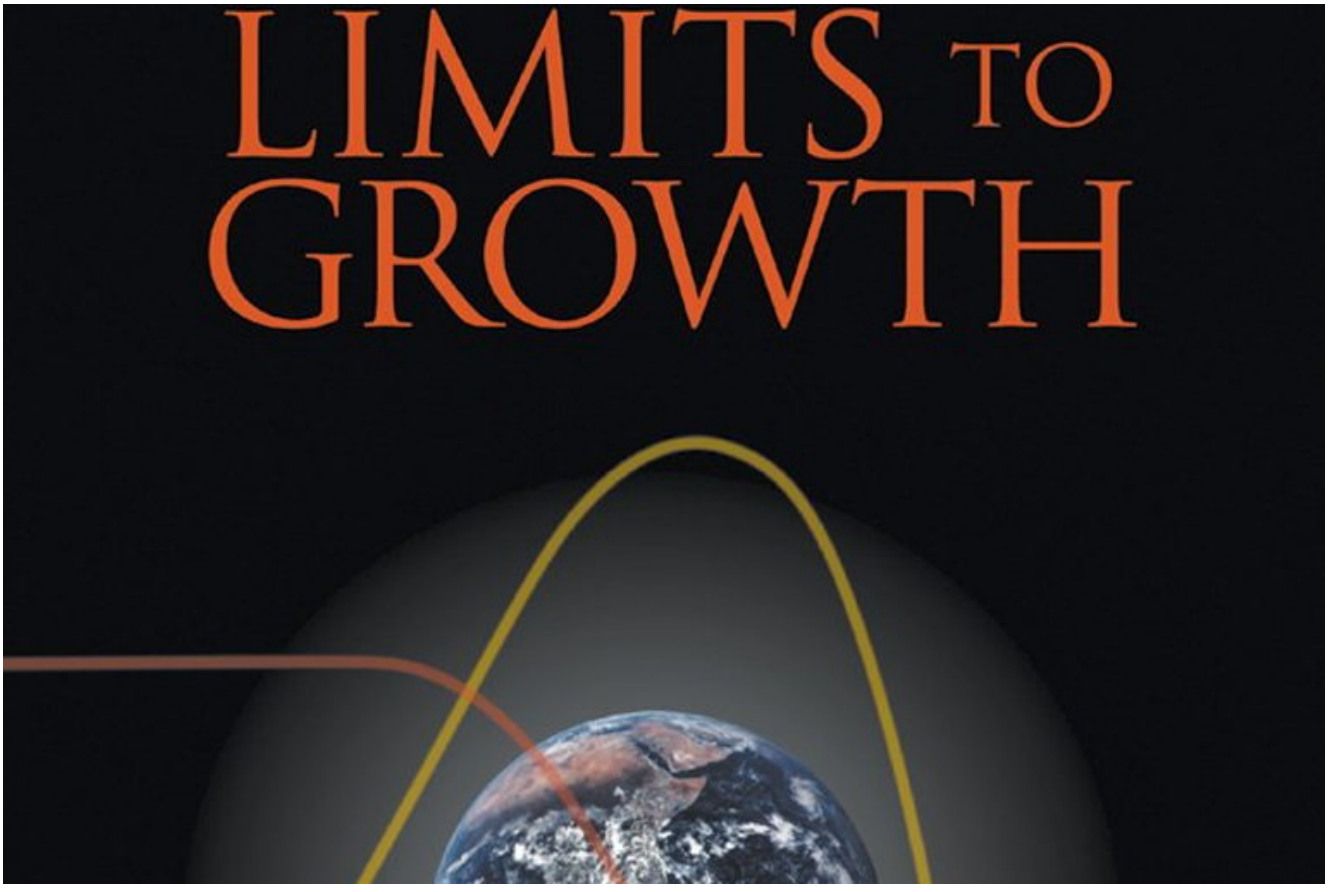
Dennis Meadows on the 50th anniversary of the publication of The Limits to Growth

Richard Heinberg



Only rarely does a book truly change the world. In the nineteenth century, such a book was Charles Darwin's *On the Origin of Species.* For the twentieth century, it was *The Limits to Growth.* Not only did this best-selling 1972 publication help spur the environmental movement, but it showed that the underlying dynamics of the modern industrial world are unsustainable on the timescale of a couple of human lifetimes. This was profoundly important information, and it

was delivered credibly and clearly, so that every policy maker could understand it. Sadly, the book was rejected by powerful people with vested interests in the Western growth-based economic model that was overtaking the rest of the world. Today we are starting to see the results of that rejection.

Of the book's four authors, only Dennis Meadows and Jørgen Randers are active (Donella Meadows died in 2001). I recently reached out to Dr. Meadows, whom I've gotten to know during the past few years, to see if he would be willing to engage in a short discussion, on the occasion of the fiftieth anniversary of the publication of *The Limits to Growth*. He graciously agreed.

Richard Heinberg: Dennis, it is an honor to have this opportunity to interview you. Congratulations on having co-authored the most important book of the past century. I'm delighted that you're willing to reply to a few questions.

First, how is reality tracking with the scenarios you and your colleagues generated 50 years ago?

Dennis L. Meadows: There have been several attempts, recently, to compare some of our scenarios with the way the global system has evolved over the past 50 years. That's difficult. It's, in a way, trying to confirm by looking through a microscope whether or not the data that you gathered through a telescope are accurate. In fact, accuracy is not really the issue here. Our goal in doing the original analysis was to provide a conceptual framework within which people

could think about their own options and about the events that they saw around them. When we evaluate models, we always ask whether they're more useful, not whether they're more accurate.

Having said that, I will also say that the efforts which have been undertaken have generally concluded that the world is moving along what we termed in our 1972 report to be the standard scenario. It's an aggregated image of the global system, showing growth from 1972 up to around 2020, and then, over the next decade or two, the principal trends peaking out and beginning to decline. I still find that model very useful in understanding what I read in the papers and in trying to think about what's coming next.

RH: Generally, when it comes to discussions about environmental impacts on society, resource depletion gets a lot less attention than pollution. Nearly everybody talks about climate change these days, but the background assumption seems to be that, if we reduce emissions to "net zero," we can continue living essentially as we do now—with a consumer culture, 8 billion people, and cruise ships (hydrogen powered, of course). There's very little discussion in the mainstream—even among most scientists, it seems to me—about how growing population and consumption will lead to a series of depletion crises even if we somehow avert the worst climate impacts. How do you see the impacts of depletion and pollution developing as constraints on future growth?

DLM: I would say that depletion and pollution are already

constraints on future growth. Take just oil, for example. In the 90s, the average price was about $30 a barrel. We're now in the vicinity of $100 a barrel, even taking inflation into account. That is beginning to put a significant damper on investment decisions. And plus, there is of course, no possibility of avoiding climate change, even if we did reduce emissions to net zero. The lifetime of CO_2 in the atmosphere (its half-life is about 120 years) means we're going to have to live for the rest of this century with the consequences of almost everything we've dumped into the atmosphere up until now.

The last time the concentration of greenhouse gases in the atmosphere was this high was about 4 million years ago. There were no humans around, and sea level was about 60 feet higher than it is today. This is not science fiction. We know that if the Antarctic ice sheet melts off, it will raise global sea levels by about 190 feet. That will add, of course, to the expansion of the water in the oceans which is coming from warming temperatures. We also see that the Arctic ice sheet is melting. And there's absolutely no reason I've seen to imagine other than that the effects of current warming will accelerate that process.

However, it is useful to imagine (although it's a fantasy) that we could eliminate climate change as an issue. Even then, major changes would be required. If you read the papers and look at the data, we see that natural resources are deteriorating on every single continent. We're far above sustainable levels. Even if we could avoid climate change,

there is no possibility of sustaining 8 billion people at anything near the living standards we've come to expect. There have been some academic exercises to calculate how many people the earth could support. That's really a silly sort of exercise, because it ignores most of the values and goals that we have for making human life on this planet worthwhile: equity, liberty, welfare, human health. These things are all intimately affected by overpopulation. I don't know what a sustainable population level is now, but it's probably much closer to a billion people, or fewer, if we aspire for them to have the kind of living standards and the political circumstances that we enjoy in the West.

Depletion in the future is probably going to manifest most directly through what look like political forces. As countries like the United States and China become dependent on imports to sustain their living standards, which they are already with respect to oil, they will begin to implement political, military, and economic measures to gain control over those assets abroad. And that's certainly going to bring us into conflict. Diverting resources off to the mechanisms of control will reduce the kind of growth that's possible domestically. We can argue about how much technology will make new resources available to us, but the key thing to remember is that, generally speaking, technology is to be understood as a way of using fossil energy to secure something. And as our fossil energy resources start to decline, the ability of technology to make evermore abundant resources available is certainly going to go down.

RH: The Limits to Growth was heavily scrutinized and criticized. Much of the criticism was unfair and based on numbers from the book that were taken out of context and treated as forecasts—which they explicitly weren't. But I wonder, with 50 years of hindsight, if any critics made you rethink some of your early assumptions or conclusions?

DLM: Of course, I've often wondered how I would do things differently if I knew back in 1972 what I know now, and were once again constructing a team and organizing an effort to develop and analyze a global model. By and large, I think we made the right choices. I'll talk in a moment about energy where, I think some important changes could have been made. One of our crucial assumptions was to look at the globe as a whole, and not try to differentiate amongst regions or countries. In hindsight, I think that was the right thing to do—although it did, of course, open us up to criticism. As little as we know about long-term global trends, we know even less about the dynamics of international transfers of people, finance, resources, energy, and so forth. So, trying to make a multinational model for the long term is going to leave you with an extremely complicated set of assumptions, all of which are based on ignorance, and that's not a very useful model.

RH: The Integrated Assessment Reports of the Intergovernmental Panel on Climate Change (IPCC) are not systems models like World3 (the model used for The Limits to Growth) and do not consider the possibility of degrowth, only growth. Can you reflect on the differences in modeling

approaches and what implications they have—for example, for the most extreme scenarios for greenhouse gas emissions?

DLM: There are profound differences between what we did and the modeling which has been carried out in support of the IPCC. I respect that effort enormously. I know many of the people involved in trying to model long-term climate change. They are excellent scientists, and they're doing good work. They have generated much useful new knowledge. But the nature of their analysis is just totally different from what we did. It wouldn't be too much of an exaggeration to say that the IPCC model starts first with what is politically acceptable, and then tries to trace out its scientific consequences, whereas we looked at what was scientifically known, and then tried to trace out its political consequences.

The IPCC model leaves many things exogenous. To use it you have to specify population growth assumptions, economic GDP level assumptions, and so forth. We worked very hard to make the important determinants of our model endogenous. It means that it evolves over time in response to changes that are occurring within the model. Making the important variables, like population, exogenous saves you a lot of criticism. You can give a bunch of different scenarios, and within that set, almost any politician will find something that they like.

The IPCC scenario is just telling us about climate change, and does not get into other issues. We were trying to provide an overall framework. So, they're both useful efforts, just totally

different. It's like picking up a hammer and picking up a paintbrush, and asking which is better. And of course, the answer is, each has its own purposes.

RH: The Limits to Growth model just has "resources" as inputs to the economy, with energy included as a resource. I wonder if you see energy as special, as it takes energy to access all other resources, such as minerals. Would you think resource declines in general will follow energy declines specifically?

DLM: The most serious omission in our model, as far as I now understand it, was energy. We lumped all forms of energy implicitly into either the nonrenewable resource sector, or, in some farfetched way, the agricultural sector. That implicitly assumes that energy is infinitely substitutable—an assumption the economists make all the time, but which is, of course, totally erroneous.

I still remember when the oil embargo occurred, I think it was in 1972. And economists said, "Well, don't worry. The energy economy in the United States is only 4 or 5 per cent of GDP. So even if it stops totally, the GDP isn't going to go down very much." Well, of course, that's just an incredibly silly way of understanding reality. If there's no energy, there is very little GDP. Whether or not the decline in energy availability will track closely or only loosely with resource availability remains to be seen. Energy availability, of course, is not only a matter of physical quantities, but also useful energy. The concept of energy return on investment (EROI) is extremely important, and probably well known to the people

who monitor your website. We know that it's trending down. Charlie Hall, in his pioneering work, has done the best job I've seen to calculate what EROI needs to be in order to sustain an economy as complex as ours. We have a ways to go, but it will be the decline of energy return on investment, which is the biggest problem.

RH: In rereading your book, I was struck by the excellent recommendations you made, starting on page 161. If only these had been adopted back then by policy makers globally! Unfortunately for us all, they weren't, for the most part (though some successful efforts were made to slow population growth). Now, 50 years on, do you think different recommendations are appropriate?

DLM: I went back and looked at all three editions of our book. I couldn't find anywhere that set of recommendations, excellent or otherwise. *[RH Note: Dennis is correct here, of course: there are no "recommendations" per se, merely hypothetical conditions, such as the application of policies to produce an equalization of birth and death rates starting in 1975, that were fed into the scenarios in an attempt to produce a stable world condition throughout the 21st century.]* However, whatever it was that we recommended back then certainly is not relevant now. In 1972, the impact of humanity on the globe was probably below sustainable levels, and the goal at that time was to slow things down before we hit the limit. Now it's clear that the scale of human activities is far, far above the limit. And our goal is not to slow down, but to get back down: to find ways to maneuver the system, in a

peaceful, equitable, hopefully fairly liberal way, and bring our demands back down to levels that can be borne by the planet. That's a totally different question than the one we addressed. It would require a totally different kind of model than the one we built, and a totally different set of books than the ones we wrote. We were careful in our analyses, when describing our different scenarios, never to make statements about the output of the model, after the first major variable peaked and started to go down, because we understood that that would bring very profound changes in the social and the political system, which would almost undoubtedly make our model quite irrelevant. So, there's still lots of interesting research to be done. There's a whole new set of interesting questions. But you'll have to look elsewhere than our work in order to get started on it.

RH: Do you think policy makers are any more open now than they were then?

DLM: It's not a question of whether policymakers are open or not; it's whether they're more likely now to take constructive action than they were 50 years ago. That's a complex question, and I don't know the answer. Action requires not just openness, but also resources and concern. I've been able to convince people that, for example, climate change is coming. They don't take action, not because they don't believe me, but because they just don't care. They're focused on a short-term perspective within which the current system is giving them the power and the money they aspire to. They see no need for change.

It's ironic, but with these kinds of problems over time, the concern tends to go up, but the discretionary resources tend to go down. And it's often the case that, by the time policymakers become sufficiently concerned about something to start wondering what to do, they no longer have sufficient discretionary resources to be very effective. And this is all compounded with what I call the time horizon vicious circle. Because we haven't taken effective action in the past, crises are mounting. It's in the nature of the political response that, when crisis comes, you focus more and more on the short term, and your time horizon shrinks. And because that leads you to do things which fundamentally don't solve the problem, the crisis gets worse. So, as the crisis gets worse, the time horizon shrinks even more, bad decision making increases, and the crisis goes up even further. That's where I see us now.

I've used the metaphor sometimes of the roller coaster, which, for my German audiences, the most prominent example would be the one at Oktoberfest in Munich. In 1972, using this metaphor, I could say that the situation was kind of like a group of people standing at the ticket window and wondering whether or not they ought to get on the train. They still had a chance not to do it. But, in this analogy, they did. They got on the car, and they enjoyed a short period of growth up to the top of the first hill. Now they're about to start to descend, and they no longer have much room for constructive action. All they can do is hold on and hope to survive the trip. That's a simplistic way of understanding our

situation, but it puts policymaking into a useful perspective.

RH: Of all the recommendations you made then (or new ones), what is the single most important? Is there a pebble of an idea that can start an avalanche of change?

DLM: The recommendations we made back in 1972 simply aren't relevant now. So, although I could say, in theory, stopping population growth or increasing people's concern for those far away might have been the most important things we could have done 50 years ago, now it's really too late for that. If I were trying to start a new momentum for change, it would be on understanding the nature of human perception. Why is it that we tend to focus on the short term and the local, when in fact, the fundamental solutions to these problems are long-term and far away? And there's a lot of research to be done. Economists have predicated their recommendations on the assumption that GDP will continue to expand forever. Certainly, it will not. We need to understand the implications of that and try to think through what practical policy recommendations could be implemented in response to that fact. I think about those things, but I certainly haven't come to the point where I'm able to spell out a set of detailed recommendations.

RH: What do you think about the prospects for people to relinquish the idea of maximizing their power over nature, and to accept the idea of "enough" as an organizing principle for a good life? Would that be going against our genes, or just our cultural conditioning?

DLM: To an extent that we don't appreciate in most cases, our species, *Homo sapiens*, and therefore its global society, are the result of 300,000 to 400,000 years of evolution, during which there was high survival value in focusing on the short-term nearby, and not worrying about the long-term far away. As a consequence, that's the mental and the institutional endowment we have now for dealing with questions that, for the first time, really need something else. There are two ways we change: socially and biologically. Fundamental genetic change in our species requires 3,000 or 4,000 years. It takes about that long before a constructive mutation can become fairly widespread. Social adaptation can, at least in theory, occur quicker, so the question here is: what are the prospects for our social system to change in ways that are more congruent with the reality? It's high in theory. In practice, I'm not sure. The dominant issue we face is that the current system is serving the interests of many people very well. There are a lot of people who get wealth and political power from the current system. And of course, when somebody else recommends a change, the people with that power are going to resist, and they have resisted. The fossil fuel industry is one example, but there are thousands. You can't understand the nuclear debate if you don't realize that some people are making millions of dollars by building nuclear reactors.

So, you need to ask not a physical scientist like me, but a sociologist or political scientist about the prospect for changing society. In the past, change happened rapidly under

periods of crisis, not typically during periods of peace and success. As the crises grow we will see what change is available.

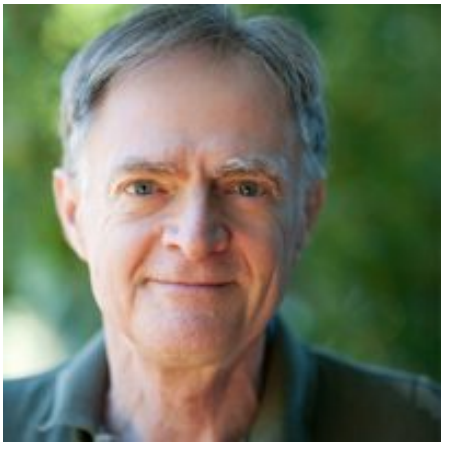
RH: You've done some research into how people change their behavior; have you learned some lessons that might be valuable for young activists?

DLM: I'm an old activist. I'm 80 years old. I don't imagine that I have the capacity to put myself in the head of somebody who's just starting out life and sees 60 or 70 years ahead of them. Nonetheless, I might offer at least a few things for them to consider. One is to recognize that people are motivated by many different factors: wealth, affection, fame, power. And if you want somebody to change, you need to understand what motivates them, and to persuade them that the change you recommend is going to serve their interests. This will be easier if their interests extend to people far away or out into the future. But one way or another, they need to find it to be in their self-interest. I've seldom found somebody who was willing to drop everything and do things I told them to do just because I thought it was a good idea.

Another thing I would say is that, no matter what happens over the next decades, at each moment there's always an opportunity to do many different things. Some of them will make the situation better, and some of them will make it worse. And it's ethically satisfying, and probably even effective in some way, to try and find the things that will make things better.

I don't know what's coming. I look at those downward sloping curves in my scenario, and I honestly don't know what it's going to look like on the ground over the next 40 to 50 years. But my guess is that some people may come through this period not even being much aware of collapse, whereas others, of course, are already far into the decline of their personal situation, their culture, their community, and so forth. Whatever turns out to be the case, I know that the people who have some practical skills, modest aspirations, and a good social network are going to fare better. So, if I were to conclude with any sort of simplistic recommendation, I guess it would be to build up your social networks. Use them as a source of new ideas, support, reinforcement, and satisfaction.

RH: Dennis, thank you again for talking with me, and deep and sincere thanks for all you've done over the years to help us understand our global predicament.



Richard Heinberg is the author of fourteen books including: - Power: Limits and Prospects for Human Survival (2021) - Our Renewable Future: Laying the Path for One Hundred Percent Clean Energy, co-authored with David Fridley (2016) -

Afterburn (2015) - Snake Oil (July 2013) - The End of Growth (August 2011) - The Post Carbon Reader (2010)...