

Bill Gates and Rashida Jones Ask Big Questions

EPISODE 04: Is it too late to stop climate change?

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RASHIDA JONES: Hi, I'm Rashida Jones.

BILL GATES: I'm Bill Gates.

RASHIDA JONES: And today we are going to talk about climate change.

[singing]

RASHIDA JONES: Sometimes I think about all of the big questions we are asking Bill, and they all feel like they don't really matter unless this one is answered. Just give it to me straight, is it too late to stop climate change? Are we doomed?

BILL GATES: No. The same kind of innovation that got us into this where we invented electricity and cars, that it brought so many benefits, that same kind of innovation power accelerated will let us do those things but in ways that don't emit greenhouse gases. It's not going to be easy. We'll have to put a lot of resources in. We have to get going now because to get to zero by 2050 is not easily achievable. Without innovation I would say this is not a solvable problem. You've seen the personal computer revolution, you see what we've done with various diseases. We are smarter today than ever and a lot of great people are working on these solutions. People should feel like god, there really is hope here and that's why it's worth politically getting countries to make this part of their agenda.

RASHIDA JONES: Right, right. Let's just break this down from the beginning. You mentioned greenhouse gasses. What are emissions for people who don't know and are emissions and greenhouse gasses one and the same?

BILL GATES: It's an interesting thing that when you burn coal or natural gas or gasoline, you create CO₂.

RASHIDA JONES: Carbon dioxide.

BILL GATES: Our atmosphere is mostly nitrogen and oxygen about 99%. Right now, about 0.4% is this CO2 and that keeps going up and that is a problem because the more of that that is in our atmosphere, the hotter the earth gets. It retains more of the sunlight, the heat that comes in.

RASHIDA JONES: Right.

BILL GATES: It's not just CO2, although that's by far the biggest part, there's a few other things like methane, which is CH4 and nitrous oxide. But basically, we emit about 51 billion tons of that CO2...

RASHIDA JONES: Whoa.

BILL GATES: ...every year, across five major activity areas. The more and more of that, that gets into the atmosphere, the hotter the earth gets and if you don't drop it to zero, you just keep getting hotter and that heat causes forest fires. It causes sea level rise. It wipes out coral reefs, polar bears.

RASHIDA JONES: Mm-hmm. [*affirmative*]

BILL GATES: It's just such a sudden change. The heating is going up quite rapidly and so the plants and animals can't evolve to adapt which they could if it was taking place over hundreds of thousands of years, but this human activity is causing this temperature rise. That is no longer disputed. How bad it gets, how quickly does the ice melt and that drive sea level rise and how quickly various natural ecosystems go away, there's still lots of uncertainty about which bad things happen, how quickly. But particularly if you're near the equator, doing things outdoors, any type of labor, but particularly farming is going to be impossible. Your crops won't grow well and you won't be able to sustain yourself being out there in the heat of summer.

RASHIDA JONES: Your book is coming out, *How to Avoid a Climate Disaster*. What's the thesis? How do you avoid it?

BILL GATES: I go through where the areas of emissions are so this industrial area that people probably are the least familiar with. I explain why are there emissions, and how much more expensive it would be to make those things green. I lay out where do we need government policy? Where do we need R&D? I hope it's a hopeful book, but it really addresses all the areas of emissions, not just the easy ones because if you look back from 2050, it will have taken huge amount of innovation to achieve the goal.

RASHIDA JONES: We have these emissions, there's transportation, which I feel like a lot of people know because there's a lot of discussion around electric vehicles and all that, but then we have buildings, we have manufacturing, agriculture and electricity generation, which are all significant parts of the puzzle. What do you think people get wrong about how to solve for the electricity part of it? I for one have been told for a long time that wind and solar and other green energy, that is the solution. Is that wrong?

BILL GATES: No, that's definitely a part of the solution. If you look in the five areas, let's start with electricity because the price of wind and solar coming down is absolutely fantastic. Now unfortunately, wind and solar are intermittent. The sun goes down at night. It can be cloudy. You can have storms that actually...

RASHIDA JONES: Mm-hmm. [*affirmative*]

BILL GATES: ...even the wind has to shut down during those storms. You want electricity all the time. During that cold storm, you still want to keep your house warm, you want the hospital to work, you want to charge your electric cars. The ability to store energy is so limited that wind and solar alone can't provide a solution. We need a storage miracle or we need some source of energy, like nuclear fission or fusion that we can call on all the time. Some breakthrough there would make the electricity sector solvable.

RASHIDA JONES: When I was a kid, I would go to the beach and clean up plastic from the ocean and I felt really good about myself. Is me doing that, am I fixing the climate crisis in any way?

BILL GATES: Yes. Individual behavior alone won't get us to zero but when you buy an electric car that not only has less emissions, but the more electric cars we sell, the better we get at making those batteries cheaper and cheaper. We do, in that area, passenger cars, expect to get to the point where eventually the electric car will be cheap enough and have enough range that it basically out competes the gasoline automobile, even without having to do special tax credits or make people feel guilty for buying a gasoline car. Then what I call the green premium, the extra cost, by the time it gets to zero, which for passenger cars we can see over the next decade that's likely to happen, everybody buying electric cars, pushing that forward. If you use less electricity, then you're reducing your emissions. The world is still going to use so much electricity that we do need to stop having coal generation, natural gas generation, because that's where most of the CO₂ is coming from.

RASHIDA JONES: How bad will it be if we don't get the emissions down to zero?

BILL GATES: If you miss then it keeps getting hotter and hotter. Eventually the ice in places like Greenland and Antarctica melts and raises sea level substantially. All the beaches that

you're used to, they're gone. People who live near the coast, they're gone. You get enough heat that you really can't work outside or grow crops near the equator. The worst effects of climate change are near the equator. Unfortunately, a lot of developing countries, countries that aren't wealthy like the U.S., are near the equator--big parts of Asia and Africa. There these farmers who grow their own food, subsistence farmers, they'll be the first one to face malnutrition and starvation. The U.S. will see forest fires. We will see more hurricanes. We will see a lot of extinction. The natural ecosystems will die off. The further north you go, the less bad climate change is. In fact, some areas will actually be able to grow more food, but net, it's a very bad thing, getting worse and worse every year that you continue those emissions.

RASHIDA JONES: Elizabeth Kolbert argues that the earth is in the midst of a manmade sixth extinction. Her book, *The Sixth Extinction: An Unnatural History*, won a Pulitzer Prize in 2015. Her next book, *Under a White Sky*, is coming out in spring of 2021. Welcome, Elizabeth.

BILL GATES: Hi, Elizabeth!

ELIZABETH KOLBERT (GUEST): Thanks for having me. It's really an honor and a pleasure to virtually meet both of you

RASHIDA JONES: Do you believe that we can actually reverse this extinction?

ELIZABETH KOLBERT (GUEST): I think that we are in a period of elevated extinction rates, extremely elevated extinction rates. Hundreds, perhaps thousands of times higher than what are called the background extinction rates that have prevailed over most of the history of life. We still have a long way to go before we reach the level of extinction that defines the mass extinctions of the past. For example, the asteroid impact that killed off the dinosaurs, killed off something like 75% of all species on earth. We definitely will make the decision whether this extinction event that we're in right now becomes truly a major mass extinction or whether it doesn't.

RASHIDA JONES: Bill, do you believe that humans are going extinct?

BILL GATES: Actually, part of the problem is we have a lot of humans. We've got over 7 billion and that is stretching the resources of the planet. One piece of good news is that most of the world is near its peak population. We're expected to go from about 7 billion to 10 billion and not much more than that. The really good news there is the burden of humanity on the planet will reach a limit. But that is, as Elizabeth's gone out in the field and met great people measuring this, these problems, it is destroying a lot of natural ecosystems. We should make sure that we're helping poor societies make this transition to lower, voluntary lower birth rates as fast as we can. Then we should make the burden per human on the environment

dramatically lower through innovation. The point that it's not just climate change that's hurting these natural ecosystems, the human footprint is more than just greenhouse gas emissions. I put it at the top of the list. I hope people don't forget the other parts of it. I'd say it's the hardest. A lot of the other things people see because it's local. It's the local effect what you're doing to your river or your lake, whereas greenhouse gases are invisible. You don't smell them. It gets worse every year, and so only by getting people to think forward where the Arctic will be utterly different, the Antarctic will be utterly different, the coral reefs will likely not survive, then we can hopefully motivate them to take action now.

RASHIDA JONES: Humans have been imposing their will on every other species for quite a while. We have to assume that animals have adapted to some of the impact but probably not at the rate that they're used to adapting. Elizabeth, what plants and animals should we be most worried about? Are there species that would survive a climate disaster?

ELIZABETH KOLBERT (GUEST): You're asking one of the great questions of biology these days. Bill mentioned coral reefs. Coral reefs are the poster creatures, I suppose you would say, for the impacts of climate change on an ecosystem. Corals are tiny animals, and they have reef building corals, in particular have these tiny, even tinier plants, symbionts, living inside their cells. That relationship, which has evolved over millions of years, is crucial to reef building. It's what gives these creatures the energy to in effect build reefs which are these extraordinary structures, way bigger than any man-made structure and take many, many generations of corals to produce. At some point in their lives, about a quarter of all marine creatures spend some of their lives on a coral reef.

RASHIDA JONES: Hm.

ELIZABETH KOLBERT (GUEST): That's a hugely important marine ecosystem. What happens as water temperatures are rising, and we're seeing that every year now practically, as water temperatures rise, the corals' relationship with their symbionts gets thrown off.

RASHIDA JONES: Hm.

ELIZABETH KOLBERT (GUEST): They sort of eject their symbionts. When that happens, they can starve to death, and that's a coral bleaching event. We've just come through a series of very significant bleaching events. When you get one after the other after the other, the corals can't recover. There was just a study very recently that suggested that something like a quarter of the Great Barrier Reef, which is just the most extraordinary place on Earth, half the coral cover has been lost in the last couple of decades, owing to these bleaching events. That's just a huge, huge example, unfortunately one example, but a very, very striking example of what happens when you change temperatures very quickly. As you alluded to, what's important here is not just that we're yanking up the temperatures of Planet Earth. But we're doing so really fast,

right? If you're a creature that has to evolve, right? A human being goes out, the weather changes, okay. If you're lucky, if you live in an affluent part of the world, maybe you turn on the A/C more. But if you're a creature that has to evolve in response to that, that's your only option is this very slow, painstaking as it were, process of evolution.

RASHIDA JONES: I often think about the fact that it's inevitable that this will only get worse. Am I right?

BILL GATES: The best case that we're aiming for is to drop greenhouse gas emissions to zero by 2050. Because of the lags in the system, we'll not only have increased heating through 2050 but for many decades after that, almost to the end of the century. Even in the best case of reducing these emissions, which has the term mitigation, we still also need what's called adaptation to try and avoid the poor farmers starving to death, to avoid the damage to human life from hurricanes, or to be ready for the sea level rise that is definitely coming. So, yes, some adaptation is required. The more you do mitigation, the less of that is required. In a really extreme case, you could say, "Okay, humans aren't going to be completely wiped out, because somebody up in Canada will still be able to grow food," but as we're messing up these natural ecosystems, that's very bad for us as well. As you said, we depend more on nature to grow food and our appreciation of where we live, and if people lose sight of that and we're not making investments now, then it gets really, really bad towards the end of this century.

RASHIDA JONES: How do you get people to understand the impact and how it's going to change their lives? Or do you have to just wait until it does change their lives?

ELIZABETH KOLBERT (GUEST): I think that's a really good question. That's why climate scientists have been beating this drum for 30 years now. Saying, "Look, don't wait till you get the climate that you don't like," because as Bill was saying, there's a big time lag in the system. You get the climate that you don't like, there's no going back, or at least not for many generations, let's put it that way. Now we are seeing very big impacts, the huge fires this summer and fall in California and in Oregon, and fires in Colorado, record breaking fires in the Rockies. The hurricane season really unprecedented. We are seeing these impacts right here in the U.S. of A. I think that you're seeing, if you look at public opinion polls, that people are increasingly cognizant and aware of what's going on. We really need to start laying the groundwork for, as Bill was saying, for tremendously cutting our emissions. Also adapting to those impacts that we cannot avoid at this point.

RASHIDA JONES: Let me just ask you this frankly, are climate change deniers dangerous?

BILL GATES: There's less climate denial now. The oil companies who backed some of those things and the data about this is so strong at this point that I'd say the main groups we have to worry about now are people who don't prioritize this problem because they see other problems

or they worry that the global cooperation required won't take place, and so why should we make a sacrifice if the other countries aren't willing to do their part. Let's call those people who minimize the problem and don't prioritize it. Then, we have people who believe in the cause, but they think it's a simple thing to solve. That in 10 years, we can have solved this problem. If they think that, they will become fairly cynical as they realize, "Oh my goodness, changing the way we make steel and cement and air travel," the number of innovations, like a dozen really amazing breakthrough things to go along with the breakthroughs we've already made, like low cost solar energy. During the financial crisis, 2008, 2009, people's interest in climate went down a lot.

RASHIDA JONES: Hm.

BILL GATES: The good news on this one is that even during this pandemic, which is so awful economically and health, the interest, particularly in young people, in climate change has remained very high. In a way, the great books that people like Elizabeth do, the constant discussion, the fact that the oil industry is no longer trying to confuse people about this, I'd say there is a bit of hope in terms of the political will. Which I'm trying to make sure we map that will into a concrete plan, and that's why I wrote a book, it's not to convert the unconverted. It's to tell the converted, "Okay, what does a real plan look like?"

RASHIDA JONES: You both work in this area that I could imagine at times can be very disheartening and very depressing. What gets you fired up in the morning? What's the thing that keeps you going when you feel overwhelmed with what's happening? Bill, let's start with you.

BILL GATES: Science has achieved so much and the scientists who are studying these problems are doing fantastic work. The scientists who are working on the different approaches, how do you store energy, how do you a next generation of nuclear, I get to meet with those scientists. Not all of them will succeed. That's why we need a lot of redundant efforts. Hundreds of efforts to get maybe a dozen that actually work. I am hopeful. For individuals, I'd say there's two things that really count. One is, your political engagement, because the government will fund the R & D and will have the policies that will drive up the scale of electric cars or clean cement. And so, political is number one. Number two is when there is a product that's a lower emission product, you as a buyer are, as you drive that product up in scale, the price will come down and so your willingness to buy an electric car or to buy meat that was made with no emissions, that is very helpful because we want to get that extra cost of all those products down to zero, so even the people who don't care so much will switch over at that point. I am enthused because I believe in innovation and this is more of a priority. In Europe, it's a priority. In China, it's somewhat of a priority. It's in the dialogue and young people are increasingly learning about it and speaking out.

RASHIDA JONES: When you are an individual and you buy something, you're also signaling to the marketplace that there is a market for said things. You're contributing to this idea that people will innovate around that and create products that people want, right? That's how electric cars became popular.

Elizabeth, what about you?

ELIZABETH KOLBERT (GUEST): I think that the point that Bill makes is really crucial. I think a very good example is solar panels which have dropped in price tremendously. That was not so much because of U.S. government policy, unfortunately, but it was because of government policy in China and in Europe and those panels came down in cost. They were subsidized for a long time now they've come down in cost tremendously, and Americans are installing them in large numbers. It's become the cheapest source of new energy right now, additional energy and that's a huge victory for trying to grapple with climate change. We need that on every level, as Bill suggested. We need that around all forms of de-carbonization and it is going to be both government policy and the world embracing a certain amount of change that we're going to need to tackle this problem. Unfortunately, one of the things we've seen, particularly here in the U.S., and this sort of gets back to your question earlier about climate denialism, is a resistance to anything that challenges this notion that we can go on with things the way they are right now. I think a really key message, if I could impart any message to people, is change is coming. It's coming in the form of climate change. You can either try to minimize that, how much the climate's going to change, or we can stick to some of these outmoded ways of doing things and cause really, potentially a climate disaster.

RASHIDA JONES: Right. Elizabeth, do you have any burning questions for Bill, big or small?
[laughs]

ELIZABETH KOLBERT (GUEST): You're a really smart, really tech savvy person, Bill. But I'm really interested in whether there was a moment or someone presenting you with the evidence. What do you think the best argument is for why people should care about this issue?

BILL GATES: I got drawn into this issue through the work of the foundation in helping developing countries, particularly in Africa. As I would fly in, I would see no lights at all, just burning fires at night, even in Lagos, Nigeria, which is better off than most parts of Africa. I thought, "Okay, we've got to electrify the entire world," and then as I looked at that, I realized that repeating the building of coal plants or natural gas, like the rich countries had done, was going to make the climate change work even worse. I wanted to study, okay, is that really that big of a problem, getting poor people electricity, come on, they deserve basic living standards. Sadly, I realized, yes, this is not an overblown thing. It is, in fact, because it just gets worse and worse as time goes on, actually understated, if you can empathize with people in future generations. My normal sort of instinct of, well, we can innovate our way out of any problem,

kicked in. I did meet people who work in nuclear, people who work on batteries. I've lost a lot of money on battery companies, I've got a nuclear power company that just won a big U.S. government award. It's the hope to accelerate a lot of innovation, including in the very hardest areas like steel and cement, where there's less ideas about how to make those things in a clean way than passenger cars, where we can see, okay, it's a slight premium still, but that will come down over time. I feel like people haven't focused on the tough areas but I do bring us a real optimism to anytime we can unleash human ingenuity.

RASHIDA JONES: I mean, that's true. People like to show that they're smart and innovative, so if we can help tie that to solving the very, very dangerous problem at hand, hopefully we'll get somewhere. Bill, do you have any final questions for Elizabeth?

BILL GATES: Yes, I'm curious, tell us a little bit about the next book.

ELIZABETH KOLBERT (GUEST): The next book looks at exactly some of these questions. Where do we go from here? I wrote about coral reefs in the last book and how coral reefs are really suffering from climate change. In this new book, I go talk to people who are trying to think of ways to innovate their way out. It's really tough when it comes to the natural world in many ways. The corals are not necessarily as innovative, as you might hope. I go places like that, where people are trying to say, "What is the next step here?"

RASHIDA JONES: Do you explore any more of pulling carbon out of the atmosphere? Is that in your book, too?

ELIZABETH KOLBERT (GUEST): There is a chapter on people who are trying to pull carbon out of the atmosphere. In fact, I go visit some of my own emissions, which I paid to have pulled out of the air and turned into stone, I should add.

RASHIDA JONES: Wow. How great. Do you have that stone? Do you own that stone now, or did you give it away?

ELIZABETH KOLBERT (GUEST): [*laughs*] They didn't give me the stone, because this stone is about a half mile underground.

RASHIDA JONES: Okay.

ELIZABETH KOLBERT (GUEST): They spent a lot of money to pull up this core to show people like me and really to show the scientific community that it was actually solidifying. But I didn't get to take it home with me. How's that?

RASHIDA JONES: That's very cool. Thank you so much for joining us and talking to us. I really hope that between these two big brains and thoughtful people that we can get people to care. Thank you so much, Elizabeth.

ELIZABETH KOLBERT (GUEST): Thanks for having me.

BILL GATES: Yeah, great to talk to you

ELIZABETH KOLBERT (GUEST): It was great to meet you.

RASHIDA JONES: Nice to meet you.

BILL GATES: I look forward to reading the book.

RASHIDA JONES: Me too. Me too.

ELIZABETH KOLBERT (GUEST): I look forward to reading your book.

RASHIDA JONES: Me too.

ELIZABETH KOLBERT (GUEST): Take care.

BILL GATES: Bye-bye.

RASHIDA JONES: I love her writing because it's so evocative. It's so illustrative and it just reminds us of how we have no contact with most of the species on the planet in a day-to-day way. That speaks to me in an emotional way because on my best days, I feel connected to everything. On my worst days, I feel selfish and I'm stuck in my head. Is there anything about her writing that speaks to you in an emotional way, or how do you respond to her the way that she writes or things she writes about? Is it just the impact?

BILL GATES: She gets out in the field and shows people seeing how the ice is melting and going, "Wow, this is a bit scary." She gets out in the field and sees people who are seeing the species die off and tells their stories of how committed they are and how worried they are. Humanizing the problem is super necessary and I would say she's been one of the most articulate. It's a field that can confuse people with all of its terminology, but her books are very approachable, and we need a mass consensus on this because we are asking governments to put a lot of resources in. There will be some short-term sacrifice to switch over so many of these physical activities and for a period you'll actually have to pay a premium price to get

cement and steel and aviation fuel and then bring that extra cost down so that we can even turn to the developing countries like India and say, "Okay, either we got rid of that premium or it's only a small premium, so as you build buildings for your poor and give them electricity at night and give them air conditioning which they'll need even more, please use the clean way of doing it." Which right now, that would be unreasonable. It's just too expensive.

RASHIDA JONES: Right.

BILL GATES: We can't subsidize them and asking them to pay for it and build less buildings or have less light, that's unfair because they haven't done the emissions. Per capita, they've done a 20th of the emissions of the rich countries so without innovation, you get into this deadlock.

RASHIDA JONES: Let's talk about this idea of a green premium. This is an idea that, the costs of doing things in a zero carbon, zero emissions way actually costs more, right? The extra cost is the green premium and that the premiums being so high makes it kind of impossible to move forward. The idea is to invest and innovate around technologies and ideas that lower this green premium so that everybody can afford it and eventually not have to pay an extra price to be green and to do things in a clean way.

BILL GATES: Right. When people say, "Are we really going to get to zero by 2050?" just looking at the parts where we've made progress, like electric cars for passenger cars or some of the electricity generation being solar or wind, that doesn't say that you've solved all the categories. The best measure is to look across all the categories: heating buildings, cooling buildings, making steel, making cement, and see how expensive the clean approach is. That is this green premium. The progress then is are those coming down as we invent green cement, as we start to get people to buy green cement? Is it getting to be so cheap that you can call up India and say, "Don't use the dirty stuff at all, just use this clean stuff," and so, in a way, the responsibility of the rich countries, particularly the United States, isn't just to get our own emissions to zero because our share of the risk-taking innovation science power in the world is still half or more. We owe the world not just to get to zero. Maybe we could do that by brute force. We owe the world to innovate to bring those green premiums down. Of all the measures of how far are we away from zero, I think the green premium should be something more focused on. Otherwise, the hard parts, nobody wants to go to work on those if it's just short-term progress metrics.

RASHIDA JONES: Right. I'm actually very interested in concrete and cement. I want to understand what about that industry creates emissions and then what, just conceptually, what would a green concrete look like or be like? What makes it more green?

BILL GATES: I love industrial processes and the way that these things work. Cement is amazing because limestone, which is the primary ingredient of cement, is available all over the world.

It's just super cheap. Limestone, called calcium carbonate, what you do is you heat it up and it releases CO₂ as you heat it up.

RASHIDA JONES: Oh.

BILL GATES: There's actually two reasons why cement emits greenhouse gases. One is the energy you use to do that heating in what's called the kiln. The other just that chemical process of knocking out the CO₂ to make calcium oxide, which is the primary component of cement. The solution would look something like, source that heat energy for the kiln from a green source. The other thing would be to capture the CO₂ as it comes out. You have a lot of hot gas leaves the kiln. Can you have something that grabs the CO₂ out of that flue before it goes out into the atmosphere?

RASHIDA JONES: Then what do you do with that? Can you dissipate CO₂ once it's captured?

BILL GATES: Yes, once you have CO₂, if you're willing to pressurize it and cool it down, you can inject it into the Earth and actually, it will calcify. It will combine and become a mineral like calcium carbonate.

It will be permanently stored with no risk that it would come back up later. At a very small scale, a company called Climeworks is doing this today but the cost per ton is more than ten times, it's over \$600 a ton, more than ten times what we need it to be to make it practical.

RASHIDA JONES: Putting stone deep into the Earth like that, that's not going to have any negative impact later? Or are we just going to create little stone underground cities later?

BILL GATES: No, the amount of space in the Earth as you dig down is kind of mind-blowing. There's tons of water and rocks. If we're at all careful, the reinjection of CO₂ back into the Earth, where over time it will mineralize, that will work. That'll be very, very safe and not leaving some huge burden to future generations. That storage piece we need lots of people to work on because it's very daunting. If we pursue all these breakthroughs, some will work out. We're just not putting enough money or IQ into it right now to give us the best chance of solving it by 2050.

RASHIDA JONES: That's what I was going to ask you. Do you think that we'll ever convince people to be committed to zero emissions because it's the right thing to do or do you think it's going to have to be a financial thing?

BILL GATES: There will be areas where we don't get the green premium down to zero. The government will have to have a requirement to reduce emissions or they'll have to subsidize the green approach so that it out competes the dirty approach. Government will for some of these things, have to have regulations. The ideal would be to have as little of that as possible, to get the green premium to zero which I'm quite confident we'll get there in passenger cars.

People won't complain about a mandate that at some point in time all cars be electric because they won't be paying some huge premium or giving up the range or worried whether they can find a charging station, because we'll have lots of those. The last thing we can do is the brute force tax that disadvantages the dirty approach.

RASHIDA JONES: Okay, so while we're waiting for this kind of greener everything, I'm just going fire a bunch of questions at you and you just tell me simply yes or no if doing this thing will actually help to stop or slow down climate change. If I become a vegetarian and I eat meatless meat, will that help?

BILL GATES: Yes. The demand for the new meat products, things like Beyond Meat, Impossible, that's going to help them scale up and reduce that source of emissions.

RASHIDA JONES: Okay, great. Buying carbon offsets. Does that help?

BILL GATES: That helps fantastically. That's a huge thing that we hope people will do more of.

RASHIDA JONES: Good, okay. Buying a private island to escape to.

BILL GATES: Probably not. Islands just flying there generates a lot of carbon.

RASHIDA JONES: Okay. Buying paper straws.

BILL GATES: Not really. There's the other problem of the plastics getting into the ocean which is mostly from countries that don't collect their garbage fairly well. In the U.S., most of those plastic straws get to the dump they don't get to the ocean. It's fine but it's not really a climate change thing.

RASHIDA JONES: Just sidebar, so in terms of recycling and collecting garbage, I feel like there's a lot of things recently that have told us that the plastic we think we're recycling is not actually going anywhere but a landfill. Does recycling help? Does it actually help?

BILL GATES: Some recycling definitely does. Take aluminum cans. There the amount of energy you need to make a new can from that recycled can is about a tenth as much as taking the bauxite, the mineral that we make into aluminum, and so that huge energy reduction is helping with emissions. Paper sometimes is used to remake things. Plastic in a few cases was used. But in a lot of cases, it's such low-grade plastic that they can't go back and make a new plastic bottle out of it. So it's a mix.

RASHIDA JONES: The answer's just to make less plastic things, right?

BILL GATES: You can recycle plastic or you can use less plastic. Packaging, there are people who are trying to innovative to have less packaging and that's definitely a good thing.

RASHIDA JONES: Okay. A couple more questions. Does eating organic produce help?

BILL GATES: No.

RASHIDA JONES: [*laughs*] Okay.

BILL GATES: Organic produce requires more land than typical farming techniques. I know that's not a popular answer.

RASHIDA JONES: It doesn't help, it actually harms. Okay. Hot take. Hot take Bill. Okay. Flying on planes less often?

BILL GATES: Definitely. We do hope to have green aviation fuel, but we don't have that today. For a lot of people their flying would be a significant category of emissions that they're connected to. In my case, it's by far the largest category so 've gone out and funded green aviation fuel to offset. It's very expensive but I want to set a good example.

RASHIDA JONES: Great. When I buy fuel, I'll make sure it's green fuel.

BILL GATES: [*laughs*] Some of the airlines are going to give you a chance...

RASHIDA JONES: Oh, you can choose?

BILL GATES: ... to pay a little more for your ticket...

RASHIDA JONES: Oh.

BILL GATES: ...as they move to try to buy this. We're at very early days. I mean, like 1% of aviation fuel is green today. It will take decades to get that number up, but the airlines are starting to think about it. They don't want to be the bad guys.

RASHIDA JONES: Right, of course. Okay, what about obsessively turning off my lights, or my air conditioning, or my heater when I leave my house and my room?

BILL GATES: Quite modest benefit, but it's a good practice.

RASHIDA JONES: What is the single, not to put any pressure on you, but the single most important thing that an individual can do to help stop or slow climate change?

BILL GATES: The biggest thing is their political voice. To tell the government, this is something we want you to hire the best scientists, the best modelers. In the same way you should've gotten us ready for the pandemic, this one is 100% sure to come, we want you to take all the brains in the country and activate them to solve this problem. That is the biggest thing. Without the governments we could get slight reductions through changes in individual behavior, but not significant. Particularly when you look at the developing countries, where just providing basic shelter, and lighting, and a little bit of transport, at a tenth the energy usage that Americans are used to, the demand is going to go up. Unless we can multiply some things by zero with innovative approaches, we're not going to bring the 51 billion tons of emissions down dramatically.

RASHIDA JONES: Great, okay. Yes, political voice, influence. We live an era where the American individual feels like they do have a voice and they can call their local government, their federal government, and apply pressure, speak openly to apply pressure on people. What do you think is the one area, if you had to, that we are most likely to innovate in the fastest?

BILL GATES: Passenger cars, even though less than 2% of the sales today are electric cars, the volume is increasing so that the batteries will come down in cost, that'll bring the green premium down, the batteries are getting better, so the range of the car will be better. I think the passenger cars, even by 2040, overwhelmingly they'll be electric. Then if we couple that with the electric generation becoming clean, that's a whole area. Now, within transport, that's one of the big five areas. You'll still have planes...

RASHIDA JONES: Buses.

BILL GATES: ...and boats, and trains, and trucks.

RASHIDA JONES: Right, trucks.

BILL GATES: Passenger cars are the easiest...

RASHIDA JONES: Mm-hmm. [*affirmative*]

BILL GATES: ...of the transportation areas. Planes are the most difficult because the energy density of that fuel is 20 times the energy density we can get in a battery.

RASHIDA JONES: Mm-hmm. [*affirmative*]

BILL GATES: We're not going to be able to stick batteries on the plane. We'll have to probably still make fuel but make it in a way that we have drew carbon in to make it net zero.

RASHIDA JONES: I appreciate how detailed and determined you are in all these areas but listening to Elizabeth, she's talking about a mass extinction. Do you really think that focusing on this and focusing on the innovation is going to prevent a mass extinction?

BILL GATES: We're already seeing species die off. There's a variety of environmental things, like invasive species, that we can't forget those, those go beyond climate change. Environmentalists should put a lot of their time into climate change, but they can't give up on other issues like overfishing, or polluting the ocean, those count as well. There's a lot of humans and we have disturbed the natural environment and figuring out how to minimize that will cut down those extinctions a lot.

RASHIDA JONES: Would you consider yourself an environmentalist? I know you believe in innovation, and I don't necessarily think that's diametrically opposed with having respect for and preserving the environment. Is that like a part of you, do you feel connected to nature in that way? And do you have an environmental preservation thing?

BILL GATES: I've been super lucky. I've gotten out to see the chimpanzees and the gorillas. I've seen the lemurs in Madagascar. The mind-blowing beauty of the earth, going to the Great Barrier Reef and seeing all the different species there. I've had that experience. Movies like Planet Earth show you even more of the miracle of the natural world. The idea that we're completely messing that up is appalling. On the record of human behavior, how can we avoid this? The fact that the population will peak gives us a chance. But that alone, the amount of damage we will have done by the time it peaks is way too much unless we change this. So yes, although that term often means people who hate nuclear energy...

RASHIDA JONES: [*laughs*]

BILL GATES: ...that's not me. Or hates advanced seeds, that's not me. It's a label that I'd embrace.

RASHIDA JONES: But you think those two things can coexist? You think that you can be a fan of innovation, an actual creator and innovator yourself, and also work to preserve natural ecosystems? We've been heading in one direction for so long where manmade innovation has

been pushing against nature in a way that's making species extinct and endangered. Can we all get along and live together, is what I'm asking?

BILL GATES: The hopeful story is that in the rich countries, the level of air pollution and water pollution, is far less than 30 years ago. As we become better off, we do prioritize taking care of the environment. A lot of countries, these developing countries, we don't want them to go through the same phase of local pollution or CO2 emissions that we went through. Innovation now is aimed exactly at not disturbing the environment.

RASHIDA JONES: That makes me feel hopeful. I'm still very concerned about the fact that people are selfish and won't take this seriously until they're forced to take this seriously and it's impacting their immediate environment. But I hope.

BILL GATES: If that's what happens we're in real trouble because this is one where you cause the problem today and you pay the price decades later. There's no easy fix if you wait until the problem's there. There's nothing like a vaccine that magically goes out and gets rid of it.

RASHIDA JONES: Between buying carbon offsets and using political power and having your voice be heard, if we could get enough people to do those two things, do you think we have a chance?

BILL GATES: Absolutely. That's why I work in the field and I'm quite hopeful.

RASHIDA JONES: Okay. I'm going let you take the hope on that one, because I am still very concerned...

BILL GATES: All right.

RASHIDA JONES: ...but I'm so happy to talk about it and know that people are thinking about it in these kinds of large-scale ways.

RASHIDA JONES: Bill Gates and Rashida Jones Ask Big Questions is a production of the Gates Notes. It is written and produced by me and Bill. Thank you to our guest Elizabeth Kolbert for joining us today. Our creative director is Ian Sanders, our supervising producers are Jen Krajicek, Pia Dierking, and David Sanger. Our design director is Anu Horsman. Our technical director is Alicia Salmond. And our researcher is Brent Christofferson. Thank you to executive producers Lauren Spohrer, Phoebe Judge, Bridgett Arnold, and Nick Moceri, co-executive producers Kara Brown and Meghan Groob, and producers Carl Malone and Nadia Wilson. Special thanks to Larry Cohen. Audio mixed by Rob Byers, Michael Raphael, and Johnny Vince

Evans. And recording by Joel Barham. Galen Huckins is our composer. Our theme song is Talk by Khalid.

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