

## **Professor Jeffrey Sachs**

Thank you so much. It's wonderful to be here celebrating. I was reminded that the first time I came to IIASA, I was 35. I reflected that, fortunately, that seemed just about four years ago. But alas, that's not quite true. Time flies and it's wonderful to be at the 35<sup>th</sup> anniversary. I think that the work that IIASA is doing and has been doing for 35 years is path-breaking and I'll say some words about that in just a few minutes. What I would like to do in my brief remarks is to reflect in a synthetic way, perhaps not in a precise enough way, on the world at mid-century—2050, and what choices we have, how to understand the fundamental drivers, and how to understand the fundamental choices that we face. So the fundamental drivers that I would propose are well known, but I think it is worth thinking about them on a single list.

First is economic convergence which I believe to be the most important single economic phenomenon in our world today: meaning the poorer countries growing economically more rapidly than richer countries because of their chance for absorbing and leapfrogging technologies. This is an extremely powerful and deep force at play. It isn't an automatic force; it didn't work during the colonial era; it didn't work for countries that were trapped in failed economic systems, but in a globalized economy of sovereignty it is a very powerful and deep force and it's the main driver for why we have unprecedentedly rapid economic growth right now—it's important to remember that economic growth is at an all time world historical high of about 5% per year, meaning a doubling time of 14 years right now. This is wonderful news if it doesn't wreck the environment at the same time, but it is actually wonderful news in terms of the improvements of living standards being experienced in all parts of the world.

Second is population. It's felt in Europe that population growth is disastrously low but the fact of the matter is, the worldwide population growth remains dangerously high. It is still at about 85 million people added net per year. Though the proportionate rate of growth has come down, most Earth systems don't care about proportions of population, they care about absolute increases, and that remains very, very large. We're on a trajectory now, according to the median forecast of the United Nations (Population Division), to add another 2.6 billion people by the year 2050. That actually builds in a lot of assumed voluntary reduction of fertility; it's a somewhat optimistic median forecast. It could be considerably larger than that.

Third is that, despite convergence, the poorest places in the world, which also tend to be ecologically among the most marginal places in the world, are not experiencing convergent economic growth, but rather are often trapped in a downward spiral of poverty and environmental degradation. So while convergence is the dominant economic force of globalization, the poverty trap is a phenomenon that holds hundreds of millions of people, perhaps a billion, in its thrall still today. And it is also very much linked to conflict, especially civil conflict, and it is a major challenge, unsolved.

Of course, fourth is energy. I won't say more about it than to say that every aspect of every sector of the economy depends on plentiful, abundant, relatively inexpensive

energy, and we have the major challenges of combining that need with environmentally sound energy.

Fifth is the fact that with 6.6 billion people on this 60 trillion dollar world economy and all of the increasing consumption associated with that as well as with convergent economic growth promising a several-fold increase of economic activity in the decades ahead, virtually every major ecosystem on the planet is under threat of collapse. Of course if those ecosystems do collapse, they will undo the economic growth—no question about it. But we have crises both terrestrial and marine, and in the terrestrial ecosystems virtually every ecosystem is under unprecedented multiple assaults.

And finally we have the tendency toward urbanization, very powerful, where we are crossing the historical divide probably never to return. Where in 2008 it's estimated—again by the United Nations Population Division—that the world will be half urban for the first time in human history and by the year 2030 perhaps 70% urban. And this is in many ways good news in my opinion, but it's also fundamental in terms of thinking about sustainability.

What are the key challenges therefore? This is not a scenario that adds up right now, in that the economic development that is aspired to and is, in fact, on track right now in a certain way would lead to a multiple of current economic activity, if you quantify it, of perhaps five or six times. That's what's built into the convergent growth of China achieving 10% per year economic growth. In the 8, 9, 10% economic growth range, that means a doubling every 7, 8, or 9 years. And do that to mid century, even allowing for a relative slowdown as income levels increase, and we're talking about a huge increase of economic activity per person combined with another nearly 50% increase of population being built in to the world economy. So when you multiply the per capita and the population, the world economy is on a desired course—again subject to environmental sustainability of reaching perhaps 300 trillion dollars worldwide, compared to today's level of about 60 trillion dollars.

Now that may seem outlandish to people. How could that ever be? How could we ever want that? But just consider the fact that in the rich world the per capita income today is 40,000 dollars and the average world income is 8,000 dollars. So if the average catches up by mid century with today's high-income world, that's a five-time increase in per capita terms. Then take into account the rise from 6.5 to 9 billion people and you see that it's not outlandish to be thinking in that scale. That's what's "desired" by most of the world. How to combine this with environmental sustainability in all its dimensions? And by that we obviously mean climate change, access to energy resources, access to water resources, habitat preservation, biodiversity management, saving the oceans from multiple forcings of destruction is the big question. And it seems to me that we have an increase of five times at least, and I'm sure one could usefully add many other categories.

First we have to achieve the demographic transition which is not yet achieved, but is already believed to be achieved. The big problem is not raising Europe's fertility rate, that's not the big problem on the planet. The big problem on the planet is reducing the

fertility rates in a voluntary way in the poor countries which remain at 5 or 6 or 7 (% population growth) and having Europe stabilized in population and the same with the US and its natural growth rate. Because we can't actually continue to absorb even 1% population growth rates extrapolated out for decades. So achieving the demographic transition would enable us to stabilize the global population at around 8 billion, if there were a more consequent voluntary fertility reduction in today's poor world than in the median forecast, rather than reaching 9 billion under the median forecast or over 10 billion in what the UN calls its high population forecast, but a rather realistic forecast. In other words we have to take steps which we've long ceased to take in a reasonable way to continue to stabilize the global population.

Second, most urgently, not for the long term, but most urgently now, is breaking the poverty trap of today's still impoverished countries. Today's poverty trap, which grips about a billion people and most of sub-Saharan Africa, claims about 10 million children's lives per year, just to give you a metric which is easy to say as a statistic but is absolutely horrendous when one starts to reflect on it. It also is necessary if we're going to avoid the massive spread of instability and conflict and unwanted population movements around the planet.

Third, is decoupling economic growth from greenhouse gas emissions. This does not mean using less energy—that would be a huge mistake actually; energy is needed for all aspects of work by definition of the physical systems, and it's needed for human improvement, but what we need to do is not to end the increase of energy use; what we need to do is decouple the energy system from carbon emissions and other greenhouse gas emissions.

Fourth, we do have to feed the planet and a growing population and increase the quality of diet, or at least (meet) the desire for a more protein-based diet, and that means a lot more food production. Now to do that consistently with habitat preservation surely means much more intensive agriculture and aquaculture if we're going to save the remaining land habitat of biodiversity, as Costa Rica is doing; if we're going to save the oceans, we're going to need much more intensive food production systems. That again is arithmetic, because extensive agricultural systems are going to take down the remaining [terrestrial ecosystems] and the remainder of marine life.

And then finally I would say that since we're about to add in the next decades 2.5 to 3 billion people to our urban areas, we need a much more sophisticated strategy of sustainable urbanization in terms of transport, energy use, protection against hazards and climate change, and urban design that is conducive to human health not to worldwide pandemics of metabolic disorders such as adult onset diabetes from lack of walking, bicycling, and physical activity. And these are all concrete and unmet challenges today. The main point that I think we lack in our specificity in discussions is that these problems will not be solved through broad discussions of ending economic growth or talking merely about cuts in consumption or using less energy or other things, which have a very nice ring to them but are actually not specific to the problems that we face. And let me dwell on that for just a moment again with energy. Our challenge is not overuse of

energy, our challenge is greenhouse gas emissions or the depletion of specific forms of energy. The world in no physical sense is running out of energy. Solar radiation by itself—incoming solar insolation—is 10,000 times (that needed for) human energy use. There's no sense in which there's a shortage of solar power. There's no sense in which actually there's a shortage of fossil fuel at the scale of two centuries. There's no sense in which there's a shortage of nuclear power. The problems are effective utilization of these energy resources in ways that are economically sound and environmentally safe. And that's a much more specific problem. If we go after this by saying we're going to solve environmental problems by sharply cutting living standards or reducing energy use or using very untargeted ways to address very specific targeted problems we'll never find effective agreements internationally and the kind of cooperation that will be vital to solve the problems. So I wanted to mention very briefly in four areas of these problems, some sense of getting to specifics.

First, on extreme poverty, where I've had the responsibility and the good fortune to advise two Secretaries-General on the Millennium Development Goals. Very specific time-dated and quantified commitments for reducing hunger, disease burden and income poverty. What is required here is something rather focused. The problems in the poorest countries revolve around low agricultural productivity, high disease burden, and high vulnerability to particular environmental challenges such as water and drought or lack of basic infrastructure: power, roads, access to international trade. What we need and what is achievable in fighting extreme poverty is therefore not large rhetoric but rather specific investments in the technologies exist. I don't have time in the waning minutes of this brief presentation to discuss them except to say that every one of the high-disease burdens that afflicts Africa—malaria, for example—has specific, proven interventions that at low cost could reduce the disease burden by 80 or 90% with existing technologies which do not get deployed because the poor who are afflicted by these diseases are too poor to access them and the governments who represent these people are too poor to deploy these technologies out of their own fiscal resources.

The problem is that the rich world (which has ample resources a thousand times over quite literally, because what is needed is one-tenth of 1% of rich world income to address the health concerns) simply doesn't do what it has promised to do. But the chances for targeted interventions exist in an ample way. Similarly, with the environmental challenges we face, I think that what is most helpful and productive for us is to focus on the specific technological pathways that allow us to continue to pursue economic objectives but in a manner which is environmentally sound. Again in the energy sphere, it is low-emission energy sources, whether it's carbon capture and sequestration or nuclear power or wind and solar, there's no shortage of energy resources at low cost. Technologies are enormously promising, but there is a whole ecosystem of policy management to develop and deploy new sustainable technologies, incentive systems, public financing and so forth, that need to be brought to bear to get these technologies into operation. Similarly, with agriculture and with aquaculture there are sustainable options that are already understood or are within 10 or 20 years of deployment that would have profound benefits, but market forces by themselves do not take care of these options because the incentives in a world of an open, free-disposal commons do not cause the incentives for technology development and deployment.

Third, is the point, that our biggest failures are not typically national management, certainly not national management within the rich countries, it's managing the global commons. And it's the plight of the poorest of the poor who lack simply the resources on their own to manage even their own domestic basic needs. So the problems are oceans, air, biodiversity, which are global challenges, and it's particularly the global aspects that prove to be by far the most difficult of all of this.

And finally, there is the problem that is a very basic problem that spatial analysis really highlights—and that is that certain parts of the world are already so marginal in their environmental services provided, or will become so marginal because of climate change and other environmental degradation, that we will need migration and trade as global safety valves or global instruments of sustainable policy if we are to achieve the objective of all being part of a growing prosperity and safety. And we also have no global regime now of norms, much less regulation, on the management of migration, especially in this context, and probably the number one flashpoint of politics in Europe these days is the migration question itself. So this is a major and unsolved problem for 2050.

Let me just say a word about IIASA's great contributions in this and give one suggestion. And that is that IIASA has long been the path-breaker in integrated systems analysis linking human and physical systems. And as far back as IIASA has studies, it's always been about how to feed the planet or where the energy resources are going to come from by mapping a global-scale set of challenges and a global-scale set of projections and forcing a look—which almost no normal scientific enterprise does—at the interface between the physical environment and the human systems. And this has been a profound contribution. But I think we need to go a step further in our work ahead. And I want to suggest four areas where I feel we are not good enough in our analytics right now to handle these problems and where I'm sure that IIASA will help to pave the way.

First is more focused, in-depth, IIASA-style dynamic technology analysis. Too much of our discussion is: How are we going to handle a situation as if we are bound to use today's technologies to solve the problem? None of our problems will be solved with today's technologies. I can tell you that because we are already unsustainable on all fronts with today's technology and yet we're about to absorb a massive increase of human activity. The only solution for sustainable development is deploying new technologies. And that means that we have to put technology at the very center of our analysis. Where it comes from, how it gets developed—the subtle ecosystem, as one could call it, of public and private institutions that bring technologies to bear. The incentive structure on the supply side and on the demand side is crucial, and we need to do a better job analytically of that.

Second, while IIASA is the institution *par excellence* which gave us more mapping analysis earlier on than any other center of analysis in the world. I think we're about to approach a new generation of spatial modeling. And I would put this from my own profession—the economic profession—as the highest need if we're going to understand sustainable development. Overlaying maps of resources and populations is an important step and it was IIASA's great contribution, but now we need dynamic mapping. We need dynamic spatial modeling so that we understand not only where people are living today

but where they're going to live in the future. The dynamics of migration. How climate forcings which are spatially diverse are going to affect the relative productivity of different parts of the world and, very importantly, how trade will have to play a role, especially under climate stress, in allowing food and other needs to be met, because some places that grow their own food now will not be able to grow their own food in the future. They will become too hot or too dry or too stressed in other ways; they'll have to import their food and if people are still living there they'll have to be exporting something to earn that food income. That's normal but it has to be understood, and it has to be modeled, and we need global-spatial dynamic modeling to do that, and we don't have the tools well developed yet for that. We also have to understand, in that regard, forces of economic agglomeration and especially the role of migration. These are just some hints and I hope a little bit helpful suggestions.

I was delighted to accept the invitation to IIASA not only because of the wonderful group assembled here but also to pay homage to this unique institution. It has pioneered the way in exactly this kind of analysis, and I am sure that it will continue to do so in the future. Thank you very much.