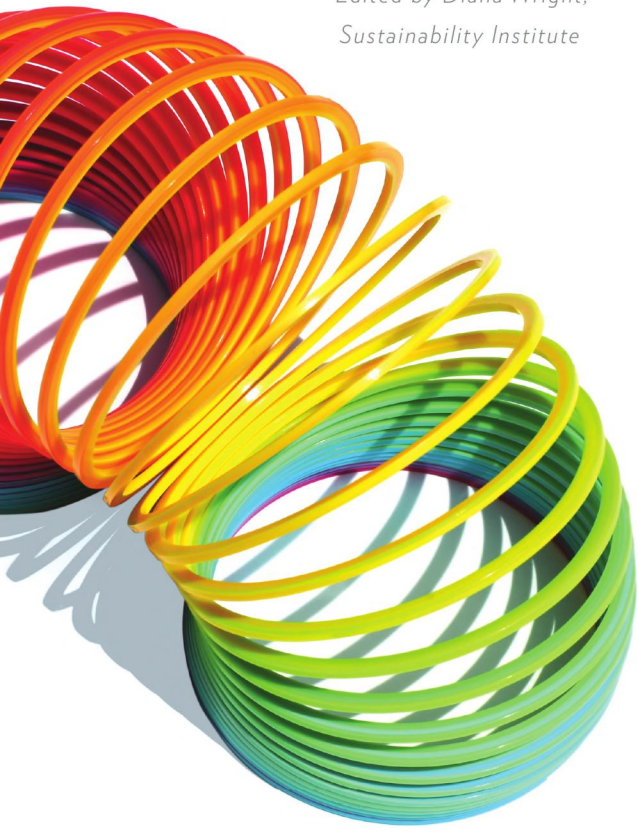
Thinking in Systems

A Primer

Donella H. Meadows

Edited by Diana Wright,
Sustainability Institute



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A NOTE FROM THE AUTHOR

This book has been distilled out of the wisdom of thirty years of systems modeling and teaching carried out by dozens of creative people, most of them originally based at or influenced by the MIT System Dynamics group. Foremost among them is Jay Forrester, the founder of the group. My particular teachers (and students who have become my teachers) have been, in addition to Jay: Ed Roberts, Jack Pugh, Dennis Meadows, Hartmut Bossel, Barry Richmond, Peter Senge, John Sterman, and Peter Allen, but I have drawn here from the language, ideas, examples, quotes, books, and lore of a large intellectual community. I express my admiration and gratitude to all its members.

I also have drawn from thinkers in a variety of disciplines, who, as far as I know, never used a computer to simulate a system, but who are natural systems thinkers. They include Gregory Bateson, Kenneth Boulding, Herman Daly, Albert Einstein, Garrett Hardin, Václav Havel, Lewis Mumford, Gunnar Myrdal, E.F. Schumacher, a number of modern corporate executives, and many anonymous sources of ancient wisdom, from Native Americans to the Sufis of the Middle East. Strange bedfellows, but systems thinking transcends disciplines and cultures and, when it is done right, it overarches history as well.

Having spoken of transcendence, I need to acknowledge factionalism as well. Systems analysts use overarching concepts, but they have entirely human personalities, which means that they have formed many fractious schools of systems thought. I have used the language and symbols of system dynamics here, the school in which I was taught. And I present only the core of systems theory here, not the leading edge. I don't deal with the most abstract theories and am interested in analysis only when I can see how it helps solve real problems. When the abstract end of systems theory does that, which I believe it will some day, another book will have to be written.

Therefore, you should be warned that this book, like all books, is biased and incomplete. There is much, much more to systems thinking than is

presented here, for you to discover if you are interested. One of my purposes is to make you interested. Another of my purposes, the main one, is to give you a basic ability to understand and to deal with complex systems, even if your formal systems training begins and ends with this book.

—Donella Meadows, 1993

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so. Perhaps you are working in a company (or own a company) and are struggling to see how your business or organization can be part of a shift toward a better world. Or maybe you're a policy maker who is seeing others "push back" against your good ideas and good intentions. Perhaps you're a manager who has worked hard to fix some important problems in your company or community, only to see other challenges erupt in their wake. As one who advocates for changes in how a society (or a family) functions, what it values and protects, you may see years of progress easily undone in a few swift reactions. As a citizen of an increasingly global society, perhaps you are just plain frustrated with how hard it is to make a positive and lasting difference.

If so, I think that this book can help. Although one can find dozens of titles on "systems modeling" and "systems thinking," there remains a clear need for an approachable and inspiring book about systems and us—why we find them at times so baffling and how we can better learn to manage and redesign them.

At the time that Dana was writing *Thinking in Systems*, she had recently completed the twenty-year update to *Limits to Growth,* titled *Beyond the Limits.* She was a Pew Scholar in Conservation and the Environment, was serving on the Committee on Research and Exploration for the National Geographic Society, and she was teaching about systems, environment, and ethics at Dartmouth College. In all aspects of her work, she was immersed in the events of the day. She understood those events to be the outward behavior of often complex systems.

Although Dana's original manuscript has been edited and restructured, many of the examples you will find in this book are from her first draft in 1993. They may seem a bit dated to you, but in editing her work I chose to keep them because their teachings are as relevant now as they were then. The early 1990s were the time of the dissolution of the Soviet Union and great shifts in other socialist countries. The North American Free Trade Agreement was newly signed. Iraq's army invaded Kuwait and then retreated, burning oil fields on the way out. Nelson Mandela was freed from prison, and South Africa's apartheid laws were repealed. Labor leader Lech Walesa was elected president of Poland, and poet Václav Havel was elected president of Czechoslovakia. The International Panel on Climate Change issued its first assessment report, concluding that "emissions from human activities are substantially increasing the atmospheric concentra-

tions of greenhouse gases and that this will enhance the greenhouse effect and result in an additional warming of the Earth's surface." The UN held a conference in Rio de Janeiro on environment and development.

While traveling to meetings and conferences during this time, Dana read the *International Herald Tribune* and during a single week found many examples of systems in need of better management or complete redesign. She found them in the newspaper because they are all around us every day. Once you start to see the events of the day as parts of trends, and those trends as symptoms of underlying system structure, you will be able to consider new ways to manage and new ways to live in a world of complex systems. In publishing Dana's manuscript, I hope to increase the ability of readers to understand and talk about the systems around them and to act for positive change.

I hope this small approachable introduction to systems and how we think about them will be a useful tool in a world that rapidly needs to shift behaviors arising from very complex systems. This is a simple book for and about a complex world. It is a book for those who want to shape a better future.

—Diana Wright, 2008

If a factory is torn down but the rationality which produced it is left standing, then that rationality will simply produce another factory. If a revolution destroys a government, but the systematic patterns of thought that produced that government are left intact, then those patterns will repeat themselves. . . . There's so much talk about the system. And so little understanding.

—Robert Pirsig, *Zen and the Art of Motorcycle Maintenance*