

Michael: Hey, Susan.

Susan: Hi, Michael.

Michael: It's a delight to have you as part of this *The Future is Calling Us to Greatness* series. Your work with communicating climate science has been just such an inspiration to both me and to my wife, Connie Barlow and others we've turned onto.

I am realizing that some people may not be yet familiar with you and your work. Could you just take a few minutes, and just don't be bashful, help us know who is Susan Joy Hassol? What is your trajectory? How did you get to be where you are now and what are some of the things that you've accomplished or have done in this field that would be of interest to folks in participating in this series?

Susan: I am a climate change communicator. I've been working in this field for more than a couple of decades. I try to help scientists communicate more effectively and clearly about what we know and I don't really want to be the voice, I'd rather be the voice coach, and I feel like that's what I do with many in the scientific community.

Sometimes, I am called to also speak about climate change and what we know. I was in Asheville, working on the National Climate Assessment. I've worked on all three of the National Climate Assessments, first one in 2000, then in 2009, and now the one in 2014, and I was there in Asheville, because the technical support unit for the assessment was based at Noah's National Climatic Data Center.

I moved there and spent two years working on this project. Before that, I was in Boulder, which is just a wonderful city for climate science. I was a visitor [inaudible 00:01:52] up on the Mesa, there at the National Center for Atmospheric Research, where I got to work and see every day wonderful scientists like Kevin Trenberth and Jerry Meehl, Warren Washington and Jeff Keel. It was just such a treat to be there.

Before then, I lived in Aspen, Colorado for about twenty-five years and Aspen is a wonderful place. I worked there at the Aspen Global Change Institute, where we did interdisciplinary meetings on climate change science and I think it was there and even before that, I worked in the energy field and it became really clear to me that climate change was the issue of our time.

I just wanted to do the most important thing there was to do in the most effective way there was to do it and for me, that turned out to be communicating about climate change and helping others communicate more effectively about climate change. That's kind of what I've been trying to do ever since and especially working in the policy—relevant kind of science, science that's actionable that answers questions that people have and helps decision makers at all levels figure out what to do about this.

Michael: That's great. That's actually one of the things that I am particularly excited about your work is both the policy end of it, the policy angle of it. There is not just science for science sake but it's basically science for moving us as a species into more right relationship to reality and communicating this science in ways that help people get it, both emotionally, as well as intellectually.

Could you just share a little bit more about some of the things that you are most proud that you have been part of or co-edited or lead author, or whatever, and then get into a little bit about how do you see the science? People watching this or listening to this series are going to be all over the map. Some have been immersed in the science for a long time and others have, for whatever reason, not emotionally let it in, because it's just too scary and just everything in between, and others.

Help us get who Susan Joy Hassol is just a little bit more and then basically, whatever you're led to say in terms of communicating the science.

Susan: It strikes me that the story of climate change that people need to understand is the world is warming, climate is changing. We are the primary cause of that change, the dominant cause by far of that change. It's already affecting us, where we live, where we work. Our whole society is being affected in enormous ways by climate change.

It's not just an environmental issue. This is not about melting of the poles and poles are [inaudible 00:04:48], although it's about those things too. This is about us and this is about our lives and the lives of our children, and their children.

We can fix it. We can turn this thing around. We're not going to stop it dead in its tracks, but the choice we face is enormous. It's between a little more warming and some more impacts that we'll still have to adapt to and deal with or catastrophic warming and a completely different planet.

I don't believe that we will continue down the road we're on. I think that that to do that to ourselves is just unthinkable. It's a man-made problem and it has man-made solutions. We can do this, and not only can we do it, not only do we have to do it, it's going to be great for us in so many other ways.

As Emery Levins like to say, "It's not a free lunch, it's a lunch we're paid to eat." It's going to be wonderful. It's going to improve our bottom line and everything is going to be good. Even now, if we cut back on coal burning, if we cut back on burning gasoline in our cars, we immediately have cleaner air. We have healthier air.

We send less kids to the hospital with asthma. We get more fit, because we're walking and we're riding our bikes, and that makes us healthier and more resilient. We have more walkable and happy communities, where neighbors are getting to know neighbors. There is a million good reasons to do this, all the things that we would need to do to cut emissions.

To me, it doesn't have to be about sacrifice and enormous lifestyle changes that some people might see as very negative. Really, it's a very positive story. Now, if this were just happening to us, if climate change was just happening, the sun was getting hotter or something that would be a real drag, because there would be essentially nothing we could do but adapt.

In a way, admitting the truth that we are the cause is empowering, because we can do something about it. We can turn it around and that's where we're headed now is everybody getting on board, people understanding and accepting the science, and then figuring out what are the best, most effective ways forward.

When I talk about the science, I can talk about the science in tremendous detail, but for most people I think that's not the most important thing to do.

Michael: Exactly.

Susan: The radiative properties of the sea trapping gases, that's not what people really care about. Whether we stabilize it four hundred parts per million or four fifty, that's not what this is about. This is about what kind of people are we? Do we clean up our own mess? Do we leave our children with a problem they cannot solve?

I don't think so. I don't think that's our values. I don't think that's the kind of people we are, and to me, that's the essence of this story is what kind of

people are we and are we going to turn this thing around?

Michael: That's great, Susan. I am curious, it leads me to think, obviously, you're aware of some of the things that are already happening that are in the right direction, that are good things. It's good that that's happening and maybe it can happen a little bit faster and a little bit more focused, but what are some of the things that have yet to be really taken on? What are the one, two or three biggest, most important things that you see that need to happen in the next two to five years or two to ten years?

Susan: I guess I can boil that down to one thing. There has to be a price on carbon.

Michael: Yes, exactly.

Susan: Right now, it is free to dump carbon dioxide into the air and that's not a reasonable thing. We pay to have our trash picked up, we need to pay to be putting carbon dioxide into the atmosphere. Some people will call that a carbon tax. I don't really see it that way.

Right now, fossil fuels are falsely cheap. They are much cheaper than we actually pay for them. We just don't pay for those costs in what we pay for a kilowatt/hour of electricity. We pay for them in other ways. We pay for them through healthcare costs from people suffering from diseases from breathing bad air. We pay for them through more heat waves and people dying in heat waves, heavy downpours that in some places are leading to flooding, that are causing enormous damages.

We're not paying those costs and we need to pay them, and so if we've got the prices right, then the cost of solar and wind and the other renewable sources of energy would be able to compete much more fairly on a much more level playing field.

I think the main thing is to get a price on carbon to make it no longer free to dump this carbon pollution into the atmosphere. Once that happens, I think everything else falls into place.

Michael: I couldn't agree more. One of the things that I've been saying is that it's collective insanity to allow for the free or subsidized polluting of the commons that are individual or corporations. Corporations can get wealthy and benefit personally by in some way having a negative impact on the rest of us and on the planet is collective insanity.

I just watched something last week. Bob Inglis said it in the most concise

way that I'd heard, like wow, what a great way of saying it. He said, "What we need to do is really simple. My message is real simple," he said, "And I worked with a lot of conservative people," as he does, as you know.

He said, "We need to put all the price in all the fuels, remove all the subsidies, and then watch the free enterprise market solve the climate crisis and the energy crisis."

Susan: Absolutely. I couldn't agree more. One of the things that goes along with putting a price on carbon and getting the prices right is removing the subsidies and then having a more level playing field, because people think that solar and wind are so heavily subsidized. In fact, they are subsidized much less than some of the other sources of power.

Fossil fuels are very mature industries, they certainly don't need any subsidies. I also think it's really important for us to start thinking in a more systems approach about this though, because for the US to be cutting back on our own coal use but then exporting that coal for use by other countries is not very smart, because the world is round and the carbon, wherever it's emitted is going to come back to haunt all of us. One half of the boat doesn't float and the other half sink.

We need to cut back on coal burning everywhere and right now, we don't have a way to capture realistically, cost effectively, with all the engineering worked out to capture the carbon and store it. I think it's something we need to work on, if we want to continue to have coal as part of the system and some people are obviously working on that.

There is some other problems with coal though, as we know, mountain top removal, all kinds of other issues with regard to coal. Until we solve all of those problems, it's maybe something that we need to continue phase down. So far, the phase down has been largely an economic one that the cheap natural gas, of course, due to fracking is now displacing a lot of coal, but we're also really ramping up on wind and solar in this country, and we're doing better on energy efficiency. Those are the things that we should be pushing very hard on.

Michael: I agree. Susan, when you wake up on any given day or it has been a good weekend and you look at your week, what is it that you're present to? You are aware of some of the scariest stuff in human history and yet clearly, you're still inspired to be in action, to be of service, to be a contribution to do the work that you do and to do it with a sense of not just a commitment but I am sensing just in what I've watched of yours, just this real passion

for life, this vitality to be alive and to do this work at this in history. It's such a holy privilege, to use my religious language.

What is that inspires you on a daily, weekly basis? Where do you find your personal source of inspiration to do the work you do?

Susan: I am a link in the chain. Each of us is a link in the chain. We can't do the whole thing ourselves. It's too big and I may not see the finale, but I am an important part of the show. As Martin Luther King said, "I may not get there with you, but we as a people will get there."

That's how I see it. I see myself as a vital link in the chain. I have to do my part so the people who come after me can do their part, and that we can get where we need to go, and that really motivates me. It really drives me to do that part and to do it as well as I possibly can.

I think connected to that, it's important to recognize that the reach is as important as the goal. Being part of it is as important as seeing the end point.

Some people fixate or focus on a very specific goal, three hundred and fifty parts per million, for example. They say, "That's the number, that's the goal." I don't quite see it that way, because I think the number, whatever it is, there is not one number below which we're safe and above which it's dangerous. It's already dangerous. We've already crossed into dangerous territory. We're seeing it all around us.

What do you do if you're driving down the highway and you miss your exit? You get off at the next exit.

Michael: Exactly.

Susan: We are driving down the CO<sub>2</sub> highway. We have missed the three fifty exit. Now, we're passing by the four-hundred exit. Maybe we can get off, but maybe we can't. So, what do we do? What's the first thing we do? Take your foot off the accelerator. Put it on the brake. Slow down. Get off at the next exit. That's what we have to do, and we're not doing that.

If you miss your exit, you don't just keep speeding off indefinitely on the wrong road. That's what we're doing now. We're speeding down the wrong road. We've got to turn that around. I guess I want to say that the number, when I say that there is no precise number, it's sort of like cholesterol or blood pressure. The risk just goes up, the higher the number gets.

You can't say this is the perfect number and if I am below that, I am safe and if I'm above that, I am going to have a heart attack tomorrow. No, the risk goes up with each bit that the number goes up, and that's the same thing with how many parts per million of CO<sub>2</sub> is in the atmosphere or whatever the temperature is.

Two C, or three and a half Fahrenheit, that's not the number. There is no such thing as too late. Wherever we end up, we've got to do as much as we can, as fast as we can, and that's the mantra for me. It's not we have to hit two C, we have to hit four hundred. It's as much as we can, as fast as we can. I think that's got to be the goal.

Michael: Amen. One of the things that I appreciated about my conversation with Paul Gilding just last week, I like his vision of a one-degree war plan. He talks about that he believes that in the next two to five, six years that we are likely to see the dam of denial break. There will be so much compelling, not just evidence but experience where one as with any dam, when it breaks, the flood waters are unstoppable and he sees us as a planet, China, India, European Union, America, and everybody mobilized like we were at the beginning of World War II.

He says, "We are slow, but not stupid," and –

Susan: I'd like to think that's true.

Michael: I hope so.

Susan: I think the World War II analogy is a good one. That was a case where it was looking pretty bad, but the world mobilized. We got it together and pretty much over night, we shut down domestic car protection and started producing planes. We did what we had to do. We did everything we had to do, and that's what we need to do now.

We really need to turn our attention to this, because we are starting to cross some thresholds and we just saw one recently with part of Antarctica that looks like it's now committed to melting eventually. That's going to redraw the coast lines of the world and I don't think we want to cross too many more of those thresholds.

The further we go, the harder we push the system, the harder we poke the beast, the more of those thresholds we cross and the worse things get. In some cases, it puts us into some vicious cycles that become largely

unstoppable, and I just don't want to see us get there. I want to see us stop just short of as many of those thresholds as we can.

We are driving again. We are on the road and it's foggy, and we don't know right where the edge is. You better be careful when you don't know where the edge is. You want to go slowly. You want to go carefully.

Michael: Stay with this analogy of going down the freeway and we're going to wrong direction and we need to get off at an exit. What are some of the institutional and psychological resistances that you see to us getting off the exit and turning around, and then what are some of the things that you have found or experienced, or believe to be effective in both meeting or addressing the psychological issues that keep people in denial or whatever, and some of the institutional things where you've got a well-funded campaign the confuse the issue? Say a little bit about that, if you would.

Susan: There are vested interests that like in the tobacco era that want to keep things the way they are, because they are making a lot of money with things being the way they are, but that can't persist. Unfortunately, I think there has been some misunderstanding that we have to choose between the environment and the economy.

That's just ridiculous. It's going to be really good for our economy to invest in the technologies of the future, rather than remaining vetted to the technologies of the past. We are seeing it now, countries like Germany, Denmark, Japan, China that are really taking on renewable energy, their economies are doing well.

We even know that for example the Northeast States that are part of the Regional Greenhouse Gas Initiative (RGGI) in the Northeast, those states' economies are growing faster than all the other forty-one states that are not part of a greenhouse gas initiative where they're actually having to limit their emissions.

One of the things that tells you is that it's actually good for the economy to move into a new energy routine, a new energy era. I think this idea that it's environment versus economy is crazy. I think it was Bobby Kennedy who first said, "The economy is a wholly owned subsidiary of the environment." Without a healthy clean environment, you don't have an economy.

The environment does so many things for us. Scientists call them ecosystem services, things that we don't necessarily pay for, we don't pay for but we don't credit the environment for doing those things for us, but

cleaning the air, cleaning the water, keeping us in a stable climate, those are things that the environment does for us, essentially for free, that if we had to pay for those services it would be enormously expensive.

This idea though that this is about sacrifice and curtailment, I think, rubs against the ideology of some people very strongly and I can understand why, but this is not about that. This is about ingenuity and innovation, and I think we all want that. We all believe in American ingenuity and innovation, and the fact that we can collectively do something really positive.

It's not going to be easy, but when John Kennedy said, "We're going to put a man on the moon and bring him safely back home," he said, "We do this not because it's easy, but because it's hard and because it motivates the best of our energies and our intelligence," and I really think that this is another moment just like that.

We really need to be mobilized and motivated in that same kind of war footing, whether it's the World War II model that you mentioned or the going to the moon model or anything else. This is one of those great challenges, perhaps the greatest challenge that human kind has ever faced, and I am convinced that we have what it takes to get motivated and do this, and turn it around.

Michael: That's great. I don't know how much you know about my background. Connie and I have been traveling and living all over North America for the last twelve years, essentially evangelizing evolution, evangelizing a deep time understanding of reality, 13.8 billion years of creativity and doing so in religious settings, where I am really trying to help religious people embrace an ecological evolution worldview, and embrace evidence as modern-day scripture or divine revelation.

In secular settings, I am trying to focus on how a purely evidential science-based perspective on reality can actually also nourish us spiritually and emotionally, and so I am a religious naturalist is the way I sometimes refer to myself, but this sense of the past rooting for us, part of the what the title of this conversation series is about is the future is calling us to greatness, but the first part of that is that the past, this idea, just holding it in my heart, when I imagine countless generations in the past who are rooting who sacrificed and actually, if it weren't for their contribution and there is sometimes struggle, I wouldn't even be alive.

To honor that is to be present and to be of service to my world and to be of

service to the future in a way that honors that. I want to invite you to share anything that comes up for you around this theme that the past is rooting for us and the future is calling us to greatness.

Susan: The first thing that comes to my mind is a wonderful line from a poem, by Terry Tempest Williams and she writes, “The eyes of the future are looking back at us and praying for us to see beyond our own time.”

I feel that really strongly. Every time I look into the eyes of a young child, I heard that line. I see those eyes of the future. I feel them looking at me. I feel them looking at all of us and praying for us to see beyond our own time, because we won't see the worst impacts of climate change.

We are seeing some of those impacts now, and we are going to continue to see them throughout our lifetimes but it's really our children and our children's children that are going to see the most severe impacts, if we continue down the path we're on. Really, the choice is, are they going to look back and say, “What in the world were you people thinking? How could you have done this to us?”

Or, are they going to look back with gratitude and say, “Thank you, thank you for thinking about it. Thank you for seeing beyond your own time and for leaving us a beautiful world, and at the same time making a better world for yourselves.”

Michael: That poem that you were just quoting, I think the next line is something like that, “We might act with restraint and we might leave room for the life that is destined to come,” or something like that. I actually use that quote as an introduction to a guided meditation that I do in my evening programs, where I then invite people to center and then to turn in their imagination to the past and allow some ancestor to communicate some words of encouragement, and then I'm just silent for twenty or thirty seconds.

Then, I invite them to thank that being in whatever ways appropriate, and then to imagine and turn to the future and allow some either descendant, if they have kids or grandkids, or just anybody alive, a hundred years from now or further out to communicate, what would say that you would find empowering, encouraging or inspiring, but I love that Terry Tempest Williams quote as an intro to that.

Susan: Yes, it's wonderful.

Michael: In fact, what I was looking for is my wallet right here. I wanted to show

you, this is my granddaughter, Ila Renee.

Susan: She is beautiful.

Michael: She is three and a half now and I keep this by my computer, because when I think about the future calling me to greatness, one of the things that inspires me to do the work that I do is not just my grandchildren, but all grandchildren.

In fact, my great mentor Thomas Barry talked about the children and grandchildren of all species. He also used to like to say that the human economy is a subset of earth economy and the idea that we can have healthy humans in a sick and dying world where a robust human economy, an increasing gross national product at a decreasing gross earth product is just crazy. It's collective insanity.

Susan: Right, and Thoreau had that wonderful line, "What's the use of a house if you haven't got a decent planet to put it on?"

Michael: That's a good one.

Susan: So yes, people worry about building these beautiful homes but if the planet is coming down around your ears, it's not good. I think sometimes wealthy people, and I think of all first worlders, basically, think that they'll be largely immune to a lot of the problem. They think that they'll just be rich enough to insulate themselves and isolate themselves.

I think that's a very mistaken notion and the metaphor that I use for that is how safe are you if you're in a limousine, driving through a ghetto? I really think that's where the first worlders will find themselves if we don't do something to turn this around. You don't feel very safe at all, and we will not be safe. If the world is full of environmental refugees who are fleeing fires and floods and sea level rise, and the rest, we're already seeing that.

We saw it during Katrina. We saw a terrible example during Sandy. I come from the Mountain West, where fire is now a fact of life and the fire season is just getting longer and more severe, and more acres are being burned. Just the devastation of all these things, insects and fire, it's changing everything. It's changing so much about how we live and I just don't think that the world is going to be a very safe place until we start to turn this around.

Michael: I agree. In fact, I am realizing, I think I interrupted you or didn't let you

complete the thought around both the institutional and the individual psychological resistance and then what if anything you have to share in terms of how to turn that around or what you see as most likely to be effective in moving that forward.

Susan: There is a lot of psychological resistance. I think some of it comes from the fear of what it means if we accept this. Let's start just with basically accepting that we're changing the climate. For most of human history, we've thought about weather and climate as the providence of god. We still call disasters that take place acts of god.

It's very difficult for us to believe and accept that we could be doing this, but once you understand the science, once you understand that we've increased this heat trapping gas, carbon dioxide and its concentration in the atmosphere by forty percent, in a very rapid time period, so in the geological blink of an eye, we dug up billions of years of carbon and are releasing it to the atmosphere in a matter of a century.

Once you understand how that works in the atmosphere to trap heat, then you understand how it is that us, the seemingly small presence on the planet could be altering the entire planet's climate system and in fact, are. We have lots of ways of knowing and understanding that.

People don't always know that. They think that maybe we're guessing, but suddenly it started warming and we started to say, "I wonder why, maybe it's us." It's not like that at all. In fact, we've known for like a hundred and fifty years that this would happen.

Back to the time of Tindal and Iranians. Their scientists were looking at this hundreds of years ago and they speculated that if we burned a lot of these fossil fuels, this coal and oil that we would release carbon dioxide to the atmosphere, it would heat up the world, and they actually even got the numbers right.

They really said, "It's going to be somewhere between one and a half to four and a half degrees Celsius." They got it and they were right. Of course, we've refined that over time, but this was predicted and then it happened. I think some people don't know that history and it's really very important to understand this.

Also, when people think and they say, "How do you know it's us?" We have lots of ways of knowing it's us. One way we have of knowing is they say, "How do you know it's not the sun? I bet it's the sun." I say well, we

measured the sun, we measured the energy coming out of the sun. It's an eleven-year solar cycle, there is no trend.

Over the last fifty years, when global average temperature has gone up, there has been no trend in the energy reaching earth from the sun. So, it can't be the sun, we know that. Another way we know that is, if it were the sun, you would have seen warming through all the layers of the atmosphere. You'd see warming at the surface, you'd see warming in the troposphere, you'd see warming in the stratosphere, above that.

That's not what we see. We see warming at the surface and the troposphere, we see cooling in the stratosphere. Could not happen if it was coming from the sun. It could happen, it does happen because we're trapping heat in the troposphere and actually, the stratosphere is cooling.

It's another way we have of knowing for sure what's causing this. People don't know that. We also use climate models and a beautiful thing about climate models is not only can we use them to project the future, we can use them to understand the past, understand what's already happened.

You can't isolate different factors, it's all just happening, but in a model, you can isolate the factors. You can put in solar. You can put in volcanoes. You can put in the human contribution of heat trapping gases from burning fossil fuels, agriculture and other things.

When we do that and we take the model and we take out the human influence, just leave in all the natural stuff. What the sun has been doing or the volcano has been doing, we actually see the climate would have slightly cooled over the last fifty years. Only when you put in the human thing, the human addition to this do you see the warming that we've seen.

Sometimes, when you think about that and people say, "How much, what percentage of what we've seen is us?" The real answer is more than a hundred percent, because it would have been cooling if not for our influence, where it's actually more than a hundred percent. It's by far the dominant cause.

We have all these ways of knowing. I think people don't know that, they think it's a guess.

I sometimes worry about some of the language we use. We say consensus, it's a consensus among scientists and it sounds like it might be opinion. It's not opinion, it's a consensus based on evidence. Based on the evidence, the

vast majority, more than ninety-percent of active scientific researchers that study climate have concluded that human induced climate change is occurring now. That's the truth, it's just a fact and people struggle to accept it, but it's evidence based. It's not a question of belief.

When people say, "Do you believe in global warming?" it always rubs me wrong, because it's not a belief system, it's evidence based. We measure it. We don't believe it, we measure it, and we know it. It's a fact.

Michael: As an evidential mystic and as an evangelist for science, at one time they thought they were criticizing me, I took it as a great compliment. It said, "Michael Dowd is like a cross between Carl Sagan and a Pentecostal preacher," and the gospel according to evidence is one of the things I am trying to communicate. I love the way you just articulated that, thank you.

Susan: Yes. I think that there are these people struggle to accept this, they don't want to believe it. it makes them feel guilty but I don't say it's our fault, I say it's our responsibility. We caused this. We're responsible for it, and so what do people like us do? We clean up our mess. We take responsibility for what we caused and we turned it around.

It's not about fault, it's not about blame. It's simply about responsibility.

Michael: Yeah. That's great. I love the way you keep coming back and that's one of the things I liked about the various videos and the stuff that I watched of yours. It's like there is a way of taking on, taking a square look at the bad news and the challenging stuff without sugarcoating any of that, but finding metaphors and analogies, and language that's tight, that's memorable and that has people naturally want to move in the right direction.

In fact, you've already shared a number of them, but any other particularly potent or helpful metaphors, sound bites, like the language that you found that's been particularly useful that you'd be willing to share with those of us, his were work sort of at that place of trying to articulate their own source of core story line or our own core way of speaking about this to people.

Susan: Yes. I've talked about the road a lot, the road we're on and I think one way of thinking about this is that we're standing at a fork in the road right now. We can choose our future. The future lies in our hands. Do we choose a future that has a little more climate change or a future with a lot more climate change and a lot more impacts, and a really devastating future?

The good news is that on that, if we choose the lower emissions future, we have so many other great benefits to our health, to our happiness, to our economy and there is a set of great reasons to do this. I think the fork in the road is a powerful way to think about this, because I do think we have to remember that it lies in our hands. I don't like when people talk about the inevitability of future climate change.

Sure, there is a certain amount of warming that we are committed to and we have to admit that to be honest, but beyond that little bit that we're committed to, it's in our hands which way we go, so I think that's an important way of looking at it.

Also speaking of the road, colleague Chris Field out of Stanford said something I thought was really effective. He said, "By putting off this decision, by not doing something now, it's like kicking the can down the road, but with each kick, the can gets heavier and harder to kick."

Michael: Interesting. I like that.

Susan: I think that's a very powerful metaphor. We kick that can and now, our kids have a bigger and heavier can to kick, and their kids will have an even bigger, even heavier one that will be really, really hard and we eventually will leave them with a problem that cannot be solved that gets into so many runaway feedbacks that there is little that can be done.

The sooner we act, the better. Also, the sooner we act, the cheaper it will be. We want to solve this problem, but we want to solve it as efficiently and effectively as possible. We don't want to spend more than we have to.

The way to do that is to start immediately, because there is only a certain amount we can emit and the longer we wait, the sharper that reduction path will have to be. Here is another metaphor, if you think about a ski mountain, if we start now, we can glide down on the bunny slope. If we wait too long, we are going to be facing a double black diamond that is a straight down path and it is going to be hard. It's going to be tough, it's going to be hard on the economy and there is going to be casualties. There is just no question about it.

I'd like to see us take the nice, easy glide. The problem with that metaphor is some people really like those double black diamonds. Sometimes people have trouble understanding how it is that climate change is affecting our daily weather and some of the weather events that we're seeing and they say, "How can you blame it, it's like your blaming climate change for

everything?” For a flood or for a drought.

I say, “Carbon dioxide adding these heat trapping gases to the atmosphere, it’s like putting the climate on steroids. What it does is it makes for more of certain types of extreme weather events and it makes them stronger, and it makes them more frequent.

Just like a baseball player, when he wasn’t on steroids, he still hit homeruns, but now with the steroids, he is hitting more homeruns. He’s hitting them farther and he’s sitting them longer. We are seeing balls that are going way outside the ballpark, like we never saw before and that’s what we’re seeing with the climate system on carbon dioxide. The weather is on steroids now and we’re seeing more of those events.

It’s not that you’re blaming, just like you couldn’t blame a particular homerun on the steroid, what you can blame is the trend, and so what we’re seeing now is a trend towards more extreme heat, more heavy downpours and those things are happening because of climate change. It’s the weather on steroids.

A similar metaphor is to say we’re loading the dice. By loading the atmosphere with these heat trapping gases, it’s like loading the dice towards more rolls of extreme weather. The extreme weather is double sixes, more rolls of double sixes like loaded dice.

There are a whole bunch of things that we can think about as ways to help people understand. I think there is a whole set of medical metaphors that are very useful. I started off earlier by saying that there is no blood pressure number or cholesterol number below which you’re safe and above which it’s dangerous. That’s similar with climate change.

Also, if you go to your doctor and she says, “I don’t like your numbers. I don’t like your heart condition. I think you should get some more exercise and watch what you eat,” do you say to her, exactly when am I going to have a heart attack and exactly how bad is it going to be? No. You follow the advice and you do it.

By the same token, for people to say to climate scientists exactly what’s going to happen and exactly how bad, and exactly when, no. We know the general picture. We don’t have every detail. We don’t have some of the regional details. That’s harder for the climate models, but we’re already seeing a lot of the things that have been predicted.

In fact, one of the things we're seeing is that the predictions have in many ways been underestimates, because the scientists have been conservative in their estimates, and so we're seeing sea level rise faster than we expected it. We're seeing an increase in hurricane intensity in the Atlantic earlier than we really expected to see it.

Many of the things we're seeing are beyond what we expected at this stage. Greenland and Antarctica are melting faster than anyone expected them to. I think it would be incorrect and if you look at Arctic Sea ice, when I was working on the Arctic climate impact assessment, we were saying that later this century, we would probably see an ice-free Arctic in summer, somewhere around 2080 or 2090.

Now, it looks like it's right around the corner. It may be within a decade that we see an ice-free Arctic in summer and that has tremendous implications, not only in the Arctic but for the whole planet's climate system.

I would say when people say, "All those climate scientists, they are just alarmists." The first thing I think is first of all, you don't know any climate scientists, if you think that, because the last thing they are is alarmist. The information is alarming but there is a difference. An alarmist is someone who is unnecessarily alarming people, shouting fire in the theater if there is no fire.

If there is a fire, you need to alert people to the fire, but my job is to say how do we alert people to the fire in the most effective way? We don't want them to stampede, we don't want them to freak out and pull the covers over their head and want to just get a bigger SUV to protect their family. We want people to respond in a way that's effective, so that's the challenge we face.

That's the challenge we face. How do we let people know there is a fire in a way that's credible, calm, yet expresses the urgency? Because there is an urgency to this. This is not like [inaudible 00:42:44], if we don't get it done this year, we can get it done this year. There is an urgency to this. We have to get it done. We've got to do as much as we can, as fast as we can.

That's the way it's going to be less expensive, and when I say less expensive, I don't only mean in dollars.

Michael: Yes, exactly.

Susan: I mean in human lives and in species lost, and in all the things that we care about. We need to get on this, there is a real urgency.

Michael: Yeah.

Susan: How do we communicate that? That's the challenge we face and it's what keeps me going. It's what gets me going every day. How do I communicate this better? How do I help my colleagues communicate this better and more effectively? We need people to understand it. It's essential that they understand it. Our future depends on it.

Michael: Amen. Wow, I am just loving this. There is two populations that I found that aren't in action for very different reasons. One would be, perhaps the myth of perpetual progress. If everything is going to keep better and better, there is no need for me to be in action, things keep getting better. Look at the last hundred years.

Then the other is the myth of the apocalypse. If the end of the world is right around the corner, then why need to be in action? Let's just be hospice workers for each other and that sort of thing. What do you say to those two groups of people?

Susan: That's a hard question. For the ones who have given up, for the ones who have gone right to despair, I say it's just not true. Things can get a lot worse, but they can also get a lot better. There is no such thing as too late in this game. We have to do everything we can. We've seen one degree, one and half degrees Fahrenheit of warming and look at the changes we're seeing already. Can you imagine five? Can you imagine ten? Can you imagine twenty?

We are on a course for passing a thousand parts per million. We are on a course for a devastating future, we cannot go there. We've got to turn this thing around, the sooner the better, the lower the level, the better. As much as we can, as fast as we can, that's the mantra.

I don't like when I hear the defeatists, that "We're screwed attitude." I just can't buy it. I just know it's not true.

For those who think things are going to keep getting better, I would ask them to simply look at the evidence of what we're seeing right now. We are observing climate change and we are observing negative impacts, and it's not that we had the perfect climate before. There is this there is some perfect number. No, what it is is we've had a very stable climate and we've

designed our society for that stable climate.

We've built our cities on the coasts. We've designed our dams, pumps and pipes and canals for the climate that we've had. Any change to that climate is going to be costly and difficult for us to adapt to and deal with.

It's not that it was perfect, but it was what we knew and it was what we had, and we've designed everything for that. Sea level rises six feet or whatever we're going to see in this century, we've been saying one to four, we're now thinking it's probably at the high end because of what we're witnessing just recently.

Four feet of sea level rise makes a big difference for cities like New Orleans, Miami, Norfolk, Virginia, Boston, New York and London. These are serious. Things are not going to just get better, not when they already have water in the streets of Miami at high tide, and they are already spending three hundred million dollars, trying to deal with that, but it's a losing battle, because it's limestone around there. You cannot build enough sea walls.

You cannot do enough to keep that sea water out. It's already infiltrating into wells and contaminating fresh water with salt water. We are seeing some pretty devastating things already.

Michael: Ninety five percent of my family, virtually all of my family lives in Miami and Key Largo. I am well aware of the challenges that Miami faces over the course of the coming decades.

Susan: It's not going to be pretty down there and at some point, we are going to have to do some thinking about what places we start to back away from, rather than continually rebuilding and rebuilding in places that continually get flooded, whether they are on the coasts or in river flood zones. I think we just have to get a little bit smarter about some of that.

Michael: There is just two last questions I'd like to ask. One is what would you say to a young person who is waking up to the challenges of this, maybe a teenager or a twenty-something? That's one question, and the second one is a practical question. For those of us who get climate change and get these challenges and who want to put our shoulder to the wheel and want to do something, what would be the thing that you would most recommend?

We can all change light bulbs and drive less, fly less and all that. That's

great, that's good, but how can any one of us or any small group of us, say a church, help further this movement to put a price on carbon? How can we learn more about that and then engage in that issue so that two, three, four, five or six years from now, when we've actually done that, we can look a young person in the eye and say, "Yes, I helped make that happen," or whatever?

Susan: I think there is a tremendous amount that can be done at the local level, the local, state and regional levels, and we are seeing that happening around the country. We can say, [inaudible 00:48:45] as a community. We have cities, hundreds of cities across the US that have signed commitments to do just that. We have mayors for climate protection, we have cities doing great things.

Get involved in your city. Get involved in reducing emissions, because you can't put a price on carbon in your city. This is a national and possibly an international issue, but you can do things to reduce your emissions and that's when it matters to the atmosphere is how much are the emissions, so the more we can cut, the better.

People started doing that in cities, and then states got together and started doing it, and then these nine Northeastern states got together and made this regional greenhouse gas initiative, so they are doing it, and that's happening around the country. That can happen in many places.

Each of these is a laboratory for things that can then take place at the national level. Let's get these things in place, then we can expand them. Let's start all those laboratories. What you do in your home, what you do in your church, what you do in your community.

Maybe your church wants to have a competition with the next church to see who can cut their emission more, make it fun. Schools can compete for this. Nancy Jackson is doing this in Kansas with the Climate and Energy Project, where schools compete against each other and they make it fun. She says, "In Kansas, there are a lot of people who don't accept the reality of human-induced climate change," but she said, "It doesn't matter. The atmosphere doesn't care if you believe it or not. What it cares is what are the emissions, and if we can cut the emissions, that's what matters."

Let's do that, and it's not only about cutting emissions, because that's one piece of it is reducing future climate change. Another piece of it is dealing with becoming more resilient to and more prepared for. The climate change, we're already dealing with and there is so much that can be done

and is being done at the local level, because that's really where these things take place.

Work on those things. Work with your community to do those things so that we'll be more prepared for the things that are coming our way and at the same time, John Holdren, the President of Science Advisor says, "There are three things we are going to have to do. Mitigate, that is reduce the amount of climate change. Adapt, that is become more prepared, and the third one is suffer."

The three pieces of the pie, they are movable. The more we mitigate and reduce, the less we'll have to adapt and the less we'll suffer, and the less we'll mitigate, the more we'll have to adapt, and the more we'll suffer. All those pieces are movable. Let's make that mitigation piece, the piece where we're reducing emissions the biggest piece, and then we'll reduce the cost of adaptation and we'll reduce the amount of suffering.

Those are things we can all do. We can do them in our homes, in our communities, in our states and we can keep working up the levels, until we get a great national plan and I believe and the President believes, that when the US takes the lead, the rest of the world will follow.

We've been the largest emitter for a long time. China has just surpassed us on a year to year basis, but just for the last couple of years, but cumulatively, we still have – and cumulative is what matters, because carbon dioxide stays up there for a long time. We've got a lot of work to do and we've just got to get on it as much as we can, as fast as we can.

Michael: Amen. To a young person...?

Susan: I would like to see young people really throw themselves into this. This is about their future and there is so much that they can do in their own communities. Think about where kids get things started. They take them home to their parents and they spread throughout the communities. That's how recycling got going.

Kids came home and told their parents, "We're going to do this. We're going to sort this stuff and this is how it's going to work." Kids can learn about this and they can tell their parents. This is about my future, help me. Let's get this going. There is a leadership role that kids can take, that young people can take, and just thinking about their career choices.

We need some serious movement on the energy front. We need to see all

the forms of renewable energy, get more efficient and less expensive. We are already seeing that, but we can do more. The price of solar cells has come down hugely. The amount of wind power and solar power are going up enormously, but we need more and we need other sources of renewable energy.

There are so many things that are being worked on now. I'd love to see young people get involved in those kinds of activities, thinking about the future and how they can make it better, what contribution they can make to electric cars and then to power those cars with renewable energy, for example.

Michael: Yes. That's great. Susan, if somebody wants to know, if they just get totally turned on with this conversation and really want to explore your work more deeply, where would be the best place or places to go?

Susan: I would send them to my website, it's [climatecommunication.org](http://climatecommunication.org). There, we have lots of resources posted. People can read about climate change, the basic science. They can find articles and reports, they can see videos. What we've done is taken some of the really important graphics in climate change and we've animated them and narrated them, so we give you a guided tour through some of these graphics, explaining what you're seeing and why it matters.

There is all kinds of great stuff there and I think that's where I would recommend that they go, and that website also points you to other good websites to explore more.

Michael: That's fabulous. I've spent some time there and I am motivated to do even more now, as a result of this. Susan, thank you so much for being part of this series, for the work that you're doing and I am just thrilled to have made this connection and had this opportunity to have a conversation with you about this.

Susan: Thanks. It's been fun to talk with you. I'll look forward to hearing about the series as it goes forward.

Michael: Thanks.