PEGASUS COMMUNICATIONS
THE SYSTEMS THINKER®
BUILDING SHARED UNDERSTANDING
VOL. 15 NO. 8 OCTOBER 2004

SCENARIOS OF THE FUTURE: THE URGENT CASE FOR SUSTAINABILITY

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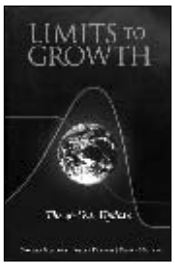

Limits to Growth: The 30-Year Update
by Meadows, Randers, and Meadows

I was in grade school when the original *Limits to Growth* (Universe Books, 1972) was published. The environmental consciousness that blossomed in the early 1970s led me and many others in the post–baby boom demographic to develop a basic confidence in society's ability to address global limits. The creation of the Environmental Protection Agency and the passing of clean air and water legislation signaled that, as a country, the United States was prepared to change the way we did things. By the 1980s, industrial cities like Pittsburg had reduced their air pollution problems by shifting to new economic activities with fewer environmental impacts. And in the 1990s, the global community's response to the hole in the earth's ozone layer provided an example of how quickly change can occur once there is consensus around the need for action.

Nevertheless, despite the progress illustrated by these and other cases, the forces of unsustainable growth and resource exploitation have continued to compound. So the release of *Limits to Growth: The 30-Year Update* (Chelsea Green, 2004) by Donella Meadows, Jorgen Randers, and Dennis Meadows comes at an important time. For newcomers to the systems approach, *The 30-Year Update* presents the logic of overshoot and collapse and emphasizes the urgent need for sustainability without dwelling too much on the mechanics of the methodology (see "Key Terms"). At the same time, those already inclined to see things from a systems perspective not only have their mental models reinforced and refined, but also have a series of cogent examples to draw upon when spreading the gospel of sustainable development.

Systems and Growth

Three themes emerge in the book: background on systems and the mechanics of growth; the introduction of a formal computer model, known as World3, and some of the scenarios that it produces; and implications and recommendations (see "The World3 Model" on p. 9). Throughout the volume, but particularly in the first three chapters, the authors explain the basic laws of system structure and behavior with a lucidity that comes from decades devoted to the dissemination of these concepts.

Though usually considered "best practice," it is not common to come across computer modelers who clearly communicate the purpose of their model and its associated boundaries; that is, the question the model was intended to address and those for which it loses its ability to provide meaningful insight. So it is a treat (for modeling geeks, anyway) to have the authors devote several pages to just these concerns in the course of their introduction to the World3 model. The central question they mean to address is: Faced with the possibility of global collapse, what actions can we take that will make a difference and lead to a sustainable future? It is clear that this is a model whose primary purpose is to help us think, not to provide *the* answer. In the course of laying out their model's purpose, the authors make one of the best cases for "modeling for learning" that I have come across.

KEY TERMS

Overshoot
When we don't know our limits, or ignore them when we do, we are apt to consume or otherwise use up system resources at a rate that cannot be maintained. Many young adults find their bodies' limits for processing alcohol by overdoing it a few times. Fishing fleets discover the ocean's limit for replenishing fish after depleting the fish stocks for a given area.

Collapse
Overshooting a limit can sometimes have dire consequences, namely, it can deplete or otherwise undermine the underlying resource. This means that even after consumption is moderated, the resource is not available at the pre-overshoot levels. If the drinking binge is hard enough so that the liver is damaged, the body may never fully recover its ability to process alcohol. If the fishing fleet grows big enough, the fish stocks may never recover.

Sustainability / Sustainable System
Systems thinkers, system dynamicists, ecologists, resource managers, and others often use "sustainable" in some form or another to refer to a system state (or operating level) that honors the limits of all vital resources.

(Definitions from Limits to Growth: The 30-Year Update*)*

THE WORLD3 MODEL

The World3 model was created in the early 1970s by a project team at MIT's Sloan School of Management. Using one of MIT's mainframe computers, the team used system dynamics theory and computer modeling to analyze the long-term causes and consequences of growth in the world's population and material economy. They gathered data on, among other things, the pattern of depletion of nonrenewable resources and the factors that drive resource extraction, the pattern of consumption of renewable resources and information about how those renewable resources are replenished, and levels and drivers of pollution, health, industrial production, and population. The resulting model allowed the team to explore a range of "what if" scenarios: What if energy resources are twice what current estimates tell us? What if pollution control technologies are developed faster than expected?

By 1992 the model could be run on a desktop computer loaded with the STELLA® software. When the authors ran the model with updated data, they discovered that the state of the planet was worse than the model had predicted it would be—many resources were already pushed beyond their sustainable limits. But they again showed that the right actions taken in a timely manner could avert a global system collapse.

In 2002 the authors began preparing *The 30-Year Update*. Once again, they have asked how well the model is tracking with transpiring events, updated the data, and made new scenario runs to explore what we can do to avoid collapse.

The authors introduce a variety of potential actions into the World3 model, at first, one-by-one, then in logically consistent groups. Each run, or scenario, provides insight into how that potential action or group of actions might affect the course of future events. In this way, Meadows, Randers, and Meadows are able to prioritize potential actions in order to come up with the set that offers the greatest opportunity for avoiding the worst consequences of collapse.

Recommendations for Action

In the end, World3 does provide an answer. Of the various assumptions tested and given the boundary conditions of the model, we can still make a transition to a sustainable global society if people around the world immediately take the following actions:

1. Stabilize the population
2. Stabilize industrial output per person
3. Add technologies to:
   - Abate pollution
   - Conserve resources
   - Increase land yield
   - Protect agricultural land

The bad news is that we have already begun to experience symptoms of overshoot—water tables are dropping rapidly in some areas and incidents of coral bleaching have risen by a factor of more than 100, to name but two of the most urgent signals. The good news is that, as the authors' account of the ozone story demonstrates, once the global community sees the clear need for change, change can come about quickly.

According to the authors, people respond to signals that a system has overshot its limit in one of three ways:

1. Deny, disguise, or confuse the signal that the system is sending
2. Relax the limits through technological or economic action
3. Change the system structure

Certain elements of society are stuck in response 1, regardless of the growing mountain of evidence calling for action. We see this mindset in the refusal by some politicians to acknowledge the science behind global warming. Others place their faith solely in the market and/or technology, even though the price would be extremely high if the market system and new technologies fail to save the day. The only truly effective response is to change the system structure, the sooner the better.

This was the core message of the original *Limits to Growth*. And while that message became a part of society's broad environmental consciousness, the warning went largely unheeded. The result is that the party's nearly over, and we need to figure out how to minimize the hangover.

Restructuring Society

Because structure determines behavior, the highest-leverage approach to these problems is to change the underlying structures that have created them, such as farming techniques, forest management policy, end-user attitudes toward consumption, recycling, and reuse, and legislation regulating pollution. So how do we go about restructuring the global system? The authors share the tools they have found to be useful: rational analysis, data gathering, systems thinking, computer modeling, and clear communication.

Notice that these tools really have more to do with making the case for change than they do with enacting change that has been agreed upon. That is, they are exceptionally useful for helping lawmakers understand the need for change and explaining to corporate decision makers the logic behind a shift. These tools can even guide the overall implementation of a change effort. But once the case has been made, the day-to-day activities can look somewhat like business as usual: rewriting laws, redesigning products and processes, reorganizing departments, and so forth. The difference is that the guidance offered by these tools means the change is less like rearranging deck chairs on the Titanic and more like fixing the hole in the ship.

The 30-Year Update is compelling: We have already overshot the planet's carrying capacity on numerous vital resources. Whether humanity is successful in avoiding the most disastrous effects of collapse will be determined in part by the actions taken by people across our society and planet. Unfortunately, politicians and other leaders often seem to be linear and "black-and-white" thinkers. Navigating the turbulence ahead will require decision making that appreciates non-linearities and shades of grey. *The 30-Year Update* will bring some to the sustainability camp. But more important, it will inspire others—those with the necessary perspective—to take action. There's no time to waste. ◘

Gregory Hennessy is honored to have worked with Dennis Meadows on several occasions and to have met the late Dana Meadows once.