

THE BROOKINGS INSTITUTION

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THE SOCIAL COST OF CARBON:
WHAT IT IS, WHY IT MATTERS, AND WHY THE BIDEN ADMINISTRATION SEEKS TO RAISE
IT

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WELCOME:

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PANEL DISCUSSION:

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DAVID WESSEL: Good morning. Thank you all for coming and for those watching online. I'm David Wessel, director of the Hutchins Center on Fiscal and Monetary Policy here at Brookings. There are a lot of really important topics dominating the headlines today. Ukraine, inflation, mass shootings, police shootings of black men. Another banking crisis, the debt ceiling, the 2024 election and the Russian arrest of Wall Street Journal reporter Evan Gersh Kovach. The word social cost of carbon don't usually make the headlines, which is why we organized today's event. The it's a bit of a cliché that the social cost of carbon has been dubbed the most important number you never heard of. Glenn Rudebusch my colleague, suggested we call this event the most important revision you haven't heard about to the most important number you've never heard about. But today's event is intended to change that. As we wrestle with the challenges of climate change, we want to highlight the importance of this measure as a way to think about climate change, but also in regulatory response to climate change in the in the United States, of course. Simply put, the social cost of carbon is the economic damage that results from emitting one additional ton of greenhouse gases. And we'll get into that in a minute. Here at Brookings, there are scholars across the institution working on policy relevant research on climate change within economic studies. It's a particular focus of our center on regulation of markets. But it's really too important for only one discipline or only one part of Brookings to think about today's event. I look at it as part of our mission to not only improve the quality and efficacy of fiscal and monetary policy, but also public understanding of those policies. And so I've asked my panelists I introduce in a minute, remember that not everybody thinks 24 over seven about the social cost of carbon. If you're one of those people, you might find this boring. But for the other 99.99% of us, I hope you find this interesting. I've got an unusual a number of really good questions submitted in advance. But if you're online and you want to ask a question, you can send it to events@brookings.edu or on Twitter, at hashtag Carbon or on Slido. Slide Deo. Again, hashtag carbon. Where? Yes, hashtag carbon where I'll keep an eye on my phone. My colleagues will forward me any questions that may come in. So let me introduce my panel. I'm going to do it in the order in which they're going to speak first. Brian Prest is the director of Social Cost of Carbon Initiative, A Resources for the Future, an economist. He's worked, among other places, at the Congressional Budget Office and at Neera Economic Consulting. Coral Davenport covers energy and environmental policy with a focus on climate change in The New York Times Washington bureau. She's been at The New York Times since 2013, And before that was that Congressional Quarterly, Politico, National Journal. And I want to talk about this later. She was a freelancer writing about food and grease. What's that?

CORAL DAVENPORT: Previous life.

DAVID WESSEL: Previous life? Well, everybody has a previous life. Just not all everybody's previous lives are interesting. Glenn Rudebusch is a nonresident senior fellow in the Hutchins Center. He's also affiliated with the NYC Youth Stern School of Businesses, Volatility and Risk Institute. Glenn spent 36 years at the Federal Reserve, first of the Board of Governors at the Federal Reserve Bank of San Francisco, where for a while he headed the economic research unit at the San Francisco Fed. And finally, but not least, Noah Kaufman is an economist at the Center on Global Energy Policy at Columbia University. He recently finished a one year stint as a senior economist at the Council of Economic Advisors. We worked on the social cost of carbon. He also did a stint in the Obama administration as deputy associate director of energy and climate change in the White House Council. Environmental Quality, which meant he had a business card that was six inches wide. He's also worked for World Research Institute and there are economic consulting as Brian. And so I asked Brian to start today by sort of trying to set the stage to define what the social cost of carbon is and why we should understand it. So Brian.

BRIAN PREST: Your Thank you, David, for having me here today to be on an all star panel to talk about the SCC. So I'm just going to kind of level set everyone to talk about what it is, what its history is and how it's used. So as David said, the social cost of carbon is an estimate in dollars per ton of CO₂ of the cost to society of an incremental ton of CO₂. Two emissions released into the atmosphere. So because the impacts of CO₂ are very long lived, the sort of cost of carbon is a net present value of the discounted stream of impacts from that an incremental tonne of CO₂ out into the future. And just as a benchmark, the interim estimates that are currently in the official numbers

used by the Biden administration is \$51 per tonne of CO₂, and that dates to the estimates from the Obama administration Modeling efforts just simply updated for inflation. We had our if joint with our collaborators at UC Berkeley and others have released our updated estimates building on lots of work over the past decade that came out of a paper in Nature this past September suggesting that \$185 a tonne might be a more appropriate number. And then EPA this past November issued a report suggesting a number of about \$180 a tonne. So just as the benchmarks for the existing and the proposed updated numbers. So what's the where's its intellectual basis? It has a long history in economics dating back 40 something years build. Nordhaus was a real pioneer on this in the 1980s and on and his work on on the SCC was part of what contributed to in winning his Nobel back in 2018. So it has a deep intellectual history. It's highly relevant to questions about, say, a benchmark for carbon prices. So we go back to Peruvian taxation. Econ 1 to 1 says that when you have a negative externality like pollution, like climate, then an efficient way of dealing with that is pricing it to internalize that externality and produce that the, you know, the economically efficient price should be should reflect the essentially the social cost of carbon, the damages associated with an incremental tonne of pollution. So as a result, it's often used as a benchmark for carbon prices and other kinds of, let's say, subsidies. So just as an example, some examples, we see echoes of these numbers, \$50, say \$180 in various carbon prices that we see around the world. Canada has a carbon tax that's \$50 per tonne that's slated to ramp up to \$170 per tonne by the end of the century. We have for many years had a tax credit for carbon capture and sequestration in the US that was \$50 a tonne. That's since been risen. If you look at the Inflation Reduction Act, we have now a methane fee that's set based on dollars per tonne of methane that when you convert it from nothing to CO₂ equivalent \$50 a tonne. The IRA also has \$180 a tonne tax credit for direct air capture. So we're again, we're seeing echoes of these numbers either implicitly or explicitly in various policies that we see. States use it for various purposes, other countries use it. Canada and Germany have official social cost of carbon values that largely adopt the US numbers with some adjustments. So it's used quite commonly, again, either explicitly or implicitly. The most common use, though, is in U.S. federal regulations. In fact, it's getting back to 2008 that there is court federal court orders that requires the U.S. agencies, when they're conducting regulatory impact analysis of cost benefit analysis associated with regulations. They have to use the social cost of carbon. And the reasoning was because back in 2008, the Bush administration said there's too much uncertainty to put a number on this. So they said we're just going to value and ignore it, essentially. And the court said, well, by ignoring it, you're implicitly treating the value as zero, and surely zero is not the right number. So the court said that agencies you actually have to accept those 2008 2009, the Obama administration came in and established something called the Interagency Working Group on the social cost of carbon that went to work to try to put a dollar value on on carbon emissions. And ultimately, after several rounds of revisions, they went on that number \$51 per tonne in 20 \$20. So it's commonly used in regulations. After the Obama administration exited and Trump ministration came in, they knew they couldn't just scrap the social cost of carbon because of the court orders. So instead they just kind of monkey with some of the modeling decisions to get the number down to where it was effectively de minimis. And Trump administration also disbanded the integrated agency working group. So there was no one left to do work to continue improving the scientific basis for this. A 2017 National Academies panel came up with a series of recommendations for improvements to the social cost of carbon. Again, the numbers that preceded the \$51 is is based on modeling that's a decade out of date. And so there was hope from the National Academies that the government would continue to improve those numbers. But that Trump ministration because they disbanded the iwg, there was no one in government to do the work. So over the past five, six years, folks that are off social Cost of Carbon emission initiative joined with collaborators at Berkeley and elsewhere. Folks at the Climate Impact Lab have really done the effort to improve that scientific basis, which has put the Biden administration in a better position now to. Update the science because at the beginning the Biden administration, he issued an executive order reestablishing the interagency working group to to get to work to address those critiques of the old modeling and get the FCC to a point where it's really up to date with the latest scientific and economic basis. And so that leads us to where we are today about the our proposed update, EPA's proposed update and probably over time. So I'll stop there and pass it off.

DAVID WESSEL: Okay. But can you. So you explained well that the social cost of carbon is used to decide whether a particular policy is a good idea or not. If we have a social cost of carbon of \$190 a ton, which is the present value which incorporates all the costs in the future, and we have a policy that we think is going to cost \$60 a ton. It's obviously a good deal. That's the nature of cost benefit. But if you had to identify the I don't know what number two, three, four factors, main factors that go into deciding what is the cost of social cost of carbon, what's \$190, what are the things that are the main ingredients of that formula?

BRIAN PREST: That's a great question. I'll try to keep this short because they could talk at length.

DAVID WESSEL: I said the two or three main, I don't mean [laughter].

BRIAN PREST: Socioeconomic projections, what the future, you know, economy and society is going to look like a model of the climate system that helps us understand how a change, a incremental ton of CO₂ emissions converts into rising temperatures, rising sea levels and ultimately impacts on society. And so that latter piece, how rising temperatures and sea levels are converted into a monetized dollar impact, and then finally, how those impacts are discounted over time. So the discount rate, these are all the key pieces.

DAVID WESSEL: Okay, good. We'll get more to that. So I asked Coral to come because it's all very nice to have economists tell us about what we should do. And most economists thinks we should have a carbon tax, but we don't. And because Coral covers this for the Times, I asked her to talk a little bit about, all right, what's the state of play here and what are the politics of this at this particular moment?

CORAL DAVENPORT: So, you know, it's interesting. I've been covering climate policy for more than ten years. And that entire time, you know, the social costs of carbon really had always been sort of this wonky thing that economists love to talk about, that I loved to understand. And I kept kind of waiting for the moment where it would elevate and sort of burst through and become really significant in terms of both politically, but in terms of how it affects policy and how it affects people's real lives. And I think that moment is coming.

DAVID WESSEL: It's this event, right?

CORAL DAVENPORT: This is it. Well, this is this event is good because you'll you'll you'll understand what's going on when it starts to burst through. So Brian did a great job of laying out how the Obama administration first kind of floated this idea of saying we're going to price carbon at \$50 per ton. They did incorporate that cost in some of their rulemaking, The Trump of the Trump administration and then the Trump administration effectively used that. They said, no, we're going to price the social cost of carbon at about two or three to less than five, 2 to \$7 per ton. And they used that as justification to roll back a lot of the Obama administration's climate rulemaking, particularly the rule on coal fired power plants. A big one, and this is really important is the rule on vehicle emissions. Vehicle emissions are the number one source of CO₂ in the U.S. right now. Trump administration essentially canceled the Obama administration's rulemaking on that. The Biden administration is preparing in the next couple of weeks to propose what I think will be the most aggressive standard the U.S. has ever seen on U.S. auto emissions. It will be designed to essentially end sales of the internal combustion engine in our lifetime. We don't know the final numbers. The president himself has directed the agency to make the rule strong enough to ensure that we'll see 50% of all new auto sales as EVs by 2030. And my understanding in my reporting is that this is supposed to put the U.S. on track to phase out the internal combustion engine by sometime around 2035. That is a massive that is a that is a transformation of a cornerstone of the US economy as we have known it for the last century. How do you economically justify that? One way you do that is you come in with a social cost of carbon at \$192 per ton, if you can justify it. If you can say this rulemaking, there will phase out the internal combustion engine and force. Automakers to change everything they've done for all of us to buy EVs almost whether or not we want to. If you say the cost of every tonne of carbon dioxide that comes out of that tailpipe is \$192.

Hurts us all, \$192. Boom. You basically have your economic justification for this powerful rulemaking, and that's just the biggest one. They are going to do new rulemaking on power plants. They're going to do new rulemaking on building efficiency. They are going to do rulemaking, not just EPA. We're going to see rulemaking for many agencies. And that's the idea. When this final rulemaking comes out from the interagency working group, it's not just going to be EPA. The point of it is to give every federal agency a tool to say this is the economic justification for squeezing out CO2 in every corner of the economy. You know that we can use this tool for. And it's essentially it means that when you do that, you have a cost benefit analysis. You can come out and you can say the cost of this regulation is going to be in the billions. The economic cost of it to consumers, to industry, the benefit of it by reducing however many billion tons of CO2 at \$192 per ton is going to so far outweigh that cost that we are economically justified in doing that legally. The economic benefit has to outweigh the cost, and these are all the justifications for doing that. Now, the first thing that's going to happen when you see these rules come out is you're going to get legal challenges. Republican AGs have already lined up their legal challenges against this. And in fact, one of the important pieces of the politics of this is that a group of Republican AGs led by Jeff Landry in Louisiana, has already started lawsuits against the social cost of carbon, even in just its proposed form. Now, at the moment, those suits have getting have been getting sort of banged around because the judges are saying, look, how can you demonstrate that this and this is why like this hasn't broken through yet. How can you demonstrate that this theoretical number is causing you economic damage right now? Come back when you've got something real to fight about. Okay. They're going to I, I think there's a good shot that those cases will go to the Supreme Court when the Supreme Court when these justices are debating the social class, hearing the oral arguments on social cost of carbon, it will not be the rule that we haven't heard of anymore. There's another way that we're seeing this as well. It's back on the Hill. We are seeing the reemergence of the use of some kind of carbon price in a proposal for a carbon tariff. And there's proposals from the left and the right on this. Sheldon Whitehouse, who is like the biggest climate hawk on the Dems, has proposed a carbon tariff that would essentially slap a price, a tariff, an import tax on goods imported from other countries based on the CO2 emitted associated. So steel, cement, all kinds of things. And Bill Cassidy from Louisiana and Lindsey Graham have also both. Bill Cassidy introduced a carbon tariff bill last Congress. Graham just announced that he's going to. Mitt Romney has also talked about supporting and being in favor of some kind of carbon tax. So you see and in the way that Sheldon Whitehouse talks about it is he says, you know, I hope that my Republicans, my Republican friends will embrace something. It will warm the cockles of their hearts if it if it hurts China. So they're trying I mean, they're trying to find, you know, the politics of this are very, very interesting because you'll see this, you know, when you start to see these lawsuits, when you start to see these numbers, when you start to see this making its way towards the Supreme Court, like you will start to we will start to feel the impacts of these policies that are driven by these numbers. And I think we'll start to see some new policies emerging as this number actually gets done and gets worked through. And one final note. I went over time. I'm sorry. Absolutely. This could be become part of the 2024 campaign because at the moment, it's it's not going to be we don't have a law that incorporates it. We don't have a statute. You know, the number the social cost of carbon right now, I don't think is going to be embedded, have the strength of a regulation. And even if it does, the DeSantis or second Trump administration can come in and undo it. Not right away. But I mean, it would if Trump brought it from 50 to 2, he will bring it back down. A DeSantis administration would do the same thing. So this this could definitely be a, you know, a football in the 2024 campaign.

DAVID WESSEL: So let me just understand, Ilir, know, you can chime in if I don't. That's right. The EPA has put forward this \$190 number. They're going through peer review. You now. It will be expected to be finalized sometime in the coming months. Is that fair?

NOAH KAUFMAN: I don't know the timing.

BRIAN PREST: I don't know the timeline either.

DAVID WESSEL: All right. And then. All right. And then it's. But Coral said it's not a regulation, so it doesn't just Congress have the right Congress has now the right to overturn any regulation. This Congress have the right to overturn this thing. Is it does it have that kind of regulatory thing, you know?

BRIAN PREST: Are you asking in the context of the Congressional Review Act?

DAVID WESSEL: Yeah. Should have had a lawyer on the panel. But that moral dilemma, Glenn, one of the things that I think is hardest for people to understand is when we talk about present value of anything, we're talking about trying to decide how do we weigh the present versus the future. And in a calculation like the social cost of carbon, we're basically asking we have to decide if if we pay some penalty today, it'll have some benefit in the future. How do we weigh those things against each other? How much should we worry about the future generations? And the way that economists do this is by something called the discount rate when you've done a lot of work on. So can you talk a little bit about why? What how do we think about the equity, intergenerational equity here? What role does the discount rate play and how the hell do you ever decide what number to put on it?

GLENN D. RUDEBUSCH: Those are all good questions. Brian mentioned discounting is one of the crucial elements that it is for social cost of carbon. And Coral mentioned the various costs and of climate change. Importantly, those costs come distributed over time, and that's true in any cost benefit analysis. But for climate change, the costs of climate change are often distributed over long periods of time. So ten, 20, 100 years because carbon dioxide stays in the atmosphere so long, creating these damages so discounted is particularly important for a climate cost benefit analysis. David mentioned present values just so everyone's set. I mean, \$100 today isn't the same as \$100.10 years from now or or 100 years from now. We've got to collapse those we call it. We translate those all into current dollars, those future dollar amounts, and that's called the present value. So how are we going to translate those dollars, those future dollars, into current dollars? It's something like an interest rate you could think of where again, if you had \$100 this year, you might have \$102, \$104 next year. That interest rate is one source for thinking about what the discount rate is. And that's sort of a descriptive approach to thinking about how to set a discount rate. You would say, well, interest rates, market interest rates probably embed public preferences about temporal tradeoffs and therefore they might be a good indication of how a society values costs in the future versus costs today. And that's called the descriptive approach to a to a social discount rate that's very popular among some. And in the past then they've looked at, say, ten year interest rates over a long period of time, averaged. And earlier, you know, a couple decades ago they were coming up with the number of 3 to 4%. And that's the number that Bill Nordhaus. 4% is the number that he uses and a lot of his analysis, and it's based on a descriptive approach. And the descriptive approach, however, is certainly imperfect. In particular, those future generations. They don't get to trade in markets, they don't have a say. And in in determining those those interest rates. And so another approach is a is that is a normative or an ethical approach to just try to say, well, how does 100 society really feel about about thinking about future generations? And today, how are we going to make that tradeoff? And this is generally led to lower discount rates, something on the order of 1 to 2%. So Nicholas Stern famously takes a a normative approach in his in the Stern Review of Climate change. And he used a number of 1.4% is the social discount rate.

DAVID WESSEL: But to be clear, the higher the discount rate, the less we worry about the future. So if I have a lower discount rate, how does that affect the number of the social cost of carbon?

GLENN D. RUDEBUSCH: Yeah. So the higher discount rate, you're discounting those future damages more so they they look smaller in present value. So if you go from a 3% discount rate to a one or 2% discount rate, you can cut the social cost of carbon in half. I mean, it's a huge it's a huge factor. It's a very important.

CORAL DAVENPORT: And that's a big part of what they did when they lowered the cost. And the Trump administration is essentially they.

DAVID WESSEL: Play with it. Yes.

GLENN D. RUDEBUSCH: And so they they raised they raised the discount rate and lowered the cost of carbon.

CORAL DAVENPORT: And they said essentially, we're saying. We are not going to value the impact that carbon dioxide emissions have on future generations. And by changing that discount rate, they were able to get to. They were able to.

DAVID WESSEL: Right.

GLENN D. RUDEBUSCH: Yes. That's an important part.

GLENN D. RUDEBUSCH: How to justify it.

GLENN D. RUDEBUSCH: So the Trump administration used a higher discount rate so that had future damages counted for less. And the social cost of carbon then was lower.

BRIAN PREST: However, what is Biden using? What is the EPA using?

NOAH KAUFMAN: 2% is their central value.

NOAH KAUFMAN: For the new one. For the new. For the new one. For the new one. It's 2%.

BRIAN PREST: 2%.

BRIAN PREST: And the interim \$50 is based on a 3%.

GLENN D. RUDEBUSCH: Right. And one of the reasons for that switch is with, you know, where market interest rates have been over the past since the 1990s, we've moved to a period of a lower new normal for real interest rates. So very often, I'm sure on this on this day, as David talked about a lower R star, which among economists is a lower equilibrium real interest rate. It basically says that real interest rates in general have seemed to have been pushed down on a persistent basis in recent decades, and that's because of huge demographic shifts. For example, longer life spans have led to more saving and lower productivity growth has led to less investment demand. And so that shift in in saving investment has seemed to have pushed down real interest rates on an ongoing basis. The US government issues inflation indexed debt and it is running even even now during this point in the cycle, the five, the 10 to 30 year tips as they're known, Treasury Inflation-protected securities are running at one and a half percent. So this has been, I think, an important development, somewhat overlooked that the descriptive and the normative approaches have converged to a large extent, that is, the descriptive approach is no longer in the 3 to 4% range, as the EPA used to be, but it's really been pushed down to 1 to 2% or two percentage point in the neighborhood of 2% is the social discount rate. And I think this convergence really helps support the kind of numbers that the EPA is talking about. They've got a 2%, which is not that far from where the normative approach had led you. And it was very close to where the descriptive approach is now, because that that impediment to thinking about discounting, I think, has been then been alleviated to some degree.

DAVID WESSEL: So I want to remind people online, if you want to ask a question, you can send it to events@brookings.edu or on [Sli.do sl i dot deo](https://www.sli.do/sl/i-dot-deo) hashtag carbon and I'll get to the in-person audience in a minute. Yeah.

BRIAN PREST: Can I just make a point correcting what Coral said with what Glenn was saying? Yeah. So Glenn was talking about, you know, the declines in real interest rates over the past two decades. So the official guidance on cost benefit analysis and how you should do this kind of work

by the Office of Management and Budget is in a dryly named document called Circular A-4, issued in 2003 that recommends 3% and 7%. And that was the Trump administration's justification for reduced from using higher discount rates as very outdated for a number of reasons. But just one particular reason is if you do that same calculation they did in 2000, 3 to 2 decades ago in that document that landed them on 3%. We did that same calculation today with updated data. You get a number very close to 2%. And so in that document in particular, a circular A-4 is actually currently undergoing a revision to update to reflect improved economic knowledge. So that that could that circular document, that justification could disappear in the future.

DAVID WESSEL: So now when I think about how hard it is to come up with a dollar number on something that involves, as Glenn pointed out, our values about the future and the present, as Brian pointed out, about trying to estimate what the damage that will be done from a cost of carbon 25, 30, 40 years from now. When we think about all the potential for technological change, it goes without saying that there's a lot of uncertainty about this number. So and I know that's something you've thought about some. So how confident should we be that any number is within the ballpark of what the real social cost of carbon is?

DAVID WESSEL: Right. Thank you for having me, first of all.

DAVID WESSEL: And the short question that way.

NOAH KAUFMAN: The short answer is, is not very confident. And I think you know, if this. Was a this was a panel on just climate risks. I think by far the most important thing that people should get away from it is, you know, how freaking scary those risks are. That's the technical term. But, you know, we're talking about arcane metrics called the social cost of carbon. And there are specific numbers being thrown around like \$190 a ton. So I do think it's equally as important that people really understand the scale of the uncertainty that that is involved in in coming up with these numbers. And so I'll give you we could talk about this all day, obviously, but I'll give you one anecdote because it involves both of the brilliant economists on this panel that I've learned a lot from, including when I was at the White House, you know, trying to help the CIA dig in on this process. So it involves discounting, which Glenn was just talking about. And so so first, we learned about the method that Brian and his and his colleagues developed on discounting, because this was the one that the National Academies panel recommended an EPA was proposing to use. And so Brian can correct me here. But, you know, the interesting thing about this method was that it links the discount rate to the uncertain projections of economic growth rate. So what that means in English is that you're going to put less value on outcomes where the world is richer, right? So that makes sense. An issue is when you combine that with the way the rest of these models work, just the way the models are built, climate outcomes are worst. When the world is richer. It's not reality, it's just how the models are built. You have the damages come from economic activity. So you put these two things together. You know, you have less value on richer futures and then you have worse climate damages in richer futures. And you put that together and you're putting less value on futures where climate damages are the worst. So we thought this is this is a concern for a model of climate damages. So nothing to do with Brian's paper, by the way, which which I would.

DAVID WESSEL: Thank you for that.

NOAH KAUFMAN: We looked around and we figured out this was a very good day. Glenn and his colleague had just published a paper very recently in a top economic journal that does something very similar with social discounting, even to the extent of using very similar numbers. As Glenn mentioned, just without this relationship that I just mentioned. So great, we thought, well, just, you know, at the very least we could use that also. Right. The next thing we discovered is that when you combine that style of discounting with these sort of new age, empirically grounded damage functions, you know, these are they're what translates temperature changes into economic outcomes. They're much, you know, much more rigorous than they used to be. The models have this tendency of exploding. So that was that was not that.

DAVID WESSEL: Mean that a model explodes.

NOAH KAUFMAN: Yeah. Yes. So I don't mean physically actually what I mean is when you add to get you know, the way you calculate this value is it's a stream of damage into the future that you're adding together. Right. So you need that stream of damages, the present value today to decline towards zero in the future. Otherwise you're just going to continue adding numbers, right? And you lose the very helpful characteristic of, you know, finite ness of the number. You could cut it off at some date. Right. But even then, now we're talking about social cost of carbons that are upwards of \$2,000 a ton and not \$200 a ton. So. By the way, a side note, if you're like familiar with this, this whole world, you may be sort of reminiscing about the late Marty Weitzman right now because this was kind of his whole thing in climate economics. And I was, too. So anyway, it led to some difficult conversations, right? Because what do you do when you have a model where you can have two equally reasonable sets of assumptions and they're giving you results that are an order of magnitude different from each other? The government's not going to come out and say the social cost of carbon is infinite. That would be silly. But how do you label the other types of numbers that are coming out of the model? What do we call \$190 a tonne? It's not our best estimate of climate damages, right? I mean, it's if you look at what we're adding up, we're probably leaving out some of the most important categories of damages. Some people like to call it like a lower bound, that type of thing. But that's that's not right either. And this might be like a sort of small side note. But I think the best way to think about this, David, you mentioned tech technological progress because that's built into these models also. And, you know, they go out 200, 300 years. So it's kind of comparable to thinking about being in the early 1700s and trying to figure out what technologies would look like today.

DAVID WESSEL: That's what the Supreme Court's going to do when they hear this case.

NOAH KAUFMAN: So, you know, I mean, to me, you think about are we not going to have carbon dioxide removal technologies 200 years from now that are cost effective enough that they can really change what these types of damage functions look like? I don't know. And that that uncertainty is pushing in the in the opposite direction. So the uncertainty goes both ways. I don't think we ever really settled on the right way to think about any specific number that comes out of these models and that maybe we can crowdsource that here today. But to me, I think of the social cost of carbon as this very useful concept that teachers will rightly continue to teach their students and how to think about climate economics. But policymakers, for the most part, I think, will rightly focus on more of a risk management approach to say, you know, how can we get on pathways for the world that avoid these freaking scary damages that I mentioned earlier?

DAVID WESSEL: Do you want to weigh in?

CORAL DAVENPORT: Yeah, I have found one way to try to explain this to general readers who are neither economists nor students of the social cost of carbon. And there's there's two other factors that I think help make this more concrete. One is when you talk about what should the number be? Normally in the United States, when we calculate the cost benefit, you know, the cost benefit of a regulation on pollution. So you do a regulation on mercury, you have a mercury plant, it spits out poison. The people around the plant are going to get sick and die. The way the EPA calculates the cost benefit analysis of that mercury is how many people are likely to die and what is the dollar cost of those deaths. So right now the EPA assigns the cost of a value of about I think it's like \$10 million per U.S. life. So if X many people are likely to die as a result of this mercury pollution, then that is the dollar amount that will be saved. And that's how you benefit. That's how you analyze. That's how you do the cost benefit analysis on on a pollutant like mercury. Okay. Now, you want to apply that to a pollutant like CO₂. Here's the problem. It's not local. It's global and it's not immediate. You know, breathe in CO₂ and die. It goes all around the world. It's global. And so what are you going to do? You know, what is the cost of those lost lives? What is the cost? If you have you know, you're driving to Walmart in your regular Subaru outback and your CO₂ goes up in the atmosphere, traps heat, that hotter atmosphere ends up leading to, you know, someone in Sudan not being able like not being a subsistence farmer in Sudan, not being able to

eat in their child dying. Well, what's the cost? How do you how do you put that together? And so that that's the impact, the cost, the global cost, the cost on the rest of the world of what we're going to say. Our cost of carbon is as one of the is one of the difficult things that you have to place a number on that you have to sort of figure out. So it's not just discount rate in time. It's like the fact that it's in space, it's global. It's not just us. We're trying the US is trying to create this dollar figure for something that is global. So that's that's one of the you know, I'm glad I don't have to figure out that number. But the other piece is what is the cost of human life and is the cost of human life in the United States different from the cost of a life that will be lost somewhere else in the world? And I mean, you guys can speak to this is something that you have had to wrestle with, right? When. Yeah. So plugging in that.

DAVID WESSEL: So can one of you explain how we got a number of the questions I got before the event had to do with how do we think about this in a global context. So can you just explain to what how did you how do you deal with the global nature of the damage of carbon, of carbon dioxide when you're doing a social cost of carbon in the United States?

BRIAN PREST: Sure.

DAVID WESSEL: You can both do it. I'm sure there's enough answer for two.

NOAH KAUFMAN: Well, I mean, I think there's two levels of questions there that coral is getting to that. The first level is, do you even count foreigners? Right.

DAVID WESSEL: And what's the answer? Do what you're doing.

NOAH KAUFMAN: So do you give them standing? And the Trump administration said no. And the Obama administration before them said yes. And the Biden administration says yes. And, you know, most scholars who work on this issue say, yes, you should, because and basically what Coral said, this is a global problem that requires a global solution. It doesn't make a whole lot of sense to think about it ending at the borders of our country. But there is a little there's some disagreement on that. So that's step one. And when I at least when I was in the administration, there was no real dissent over whether this should be a global issue. It clearly should be step two. And Coral got at this, too, is how do you value damages across the rest of the world? And I think this is actually one of the more unfortunate features of the framework that the government is currently using. Is that. Basically the value is scaled to the level of income in the different countries. So that there is the approach essentially says, you know, lives in sub-Saharan Africa are worth maybe a penny on the dollar of lives in the United States today. So I don't know if it's.

DAVID WESSEL: In a moral sense, but because they scale it by what the income is of those people.

NOAH KAUFMAN: I think economists do a lot of jujitsu to convince themselves that it's not a moral judgment. But at the end of the day, you are what it comes down to is you are scaling what is the willingness to pay of people to avoid these damages. And that is going to be constrained by their ability to pay. Right? So there's clearly a moral judgment baked into that.

DAVID WESSEL: Brian Right. I'm sorry.

BRIAN PREST: So you're just jumping on the last piece that nobody's noted? Is that. Yes. What is that \$10 million that come from that is based on empirical studies in the US of how much people are willing to pay to reduce their risk of death. So say if someone is willing to pay \$10,000 to reduce their risk of death by 1000 than that with the product of those two things gets you \$10 million. So that's exactly what it's based on. And it's and it's based on, you know, values in the US. Now, it won't be guidance. EPA guidance, the EPA Scientific Advisory Board are very explicit about, you know, what is the right approach to when you're talking about impacts to individuals with different incomes and that's to scale at one for one for income. There's a lot of empirical

economic basis for this in the literature. There's maybe some dispute of whether it should be scaled more than one for one less than one for one, but one for one is basically the central case. And so this is you know, that's the approach that we took in our paper. It's also the approach that EPA took in their report. And I think the the concerns that Noah is raising are valid, but I don't think it's about VSL specifically that number. I think it's about the broader issue of equity weights. And I think if you're and if you want to think about that, but thinking valuing impacts to poorer individuals more, you shouldn't do it with the VSL because that's just only one based the.

DAVID WESSEL: Best value of to.

BRIAN PREST: Value like life. You should do it more broadly. You value not just mortality impacts more. We should value impacts on agricultural markets, more coastal, and that's more everything. And so I think a more appropriate approach is not to use like at the same number for everyone, but, you know, use the kind of standard economic tools, but then think about, you know, the equity concerns separately. Now, of course, that raises a whole bunch of other tricky issues. It introduces some subjectivity into the numbers, but I think it's worth discussing. But I think it would have been far too premature for EPA to launch into that from out of the gate.

GLENN D. RUDEBUSCH: If I could just follow up, I think I don't want to get bogged down in the details too much. I think the bigger picture is how there's been, as I said, less uncertainty in terms of the discount rate, perhaps more convergence on that. And I think we've also made a lot of progress on on pricing these or determining the monetary value of these of these damages. So something like the Climate Impact Lab has made incredible progress in sorting out what these damages are, not just mortality, but of course all the of the extreme weather, the rise in sea level. There are lots of damages that have still not been quantified. But I think we've made a lot a lot of progress since the Obama administration in the damage side, quantifying those damages and also some convergence on on the discounting. There's still a lot of uncertainty. So if you look at a survey of experts, what do they think is the proper value of the social cost of carbon? It goes from very low to quite high, but the median is somewhere around the \$200 value.

DAVID WESSEL: Glenn somebody asked online, Do you think the same social cost of carbon should apply uniformly across the world or does it differ by where you sit?

GLENN D. RUDEBUSCH: I would say it would be the same. Now, again, there's a huge issue of of ability to pay. And this gets into, you know, essentially how are we going to solve this problem when a lot of the emissions are abroad? But that's a separate issue. If we actually think about what the cost is for making a ton of CO₂, it is there Is that uniformity.

BRIAN PREST: Just to put a point on that, if there were, you know, very different carbon prices in different parts of the world and the emissions would migrate to where it's cheapest and that it's not really efficient.

DAVID WESSEL: Does. One hopes that we're not going to update the social cost of carbon every time we have a presidential election. But still, we learn as we go. So is this a number that in let's say we had good government in the United States for the next 50 years, Like you guys can assume things. Why can't I? Is this the number we should constantly be updating as we learn more about the damage that climate change does, the changes in technology, the changes in demographics?

GLENN D. RUDEBUSCH: I would say definitely. I mean, I don't know, maybe a five year basis, I'm not sure. But we learn more about damages. They're more about discounting, but also learn more about the socioeconomic path we're on. So no one mentioned direct air capture. And I suppose if we, you know, technological advantages, you could imagine a future in which we're looking at a different path.

NOAH KAUFMAN: So one thing to think about is these new age damage functions that they're really sort of latching on to the stuff that is most quantifiable and actually the majority of the damages that are coming out in these models today are what's called temperature related mortality. So it's looking at historical relationships between how temperature changes have affected mortality rates at different parts of the world, and then just projecting that into a ever hotter future. Right. Which makes some sense. But but I just think it's also an extremely limited way to think about the future impacts of climate change. Right. You're not getting into any of the types of issues that a lot of us worry most about, right? Like the extreme weather and the migration and the conflict and the cascading impacts across different sort of interconnected systems. So I think absolutely we're just sort of scratching the surface on what we understand about the future damages, right?

BRIAN PREST: Yeah, I think that's all right. So there's definitely a lot that's admitted and such a cost to carbon. EPA report goes into detail with tables of here's what's included, here's all the things that are not.

DAVID WESSEL: So give an example of something that's important that's not-.

BRIAN PREST: Storms. Vector borne diseases. The so many things that are included, they're sort of they're not included that ocean acidification.

GLENN D. RUDEBUSCH: I think biodiversity.

BRIAN PREST: Biodiversity work, you're working on the biodiversity components not ready to share but but yeah, but number I can't tell you sorry but, but the updates will be definitely to continue to updates over time. I mentioned the 2017 National Academies report that made recommendations, specific recommendations and they actually speak made specific recommendations for the frequency of update, balancing the time for new literature to come out and to assess that new literature on climate impacts and that they came up with a proposal in five years. So I think that perfectly makes sense.

DAVID WESSEL: Coral, can you talk a little bit about what it's like to be a New York Times reporter trying to get the word social cost of carbon into the paper? And if you get fired as a result of this, we'll find your job here.

CORAL DAVENPORT: You know, my my current editors, I think, are much more open to it. I will share that, you know, probably seven or eight years ago, certainly when seven or eight years ago when I would go to my editors and I would say, okay, you know, Obama, the Obama budget proposes the social cost of carbon. And, you know, we should write about this, just even explaining what that was with, you know, with such a hill to climb. And it became, you know what it. It became for a long time. It was just sort of the same surface thing. And then I had an editor who didn't understand it and and had covered it and had covered economics and just said, Oh, my God, don't subject our readers to that. No. And and it was something that was very it was theoretical, it was academic, even a story that explained, you know, I don't I don't even remember who came up with the headline. It's the most important number you've never heard of. But if there was no way to make it clear that this why this affected a reader's life, we weren't going to write about it. And I think I think we had a headline piece when the Trump administration jacked it back. And that was because it was kind of about the broader story of what Trump was became a centerpiece of policy, centerpiece of the Trump administration, which was rolling back environmental regulations. But and then and then years went by. You know, I think I just remember being told sort of it became a joke. Oh, my God. No, there's there. [Inaudible].

CORAL DAVENPORT: And finally, when Bill Nordhaus I profiled Bill, I profiled Bill Nordhaus and his brother, Bob Nordhaus, who's an environmental lawyer when I first came to The Times, and it was like this great story about both of them and they both grew up like, you know, Bill was the economist. They both grew up worried about the environment. And like Bill was the economist who

came up with a theoretically brilliant way to deal with climate change, which is put a tax on it. And Bob was like the pragmatist who became a lawyer who ended up writing the piece of the Clean Air Act that Obama ended up using to do all these regulations. And they both agreed that Bill's way was the better way to do it. But Bob's way was the only way it was ever going to get done. So I did this profile and we put lots of human stuff in it. We ran that profile. And then when Bill Nordhaus ended up winning the Nobel Prize, I was like, Finally, I can write about it. We re-upped the profile. But it took I mean, it took the inventor of the the social cost of carbon winning the Nobel, I think.

DAVID WESSEL: I think you made a pretty compelling case when about the Biden administration is going to use the social cost of carbon to prevent you from buying an internal combustion car in 2035. Right. That would that would [inaudible].

CORAL DAVENPORT: The thing is, like now it's I mean, the regulations that Biden is looking at are so far out ahead, certainly on auto pollution than where Obama ever was in this place. I mean, the Obama administration was trying to increase fuel efficiency, you know, boost EVs. But where I mean, what Biden himself has said, the orders he's given on on where he wants these regulations to go are a transformation of the industry. And this will be that the I mean, this this is where it will hit people in their lives. So it's been like a long, slow, uphill thing. And then now I think we're going to be writing about it also.

NOAH KAUFMAN: I mean, I think one thing that also look out for in those forthcoming regulations is the magnitude of what gets called the co-benefits. Also, because typically when anything involving tailpipe emissions or coal power plants that the magnitude of the benefits just from reduced local air pollution typically far and away exceed the estimated costs of the policy and those regulatory impact analysis. So maybe that'll change this time around.

DAVID WESSEL: But I mean, so if I'm proposing something, I don't have to only look at the benefits of reducing greenhouse gas emissions over time. I can look at the short term benefits on just less air pollution, less soot.

CORAL DAVENPORT: Less stuff. Yeah, but a high social cost of carbon also just gives you the juice that you need to do it just straight up. Very aggressive.

DAVID WESSEL: Somebody asked on line How dependent are social costs of carbon estimates on studies to suggest a negative impact on increases in temperature and productivity growth. I assume you have to come up with some economic growth forecast and this is a factor, yes or no.

BRIAN PREST: So there's two pieces. One is the kind of baseline economic growth. And so we did a lot of good work on that, including at a paper at the Brookings Papers on economic activity in 2021 that generated very detailed probabilistic distributions of economic growth at the country level out into the future. The second question is, are there also impacts of climate on productivity growth? And this is something I've actually written on completely separate from the social cost of carbon work. And there there's still a lot of uncertainty in the literature, to put it mildly, about whether climate rising temperatures affect the growth rate of productivity or the level of GDP. And those things, maybe they sound very similar, but they have like orders of magnitude difference in terms of the impact on society. And so the modeling that we've done and the modeling that EPA has done does not assume the effect on on growth rates. It's more of a bottom up, you know, category by category impact on energy expenditures, on agricultural yields, on human mortality, that kind of thing.

NOAH KAUFMAN: And that actually gets exactly to that point I was making earlier, where the way these models are built is that there's this direct way where economic growth leads to more and more damages, but they don't really have the damages then coming back and decreasing economic growth. So that's why you end up with this relationship where rich, rich, rich states of the world are the ones that see the worst climate damages, which I think to most people is a little bit counterintuitive.

DAVID WESSEL: I want to turn to the audience. We have mics. No. So why don't you start here? David, if you could stand up so they can see who you are once you introduce yourself.

AUDIENCE MEMBER: I'm David Wilcox, senior fellow at the Peterson Institute and also at Bloomberg Economics. In Glenn's and my world, there's a lot of controversy about whether our star is going to remain low. The structural interest rate that Glenn was talking about, it's kind of an anchor point. That's a key part of your analysis. And I'm curious for what your view is about whether COVID or other factors might cause a reversal of some of the downdraft that we've seen over the past three or four decades in that crucial parameter.

DAVID WESSEL: So let me just put a little context on that. In general, central bankers and David used to work at the Fed, as Glenn did. Think about then there's a long run sometimes called the natural rate of interest. And when interest, when the Fed holds interest rates below that level, they're giving the economy a boost. And when they put it above that level, they're they're giving it a decline. So this interest rate for decades has been trending down. And the question David's asking is, is this an inflection point where we expect it to start to rise because the world has changed a lot because of COVID and maybe investments in green energy and will increase the demand investment, and that will push up the rate or once this COVID period is over. Will it begin to decline? So, David, I mean, Glenn, what's the answer, Yes or no? Is it going to keep going down or not?

GLENN D. RUDEBUSCH: Yes.

DAVID WESSEL: Wow.

GLENN D. RUDEBUSCH: Well, that's the question. No, I would say so. In fact, I've talked to written papers about the new normal, new normal of lower interest rates. And then someone said to me, oh, interest rates are high now. You must be so you must have changed your mind. And I said, No, of course, interest rates, nominal interest rates are high, but inflation's also high. Real interest rates are still not very high. Of course there is this cyclical element and we're probably at the top of the cycle in real interest rate space. Maybe not. And as I mentioned, the tips are only at one and a half percent, even on a ten or 30 year maturity. So there's nothing in the markets that suggests to me that we are, you know, leaving a low interest or low real rate interest rate world or that we won't return to one. And I think that's true when you look at the economic fundamentals. I mean, one of the biggest drivers of this low, low interest rate environment, low new normal for interest rates has been demographics. And those trends are just continuing where, you know, we've got this tsunami of shifting to an older and older population. And then, of course, as I mentioned, the inequality and the lower productivity growth. There's nothing that suggests to me that we're not going to see a lot of savings. And and indeed, you know, in a more risky world, in a more with more climate risk, you could imagine more precautionary saving, for example, which would it would also tend to to push down that extra saving would also tend to push down real interest rates. So I am unshaken in my belief that we're in this lower real interest rate environment.

BRIAN PREST: Right. I think everything Glenn said is absolutely right. But I just want to build on a kind of technical point, which I hope you'll appreciate, which is that we're not just using a fixed, you know, 2% discount rate. It's a it's it's linked to the rate of economic growth, which is uncertain. So, you know, and we have this for Monte Carlo analysis. So in a world where economic growth is really taking off, then the interest rate we're sorry, the discount rate will drive up the discount rate. And so we'll be using a higher discount rate in a world of, you know, secular stagnation, low growth rates will be using a lower growth rate. So we're actually accounting for that uncertainty, not assuming it's just going to stay the same forever.

DAVID WESSEL: They're over here.

AUDIENCE MEMBER: Thank you. My name's Sam. I'm the No. One, just a recent college graduate, but most importantly, a Brookings obsessive. And I love all the work y'all are doing. So thank you so much. I'll get.

DAVID WESSEL: I'll get you a T-shirt when you leave.

AUDIENCE MEMBER: Oh, yes, I'm honored. Yes. The free advertising. My question is, as someone who's really interested in the intersection of policy and the law, you know, Supreme Court ruling last year undermining EPA rulemaking authority under the Clean Air Act, most likely ruling going to undermine EPA authority under the Clean Water Act. And just looking down the line, you know, you discussed how skeptical I think a SCOTUS observer would be of how amenable they're going to be to some of these rules. And also, as someone like myself who's sort of skeptical of Congress's ability to pass regulation regarding the social cost of carbon, what is the realistic role, given some of the skeptical of both those bodies, support the social cost of carbon legally of such a number? And are there different institutions who can formally or informally introduce it into or even at the state level, formally or informally introduce that number and have the judicial or legislative backing to do so?

DAVID WESSEL: So my error was not in having one less economist and one more lawyer on this panel. But does anybody want to try that? Let me just say, I think that one of the things that the Trump administration demonstrated is if you don't provide a very good basis for changes in regulation or numbers like this, you're liable to get overturned by the courts. So I would imagine that the Biden people are being very careful about making a record so that they can say that this was not arbitrary and capricious. But as Coral said, it will certainly be challenged. And I don't think it's hard to know how to think about the court on this thing, because this is that there is provision in the law for the OMB to have certain authority here, which they're exercising, but we'll see.

CORAL DAVENPORT: It's a question of whether it's a made I mean, whether it's a major question. Yeah, that's that's the issue.

NOAH KAUFMAN: I think. I think it's a very reasonable concern. But maybe I'd also point out that we've never really been in a position where. The regulations that EPA type regulations have been driving aggressive decarbonization in this country and the Supreme Court ruling last year to to a non-lawyer like me suggests that future may not come anytime soon. Right. So maybe the regulatory pathway will continue to get more and more aggressive and start driving the way. But so far, regulations have been yeah, they're sort of churning in the background, but it's really been other factors. And I think looking forward, you look at what Congress has done with the Inflation Reduction Act and the bipartisan infrastructure law, what states are starting to do. My sense is those are going to be the real drivers of progress, and I would put my hopes less on regulations. And that's one of the reasons why.

AUDIENCE MEMBER: The business spoke.

DAVID WESSEL: No, no, you can you can.

AUDIENCE MEMBER: I just wonder, do you think specifically and finally, I know there are no lawyers on the panel and certainly not one. Just do you think a greater burial would be legalizing framework for any social cost of carbon or for particular number? Right. So introducing the idea of a social cost of carbon into, you know, let's say ten year timelines on certain regulations that after laws that have to be budget neutral on that ten year timeline or this specific 180 versus 40 versus 50 versus 100 versus 2000 number.

NOAH KAUFMAN: Well, just to clarify my my answer, I have no idea. I'm just looking at this legal questions doctrine that has been announced, you know, by the Supreme Court. We don't know what that is. Right. That could be that could be anything that they interpret as having a large effect on the economy.

CORAL DAVENPORT: But I think like having a social cost of carbon at all, like. That. I don't think that's going to be a challenge, is it?

BRIAN PREST: It has been challenged. I mean, the court cases didn't really go anywhere. I mean, they actually were appealed all the way up to the Supreme Court. The Supreme Court declined to take the case. Now, who knows exactly why? Because they didn't have to give a reason for why. So I'm sure they'll be challenged. But we're we're in kind of a weird world where so we're talking about cost benefit analysis and you know how an agency thinks about regulations and what are you know, what are the benefits and what are the costs. I don't think we've ever been in a world where we've had a court case filed against like the VSL. It doesn't make any sense to Sue to say, Oh, you're using the wrong VSL, It's this. We're kind of in a new world. It would seem to be kind of absurd a priori, but, you know, major questions.

NOAH KAUFMAN: While we're all playing lawyer, I think that's part of the reason why those cases were thrown out. And now, as Coral was saying, now that they are attached to actual regulations like the Brazilian rule, etc., you could see those rules challenge.

DAVID WESSEL: Somebody would have standing to sue because they're being.

NOAH KAUFMAN: I mean, my point is, you could say that about about any cost estimate or any benefit estimate that's.

DAVID WESSEL: There are there are people in this building who worry that we're on that direction. Right. So. In the front here.

AUDIENCE MEMBER: Name is Tyler Moen Dress. Senior director of research at the. American Bankers Association, but also just very personally interested in this topic area. One of the questions that I had was for kind of Noah and Brian with. Related with relation to the models that are currently being. Used. And you mentioned that there's a wide degree of uncertainty and variability across the models. My understanding is that kind of the integrated assessment models. That are used today, it's heavily dependent on your assumptions. What's kind of the progress in that area. With regards to improving these models and getting more convergence. Regardless of kind of what the initial. Assumptions are? I've heard, you know, chatter about agent based modeling that incorporates more circular effects. And allows for. Bounded rationality. To produce more potentially reasonable output, but. Want to kind of get your. Guys's thoughts on to what degree that's actually being used today or what the actual. Promises behind those sorts of models and. Where we are in that. Time horizon.

BRIAN PREST: Yeah, I'll go first. I'll just note that EPA's report used three models and essentially averaged across them. One of them was the work done by our IFF and Berkeley Initiative called the Give Model Greenhouse Gas Impact Valuation Estimate or Give. And then they built the they brought in work by great, great work done by folks at the Climate Impact Lab and then work based on a meta analysis. And they essentially averaged them together. Those three models and relevant to the \$190 proposal that represents an average across those three. And those three numbers rounded to the close to \$10 were 194 give 190 for the kind of impact lab estimates and about a little bit more than 200 for the third meta analysis. So at least at least in the first year, there's a bit more divergence as you go out into into the future. But among the three models used by EPA, there's actually a fair amount of consensus. Now there's, of course, a lot of other work that's academies report, which I'll bring up again also made a bunch of longer term recommendations in addition to the near-term recommendations that have been satisfied that include things like feedbacks. And I think that's certainly something that we want to continue to build on in future iterations of this. I'll stop there.

NOAH KAUFMAN: All right. I mean, there's no question we're getting better and better at, you know, every aspect of the methodology is improving over time. But I think you just can't lose sight

of the question we're trying to answer here. Right. Which is, you know what, the damage of a puff of carbon dioxide today to the whole world for hundreds and hundreds of years. Right. And that requires predicting technological progress and economic growth around the world for hundreds of years. And how, you know, carbon dioxide concentrations are at a completely unprecedented in human history level right now. And it requires predicting what that means for the world for hundreds of years. And then all these value judgments about how we value future generations and what kind of risks are we willing to take and how much do we care about, you know, Southeast Asia impacts versus impacts in the United States? I just think we have to keep our expectations in check for how sure we ever are going to be about.

DAVID WESSEL: Can I ask two naive questions. So how far do you go when you're doing like.

NOAH KAUFMAN: I think the models go to 2300 right now.

NOAH KAUFMAN: Wow.

BRIAN PREST: Yeah. NORDHAUS This model goes out to 2500, I believe. Is that right?

DAVID WESSEL: And can you scale what one tonne of carbon is like? How much? Well, how many tons? Well, how much carbon comes out of the tailpipe of a car in a year. Do you have any idea?

BRIAN PREST: It's about 100 gallons of gasoline. Gets you one ton.

DAVID WESSEL: Of hundred gallons of gasoline. Yeah, wow. Jenny? We'll get to everybody, don't worry.

AUDIENCE MEMBER: Jenny some of the senior fellow at Brookings Metro. And as the state and local part, I'm going to ask you a sort of subnational question. So leaving aside the question about what states are allowed to do, you know, given that state politics is a little bit more stable than federal, if, say, California, New York, New Jersey, Illinois, Washington state, all decided to essentially adopt the social cost of carbon at the higher cost and use that to guide their internal decisions. Would that make much of a difference nationally? And do you want to sort of play that out? Is that likely to just drive things like all of the coal fired power plants move across the state lines to places where they're allowed to do this? Or could you actually drive kind of larger market decisions? Right. We have some evidence like, you know, California phasing out internal combustion engines is going to push all the car manufacturers to coming up with electric vehicles because that's a big market. But I don't know what other kinds of markets might be dependent of state level action.

GLENN D. RUDEBUSCH: Since I'm from California. You know.

DAVID WESSEL: You should ask everybody what kind of car they drive.

GLENN D. RUDEBUSCH: The subnational can make a lot of progress, as Noah said. I think states can do a lot. But there is, you know, just as we've had the leakage, we worry about leakage where people are citing the carbon emitting industries and other states in other countries. That's an important consideration. And that's that's, you know, a real problem to make, to push a lot. I don't think I don't think California could institute 190 and actually make as much progress and not have secondary adverse repercussions on their economy. But on the other hand, being able to an important part and I think there's something we've, you know, come to realize in the last ten or 15 years, an important part of this of solving the climate issue is innovation and invention and technology. And that can be that doesn't happen in a vacuum, but that gets induced by policy. So putting in proper incentives and you can actually then promote more technological innovation, which has a positive externality, that it could be used more broadly. So that that's an important that's an important attribute.

NOAH KAUFMAN: I think to some extent, we're conflating two things here, though, which is the sort of stringency of your climate policy and whether you're adopting a social cost of carbon. Right? Because like a state like California is saying, you know, we're going to get to net zero emissions by 2050 and maybe even earlier in California. Now that is where their state policies are geared towards and that is completely disconnected from any social cost of carbon.

BRIAN PREST: But by contrast, the state of New York in their sales, EPA, the Climate Leadership and Protection Act, explicitly adopts the social cost of carbon, and they have a high profile way adopted \$125, which is the Obama era, \$51. But if you swap out the discount rate from 3% to 2%, and so they use that. And one thing, for example, that they use it for is selling the value of distributed energy credits. Other states have also adopted social cost of carbon, like Illinois for various uses. And as I said, Canada adopted the U.S. value with some adjustments and Germany is up to the US willing with some adjustments to break. So I agree we are maybe completing two different things. But you know, there's there is action on both fronts.

DAVID WESSEL: Over here.

AUDIENCE MEMBER: Thanks. I think you started to touch on this. My name is Christine and I, working in London for a large asset manager. I work in sustainable investing. I'm actually here on holiday, so this is kind of fun, personal and professional interest. But can you provide a little more global context? So to what extent is there much collaboration between the U.S. and other countries? Are we way behind? Are we maybe in some ways ahead? And is there some sort of ideal yet also reasonable way we could work better, outside of just the US.

NOAH KAUFMAN: Well, there's a few other countries, I think Brian mentioned that that that used a similar framework or in some cases just borrow our social cost of carbon numbers for similar uses. But my sense is that most of the rest of the world and sort of the climate policy framework that the international community has developed, again, is not based on trying to monetize the value of the damages. It's it's how do we constrain global temperatures to, you know, under two degrees or 1.5 degrees? And what does that mean for when do we have to get to net zero emissions as a 2050 is a 2080. That tends to be the framework that the rest of the world has adopted to guide their climate policy.

GLENN D. RUDEBUSCH: I would say that there's a cost or.

CORAL DAVENPORT: If Congress actually moves forward with the carbon tariff, the rest of the world will have something to say about it real fast. I mean, that will essentially be a way of inflicting, you know, the US price on goods, you know, carbon price on goods on the rest of the world. I mean, the problem, the reason we haven't seen a carbon tariff yet so far is that it's also a great way to maybe start a trade war. But but I mean, it has got.

DAVID WESSEL: The Europeans have some beginning.

NOAH KAUFMAN: But they inflicted on themselves. So the difference that some some especially the Republican proposals right now are saying let's not charge domestic producers, let's only charge the foreign producers. Europe is at least doing both calls right about the reaction.

GLENN D. RUDEBUSCH: So Europe has that emissions trading system where they essentially have a carbon price in Europe. And, you know, it's not linked to a social cost of carbon, but it's certainly I mean, social costs of carbon would be one benchmark for what what that might be.

BRIAN PREST: Yeah. The EU price right now is north of \$100 per tonne of CO2 and they're planning on implementing a border adjustment that is linked to that market price. So that tariff, we're looking at something north of just to.

DAVID WESSEL: Just to bring this basic. So when you talk about a tariff, you mean when a good comes into the United States, we would assess how much was the carbon emitted in the production of that good and we charge a penalty on that in order to get the. Yeah. Discourage people from using carbon intensive production techniques. Yeah. Yes. And just can you, Brian can you elaborate on that? So when the Europeans set a price on carbon, which means they have an estimate of what they want people to think about when they internalize that damages, but they don't use the social cost of carbon to determine that price?

BRIAN PREST: That's right. They have a cap and trade program. This goes back to a classic, you know, Marty Weitzman, prices versus quantities. Do we want to put a price on something or put a quantity limit on something? The US tends to be more on the price camp. Hence, you know, the Inflation Reduction Act, lots of tax credits and whatnot. The Europeans tend to be more in the quantity world. There is a caveat to that which they have something called the market stability reserve, where they add or remove allowances to make sure the prices don't get too low or too high. So that's start to look a little bit like a hybrid instrument. And we have, as a result, seen pretty stable prices in the ballpark of \$100 a tonne, €100.

GLENN D. RUDEBUSCH: That is, you can only separate the carbon price from the social cost of carbon. It should be. I mean, ideally you've got this, you know, these two margins and they should be equal and in theory. But but they they can move around.

DAVID WESSEL: All right.

GLENN D. RUDEBUSCH: I guess what in terms of setting quantity restrictions in Europe, has you set sort of net zero goals? There's still an issue of cost effectiveness, which raises many of the issues that social cost of carbon does. You've got to think about discovered in one of these costs developed. So, you know, there are a lot of the same uncertainties go into implementing a net zero policy.

NOAH KAUFMAN: And this is what the United Kingdom does, some of the same similar regulatory type analysis as we do, and they've adopted a more of a cost effectiveness approach to carbon valuation where they say, how do we get on a low cost pathway to our net zero?

DAVID WESSEL: In other words, you set a target and then you figure out what is the cheapest way to get there.

NOAH KAUFMAN: Yeah, and like if you want to get sort of next level economist wonky, they say, all right, let's let's pretend our target is sort of an optimal pathway. Well, the marginal benefits of the marginal cost sort of intersect at that pathway. So we're kind of using the cost as a proxy for what this sort of more uncertain damage number could look like on an optimal.

DAVID WESSEL: All right.

AUDIENCE MEMBER: Hi, I'm Laura. I'm a research assistant here at the Hutchins Center. My question is, you've discussed there's kind of this uncertainty in terms of how you should measure the damage function, what the economic trajectory is looking like, and just climate change in general, what that will look like. I'm wondering, since you mentioned that the social costs of carbon is a marginal cost and the stock of carbon dioxide in the atmosphere is growing, what what do you see as the future directory of the social costs of carbon? How much of that is coming from the increasing stock of carbon and therefore the increasing marginal cost of an additional tonne of carbon versus the actual improving measurement that we have of the social cost? Thanks.

BRIAN PREST: Yeah, I'm happy to take that. So we have a great data tool on our efforts website. You can Google SCC Data Explorer and we actually don't just present a number for 2020, which is the \$185, but we present a number for polls, possible emissions in future years. And you can see it increases, although not very quickly over time. And there's a lot of technical reasons for that. But if

you're interested in those future developments, check out the data tool. In addition, EPA's report lists values, I think for either every ten years or even every year and maybe even in the appendix. So you can see that for full trajectory. So that's, you know, based on the modeling that we have today, of course, we'll continue to update the modeling out into the future. And so that's another dimension by which things could change over time.

GLENN D. RUDEBUSCH: And I don't think it's actually the increasing CO2 concentration. That's not a major factor. It's more the growth in the size of the economy. And so the amount of damages is increasing.

BRIAN PREST: Yes, I think that's that's.

BRIAN PREST: That's generally right. Yeah.

DAVID WESSEL: No, I know I there's a question online. I'm just going to read it as it was written. Can you ask the panel to discuss the moral dilemma that exists if we demand a higher value of statistical life for poorer countries, if we insist on this, it could lead to lower growth for poorer countries and have the unintended consequence of keeping them in or near poverty. So while it sounds immoral to have a lower VSL for poorer countries, it respects their very real current economic choices and preferences and allows them the flexibility to grow. Brian seem to be trying to say something similar when he was saying you should capture equity concerns outside of the VSL.

NOAH KAUFMAN: Right. So so in no sense when we're trying to put a value on the debts that the U.S. emissions are causing in India, let's say, in no sense is that constraining anything that Indians are doing. Right? This is purely evaluations that we are using in our regulations here. So, yeah, I mean, it's a totally different ballgame if you're in India and you're trying to weigh costs and benefits of different actions, that that that makes all the sense in the world. They're going to do their own thing. The question that that that I was getting to earlier from the US perspective is, you know, we have this vessel in the United States and we've kind of made the decision. Well, if you're in Maryland or if you're in West Virginia, we're just going to value the lives the same. Even though Maryland might have incomes twice as high as West Virginia because people would freak out in West Virginia if we if we didn't do that. Right. But we've decided to take it when we've taken a global perspective. Now we've decided to do it another way and we've decided to say, no, we're going to put a value that scales by the level of income. And I actually agree with Brian said earlier, you don't necessarily need to move away from this vessel approach. You just have to recognize I mean, one of the sort of the basic principles of economics is that a dollar to a rich person is worth much, much different from a dollar from a poor person. And that's what these models are leaving out.

BRIAN PREST: I think, yes, the concern I have about using the VSL approach is that is that it does inject a bit of subjectivity. Like how much, how much lower, how much higher should it be? I'm pretty sure if we have an.

NOAH KAUFMAN: Equity weighting approach, use of the vessel.

BRIAN PREST: Yes, you're right. Equity weighting. I mean, it's it's sometimes it's true both ways, actually, because you're still scaling it. But how much do you scale it or do you not scale it at all? All of these, you know, are things that we would have to talk about and figure out, and it injects a high degree of subjectivity, which I worry that if we do, we could have a second Trump administration. I wouldn't be surprised if that administration valued West Virginia lines much higher than Maryland.

NOAH KAUFMAN: We can pretend this objectivity doesn't exist, but I think it does. And I think there's just it does. And that there are value judgments in every aspect of these calculations. And I think you're right that the government tries to avoid them because it's an awkward situation.

GLENN D. RUDEBUSCH: I didn't get the separation between the U.S. government and the Indian government. It seems like. I'm not sure why those valuations would be different or why they shouldn't be. I'm not sure why the U.S. government should value a life in India different than what the Indian government does.

NOAH KAUFMAN: What I'm saying is that so if you're on the ground in India and you're trying to trade off the benefits and costs of, let's say, climate action versus building infrastructure to alleviate poverty or something like that, that is a completely different framework than a policymaker in the United States that is simply trying to estimate a global damages of carbon dioxide emissions and include a value of lost lives.

GLENN D. RUDEBUSCH: Yeah, it seems like, again, coming back to these questions of what the social cost of carbon is the same around the world. I mean, I think this is this is exactly this issue of of in India. What kind of climate policy are you going to have and and how to think about it. And that's a tension that has to be there has to be reconciled.

DAVID WESSEL: But as you said earlier, it may be this is what comes out of the international negotiations, which is, okay, how much of the rich countries going to pay the poor countries, compensate them for restraining their economic growth or changing their economies in order to reduce the risk that climate change poses to all of us?

NOAH KAUFMAN: And this happened, by the way, in the 1990s, the IPCC came out with a report, I think David Pearce was was the lead on it. And it did exactly this. It gave some of these cost benefit calculations that said lives in Africa were worth, you know, a cent on the dollar of of, you know, lives in the Western world and everybody freaked out. Right. And the report, you know.

DAVID WESSEL: I mean I think I think your point now is, is a very good one that sometimes we economists and others try to hide behind formulas and pretend that there's not some values baked into them. And we can hide behind the numbers and pretend they're not values. But in very often, particularly if you're talking about a global problem over centuries, it's inherent in the thing that we have to make decisions. It doesn't mean we shouldn't do them. But you're suggesting that when we get to explicit, everybody freaks out, so we pretend we're not.

DAVID WESSEL: Right? Eli?

AUDIENCE MEMBER: Hi. My name's Eli. I'm also a research assistant at Hutchins. Another thing that comes up on this VSL question in the health literature is value of a statistical life year. So saving an 80 year old person's life. Maybe you're saving five years of life, but saving a five year old with cancer, maybe you're saving. 80 years of life. I wonder if. Like on this global question. Considering countries with much younger populations, why do you think that should kind of come into account? So the Global South is just full of many, many younger people than like the West and America, so that the. Lives of the people. Are just much younger? I just I wonder your thoughts on that.

GLENN D. RUDEBUSCH: No, that's your question.

NOAH KAUFMAN: I mean, there is a rationale for it, I want to say. EPA did consider a shift to that type of methodology 20 years ago, and there was a huge outcry and they pulled back from it. You know, I mean, again, it's there's no there's no right answer to that question. Right. Some people are going to say a life is a life. Some people are going to say you should value longer, lives more. And then you have to decide what the you know, how to scale that. And I think these are impossible value judgments.

DAVID WESSEL: James.

AUDIENCE MEMBER: Hi James Lee, the research analyst at Brookings. I was wondering. If, you know. Whether there is an estimate of the costs of adopting alternative technologies. For instance, is there a cost or an estimate of the cost of the environmental damages caused by producing more. Lithium ion batteries from increased mining activity, as well as. Disposing additional batteries? Thank you.

DAVID WESSEL: Don't look at me. I.

BRIAN PREST: I'm. I'm sure those supports exist. I don't have them handy off the top of my head.

DAVID WESSEL: Okay, well, I think we're at the appointed hour. I want to thank Glenn, Brian, Noah, and Coral. I want credit for getting your names right at least once during the coverage. And thank you all for coming and particularly thank the people online from watching for watching. And I think this is a conversation will be continuing. And I promise next time I'll have a lawyer on the panel.