Paul Theruviparampil: Good afternoon everyone. I'd like to thank everyone for coming to attend FHFA's first Listening Session on Climate and Natural Disaster Risk Management. My name is Paul Theruviparampil, I'm a Co-Lead of the Climate and Natural Disaster Risk Working Group from the Division of Enterprise Regulation. And I'll be introducing today's discussion with several great speakers.

The first thing I would like to do is thank you all for participating in this session. We know your feedback, attention and time are valuable. We appreciate the efforts our presenters have made, and the investment in time that you as listeners have also committed. This is a long session, but there's a lot of valuable insight and information to be shared today. Thank you so much. And we really look forward to your insightful comments.

I do want to make sure that everyone knows that this session is being recorded. We do this for the purpose of reference, if you want to go back and hear marks from specific speakers. And now it's my pleasure to introduce FHFA Director Dr. Mark Calabria.

Director Mark Calabria: Thank you, Paul. And let me also thank Michela Barba and all your Co-Chairs of our FHFA Working Group on Climate Natural Disaster Risk. And thank all the members internally and the staff that really made today happen. I certainly want to thank all of our participants for taking the time to put presentations together and joining us for today's Listening Session.

I think it's fair to say there may be no part of our financial system that's more vulnerable to climate and natural disasters than our mortgage finance system. It is also critical in my view that we have to examine how our mortgage finance policies may be adversely contributing to climate and natural disaster risk.

So today is our opportunity for FHFA to hear directly from you, our external stakeholders. We've tried to structure this to hear from as many perspectives as possible. And while we normally get a pretty good range of views for the mortgage, finance and real estate sectors on a number of topics who are also included today, I'm delighted that we're also hearing today from climate natural disaster risk specialists and we certainly welcome those views.

This input today, as well as our entire RFI process on this issue, will enhance our ability to fulfill our statutory responsibilities as a safety and soundness regulator. We're looking to strengthen our analytical capacities, as well as our supervisory and regulatory approach to handling climate and natural disaster risk.

So first, I would encourage all the presenters today to submit written responses to our request for input. And also encourage everybody listening to be able to submit as well and remind everyone the deadline for that is April 19th.

We've got 26 questions in that RFI. You can feel free to respond to any one or all or as few as you would like. And if you wonder where those questions are you can find those at FHFA.gov. We'd be happy to try to get you a copy of that. Again, it's on the website. Really encourage everybody to offer input.

And even if you feel like the issues you're interested in aren't representative in those 26 questions, feel free to list additional questions and send us additional feedback. Those responses will really help us understand as we approach climate and natural disaster risk.

And I think it's not being overly modest to say we are financial services regulators. That's the perspective we bring to this. And we're trying to build out our knowledge base and analytics in these areas as we move forward.

Certainly, the agency, as well as our regulated entities, have done research and have framework in this. And we developed what I would consider a pretty good framework to respond to the impact of natural disaster risk on borrowers and renters.

For instance, many of you may be aware of the forbearance programs that we've set up in the aftermath of natural disasters such as Sandy, Katrina. And, of course, we were able to use that framework as our natural disaster response to build out a framework responding to COVID.

Much of our COVID resource forbearance policies for borrowers and renters were based upon our experiences we've learned in responding to natural disaster risk.

But today really is about, the RFI is about looking forward. How do we be more proactive in addressing these issues on the front end. And again, that comes from building out our own analytical capacity in this regard, understanding the environmental risk facing our regulated entities. That's why we're here today.

I view this as a critical step. As I mentioned earlier, at the beginning, thanking our natural disaster working group here at FHFA, which we began in the fall. We've done a lot of internal work, but we figured that, we figure it's important to leverage outside knowledge.

And that's again what we're here to do, to get that feedback. So, I want to thank everybody for participating, for presenting and hand this off to Hadi, who will give you a little bit of the guidelines for today's listening session.

Hadi Reza: Thank you Dr. Calabria. And so, as you have heard, we've invited you to meet with us today in order to obtain your input on climate and natural disaster risk management. Anyone who participates in these discussions is also welcome to submit written feedback, as Dr. Calabria has mentioned, in response to the questions as posted on our website. All feedback offered in today's session should be directed to FHFA, without reference to the remarks of any other participants.

This Listening Session is not an advisory group, however we may summarize the feedback gathered at today's meeting. If summarized, the transcript will be posted on our website along with today's materials. Anything said in this meeting should not be construed as binding on or as a financial decision by the FHFA Director or FHFA staff. Any questions you may have are focused on understanding your views, and do not indicate a position of FHFA staff or the agency.

So, here's the logistics for the session. As part of the Zoom process, those that have speaking roles will have the ability to mute and unmute themselves. When it's your time to speak, please unmute yourself. When you're not speaking, please keep your microphones on mute to reduce any background noise.

For those that have sent us presentations to be displayed, my colleague Meghan Aines, will be sharing her screen displaying your information. Please let her know verbally when to advance to the next slide.

Given the number of speakers that have requested slots, we are limiting each speaker to nine minutes to deliver your presentation. I will inform each speaker when you have one minute left of your allotted time. Please forgive the interruption.

I know you have a lot of material to cover. But if we can focus on that timeframe, I would really appreciate it. This gives everybody the opportunity today to speak and make sure we get everyone's input. We have a break about halfway through the session.

The way I will proceed is by queuing up the first speaker and give the next speaker a heads up that they will follow right after. My sincere apologies in advance if I mispronounce any names, I will try

to do my best. So, let's get started. And thank you again, we really look forward to some insightful input from you all.

So, with that, I will turn it over to Rachel Cleetus, of the Union of Concerned Scientists, followed by Amine Ouazad of John Hopkins 21st Century Cities Initiative. So, Rachel, please unmute and you may begin. And I will be setting a clock right now.

Rachel Cleetus: Thank you so much. I really appreciate this opportunity and the RFI that FHFA has issued. This is a very important moment for our nation and as we all understand, this is about more than just mortgages in the financial market. This is about people's homes, often their single largest assets.

And what I'd like to share with you today is some research that my colleagues and I at the Union of Concerned Scientists have done on the risk that accelerating sea level rise in particular poses to our coastal real estate market, and make some recommendations for the FHFA as it is moving forward in how to take these risks into account and better protect people and their home. Next slide, please.

So, I wanted to start by saying that we have some really incredible scientists that the federal government has already assembled in the form of the Fourth National Climate Assessment. And the latest science continues to be very sobering, including the impacts we're seeing unfolding around our nation now. The extreme storms, the flooding, the wildfires, all of which pose a big challenge to our people and to their homes and property.

One quick note, are my slides being run? I'm not seeing them on the screen. Just wanted to make sure that someone's running the slides.

Hadi Reza: Yeah, you know, let's -- I'm going to give you a little more time. I think Meghan is launching them right now, so apologize for that.

Rachel Cleetus: Okay, no worries. Thank you. Next slide, please. So, as I mentioned, the research that we -- I'm going to focus on today has to do with accelerating sea level rise. We know that globally sea levels are rising. Here in the U.S. the East Coast is a particular hotspot, sea levels are rising faster than they are at the global average level. Next slide, please.

So one thing that we tried to do was recognize that well before places go underwater so to speak, we're going to start to see chronic inundation, frequent, disruptive, high tide flooding, that will cause

real impacts on properties, property values, infrastructure and other aspects of our economy and our daily lives.

So, what we set out to do was define a threshold for chronic inundation that would lead to really disruptive changes. And for the purposes of our research that's 26 plus or more per year, on average flooding once a month. Next slide, please.

And what we did was put together a data set that essentially married existing publicly available data sources, normal high tide gauge data, digital elevation maps, sea level rise projections coming from the NAS, and then localized using a formula from the Army Corps. We also used property data set from Zillow. Zillow was not associated with the research itself at all, but we used their property database, which includes both homes as well as private business properties. Next slide, please.

And what we found through our research was a really profound impact everywhere in the country. So, this is a snapshot of homes at risk all around the country. By 2045, well within the typical 30-year mortgage issued today, we've got over 300,000 homes around the country at risk, and by 2100, that gets to 2.4 million.

You can see on the slide, places like Florida, New Jersey, Louisiana, California, are particularly high risk, those shades are brighter on the map. Next slide, please.

And that's a lot of value, of course at risk. So, we've got about, in places like Florida by 2100, we're talking about $250 billion of real estate at risk. Nationwide, nearly $118 billion by 2045, $1 trillion by the end of this century. Next slide, please.

We also looked at the tax base at risk, because of course it's not just about individual homes, it's also about community tax bases that will get eroded as these homes start to lose value because they're being repeatedly flooded. And in four states by 2045 over $100 million and property tax base is at risk, West New Jersey, Florida, California and New York among the highest at risk. Next slide, please.

Places like Florida, as I pointed out a very acute risk. And a very near-term risk there. Next slide, please.

And there's a tremendous amount of value at risk in places like Miami Beach, for example, $6 billion by 2045, Miami $2 billion. This is a really profound, profound risk to the whole market. There are also, next slide, please.

There are also some very densely populated places at risk. These are just a snapshot of two of those places in San Francisco Bay and in New York, Long Island. Next slide, please.

The other thing that we tried to do was layer on socio economic data on these places at risk. And by 2045 of the 174 communities that will experience chronic flooding nationwide, 40% of them have poverty levels above the national poverty average. This is really significant. These are people for whom these homes are likely a much bigger share of their assets, it's devastating loss of value for them, particularly.

And Louisiana and Maryland, particularly, we have a lot of communities with low incomes, higher than average disproportionate number of communities of color whose homes are at risk. Next slide, please.

All of this data is available in an online interactive mapping database that's on our website. You can zoom down to the zip code level, go anywhere in these coastal states and get information. Next slide, please.

So one thing that we wanted to point out was that while this is about individual homes and properties, this is also about a wider circle of reverberation through our economy. And this is where FHFA's role, of course, is very, very important. We're talking about insurers, mortgage lenders, we're talking about communities and their tax base. We're talking about taxpayers, everybody tied up in this challenge. Next slide, please.

So, we've got a really big challenge ahead of us. We've got, we know the science tells us where and how quickly these challenges are going to be unfolding or are already unfolding in our country. But having that timeframe gives us an opportunity to act quickly, commensurate with a lot of scale at risk of challenges coming at us. We have to use that time wisely. Next slide, please.

We also have to recognize that there are limits to adaptation, especially in some places that face really, really high risk. We have to be very smart about what we're doing in the next decade or two to make sure that we're actually protecting people from the kinds of really high end risk that could come our way in places that are highly exposed to sea level rise. Next slide, please.

So this is where the crux of the matter about where FHFA's role comes in. Because we need to, as a nation, be recognizing that this is not a challenge that can be solved solely by the market, we will

need a whole of government type of approach. We will need to coordinate from the local to the federal.

The federal government has a key role to play in providing the data, communicating the risks to all the actors in the marketplace, but especially to the public. Because right now, there are a lot of proprietary databases that only those who have a lot of money and resources have access to. And it can lead to very inequitable outcomes as the market adjusts to these changes coming our way.

We need to be mandating climate risk disclosure in the marketplace, but recognize that we have to do it in an equitable way. We need policy support so that we're not just punitive, and having properties lose value, having people lose asset value. We cannot afford to do so because this will have a disproportionate impact on low income folks and fixed income folks. We have to have these support programs in place alongside.

The federal government must work together with state and local authorities. There are a lot of pieces here, including local land zoning, that create incentives or disincentives for how, where and how people build and where insurance is available or not.

We have to be thinking in the long term about whether and how to pull back from some of the highest risk places. But to do so in a way that's fair and equitable. We do not want to recreate our nation's very shameful history around mortgage redlining, which led to very inequitable wealth and income gaps that persists today, in many communities, especially African American households.

So as we're thinking about these high risk mortgages and how to adjust, I want to say that the most important thing that the federal government and that FHFA needs to be thinking about is they must focus on steps to limit harms to housing affordability and inequitable losses in wealth. Even as we seek to reflect on the latest climate science or even as we seek to limit the fiscal exposure of taxpayers.

These are all imperatives of the same order, the highest order and we can do this together. But we will need a whole government a whole nation type of approach.

Thank you very much for the opportunity for these comments. And I look forward to written comments that we will also submit by the deadline.

Hadi Reza: Thank you very much Rachel, you got it right in time. Thank you. Appreciate that. So next, we'll have Amine Ouazad, followed by Lindsay Owens. Amine, feel free to unmute, please.

Amine Ouazad: Thank you very much. Thank you for the time you're giving us to speak on these issues. I speak today as a Senior Fellow of the 21st Century Cities Initiative at Johns Hopkins University. And also on behalf of Matthew E. Kahn, who's the Director of the 21st Century Cities Initiative and a former distinguished professor at Johns Hopkins University. Next slide, please. Thank you. And the next.

We are not climate scientists. But we are environmental economists. And we're not consultants, but rather researchers looking for ways to help households adapt to rising climate risk. And as such, we're really concerned about the potentially unequal impacts of climate change on minorities and lower income households.

So the economics literature has documented the fact that households are at risk, for instance, hurricanes, storm surges are likely to be worse for lower income households. They're more likely to be minorities, and they're less likely to have health insurance. So the potentially unequal impact of climate change is a primary concern.

We want to also follow up from the previous great presentation on climate risk by trying to sort of focus on the tools that FHFA has at its disposal to help households navigate through the challenge of climate change adaptation.

The FHFA has a key role in setting specific sets of rules to guide households through the challenge of climate change adaptation. So perhaps what we can sort of add is the set of tools in housing finance, in mortgage credit supply, that FHFA can use to facilitate access to housing while reducing the exposure to climate risk.

So in our career, Matt and I, have focused on adaptation, housing finance, real estate finance, but also on social justice and urban stagnation. And so I'll mention three of our work.

Matthew spoke on adapting to climate change, our work on mortgage finance in climate change, that estimates the impact of natural disaster risks on the securitization of climate risk. And we believe that FHFA here has a key role in providing rules of the game to help commercial banks help households navigate through the challenge of climate change adaptation. So mortgage credit supply

here is really a key tool to help households navigate through the challenges of adaptation.

And then the third work that I might mention is a paper on credit standard segregation, suggesting that mortgage credit supply affects the patterns of urban segregation across neighborhoods. And so we believe that this tool of mortgage credit supply does affect the makeup of cities in a very deep way. And therefore, it can change the landscape of Miami, New York, New Orleans, a number of cities that are likely to be affected by climate risk. Next slide, please.

So we believe also that our research agenda is likely to help FHFA in this role. And we only have nine minutes, so I'll only mention, you know, six parts of our research agenda that we believe are going to be useful for this challenge of climate change adaptation.

The first one is to transfer climate risk from FHFA to private counterparties to protect the American taxpayer against these climate tail events. And so the credit risk transfer program that started in 2013 is key to this process of transferring risk.

Another aspect of our research agenda is to ensure equal and transparent information for borrowers, lenders and securitizers. So right now, we believe that there is some asymmetric information in the sense that climate risk may be in the U.S. financial system without an appropriate level of information about the risks that each asset has, is exposed to.

A third aspect of our research agenda is to ensure broad and equal access to mortgage lending for all Americans, regardless of their neighborhoods, their race, their color, their national origin, disability, age, sex and religion. We believe that it is really important to make sure that we are reconciling the challenge of climate change adaptation, with the challenge of a broad access to mortgage credit.

We want to also provide lenders with incentives to share their local knowledge. They have a network of 75,000 plus bank branches, and they have the big data of the loan performance at the monthly level. And we would like to help them share their knowledge with the agencies and with borrowers.

Another aspect is to price the mortgage guarantees that the Agency sets and thus the American taxpayer, to accurately reflect climate risk. And so, this debate about the adjustments of guaranteed fees and the loan-level performance adjustment matrix, to provide the

right nudges, so that the cost of living in a climate exposed area is transparent and clear.

And then finally, there is our ongoing work in progress on how FHFA can help in the pooling of climate risks across mortgage backed securities, to turn the systemic risk of climate change into harmless diversified iconoclastic credit risk. And therefore, we believe FHFA has a key role here in its financial know how to diversify away climate risk and help American households and the American taxpayer.

And so we believe that FHFA can play this role of the adult in the room that guides present and future homeowners through the challenge of climate change adaptation in a fair and equitable way. Next slide, please.

And so, we're just going to make broad observations that our analysis that suggests that, for instance, about 10% of mortgage originations, U.S.-wise are in areas exposed to hurricane storm surges. We've also done work on wildfires, suggesting that a substantial share of houses in areas hit by wildfires are also, originate a number of those mortgages originated there.

And so if on top of that we add houses exposed to riverine flooding, we believe that the substantial dollar amount of mortgages --

Hadi Reza: Amine, I'm sorry for the interruption, but just one minute left, please.

Amine Ouazad: Great, I'll make that. I won't use one minute. And so finally, we think that adapting our institutions is key. The resilient U.S. housing policy should encourage more Americans to become homeowners, while providing incentives, signals, information to take increased precautions to increase their own and their communities climate resilience.

And so, we really want to help FHFA and the American public build stronger institutions to face less risk from, for instance, the next Texas freeze and other inevitable shocks that will occur. We're talking about hurricanes, we're talking about wildfires, we're talking about riverine flooding. But potentially, we're talking about droughts and other climate events.

Thank you very much for the time, and we look forward to more discussions on climate risk with FHFA.

Hadi Reza: Thanks very much, Amine. Next up is Lindsay Owens from Groundwork Collaborative. And then will be Michael Craig. Lindsay, please unmute.

Lindsay Owens: Yeah, hi there. Can you hear me?

Hadi Reza: Yes.

Lindsay Owens: Great. So really happy to be here today. And congrats to FHFA on putting the panel together and also on the recent RFI. Looking forward to submitting comments on that as well. I think, you know, exciting to follow Amine Ouazad as well as his work really inspired my piece, which I've submitted and which I'll talk a little bit about here today.

So, I think my fellow presenters have made clear that climate change presents substantial risk to the residential real estate market. And the question before us is really what policymakers should do to address this risk and mitigate it.

And I argue in the paper that the first step really is to write climate risk into the rules of our housing market. And with a couple of notable, but narrow exceptions, like the National Flood Insurance Program for homeowners in special flood hazard areas, we haven't really done that yet.

What would writing climate risk into the rules of the housing market looks like? It looks like a lot of different things. It looks like appraisal standards, it looks like permit and building codes, pricing potentially, different forms of homeowners insurance and mortgage insurance, disclosures for consumers and a whole host of other, you know, potential policy changes.

So, I think the questions, you know, that FHFA is interested in looking at are sort of who should do this, and should it be FHFA, and how. You know, it's a big task, there's going to be a lot of state and local and federal regulators and maybe Congress that will be needed to take this on.

But I would argue that FHFA, you know, can and should lead the federal work on this for a couple of reasons. You know, the first is that FHFA's purview over, you know, $6 trillion in debt held or guaranteed by Fannie or Freddie is the sort of big game policy lever in this space.

And the second is really that I would argue that FHFA has a statutory obligation to take this on. You know, Congress put the GSEs under conservatorship after the housing crisis to avoid another one. And

there's an obligation to ensure the safety and soundness of the GSEs and to foster a liquid national housing market.

And so far as climate risk jeopardizes either of those two goals, you know, FHFA is really going to need to take this on and to take it seriously.

And I do think that this should be addressed. In addition, from a mitigation standpoint and a risk, you know, a resiliency standpoint, we should be thinking about this as a systemic risk as well.

So, in the paper I cover four policy options that I think FHFA should look into. But I'll just talk about two of them today, just to keep things brief and under my time limit.

So, the first recommendation that I have in the paper is for FHFA to invest in asset level data on climate risk across all perils. You know, this data is increasingly available for, you know, for purchase and FHFA should have, you know, asset level data for the entire mortgage portfolio.

I think, you know, this is really a first order policy recommendation, because a lot of the other policy recommendations that we would consider, we can't really take on until we have, you know, a crystal clear assessment of how much risk Fannie and Freddie really hold.

And it's also important, because I think FHFA should play a key role in ultimately making that data publicly available. You know, as my colleague mentioned, there are a huge number of information asymmetries in this space right now. Information asymmetries between different players in the market, local banks who maybe have tacit information about flood risk, larger companies who purchased, you know, high quality data between those players and the government potentially, and between all of these entities, organizations and institutions and consumers. Borrowers have very little information about the climate risk, you know, posed to their, you know, to their potential investment.

And, you know, as we all know, you know, this is for many folks their nest egg when they purchase a home. And we need to really think about how we can disclose that information. So I think it will be imperative for FHFA to work with, you know, pure organizations like the Consumer Financial Protection Bureau to think about disclosure regimes as well.

The second recommendation I make in the paper is, you know, after we've got this high quality asset-level data, you know, it's time for a climate audit of the GSEs. How much risk is there? Where is the

risk? And potentially some stress testing of regional and hazard level perils over different time horizons. I think this is ultimately how we're going to better understand the scale and scope of the problem. And it's how we're going to begin to strategically develop prevention and mitigation policies.

So, you know, I think FHFA should take this on, you know, of their own accord. I think, you know, Congress should encourage it, and, you know, and facilitate it. But I think that's going to be a critical piece of the puzzle.

The next, the one other thing I should say about a climate audit is, you know, the first presenter, Rachel, mentioned the potential for disparate impact. And I just couldn't agree more. I think we've got, you know, because of, frankly, you know, a century of racist housing policies. We've got, you know, low lying areas and some of the most at-risk areas, they're disproportionately areas where black and brown homeowners reside.

And so, as Fannie and Freddie to take on that climate audit once they have the data I think, you know, the audit should really be looking at disparate impacts as well. We're going to need real data on the potential disparate impacts of climate change on homeowners, if we're going to also later put in place policies to mitigate that disparate impact, or to hold legacy borrowers harmless as price changes and other types of policies need to be put in place.

So those are my first two recommendations in the paper. Getting the data and making it publicly available and performing a climate audit, which should include a look at disparate impact.

The other recommendations that I look at in the paper relate to some pricing changes, and then also some work that Congress could do to create a fund to potentially help, you know, low income and black and brown borrowers, you know, who do live in the riskiest areas.

But I do think the first order of recommendations ultimately are going to be that, you know, that data and the risk assessment. And that's all for me. Thank you.

Hadi Reza: Thanks so much Lindsay. And I know you referenced your paper a couple times. We will be posting it along with the other meeting materials, if that's okay with you.

Lindsay Owens: Okay, wonderful.

Hadi Reza: Thank you. Okay, so next up is Michael Craig of HUD, followed by Clifford Rossi. So Michael, please unmute and begin your presentation. Michael, are you there?

Michael Craig: Can you hear me?

Hadi Reza: Hear you now. Thank you.

Michael Craig: All right. Thanks. My name is Michael Craig, I work as a research economist at HUD. And this is an overview of issues in climate change and mortgage finance. This presentation is my own work and does not imply any HUD endorsement of specific findings. Next slide, please.

So, as you know, many people are aware, climate change is bringing about more intense and more frequent natural disasters. The NOAA reported $119 billion natural disasters since 2010. That's more than twice as many as the previous decade. And this poses a significant threat to the housing stock and to the mortgage finance industry.

And even though this includes things like wildfires and wind events, my discussion is going to focus mostly on flooding, because that poses the largest, you know, type of disaster in terms of threats to the mortgage market. Next slide, please.

So, potentially, you know, we're looking at a wave of mortgage defaults that would be similar to the subprime crisis and how it would play out. You could have defaults on mortgages that results directly from storm damage. You could also see defaults on mortgages that result indirectly from storm damage that are the result of community wide depreciation of property values. This leads to an abrupt tightening of lending in these flood prone areas that could lead to a potential negative feedback loop causing further depreciation, further tightened lending and so on. Next slide, please.

So, this is a pretty broad problem, and to kind of, you know, make it digestible, we've broken it down into nine topics that we spread across three general contexts. We want to think about pre-flood issues, post-flood issues, and then issues in the secondary mortgage market. Next slide, please.

So, looking at pre-flood issues, we need to know how flood risk is assessed, and how climate change and development patterns are increasing this risk footprint. When we think about risk, you know, we can sort of look at it from two perspectives, we have financial risk and physical risk. And so with regards to those, understanding flood insurance markets, and the National Flood Insurance Program

is crucial. And we also want to understand what individual homeowners and communities are doing to mitigate physical flood risk at those levels as well. Next slide, please.

When we have a flood event, we need to understand, you know, what borrower and homeowner behavior looks like and what are their financial outcomes. Particularly, in regards to their mortgage performance.

We also want to understand how communities are able to adapt and respond and recover from a significant flooding event and what role that federal assistance programs can play in these recoveries. We also want to understand the behaviors of participants in the mortgage market that could include mortgage originators, the GSEs, federal agencies and regulators, and even purchasers in the mortgage backed security market. Next slide, please.

Looking at secondary mortgage market issues, we need to understand what is the portfolio exposure of the GSEs and of Ginnie Mae. We also need to understand how secondary mortgage market participants are responding to climate risk. And then we also want to understand parallels between the 2007 subprime lending driven housing crisis and a potential climate change driven housing crisis.

I think, you know, previous speakers have sort of mentioned, how is this risk distributed throughout this mortgage backed security market? That's one of the topics that we really need to understand, to see how systemic this risk is. Next slide, please.

So, a few conclusions I want to touch on that have sort of emerged from the literature looking at these issues. One of the first things that stands out in the literature is that housing markets do not fully price in flood risk to home values. There is some evidence of floodplain discounts though not enough by some calculations.

Furthermore, it's possible that the National Flood Insurance Program and other disaster relief measures encourage or even subsidize rebuilding a new development in high risk areas. The literature also finds that the insurance premiums are too low to cover the cost associated with claims, and also that the GSEs currently cannot or do not price in flood risk through their guarantees fee or through other means. Next slide, please.

Insurance can play a critical role in reducing financial risk. It reduces post flood risk of delinquency and mortgage default. However, flood insurance can lead to an increase in prepayment risk if homeowners decide to sell and -- rather than rebuild or repair.

There's also evidence that whether or not the lending institution was local or non-local plays a role in that decision. Next slide, please.

Despite flood insurance providing such an important safety net, the literature concludes that households are severely under insured against flood risk. That can be for several reasons. One is this perception of binary flood risk based on location in or out of a Special Flood Hazard Area. FEMA flood maps are sometimes inaccurate or out of date, or incomplete.

And there's also a potential of incomplete enforcement of mandated insurance for agency and federally backed mortgages within Special Flood Hazard areas. I believe Lindsay touched on this a minute ago, there's, you know, some data, you know, we need asset level I think is the term she used, asset level data on risk for homes and to be able to track whether or not they maintain insurance to kind of protect against these financial risks. Next slide, please.

The literature is also, however, starting to find that market participants are beginning to understand and react to climate risk. Banks are securitizing more homes with flood risks and keeping less risky loans on their own balance sheets. This is essentially transferring flood risk to the GSEs and the federal government. There's also evidence that homeowners are starting to take out interest only loans in order to protect themselves from equity loss if their homes were destroyed from a flood. Next slide, please.

Purchasers of mortgage backed securities are starting to indicate that they are becoming more aware of flood risk to the underlying assets and are less willing to accept securities that have these at-risk homes.

There's also been responses from third parties in developing new climate risk tools specifically for estimating the exposure of mortgage backed securities to climate risk. And recently, investment firms and rating agencies have started publicly discussing the risks of climate change to the mortgage backed security market, you know, specifically mentioning that the market tends to underprice climate risk.

Hadi Reza: One minute left, Michael.

Michael Craig: Okay, thank you. And so this is, you know, just kind of been a, you know, quick discussion of a lot of the research that's been done addressing some of these issues in climate change and how it will

affect the mortgage finance market. And there's still plenty of work to be done. And that's all we have today. Thank you for your time, and we welcome further discussion, and I look forward to hearing what everyone else has to say. Thanks.

Hadi Reza: Thank you very much, Michael. The next speaker will be Clifford Rossi, followed by Edward Kearns. Clifford, please unmute and begin.

Clifford Rossi: Okay, can everybody hear me?

Hadi Reza: Yes.

Clifford Rossi: All right. Super. Well thank you for the opportunity to make my remarks today on what is an incredibly important topic. My comments, just to give you all some context, are based on my 23 plus year experience in the financial services industry as a C level executive overseeing risk management functions of the largest bank, the largest S&L, and the largest nonbank SIFI, during my tenure as well as my decade of experience at both Fannie Mae and Freddie Mac in risk management, a number of years as a banking regulator early in my career and now as an academic at the University of Maryland's Robert H. Smith School of Business.

Climate change presents yet another challenge for those of us in risk management and also for the housing finance agencies, and the FHFA to integrate the latest data analysis into enterprise risk management frameworks for both of these entities, as well as the Federal Home Loan Banks.

The challenge in front of front of us though is finding a tractable implementation strategy for ensuring effective natural disaster and climate change risk management is performed by the GSEs and the Federal Home Loan Banks, rather than being an exercise and feel good analysis and regulation.

As outlined in my presentation, the climate and integrated assessment models present a number of issues surrounding their ability to accurately project outcomes over a long period of time, and their outputs do not lend themselves to traditional scenario or stress test analysis.

So, we push to slide two, what I suggest that housing -- the focus of the Federal Housing Finance Agency should be on is on the following pillars. The first one is integrating climate risk management governance with their board and management governance practices that they already have in place. Two, develop a realistic climate change financial disclosures based on data that can be directly tied

back empirically to various mortgage risk exposures. Three building climate change processes that leverage their existing ERM capabilities. And four, developing a staged rollout of risk analytics compatible with the state of climate risk assessment tools today.

To support those pillars, the GSEs and the Federal Home Loan Banks should focus on conducting loan level analysis of potential risk exposures to various natural disasters and climate risk. Work that can be readily performed today may have already been done by the GSEs, in fact, and provide significant insight to the housing agencies and FHFA.

These agencies should also begin to bridge physical climate data with financial and where applicable nonfinancial risk data. For example, my latest research, which I'll discuss a little later here, in estimating the impact of hurricane frequency and severity on mortgage default, illustrates how this can be done and used to make forward looking projections based on scientific analysis of climate change events.

If we turn to slide three, so in the interest of time here, I'll simply highlight a few details that support my case for a practical and effective approach to climate change risk for both of the agencies, GSEs that is, and Federal Home Loan Banks.

First, there are a number of issues with the climate and IAM models, Integrated Assessment Models that while not fatal, are not well suited to linking up to standard scenario and stress test models used by the housing finance agencies at this time, such as the following.

The outputs are not relatable directly to measured risks. For example, mortgage credit risk. The climate models overestimate the expected path of projected temperature anomalies. The climate model projections beyond five years are fraught with potential model issues compounded by the IAM that leverage these results for scenario development.

And finally, the climate and IAMs have not undergone the type of model validations that the FHFA would require of the regulated entities' models. For example, the models appear to have been validated by the same people that have developed them.

So consequently, requiring the housing finance agencies to perform assessment of transition risks from climate change would be of limited value at this point to risk managers and regulators. Rather, a focus on measuring direct impacts from climate events on specific risks should be a primary focus of the analysis.

Now turning to slide four, applying climate change scenarios to housing agency scenario analysis at this time suffers from the proverbial, I'll call it square peg in the round hole syndrome. Organizations such as the NGFS have developed climate change scenarios, focusing on measuring both physical and transition risks of climate change.

As someone who led the first formal regulatory stress test of mortgage risk at Citigroup during the great financial crisis, forcing the GSEs and Federal Home Loan Banks to assess transition risks would not produce meaningful results at this time. The scenarios are simply too diffuse, and the time horizon is too far out to be a real use for informed decision making.

Even the NGFS acknowledges that, that these scenarios are subject to significant uncertainty. So, I have to ask, what good are they for decision making in their current form?

Evidence to some of these issues is seen in slides five and six of my presentation where greenhouse gas outputs from the shared socioeconomic pathways, or SSPs, are not something that we can just model with today's data.

On slide five, for example, I know of no data today that provides a linkage between greenhouse gases and mortgage risk in the same manner that macroeconomic factors such as changes in home prices or interest rates have on either mortgage default, or prepayment.

Slide six supports my earlier point that the climate model projections are running much hotter than what past experience suggests. This information is not provided by me but by the IPCC and illustrates that beyond 2020 the dispersion of temperature anomalies widens out significantly, rendering any analysis in my opinion beyond 2025 will be of limited value.

Now recall that today's annual defect stress test performed by the GSEs can only go out nine quarters.

Slide nine describes a number of issues associated with the integrated assessment models that are used to generate these climate scenarios. These models themselves rely on a set of complex and interrelated climate and socioeconomic relationships that in many cases lack transparency and are too broad to provide reliable output for the housing agency models.

I provide a blueprint on slide eight of a pragmatic and effective program for conducting natural disaster and climate change risk management for the housing finance agencies. It starts with

ensuring that these risks are well defined and integrated into existing ERM frameworks, including preparation of climate change financial disclosures.

It also focuses on assessment of direct risks first by the GSEs and Federal Home Loan Banks. I also encourage the FHFA to test various climate change risk transfer structures beyond standard reinsurance contracts. Research that I have underway suggests that there are several structured finance vehicles that could effectively distribute this risk with good price discovery to provide sufficient market liquidity in these structures.

Lastly, I would like to emphasize an important area of suggested focus for the housing finance agencies and one of the biggest impediments facing financial services companies today in conducting climate change risk analysis at all. That is developing data and analytics linking physical climate change data with financial risk data.

If you refer to slide nine, in a recent empirical study, for example, I estimated the incremental default risk associated with hurricane severity and frequency holding all other factors constant. Several recent studies of Atlantic hurricane suggests that a significant increase over the next 30 years and the number of hurricanes rated four or five on the Saffir-Simpson Hurricane Windspeed Scale, a standard statistical methodology consistent with the GSEs automated underwriting systems was used in my analysis.

And further to perform the research I leveraged the historical GSE loan level credit performance data, along with FEMA declaration disaster and NOAA hurricane data. My analysis suggests the incremental default from hurricanes rated two and greater would be 10% to 15%, higher controlling for all other factors, and could increase 25% to 100% if multiple hurricanes over the life of the loan could occur, just to give you an idea.

So, using hurricane model projections to perform sensitivity analysis using these types of results, slide 10 provides a table from the study illustrated to bill -- illustrating rather how they could be leveraged for conducting forward looking hurricane default risk.

Hadi Reza: Your time is about up.

Clifford Rossi: Okay, sorry. Exactly the type of direct impact analysis that's needed for business and risk managers. And that type of analysis could be conducted in similar fashion on various types of risks and climate event types.

So to close, I support a direction to amplify the housing finance agencies efforts to conduct natural disaster and climate change risk management that is appropriately staged and focuses first on building the data and the tools to measure direct impacts effectively, and accurately to afford the agencies and the FHFA to make sound risk management decisions. So, with that, I'll turn the balance of my time, probably 30 seconds or so back over to the group. Thank you.

Hadi Reza: Sorry, I realized I was on mute. Thank you for that. Edward, you're up next, followed by Glenn Pomeroy. If you can unmute and begin, that's be great.

Edward Kearns: All right. Can you hear me okay?

Hadi Reza: Yes.

Edward Kearns: Great. Thank you for the opportunity to address you today. My name is Ed Kearns. I'm a scientist and a former chief data officer at NOAA and the U.S. Department of Commerce, and I joined a nonprofit called the First Street Foundation last year. Next slide, please.

What is the First Street Foundation? So, we're a nonprofit whose mission is to communicate climate change risk to individual Americans. We've started with flood risk for the reasons that we've already heard here. And this was a great lead in, I don't actually have to justify why we're doing what we're doing. Thank you to all the previous speakers, particularly Michael, for teeing this up so well.

But we recognize the need for a consistent and property level asset level assessment of flood risk in the United States. And we're also making this publicly available through a website called floodfactor.com. So we're giving this information away for no commercial use to raise the awareness at the individual property level for individual Americans so they can know what their climate, what their flood risk is today, and what it's going to be in 30 years. So, we've built a flood model that addresses this risk for each of the 142 million properties in the contiguous United States. Next, please.

We began by looking at every major modeling type, including title and sea level rise, heavy precipitation, riverine flooding, which is usually what most people think of when you think of flooding, and then hurricane storm surge.

So, we're looking at that under current conditions. And then we're also projecting out into the future using FEMA 5 model outputs. We

are scaling the current conditions using these model outputs to account for some of the modeling uncertainties we just heard about, and we're doing a low, medium and high estimate to capture the uncertainties in these climate models. And this is all based on government open data from NOAA, USGS, and FEMA, and projecting out 30 years as a typical mortgage term. Next, please.

What we've done is we've taken information about every parcel in the United States. So, we know what the shape of the parcel is and where it is. We know where the building footprints are. We use data partners from a group called Lightbox and from Microsoft and Mapbox with the building, excuse me, the building footprints.

We compute the flooding on the on the landscape, and then we match those up. So, for every parcel, for every building, we know we can expect flooding today and the future under different return periods, and under different severity of flooding. And we calculate the maximum depth to either the building footprint, or if there's no building on the property to the property centroid. Next, please.

So, FEMA is the gold standard for this. And so, when we released this last summer, we compared our results to those from FEMA. So, within the FEMA Special Flood Hazard areas, which is a 1%, one in 100 annual risk, we found that there's 70% more properties in our analysis that show up as having that 1% significant flood risk than we previously thought.

So that's about six million additional properties, six million more homes across the United States that have risks that they may not know about today.

Now with FEMA, this is not meant to be critical of FEMA, we have the same goal of FEMA of protecting Americans from flood risk. We're just, again, they are the gold standard that we all measure against.

And then you'll notice in this map on this figure that it looks like a patchwork quilt of maps across the United States. If FEMA's methods vary from region to region, as they negotiate with local communities to assess flood risk using different methods. First, we applied the same method consistently across the entire United States. So, it allows us to compare easily, you know, West Coast and East Coast and coastal versus inland. Next, please.

Looking out into the future, going out 30 years using the FEMA 5 climate models to scale out inputs, what we're seeing is about 11% more risk, about 1.6 million additional properties having that 1% of

risk by 2050. And you'll see, you know, along the coasts, and particularly the southeast which comes to no surprise to everybody here that, you know, some increasing risk there.

But there is also an additional risk growing inland too, out west and to the Appalachians. There's also some areas in the U.S., where its projected to be drier. So those flood risks are going up. Next, please.

To the point that, again several folks have made already, that one of the implications of this additional flood risk is impact on home values and economic risk for these homes. So, First Street Foundation recently released an assessment of that average annual loss of that risk and how it's going to be playing out going out 30 years.

So, what we did is we assessed the flood damage today under different return periods. So, everything from the one in 500 year storm or 0.2%, all the way to the one every year storm, or 50% risk. We assessed that today and we looked out 30 years and so we have the flooding depth at an individual property. We've assessed an estimated -- the characteristics of that property from public records, so that we could make an estimate of what this average annual loss is going to be. Next slide, please.

To assemble this financial risk, we used the U.S. Army Corps of Engineers depth damage functions that are valid for residential properties between one and four units. And then we've assessed the damage that each kind of storm would have on that home.

So, for example, in the one and 500 year storm, which is, you know, the big event that's going to cause a lot of damage. And so, we do this kind of assessment for every return period. And so, we have a list of possible damage under different scenarios. Next, please.

Then they come up with the average annual loss. We take the probability of that event occurring, multiplied by the magnitude of the damage. And then we add that up to come up with an estimate of the average annual loss.

So, the takeaway here of course, is that, you know, the one to 500 year storm is very unlikely, but very damaging. And so, what really drives the average annual loss estimates are those less -- there's more frequent storms, excuse me, more frequent storms that are less damaging but much more likely to occur. So, for example, the one and 10 year storm. Next please.

So why does this matter to FHFA and all of us? Again, as has been mentioned already by other speakers that this impacts home values. So, if the damage is anticipated to be very large, what that's going to do to real estate values it can be significant. Next, please.

As an example of how significant this can be, taking as an example, a residential unit in Florida that has this kind of flood risk in order to cover the investment necessary, say for a rental home in this case, how much money would you expect to be able to invest in your net operating costs for this home? And then what can you expect to happen to those operating costs in the future if you include this kind of flood risk and the price of what it's going to take you to maintain this rental property.

Looking at this, and again this is just an example, but you can see that incorporating this kind of flood risk can significantly lower the value of such a rental property today, maybe up to 38%. Under current conditions in this example, are even greater than 70% with the increasing risk out in 2051.

Hadi Reza: One minute left, Ed.

Edward Kearns: Thank you. Next please. This is my final slide. The takeaways. So yes, it is possible to model this risk down to the property level. And we've done so at First Street, we're making this in a very open and transparent fashion. We don't have any black boxes, and we're giving this data away to the public.

There are over four million residential homes today with 1% substantial flood risk, that would also result in financial loss if that flooding occurred. In the one in 500 year event that's 5.7 million homes. So, there's a lot of homes at risk here.

As was mentioned previously, the NFIP is grossly under covering this risk. We estimate it to be over four times off today and over seven times off in the future, and in 2051. We understand that FEMA is seeking to help reform NFIP with Risk Rating 2.0 later this year, and we are eagerly awaiting the results of their work.

The average annual loss for this 5.7 million properties is significant. It's over $20 billion, and in 30 years that average annual loss rises to $34 billion. So, what we'd like to leave you with today is that the property losses due to flooding in the future they're significant, predictable, and increasing with climate change. Thank you very much.

Hadi Reza: Thank you very much Ed. So next up is Glenn, and I believe Glenn you probably just dialed in, so you're right on time. And followed by Daniel Raizman after that. So, Glenn.

Glenn Pomeroy: Great. Can you hear me okay?

Hadi Reza: We can thank you.

Glenn Pomeroy: Okay, thank you. Well hello everyone. My pleasure to be here with you. Glenn Pomeroy, CEO of California Earthquake Authority. I'm going to, I have a grand total one slide. And it's designed to give you a view of the main three things that we do here at the Earthquake Authority.

To start with, we're a residential earthquake insurer. We were formed 25 years ago this December in the wake of the Northridge earthquake back in '94. Devastating event that led to the creation of a, really a problem in California because homeowner insurance carriers have to offer earthquake insurance as a separate policy when they sell a homeowner's policy. And after they got their clocks cleaned in Northridge, insurance companies didn't want to be forced to write earthquake insurance if they didn't care to.

Well that led to a problem because when the mandate didn't go away, companies then started going away, or leaving the market, or not writing new policies, so that's what led to the creation of the California Earthquake Authority by the state legislature.

We're not a state agency. We're not a state budget. But we're created by the state, governed by public officials, governed by the Insurance Commissioner and Treasurer. With a public mission, and that is an insurance company who joins the CEA is able to sell their homeowners policy and satisfy the mandate to offer earthquake policy by selling our policy. So that's how this thing works.

Agents of our participating insurance companies sell our policy. We now have over a million policies in force. We've grown pretty significantly over the last five years or so. Now with $19 billion in claims paying capacity, which is a lot for the billion some policyholders we have, the rating agencies require us to have the ability to withstand a one in 400 year event, that's pretty tough.

There's one quarter of 1% probability that's going to happen. But we need to demonstrate we have that amount of financial strength every day, in order to have the financial rating that we have. So, it's, it's a challenge, but we get through it. And we've grown pretty significantly, especially over the last several years.

But that's not all we do, because the legislature also assigned us this responsibility of promoting mitigation in California. Finding a way to help older homes find their way to become retrofitted. So, the way that works is the law that established this also requires us to put a certain amount of money into mitigation, research and projects.

And a number of years ago, we settled on this program called the Earthquake Brace and Bolt Program. The way that works is this money that we have available, we use that to make grants available to help people who live in an older home, say a home built prior to 1980 before building codes are strengthened. We have the ability to help a select few, who are selected in a lottery actually, with the cost of retrofitting their home when we give them $3,000 to reimburse the cost that they've incurred.

Now $3,000 actually goes quite a ways to take care of the entire retrofit, especially in Southern California. It's more expensive in the Bay Area. But still $6,000 to $7,000 total and our grant provides half of that. So, it has proved successful, at least to the extent we've had access to funding.

FEMA has also been very helpful. And we've been able to augment the source of our funds with dollars coming from the federal government in the form of FEMA grant. So, all told now we've retrofitted close to 14,000 homes.

But with respect to either of these programs, ensuring a million homes, retrofitting 14,000 homes, there's no one at the CEA breaking our arms, patting ourselves on the back, because both of these are just the tip of the iceberg.

On the insurance side about 90% of the homes in the state are not covered with an earthquake insurance policy. California's home to two thirds the nation's earthquake risk, but only 10%, maybe even a little less, protect that home with earthquake insurance policy. And constantly -- effort is constantly underway to try to move that needle. And while we've had some success lately we got a long ways to go, obviously.

In terms of the 14,000 grants well that's good, but there's over a million homes in California that need just that kind of retrofit. So, we're just scratching the surface there as well.

In terms of how this relates to FHFA well to the extent that you've got the two programs, Fannie and Freddie, have a significant amount of exposure in California. A pretty good bet that 90% of that's uninsured for earthquake, which is a problem and I look

forward to working with the program, people to help see if there's ways that we could work together to get more earthquake insurance in place, keep it affordable, so more people can buy it. And we have that protection more broadly available.

I'll close by just describing the new responsibility we got a couple years ago, when we were asked to administer this new thing called the California Wildfire Fund. This is different, this is not about insuring homes, but it's a part of the chain that will be necessary when a big wildfire destroys a number of homes.

Because here's how it works. In California, there is a provision that makes utility companies strictly responsible, strictly liable for fires that their equipment causes, it's called the Inverse Condemnation Law. Pretty tough standard. So, if a power line sparks a fire, gets out of control, burns a lot of houses, the utility company is strictly responsible. Even if they were very careful in terms of managing of their equipment.

Well that drove one of our utilities, PG&E, into bankruptcy and others were threatened. And so the legislature, a couple years ago, put this fun together to provide some financial protection for utility companies in case their equipment did cause fires down the road, even if they were being extremely careful and invested a lot of money in safety, it's called the California Wildfire Fund, $21 billion fund, funded in equal parts from monies that came in -- from monies that are coming in from ratepayers through an annual surcharge on their utility bill, matched by $10.5 billion contribution of the companies. A direct payment for which they cannot pass that on to their customers, $21 billion fund.

Then the way that program is going to work, it's been in place now two fire seasons and hasn't been tapped into yet, thank goodness. But if the day comes when there is a massive fire and the cause is linked back to a utility company, the homeowner, either through their insurance carrier or themselves, sues the utility company directly. The utility company ultimately makes a payment to the fire victim. Then utility company turns to the Wildfire Fund and seeks reimbursement from the fund.

But if it's ultimately concluded that the utility company was negligent in maintaining, maintenance of their equipment, were not a responsible operator, they've got to pay the fund back. So it's not only a way of providing financial protection for utility companies so that we can keep lights on in this state, it's also a way of providing a real strong incentive for companies to continue to invest in safety measures, equipment technology personnel, so that our utilities can

increasingly become capable of managing this risk, which becomes more difficult every day with climate change.

So, my time is about up. A quick run through of our three programs. Can I say this? If anyone has any questions about any of these things, my email address is GPomeroy@CalQuake.com. Be happy to answer any questions you might have. Thanks for the time.

Hadi Reza: Thank you, Glenn. Okay, next up is Daniel Raizman, AIR Worldwide, followed by Stuart Pratt. So, Daniel, if you're on, please unmute and begin. Daniel, you're still on mute.

Daniel Raizman: Apologies. I was trying to do it through my headphones to make the quality a little better.

Hadi Reza: No worries.

Daniel Raizman: All right. Good afternoon and thanks for the terrific presentations so far. It's so nice to see familiar faces and names. And it's good to hear collective themes that I'll build upon. My name is Daniel Raizman, and I'm a manager in the Global Resilience Practice at AIR Worldwide, a major provider of catastrophe models for the insurance industry in the public sector. And thanks again for the opportunity to comment today and to contribute on this important topic.

So, our goal is to be a partner in helping to address the challenges associated with quantifying the existing and future threat posed by natural disasters and climate change to the housing finance system and regulated entities. To that end, we would like to comment specifically on the benefits of catastrophe models as an important tool in understanding and managing natural disaster risk.

Our company was founded in 1987 and was the first to apply science and data to the problem of managing risk from extreme events. So from Florida's Hurricane Andrew in 1992, to the Northridge earthquake in 1994, to floods and wildfires afflicting the country year after year, catastrophe models have become the standard risk management tools used by the insurance industry, and have continuously evolved to provide a science based and data driven view of risk.

So, the models are a key component in the important principle that risk must be measured to be managed. So catastrophe models estimate the damage and also the corresponding financial losses from the most severe events, the type of events that can cause an insurance company to go insolvent and leave home and business owners without protection at a time when they need it most.

Since the largest events are rare, the historical records of these events, while useful, is often not sufficient to really understand the amount of damage that could occur in the future.

There's three reasons for this. Number one, the simplest reason, is that the historical record is short and sparse and may not paint a clear picture of the range of damage that can occur. They're physically plausible, large event that have not happened yet.

Number two, is that the risk changes from one year to the next, evolving with climate, weather patterns, the underlying landscape. And historical data associated with a peril in one year may not be useful to assess the risk in a different year, when risks may be higher or lower, depending on various conditions.

Three, the underlying built environment is also evolving, not only with new development, but also with improvements in building codes and community mitigation. And the historical record will often not account for how the built environment changes, which can increase or decrease risk in a given region over time.

A strict reliance on the available loss history, as is commonplace in the public sector today, is simply not enough. Augmenting historical data with model estimates can provide a more robust view of the kinds of events that are possible, which allows public officials and risk managers to be much better prepared.

Catastrophe models augment the available loss experience by simulating what a year's worth of hurricane, flood, wildfire or severe thunderstorm, for example, might produce. The models perform many thousands of simulations relying on the science and engineering data built into the model to develop this wide range of realistic scenarios.

If we take an example of flood, AIR's modeling begins with simulating weather systems and flooding at a 10 meter resolution across the U.S., using a physically based approach that incorporates land use, levee systems and urban drainage capacity. We generate probabilistic catalogs of precipitation for tens of thousands of simulated years' worth of activity to capture events of all levels of severity. Presenting a unified view of flood hazard, capturing tropical and non-tropical precipitation and large and small scale precipitation patterns.

The result is a seamless picture of flood hazard across multiple geographic scales and annual frequencies. And the modeling on the foreside contemplates the risk from both pluvial and fluvial flooding.

The flood depths that are generated for each simulated event are reflected as local intensities or inundation depths at each location or property. And our scientists and engineers develop mathematical functions, or damage curves, which describe the interaction between the buildings and the local intensity or flooding to which they're exposed. Because different structural types will experience different degrees of damage, the relationships vary depending on the construction materials and occupancy or use type of a given risk.

Most importantly, in the context of mortgage portfolios, the models calculate the financial loss. The financial model embedded in the process can account for property and mortgage values to estimate potential losses from extreme events. This loss is generated at the property level and can be seamlessly aggregated to a community, county, state or country level. And can provide crucial input into the analysis of default rates and how risk might affect property values.

In the end, the model creates a catalogue of events that are physically realistic and statistically consistent with the historical record containing many thousands of events, including those that have not yet occurred but could occur, and simulates the losses associated with those events.

In addition, the models fill a critical gap in the historical record by including events similar to events that have occurred but on today's built environment.

In addition to contemplating the historical record, or complementing the historical record rather, catastrophe models bring two additional benefits. The first is that as we learn and develop new ways to effectively mitigate risk, the models can be updated to consider these factors. We can quantify the benefits of mitigation to specific properties or to broader portfolios. And this data driven approach aligns with our goal of providing risk assessments based on the latest scientific understanding.

The second benefit, and one that is critical in the context of the housing finance system, is that the catastrophe modeling framework can be extended to consider the impact of climate change. The weather inputs for the models we use today reflect the current climate, including climate change that has already occurred. However, we have developed techniques to condition the models on a future climate to assess the ways in which the risk may evolve in the future. Out of the box, the models reflect the risk as it is today, but they can be adapted to reflect what the risk might look like tomorrow.

So, over the last 30 years catastrophe models have become an integral tool that insurers use to manage risk. In particular, model estimates are the currency through which a wider pool of capital is brought to support the insurance market through risk sharing with reinsurers and other capital providers. And the U.S. government for one is actively engaged with risk transfer to the capital markets. These risk sharing entities can play a critical role in supporting the housing finance system to provide financial resilience to homes, businesses and communities.

Current insurance regulations allow insurers to use models in developing actuarially sound rates for hurricane, earthquake and increasingly flood risk, which enables the market by creating a common means of understanding and transferring risk. And government entities have increasingly expanded the use of models with FEMA, for example, licensing flood models, to evaluate risk, and working to establish an improved risk-based rating system for the National Flood Insurance Program.

Hadi Reza: One minute left Dan.

Daniel Raizman: So, we believe that these methods and tools can be seamlessly adapted to manage the housing finance risk by assessing the risk from hazards to portfolios today, and estimating the future risk posed by climate change. The models provide an unbiased view of risk that benefits all stakeholders, including lenders, home and business owners.

So, we look forward to providing feedback on the request for input in the coming weeks. And as always, continuing this discussion on how AIR can be a helpful resource to FHFA in assessing the risk from climate and natural disasters to the housing finance system and regulated entities. So, with that, I'll conclude and thanks again for your time.

Hadi Reza: Thank you, Daniel. Okay, next up is Stuart Pratt from CoreLogic, followed by Petr Zemcik from Moody's. Apologize, Stuart please begin.

Stuart Pratt: Hadi, thank you for, well let me just do a sound check. I think you can hear me all right?

Hadi Reza: Yeah, you're fine. Great, thank you.

Stuart Pratt: Sounds great. All right. Well, listen, my thanks to the FHFA team for a chance to share some thoughts about both the topic broadly and also the RFI. We actually applaud FHFA for both the establishment of a working group cross functionally within FHFA. We applaud

them for the RFI, because we think it gives us all a chance to ensure that your inquiry is provocative, it's thoughtful, it's informed. And we look forward to responding to it.

I'm actually very proud to speak on behalf of our global team of nearly 5,000 colleagues around the world, in particular our science and analytics team. We share the view of our colleagues who have spoken today. This is an inquiry about science and data, there's no doubt about that. It is a dialogue with a very broad range of stakeholders, their voices all need to be heard. And it is particularly a focus, there is a focus that is absolutely needed on equity and consequences as we learned.

Over the past 12 months, CoreLogic has actually visited with more than 30 congressional offices, House and Senate, as well as engaging with prudential and financial services regulators, as well as international organizations and the housing finance ecosystem broadly. And we came away with some learnings that we think are important.

First of all, there is agreement that there is a risk to constituents, there's a need for understanding data in order to speed recovery of affected communities. There is taxpayer risk. There is certainly some debate about the science around climate change depending on who you speak with.

One of the questions asked very commonly is property casualty insurance enough, do we really have a problem? What about the role of reinsurance players? What can states do to augment insurance coverages? Examples would be, for example, the California Earthquake Authority. And what role does, for example, parametric coverage play as well?

Maybe most importantly, will insurers begin to retreat from the risks that they see as uninsurable where they think they're simply priced out of a viable market? And these are right at the front end I think of that inquiry going forward.

Is this about just flood? We don't think so. We know that's not right. But that is one of the questions commonly asked. Is it just coastal? Is it about sea level rise? Again, no. Is it pure -- what about transition risks? Those are harder questions that implicate the IPCC and some of the thoughts actually shared with us by previous speakers.

What about staged retreats from areas of the country as climate change and the frequency and severity of natural disasters and

natural hazards increases over time? What happens to communities along the way? What happens to individuals? What happens to communities of color, in particular?

How do you create consumer transparency? I mean, the North Carolina test on providing flood insurance, flood risk scores for every property in North Carolina has already demonstrated to us that there's actually very little take up in terms of additional flood, in policies being bolted onto the side of the standard policy.

So, we think there's actually an interesting inquiry about really, behavioral economics, how do consumers make decisions about risk? How do they properly assess that risk? What is the best approach for reaching consumers? I'm not sure we're fully there yet, but it is an important question and transparency for consumers so it's important.

Can you create hazard risk transfers along the same lines as credit risk transfers? Where is risk being transferred to today? Is it preponderantly now on the shoulders of Ginnie Mae, Fannie Mae, Freddie Mac, and maybe PLS as well?

How does knowledge and measurement inform examination stress test, CECL, CCAR? Several of our presenters have spoken to this already, that is probably the most difficult question. But if I could leave you with just one important thought it is, we should not wait to find that answer. We should inform ourselves now with the data and the analytics in order to get to that answer. And then in that way, I agree entirely with the first recommendation that Lindsay Owens shared with us, we must have the data, we must have the analytics today.

We've had conversations with the TCFD, the IFRS, FASB, as well and there are FASB and IFRS issues in addition to materiality issues implicated through the Securities and Exchange Commission, in addition to how we deal with this issue in the housing finance ecosystem.

For us, we view this as a capstone opportunity. It is why we do what we do, it is the more than 100 scientists, seismologists, hydrologists, experts in wind and hail and wildfire, that we bring together into the confluence of the solutions that we have built in this country, which are being delivered in the commercial market today.

We are, we were, we have delivered to FEMA, for example, the only existing model for calculating first floor height, which is an essential cornerstone, not just simply for modernization of the NFIP program,

but also for how we're going to assess risk on a more precise level property by property.

Japan uses this for cyclone and earthquake risk. So similar to other speakers, we are a cap risk modeler and similar to them, we understand probabilistic modeling at a very deep level, and cap risk modeling therein.

The International Monetary Fund is working with us now and asking us more questions. We have a dialogue up and running with the Federal Reserve. And we are continuing this dialogue with FHFA as well.

I think if I were -- let's jump to the first slide, I know I only have two slides so this should go easy. First of all, to quote one of my colleagues, this is really about precision and granularity at scale. And it -- and I'll add a few thoughts, and tested in the marketplace, real world. That's what we do every day, because we're one of the largest suppliers of this type of risk and analytical tools into the property casualty insurance marketplace today.

This slide actually is important because it is factually true. That what we have with climate change, what we have in natural disasters, it is a multiperil dialogue. This map actually shows a composite risk. It is a composite risk score tool that we have built. It allows us to merge together the many different tools, the many different scores that we have built over the years for various clients in the property casualty space and otherwise. We're obviously covering coastal risks, wildfire hazards, earthquake flood data, severe convective storm. We even have some really unique tools such as sinkholes, which not surprisingly, are particularly applicable to Florida and just a few other states.

You can see on this map in this central portion of the country. A lot of that heat map is really composed of the convective storm risk. The Mississippi River Basin is in fact often thought of as primarily a riverine risk, but in fact it is also a seismic risk. The western half of the U.S. is the preponderantly the wildfire and as well as the seismic risks that we already talked about.

And in fact what's most important though, is we must get down below the level of counties, we must get down below the level of the heat map, we must get down below the level of the county, we have to get to a property by property assessment, and that's what we've been able to do.

So, with the tool that we have built, we're able to give you a composite score property by property, centroid by centroid, structure by structure on a property. We have geo geospatially mapped the entire United States, the border of every parcel of land, the building footprint for every building and structure, the centroid location of the exact location of the building, not the curb, not the centroid of the parcel, but the parcel, but the actual structure.

And then we can also not only tell you the composite risk, but we can tell you the stack rank of various risks that comprise that composite risk. We then project that forward.

Hadi Reza: Less than one minute left.

Stuart Pratt: Okay, I'll close out quickly then. We can then project forward multiple years in advance. So, let's just jump to the next slide. And in addition to what we're able to do today, with projecting forward many years in advance, lining up pretty well with the length of time that consumers have to hold a mortgage in general, seven years to 10 years. We are doing what others are doing as well, and that is we are we're looking at IPCC and CO2 modeling. And that is layering in on top of the probabilistic models that we have today.

And what you'll see going forward is essentially a new composite that will merge those two sciences together as we look forward beyond the initial five to seven-year risks, and we begin to project 10, 15, 25 years with greater and greater precision.

I'll close by saying this. What we need, however, is a year over year standardized approach to portfolio analysis, servicer by servicer, GSE by GSE, counterparty by counterparty. And that needs to be aggregated up and stored so that you can begin to track risks on shorter term bases, even as you begin to capture IPCC, CO_2 emission risks that extend further out, and candidly are harder to project definitively once you get out beyond a certain point.

That's what we need going forward. So, let's start with the data. Let's start with the analytics. And I appreciate the chance to share some thoughts with you. Thank you.

Hadi Reza: Great, thank you very much Stuart. Our next speaker will be Petr Zemcik, I hope I'm saying that right, of Moody's. So Petr.

Petr Zemcik: Yes, yes. Can you hear me?

Hadi Reza: Yes, thank you.

Petr Zemcik: Great. If we perhaps could go to the first slide. The second one. Okay, thank you. So, yeah, my name is Petr Zemcik, and represent Moody's Analytics. Moody's has actually invested quite a bit in relevant data and modeling to capture mainly credit risk associated with climate change. And I'd like to thank FHFA for the opportunity to share some of our progress in this area.

I'm actually a member of the team that is aiming to provide a holistic solution to the problem. So, it has been touched upon by some of the speakers who are looking at it from the perspective of financial institutions. And we are aiming to get end to end sort of solution.

So, my objective here will be to present our thinking on this subject and present some of the key components of the solution. I believe Clifford Rossi, touched upon the subject of the integrated assessment models and potential shortcomings from the perspective of using them for standards justifying exercise that we have seen in the U.S. and elsewhere.

And, by the way, I'll bring sort of a global view to this because we have done similar work not only in the U.S., but globally. We've been working with the Bank of England that is rolling out climate change scenarios this year. Also, Hong Kong Monetary Authority and other regulators globally.

So, we start with macroeconomic projections. And the thought here is how to produce them in a way that's consistent with climate change scenarios as produced, for example, by NGFS or other institutions.

So, on the right hand side, you see the kind of standard macro-financial variables and actually have a global macroeconomic model with well developed trade and financial links which can help us to estimate the economic impact of various shocks globally.

So, the challenge has been to bring in climate risk variables into the existing framework. So, for example, we need to extend the forecast on Delta 100, which means that we need to deal with population projections and productivity and so on.

And we have come up with a solution which allows us to incorporate both the physical and transition risks into the projection. So, the physical risk looks at the impact of the increasing temperature, increasing sea level rise and so on, on productivity and subsequently on economic output. And we've also embedded transition risk, you

know, more than block, and the embedded risk is typically working through carbon price pathways.

So, the view is complimentary to the INS in some ways. So, we can think of, if you look at the southwest corner of this slide, the CO_2 pathway and temperature pathways typically captured by some sort of climate module in the IMM's type of models. So, our approach is complimentary. We don't aim to model disconnection, we do take the CO2 pathways, or temperature pathways as given. We can rate the associated emissions and the associated changes in the price level, reflecting the increased carbon taxes.

So, we model the physical risk, we have the carbon tax, we also look at the financial impact. Sometimes this is referred to as the Minsky Moment because there's a question of when the markets actually embed, or price in, the impacts of climate change. And once we have all those elements, we can produce a climate change scenario.

And so, at the bottom of the slide you can see some of the predictions by NGFS, which the Bank of England, for example, is planning to use. So, this as the Courthouse World Scenario, with mitigation and to transition scenarios with orderly and disorderly transition. Next slide, please.

So, while the slide is appearing, so we are looking at this from global perspective, so this global macroeconomic model. And we also need to bring the location specific elements of the physical risk.

I was wondering, is the slide visible, because I can see it.

Hadi Reza: It is not. Meghan can you see the slide on your screen?

Megan: The slides all just went blank, I'm not sure.

Hadi Reza: Try moving forward one slide. Maybe --

Megan: All of them are blank now. It's like every single one, I'm trying --

Hadi Reza: All right, let me see if I can pull it up, apologize for that, Petr, actually I'll get you.

Petr Zemcik: Should I maybe share my screen, because I could present from my laptop?

Hadi Reza: I think that's, yeah, why don't you do that, while we try to figure it out on our side.

Petr Zemcik: Okay.

Hadi Reza: Thank you.

Petr Zemcik: So, can you see my screen?

Hadi Reza: Yes.

Petr Zemcik: Great. So moving from the macroeconomic view, we analyze the acute physical risk, which is associated with a particular event such as Harvey, in the U.S.. And we finalize the economic impact, which could be light to moderate to severe, depending on the location. And we can notice a sharp increase in the probability of default on mortgages in the area as a consequence.

And the acute physical is something that we'd like to take into account, in addition to the global physical risk which affects the whole country. And in addition to the transition risk transition to the carbon free economy.

The chronic physical risk has two aspects as well. So, it could be location specific. So, here you can see scores of 427. 427 is a company which was acquired by Moody's recently. And you can see the level of flood risk and wildfire risk in the U.S.. And those are the types of events that we would like to take into account in addition to the global risk.

The key channels of the physical risk, you can see, so this would be energy demand, sea level rise. Sea level rise is, for example, prominent in Southeast Asia. You can see the area in red in the map below, which actually shows the IPCC Hothouse scenario where the increase of the global temperature is some four degrees of Celsius by the end of 2100, as compared to pre-industrial levels. And you can see the impact of agricultural productivity decline in some of the African countries that you can view in red.

So, this is the acute physical risk. The chronic physical risk. And it's combined with the transition risk which is part of the modeling. So, these are actually, the three NGSF scenarios which were published in the summer last year.

And on the left hand side, you can see the carbon tax. The red scenario is the Hothouse where there is no carbon tax and no mitigation. And in the other two scenarios, you can see the carbon tax rising by the end of 2100.

And as a subsequent -- as a consequence of this increase, there is impact which is different across industries. So, the impact is different across industries and regions. And this is the industry impact. And you could see the output of the mining industry in the U.S. declining by some 60% or 70% by the end of the century. The

impact would be actually much smaller for other industries, and perhaps almost flat for industries which incorporates some services.

So, we have the global macroeconomic model, we have a way of capture either acute or chronic physical risk. And ultimately, we'd like to put all of this together in one place. So, the ultimate objective for us would be to get the risk associated with climate change and the risk associated with, for example, mortgages.

So, the standard risk parameters here would be PD and LGD. So, we would like to see how they would be affected, conditional on some climate change scenarios. So, we have those NGFS models, for example, they're part of the mortgage portfolio analyzer. And we have similar solutions on the commercial real estate side as well. And we have a model for the U.S. and we have a model for the UK and other countries.

We take the climate change forecasts, for example, the three NGFS scenarios which are expanded for the types of variables that you can see in standard existing models. So, we're essentially trying to solve the problem which was posed by Clifford Rossi for example earlier. So, we are actually trying to come up with the solution and put everything together.

So, we have the risk, the models risk parameters, the climate change forecast, we have the local information on the physical risk, right. So, we actually have the data on six risk parameters, which are, for example, heat stress, water stress, flood stress, hurricanes, sea level rise, and risk score. So, all of these can be captured.

Either they're going to be embedded with the model structure or there can be an overlay on the PD and LGD. And once we combine all these factors, we can come up with adjustment of the risk parameters. So, the adjustment will take care of the global evolution of the macroeconomic variables. It will add on the risk which exists with a particular mortgage, within a particular region. And it will take into account the specific information associated with that particular location at the address level. Right.

So the objective here is to combine all the elements in one place. And at the end of the day we'd like to have the result for each mortgage. And this is the approach that we have taken, and this is the way we are we are looking at this.

So, our objective is to have end to end solutions starting from macroeconomic scenarios, which are in principle similar to the stress testing scenarios, with the challenges that I touched upon,

such as the long-term projection and others. And combining all these in one place and having a result for, at the mortgage level associated with both the probability of default and loss given default, which is linked to the reduced values of the houses.

Hadi Reza: Thank you Petr. Apologize misspelling your name, I'm sorry, are you finished, have you -- I'm sorry, Petr, thank you so much. So, at this time, we are going to take a short break. We are running a little behind. So, if you don't mind, if we can make the break about five minutes and start up at around 2:50 p.m. if that's okay. So, we'll give everybody about a five-minute break if that works. Thank you.

Okay, welcome back everyone. I'm going to move on to the next speaker. First up is Alex Gelber, of FutureProof, followed by Chuck Fowke. So, Alex, if you're on, please unmute and begin.

Alex Gelber: Thank you very much. First, I'd like to thank FHFA for holding this listening session. I commend FHFA on taking the step to address this issue, which I believe carries crucial implications for both economic and environmental resiliency. So, my name is Alex Gelber, I'm a Professor of Economics and Policy at UC San Diego and a Research Associate at the National Bureau of Economic Research.

I am presently on leave from both of these positions, working full time on FutureProof, which is a startup that is working on translating climate risk and financial risk, including for residential mortgages. I should be clear that I'm not here in my capacity of UC San Diego or at the NBER, so these institutions are not associated with my remarks here.

I previously served at the U.S. Department of the Treasury, initially as the Deputy Assistant Secretary for Economic Policy, and later as the Acting Assistant Secretary and Acting Chief Economist at Treasury.

Together with a team of researchers around the country, I have been performing research on the impact of climate and climate change on residential mortgage performance and the attendant risks to the GSEs.

We're finding financial material and significant impacts. As a result of this work, I'm in a position to provide my thoughts on a number of the questions posed by the FHFA in the RFI.

With regard to the RFIs question about how FHFA should define climate and natural disaster risks. So as background, as we've heard in previous presentations, there are a number of tools in the market today. So first, a large body of research and commercially available

products provide information on physical climate risks, for example, on the probabilities of climate disasters or the propensity for non-catastrophic risks as well.

Second, a number of commercially available tools and academic tools will project damages to property or insurance losses. However, those tools typically do not project the financial implications to bonds specifically. For example, to the present value of the cash flows on residential mortgages or commercial mortgages, the probability of default or loss given default. And these metrics, I believe, are more relevant to the financial management of the regulated entities then either the pure hazard assessment of disaster probabilities or the assessment of property damage, such as average annual loss or probable maximum loss for insurance purposes.

So I believe financial projections for bonds specifically are necessary to manage risk appropriately, and I therefore believe that the FHFA should define climate and natural disaster risk with respect to the regulated entities based on the financial risk to the regulated entities bond portfolios specifically.

With regard to the RFI's questions about what methodologies and measurement tools are used to measure and monitor climate risk to the national finance housing markets, I believe that a catastrophe risk model must be developed that specifically projects the implications of climate for residential mortgage and commercial mortgage debt. Such as the impact on probability of default, loss given default, probability of delinquency, and aggregating these together to derive the implications for the present value of the cash flows, and its impact therefore, on the GSEs, as well as other regulated entities.

So at FutureProof we've estimated vulnerability curves for mortgages that projects the financial impact of climate on mortgage portfolios, specifically, including some of the outcomes that I referred to earlier, such as the present value of the cash flows, and then the component probability of default loss given default and probability of delinquency.

And those estimates rely on microeconomic data, including from the regulated entities themselves, that relate to default and other mortgage outcomes to the incidence of climate disasters by comparing areas affected and unaffected by these disasters.

And those estimates of what are called vulnerability curves are then combined with a hazard model that projects the probabilities of

climate disasters and their implications for damages, to derive the implications for cash flows, defaults and other outcomes on bonds specifically.

With regard to the question about whether risks now or in the future impede the ability of regulated entities to operate in a safe and sound manner, our research does show that the implications of climate for the expected present value of cash flows can be in the hundreds of basis points today, for -- as an average of whole loans within certain geographic -- climate affected geographic areas, particularly along the Gulf Coast and other climate affected places.

Tail risk as measured by probable maximum losses can be even larger, and such risks now or in the future will impede I believe the ability of the regulated entities to operate or can impede their ability to operate in a sound manner.

In fact, I believe that the regulated entities are the most at-risk entities in the market with respect to the financial impacts of climate change and climate risk today for residential and commercial mortgages. And in fact, those risks as many others have alluded to here, will increase in the future most likely, on average.

In translating these impacts to policy, I believe there are a number of important considerations relating to social justice. An important consideration, I believe, is the impact of potential policy measures on disadvantaged groups. I believe that an initial step to assess this would be a study of how large this correlation between climate impacts and disadvantaged communities, how large that correlation is.

With regard to the question about gaps in available data that limit the ability to measure risk and how those gaps may be resolved, I believe that a very important gap is in address-level data on mortgage outcomes. With that data, it would allow a much better assessment on how climate risk or damage at the property level relates to mortgage outcomes on the loan backed by the collateral at that property.

I believe that such data could be made available to relevant parties in a secure manner, perhaps along the lines of similar secure data access structures that have been set up by the IRS, the U.S. Treasury or the Census.

With respect to FHFA's risk management and disclosure requirements for the regulated entities that the RFI asked about, I believe the FHFA should implement a stress testing regime to assess

the regulated entities climate risk. I believe it should Institute regulatory capital requirements, as well as disclosure requirements for climate risk, and require enhanced reporting on regulated entities management of climate risk. And FHFA should similarly support efforts to develop standards of data reporting on climate risks.

In all of these cases, disclosure and financial risk management, such as stress testing or capital requirements, should be based on metrics like that are expressed in financial terms such as probable maximum losses and the like, and average annual losses.

Collectively, these steps would allow FHFA to evaluate the adequacy of the regulated entities ability to assess and manage the impacts of climate risk. To address the significant uncertainties and data limitations that the FHFA notes in its RFI, I believe it's necessary to develop projections of the probability distributions of these risks so that extreme scenarios, such as probable maximum losses, can be assessed in a quantitatively rigorous manner.

With regard to the risks to the regulated entities critical service providers and other third parties that the RFI asks about, I believe the agency should consider risks to reinsurers as well as to servicers. Servicers can place liquidity crunches from natural disaster risk that I believe will, on average, intensify in the future. Reinsurers' solvency I think can be threatened by major disasters in the long run absent improved capital adequacy standards, which I believe could impact their appetite for CRTs.

With regard to organizational structures, that the RFI asks about that the FHFA and the regulated entities can adopt and supportive management of climate risks, I believe working groups would be a good start. And then a next step beyond working groups for the FHFA and the regulated entities could be to create additional positions focused on operationalizing the financial management of climate risk, along the lines that that I briefly described in this presentation.

FutureProof is glad to be a resource for FHFA, as FHFA and the regulated entities grapple with these issues. Thank you again for the opportunity to speak at this event and for the FHFA's work on these important matters.

Hadi Reza: Thanks very much, Alex. Next up is Chuck Fowke, from the National Association of Home Builders and followed by Lesli Gooch. So, Chuck, if you're on, please unmute and begin. Chuck, are you there?

Chuck Fowke: Yes, I'm trying to see how to unmute it here.

Hadi Reza: Oh, there you go. We hear you now.

Chuck Fowke: You got me?

Hadi Reza: We got you.

Chuck Fowke: Gotcha. Okay. Thank you, and thank you for the opportunity to speak today and for your interest in hearing from stakeholders about how Fannie Mae and Freddie Mac and the Federal Home Loan Banks should manage the risks of climate change and natural disasters posed to the mortgage industry.

I am Chuck Fowke, a homebuilder from the Tampa Bay area in Florida, and the 2021 Chairman of the Board of the National Association of Home Builders. I am proud to represent more than 140,000 members of NAHB, hard working individuals and businesses that construct about 80% of the new housing built each year, both for sale and for rent.

For the nation's home builders to meet the demand for housing, including addressing affordable housing needs, the housing finance system must be efficient, accessible and highly liquid in all geographic areas and all economic conditions.

We understand FHFA's effort is to explore the risks associated with the increased frequency, severity and unpredictability of natural disasters on the housing finance system. However, any changes to FHFA policies for it regulated entities, even if well intended, could have consequences that impact the housing market and ripple through the entire economy.

For this reason, the role of housing affordability and ensuring broad access to credit must be central to the agency's deliberations. Many people cannot afford to purchase a new home or install energy efficient or resilient features in an existing home. And that's before the GSEs have even considered any new restrictive policies aimed at tackling climate change.

These challenges are real, and we're hopeful that FHFA will not propose policies that will exacerbate these existing realities. The unusual number of significant national disasters over the past several years has been sobering. At the same time, they have ignited a nationwide dialogue about risk, resiliency and mitigation.

NAHB has been actively engaged in these discussions for many years. We have taken a leadership role in improving the resiliency

and performance of new and existing homes. NAHB, and its members have been hard at work preparing for and responding to natural disasters.

For instance, our members in Louisiana gathered and distributed supplies after Hurricane Laura. In Florida, we have worked with EPA to develop and implement response plans. And members throughout the country have stepped in to help responders and communities tackle the challenges of the COVID pandemic.

And most recently, NAHB developed winter storm safety tips for Texas residents facing an unprecedented ice storm that resulted in widespread power outages with the threat of frozen pipes, paramount for homeowners.

We have seen the benefits and drawbacks to the various approaches and look forward to sharing the lessons learned with FHFA throughout the RFI process. What we've learned to be the most important factor for success and holistic approach to assessing the risks and mitigating the impacts of climate and natural disasters. The issue cannot be solved by just focusing on housing, or the housing finance system, or one level of government or the other.

In many initiatives to do just that, they're already underway. Federal agencies are considering the climate impacts of their actions and regulations, states are increasingly providing initiatives, incentives to reduce greenhouse gas emissions, and improve energy efficiency. And cities and towns are rethinking their development patterns and transportation systems to improve their resiliency.

Similarly, NGOs are studying and proposing alternative solutions. Advocacy groups are initiating pilot programs and homeowners are taking steps to reduce risk and improve the resiliency of their homes. To be most effective, these efforts cannot happen in a vacuum.

Policymakers must understand the cumulative impacts that policy changes have had on the ability to create new housing or improve existing homes. Solutions must be balanced and ensure housing is not only available but affordable and sustainable.

Resource research demonstrates that while contemporary building codes yield homes that are much more resistant to natural disasters, especially hurricanes and tornadoes than homes built just two decades ago, stricter codes are more expensive and these higher costs ultimately paid by the homebuyer.

Oftentimes, these higher prices are not sustainable and can further exacerbate housing affordability. Further, it is worth noting there is a lot of conflicting data and misinformation about whether properties are located in flood plain earthquake zones and considered at risk for other natural disasters. Absent good data, it can be hard to find the balance between affordability and an acceptable level of risk.

Policy decisions must be based on information that has been thoroughly vetted and researched with confirmation that the data is accurate. To start, NAHB recommends Fannie and Freddie collect more comprehensive information on homes as part of the appraisal process.

Better data is needed on energy efficiency, water conservation and resiliency for new and existing homes in order to develop policy recommendations and strategies that accurately reflect the details of the U.S. housing stock.

NAHB has been a part of Fannie Mae and Freddie Mac's joint working group on the uniform appraisal data set, and the group is making great strides for future improvement. However, the collection of important data cannot wait until this initiative is complete. The sooner the enterprises have been, and can begin the process of collecting more robust data the better, as they must have accurate, thorough information to develop sound and reasonable policies.

Specific to the financing side, we are encouraged that Fannie Mae has issued $100 billion in single family green mortgage backed securities since the program was launched in April 2020. And we are pleased with the favorable market response.

Single family green mortgage backed securities are backed by newly constructed single family residential homes with Energy Star certifications that meet or exceed the national program requirements for Energy Star 3.0 certified homes.

We're hopeful that this program can lead to economic benefit to the buyers of homes that meet high energy efficiency standards, such as through lower mortgage rates, interest rates, or other financial incentives.

We believe this is the kind of solution that should be expanded to create further opportunities for homeownership, while at the same time reducing risks. NAHB looks forward to responding to the RFI and working with FHFA and other stakeholders to develop sound

and sensible policies that prioritize the need for safe, decent and affordable housing focused on market driven solutions that emphasize performance over restricted requirements, and ensure that actions do not impede local land use decisions. Thank you for the opportunity to be here today.

Hadi Reza: Thank you very much, Chuck, appreciate it. Okay, next up is Lesli Gooch, from Manufactured Housing Institute, followed by Joseph Kane. So Lesli, if you're on, please unmute and begin.

Lesli Gooch: Thank you so much. I appreciate the opportunity. My name is Lesli Gooch, I'm the Chief Executive Officer at the Manufactured Housing Institute. We're the only national association that represents all sectors of the manufactured housing industry. Our members include homebuilders, suppliers, retail sellers, lenders, installers, community owners, community operators and others who serve the industry.

In 2020, we produced nearly 95,000 homes as an industry and that accounted for approximately 9% of new single family home starts. These homes are produced by 34 U.S. corporations in 135 plants located across the country. MHI's members are responsible for about 85% of the homes that are produced every year.

We really appreciate the natural disaster risk working group for allowing me the opportunity to speak at this listening session today about the impact of climate and natural disasters on the GSEs. MHI commends FHFA for assessing the extent to which climate change and natural disasters could affect the risk of the GSE's purchasing mortgage loans, as well as the steps the GSEs should take to assess these risks.

So, a little bit about manufactured housing. We are the largest form of unsubsidized affordable housing in the United States and the only type of single family housing that is built to a federal construction and safety standards, the HUD code. The HUD code's single regulatory framework for home design and construction includes standards for health, safety, energy efficiency and durability.

Today, manufacturers deliver high quality HUD code homes with designs and features that consumers want at a lower price point than site built homes. It is also the only type of housing that Congress specifically recognizes as having a vital role in meeting America's housing needs as a significant source for affordable homeownership accessible to all Americans.

Today, 22 million people live in manufactured housing. As you're well aware, the 2008 Housing and Economic Recovery Act made major reforms to Fannie Mae and Freddie Mac. One of the most important reforms from our perspective, was to address the prior failure of the two enterprises to adequately serve underserved markets that are critically important to single family and multifamily housing.

Specifically, the law established on the part of the enterprises a duty to serve manufactured housing, low income housing preservation and rural housing. Under the duty to serve, Fannie Mae and Freddie Mac are required to, "provide leadership to the market in developing loan products and flexible underwriting guidelines to facilitate a secondary market for mortgages for very low, low and moderate income families for manufactured housing".

We believe the FHFA needs to ensure that Fannie Mae and Freddie Mac are adequately facilitating the important homeownership option of manufactured housing. More support from FHFA -- with more support from that, Fannie Mae and Freddie Mac in the manufactured housing market will not only strengthen homeownership opportunities, but it will also provide more options to consumers who are hurt by unaffordable rents and the shortage of adequate housing options.

In addition to the duty to serve though, we think that today's conversation on this -- during this listening session is key, because we as manufactured housing are pioneers in home building efficiency and resiliency. Not only does the construction of manufactured home produce significantly less waste than the construction of a site built home, but the controlled environment of the factory built process has been an important pioneer in the development of processes that value efficiency and reduce waste.

Our in factory home builder members are constantly developing new initiatives and technologies such as comprehensive recycling programs, or ductless mini split heat pump systems. Today's modern manufactured home -- manufactured housing plants are so efficient that in two weeks they can build a home that is ready for delivery and installation with no more scrap waste than can fill a 55 gallon garbage barrel. Everything else is reused or recycled.

In comparison, the National Association of Home Builders estimates that a construction of an average 2,000 square foot site built home generates 1,500 to 3,700 pounds of solid waste, and between 1,000 to 1,800 pounds of engineered wood waste.

With respect to the energy efficiency of manufactured homes, just like site built homes, manufactured homes are constructed and fitted with energy efficient features that are tailored to the climate demands of the region in which each home will be sited.

Built to a federal building code, our homes are required to meet minimum federal standards for installation and anchoring in accordance with the home's structural design and windstorm standards for the area where the home will be placed. In addition, states have the authority to establish additional installation standards above the minimum federal standard.

State governments may establish installation and anchoring requirements for homes depending on soil conditions and other factors in their state. These standards were the culmination of a series of changes over the past 15 years in response to natural disasters.

First, HUD revised and increased its wind safety standards after Hurricane Andrew in 1992. The result was that during the hurricanes that struck Florida in 2004, not one manufactured home built and installed after '94 was destroyed by hurricane force winds.

As with site built homes, damage to property or physical harm to occupants is primarily caused by flooding and flying debris rather than high winds.

In May of 2001, Texas Tech and Wind Science and Engineering Center in Lubbock, Texas conducted studies on the effects of strong winds on manufactured housing. A single section manufactured home built to wind zone one standards, and that is for regions not likely to experience hurricane force winds, was exposed to the propwash of a C-130 transport aircraft, which created winds over 90 miles per hour. After prolonged exposure to such winds, the manufactured home experienced only limited damage, primarily loss of roofing shingles and some minor structural damage.

The bottom line, and this is according to HUD, manufactured homes produced under the HUD code performed better than pre-HUD cone homes in high wind events, due to the enhancements to modern manufactured home construction standards.

Let me close by quoting from a number of findings from HUD's Winter-Spring 2020 Evidence Matters Magazine which was devoted to factory built housing.

"Attention to the material and design of manufactured housing can improve not only energy efficiency, but also disaster resilience. In

the past, manufactured housing was highly susceptible to damage and natural disasters. The HUD code has mandated changes that make modern manufactured homes significantly more resilient to fire and natural disasters than pre-HUD code housing."

Another quote, "In addition to its affordability benefits, factory built housing can incorporate advances in energy efficiency, thereby using resources more responsibly and reducing resident's utility bills."

Another quote, "Attention to the materials and design of manufactured housing can improve not only energy efficiency, but also disaster resilience."

And then finally, another quote, for example, in their review of factory built housing in coastal areas center at all state that, quote, "Owners and construction companies have found that prefabricated construction allows the rebuilding of homes affordably efficiently and quickly. In addition, new prefabricated units can be as wind resistant, or earthquake resistant as site built buildings, minimizing the effects of strong climate events."

In conclusion, MHI looks forward to working with the FHFA to ensure the Enterprises' greater support for manufactured housing. It's not just a statutory duty to serve imperative, but we also believe manufactured housing can help mitigate concerns about how policies to manage climate and natural disaster risk could increase the cost of housing. Which would make it more difficult for lower income households in some areas to obtain affordable housing.

Given the affordability and the resilience of manufactured homes, we believe manufactured housing should be better supported by the GSEs. Thank you for your time today. This concludes my remarks.

Hadi Reza: Thank you very much, Lesli, appreciate it. Next up is Joseph Kane from The Brookings Institute, followed by Ken Klein. So, Joseph if you're on, please unmute.

Joseph Kane: Thanks for having me. And good afternoon everyone. My name is Joe Kane, I'm an Associate Fellow at The Brookings institution's Metropolitan Policy Program. I focus on a wide range of infrastructure and built environment issues, including transportation, water, land use, and more.

These views are my own, although I will say that many of my colleagues are interested in these topics. And I commend FHFA for having this conversation and considering new ways of addressing

our climate challenges and opportunities. It's not going to be just up to FHFA, obviously, to address these issues, but it should be part of a whole government approach at a federal, state and local level, to say nothing of all the private sector actors and community organizations who need to be involved.

Along with my colleagues, Ed Homer and Jenny Schultz, we've been exploring these interrelated issues quite extensively, especially as they relate to economic development, investment and governance concerns. And climate is certainly front and center in our focus as well.

And when I say climate, I'm referring to both acute and chronic concerns. So, we know from NOAA, you know, more than $1.8 trillion in economic costs since 1980 across more than 265 major climate events, those over $1 billion each.

We also have to realize we're in an era of infrastructure repair and replacements, amidst many different daily pressures from flooding, heat, and so on. So, a wide range of impacts that are evolving, which I'll describe more in a bit.

I also want to emphasize, it's not just a mitigation challenge, it's an adaptation challenge. That yes, we need to help withstand the impacts in future years to come, but also that we're living with these realities now. So, as we define risk, it's not just avoiding future risk, but actually dealing with the current risks that we're facing today.

Our housing, land use and infrastructure policies all depend on distorted market forces, create unsustainable development patterns, including more expensive housing, growing trip distances and overconsumption of natural resources.

The country's building stock is a top source of energy consumption, and continues to encroach on fragile ecosystems, all of which intensify climate change, mode choice, trip distance, sprawling development all have a role to play here. Restrictive zoning can drive up housing costs in some neighborhoods, promote segregation and incentivize low density developments on the urban fringe.

Employment decentralization and greater separation between homes and jobs have pushed the average trip length to over 10 miles, which can lead to huge economic costs and of course, rising GHG emissions. You know, impervious surface cover and other unsustainable materials, we know that these are stressing our built environments as well.

And last but not least, you know, black, brown and low-income households, disproportionately bearing the costs of these problems, reinforcing economic inequality and climate injustice. A lack of access and affordability, public health impacts including extreme heat, polluted water, air quality, we've seen this in Texas more recently, but of course, Flint and many other communities over the last few years.

So, what strikes us is the need for a new approach. One that addresses both economic forces and regional coordination. So, when we think of identifying and measuring risks as noted in the RFI, we need to better recognize both costs and benefits. Yes, there are risks, but there are many benefits from making these generational investments for people and places.

But where are we struggling in our measurement? First, a lack of accurate pricing. So, markets for land, infrastructure and natural resources do not accurately price the social and environmental costs of development. Low gas taxes, for example, can hide the social and environmental costs of driving and sprawling development. We're building and subsidizing homes in locations with elevated risks of recurring damage from climate change. Flood losses have been concentrated in some of the fastest growing communities nationally, Houston, Miami.

Also, there could be declining property values in communities of color, where most risk is concentrated. So, a wide range of climate impacts, flooding, wildfires, droughts, freezes, we need to consider all of these. Changing consumption patterns from land cover, water use, we can measure these from USGS and other agencies. So, the data is out there, but we're not using it right now.

Second, is fragmented local governance, which you know, I think impedes coordinated land development. We know jobs, housing, and transportation are all operating at a regional scale. Yet the policies that most directly regulate these markets are primarily a domain of local governments. This is not well tracked or recorded. But we know fragmentation is a big problem in the infrastructure space, in particular.

I want to say also fiscal circumstances over municipalities can vary widely too. You know, census tracks this, there are also ratings agencies that track this, but we cannot afford proactive infrastructure investment, let alone daily maintenance, new designs to address some of these concerns. As a result, poor cities, counties and territories get locked into a chain of disinvestment, devaluation and destruction, including higher casualty rates.

So, enhancing FHFA's regulatory and supervisory framework. I think there's a few considerations here. First, is striving for a model that emphasizes resilience not simply recovery, as we currently have with the NFIP and other federal programs. We can't just focus on the 40,000 foot solutions either, whether it's a carbon tax or something else. We need to think of building local financial and technical capacity based on the ground experiences and realities faced by municipal leaders, residents, businesses and others.

Insurance needs to discourage risk, but also recognize the existing economic and racial disparities that we're facing regionally and all across the country.

Second, we need to recognize that one consistent standard probably will not work across the whole country. These issues are all interconnected, yes, but also highly variable and have varying impacts depending on physical geography, market structure and other prevailing economic concerns.

We must recognize this variability but also strive for a more integrated approach where we can. We know that urban, rural, suburban concerns can vary, as can small, midsize and large metro concerns. It's not an easy task, but it's something that we have to reflect in whatever standards are developed that it reflects these regional variabilities we see across the country.

But I think, and I'll end on this, we can harness the power of markets. Better price, scarce resources and externalities. We've heard this from other speakers today and certainly in many publications, both before today and ongoing.

How can we do this? We need to price riskier houses appropriately, not just to taxpayers, but to buyers. Our current system is complex and relies on multiple actors, insurers, lenders, and others, which artificially spread the risks and costs.

There are a couple options here, right. Fannie Mae and Freddie Mac could refuse to securitize mortgages on properties in high risk locations. I think that's a pretty extreme approach. But the other, you know, Fannie and Freddie could continue securitizing loans in high risk locations, but would need to incorporate climate risks into prices, whether it's higher interest rates, lower loan to value ratios, etc. That's going to require agencies to have frequently updated geographically specific data on a wide range of climate risks. So this is going to be an ongoing task, but something that obviously is being talked about here today.

And I'll just end too with considering less visible and costly issues as it relates also to potential for experimentation. We know that beyond housing, other types of infrastructure are water infrastructure, stormwater impacts, these are costs that are hitting us every day in big ways. Many of our utilities know this, many of our community leaders know this.

But they can also inform the development of new financial instruments. We're seeing this through the emergence of green bonds, environmental impact bonds, other instruments that can make a difference to support climate friendly infrastructure improvements, and more resilient land use patterns moving forward.

So, I thank you for giving me the chance to talk today and hope to stay in touch.

Hadi Reza: Great, thanks very much. Joe, appreciate it. Next up is Ken Klein, from California Western School of Law, followed by Eric Selk. So, Mr. Klein, if you're on, please unmute and begin.

Ken Klein: Thank you. Good afternoon. I am Ken Klein. Thank you for this opportunity. I am a Professor of Law and Associate Dean of California Western School of Law in San Diego. These views are my own.

My focus today is what occurs post-disaster. And my headline is that some of the major impediments to homeowners who have lost everything in a natural disaster are things the FHFA could do something about. Next slide, please.

I come at this from perhaps a unique perspective. I personally am a natural disaster survivor. This is my home as it looked on October 27, 2003. I now am an academic who researches and works with both natural disaster survivors and regulators on this issue. And in my prior career as a lawyer, my clients often were mortgage lenders and insurers.

And I agree with Joseph Kane, that mitigation and resilience and climate change response is essential. But it's not my expertise. So, it's not what I'll be talking about today. Next slide, please.

I start with the premise of wanting homeowners to rebuild. So, my perspective is on getting people back home rather than on managing harms to financial institutions when people can't get back home. Next slide, please.

Homeowners trying to get back home after a natural disaster have two primary challenges, time and money. Time meaning doing everything they need to do before their insurance coverages expire. Because often the time the project takes, three, four or five years when hundreds of folks are trying to do the same thing at once in a single community, is longer than the time insurance policy allows. And money, meaning that well over half of the time, even with insurance policies purporting to provide enough coverage to fully reconstruct a destroyed home, insurance proceeds are often a lot less than reconstruction actually costs. Next slide, please.

I'm excited to be part of this meeting because FHFA can be an agent of change on many of these issues through the power over what is the content of standard Covenant 5 in each of the state specific templates for Fannie Mae and Freddie Mac's deeds of trust. Next slide, please.

So, let's start with time. Next slide, please.

Delay can be caused by claims adjusting, by a mortgage lender or servicer holding on too tightly to insurance proceeds creating cash flow construction delays, and/or by simply everything taking longer when an entire community simultaneously is trying to rebuild in a resource strapped environment.

But no matter what the cause, it creates a dilemma for the homeowner, because often critical coverages, such as covering the cost of the homeowner living somewhere else while their home is being rebuilt, lasts only one to two years, while reconstruction actually takes perhaps double that. Next slide, please.

So, one possible solution is to simply give the homeowner more time. Amend the Covenant 5 to provide that mortgage compliant insurance in the wake of a declared natural disaster event or emergency has to keep all coverages open for a minimum of three years. Next slide, please.

Next, flood is the dominant event every year. Just today, this morning, the Insurance Information Institute reported that about 90% of natural disaster loss in the United States involved flood. But while Covenant 5 requires hazard insurance, flood is excluded from most standard hazard insurance coverage through an exclusion to the HO3. Next slide, please.

Which is a problem because the vast majority of homes that have flood risk are not required to have flood insurance. In fact, FEMA's fond of saying, if you live where it rains, you're a flood risk.

Voluntary take up rates for flood, or earthquake for that matter, are very low and NFIP coverage for flood often is inadequate. Next slide, please.

By contrast, voluntary take up rates of standard hazard insurance is very high. Almost all first-time homebuyers have a mortgage. At any given moment in time, about two thirds of homes in the United States have a mortgage, and 75% of people who do not have a mortgage continue to buy hazard insurance.

So over 90% of this nation has hazard insurance. And most of the nation that has a choice, chooses to have hazard insurance. In other words, any peril that is within mortgage-required hazard insurance becomes ubiquitous even after there is no mortgage. Next slide, please.

So, another thing that could really help is to change Covenant 5, so that mortgage compliant insurance is not allowed to exclude flood or any other natural disaster peril from the required hazard insurance. Essentially, you would create a marketplace in all perils insurance that a private insurer could compete and succeed in. Next slide, please.

As I mentioned earlier, under-insurance is a huge problem. It is my area of expertise. Next slide, please.

Most homeowners actually want to be fully insured, are willing to pay for full inadequate insurance, think they are fully insured, actually are not fully insured and are short by quite a lot. The whys and wherefores are complex and nuanced, but suffice it to say, it all rests in the end on the problem that coverage is set based on recommendations of the insurer, that responsibility for error often resides on the homeowner. Next slide, please.

So, for example, insurers seem unanimous that limits on coverage do not anticipate or capture post disaster demand surge pricing, and insurers know that, but their insureds do not.

And so, I suggest that risk and responsibility be reconnected. Covenant 5 should provide that mortgage compliant insurance an estimate of full reconstruction costs. And if the homeowner purchases coverages in that amount, then the insurer has to bear the cost of any error of greater than 5%. Next slide, please.

Finally, I want to talk to you about the mechanics of handling the reconstruction insurance proceeds when a mortgage company or the lender is involved. Because, pursuant to Covenant 5, when the insurance company pays that money, for obvious reasons, its paid to

the mortgage lender servicer who holds the money, not the homeowner. Next slide, please.

That creates a host of problems. Because the lender servicer often does not disperse on a normal schedule approximating a construction loan, often is not a bank of the depositor's choosing, doesn't hold the money in a way that's insured, does not pay interest. And as to that last point, interest, keep in mind that to the lender servicer, the interest is way to the right of the decimal point.

But for the homeowner, who has literally lost everything, when I lost my home, the first thing I bought the next day was a toothbrush because I no longer owned one. That interest buys a sofa. And just this past Tuesday, California court said that a statute in my state that appeared to require 2% interest on these monies actually doesn't. Next slide, please.

So, it would be tremendously helpful to many natural disaster survivors, if lender servicers were directed by FHFA, and I choose the word directed intentionally so that we're not talking about it only applies to newly placed loans from here forward. That when holding insurance proceeds, the lender or servicer should not hold the insurance proceeds in excess of the outstanding balance of the loan, should pay interest on what it holds, should ensure the money is put in an insured account, confirm that it is not the lender's option to force prepayment rather than rebuild. Release the proceeds to the homeowner on no slower schedule than the same schedule as a normal construction loan fund would disperse.

And finally, and this may seem like a trivial point to you, but let me assure you it is huge. Provide a direct contact with authority within the financial institution, rather than farm this workout to a third party vendor who is hard to reach and has no authority. Last slide, please.

That's a whole lot of information in a very little amount of time. And I thank you for this opportunity. I hope I've given you food for thought on some things that you maybe hadn't thought about before hearing from me. And I will be providing all of the detail and support in a lengthy written submission in a few weeks. I thank you very much.

Hadi Reza: Thank you very much, Ken. Very informative. Our next speaker is Eric Selk, and followed by Carlos Martin. So Eric, you're on, please unmute and begin.

Eric Selk: Can you hear me?

Hadi Reza: Eric, are you there?

Eric Selk: Hello, can you hear me?

Hadi Reza: Sounds like you're really far away.

Eric Selk: Hang on. Okay, there you go.

Hadi Reza: That's better, there you go.

Eric Selk: Thank you very much. Now you can hear me, which is great. Thank you very much for inviting me today. I really do appreciate the opportunity to share with everyone my experiences in working with the Hope Now membership.

First off, thank you, of course to FHFA. And the four pillars, I was really excited actually when the Biden Administration announced the four pillars to include natural disasters. Because it's something that I've sort of been looking at the last few years and thinking how are we going to move forward on this issue until it's sort of raised to a national priority. And I think we're there, right. It's now a national priority. This issue impacts millions of Americans.

I'm here today to share some of my observations based on my experiences in working on the ground with natural disasters and working side by side with the mortgage servicers, and really always working towards improved consumer outcomes. So a lot of what I'm going to share today is through a consumer lens, and thinking a little bit more about the consumer advocacy piece.

From these experiences, I was personally involved with hundreds of micro and macro issues that made me really passionate about the subject. I've also had the really good fortune to work with many experts on the subject that range from researchers, think tank experts, data providers, nonprofits and a lot of experienced government officials.

These folks were invaluable in helping to develop an insightful approach in working with the membership. And we're all experienced directly or indirectly, on these impacts from severe weather. I know, I live here in DC, and I have friends who've experienced stuff within the time that I've lived here in the city for the last 10 years. These experiences can wipe out financial futures for hard working families. And as discussed, for years I think with the government agencies, it's one of our greatest threats to national security.

So, a little bit about me, I was the Executive Director for Hope Now. This was an alliance of mortgage servicers and nonprofits dedicated to home preservation. In the last few years of existence, obviously with mortgage delinquency being so low, we really started looking kind of at the what else, what else could we be doing. And obviously with the series of natural disasters really it just seemed like a likely place to go in terms of looking at mission driven work.

Some of my observations I have collected and put in the RFI -- in an RFI response letter. I'd like to offer some thoughts on ways FHFA could move forward with what I think is a very daunting and somewhat impossible task, comprehensive reform, to meet the undeniable science of climate change.

Unfortunately, we have not seen the full fury of Mother Nature yet. And I think that a lot of the modeling that's been shared today sort of indicates a lot of that. It's incumbent for the stakeholders in the housing industry to think proactively. Each home is a small enterprise and it's our duty to support the homeownership and access to homeownership, which is the bedrock of this enterprise.

The first step has happened already. The collaborative and broad coalition of stakeholders to provide input to FHFA. As some background, let me share a fairly simple direct course of action Hope Now took to help membership to sustain and improve business models.

Now remember, Hope Now members had competing interest, various portfolios, and various tolerances for natural disasters and risk management. We simply started much like FHFA is doing now with a working group that met regularly. We adopted an educational stance and learned from federal, state and local stakeholders. Different presenters helped to inform membership not only on what they do, but how those activities could impact our customers and improve their business models.

We started small and eventually expanded to a model that included conferences, which FHFA, the GSEs and HUD were invited to. Four conferences focused on a single issue, and I think that's sort of amazing when you think about natural disasters. So, you could just take one slice of the pie and spend an entire day on that issue. And I found that to be very daunting.

I could see how this issue could, some issues could be really never ending and the various iterations of a single subject can take everyone down different rabbit holes. I believe many of the

partners have helped to illuminate all of those different factors today.

So, number one, identifying and assessing climate and natural disaster risk. The agency and regulated enterprises will need to widen the scope of information collecting and sharing. Traditional data partners and industry leaders have a very important role. But I think that there is a great opportunity for new partnerships and new types of information gathering. And I think that's also been illuminated here today.

The work being done around this issue globally speaking is really breathtaking. Additionally, there are leaders in positions with state agency and natural response networks that provide incredibly deep learnings. And I was really glad to see Glenn and some other people on the call today, I think they're incredible leaders and bring incredible experience to the table.

Many of these folks feel a personal calling and brought their passions with them to an issue that involves servant leadership. Going as far back as the White House Report on Hurricane Katrina, which is something I did when we started looking at natural disasters and what we should do, I thought well where, what would be something I could start. And I landed on that report. It's quite dense. But obviously, housing is discussed quite a bit. And there's a really great summary at the end of the report that actually identifies different things that could be done differently, including talking about housing.

Going back that far, housing and recovery has been a challenge and nearly 2,000 citizens died because of inadequate preparations, infrastructure and response. Since then, many reports have been written that include recommendations for sustainable and a resilient housing market.

Each disaster usually has some sort of report that captures lessons learns or recommendations. And I really don't think it's so much about studying each of these papers to try and address every issue. But I do believe there are common themes that can be discovered and lending that help guide maybe some of the agenda priorities with the working group.

There might be some industry learnings that could be captured. But most financial companies, I've discovered, especially the servicers, have not really developed special teams with a deep experience that produces memorialized reports.

I encourage finding the folks out in the field also who bring years of experience and personal insights. I hope that the working group can separate out what I see sometimes in my own meetings, where the profitability goals were being separated out from the larger issues of sustainable, resilient and accessible housing for all Americans. And I think that that has been illuminated really well today.

I truly believe that that's what's at stake. In my own experience, I can see a clouding of issues when the consequences have costs and the costs of the Enterprises or the business models take priority over the life impacts for working families.

From our learnings with our educational partners, it was clear more impacts were coming. We have to think differently to create new paradigms. Currently, there is a heavy focus on business continuity, right. It drives the C suite priorities and can leave behind the larger costs of human capital.

The system failures will happen, it's unavoidable. And we only need to look at Puerto Rico as an example, where business continuity plans really didn't change the outcome for families who fled to New York, Orlando, and the Carolinas, setting off another set of housing crisis issues that needed to be managed.

I encourage thinking about the total lifecycle of the mortgage loan so disaster impacts can be minimized for safety, economic and environment issues. Before Maria, the issues around building codes and resilient roofing and clear titles were no secret. These are all things that I was hearing in conferences in Puerto Rico, at least three or four different times. And then obviously, this all came to a head with Maria, and everyone was sort of left with not only devastation, but the existing issues at hand.

In the industry we talk a lot about consumer and public education. But there is clearly an opportunity to expand the current delivery models, the information sharing can go beyond the homeowners, I think, to the local housing offices, state and community development agencies, HFAs.

I wholeheartedly agree with Lindsay's comment earlier about the information asymmetry. And I've personally seen this a lot out in the field.

Hadi Reza: About one minute left, Eric.

Eric Selk: Pardon?

Hadi Reza: About one minute left.

Eric Selk: Okay. Okay. Okay. The GSEs have the bandwidth to create more information sharing and expanding smarter local policy, which I also think has been iterated with some of the other speakers today. And I want to thank you so much. So, I, thank you, I appreciate it. I'll jump off now.

Hadi Reza: Great. Thank you so much, Eric. Next up, we have Carlos Martin from Urban Institute, followed by Michela Zonta. So, Carlos, if you're available, please unmute and you may begin.

Carlos Martin: All right, thanks, Hadi. It's actually Carlos Martin, and I'm leading Urban's research on climate disasters and housing. These expressions are my own and do not necessarily reflect those of Institute or its trustees. But my comments came as an encouragement of FHFA's inquiry and your desire for evidence - based rule changes regarding the GSEs climate exposures. But, also somewhat of an admonition to proceed with caution to ensure that the very homebuyers and homeowners affected by these rules are not harmed or disadvantaged by these changes.

So ultimately, you must continue to support getting the right mortgages into households hands, that is borrowers in need of affordable, accessible loans, protected and prescribed by the duty to serve. But to use those right mortgages now to purchase the right houses, that is those that are out of direct harm's way. So, you must also support current borrowers that have that information, that need the information and resources to make the right decisions about their current homes.

So, let me start off with your first line of inquiry regarding identifying and assessing climate and natural disaster risk. Adding to the literature you have already heard on climate exposures to your graph, I would also like to add that many of the same regions that are already experiencing those direct climate effects, the Gulf Coast, coastal Atlantic, Arctic, Alaska and rural Southwest also are those with highest shares of households with subprime or no credit scores. Some of its highest 75% of those communities.

But I would like to nuance much of this information you've already heard today, and just follow the work you've likely read that estimates current financial exposures from future climate change effects, prior to sharing your work that my organization and colleagues and I have done on past climate related damages, and their financial effects on borrowers.

Delinquency peaked in the areas affected by Hurricane Katrina by the fourth month after a high of about -- at a high of about 26%.

Taking three years to return back to national rates. Similar timeline occurred after Superstorm Sandy, though with a smaller peak rate of about 11% delinquency. Foreclosure rates, though tend to peak three to four years after an event, as Alex explained in large parts due to the persistence of the overall negative financial consequences for borrowers from the disaster.

An important nuance to this point, much of the work on financial effects after hazard events, has focused solely on the most severe and acute disasters, that is Katrina, Sandy, Harvey and Maria, for which there has often been discretionary forbearance and borrower relief from the GSEs and FHA, as well as direct financial assistance.

So consequently, we have seen a different pattern emerge from medium sized disasters where delinquency rates do not rise as quickly or --

Hadi Reza: Carlos, we may have lost you. Carlos are you there? Okay, so we'll move on. I'm not sure we may have lost him in the middle there. So, let's move on to Michela Zonta, if you're available?

Michela Zonta: Yes. Okay. Can you hear me?

Hadi Reza: Yes, we can.

Michela Zonta: Okay. Hello and thank you for the opportunity to share some of the work that I've been doing at the Center for American Progress. My name is Michela Zonta -- all right. My name is Michela Zonta, and I am a Senior Policy Analyst at CAP. I recently released a report on the Community Reinvestment Act and the challenge of climate change.

And building on the analysis of the recommendations provided in that report, I'm now performing a nationwide analysis of vulnerable communities that would greatly benefit from a finetuned geographic targeting by different agencies, including FHFA, in order to address climate change, and environmental racism.

Addressing climate change and systemic environmental racism is a very urgent matter that requires policymakers to use every tool at their disposal to promote equitable community development and climate resilience.

And one arena in which the government can actually tackle climate change, environmental racism is in financial protection and community investment. Low and moderate income communities and communities of color need more resources to build healthier, more resilient economies, housing and infrastructure.

Specifically, investment in these communities should simultaneously advance climate resilience and reverse the effects of environmental racism. Environmental racism is unquestionably related to climate change because it determines who is most likely to suffer most from the consequences of activities that produce global warming.

Low and moderate income communities of color find themselves on the front lines of climate change, is in often outdated housing and infrastructure, which include a lack of adequate insulation and air conditioning, is more vulnerable to the advance effects of extreme weather and climate change.

These communities are often located in areas such as flood plains and fire zones. And as the global sea level rises, African American coastal communities in the south are at greater risk of displacement.

And a growing body of research argues that it will also have a dramatic second-hand effect on the areas that are more sheltered. There's growing evidence that finds that the rise of sea levels and flooding are affecting real estate markets in American cities most vulnerable to climate change. But most importantly, this trend could lead to climate gentrification, whereby residents are being priced out of valuable ground and neighborhoods, and often in black and minority communities could be basically victims -- become victims of the phenomenon.

Communities of color have the fewest resources with which to prepare for extreme climate events. Numerous studies have documented that disproportionate exposure of people of color to land uses and activities that exacerbate the climate change. A study called Redlining, the siting of affordable housing and the past, and even these advancements have greatly shaped the character of urban development and the uneven distribution of ecological benefits, including access to amenities such as green space.

Extreme heat is considered one of the most serious threats to human health in urban areas across the United States. Heat, for instance, accounted for more deaths than from flooding and hurricanes combined from 1990 to 2019. Because of climate change, extreme heat events are becoming more common and more intense. And studies of extreme heat pointed to racial disparities in heat-related mortality.

Land cover characteristics in racially segregated areas contributed to heat-related health disparities. Some studies also connect the land use planning and zoning to the urban heat highland effect because of the influence that they have on the location, density, mix of

buildings and structures and construction materials of the built environment in cities.

Also, areas that have experienced the systematic -- these investments driven by racial bias through practices such as redlining, are more vulnerable to heat because of their built environments, often feature heat retaining materials and limited green space.

It's possible, you know, like in the study that I performed on the, you know, on how to green at the CRA basically, I looked at the measures of the land surface temperature and, which is a very important climate change indicator. But adopting land surface temperature as a climate related indicator for GSEs purposes, would be impractical given the amount of processing time and resources that will be required to estimate exposure to heat throughout the entire U.S. territory on a regular basis.

So, the purpose of my analysis is to identify readily available environmental indicators that are highly correlated with heat exposure, and with current disinvestment patterns and, you know, on mortgage lending patterns as well. And such indicators can then be combined with income levels and racial characteristics at the census tract level in order to fine tune geographic targets.

And there are a few data sources out there that could be utilized for these purposes. For instance, the Environmental Protection Agency provides a set of environmental indicators, such as at the census block group level, that can be compared with the land surface temperature distribution across a geographic area.

These indicators can be accessed through the EJSCREEN that was established to combine consistent environmental and demographic data to address environmental justice issues. And these indicators include a number of measures of air toxicity, exposure to, you know, diesel, particulate matter, levels in air and traffic proximity and volume, proximity to waste facilities and so on.

So, my analysis of the Baltimore Metropolitan area has shown that land to surface temperature, exposure to poor quality air and proximity to hazardous sites presented statistically significant correlations with the percentage of minority population income levels in the land volume in census tracts.

Specifically, the higher the values of land surface temperature and environmental indicators that were chosen, the larger the percentage of minority population, the lower the income level, and

the lower the amount of all lending, particularly single family home market lending.

So, targeting the census tracts that are currently considered underserved for GSE's evaluation purposes, and simultaneously feature poor air quality and high exposure to environmentally others facilities would be a practical way to highlight the areas that are also vulnerable from a climate change perspective.

Hadi Reza: About one minute left, Michela.

Michela Zonta: Yes, in addition, streamlining geographic targets across the regulatory system has the potential to boost lending and investment in underserved areas that are environmentally vulnerable. So, defining such targets based on climate and environmental justice indicators will greatly boost the GSE's role, not only in mediating risk, but also in promoting investment resilience in a proactive way. Especially when it comes to communities of color. Again, I thank you for the opportunity to speak at this event.

Hadi Reza: Thank you very much Michela, I appreciate it. Carlos, I understand you're back on, I can give you your -- I think you went about five minutes in. So, if you'd like another five minutes, I'm happy to turn the floor back over to you.

Carlos Martin: Sure, and I apologize. I have no idea what happened. It wasn't my internet. And so, it seems zoom kicked me out. So apparently zoom doesn't like what I have to say. But I'm not sure where I left off. So, I don't know if you can recall that.

Hadi Reza: Thank you in about five minutes. So, I don't recall exactly.

Carlos Martin: Okay. Well, let me -- I could go back into some of the ideas of the recommendations that we have. So, if I repeat myself, I apologize since I don't know where we left off.

But the comment was around approaching it from two different approaches, the existing borrowers as well as future borrowers. So, on the existing borrower side, we urge FHFA to consider promoting forbearance and release standards for current disasters with consistent triggers, so that the GSEs will provide those based on disaster severity or extreme chronic exposure, and borrower financial capacity. But ensuring that those forbearance costs are streamlined so that they do not reduce access for future low and moderate income borrowers.

Expanding duty to serve areas for resilience for refinance and equity lending that promote home hazard mitigation projects.

Partnerships with insurers for reduced premiums, such as the Fortified Home Program where reducing physical and financial risk is possible, in some cases, that is not possible.

In partnership with FEMA, HUD and state and local governments to plan and resource community level decision making on adaptation options, which will affect mortgage properties but may also relocation.

For future borrowers, we recommend expanding duty to serve area definitions for new loans, new mortgages, to focus on regions with less immediate and severe exposures to climate change risks. And you can expand the use of the Federal Home Loan Banks affordable housing program to finance the construction purchase, or rehabilitation of housing in less exposed places.

You could require Fannie Mae and Freddie Mac's affordable housing goals to focus on purchasing low income and very low income single family and multifamily mortgages in those same less exposed regions. Those loans have increased dramatically to provide for natural population growth. But you also have to incentivize settlements and ownership away from exposed places, giving those low and moderate income folks an opportunity to still purchase while purchasing in safe places.

For the entire portfolio, both existing and future home borrowers, there are a couple of other recommendations we have. And I'll list them as quick as possible. Certainly, partnering with other stakeholders that have contributed to the exposures by extending study and programming in specific intervention points. Such as, supporting accurate exposure data, much like the kinds we've heard today, along the lines of FEMA's Risk Rating 2.0, but also expanded to other climate related risks. Monitoring local property risk disclosure rules, and their effectiveness.

Other urban research suggests that disclosures need to be better communicated as we'll expand it rather than just being enacted. Exploring the role of financial counseling requirements that include risk awareness, along with other educational campaigns. Uncovering potentially fraudulent home sales and mortgage loan practices that consciously do not disclose risks and spread false information about them even when those risks are known. And documenting in and weighing in on local land use and development practices that encourage built in in risky areas. Again, when that risk is known.

All the stakeholders associated with the development, purchase and ownership of mortgage properties have some role in contributing to its risks and have a stake in mitigating the physical damage and financial costs when that risk materializes. That includes the housing markets, regional economies and state and local governments that rely on a stable housing stock and the financing board. But that risk needs to be distributed. Transferring the GSEs risk to others, such as the FHA just moves the risks to other hands within the federal government, or it issues blanket loan -- issuing a blanket loan level pricing adjustments, for example, will just have a dramatic effect on that local housing market, and the ability for low income households to access finance. Those should not be an outcome of FHFA inquiry.

So, but we are on a climate timeline, we must all acknowledge that the changes we see happening are gradual, and that for the sake of current and future low-income borrowers lives must be addressed sensitively. Simply refusing GSE backed mortgages to low income households in certain areas in blanket terms does not accomplish that. And in fact, contributes to social inequities that will ultimately harm the environment and climate more.

Our National Environmental Policy is finally awakening to environmental injustice and considerations for the well-being of our most vulnerable citizens should be paramount in FHFA's inquiry. My colleague and I will submit formal written comments to the RFI that detail the points I've made, as well as a few others. And thanks again for the opportunity to come in a second time.

Hadi Reza: Thank you so much, Carlos, appreciate that. Okay, and our final speaker for the day is Marion McFadden from Enterprise Community Partners. So, Marion, if you're on, please feel free to unmute and begin.

Marion McFadden: Thank you so much for the opportunity to speak in today's session. My name is Marion McFadden, I'm the Senior Vice President for Public Policy and a Senior Advisor for Resilience Enterprise Community Partners. Enterprise is a national nonprofit on a mission to make home and community places have pride, power and belonging, and platforms for resilience and upward mobility for all.

For more than 40 years, Enterprise has been committed to helping communities break down silos and build organizational capacity in both the public and private sectors so that funding is deployed more effectively.

Today, we have invested $61 billion to help create or preserve 775,000 homes in all 50 states, the District of Columbia and Puerto Rico. Enterprise is a leader on climate resilience in the affordable housing industry. We invest in disaster recovery and resilience work because people of modest means are most likely to be harmed by disasters and tend to be the slowest to recover. We work to ensure that the people who need help the most are able to get back on their feet more quickly.

Through our Building Resilient Futures Initiative, we're working to ensure that sustainable, resilient, affordable housing becomes the norm and that communities are equipped to withstand and recover from disasters.

In 2005, we made a commitment to help rebuild homes and communities in the wake of the devastation caused by Hurricane Katrina. Fifteen years later, we have a track record of helping developers and owners assess their risk and adapt buildings so that they can withstand threats from disasters in our changing climate. We all know that investments in mitigation pay off, including seeing that the FEMA endorsed study by the National Institute of Building Science found that taxpayers save an average of $6 in future disaster recovery costs for every dollar spent on hazard mitigation.

At Enterprise we saw that firsthand a couple of years ago when a very heavy rainfall flooded New Orleans and the streets were waist deep in water, but our [inaudible 02:59:28] development escaped harm completely because the homes had been built two feet above the base flood elevation to take into consideration the possibility of future harm. After that storm, water did not breach the first floor so we didn't have to make any claims for the National Flood Insurance Policy. And more importantly, residents were able to get on with their lives as soon as the floodwaters receded.

The challenges of the new climate are many and I'm sure at this point, you've heard many statistics about the increasing intensity and frequency of weather-related disasters. Climate change poses a major risk to human lives, as well as to the stability of the U.S. financial system and to its ability to sustain the American economy, as well as to our national affordable housing stock.

The impacts of climate change put millions of households at risk of uninhabitable conditions, exacerbating the vulnerabilities of lower income households and communities of color. Socially vulnerable populations are more likely to live in cities.

Experience shows that disasters exacerbate wealth inequality. Due to its age, physical condition and maintenance needs, most of the country's existing affordable housing stock cannot withstand our changing climate. At the same time, the systems designed to support affordable housing and its residents, from policy to financing, to insurance and federal disaster recovery programs, all to this day still, unfortunately, inadequately address community needs.

And these are compounding the challenges faced by owners, investments, and investors, excuse me. So, I'd like to offer several recommendations for your consideration. In order to protect people, properties and financial investments from harm, we need to start with a shared understanding of risk. Enterprise recommends that the federal government work collectively to increase awareness of foreseeable risks that communities face by providing the best available science and data on climate risk uniformly across the country available at the address level.

Only the federal government has the true incentive to identify risks. So, we ask that the federal government, as a whole, ensure that these data are available in a way that consumers can use.

As part of your strategic goal to ensure safe and sound regulated entities, FHFA should commence a comprehensive national climate adaptation planning process to guide the way that GSEs assess, underwrite and operate the mortgages. The climate adaptation plan should assess risks and recommend solutions and actions that can be supported and funded to encourage climate safe communities.

The GSEs should explore forms of risk-based pricing to create a capital buffer against climate induced losses. The enterprises, as you know, are responsible for a significant share of all residential mortgages in the country. Many of these properties are vulnerable to significant risks, including wildfires, tornadoes, earthquakes and repeated flooding. America's housing stock is chronically under insured against disasters of all types, but especially flooding.

As part of the commitment to housing affordability and community investment as well as housing preservation through their duty to serve and neighborhood stabilization, it's key to identify a financial subsidy mechanism for low income communities and owners to maintain and increase their insurance, as well as to make upgrades to buildings.

Due to the increased climate risk, Enterprise recommends promoting climate disclosure and lending applications, as well as

mandating every multifamily property have a business continuity plan. The climate disclosure would ask applicants about their local climate risks and the measures taken to adapt or mitigate those risks. And the plan would ensure continued viability.

Enterprise and our partners have created tools to help determine and address climate risks. The Enterprise portfolio protect tool kit helps owners, operators and developers of affordable housing understand which properties are at the highest risk from flooding fire, earthquakes and other natural hazards.

Enterprise, in partnership with HUD and Fannie Mae, recently launched the Ready to Respond Business Continuity Toolkit, designed to help organizations develop their comprehensive disaster staffing plans, and to protect buildings, engage residents and continue business operations in the event of a disaster.

And our Green Building Program Enterprise Green Communities for 15 years has helped ensure safe, sustainable, affordable housing and supports the construction of affordable housing that's encompassing adaptation and mitigation strategies from site selection through operations and maintenance.

More information about all of these free climate resilience and disaster recovery resources can be found at EnterpriseCommunity.org.

Finally, I ask that FHFA be intentional in considering how any new climate risk procedures will impact the value of homes in low income communities and communities with significant numbers of residents who are black, indigenous and other people of color.

In order for the regulated entities to support housing finance missions, while minimizing the impact of climate natural disaster risk, equity must be at the center and any additional processes, procedures or changes in valuation could have a potentially negative impact on those communities.

FHFA must ensure that the GSEs, banks and the communities they serve have the tools, the knowledge and the capital to reduce risk to the nation's most vulnerable assets. Enterprise looks forward to working collaboratively with you to shape a climate resilient nation. And we look forward to submitting written comments. Thank you again for the invitation to be here.

Hadi Reza: Thank you very much, Marion, appreciate it. So, I believe we've made it through all the speakers. I don't believe I've missed anyone. Let me do a quick double check. I think we're good. So, thank you

again, for all your free time and all the informative presentations. I thought they were wonderful. I learned a lot.

At this point, I would like to turn it over to Michela Barba, another Co-Lead of the Climate and Natural Disaster Risk Working Group for her closing remarks. So thank you, Michela, it's all yours.

Michela Barba: Thanks. Thank you, Hadi. And I think we're right on time, I think this might be a first for me to be right on schedule. So thank you, Hadi, and thank you to all of you for joining us this afternoon. I especially want to thank our speakers for sharing their thoughtful feedback with us. I'd also like to thank Danielle Walton, Meghan Aines and my other FHFA colleagues that helped behind the scenes to make the Listening Session such a success.

My name is Michela Barba and I'm one of the Co-Leads of FHFA's Natural Disaster Risk Working Group. I'll keep my closing remarks brief. It's been a very productive afternoon, at least for FHFA. But I also know it's been a very long afternoon for all of you.

We recognize that climate and natural disaster-related events may pose a significant risk to our regulated entities and to the housing market more broadly. And as Director Calabria mentioned in his opening remarks, the regulated entities and FHFA have done a great deal of work on disaster response and recovery.

And now we're turning our attention to our front-end, to more proactively managing this risk. This is an area of priority for FHFA. And I'm proud to be on the working group team that is leading this effort.

But we have to start with educating ourselves. We need to start by studying, we need to learn the issues and also the impacts of these issues. In general, we will use the same approach in managing climate and natural disaster risk as we take with our other risks. We will strive to develop a data and research-driven decision-making process, while also keeping an eye on important policy considerations, such as many of the ones that we've discussed here today.

I'm impressed and encouraged by the participation on this call. I think we reached a high of about 160 participants and had over 220 registered. When I look at the list of speakers and the list of attendees for today's Listening Session it underscores, I think how critical it is to bring together, to work together with stakeholders with varying perspectives, and with different focuses. Climate

scientists, data providers, researchers, modelers, advocacy groups, policymakers and others.

We will need to work as an interdisciplinary team to improve our understanding to develop solutions and to take actions that are not only backed by data and research but that are also thoughtfully executed.

I think we took a very important step with releasing the RFI. Our goal is to gather as many different perspectives across many diverse fields, to help us improve our understanding on how to measure and manage the risk and to ensure we account for the various considerations.

What we learn will help enhance our ability to fulfill our statutory responsibility as a prudential financial regulator. It will help ensure that our regulated entities operate in a safe and sound manner, and it will help ensure that they continue to fulfill their important missions.

And I believe we've made a very good start here at our Listening Session today. We appreciate all of your feedback. You've given us a lot to think about. We're hoping for high volume of responses to our RFI and invite all of you to respond to it and also to share it with others.

I cannot emphasize enough that we have no expectations on what we will learn. We're open to hearing and would like to hear from as many different stakeholders as possible. As a reminder again, the RFI can be found on our website, and the comment period is open through April 19th.

Let me close by thanking you all again. Thank you for taking time out of your day today to discuss such a critical issue. Have a good evening.