3 Takeaways Podcast Transcript
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Ep 107: Climate Future: What We Know and Don't Know with MIT's Robert Pindyck

INTRO male voice: Welcome to the 3 Takeaways podcast, which features short memorable conversations with the world's best thinkers, business leaders, writers, politicians, scientists, and other newsmakers. Each episode ends with the three key takeaways that person has learned over their lives and their careers. And now your host and board member of schools at Harvard, Princeton and Columbia, Lynn Thoman.

Lynn Thoman: Hi everyone, it's Lynn Thoman. Welcome to another episode. Today, I'm excited to be with MIT professor, Bob Pindyck. He believes that many people make it seem like we know a whole lot more about climate change than we actually do. He says that, quote, "Commentators and politicians often make statements that if we don't reduce carbon emissions, the following things will happen as though we actually know what will happen." I'm excited to find out what we know and what we don't know, and what we should do in the face of this uncertainty. Bob's new book, which is excellent, is Climate Future. Bob, welcome, and thanks so much for our conversation today.

Bob Pindyck: Thank you. It's great to be here and to talk with you, Lynn.

LT: It is my pleasure. Bob. Let's start with where we are. 100 years ago, what was the atmospheric concentration of carbon and what is it now?

BP: So what's happened is the atmospheric concentration has risen steadily over the past 100 years, but especially in the last 40 or 50. So if you look at, let's say, 1900-1950 or 1960, there was an increase, but it wasn't terrible. It's really got a big increase, however, in the last 50 years, even 40 years, and a corresponding increase in the global mean temperature. So the global mean temperature has increased by about 1 °C; 1 °C is like about 1.7 degrees Fahrenheit. And that increase of one degree, much of it happened just in the past 30, 40 years. So the problem is, there's been an increase in the CO2 concentration, an increase in temperature that has accelerated and is now moving rapidly.

LT: And why does that matter?

BP: Because what happens is that higher temperatures, and this is what we do know, there are things we don't know, but this we certainly do know, an increase in the global mean temperature corresponds to climate change, and it can do things that are not so good. So if the temperature goes up by say 2 °C, what might happen? We could have an increase in sea levels, which would inundate low-lying areas, countries have people living close to sea level, it could affect crops, it could affect production, many things. So generally speaking, climate change is not a great thing, and we're pretty sure that increases in temperature will bring about more and more climate change.

LT: So what most people are talking about as being potentially catastrophic is a 2 or 3 degree increase in the Earth's average temperature. In an earlier 3 Takeaways episode, episode # 30, with Princeton professor and geoscientists Danny Sigman, I don't know if you know Danny, but Professor Sigman shared how earth used to be about 20 degrees warmer a long, long, long, long time ago. Do you think it matters if the earth is two or three degrees warmer in the coming decades?

BP: I think the answer, and you're going to hear this a few times, the answer is, we don't know. And this is the problem; we don't know exactly what would happen. Let's take three degrees, 'cause that's well beyond the two degree limit that many people talk about as you go beyond that point, it's catastrophic. Let's suppose we do have an increase in the global mean temperature of three degrees, what would happen? And we don't know. It depends on how that increase in temperature affects the climate broadly. What does it do to the sea levels? What does it do to the frequency and strength of hurricanes? What does it due to productivity and to health? And so on. And we don't know a lot of these things. We don't have experience with it. What happened 100,000 years ago is interesting, but we didn't really have a market, we didn't have an industrial economy 100,000 years ago. We didn't have any economy. So we don't really know what would happen. This is the problem, and people use the words “it would be catastrophic” a little too freely. It might be that a three-degree increase in temperature would not be that terrible, it might be that really it would be terrible, it might be something in between. We just don't know.

LT: Many countries are pledging to cut their CO2 emissions. Should we expect greenhouses gas emissions to keep increasing?

BP: Yeah, sadly, we should. Because the United States is moving in the right direction, maybe not as much as it could, but it's moving in the right direction. Europe is moving in the right direction even more than the United States. But if you look at the rest of the world, if you look at Asia, if you look at China, if you look at India, if you look at Southeast Asia, Vietnam, Thailand, Cambodia, if you look at Bangladesh, if you look at Pakistan, there's no movement, almost nothing. And you can understand why. India, for example would be reluctant to spend the money required to sharply reduce their CO2 emissions, stop using coal and so on; it's a poor country. And they would argue, why should we? We're struggling, we don't have a lot of money, let the United States and Europe and other wealthy countries, let them reduce emissions. The problem is that even if the United States and Europe and the UK, which I include that as part of Europe, even though it's no longer, all cut their emissions to zero, which won't happen, but even if they did, well, that's 30% of global CO2 emissions. The other 70% is still growing. So it's sad, but true that it's likely that emissions will continue to grow, the CO2 concentration will continue to increase, and that's why I think that a three-degree increase in temperature, certainly by the end of the century, is quite likely. It's quite possible.

LT: So you believe that if the developed world, which is to say the US and Europe, primarily those two areas, cut their greenhouse gas emissions substantially even by 40 or 50% over the next decade, that that will not be enough to avoid the damaging effects of global warming?

BP: Exactly, because it just doesn't account for enough of global CO2 emissions. Right now the US and Europe and the UK, all together account for roughly 30% of global CO2 emissions. Well, that's a lot left in the other 70%, that's the problem.

LT: And what is the time lag between the carbon levels and the atmospheric carbon and its impact on the temperature?

BP: Well, when you emit carbon dioxide, it accumulates pretty rapidly in the atmosphere, so there's almost no time lag. As you pump out carbon dioxide, it goes up into the atmosphere and it stays there, it accumulates, it stays there for 100-200 or more years. It stays for a long, long time. So that's very quick. But then the question is, if the atmospheric CO2 level rises, how long does it take for that to have an impact, let's say, on temperature? And the answer is maybe 20 years, 30 years, 40 years, somewhere in that range. So there is a delay, and that means that even if we were... This is all fantasy, but even if we were going to cut global emissions to zero, tomorrow morning the temperature would still be rising because of the increase of the concentration over the past 20 years, so we are still going to experience, never mind the ongoing increase in concentration, we're going to experience warming as a result of the past increase in concentration, over the past 20, 30 years. Doesn't look good.

LT: Assuming we have no more greenhouse gas emissions starting now, what do we know about global warming then in 10 or 20 or 30 years? Do we know what global temperatures will be, or is that even very uncertain?

BP: First of all, under any scenario, we continue to have an increase in emissions and the concentration, if we stop emissions completely, under any scenario there's a great deal of uncertainty as to what will happen to temperature, we simply don't know. So under, for example, business as usual, where we don't cut back on emissions and the temperature rises, how much will it rise? Will it rise by three degrees, four degrees, two degrees? We don't know, there's a... We say a probability distribution, it's uncertain, there's just uncertainty over how much the temperature would rise. Maybe it would rise by two degrees and we'd be lucky, maybe it would rise by four degrees, we'd be very unlucky, we just don't know. And likewise, if we, tomorrow morning, turn off all the lights and all the air conditioning and all the televisions and all, everything around the world, stop burning coal, stop burning everything, tomorrow morning, and emissions went to zero, temperature would keep rising for a while, eventually it would kind of level out, and it would take a long time to come back down, it wouldn't come back down right away, it might take another 30, 40, 50 years. So we'd still be experiencing climate change even then under that fantasy, but incredibly optimistic fantasy, that if we just stop emitting CO2. That's the problem.

LT: And assuming that what you're calling an unrealistic scenario of no more emissions at all, do we know what the consequences will be in terms of the specific impacts on climate change, for example, on sea levels or on extreme weather? What do we actually know?

BP: Sadly, we know the direction things would go in, but we don't know how much things would move. So a good example is extreme weather, hurricanes. So what happens is that when the atmosphere becomes warmer, it makes it possible for hurricanes to become stronger because they pick up the warmth, it comes out of the ocean into the atmosphere, and then we have hurricanes that are more severe and much worse and more frequent. Now the question is, if the temperature goes up by two degrees or three degrees, how much more severe, and how many more hurricanes will we have? We don't know. We know that it'll be worse than it is today, but we don't know how much worse, that's the problem, it's very hard to pin this

down; there's a lot of uncertainty. We know that the change will not be a good one, but we don't know how much.

BP: Same thing with sea levels. If you buy a house on the beach in Florida, which I don't recommend, because it's going to get swept away eventually, if you buy a house on the beach in Florida, you might be worried about how much sea levels will rise. And there have been many studies of this, if the temperature goes up by three degrees, what will happen to see levels on the Eastern United States, what will happen to sea levels in Southeast Asia? And so on. And the estimates are all over the place; we don't know. We might have a very small increase in sea levels, we might have a big increase, we just don't know. We know there won't be a decrease.

LT: Given the uncertainty, should we just wait until we know more?

BP: Well, you see, that's what a lot of people say, and they... People accuse me, by the way, of being a climate denier, or I'm sticking my head in the ground and talking about all this uncertainty. Look, the uncertainty does not mean that we shouldn't do anything. In fact, it's just the opposite. What I said is that we may be lucky and the temperature might not go up by that much, maybe only two degrees or a degree and a half. We may be very unlucky and the temperature might go up by four degrees. It might be that the impact let's say on sea levels, won't be that bad, it might be it'll be terrible. In other words, because we don't know what's going to happen, we need insurance. If you don't know what's going to happen to your home, you get insurance for your home, you buy insurance, and that's what reducing emissions does. The reason you don't want to wait, is that, is the very uncertainty that makes you need to take action. We need to take action because of the uncertainty. It's not that with uncertainty we shouldn't do anything, it's just the opposite. But people don't quite get that. Oh, it's funny, they don't get that.

LT: What are some examples of climate change, what it will bring? Can you make it concrete?

BP: We've seen in Europe, even this summer, very, very high temperatures, and people die as a result because not everybody has access to air conditioning, and many people who don't have that access end up sick or even dying. So we know there's a health impact. We also know that diseases proliferate, intestinal diseases, for example, in high temperatures, so we know that warming directly affects health and even survival rates. Very, very big increases in temperatures can hurt people, are harmful. But beyond that, those increases in temperatures that cause more hurricanes and stronger hurricanes, that cause more floods, cause more extreme weather, flooding and so on, those are harmful, those cause harm that kills people, it's extremely expensive. We know that the impact of climate change is not a good impact, it's a bad impact, we're not able to quantify exactly what the impact would be.

BP: Even if I could tell you, look, by the year 2060, then we'll have to come back in 2060 and do another podcast, in 2060 the temperature is going to go up by three degrees and sea levels are going to rise by one and a half meters, even if we knew that, we would not know exactly what the impact of that would be, how bad it would be. We know it's not going to be a good thing, but we don't know how bad it would be. Could be terrible, it could be not as bad. So that's the issue. That's the problem we face.

LT: So Bob, you believe that there are two ways that we can adapt to climate change. The first is adaptations that reduce the harmful effects of climate change, but essentially don't prevent climate change from happening. Can you give some examples of those?

BP: Sure, but look, I just want to be clear, I am not big on the idea that we should only do adaptation and not prevent climate change from happening. I think we need to do both, we need to try to reduce emissions, which we are trying to do, but I think we need to be realistic and ask, "Okay, we're going to do everything we can here in the United States and in Europe, we're going to do everything we can to reduce emissions and we will reduce emissions by some amount," and hopefully we'll get some other countries to do the same. But we have to be realistic and say, with all of that, do we really think that we're going to keep the temperature from increasing by two degrees or more? So if we think it's not realistic, and if we think there's a good chance, we're not sure, but there's a good chance we're going to see a large increase in temperature, then what do we do? Then we do have to turn to adaptation and work on that. And there are a variety of things we can do. Let me give you just one example, because I said, "If you're going to build a house, I suggest that you don't build a house on the beach in Florida, in the Atlantic Ocean."

BP: But don't worry, because if you happen to have a house there and it gets washed away, the federal government will take care of it for you. So one of the things we're doing already is we're doing negative adaptation, we're encouraging people to build homes in places where they should not be building homes. By the way, these are wealthy people, these are vacation homes, that are being built on the beach, on coastal areas, that are going to get swept away in a hurricane, but you see, we subsidize it, we subsidize it through federal flood insurance, and so we make it cheaper for people to build those homes. And you might ask, why do we do that? Because those are wealthy people who contribute money, and the developers who build those homes have a lot of political power, so we build the homes and we provide insurance subsidies for the federal government so that you don't have to worry so much about the house been washed away. So one form of adaptation is real simple, get rid of that, you want to build a home on the beach, go ahead, but don't expect the federal government to subsidize it by covering your insurance. You take the risk when it gets blown away or washed away. Too bad. You pay for it. That's one example.

LT: But Bob, you believe there're basically two broad ways that we can adapt to climate change, can you talk about both of those ways and give some examples? I realize that's one example: No insurance for houses built on the beach.

BP: There are other things related to floods, which is developing better dikes, levees, ways of preventing the water from coming in. Most of the Netherlands is below sea level, it's underwater, below the level of the sea, it's not underwater, it's below sea level, and the reason that people live there is the dike system that was started around the year 800, about 1200 years ago, they started building these dikes that prevented the sea from flooding, from coming in, and that way they could use the land and live on the land. So we know how to do this, the Dutch have been doing it for many, many centuries. We do it to some extent. New Orleans, for example, has a levee system, a levee is like a dike, it's the same idea, New Orleans has a levee system around it, you could argue that it's not good enough, that we need a bigger levee system that can better withstand bigger hurricanes, but these are the things you can do. There's a proposal to build a sea wall around Southern Manhattan so that we don't have a repetition of Hurricane Sandy, and you might remember Hurricane Sandy caused major flooding in Southern Manhattan.

BP: Subway system, everything was flooded. So if we have an increase in sea levels, how do you adapt? Well, you try to prevent that and you prevent surges, storm surges, and you do that with sea walls. And we could do that; there is a proposal to build such a sea wall around Manhattan. Might cost $8 or $10 billion dollars which is a lot of money, but if you think we're going to have increasing sea levels and worse hurricanes, it's worth it, that's what you have to do, so that's another example. Then there's geoengineering. Geoengineering, this is something environmentalists really don't like. So the idea of geoengineering is you bring up into the upper atmosphere particles of sulfur, or you burn the sulfur and it becomes sulfur dioxide, and you spread that up into the upper atmosphere, and it combines with moisture, water, and forms an aerosol of sulfuric acid. But what does that do? What that does is it reflects sunlight, doesn't get rid of the CO2, CO2 is there, but what it does is it makes the CO2 less able to warm the planet, it reduces the greenhouse effect, and it's very inexpensive, by the way, it turns out, to do this, sulfur is cheap.

BP: So by spreading sulfur dioxide in the upper atmosphere, what you're essentially doing is creating an aerosol that prevents or reduces the warming effect of the atmospheric CO2 concentration, doesn't get rid of it, but it prevents as much of the greenhouse effect, you don't know as much warming. So that's called geoengineering or solar geoengineering. Environmentalists don't like it because they say, first of all, we shouldn't be mucking around with the atmosphere, all right. Secondly, it'll distract us from doing what we should be doing, which is reducing emissions, because it's quite cheap to do this. If we know that we can eliminate much of the effect of climate change by using geoengineering, why should we bother to stop using coal and oil, which is expensive to do that, why should we bother with that? So environmentalist are afraid that if we go and start working on geoengineering, we won't do these other things, but there's no reason why we shouldn't do these other things, we can do all these things. So geoengineering is simply one additional thing that I think we should be looking at and investing in.

LT: Many people also believe that there are risks of unintended consequences with different methods of geoengineering.

BP: Yes. There is a risk, and the risk is not the sulfur dioxide. People feel all the sulfuric acid is going to come in the rain and then it's going to acidify lakes and rivers. It actually isn't that much sulfuric acid, that's not an issue. It's a different issue. The concern is that you're not getting rid of the CO2. Well, what does that mean? It means that the CO2 concentration keeps increasing. So what? If it doesn't cause warming, who cares? Well, the increased CO2 concentration can cause acidification of the oceans, can make the oceans more acidic, now, this takes years and years and years to happen, but by the end of the century, you could have oceans that are more acidic. What is wrong with that? We don't know exactly what is wrong with that, but we think there could be some things that are wrong with that. It might kill off coral, it might kill off some species of fish or plants that live in the ocean, we don't know, we don't fully know what would happen, but that's an example of an unintended consequence where we get rid of the problem of warming, but now we got a problem that the oceans are more acidic, and again, not because of the sulfuric acid that you're pumping up into the atmosphere, but because of the CO2 that's accumulating.

BP: We're still accumulating CO2. My view is that geoengineering should be developed so we're ready to use it and it should be used as a fallback if we are unable to reduce emissions enough, if we are unable to

prevent CO2 emissions globally. It's not the United... United States and Europe are not enough, globally, from reducing, if we can't reduce emissions enough, we ought to have that available as something we might need to use if climate change happens and it's catastrophic, we have to use it. So that's my view. We have a whole portfolio of things we try to use and do.

LT: So China is in the midst of a drought and as you know, they're seeding clouds above the Yangtze river to make it rain. What do you think about this? And what happens if many countries start seeding clouds or taking other geoengineering approaches to improve their own local climate?

BP: Well, first of all, my understanding of the cloud seeding that's going on in China and it's going on in other places too, the Emirates, the United Arab Emirates are doing the same thing by the way; they've been doing it for a long time, not very successfully, but they're trying. It's quite different, you're not putting an aerosol in the atmosphere that's going to prevent warming, you're seeding the clouds with chemicals that you hope will cause those clouds to more coalesce and precipitate. You want the water to precipitate out and fall to the ground rather than stay up there in the atmosphere. So I think that's a very different technology. I mean, it has been used for many years, and I don't know of any environmental harm that that causes. China's got a problem with water. We've got a problem with water. Not in New York, but in... Or in Boston, but out in the West, we have a problem with water, and not enough of it. And that's why China's doing what it's doing, it has to deal with droughts. It's a real problem. Climate change may, we don't know, may make the drought problem worse. In the United States we have a problem with drought even if there were no climate change, we've got a problem. Too many people are using too much water, it's fairly simple.

LT: Bob, before I ask for the three takeaways you'd like to leave the audience with today, is there anything else you'd like to mention that you haven't already touched upon?

BP: We tend to want answers. I teach in a business school, and I tell the students, look, suppose you're working in a company, you're a consultant, and you're asked to tell the boss what is the price of oil going to be two years from now. Now, what's your answer? And they think about this, and some say, "It will go up, it will go down," whatever. And I say the right answer is, that's a stupid question. You should never ask a question like that because we don't know what the price of oil will be. But people want those answers, they ask those questions and expect answers. People want to know exactly what will happen if emissions increase or don't increase, or if we do this, if we do that, exactly what will happen. And they use words like catastrophe, the end of the world. We don't know what will happen. And it's hard for people sometimes to accept that there are things we don't know and questions we can't answer. It doesn't mean that scientists aren't doing good work, that climate scientists haven't learned a lot. It just means that there are questions that we just can't answer even though they do, have done a lot and have learned a lot; it doesn't mean that they can answer every question. So I think it's important to understand that and realize that you can't always get answers to questions.

LT: Or maybe those answers are simply probabilities and ranges.

BP: Yes, that's right. You can say, well, you know, there's a chance that, take the price of oil, which today is around, as we're speaking, it's around $90. Well, it might go to $110, it might go down to $70, it might

go down to $30, we don't know, but there's a range of possibilities. And that's what we have to think about. What would happen?

LT: Bob, what are the three takeaways you'd like to leave the audience with today?

BP: So the first takeaway is, there's a lot we don't know; certainly with respect to climate change, quite a bit. It would be nice if we could say exactly what will happen, but we can't. There's simply a lot of uncertainty. Number two, that doesn't mean we should sit back and do nothing. It doesn't mean that because we don't have the answers, we shouldn't do anything, that we should wait until we learn more. No, quite the contrary. We should buy what I call climate insurance, which means reduce emissions as much as we can, get other countries to do the same, and invest in adaptation. And the third takeaway is, we live in a dangerous world where bad things could happen. There could be a variety of different catastrophes that could occur. Climate is one, it's in the news all the time. But a pandemic much worse than COVID could occur, much, much worse than COVID could occur. And we need to be ready for that and invest in preventing that, in dealing with that. Nuclear terrorism, bioterrorism, nuclear war. We could go on and on here. There are a lot of terrible things that could happen, and we need to think about those things, and think about what should we do about them. And how much should we invest in being able to prevent or reduce the impact of any of those things?

LT: Bob, thank you so much for our conversation today. I very much enjoyed your book, Climate Future.

BP: Thank you, Lynn. It was fun to be here and talk.

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