

Bob Engelman

Population Action International

State of the Planet

Human population has had a long history of growing from low numbers to the numbers we have now, which are approaching probably six and a half billion people. Over that time we've occupied more of the planet. We've used more of the planet's natural resources, renewable water, wood from forests, fish, the soil we use to grow our, our food.

Overall, as the scale of the human presence of the planet has grown, the scale of the use of those resources have grown and the impacts of that have spread and grown on the planet. And the logical impact has been that there have been more environmental problems associated with that use.

On top of that, as we've grown we've increased the technological sophistication of our civilization and that has resulted in the use of fossil fuels for energy, all kinds of machinery, chemicals that we've released onto the land so that we're actually changing the texture, the nature of the atmosphere, of the soil, of the water that we deal with. This technological change in combination with the greater numbers of human people has had a progressively bigger impact on the planet to the point that just in the last century, and especially the last half of the last century, we've really seen tremendous pressures, tremendous tensions and kind of breaking points, thresholds that are being crossed in terms of our, our renewable water, in terms of the atmosphere and its impact on the climate, in terms of the fisheries around the world, uh, and a lot of this is, is, uh, has been degrading rapidly and is posing real problems for a long-term use by the human species.

Well, we know the population is growing. Beyond that we can't really know the future because, of course, it's the future. But demographers can make a pretty good guess as to what the ranges of likely futures for the human population—at the moment we have, uh, just under 6.5 billion people on the planet and we're likely to be heading toward, uh, eight or nine, possibly more, by the middle of this century. Uh, it depends on a lot of things, however. Uh, it depends on how many children, uh, women have on average. It depends on whether, uh, death rates increase, which is certainly possibly, or continue to decrease, which is also, uh, possible. But we're looking at a range of a, an addition of perhaps a couple more billion people on the planet in the next 45, 50 years. That's kind of the best guess by demographers who look at these things.

Well, it means there's going to be a lot more strain, particularly as people as increase their standards of living. It means that we're going to have to work a lot harder to make sure the Earth is a compatible place for human presence. Uh, it doesn't mean that we're going to face a disaster. Uh, it just means the challenges are going to keep growing. They're not going to go away. We're not going to be able to ignore these issues, as we

seem to have mostly ignored them over the past few decades. Uh, a number of things are likely to come to a head.

Uh, we're likely to see more definite climate change and perhaps in ways that really demonstrably makes it more difficult to live, particularly in the poorer parts of the world, for farmers to get the crops they need to feed people, uh, for example. Uh, we're likely to see impacts on health. We're likely to see serious water shortages beyond what we've seen already, uh, in many of the tropical parts of the world, in parts of Africa, in parts of western Asia, even in some parts of Latin America.

These things are beginning to crop up now. We see them in lots of newspaper headlines, uh, but the, the attention of the world has not yet been grabbed enough by these, uh, to really focus on the connections between population growth, economic growth and the environment. I think we'll be seeing more of that, certainly in the next 40 or 50 years. There's also the possibility that it could get really bad. Uh, there are things, they're wild cards, they're things we, we can't really be sure about. Climate is certainly a wild card. We don't really know what kind of climate change we'll be seeing over the next 40 or 50 years. We can hope it will be gradual, incremental, uh, a little bit warmer here and there, uh, a little bit harder rains here and there, but based on what we've seen over the last five or ten years and what some of the models show, uh, it could be, it could be much more than that. We just really don't know.

Similar with water shortage, 40 or 50 years ago water shortage wasn't on anybody's radar screen. Heck, 20 years ago it wasn't on anybody's radar screen to speak of. It's only really recently, in the last couple of decades that it's popped up as a significant issue for health, uh, for well-being generally, for, uh, the sustenance of, of, uh, irrigation based agriculture, for example. Uh, that's typical of the way a lot of population and environment interactions are happening in the world. Things just get gradually a little bit more stressful in an ecosystem or an environment, uh, but people figure they can live with them. Things are a little more difficult, a little tougher, but people think they can get by. And then suddenly some kind of tipping point is reached or some sort of natural threshold is reached where something shifts in the climate, or where suddenly water that was available for generations just isn't there anymore; uh, where a forest that seemed to have been healthy suddenly is really ill; where a fishery that had been fished for hundreds of years suddenly collapses. Uh, these things have been happening a lot over the last few decades and based on current trends, and absent of much greater effort by governments and societies in general to, to, uh, step up to these challenges, I think they're going to happen more in the next few decades of this coming century.

One of the results of the technological advances that, uh, we've seen over the last 40 or 50 years is that the average person has a much bigger impact on the planet and on her or his immediate environment than tended to be true in the past. Uh, the energy that we use, for example, uh, author Bill McKibben compared us to, uh, uh, carrying around the equivalent of a sperm whale-sized balloon around us in terms of the amount of energy we require to air condition our houses, to get to work in our sport utility vehicles or whatever, to simply live the way modern Americans live. This particular energy balloon

that we carry around, uh, let's call it an ecological footprint. That's a different image but people often refer to the, the natural resource footprint that we leave around the world, the amount of space we need to give us all that need to sustain our lives and our comfort, uh, is substantially larger in an industrialized country than it is in a developing country and the place that it's probably the largest in the world, overall, is the United States.

Uh, Americans use a tremendous amount of energy, a tremendous amount of natural resources, more even than the average European or Japanese, or, um, certainly more than the average African or South American or Asian. On top of that we have nearly 300 million people so the, the ecological footprint of the United States as a nation, uh, far exceeds that of any other country and, and far exceeds that of our proportion in the world's population. Uh, there is really a huge variety, a, a huge diversity or spread, uh, of the ecological footprint of very wealthy countries like the United States and very poor countries such as, uh, some in sub-Saharan Africa or in South Asia to the extent that Americans use 20 or 30 times as much paper, uh, 20 or 30 times as much carbon-based fossil fuels like petroleum and coal.

On average, for the average American as the average, uh, citizen of, say, Niger in, in Africa or Nepal in south Asia. Now, one consequence this is, of this is that we need to think about how the use of these resources is going to be increasing as people get gradually wealthier. That's something that we want to happen. Who could deny people, uh, the right to achieve the aspirations they have to live like American have. The somewhat frightening prospect, frightening because of its ecological impact, although hopeful in terms of the impact on, on reducing poverty is that, uh, people will, uh, increasingly live like Americans live all over the world. We're already starting to see that in China and in India and one consequence of that is that the price of petroleum has been, uh, climbing quite rapidly just over the last, uh, few months, at least as I speak right now. Uh, who knows where it will be, uh, in the next year or two but it has been rising dramatically because of increased demand in China and increased demand in India. We tend to think of those as developing countries. We tend to think of people there as living much more simply than we do. But the reality is they are developing. They're in a process of development. And what are they developing toward? They're developing toward achieving lifestyles that are comparable to those we take for granted in the United States, or in parts of Europe or Japan. This is the development process and it's a good process in that it reduces poverty around the world. It allows people to live good lives and we all want that to happen.

But ecologically, it's going to create an enormous challenge that we're all going to be facing and our children are going to be facing for the next several decades, particularly as population continues to increase. That one or two billion people increase that, uh, I mentioned earlier, uh, may seem manageable given that we already have more than six billion people on the planet but we don't really know what will happen as a result of that increase in combination with the, the increase in consumption, the increase in economics, uh, the increase in the use of natural resources, um, that will be accompanying the increase in population.

In theory we have enough water now to take care of everyone's needs, uh, in the same way that we really have enough food right now to feed everyone. But water is different than food. Water does not, uh, travel easily around the world the way, say, petroleum does, or microchips do, or the way, in fact, food does. You really have to have water where people live and there are now a number of areas around the world where water is beginning to be in acute shortage. To some degree the shortage of water is masked by the fact that countries that are short on renewable water, that is water that is constantly renewed by what's called the water cycle – rain, snow, uh, falling on the, on the Earth's surface every year, the rivers that carry rain into a country. To some degree, countries that don't have enough water from the sky are getting by on the water they have underground.

Saudi Arabia, Libya are classic examples of this. They aren't feeling the pinch of water scarcity right now because they have so much what's called groundwater, deep in the ground. That water was laid down by rain that fell back in the Pleistocene and it's still there and they're mining it the way they mine oil. Once they use it it's gone. Now, there's enough water for those countries to last for several decades, maybe even more, but when that water is gone they will be once again dependent on the water that falls from the sky. And there's no way their populations, as they currently are let alone, uh, in the future would be able to get by just on the water that falls from the sky in those desert areas. Maybe by the time that groundwater is gone somehow we will, desalination will come to the rescue and we'll solve that problem by desalinating ocean water but desalination has a number of problems as well.

Water scarcity is going to be increasingly a problem in the world until really population stops growing and levels off or begins to gradually decline and the reason is simply that people have to have water to live and it, it can't be substituted. There's no substitute for water in the sense that there might be for petroleum, or there might be for cotton or various natural products. You have to have water to, to survive, to live.

Health depends on a plentiful supply of water. And people in industrialized societies require vast amounts of water. Uh, we might come up with some good technological solutions. There's lots of fantasies about, uh, harvesting, uh, droplets from fog, about towing icebergs, uh, from polar areas to tropical areas. Um, there probably are some successes we might be able to have in these areas but overall, if you look at the growth of population and you look at where the water is and how much water there is, it's hard to avoid the conclusion that we will be seeing some really scary amounts of water scarcity in key parts of the world, uh, in the coming 30 or 40 years.

The good news about food is that we're really good at growing it. Uh, particularly, the best farmers in the world are, are really good at squeezing, uh, a high yield of crops out of a small area of ground. And, in a sense, we're better all the time. Food, uh, has a lot of science behind it. Food production has a lot of science behind it and our ability to, to get higher yields out of the same amount of ground is, is constantly improving. That's the optimistic sign and it has enabled us to, uh, keep up with world population growth, really since, uh, Thomas Robert Malthus and others began predicting we might run out of food

a couple of centuries ago. So, for many people this makes us pretty comfortable about food.

Uh, we have enough food to feed, uh, the world's population right now. The real problem with hunger, and there is a lot of hunger of in the world, is essentially a problem of poverty and of maldistribution of food. But there are problems with food and there are things about food that give us reason to be worried about the future. One of them is that it's not clear we're producing food in the world sustainably. Uh, it's not clear that we're maintaining the soil base of agriculture in a healthy, uh, way that, uh, can survive to grow food, uh, not just for today's people but for all the people that will ever live on the planet. Um, the U.N. Food and Agricultural Organization has said, uh, that primarily the cropland that is now used to raise the world's food is the exact same cropland, give, give or take a few hundred acres here or there, or a few thousand, uh, that we'll be relying on for food for the future of the human species as long as we're on the planet. Uh, so we need to take care of it and it's not clear now that we are taking care of it.

Uh, tens of millions of tons of topsoil are lost every year to soil erosion. The quality of the soil, the nutrient value of the soil, the biological value of the soil, is being degraded to the extent that just since World War II an area of land about the size of the United States and Mexico has been almost lost to productive agriculture because it is so degraded. On top of that, we need abundant water supplies to produce the food the world will depend on for the rest of humanity's future and, as I mentioned earlier, water is a question mark. Will there be enough renewable fresh water to irrigate cropland and to grow the food, uh, human society will be needing over the next decades or centuries.

One of the things that happens as water becomes increasingly more scarce is that farmers find that water is more valuable to nearby cities, or by industries, and they sell their water rights to people who live in cities or to industries who need to produce various things. Um, this is fine for the farmer. It might make them more money than growing crops in some cases but it's not necessarily good for food security. On top of that, we face the reality that food production per capita, that is for each person on the planet, has been fairly stagnant since about 19, the mid-1980s or 1990. It has not been increasing dramatically. And that's a little bit scary because we like to think that we'll always keep ahead of population growth. The reality is is we've just barely been keeping up with population growth, uh, for about the last decade and a half, which makes one wonder whether we'll be able to continue to keep that trick up, uh, for the next decade or two decades, or five decades, or centuries. My personal hunch is that we probably could do it, uh, but only if we take time now and make the effort to really put agriculture on a much more sustainable footing and only if we attend to the growth of population and see if we can't, uh, through positive population policies and progressive population policies see that the world grows on a slightly lower trajectory, uh, than what the U.N. demographers are expecting right now.

One of the clearest connections between population and environment is the connection between the number of people on the planet and the number of species, uh, nonhuman animal species and plant species that are able to survive on a planet that increasingly is,

uh, being taken over not by human being, *per se*, but by the ecosystems that are essentially there to support human beings. Uh, more than 40% of the photosynthesis that happens on this planet, that is more than 40% of the energy that plants are converting into plant material from the sun, is used for our purposes, uh, directly or indirectly for human purposes. Uh, can that double without, uh, basically crowding out much of the rest of nature? There's a real question about whether that will be possible. Hum, human beings, because we are all over the planet, uh, we're more numerous than ever and our demands for land, uh, for water, for energy, for places to dispose of our waste, um, is increasingly making it difficult for other species to survive. And as a result, the rate of extinction of species, or the rate at which species are, in effect, getting committed to go extinct, that is, they may still be with us but they're on a track that is extremely hard to imagine surviving for much longer is really thousands of times greater than it is under natural conditions. It's true that species have always gone extinct. Long before human beings ever emerged on planet Earth, uh, species went extinct at a, at a regular pace. Most of the species that have ever lived on Earth, uh, went extinct for reasons that had absolutely nothing to do with human beings because it happened before we were around. But what's happening now is that a...

What's different now, uh, from the past is that the rate of animal and plant extinctions is far higher than it was in history, or certainly in prehistory, and that has everything to do not only with human numbers but the way that we use the land, the way that we settle the land, the way that we grow our food on the land. Uh, there's a great tendency for human being to essentially spread out over the landscape and to be very unfriendly about the coexistence with, say, large predator species like lions and tigers and bears, oh my. Uh, they have to go where, when we want to live someplace. We, we aren't compatible with them and the reality is they have gone. Uh, the only grizzly bear in California is on the State flag, um, and that's true all over the world. Um, the sad thing is that isn't just a matter of the, the big fuzzy mammals that we want to watch in zoos and hope will be around for a long time. This is a matter of all kinds of plants and all kinds of animals, insects, things that we think we don't really care about but that are lives are actually dependent upon. Um, these things disappear as we not only spread our cities out but as we carve up little pieces of forests and little pieces of, uh, wetlands and little pieces of, um, marine waters for human purposes and increasingly isolate the rest of nature, the nonhuman animal species and the plant species in the little islands of nature that get progressively small as our settlement increases to the point that eventually, even if there's still something there, these species can't really thrive and eventually they can't survive and they blink out. Uh, that's happening all over the world as human beings increasingly occupy the landscape. Do we care? Why should we care? Uh, we may still be able to see some of these animals in the zoo but we're not likely to see as many of them in nature. But it's a, a bigger picture and a bigger problem than that. People often ask, well you know, isn't that something that only the rich really have the luxury to afford. If you're poor why would you care about biological diversity? What difference does it make you? The reality is is that the poor of the world depend on biodiversity really more directly than the wealthy of the world. Eighty percent of the developing world is dependent upon traditional medicine and that traditional medicine is based on the plant and animal species around them. In many parts of the world 60 to 70% of the protein that people consume

comes from wild food sources, food sources in forests, food sources in the waters immediately around them and not certainly from the grocery store or not even from livestock they have immediately around their village. Uh, there are parts of the world where, uh, just about everything people do depends on the existence of, uh, wildlife around them. Um, soil erosion, uh, floods increasingly are a problem in tropical areas where rains, which may be made, uh, stronger by, by human induced climate change, are washing soils down, uh, mountain slopes and burying villages and killing people. One of the reasons this is happening is that the forests that were once there to hold on to that soil are no longer there. And the soil that used to be kind of a sponge that could absorb all sorts of water and then release it gradually down a stream so that farmers could use that water to irrigate their crops suddenly are becoming hard-baked hardpan and they just shed all the water immediately and it wear, wears the soil down and breaks it down and, and, uh, inundates villages.

So biodiversity is something that really people need to live in balance with everywhere forever. It's not a luxury that we can simply take for granted and not worry about. And as population increases both locally, uh, and as it increases in the world at large, it increasingly is more and more difficult to save, uh, the natural species that were there to begin with. On top of that, as we become more populous, as our economy grows, we become more mobile. We're traveling all around the world by airplanes. We have freighters that are carrying our goods every which way and all kinds of species are hitchhiking onto ocean freighters and then stepping off the boat just the way immigrants have for thousands of years. Uh, are into new places where they've never been before and suddenly are taking over the places where they have no predators so you have zebra mussels and kudzu and a world of earthworms that, uh, didn't grow in that soil but grew in the soil of some other continent and are now taking over in very, very unhealthy ways. So there's this mix of species that's having a, a terrible impact on the natives that are, um, on all the world's continents and are struggling to survive. It's a mixing bowl effect that we don't really know what the result will be but it's probably not going to be a friendly result for, uh, for long-term human health and well-being. And it's certainly not a friendly result for nature. Similarly with water, as we use more and more water, we take most of our water from rivers. Uh, that's where water tends to come from in developed countries and in developing countries. And as we draw down those rivers for our own purposes, to put water in our houses, to irrigate crops, to run factories, progressively those rivers, uh, have less and less room for the aquatic species that live in those rivers. So fishing becomes more and more difficult, um, and just in general the, the harbors or the wetlands or the ocean waters that those rivers feed are biologically impoverished so we see that result as a well, as well. And on top of that, climate change is, seems to be exacerbating the hydrological cycle of the extal, extent that we either have huge inundations of water that flood the streams, incidentally filling them with silt, or droughts that draw the streams way down to the point that all kinds of, uh, plant and animals are effectively killed by the combination of all those circumstances. All of these relate to human population. All of these relate to the intensity of the human use of natural resources that we all depend upon to survive.

Surely throughout history there have been some very positive aspects of the rise of cities. Um, they make life exciting. Uh, they bring economies of scale economically. Um, they're centers of culture. They're really responsible for a lot of the cultural development that's happened over the world's history. Um, overall, I think most human beings, whether they live in cities or not, would say cities are a human success story. It's one of the wonderful things about being human that, that, uh, many of us live in cities and many of the rest of us can visit them once in a while. Um, but like any process, there's sort of a life cycle to, uh, the growth of cities and we may be reaching points, certainly in a number of cities, uh, where they simply are getting too big, uh, too fast. There are a lot of environmental risks to, uh, grouping large numbers of people, say, especially more than ten million people in cities. When a city gets more than ten million people it's known as a mega-city. And the problem is chiefly one of concentration, of impacts, concentration of behavior. Uh, on the one hand, by living in cities people, in theory, free up land that they would otherwise be sprawled over and, uh, we know that sprawl has its environmental consequences.

On the other hand, by concentrating in huge areas, uh, huge numbers of people in, in, in concentrated areas. Let me say that again. On the other hand, by concentrating, uh, huge numbers of people in relatively small areas we're also concentrating our processing of natural resources in those areas so that there is intense air pollution experienced in cities, uh, that isn't necessarily experienced in rural areas quite the same way. Uh, our wastes are deposited in, in one, finite point, say, on a river, uh, where it might have a devastating impact on the, in the life of that river. Um, the, the effect on the climate, uh, tends to be there is very little plant life in a city, aside from maybe a few parks. Uh, the temperature of the city rises in part because of the pavement is simply baking. And particularly in poor cities and in very large cities in tropical areas, the temperatures in cities are several degrees Fahrenheit, uh, or Celsius, higher than they are in surrounding areas so people tend to suffer more from extremes of heat. Uh, there just are a number of environmental problems with cities.

On top of that, there's the institutional infrastructural problem of how can you accommodate so many people, uh, in a way that gives everyone decent housing, decent transportation networks, an effective system of removing wastes safely, uh, getting clean water to people in cities, uh, making sure that people have access to sanitation. And the reality is that many of the largest and fastest growing cities right now are not succeeding at that. They're not succeeding at providing what people need to thrive. It used to be, for example, that one of the things that drew people from rural areas to cities was the fact that health was better. There was access to healthcare. Your child was more likely to survive infancy and childhood in a city than in a rural area. In many parts of the world that's starting to reverse now, to the extent that infant mortality, uh, childhood mortality, uh, has worse indicators in urban areas than it does in rural areas. That's probably not sustainable. If that trend continues that probably is going to have an impact on how many people are going to want to live in cities. In addition to that there's social and economic, uh, strains and challenges to governments that many have not been able to, uh, to rise to so far. Um, such as how do you employ all the people in a city? Cities tend to draw young people. They tend to draw people from rural areas where farms are increasingly

smaller and there's just little opportunity to make a living on a farm. So often second sons, or second daughters, or third or fourth sons or daughters, who aren't getting access to that land will say, "I'm going to go to the city and see if I can't get a living there because it's the bright lights of the city. There's got to be opportunity there. And what's happening all over the developing world is that it's not as easy as it once was. Uh, their uncle might have found a, um, a job..."

If I had to use one word to describe the environmental state of, uh, the planet right now, I think I would say precarious. Uh, it isn't doomed. It isn't, uh, certainly headed toward disaster. Um, but it's in a very precarious situation right now and much of which way it tilts, toward greater sustainability, toward greater human well-being, toward greater environmental well-being, uh, depends on decisions we make, uh, right now.

There are a lot of strengths. We're a really smart species. We're very good at understanding our predicaments. Um, we've shown an amazing ability, uh, to either muddle through often, or to innovate our way out of severe problems. And that gives me a lot of hope.

On the other hand, we seem to have trouble attending to slow growing, long-term, systemic trends that threaten our long-term survival such as the continuing growth of the human population, such as the slow but potentially accelerating degradation of the environment on which we depend for our lives and our well-being. Uh, environmentally, most of the trends are not terrifically promising at the moment. Uh, the atmosphere is becoming more filled with greenhouse gases every moment. Uh, the temperature of the Earth is rising. Species are increasingly threatened or going extinct even as we try to study them. Water is progressively more and more scarce as more and more people depend on clean water and sanitation to survive. Uh, fisheries are increasingly, um, in, in dire or threatened or collapsing states. So we have a number of environmental problems. We're working on quite a few of them. The governments of the world are talking about them, trying to do something. But there has been a lot more talk than action. When all is said and done, a lot more is said than done on most of these problems. That's going to have to change for the situation to get better. There is one area where I actually see a lot of hope in a current trend and that is the direction of population growth.

The reality is that although population is sometimes seen as a doom and gloom kind of story, it's actually been a positive trend as far as the environment is concerned, at least with respect to the way and the speed at which it's growing.

The growth of human population is slowing down. There's a really good possibility that population growth will actually end in this century, uh, possibly in many of our lifetimes, uh, not as a result of catastrophic increases in death rates, which we need to work to prevent, uh, but as a result of more and more women and men being able to have children when they want to have children because the reality is they want to have fewer children than their parents and grandparents did. That trend is tremendously positive.

Uh, people used to have five or six children, uh, in a family poor, per average woman, uh, in my own lifetime, in the 1960s or so. Today it's more like two or three and when it gets down to two we'll be on a track to stabilize human population. This isn't the result of population control. This is result of governments and healthcare providers and nonprofit organizations making available to women and men the means to basically plan their own pregnancies and have children when they want to have children. It's also the result of better education, of more economic development, and a gradually improving status for women themselves.

These are all areas that governments should recognize, should promote, should not be distracted by, by worrying that maybe there'll be too many old people in the world or in their own societies and that we need to actually birth rates when certainly from an environmental perspective the last thing you really want to do is somehow try to artificially boost birth rates. Uh, these are really good environmental trends.

Uh, so from that perspective I think there's a lot hope that if birth rates continue to fall, based on women's own intentions for their own childbearing, and if we pay greater attention to the environmental problems we face, if we collectively, as a family of nations, look at these issues and try to work on them together, I think there's a really good chance that we can turn things around. If we just try to muddle through, if we focus on just continually, uh, living more prosperously and more comfortably and not worrying about other countries or our neighbors, um, then I think it's sort of scary what might be happening over the next 40 or 50 years.

Uh, one of the exciting for me, having traveled in developing countries, um, and, and studies this phenomenon is that increasingly the organizations that are working to improve the environment of remote, rural areas around, say, parks and other protected areas, are hearing the voices of women who are asking to make family planning more available to them as they also improve their own agricultural practices and learn how to feed their families better. Uh, all over the world there are partnerships of nonprofit organizations, nongovernmental organizations and communities to find ways to more sustainably farm, to more sustainably use the resources of biologically wealthy areas.

And increasingly part of this is a focus on those communities and those families, to improve their health. And there's a realization that if you're going to work on people's health one of the most important things to work on is to enable them, uh, to choose when to become pregnant and have children when they want to rather than to simply rely on fate, or chance, or God's will, or whatever. One of the things that's interesting about, uh, marginal rural areas around the country is that they're one of the places that the demographic revolution, you might call it, is happening fastest. Everyone in these areas knows that it's possible to plan your family. Everyone in these areas, really everyone in the world, now knows that contraception is a possibility but many people in these areas, perhaps most of the people in these areas, don't actually have access to those services. There isn't a health post nearby. There isn't a good health infrastructure. So those groups that go into these areas to try to help communities help themselves self-develop by learning how to farm more efficiently, to get clean water for their children so their

children don't die of diarrhea, those organizations helping them with that can also say, "Sure, we'll help you if you want to get some reproductive healthcare, have healthier children, healthier pregnancies, not die in pregnancy and childbirth, and have the family size that you yourself want to have."

Uh, this is one of the frontiers of work on population around the world and it's in a very exciting area and it's showing a lot of success stories right now.

Yeah, it's, it's a kind of an irony because one of the reasons that population has grown over the last, uh, few centuries as it has is because we've done such a good job of enabling children to survive. It isn't that people get older. It isn't that we've extended life expectancy from, say, the 70s to the 80s over the last few decades. It's really that we've enabled so many children who in earlier centuries would have died before they ever reached their own reproductive age, ages, to reach those reproductive ages and become parents themselves. So it almost seems today counterintuitive that by helping children survive now, that we can actually slow population growth rates down. But the reality is that's an important piece of the puzzle and it happens because when parents see that their children are all surviving, they realize they don't need to have so many children to have a few survive.

And gradually, over time, as most children do survive, parents increasingly want to have smaller families, make sure those children are healthy and are well educated, are able to go to school. Those children then go on and have small families themselves and their kids survive. It's really an issue of health overall. When people get access to good healthcare and when they learn good health practices and when they learn how to stay healthy themselves and to keep their children healthy, population growth rates go down. And they go down for the best of reasons. Even though more people are surviving, even though fewer people are dying in a population, many more, many fewer births are happening so that the, the net result is that population growth rates actually go down.

Bangladesh is one of the success stories of the effort that's been going on really since the 1960s to make good quality family planning and reproductive healthcare available to everyone who wants it. Uh, when people started working on health in, in rural communities, uh, in Bangladesh in, say, the late '60s, early '70s, family size was up around six or seven. Today it's, it's half that, uh, and, and still gradually trending down.

It's a little bit more than three children per woman in Bangladesh. Uh, and it's in part because of a major government commitment to programs that allowed women to, uh, choose the timing of their own pregnancy and because a lot of money was poured in by international donors, uh, by private philanthropic organizations and a real commitment by healthcare workers, Bangladeshi healthcare workers and also healthcare workers from, uh, countries all around the world to help Bangladesh pioneer what were really some, um, initially some very experimental programs about how to do this effectively.

Uh, Bangladesh is, is really a pioneer in the whole family planning movement but it's not the only country where this has happened. Family planning has been an incredible

success in places from Bangladesh to Sri Lanka, to Tunisia, to Colombia, uh, to Mexico, um, to countries really all around the world, many developing countries that, where there has been a government commitment to make family planning available to everyone that wants it, to couple that with improvements in healthcare generally, to make sure girls go to school, into or through secondary school.

When these things have all come together fertility rates have plummeted. They've gone from five, six children per family to sometimes as few as two. Iran, paradoxically, a predominantly Muslim country, uh, that we tend to think of as still having very, very large families is now to the point, point where really the average family in Iran is having about two kids, quite similar to the United States.

Again, government commitment, big improvements in healthcare and a real interest by women and their partners in having small families. Uh, Bangladesh probably in some ways led the way, uh, to enabling that to happen in quite a few other countries, um, but it's happening all around the world right now.

Educated women improve their local environment and they indirectly help improve the global environment through two main pathways. Number one, they become better stewards of their own local environment. They become better stewards of their own natural resources. As they become educated they come to understand how closely their own lives and their children's lives depend upon the cleanliness of their water, the abundance of wildlife around them, the health of the forests, uh, and the fish in the waters around them. And they learn how to take better care of these things. They educate themselves. They educate their husbands who often are ignorant about these things. They educate their children about it. So they have this direct impact on their local environments. They just do a better of, uh, taking care of their natural resources and disposing of the family, uh, waste in, in healthy ways. Uh, secondly, educated women, and this has been demonstrated in every, every continent, just about every country in the world, uh, tend to have pregnancies later in life, which helps slow population growth, and they tend to have smaller families. Their pregnancies are much likelier to be intentional so they tend to have the family size that they wanted to when they began. And they tend to get jobs. They tend to make a positive contribution to their family well-being. And in doing that, they tend to be environmentally more conscious of their own impact on the environment. They tend to become leaders in their own societies and eventually at the level of their own nations and in their national and their local governments. They become more civically active. All of these things tend, because of the way it seems, women view perhaps maybe a little more holistically than men – I'm not sure anyone's figured this out – the connections between nature, natural resources and human well-being. So it's a net positive effect through their behavior, their demographic behavior and also just their living day to day behavior, and probably through their political impact on their societies.

One of the more exciting development ideas that's, uh, had a big impact not only on women's lives but indirectly on population and on the environment is the idea that, that banks and institutions that provide credit to poor and marginalized communities and people and populations should work to direct a large proportion of that money, that

credit, directly to women. Make them responsible for the loans. Make them responsible for what they do with the money. Make them responsible for repaying the loans. This is often called micro-credit, although it doesn't have to be micro. It's getting to the point now where it's beginning to be macro-credit for women. But the key is that it, that, that women gain the financial resource. They gain the money, the credit, and they be empowered to decide how it's going to be used and they take responsibility for repaying it, often in a collective or group. When this started happening, it was actually pioneered in Bangladesh, uh, by a bank called the Grameen Bank, um, in the '70s and it's taken off like wildfire since then. Uh, and one of the first things that people who began this innovative and somewhat high-risk experiment with credit, one of the first things they discovered is that women were actually more likely than men to pay the money back. There were higher repayment rates from women than there actually were men. Another discovery they made is that the money was much more likely to go directly into enterprise that helped families than it was in the case in men. Women were taking fewer risks. They certainly weren't squandering the money on gambling and alcohol, not that most men did that but it sometimes, uh, had happened, um, and tended to go into safer but in the long run more productive investments that had multiple financial benefits. And it also made women very conscious of themselves as people of power, people of opportunity, people of ideas. And interestingly enough, research that was done on their own reproductive behavior quickly found out that women who were getting these loans were likely to have fewer children, were likely to have more intentional pregnancies and were likely to, to have healthier families as a result. So micro-credit is one of these win/win strategies that actually makes me really hopeful about the future of population and the environment. When we employ these things, when we know what we're doing and can put a, a, a healthy amount of resources into these areas it tends to have multiple benefits that kind of ripple out from a women to her family, to her community, to a nation, to the world as a whole.

State of the Planet's Wildlife

One of the things we've been doing for years is trying to understand better — to do research on, to write about — how human population dynamics affect wildlife population dynamics. We're concerned with where human beings are moving to, how fast (human populations) they are growing in various areas, how this affects the areas where wildlife are richest. We are trying to assess as best we can what is the future of wildlife in a human dominated planet. A lot of that of course has to do with how fast, how much human population grows and exactly where it grows. So we do a fair amount of mapping work. We look at population projections.

We look at where species are threatened. In addition to that, we also work on programs that go into communities in developing countries that are close to protected areas or around protected areas, wildlife refuges, and parks. We try to make sure that people have the means to manage their own natural resources with the hopes that it will make it more likely that wildlife will survive. But, we also try to make sure that people have the means to plan their families and have the number of children they really want to have in good

health. Very frequently people in these areas have quite large families, which impacts the wild land around them. Often they don't really want to have families as large as they're having. So family planning and reproductive health is actually an important part of the work we do, with the hopes that over the long term that will make it more likely wildlife will be able to survive.

When you think about farming, which is all about feeding people, the whole nature of farming is that it's the human management of land in such a way that the only species that are going to be on that land are the ones that contribute to human food supply. The last thing farmers want is wild animals on their farms. So for the most part wild animals or anything wild on a farm are fenced out or poisoned or shot. And as more and more of the world is taken over by land that's needed for farming to feed a growing population, the land that's available for wild animals to thrive on is progressively less and less.

Moreover, the way this often works is that wild areas are increasingly patched; they turn patchy. Farms start as little islands within a forest, for example. As there are more and more farms, they actually divide this forest up into little islands of woods, islands of trees where animals can survive. But, the patchiness is very threatening to animal survival. Animals are very vulnerable on the edges of small patches of forest and as a forest becomes patchy due to the increasing numbers of farms, it becomes increasingly less likely that the animals living in that forest will survive. So there's a whole process of converting forests to agricultural land that even in its earliest stages can be really destructive to wildlife survival.

Farms and forests are fundamentally incompatible. You can have a few trees on a farm, but it's very hard to have a forest on a farm. So, as farms spread, they tend to do so on the only really decent land left, which is under trees for the most part. Now we can improve this situation by farming more intensively. We can find ways to take the farms we already have and increase the yield on those farms. That's ultimately the way we are going and the way we need to go in the future.

As you intensify farming, there are off-farm effects, such as chemical run off, and a use of energy that affects the atmosphere and has an effect on climate. There is no one way to make sure that farming is not going to have an impact on wildlife. Generally, I think of farming and the need to feed a growing human population and the need to conserve wildlife as a bit of a trade-off. You need to be very, very careful as you expand human food supply to see if there are ways that somehow you can provide space for wild plants and animals. And that's a really tricky thing to do. Disappointingly the number of people who really focus on that issue is much smaller than the number of people who simply focus on the need to supply food worldwide.

Basically, we're converting the planet into a sphere of land and water that primarily is serving human ends. There is nothing wrong with that; we need to do that to end poverty and to increase the standard of living for six and a half billion people. But, by and large the more we do that, the less ecological space there is for wild animals and wild plants. I think people worldwide have a concern about that. I think most people want wildlife to

survive so we're increasingly thinking of ways that we can expand our use of the planet with the growing and increasingly wealthy human population, while at the same time trying to find ways to manage the planet. It's a fantasy to think that this is going to be easy -- that we'll be able to continue growing our population and increasing our wealth and not lose species. We're going to be losing species of plants and animals over the coming century. There's no question about it.

Wildlife serves all sorts of purposes for human beings, frankly. There are what are called ecological services that wildlife provides. Something like one out of every three forkfuls of food that you eat on any given day were pollinated by wild pollinators, insects, birds. When you have a less diverse biological ecosystem you're much more likely to need chemicals to prevent pests from taking over your farm land or your crops. It's well documented that farms that are next to forests or next to meadows need need fewer and less amounts of chemicals in order to preserve the food supply.

Our whole climate is in part regulated and balanced by a constant inflow and outflow of nitrogen and carbon dioxide based on the wildlife that exists in our soils, in forests, in our oceans. These are things we tend to take for granted because we don't see these services being provided for us. But, we're going to be increasingly aware of them when they are not there. A good example of that are the wetlands that for many, many hundreds of years, really thousands of years protected the coast of Louisiana.

As we gradually altered and destroyed those wetlands, we came to realize that cities like New Orleans were much more vulnerable to flooding and dangerous hurricanes. A lot of this is the geological structure of coastal land but quite a lot of it is, as well, the plants that hold soils in place and the animals that feed on those plants and help fertilize and help spread those plants. It's a system that we don't fully understand. We're learning more about it all the time. But the more we learn about the way plants, animals and human beings interact on this planet, the more we realize that it's been incredibly beneficial to human life and to human health and that we mess with it at our peril. We don't really know what we're doing when we make life less generous or amenable for the survival of plant and animal species.

What's different about the last century, a century in which human population more than tripled from about 1.6 billion people at the beginning of the 20th century to 6.5 billion people now, is that there's a multi-pronged assault on wildlife. Every kind of species, every broad type of species, every broad type of habitat is under threat now in a way that wasn't true in all of past human history.

It's not just that we over hunt or over fish, which used to be one of the biggest problems. It's not just that we're altering habitat, although we are altering habitat at a scale the world has never known before. It's also the issue of the introduction of alien species, species from other continents altogether that have no predators when we bring them to a foreign place. They so completely out-compete the native plants and animals that are already in a locale. All these things that human beings introduced like kudzu or the zebra

mussel, etc. to places where they had never evolved to be in and where they have no predators - they tend to take over at the expense of the wild species that are there.

On top of that we are polluting ecosystems. We have chemical pollution of all kinds. Our oil trade is constantly putting oil where it doesn't belong at the expense of bird life and fish life. And then finally to add to it, as a wild card, we have human induced climate change. We don't really know what climate change is going to do to species, but it's very likely to continue to increase world temperatures. It's very, very likely to change the way rainfalls around the world. All kinds of animals and plants that have evolved to thrive at certain altitudes, at certain latitudes and longitudes are suddenly going to be in a position where they're going to need to move.

Again in ancient human history, up until the 20th century, it wasn't hard for animals and even to a certain extent plants over time, to just move over a little bit, shift their ground if things became a little bit incompatible and a little too hot or dry. They just had to move over a little bit. Now there is nowhere for them to go. The world is filling up. The world is filling up with farms; the world is filling up with suburbs and cities with metropolitan areas.

Wildlife conservation has developed the concept that what you really need to protect wild species from human encroachment and from the dangers of climate change is something called wildlife corridors, where you set up long corridors of wild areas where animals and perhaps eventually even plants can essentially move --toward the poles, for example, to escape warmer temperatures. But this is really something of a fantasy because these wildlife corridors would have to displace farms, interstate highways, in some cases entire metropolitan areas. That's not going to happen. So, we have a real dilemma of how we can actually make the world a more compatible place for threatened plants and animals to ideally survive. This is a problem the world has never faced until the last 40 or 50 years because we are now in a population level and a wealth level where it's very difficult to make room for plants and animals.

There has been a real demographic revolution that has actually helped wildlife for a number of decades now, which is that women on average are having about half the number of children that they had 50, 60, a hundred, 200 years ago. This is one of the best things, one of the most hopeful things really that has happened in recent decades for the survival population and wildlife. There's a lot of joking and more than a few put-downs of the idea of no growth. People are sort of dismissed if they're no growth fanatics, but when it comes to population you eventually have to reach a stage of no growth. There really isn't much hope for wild plant and animal species if human population doesn't eventually stop growing and this is one of the most important needs that we should be thinking about for the future of human population and for the future of wild plant and animal species.

There is no question that the wild world is facing a bottleneck of survival and that bottleneck is largely a human made bottleneck. The real question is how narrow is that bottleneck and how long will it last. Wild species are facing the prospect of a kind of

demographic winter, a period of time in which there are so many human beings on the planet and their economic needs are so great. The good news is that population growth is slowing and predominantly because women are having fewer children.

But the reality is that this is a demographic revolution that we're only about half way through. Women are still having slightly fewer than three children on average. In a world that's really friendly to wildlife, women on average would need to be having about 2 children. My hunch is that worldwide most women would like to have 2 or fewer children. But they need help putting their childbearing desires into effect and that's something governments need to be thinking about for the future, not just for wildlife but also for all kinds of environmental, economic, social and certainly, health reasons. If governments prioritize providing health services that allow women and men to have the children they want in good health when they want them, I think we'll reach a world by the end of the century where human population has stabilized and perhaps is beginning gradually to decline based on low birth rates. And that's about the best thing we could hope for, for wildlife.

As for wildlife corridors, Canada is a thinly populated country now and Montana doesn't have very densely populated land. So, there are certain local even regional areas in the case of Montana and Canada even international areas, where you could effectively design some wildlife corridors for specific animals and specific circumstances. What concerns me is that much of the wildlife that needs to be saved in the world is in places like Africa and Asia where you would have to have substantial corridors covering substantial changes in latitude. We had better start working on them right away because they're getting harder and harder to imagine as being really feasible. So I would say there is certainly some possibility for wildlife corridors and it's an important wildlife conservation concept. But there's limited applicability for that concept worldwide and there's less and less every day.

Some parts of the world are so very densely populated and Bangladesh is an example of that, a country that has next to no place where wildlife could exist without fear that ultimately humans will encroach on their wild areas. There are some parks in Bangladesh and the country is making a good faith effort to manage them as well as possible. But, it's extremely difficult when you have 142 million people in a country the size of Wisconsin, to really provide the space that's needed for wildlife. The average large predator needs about the equivalent of almost a square mile just to have a decent livelihood. It's hard to imagine countries as densely populated as Bangladesh and India, and certainly some parts of China which has 1.3 billion people, managing land in such a way that particularly large animals and large predators really have an opportunity to stretch out to have the livelihood that they need to survive.

The pandas are a good example in China. The natural habitat for pandas in China is increasingly under threat. This is one of the reasons why you see so many pandas in zoos. The government of China is wisely realizing that much of the hope for the future of the panda is that zoos take them in and try to encourage their reproduction. We just had a

panda cub born here in Washington not too long ago and the press and the public was very excited about that panda cub.

But long term you have to ask whether we can get pandas to survive if they don't have a natural habitat where they can be wild. And in China that's a real question because so much of it is determined by what will be the peak population that China reaches. Those are the sorts of questions that will make the biggest difference in China, in places like Bangladesh and India to how much wildlife will really manage to slip through the human bottleneck into future generations and future centuries.

There isn't much certainty that wild places will be able to last into the 22nd century and this is one of the greatest questions we face for the future of wildlife and wild places. What is going to happen for the rest of this century on an overwhelmingly human dominated planet that will allow our only known companions in the universe to make it with us into the 22nd century?

I don't really know whether I'm pessimistic or optimistic about the future of wildlife. Some days I wake up optimistic, some days I'm not so sure. I think we have a high capacity to understand better the perilous situation that wildlife is in. I think we could wake up some day and realize how much more we need to do to make it possible for wildlife to survive. But at the moment I don't feel we're doing nearly enough; so I guess I would say I'm pessimistic unless we really change the ways we behave and change the ways we think about wildlife and wild species, wild areas, but I'm optimistic that we can make that shift. We need to make that shift really soon.