promise. Here are the three summary conclusions we wrote in 1972. The second of them is the promise, a very optimistic one, but our analysis justified it then and still justifies it now. Perhaps we should have listed it first.

1. 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 100 years. The most probable result will be a sudden and uncontrollable decline in both population and industrial capacity.
2. 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 or her individual human potential.
3. If the world's people decide to strive for this second outcome rather than the first, the sooner they begin working to attain it, the greater will be their chances of success.<sup>5</sup>

## *Beyond the Limits*

To us those conclusions spelled out not doom but challenge—how to bring about a society that is materially sufficient, socially equitable, and ecologically sustainable, and one that is more satisfying in human terms than the growth-obsessed society of today.

In one way and another, we've been working on that challenge ever since. Millions of other people have been working on it too. They've been exploring energy efficiency and new materials, nonviolent conflict resolution and grassroots community development, pollution prevention in factories and recycling in towns, ecological agriculture and international protocols to protect the ozone layer. Much has happened in twenty years to bring about technologies, concepts, and institutions that can create a sustainable future. And much has happened to perpetuate the desperate poverty, the waste of resources, the accumulation of toxins, and the destruction of nature that are tearing down the support capacity of the earth.

When we began working on the present book, we simply intended to document those countervailing trends in order to update *The Limits to Growth* for its reissue on its twentieth anniversary. We soon discovered that we had to do more than that. As we compiled the numbers, reran the computer model, and reflected on what we had learned over two decades, we realized that the passage of time and the continuation of many growth trends had brought the human society to a new position relative to its limits.

In 1971 we concluded that the physical limits to human use of materials and energy were somewhere decades ahead. In 1991, when we looked again at the data, the computer model, and our own experience of the world, we realized that in spite of the world's improved technologies, the greater awareness, the stronger environment policies, many resource and pollution flows had grown beyond their sustainable limits.

That conclusion came as a surprise to us, and yet not really a surprise. In a way we had known it all along. We had seen for ourselves the leveled forests, the gullies in the croplands, the rivers brown with silt. We knew the chemistry of the ozone layer and the greenhouse effect. The media had chronicled the statistics of global fisheries, groundwater drawdowns, and the extinction of species. We discovered, as we began to talk to colleagues about the world being "beyond the limits,"

## Preface

that they did not question that conclusion. We found many places in the literature of the past twenty years where authors had suggested that resource and pollution flows had grown too far, some of which we have quoted in this book.

But until we started updating *The Limits to Growth* we had not let our minds fully absorb the message. The human world is beyond its limits. The present way of doing things is unsustainable. The future, to be viable at all, must be one of drawing back, easing down, healing. Poverty cannot be ended by indefinite material growth; it will have to be addressed while the material human economy contracts. Like everyone else, we didn't really want to come to these conclusions.

But the more we compiled the numbers, the more they gave us that message, loud and clear. With some trepidation we turned to World3, the computer model that had helped us twenty years before to integrate the global data and to work through their long-term implications. We were afraid that we would no longer be able to find in the model any possibility of a believable, sufficient, sustainable future for all the world's people.

But, as it turned out, we could. World3 showed us that in twenty years some options for sustainability have narrowed, but others have opened up. Given some of the technologies and institutions invented over those twenty years, there are real possibilities for reducing the streams of resources consumed and pollutants generated by the human economy while increasing the quality of human life. It is even possible, we concluded, to eliminate poverty while accommodating the population growth already implicit in present population age structures—but not if population growth goes on indefinitely, not if it goes on for long, and not without rapid improvements in the efficiency of material and energy use and in the equity of material and energy distribution.

As far as we can tell from the global data, from the World3 model, and from all we have learned in the past twenty years, the three conclusions we drew in *The Limits to Growth* are still valid, but they need to be strengthened. Now we would write them this way:

1. Human use of many essential resources and generation of many kinds of pollutants have already surpassed rates that are physically

sustainable. Without significant reductions in material and energy flows, there will be in the coming decades an uncontrolled decline in per capita food output, energy use, and industrial production.

2. This decline is not inevitable. To avoid it two changes are necessary. The first is a comprehensive revision of policies and practices that perpetuate growth in material consumption and in population. The second is a rapid, drastic increase in the efficiency with which materials and energy are used.
3. A sustainable society is still technically and economically possible. It could be much more desirable than a society that tries to solve its problems by constant expansion. The transition to a sustainable society requires a careful balance between long-term and short-term goals and an emphasis on sufficiency, equity, and quality of life rather than on quantity of output. It requires more than productivity and more than technology; it also requires maturity, compassion, and wisdom.

These conclusions constitute a conditional warning, not a dire prediction. They offer a living choice, not a death sentence. The choice isn't necessarily a gloomy one. It does not mean that the poor must be frozen in their poverty or that the rich must become poor. It could actually mean achieving at last the goals that humanity has been pursuing in continuous attempts to maintain physical growth.

We hope the world will make a choice for sustainability. That is why we are writing this book. But we do not minimize the gravity or the difficulty of that choice. We think a transition to a sustainable world is technically and economically possible, maybe even easy, but we also know it is psychologically and politically daunting. So much hope, so many personal identities, so much of modern industrial culture has been built upon the premise of perpetual material growth.

A perceptive teacher, watching his students react to the idea that there are limits, once wrote:

When most of us are presented with the ultimata of potential disaster, when we hear that we "must" choose some form of planned stability, when we face the "necessity" of a designed sustainable

## Preface

state, we are being bereaved, whether or not we fully realize it. When cast upon our own resources in this way we feel, we intuit, a kind of cosmic loneliness that we could not have foreseen. We become orphans. We no longer see ourselves as children of a cosmic order or the beneficiaries of the historical process. Limits to growth denies all that. It tell us, perhaps for the first time in our experience, that the only plan must be our own. With one stroke it strips us of the assurance offered by past forms of Providence and progress and with another it thrusts into our reluctant hands the responsibility for the future.<sup>6</sup>

We went through that entire emotional sequence—grief, loneliness, reluctant responsibility—when we worked on The Club of Rome project twenty years ago. Many other people, through many other kinds of formative events, have gone through a similar sequence. It can be survived. It can even open up new horizons and suggest exciting futures. Those futures will never come to be, however, until the world as a whole turns to face them. The ideas of limits, sustainability, sufficiency, equity, and efficiency are not barriers, not obstacles, not threats. They are guides to a new world. Sustainability, not better weapons or struggles for power or material accumulation, is the ultimate challenge to the energy and creativity of the human race.

We think the human race is up to the challenge. We think that a better world is possible, and that the acceptance of physical limits is the first step toward getting there. We see “easing down” from unsustainability not as a sacrifice, but as an opportunity to stop battering against the earth’s limits and to start transcending self-imposed and unnecessary limits in human institutions, mindsets, beliefs, and ethics. That is why we finally decided not just to update and reissue *The Limits to Growth*, but to rewrite it completely and to call it *Beyond the Limits*.

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*November 1991*