ALESSANDRO COCCO: --management technology. We study challenges and risks in financial markets and infrastructures. Our mandate is to contribute to the mission of the Federal Reserve and that is fostering the stability, integrity and efficiency of the monetary, financial and payment systems in the United States.

We have deep expertise in the derivatives market and clearinghouses in which Chicago is a global leader. We also conduct research on the impact of climate change on financial markets. We have recently launched a podcast, *LaSalle Street Financial Markets Insights.* The podcast is available on our website chicagofed.org and on all platforms where you get your podcasts from.

We collaborate with a network of colleagues across the Federal Reserve System to conduct research on this important topic. In fact, there's a virtual seminar on climate economics right after our panel today. It's hosted by the Federal Reserve Bank of San Francisco. Staff at other Federal Reserve Banks, such as New York, Richmond, Kansas City, Atlanta, as well as the board, are also very active in this area. I'd also like to mention that the Fed's Financial Stability Report of November, 2020 noted that Federal Reserve supervisors expect banks to have systems in place that properly identify measure control and monitor all of their material risks, which for many banks are likely to extend to climate risks.

So the purpose of our work in the financial markets group is aligned with these collective efforts and we are dedicated to developing a deep understanding of the challenges that climate change risk poses to economic and financial stability. Market participants and regulators are aware that climate change affects global financial markets but we're still working collectively both in the private sector and the public sector on a comprehensive risk management approach to climate change risk.

On this topic, the financial markets team of the Federal Reserve Bank of Chicago recently published a paper, and the paper is titled, *A New Framework for Assessing Climate Change Risk to Financial Markets.* In our paper, we establish a new framework for research in this area and we do that by merging the climate change risk categories of physical risk, transition risk, and liability risk, with the risk categories commonly assessed in the financial markets, in that market risk, credit risk, liquidity risk, as well as operational risk. We then take into account market structure and market regulation. Our framework shows that climate change affects each of the risk management categories in financial markets as well as the ways in which they interact to create broader systemic risk.

We are also planning to conduct more research in this important area. By way of example we're looking into what role the financial markets can play in establishing a global price on carbon. Will there be contract specifications for carbon emissions that are similar to the contract specifications on a futures contract? Will the global financial markets serve as a mechanism for price discovery and risk allocations? What role will derivatives play in scaling this new global market and will the market be voluntary, mandatory, or perhaps a combination of the two with some countries imposing mandatory carbon emissions trading and other countries leveraging voluntary markets?

This brings me to today's panel. In this panel we want to address some important questions about the impact of climate change risk on global financial markets, key developments to watch for in technology, investing practices, as well as legal and regulatory development. We're also going to explore what role the financial markets and the public sector can play in managing climate risk. In addition, we're going to look at challenges and opportunities that lie ahead.

Finally, we will take some questions from the audience. Our moderator today is Nahiomy Alvarez, senior financial markets analyst in the financial markets group at the Federal Reserve Bank of Chicago. Nahiomy has deep expertise in the topic of today's seminar. She's also a co-author of the paper I mentioned earlier. And now I hand it over to Nahiomy.

NAHIOMY ALVAREZ: Thank you, Alessandro. And I just want to do a quick check to make sure there is no lag. Great. So Alessandro, I appreciate the great introduction of our group and welcome everyone to our first webinar of the year. FMG has been recording different podcasts and different events for a while, but this is the first one in 2021.

As Alessandro said, I am a senior markets analyst in the group and I'll be serving as the host and moderator of this discussion today. With me virtually today is a panel that I'm thrilled to discuss this topic with. We have Anita Hererra, the general counsel and chief--

ALESSANDRO COCCO: I think we lost Nahiomy. Anita, do you to introduce yourself?

ANITA HERRERA: Certainly I will. Thank you very much.

NAHIOMY ALVAREZ: I do think actually my internet reconnecting of course. A couple of head nods if you can hear me. Anita?

ANITA HERRERA: Yes, I can hear you. Did you want me to go on? I'll go ahead and I believe I'll go ahead and introduce myself. I am Anita Herrera. I'm the general counsel for Nodal Exchange and I'm also the chief regulatory officer. Nahiomy are you coming in? Anyhow, let me go ahead and proceed. So Nodal Exchange is a commodity futures exchange regulated by the Commodity Futures Trading Commission. We offer energy in the form of power, natural gas, and we also have some environmental contracts that we offer.

We see the environmental impact of climate change obviously in our environmental products and also in our power products. Our power products have achieved about 50% of the open interest in this marketplace in futures. We also clear all of our contracts through Nodal Clear which is a subsidiary of Nodal Exchange. We are owned by the German company, EEX Group, which is a subsidiary of Deutsche Boerse. And with that, I'll pass it on to the next person.

CHRIS PALAZZOLO: I can go next. This is Chris Palazzolo, I work for AQR Capital Management, which is a systematic investment management firm based in Greenwich, Connecticut, with about $130 billion under management. My role is to head the Responsible Investment Group, which is all things ESG. And I'm very happy to be here today. Thank you.

STEVEN ROTHSTEIN: And this is Steven Rothstein. Again, it's a pleasure to be here. I first want to thank the Chicago Fed for their leadership on this and so many other things. I am the managing director of the Ceres accelerator for sustainable capital markets. Ceres is a nonprofit focused on sustainability. We do four things, very quickly, first work with investors, investors collectively with over 30 trillion of assets under management and helping them become more sustainable. Second is companies, to help large Fortune 500 companies become more sustainable, policy work, and the work that I do on capital markets and regulators. And I'll turn it over to my colleague, Steven.

STEVEN KENNEDY: I am the other Steven on the panel. Hi, I'm Steven Kennedy, I'm the global head of Public Policy at the International Swaps and Derivatives Association, which you all probably know better as ISDA. I lead our government affairs and our research function in North America, Europe, APAC and Japan. ISDA, you may know, has over 900 members in over 70 countries around the world.

And I think our members are very interested in ESG and climate finance issues from two broad perspectives. One, the trillions of dollars that will need to be mobilized, the trillions of dollars in capital that will need to be mobilized to deal with climate change will require financial innovation. And we think there's a role for derivatives there. And Mitigating the risk stemming from climate change will also require derivatives and other risk management tools. So our membership's been pretty engaged on this issue. Nahiomy?

NAHIOMY ALVAREZ: Thank you, Steven and I'm back. Thank you for the seamless transition to introductions. I will kick it over back to Steven R. in a second. But before that, I want to ask our audience to start thinking about questions that you might ask our panelists in the end. We are leaving ample time for you all to interact with our fabulous panel and I recognize there are a number of you who submitted questions in advance. I want to thank all of you for doing that. I will try to sprinkle some of those into the discussion today. So, Steven, can you-- Steven R, can you kick us off with your thoughts on how climate change risk has impacted the global financial markets to-date?

STEVEN ROTHSTEIN: Sure. Thank you again for the question and thanks again for hosting this. So climate has affected a number of ways. First is that the risks are growing exponentially. And there's different kinds of risks, there's physical risks, fires, floods, hurricanes, locations, and we all know those numbers are growing dramatically. This year we had 10 times the number of acres burned that we did a year ago. We also had 29 named storms and things like that. So physical risks.

Second, are transition risks. Transition risk caused by dramatic change, i.e. a pandemic, or a change in regulation, carbon pricing, Alessandro mentioned as a possibility. If carbon pricing for example was put in place in the next four years, that would have a dramatic impact on those areas. So there's physical risk, there's transition risk, there are legal risks.

But the second big area we can talk more about is regulatory response. There is dramatic regulatory response, some in the US and all over the world. And third, there's new opportunities in green finance. So we can talk more about all those but I'll turn it back to you now.

NAHIOMY ALVAREZ: I ask you to share your thoughts on how climate change risk has impacted global financial markets to-date? That was Chris, I'm sorry.

CHRIS PALAZZOLO: Oh sorry, we missed the first part of that. Yes thanks, Nahiomy. So what I would like to comment on is the demand side, what I see from investors. I speak to many of the leading investors worldwide and I can see there's been a discernible shift in focus on to climate change and how they can help in that regard. So we have been seeing new things like climate pledges to reduce carbon emissions by certain dates. There's a few different organizations leading those types of pledges. And we're seeing more questions about how that can be implemented.

And it's quite a complicated topic, we don't I think, have time to delve into every aspect. I will note that we just published a paper on this topic called, *Carbon Voyage,* which is available on our website if you are interested in the details. I'll try to touch on some of the aspects later in this call but I think the implementation side of climate reduction, climate improvement, and carbon reduction targets is the big shift that we're seeing, especially led by Europe and parts of Asia.

NAHIOMY ALVAREZ: Thanks, Chris. Anita, let me turn to you. And you're on mute, there we go.

ANITA HERRERA: Thank you, Nahiomy. Yes, to follow up on Chris's comment, it is true we are the supply side with the exchange. So where Chris mentioned too that much of this movement has started in Europe. In fact, we got into environmental products as a result of EEX acquiring us, which is in Germany, where they have been focusing on environmental products for a while now. And so we are responding to the demands of the investment community and the actual industry itself as they are looking for ways to hedge their climate change risks in order to continue to be viable institutions. And so we are also responding to the investment community as a whole, those that are as Chris is mentioning, are responding to the investment community as a whole looking for more responsible investments in this space. Thank you.

NAHIOMY ALVAREZ: Thank you. And so we've touched on this growing recognition of climate change risk on the transition side, on the physical side, changing investing practices on the demand side and then a response on the supply side. Steven K, do you want to add anything else to these remarks?

STEVEN KENNEDY: Yeah, sure. I just want to kind of sprinkle a couple of data points out there. One, and I want to flip your question around, the question was how has climate change impacted financial markets? Let's talk about how financial markets are impacting the climate change discussion. And I think the big story is that I think the financial markets are embracing their role in climate change and transition to a sustainable and greener economy, whether that's helping firms raise capital, whether that's developing new risk mitigation strategies, innovations. There's a big role for the financial industry to play in this process.

There's been a lot of talk about risk management and how to incorporate climate risk into risk models. And I think we would agree that at least at this point that the capital behind that asset is less about whether the asset is green or brown but what the risk of the asset is. And if there's a correlation between greenness and brownness and risk then capital should be allocated appropriately.

That discussion is becoming mainstream. We've seen the Fed join the NGFS, Network for Greening the Financial System. We saw two reports, *Voluntary Scaling of Carbon Markets,* the CFTC report. So I think the financial markets are embracing their role in climate change, which I think is important.

The other thing real quick, product innovation, we've seen a lot of that. We've seen sustainability linked derivatives out there. We've seen virtual power purchase agreements, which are basically commodity swaps that enable green energy producers to have a stable supply of revenue coming in. So there's a lot of seeds that have been planted from a financial innovation standpoint which I think will bear fruit in the future.

NAHIOMY ALVAREZ: Absolutely. Thank you, Steven. And I'm glad that you touched on some of those things because it does I think, nicely capture some of the developments we saw in 2020. Of course 2020 was also the year of COVID and a pandemic unlike one we've seen before or at least in recent years. And so this is a question maybe for Chris, Steven R, but then anyone else who would like to comment, do you think the COVID pandemic and sort of the discussions that unfolded in markets as a result of it, impacted the climate change space at all or do you think these conversations are sort of happening in their silos and not directly impacting each other?

CHRIS PALAZZOLO: You know, it's hard to say exactly. I will point out obviously that what we're talking about here are long term trends. So one year is not going to change the overall picture very much. However it was an interesting experiment. It's obviously not easy to have a complete downward shift in demand for travel and therefore an extreme reduction in pollution and carbon emissions. So we did see a discernible change in that. And I think it proves the point that there could be policy and political pressure to actually reduce the demand and the output from fossil fuels. So I think that's an interesting data point and I think it is worth studying that in greater detail this year.

There's other things that I think obviously came out of this crisis. There was a lot of examination on social issues and how the COVID crisis may have exacerbated some of those, including both health effects and socioeconomic breakdowns according to both race and status and work environments. So I think what we have to do is focus a little bit more on understanding what the actual changes might be from a travel and usage standpoint and how we can change that. I think this is a good example where we're meeting quite efficiently on a virtual platform. But also I think we have to look much more carefully at the social side of things on health and well-being and try to examine how socioeconomic factors are playing themselves out and it seems they are doing so in unequal ways in many respects. So I think those two things are going to be quite a big focus in 2021.

STEVEN ROTHSTEIN: This is Steven. And I completely agree with everything Chris said. And the social inequities is highlighted so I completely agree. I guess, a few other points. First is I think this highlights that nature doesn't wait for one crisis at a time. In other words, while we were facing COVID, we also had the West that was literally burning, we had hurricanes, we had floods. So that you can't say, oh I'm going to get to this when we have time. We have to deal with it when mother nature wants, number one.

Number two, I think it highlights the importance of scenario analysis and planning. Because if someone had asked a banker two years ago do you have plans for a pandemic? Probably most of them wouldn't have had plans at least to this level. And because we didn't know this was happening, well we do know that climate change is happening. There's a lot of data about it unfortunately. So we know the problem is happening. So the question is, what are we doing to solve it? That the regulatory agencies and the banks overall do a great job looking at risk but this is like risk like any other risk. So why not get into the details of climate risk just like currency risk or market risk?

The last point is as challenging as the current situation is, and it is heartbreaking for all of us and our lives and livelihoods, we now have a vaccine. In the coming months it will get better. There is no vaccine for climate change. So unless we make systemic changes what we know it'll get worse and worse. Back to you.

NAHIOMY ALVAREZ: Anybody else want to jump in on this one? And I love that there is no vaccine for climate change. I think that is a very important point to note. Anita, and Steven K, let me turn to you. So this is a nice segue into what we might expect for 2021. A lot of these trends were of course impacted by the pandemic but it's sort of hard to tell which ones will stick and which ones were sort of transitory. So, Anita, do you have any views on what we might expect for 2021?

ANITA HERRERA: Well, you know what's interesting is that I'm seeing it mostly from the power side. And because of the shut downs industry essentially also reduced its level of power usage for example. So that we observed that there was more of a flattening in the need to hedge power products at least for on the short term. This of course, we see that this is something that changes though as we are looking more longer term and that this is part of the planning process. So that's where we've just seen that impact.

Aside from that it really is something that on our environmental products, we're just seeing more and more demand for it because there is increased, I guess, increased needs and just observing more that climate change is having a very dramatic impact. And that to Steven's point, that there is no vaccine and so it is merely trying to manage this risk going out long term.

NAHIOMY ALVAREZ: Thank you. We'll certainly talk more about how some of these products might be used from a risk management perspective briefly, but I want to allow anyone else maybe to comment on this question of what might be expected 2021 based on what we've seen so far?

STEVEN KENNEDY: So I think one of the biggest questions in 2021 is what is the Biden administration's plan going to be in the area of climate finance. We know that former Senator and former Secretary Kerry is his climate czar. So it'll be interesting and important to see how the administration rolls out their strategy.

And then secondly, how does that align with what the Europeans are doing. They've been hard at this work for several years. I think we at ISDA have responded either alone or jointly with other groups to 19 different ESG consultations over the last few years. I think we're all looking for some kind of international coordination and alignment on how the different jurisdictions approach it.

And which leads to my last point, which is I think it's a question of standardization. I think standardization is required for the innovations to scale and to really to transform the markets and the standardization coming in the form of both disclosures and in definitions of different types of products. So those are three areas that we see as being important.

CHRIS PALAZZOLO: If I can just comment. I think I would bring it back to from my perspective among investors, bring it back to implementation. So I think for 2020 there's been a lot of analysis and thought. 2020s I think there's going to be a lot more about putting where the rubber meets the road. There's going to be a lot more thought to how to translate pledges into action and how to deal with complexities. And derivatives is a good example where that is not at all a problem that I think has been completely solved, how to think about derivatives versus individual assets.

There's a lot of thought, a lot of careful consideration that investors are going to be taking. And I think that's a good sign, because it means that it's leading toward significant action. I think there's going to be hundreds of billions of dollars moving around over the next couple of years in response to climate change specifically, if not over a trillion. So I think we're going to see major, major moves in markets. And it's hard to predict in what ways but I think the overall theme is going to be highly connected to sustainability and ESG.

STEVEN ROTHSTEIN: Right. I would agree with my colleagues just to emphasize a little more. First is climate disclosure, I think you're going to see a lot of activities in '21, clearly driven by the SEC, but there are many other federal agencies that are involved, from PCAOB and Municipal Securities Rulemaking Board and others.

Clearly, the new appointments, the announcement of Gary Gensler the SEC and what's going to happen at the Fed, the others, those will be critical benchmarks. But I also would highlight the state regulators, the state insurance commissioners, and the state banking commissioners, they're playing an important role, some have already made some big pronouncements. I think you'll see a lot more in '21 and '22.

NAHIOMY ALVAREZ: Thank you. I think this question of standardization is something that is of special interest to me at least. And as Alessandro mentioned earlier, our group focuses on exchange traded markets and futures. And so maybe this question is more for Anita, who's representing the exchange perspective, but anyone else is of course, welcome to jump in here, but could you talk to us a little bit about how you think about climate change risk in the sense is it similar to other catastrophic risks that the clearinghouses and exchanges consider or is there something sort of fundamentally different from your perspective?

ANITA HERRERA: That's an interesting question as to whether we view this type of climate change risk as being any different. I think that from the exchange perspective where there is a risk that demands a product, we look for ways to solve it. But there are certain commodity risks I suppose. For example, water, I believe that the CME has introduced a product in water futures that has received some criticism because there is views of inviting the speculators. From an exchange perspective you need the speculators in the markets in order to provide liquidity. So this is as an exchange we look at the product and see is there a potential appetite by the speculators because it's needed along with those that are looking to hedge their particular risks. From our perspective we view if as long as you have those two parts it plays a critical role in being able to provide the hedges that the industry may need in order to meet their climate change risks.

NAHIOMY ALVAREZ: Thanks, Anita. Does anyone feel especially motivated to respond to this question of tying, not just water futures, but the thinking about what specific products we might want to develop in response to this emerging crisis?

STEVEN KENNEDY: So if we look at derivatives, you can't raise $5 trillion of capital and allocate it towards a sustainable economy without having risk management tools. You can hedge a green bond with an interest rate swap but that's an interest rate swap and that can be cleared. So that's not a problem.

But when you start getting to more bespoke products like what we call sustainability linked derivatives, and sustainability linked derivatives is the derivatives which the floating rate payment is keyed off of some KPI. And the counterparty will pay more or less depending upon the performance against that KPI. Like how much solar energy it uses, so to speak. And those transactions aren't cleared. They can't be cleared right now. And there are a bunch of them out there. We did a research paper, which we catalogued probably two dozen of them. But there's no standardization in the KPI.

So the metric that determines what the floating rate payment is keyed off of changes from contract to contract. It's similar to doing an interest rate swap off say LIBOR or not having a standard metric against which the interest rate swap is measured. So I think at some point for those types of things to scale there needs to be some kind of standardization, then perhaps they could be cleared.

There are other things like these virtual power purchase agreements which are basically fixed floating commodity swaps and they give say a wind farm a stable source of revenue but they give a corporation renewable energy certificates. Those are always going to be bespoke and you could probably standardize terms to make it a little bit more legally efficient to transact them, but I don't see those ever being cleared. So it really runs the spectrum.

STEVEN ROTHSTEIN: I'll just add briefly on the question of the risks, that climate unlike some other risk is very much of a systemic risk. Meaning, it doesn't just affect a company that's on a coastline or something else. There was an analysis done by SASB, the Sustainability Accounting Board and they identified that 72 out of 79 sectors of the economy would be affected by this. We're going to have tens of millions of climate migrants. People won't be able to either live or work where they are and now. So it will affect all of us and that's why it's needs to be built into the risk analysis. A chief risk officer needs to be looking at this at every business, every bank, every insurance company.

NAHIOMY ALVAREZ: Thanks, all. Any final comments on this question? Great. So I want to stick to my promise of allowing ample time for an audience Q&A. So I have five more minutes to ask you a couple of questions before I turn it over to the audience. So let's close the moderated chunk of the discussion with-- I want to hear your views on what role markets and the public sector can play in managing this risk in 2021 and onward, and then any sort of concluding remarks that you have for the folks who might be in attendance today.

STEVEN ROTHSTEIN: I'll start. So for first is investors and companies have to play a critical role. There are every day new companies announce that they're setting net zero by 2050 or 2040 goals, which is great. Investors are starting to do that. We work with a group of international investors in December collectively about a $9 trillion of assets under management and they committed to going to net zero by 2050.

So investors and companies need to have a critical role but also the regulators do, that the United States is taking some great steps with what the Fed said in November, joining the Network for Greening the Financial System. But we're way behind. There are 85 members of the International Consortium and we need to do more, both all of our federal regulators the SEC, FDIC, OCC, and the Fed, but also the state regulators. So I think there'll be a lot of activity at the federal level. Who knows what Congress will do. There might be policy activities, that would be good as well but then the private sector needs to continue to show leadership.

NAHIOMY ALVAREZ: Thank you. Steven. Steven K?

STEVEN KENNEDY: So I think part of the question was, does the public sector have a role to play in this is that-- did I hear that right? Yeah, so here's the thing, I think if you ask our members, which we did, you just say will incentives be required to raise the trillions of dollars in capital that will be needed to help build a sustainable greener economy. And the answer is yes, incentives are going to be required. So then the next question is what do those incentives look like? And we talked about one before, an incentive from a capital standpoint.

But then you start getting into moral hazard issues, like you start incenting certain types of assets and then you get a plethora of these assets and that leads to some risk. But are there other types of incentives? There are other, and there's a whole measure of fiscal policy tools that regulators potentially could use as incentives to help raise capital. And that's what I said before, it'll be interesting to see what the Biden administration comes up with in terms of their game plan to catch up with Europe as Steven said. Which the US has been totally lagging behind.

NAHIOMY ALVAREZ: Thanks, Steven. Chris?

CHRIS PALAZZOLO: Yeah, just follow on both of those comments. I think so first of all, as a consumer of data on behalf of investors, we look at pretty much all liquid markets globally. I think the first and most obvious thing for us is availability of data, data transparency, and I think the role of government is to enhance both of those things. So from our standpoint, we very much believe in market forces and markets will clear at efficient prices, assuming information is accurate and available.

One of the challenges in for example, climate change is the lack of standardization and lack of availability of this data, not only across global markets but even within single markets like the US. It's clearly not available among all public equities for example. So we're big sponsors of CDP, TCFD, and we want to make sure that the reporting and the standards that come out along with SASB, all are moving in the direction of more transparency and availability. Our belief is that with that information investors will make more accurate decisions and allocate capital efficiently.

I will again touch on something I said earlier, Steven Rothstein mentioned the climate pledges, getting to a net zero target is not going to be an easy feat. And that was part of the reason we wrote that paper called *Carbon Voyage.* So I encourage people who are interested in that topic to look at this but getting to a net zero target without the right information is going to be extremely challenging. It's even challenging with the right information. So I guess my perspective would be for policymakers if they could just focus on whether to outright require or at least encourage that standardization along with a public-private partnership in this area.

NAHIOMY ALVAREZ: Thank you, Chris. And Anita?

ANITA HERRERA: Thank you. Yes, to follow on these comments, standardization obviously is a very key tool for us in order to be able to provide the products that can be traded and cleared. And so this has been essentially our goal obviously, we want to be able to provide those products and we look for ways for standardization.

When it comes to our relationship with our regulator, the Commodity Futures Trading Commission, the CFTC has a Commissioner right now, Commissioner Behnam, who has very strong feelings towards more environmental products to be able to provide some mechanisms to counter the hedge against climate change. And now with the changing administration we would expect to have more of this kind of an impact coming from our regulator, which we welcome.

I know it's also been discussed about the green collateral. And as a clearing house we obviously, we collect collateral in order to clear products and when it comes down to green collateral it really comes down to the basic risks in our regulations of credit, market, and liquidity and as to whether we could accept green collateral. And to that point, and much of that could be driven by the types of incentives that could be provided from the public sector, from the government, on these types of products. So that there could be more-- a greater sense of reduced risk in holding that type of collateral.

NAHIOMY ALVAREZ: Thank you, Anita. You touched on some of the questions that the audience had submitted in advance. So that's great, we're getting some out of the way. It's a good segue, I'd like to ask the audience now to start chatting their questions. You have a function that allows you to do it privately, so only Lauren or I would see it and then we can share with the panelists if you so choose.

But let me kick off this part of the discussion with a question that was submitted in advance. Let's see, so this is a question that the ties in to something that the Chicago Fed has been interested in exploring recently, which is the impact that low to moderate income communities face. And so a plug for Project Hometown, encourage you guys to go out to check out the webinars that have been posted over the last 12 months or so. But to any of the panelists, what are your views on how the financial sector and some of the tools that we discussed today might be able to help communities that traditionally have not benefited from the products that we have out there today?

STEVEN ROTHSTEIN: I'm happy to jump in. So first is the point that you made that climate justice is racial justice and racial justice is climate justice. That individuals in our community that are affected with discrimination on economic issues are also faced it because of power plants in their neighborhood, lack of parks, lack of public education, public transportation, et cetera.

But then there are variety of ways from the current notice on the Community Reinvestment Act and the critical issues there. There is important work now being done on the increasing risks of floods. And both the Federal Reserve, the Federal Housing Finance Agency, FEMA, and at the state insurance level, there was so much happening we've seen those numbers grow dramatically, not just on the coast but from even inland areas. So the risks are larger and that we have to look at areas.

Then on the opportunities because most low income folks don't have the opportunity to own their own home, things like community solar and how do we have solar if you don't have your own home or wind. So there are great market tools out there. We have to expand those tools and recognize the challenges.

NAHIOMY ALVAREZ: Great. Does anyone want to add something to that? Great. Question specific for Anita, could you please give an example of green collateral and maybe this is a question for you as well, which products do you see as being the biggest accelerators of repricing green versus brown risk?

ANITA HERRERA: Quite frankly, I haven't really even considered this. So when I was referring before to green collateral, obviously those would be bonds that are used to provide the funds necessary to develop a green project. And so when I refer to that I mean that there are these projects are getting bigger and bigger throughout the country, clearly more of them in Europe, and therefore in order to ensure that there is an active investment community feeding those projects, that's where the incentives would come in, certain incentives that would ensure that the funds would always be available and that those bonds would be sustained throughout the life of that term. And I forgot the rest of the question.

NAHIOMY ALVAREZ: I think you touched on the foundational question there. But let me let you off the hook here with maybe a larger question for everyone else as well, this is from the audience, do you think that rating agencies properly account for climate change risk across assets and communicate sufficiently clearly their climate related ratings? It's a good question.

STEVEN ROTHSTEIN: So, Steven. The short answer is no. I think the rating agencies are doing a lot more than they did five years ago. And I give them credit for the deep analysis but no they're not. And it's also not in-- there's some sectors that they're focusing more on this, so like oil industries are spending a lot more time trying to understand it, but municipal debt, just as one example is a $4 trillion a year market that is very opaque. We think there are a number of actors that the accountants, the rating agencies, and the stock exchanges just as three, all have an important role to play in addition to the regulators.

STEVEN KENNEDY: Yeah, I know that our members want the rating agencies to-- in a recent member survey we did, they told us that they want the rating agencies to focus more on climate risk in their credit ratings. It doesn't particularly surprise me that they're not that far along because I think we need to get further along in terms of the disclosures that companies are making in terms of climate risk. So I would expect that they would improve that in the future.

NAHIOMY ALVAREZ: Thank you. Does anyone want to add any final comments to that question? Great. And I have another good question here. So with the ongoing concerns about global warming and issues of water scarcity, do you have thoughts on the profitability of investing in water as a commodity?

So Anita mentioned earlier that some of these products are used for hedging and Steven mentioned the importance of having these tools to raise the capital we need to transition. I think this question is getting to more fundamentally we expect to have issues of water scarcity. Is there a risk in having some of these scarce resources tied to potential use for speculation and things like that?

ANITA HERRERA: The one thing I would say about that is that without these types of tools you have businesses, agricultural businesses that cannot plan long term. And to the extent that you have a balance between those that need these types of tools and the speculators, I don't see an issue.

But this is where I would say the economist might have a better perspective but from an exchange perspective, we're looking for ways to assist the industry, any particular industry. In this case, it would probably be the agricultural industry seeking to hedge their longer term risk in water. Particularly with climate change, which has become so unpredictable and that I admit that the fact that it is so unpredictable on the one hand does demand a hedging tool but it also could create an environment that could be damaging but I'll leave that to the economist to comment on.

NAHIOMY ALVAREZ: And even though I work in economic research, I am by no means an economist. I'll have to kick that to my colleagues. Does anyone else want to comment on this question of water scarcity and some of these commodities? Great. I mean, I'm thankful for many, many good questions. So thank you for the audience and of course, you guys are welcome to continue chatting them away.

So this question is for, I think, most of you mentioned something about the work that is being done in other countries related to climate change risk and how the US is behind, are there particular policy changes or things that stand out to you as things that the US should do as well?

CHRIS PALAZZOLO: I can just comment, first one of the markets where I see a big sea change in terms of regulatory requirements is in the UK, where there's starting this year a major shift in what for example, pension plans have to report as their climate exposure. So I think that's one of the big things. It's not a specific recommendation in terms of what any investor needs to actually invest in or do, but it is requiring that the information be reported. That obviously leads to renewed focus on that issue and probably a more efficient allocation of resources. I think in the US we haven't seen anything like that so far. So that would be my first question to the regulatory community is, should there be any kind of increased requirements for transparency among certain investors about what their climate exposures even are?

STEVEN ROTHSTEIN: I agree with Chris. Ceres did a report on this last summer, it's on the website, Ceres.org, with 50 recommendations of what financial regulators should think about doing, some that have already been done, but following up on Chris, there are many individual areas but there's two big buckets. The first is, as Chris said, is climate disclosure and that is critical. There are lots of examples across Europe and different areas, New Zealand has some, Canada. So there are a variety of examples and what the SEC does but then other federal agencies have a role there's potential legislation on this. What size of company would be impacted, how quickly they get implemented, all those are critical issues. So climate disclosure is number one.

And then the second big area is prudential supervision. For banks and looking at that stress testing and scenario analysis, the training of bank examiners. So from the Fed or others to look at climate errors. So prudential supervision and then monetary is a third area.

NAHIOMY ALVAREZ: Any final comments on this question?

STEVEN KENNEDY: Yeah, let me just add. I think I would agree with everything that Chris and Steven just said. But just another couple of other things. One, the EU's been engaged in this effort to develop a taxonomy, a green taxonomy and disclosure standards for non financials and whatnot. And it doesn't need to be perfect, the US doesn't need to perfectly align with these initiatives, but at least there should be some realization that let's be aligned where we can be. As opposed to having totally a separate stream of initiatives. And maybe the close coordination between the US and the EU will improve both what the EU does and what the US does.

But especially with regards to prudential supervision, we saw Governor Brainard at the end of the year note in the last Fed Financial Stability Report, her expectation that risk models would be more climate focused. And I think that there is a serious attempt by financial institutions and others to start to do that. But I don't think we want to start imposing incentives or penalties until we're able to really have a true understanding of the data and the risks.

Somebody mentioned before, brown versus green risks. The risk of an asset is the risk of an asset independent about whether it's brown or green. There could be brown assets that are less risky than green assets and I'm not saying from a public standpoint the policymakers may decide to create incentives based on whether something's green or brown but I just think we need to be careful when it comes to prudential supervision. Disclosure, yes, standardize it, make sure it's out there, whether it's the SEC or whether it's the bank supervisors. But once we start, before a better appreciation of how the data correlates with risks before we start changing prudential capital standards.

NAHIOMY ALVAREZ: Thank you. And so I just have a couple of questions and I think that will conclude the session for today. These are a little bit more specific. So one question is, how can we develop derivatives to transfer long dated risks like transition risk? This is a question that I thought about at some point, especially in the context of climate change being perceived as sort of a long term risk. I think some of those views have changed over time but welcome to disagree there with folks.

So to reframe that question, can we perhaps is a better way to frame it, can we develop products that can transfer more longer dated risks associated with climate change or should we focus on the near-term?

STEVEN KENNEDY: I think the World Bank has already started doing some of that. I think they've worked with the government the Philippines and the Maldives and whatnot to think about how climate risk might affect specific geographic areas and develop some hedging programs to mitigate the impact of climate change. So I think some of that is ongoing. And I think there's different types of structures and different types of vehicles for how that might get done. The question is whether it can be done at scale and I don't think we know yet, but I think people are interested in trying to find out.

STEVEN ROTHSTEIN: I agree with what Steven said. I also think that the answer is we have to. That what used to be considered a long term risk, the pace of change is happening so much faster. It's happening so much faster on the technology side, it's happening so much faster on the product side. It's also on climate area.

And again, we can go back to the question you asked earlier about the pandemic, we've learned things that we thought a year ago were impossible could happen. And we've seen that and how many on this call would bet that in the next four years there'd be some kind of carbon pricing? If there is, that would have a dramatic impact on our markets overnight. Even if it's a timeline to build it in. So yes, I think we have to deal with not just the short term risks but plan for the long term because we know that they're coming and the one thing we know about Mother Nature is we can't stop it, we can plan for it, we can help the mitigation by that planning.

CHRIS PALAZZOLO: I would add that I think the availability of more financial products that would allow hedging and/or investing in for example, carbon and climate change would facilitate greater use of them. So for example, if climate futures become much more prevalent, more liquid, and more widely used, those will be tools that would be of greater importance to asset managers like us.

Oftentimes with these types of strategies there are some futures that we use but they can often be of limited use due to liquidity issues or just market size. So the greater the market size, the greater the liquidity and information transparency, the more they will be used and the more we can implement longer term hedges as you asked.

ANITA HERRERA: And I just have to say, that I agree with everything that everyone has said. And coming from the exchange perspective, that's exactly what the function of our exchange is, is really to try to develop products that can gain the liquidity necessary to sustain them. To accumulate the data on such products and related products in order to be able to develop that type of a hedging mechanism on a longer term basis. So we see this as an ongoing process that we just have to engage in and it's-- well, it's good for our business anyway. So thank you.

NAHIOMY ALVAREZ: All right. With that, I would like to just thank our wonderful panel of experts. We hope that you guys continue to produce some of the great work that you've referenced. If any of the audience members are interested in the link to those pieces, please reach out to us on our website or LinkedIn. We are happy to pass it along. And yeah, we hope that this conversation continues in a productive manner this year and we will be continuing to do research in this space.

So thanks again, everyone, for joining early this Thursday morning and we hope you have a great rest of your day. Bye, everyone.

ALESSANDRO COCCO: Thank you.