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Changes in population means more demand on resources. We need more food. We need more energy. We need more space to live, more space to farm, but it's not just population and the numbers of people by themselves. It's also lifestyle and levels of consumption, and so you have these multiple effects both in terms of the absolute numbers of people but also in terms of how they live that generate a variety of pressures on the environment

Our ecological footprint here in the U.S. is large because of how much we consume. We use energy on a per capita basis much more than really any other country on earth and, those materials, that energy, the diet that we eat, has to come from somewhere. And so that generates, in a sense, more of a footprint of our economy and our population than equivalent numbers of people with lower standards of living elsewhere in the globe.

I'm concerned about the overwhelming dependence on fossil fuel as a source of energy. Most of our actual growth in energy use has come from the increased use of fossil fuels over the last century. Some of that will continue, but if we don't really put the resources, put the research, put the market forces into play to help generate energy from other renewable sources and so forth. We will end up in a state where the environmental costs of energy, as well as the economic costs of continuing to use fossil fuel energy will grow, and grow, and grow.

By far the international consensus of scientists is that there's been a discernible human imprint on the physical climate system, on rainfall and the temperature of the ocean and the earth over the last century. In fact, the best modeling groups in the world now say that you can no longer even simulate the climate with computer models unless you include the human influence on climate.

I co-chaired a study for the U.S. that looked at the potential consequences of climate change and climate variability for the United States. We found that, for example, natural ecosystems are really quite sensitive to the kinds of changes that one might expect in climate over the next several decades to a century. Internationally, the scientific community has found over the last three rounds of rigorous scientific assessment, that the impacts of climate change are potentially much more severe in the developing world than they are for the industrial democracies. This is a very common pattern. Some of the kinds of impacts that we and other research groups have studied include changes in forests, loss of high altitude ecosystems, increased coastal damage from sea level rise, which results then in an increase in storm surge, damage from storms, and changes in rainfall patterns.

Hurricanes are really a tricky story. We couldn't find any evidence in the scientific literature that would suggest that the frequency of hurricanes, overall, would increase. There is some evidence that suggests that their intensity might increase, but that's not a robust result yet. What is a robust result is that particularly as sea levels continue to rise,

even if the frequency or intensity of hurricanes doesn't change, one may be looking at greater risk of coastal damage simply because they're pushing more water around.

Sea level has actually risen fairly dramatically over the past century or so. Most of that, we think, is driven by the thermal expansion of the ocean. It's a very easy concept. When you warm up most substances they expand. The same is true of seawater. And the oceans have, in fact, warmed. We can document that fairly carefully, and calculate, in fact, how much sea level should have risen. The sea levels have risen a little bit more than just from thermal expansion. The additional increase is probably due to glaciers having melted and added additional water to the ocean. The big question is, is how fast will that continue and how big a sea level rise will we get over the next hundred, or even two or 300 years. That's much more uncertain because there's relatively little understanding quantitatively of what will happen to the big, grounded ice sheets, particularly in Antarctica.

Well, there's been a lot of discussion over what one might do. In fact, one of the challenges, I think, that governments and individuals face, is now what do you do? Do you begin to limit greenhouse gas emissions? Do you try to make economies efficient with respect to how much carbon and greenhouse gases they actually generate? Are there personal choices that people can make? There's quite a lot that's been written about this. We've seen, in some cases, governments in Europe, for example, set some quite ambitious goals for themselves in terms of becoming more efficient and actually begin to slow the increase in greenhouse gas emissions.

The last few decades have also seen some fairly dramatic success stories in the U.S. and in much of Europe. For example, in general, the air is cleaner than it has been in large parts of the U.S. There's been a fairly dramatic turnaround in water quality. But that having been said, there are still some very significant challenges. Climate change and greenhouse gas emissions are only one. It has proven in the U.S., for example, to be quite difficult to get a handle on ozone pollution. Also the provision of enough drinkable water, in a large part of the world, is a major environmental problem with very large health consequences for literally billions of people on this earth.

China's a really interesting case right now. China has had tremendous economic growth in the coastal provinces. And it's been well documented that they've had a lot of environmental challenges that have come along with some of that growth. The Chinese right now are trying to figure out how to extend that growth to the western part of the country, which by and large is poorer and not as heavily urbanized as the east. And interestingly, they're paying a fair amount of attention to questions of environmental quality and how to manage water and how to manage agricultural soil. They've actually become quite sensitive to the notion that if you spur economic growth at the expense of environment, that you've lost something important in doing that and you may not end up getting the kind of stability that you would like to have go along with the growth.

What I'm hoping that my children will see in 50 years is an environment that has several characteristics. One is that population growth will have slowed and stabilized; that we'll have an environment where the demands for energy and the use of energy will come from

cleaner sources than they do today; that we'll have turned the corner on greenhouse gas emissions and begin to actually bring those emissions down; and that for most of the world's people we'll have resolved the issues of access to fresh water, lumber, fuel, wood, and food.

If a quarter of the world is living at levels that we would not be willing to tolerate here at home, then one would hope that we have the generosity of spirit not to tolerate that abroad. It's clear that we're in a global economy. We're part of a global community. What happens in China, what happens in India, what happens in Asia, and Europe, and South America affects us. It affects us environmentally. It affects us economically. It affects us culturally. It affects our stability. So it's important, I think, to have a role in affecting those situations for the better.