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The population has grown from about just about three billion not so long ago to six billion, in fact in my lifetime. When I was born in 1959 there were about three billion. Today there are close to 6.4. That's the fastest doubling in history and that probably won't happen again, but we could easily see another three billion people in the next 50 years. And that would take an enormous toll on the environment.

Well, let's start at the large-scale issues. We know that we're already warming up the climate and it's beginning to have an effect on things like sea level and on temperature change. That's very likely to increase over the next 50 years and it probably will begin to affect population in the sense that people will have to move away from problems and towards scarcer resources. And the climate is going to affect all those resources.

One of the things that we're seeing already is that precipitation patterns are changing and people have already moved to places in order to take advantage of water that they use for agriculture and for other development. If you can imagine the western United States losing its water, and it may be doing that right now, places like Phoenix, Arizona are highly dependent on water taken from nearby mountains or underground reserves. Suppose the patterns change and that becomes a true desert. We might have to move millions or tens of millions of people out of those areas and it's probably easier for us, as a rich country, than it would be in a place like sub-Saharan Africa where people have very few resources and when a drought happens, they move by the millions but many of them starve in the process. Imagine a climate change on a large scale and what would happen.

Well, you know if you look at the global scale, we have enough food resources. We've got enough food to feed the world and we will for the foreseeable future but you don't eat food globally. You eat it locally. So again, in areas where there isn't enough precipitation, there might not be enough to provide food locally. People are starving now in places like Ethiopia. And that's likely to occur on an even larger scale. We would all love to see an equitable distribution of things, at least when we're thinking in a humanitarian sense. But in fact, that's not the way humans have ever operated. There have been very few societies where things were distributed equitably or spatially equally. So, looking at those global averages doesn't really tell you who's going to starve and where.

A child born in the United States, depending on the resources you're looking at, consumes between ten times and maybe a hundred times as much as a child born in a place like Bangladesh during its lifetime. So the impact of population in the United States is much, much greater. If you take something like greenhouse gas emissions, the average person in the United States produces five times the global average of greenhouse gases. And, when you compare it to Bangladesh it's more like a hundred times. So population growth in the United States, which is really still one of the major features of the developed world, is a serious issue.

China, while its per capita carbon emissions are growing, may never catch the United States because China's population is going to level off around 2030, whereas the United States' population is not expected to level off ever, or at least as far as we can see. We're growing by about three million people per year, and that's likely to continue at least through 2050, according to the Census Bureau. That's really a serious environmental concern.

Well, it's definitely a concern and in fact, China and India probably can't get to our standard of living because there's just not enough stuff in the world to consume. But the irony is that we used to think of China, for instance, as a place where the population was the real issue, and the United States as the place where growth and consumption was the issue. In fact, it's now reversed. The United States is the country that's expected to grow by 140 million in the next 50 years. China is going to level off but its consumption per capita is going to be the major issue for the environment in the next 50 years. It's rather interesting. When you add 140 or 150 million Americans to the world population, as we said before, it's the equivalent of adding a billion or two other people in terms of consumption, so it's a really big impact.

About 100 years ago Margaret Sanger thought of the idea of public family planning. And she was a very courageous woman and she made it happen. Today the organization that she founded, Planned Parenthood, is in all 50 U.S. states and in almost every country in the world. The results of that phenomenon, making family planning available to women all over the world, has been that birth rates have come down substantially and that women really have a choice on how many children they're going to have. It's a success story, but it's not a complete success story because there's still probably a couple of hundred million women who do not have access to family planning. And it's mostly those situations that are driving the rapid population growth.

Now, what can turn that around? Well, the current theory, it's almost a mantra, is that women's education and empowerment can change that. And I think by and large that's true. However, we have to make sure that family planning programs are still funded and that women have choice of contraception, access to it and education because without those things, the natural condition remains the same. Before Margaret Sanger started -- and in some parts of the world that's the way things still are--women were likely to have six or eight children during their lifetimes and they had a very high probability or possibility of dying in childbirth. That's the way things were when I worked in Guatemala, in the Peten, and in an area where only about 10% of women were using contraception. That's only a few hundred miles from the United States border, and yet it's a world away.

I remember coming down there once after being away for six months, to a village that I used to visit. Out of the hundred families during that time, two women had died in childbirth. This is a reality that will always exist as long as we don't provide family planning to every woman on the planet. And so it's a critical task. It continues. It doesn't get easier because demographers forecast an end to population growth. We're

still talking about eight or nine billion people, maybe ten. And we're still talking about maybe a couple of billion, two or three billion women who every day and every week need access to family planning, contraception, reproductive health. If they don't have that in any year in the future, we'll see birth rates go up. We'll see unwanted pregnancy rates go up and we'll see all the problems associated with that. So we can't relax simply because demographers show you a curve where the population may level off in 50 years. You can't eat math and you can't use it for contraception.

Even where we have contraception, it's certainly not perfect. About half the pregnancies around the world are unintended and that's also true in the United States. And roughly of those that are unintended, women choose abortions in half those cases and that creates a large number of abortions around the world and in the United States. It's about 50 or 60 million abortions per year, globally. And it's about 1.3 million in the United States. So abortion, whether or not you call it a method of family planning, and I don't think it really is - is a very poor substitute. It's a last resort. But it does have an enormous demographic impact. Without those abortions in the world, at 50 million a year, our growth rate would be much higher. The world's population is growing by about 75 million a year and so you can see that 50 million is a very large number. What happens to abortion rights, both in this country and globally, is going to have a large impact on the future population of the planet unless we find a way to provide much better reproductive health and, and family planning. And of course that is always the goal.

But in recent years our interest in providing family planning has kind of flagged and I think the main reason is that there are some countries that are experiencing population decline. Most of Europe has got a fertility rate below two and in some cases closer to one, meaning only one child per family and you need two to reproduce the population. The United States was also below two but it came back up. It was below two between the late '70s and just a couple of years ago. Now it's up between two and 2.1. But those countries tend to be the donor countries and we tend to look first at home to decide what kind of problems there are globally. And when we see that our fertility rate is more or less flat and it's close to replacement, I think it may be natural to lose interest in whether fertility rates are still very high in countries in Africa or like Guatemala, where the fertility rate is five children per family, or the Middle East where it may be six or seven in certain countries.

Population links to environmental trends in a variety of ways. And some of the effects are very global, like climate change. We have not been able to decouple population from environmental change. In general, per capita usage rates on the global scale are about what they were 30 years ago. A lot of countries are doing different things but that's the way they average out. Per capita greenhouse gas emissions are roughly the same as they were in 1970 on a global scale and also in the United States. So what happens to population has enormous impact on climate.

It's very complicated and difficult to relate population growth directly to the disappearance of a particular species and usually you don't have the data until the species is gone. But in general, if you get rid of a species' habitat it's only a matter of time

before it dies. And that's why people often use deforestation as a marker. And I've shown in some of my research, and others have too, that population density is very closely correlated with deforestation rates in a lot of the world. Even though we've had wonderful conservation programs, these have not succeeded in breaking that link. The more people you have in the area, the less forest there is. And when the forest disappears, particularly in tropical systems, most of the species disappear with it. So you have local extinction and eventually you may have global extinction.

Is technology the answer? Well, it hasn't been so far. And in general, I would say that in consumption terms, every gain we've had in technology has been canceled out by an increase in affluence. We have more efficient cars in terms of how much energy it takes to move a unit of steel forward but we decided to get larger cars and drive them more. So we're using about the same amount of fuel per capita. The same is true of houses. In my neighborhood a family of four lived in a house of about 1,500 square feet when it was built in 1940. Everyone has added a second house. They're now living on the back of their original one. They're now living in houses that have 3,000 square feet. They're more efficient, but they've got more gadgets so we're using the same amount of energy overall. And on a macro level that's true of the entire economy. And this is true of the world as well. It's happening in places all over the world. It would be wonderful if technology could break that link but we haven't done it yet and I see no reasonable prospect for doing so in the last 50 years. We haven't done it in the last 35, so why should it be any different now?

Most of the population growth is going to occur in the developing world and there's an affluence issue in the developed world but actually, we aren't using that much more per capita in the developed world. And in some cases we're growing very fast, in population terms. The United States is growing from about 200 million in 1970 to almost 300 million today and then probably 420 million by 2050 and that's going to be a major influence. Concerning the developing world population trends, I think we have a little bit more confidence in the future than we should. The U.N. does projections and they assume that all countries will behave more or less the same. That's an assumption that has no relevance to the past. Often population models of the U.N. assume we'll all hit around two children per family by some date in the future, 2050. But right now we've got fertility rates that range from one child per family to six or seven in the world and I think we'll still have a spread like that by 2050.

Well, one thing I think we need to do is to refocus part of the debate on United States population growth, because as I said, that's an enormous environmental factor. And somehow that's fallen off the agenda. 1972 was the last time we really took a close look at national population policy. John D. Rockefeller, III and President Nixon actually called for this. And a commission suggested, advised that we try to stabilize the U.S. population at 275 million. It said there is no substantial benefit in further population growth for the United States. Well, the commission's findings and recommendations were shelved around the abortion issue and things that the Catholics brought up about birth control. And Nixon of course, in '72 and '73 had other bigger problems on a personal level and we haven't discussed this issue since then. Instead of leveling off at

275 million we're at 295 now, growing at three million a year, and expected to hit 420 million. If we could focus people in the United States on that issue, and also our very limited resources, our, our coastline, our water, etc., I think they would also begin to consider the issues of the planet as a whole. That's really what happened in the '60s and '70s. We were concerned about our own population growth because we had fertility rates that were three or four coming out of the baby boom. And then we had these environmental books like *Silent Spring* and then Paul Ehrlich's *Population Bomb* and everybody got very excited about the future of the planet, but they were thinking about it in terms of the future of America at the same time. I think we need to get those two things back on the same track and I think they really do fit together.

I think that given past experience we have to be very careful about a one-size-fits-all theory. For a while development was the best contraceptive. More recently it's women's education and empowerment, and they don't say the best contraceptive anymore, but that's the subtext. But in fact, we found looking back that there was a lot more divergence in terms of experience than the theories ever explained. So, really we have a diverse world. Different countries adopt different practices. Women's education might be the right answer in one place, but it might not be the whole answer in another place. So, if the concern is population leveling off at some point and coming in balance with our resources, I think we have to remain very flexible and, and look at a lot of issues and not get trapped repeating the same mantra, even in the face of evidence to the contrary.

In Egypt, for some reason, the fertility rate has leveled off between three and three and a half children per family. And that's across all socioeconomic brackets. We all assumed that it was going to continue to drop. We may have it something like simple social preference and maybe that social preference for children will never drop to two. We just sort of assume that. Kenya is another place where the fertility rate decline has stalled. We don't yet know the answers. That may be an economic collapse of some sort. But the point is that you just can't pick up a solution and say this is the one thing that'll cure all our problems. It's great for politicians to say that but that's not the way it's worked in the world.