

AIR Responses to FHFA's Climate and Natural Disaster Risk Management Request for Input

April 2021

I. Identifying and Assessing Climate and Natural Disaster Risk

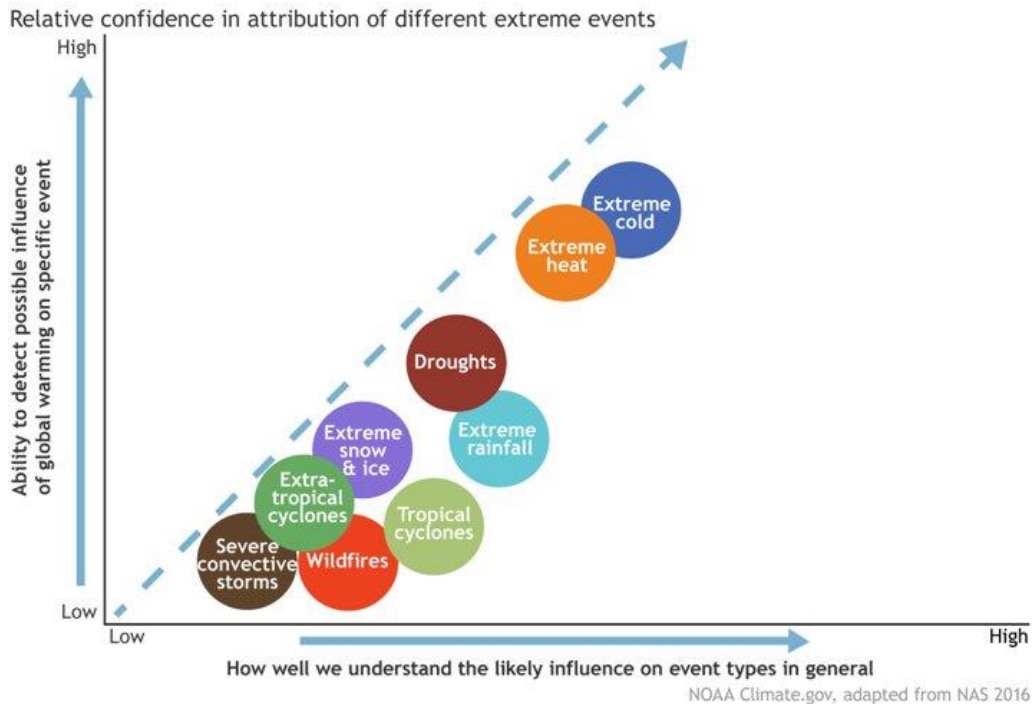
1. How should FHFA define climate and natural disaster risk?

It is important to distinguish between climate and weather; climate is an amalgamation of weather over an extended period. Climate is inherently the cause of weather and weather variability, and the real driver behind weather extremes. Individual natural disasters caused by weather events can create shock (acute) losses. Climate change can lead to an accumulation of shock losses over time, and contribute to chronic risk (e.g., sunny day flooding) as well.

Understanding the risk from natural disasters requires an understanding of how the climate impacts weather variability, but additionally requires the distinction between hazard and vulnerability. Hazard is the physical flood, wind, or wildfire threatening buildings and populations. For example, what assets are exposed to shocks and stresses. Vulnerability refers to how those structures will react if the event in question occurs. This can vary by building practices, code adherence, and geographic location.

2. What are the climate and natural disaster risks to the regulated entities, including long- and short-term risks, and how might such risks change over time? To what extent, if any, could such risks now or in the future impede the ability of each regulated entity to operate in a safe and sound manner, fulfill its statutory mission, or foster liquid, efficient, competitive, and resilient national housing finance markets?

Risk is constantly evolving. To understand the changing risk, it is important to first quantify the risk today to serve as a baseline. The extent to which perils are influenced by climate change is understood with varying degrees of confidence. The chart below shows the relative confidence in attribution of different extreme events by NOAA Climate:



The regulated entities are exposed to all of these risks to varying degrees, but most acutely to large scale natural disasters such as floods, hurricanes, wildfires and others. Limitations in existing climate models (general circulation models, or GCMs) related to the geographic resolution of these models and the complexity of the interactions they consider, coupled with scarcity of data for extreme events, limits the confidence with which GCMs can quantify how natural disasters will evolve. Furthermore, the effects are likely to vary by geography; for example, areas in the Western US may see less rainfall, and perhaps fewer large flooding events but increases in areas burned by wildfire, while the Eastern US may see increased rainfall and flooding.

Understanding the complex interactions of weather and climate, and the associated uncertainty, will be an important part of identifying risks to the regulated entities and their ability to fulfill their missions. The insurance industry faces similar challenges, as the ability to operate efficiently and remain solvent and competitive are goals which the industry strives to achieve. Insurers utilize catastrophe risk models to manage exposures and develop risk transfer strategies for extreme event risk. As these tools continue to evolve, they will help risk managers understand how climate change could impact insurability, property values, and community resilience. Models can be used to improve an understanding of these impacts, building on lessons learned from the insurance industry over the past decades.

3. What methodologies, datasets, variables, assumptions, future climate scenarios, and measurement tools are used to measure and monitor climate risk to the national housing finance markets? Describe any gaps in available data that limit the ability to measure such risks. How could such data gaps be resolved?

Traditional methods of risk quantification and prediction often rely on historical loss experience, by estimating future loss potential based on proportions of exposed values. While such data are

useful and available from multiple sources (e.g., [NCDC](#), [FEMA Risk Index](#)), they are limited in important ways. First, since the most impactful events are rare, the historical record is short and geographically sparse; i.e., there are physically large events that have not yet occurred, but which could occur in the future. Furthermore, the underlying built environment is constantly evolving, from new development to improvements in building codes and community mitigation. Finally, significant changes in land use, development and economic growth can dramatically alter the exposure at risk, and the loss from memorable past events may be very different should those events reoccur tomorrow. Examples of how past events may impact today's exposures are available in [this report](#) from AIR.

Climate change adds an additional variable which limits the utility of historical data. As discussed above, climate change is likely to influence perils and geographies in unique ways, further challenging expectations of future activity based on past experience. As policy changes occur and local, state, and federal governments adapt and invest in resilience to mitigate the impacts of severe events, even today's best estimates could fall short of answering the question of what a severe flood or wildfire could look like 30 years from now, or the loss it might cause to the housing finance or insurance sectors.

For several decades, insurers have augmented their historical loss experience with extreme event models developed by AIR and others. These models simulate hurricane, flood, wildfire, or severe thunderstorm activity, superimposed on models of the built environment to generate probabilistic estimates of damage and loss. These models can and have been used to estimate the losses to mortgage portfolios and could be leveraged for further assessments of the natural disaster and climate risks to the housing finance markets. The models are housed in software tools which can be seamlessly integrated into risk management workflows, as is done today by the world's largest insurers, reinsurers, and brokers, and the outputs from these models serve as currency for transferring risk to the reinsurance and capital markets. Such models can also be used to estimate the impacts of climate change by employing "climate conditioned" views of risk (see reference to AIR study below) for scenarios and timeframes of interest.

The input data for these models include information on underlying properties' locations (latitude and longitude or address), building materials (construction type), building use (occupancy type), year of construction, and asset values. Additional building details can provide more robust loss estimates, but some modeling firms alternatively offer data to supplement existing datasets where possible. The regulated entities should seek to collect these details for assets in their portfolios or source this information from third parties

4. What risk management strategies or approaches—including but not limited to those related to pricing, insurance, credit risk transfers (CRT), loss mitigation, and disaster response—do industry participants use to address climate and natural disaster risk?

(Re)insurers leverage models to inform their exposure management decisions and strategically take on risk. Through geographic and peril diversification, (re)insurers build portfolios that correspond to their specific risk appetites. Risk is transferred among parties to limit exposure, with this transfer taking on different forms, whether the ceding of insurers' risk to reinsurers, or the issuance of catastrophe bonds to the capital markets.

These strategies can be adapted to the housing finance space, whether assessing the overall exposure to risk geographically or estimating the risk of default across the underlying borrowers' assets.

FEMA has been active in the traditional reinsurance market since 2017, with the inaugural placement for the National Flood Insurance Program (NFIP). FEMA has also turned to the catastrophe bond market for reinsurance coverage for the NFIP, issuing four bonds to date beginning in 2018. These catastrophe bonds provide critical coverage against the NFIP's losses from named storms; the latest secured \$575 million in reinsurance protection.

In addition to FEMA, the World Bank has helped sovereign governments to access protection via the capital markets. Notably, in 2018, the Pacific Alliance catastrophe bond launched providing a collective \$1.36 billion in protection from large earthquakes to Mexico, Chile, Colombia, and Peru. The bond triggers based on event parameters, and enables timely payouts following qualifying events.

In addition to risk transfer, the insurance industry and others support a wide variety of loss control and mitigation measures, including strong building codes and building code enforcement (e.g., [ISO BCEGS program](#)) and improvements in building materials and practices (e.g., [Institute for Business and Home Safety](#)).

5. How, if at all, should FHFA incorporate into its assessment of the regulated entities' climate and natural disaster risk the potential for abrupt repricing of real estate properties exposed to acute natural hazards?

There are many historical examples of abrupt market changes following extreme events. The insurance industry notably shifted following Hurricane Andrew's devastation in South Florida which led to numerous insurer insolvencies. A decade later, the attacks of September 11th shocked the property, life, and liability markets and prompted the enactment of the Terrorism Risk Insurance Act (TRIA). More recently, insurers are concerned with the devastating losses caused by wildfires in California and adjusting their risk management approaches to contemplate ever-evolving threats.

This question additionally closely relates to the discourse surrounding the updating of the NFIP's risk rating methodology, [Risk Rating 2.0](#). The program seeks to establish actuarially sound rates that more accurately reflect the true flood risk to properties. While seeking to deliver rates that are equitable, better reflect a property's individual flood risk, and geared to improving the solvency of the program, premium increases could influence real estate markets in [many areas](#). Additionally, improvements in modeling and mapping technology are highlighting the flood risk in many areas formerly subject to [redlining](#).

There is also increasing evidence of changes in consumer behavior and market adjustments related to [wildfire](#) and perceptions around threats posed by [climate change](#).

6. With respect to the foregoing questions, FHFA invites interested parties to submit any studies, research, data, or other qualitative or quantitative information that supports a commenter's response or is otherwise relevant to the regulated entities' climate and natural disaster risk.

In addition to over three decades of experience in building catastrophe models, AIR has completed numerous studies evaluating the evolving risk posed by climate change on natural disasters. Below are a few resources of note:

- [Quantifying the Impact from Climate Change on U.S. Hurricane Risk](#) – a report released in 2021 in collaboration with the Brookings Institution and AXIS Capital exploring the impact from climate change on hurricane risk in the United States, specifically quantifying the financial losses to residential and commercial properties resulting from an increase in the frequency of strong hurricanes and the elevated storm surge risk posed by rising sea levels
- [Climate Change Impacts on Extreme Weather](#) – a 2017 report by Dr. Peter Sousounis, Vice President and Climate Change Practice Leader examining climate change and its effects on atmospheric perils
- [Climate Change: A Reckoning and a New Approach to Modeling Risk](#) – a 2020 article by Dr. Jay Guin, Chief Research Officer, discussing AIR's motivation for and approach to modeling and quantifying climate change risk
- [A Forward-Looking Perspective on the Interconnectedness of Climate Risks](#) – a 2021 article by Bill Churney, President, discussing the need to understand not only the rising losses from climate change, but also thoughtfully prepare operational and strategic resilience initiatives that meet the needs of all stakeholders
- AIR [Climate Change blog series](#) covering a variety of topics and perils
- Websites focused on AIR's [Climate Change](#) and [Global Resilience](#) Practices

Additional studies and information on AIR's consulting work in the mortgage space are available upon request. In addition, there are many relevant insurance industry publications, a few recent examples include:

- [Research Report on Climate Change Risk Assessment for the Insurance Industry](#) by the Geneva Association, 2021
- [Insuring the climate transition](#) – Final report on the project of UN Environment Programme's Principles for Sustainable Insurance Initiative to pilot the TCFD recommendations, 2021
- [The 2021 biennial exploratory scenario on the financial risks from climate change](#) – Bank of England Discussion Paper, 2019

II. Enhancing FHFA's Supervisory and Regulatory Framework

7. How should FHFA evaluate the adequacy of a regulated entity's ability to assess and manage the impacts of climate and natural disaster risk, particularly in light of the significant uncertainties and data limitations?

FHFA might consider the following criteria when determining the adequacy of a regulated entity to assess and manage the impacts of climate and natural disaster risk:

- Identify the assets exposed, and how the exposure changes by peril
- Estimate the materiality of the risk relative to its capital
- Identify major drivers of risk accumulation and therefore most critical areas for mitigation efforts
- Articulate and quantify the risk mitigation or risk sharing strategies that will be most effective in the short and long term

8. What specific processes and systems of a regulated entity should FHFA examine in its supervision of the regulated entities' climate and natural disaster risk management?

FHFA should ensure that the regulated entity has a defined:

- Process established to identify assets exposed to climate and natural disaster risk
- Process for evaluating value at risk for each asset, who bears the risk (e.g., the regulated entity, its customers, the government, taxpayers), and how it is shared
- Process to track and quantify losses associated with climate and natural catastrophe events or threats
- Process to identify mitigation efforts and their efficacy (e.g., potential monetary savings)

9. How should FHFA prioritize the various climate and natural disaster risks to the regulated entities?

FHFA could consider multiple strategies for prioritizing the various risks to the regulated entities. One might be to quantify the relative risk today from different perils and identify the areas at greatest risk from either relatively infrequent, severe events like earthquakes, or more seasonal and frequent threats like hurricanes and floods. This could begin by understanding the average annual loss from specific perils in areas with high exposure concentrations and targeting those. Another could be to prioritize perils based on the relative proportion of insurance penetration or those deemed the highest risk for default. These considerations align closely with how an insurance portfolio manager manages concentration risk and peril exposure and can thus build upon existing methods and frameworks.

10. Some government programs and interventions that mitigate disaster-related credit losses at the regulated entities are not available to all mortgage market participants and may not be available to the regulated entities in the future. How, if at all, should FHFA consider current risk mitigants and their uncertain future availability in its supervision and regulation of each regulated entity's management of climate and natural disaster risk?

AIR defers to other parties with more direct expertise on this topic.

11. What risks to the regulated entities' critical service providers and other third parties— including but not limited to mortgage servicers and insurers—should FHFA consider when assessing each regulated entity's management of climate and natural disaster risk?

While it will be challenging for FHFA to assess all the counterparty risks, in many cases they will be correlated and have the potential to introduce systemic risk. For example, insurers are exposed to catastrophe risks which they seek to quantify and plan for, and mortgage providers are exposed to market and credit risks. To the extent the risk of climate and natural disaster is shared by the third parties, implicitly or explicitly, and that risk is material, it should be considered in the FHFA assessment.

A standard framework for assessing climate risks considers physical risk (e.g., damage from increasing frequency and severity of extreme events); transition risk (e.g., associated with transition to lower carbon economy) and liability risk (e.g., tort claims related to director/officer actions or inactions). The Bank of England report referenced above, among others, outlines some of the approaches available to assess counterparty risk.

12. What differences between the Enterprises and the FHLBanks should FHFA consider in tailoring its supervision and regulation of each regulated entity's management of climate and natural disaster risk?

AIR defers to other parties with more direct expertise on this topic.

13. Should FHFA implement a stress testing, scenario analysis, or similar program to assess the regulated entities' climate and natural disaster risk? If so, what factors should FHFA consider in defining the purposes, design, and scenarios of any such programs?

Stress testing (and scenario analysis) is highly effective to understand sensitivity of regulated entity capital and financial position to different types and sizes of events. It is important that the regulated entity have a way to estimate the potential loss to its assets from each scenario and contemplate different timeframes and pathways, and the respective uncertainty associated with each. FHFA should ensure that the regulated entity understands the exposed risk and loss mechanisms from the scenario. As discussed in previous sections, the data and tools are evolving and should become a part of FHFA's risk management process; FHFA can continue to monitor new developments and enhance its approach in the future.

FHFA might consider multiple time horizons, with different analysis approaches for each. The Geneva Association Paper referenced above proposes a framework which considers short-term (e.g., present to 2030) and longer term (2030-2050) horizons. In the short term, existing tools and data tuned to the current climate may be sufficient, given the slow pace of climate change year to year. Over the longer term, climate risks may become more pronounced, suggesting that a greater emphasis on climate scenarios and stress testing may be appropriate. Model and data uncertainty exist in all cases, and in the longer-term scenarios additional uncertainty arises due to potential migration, adaptation, mitigation and other factors. The uncertainty for much longer periods (2050 and beyond) may limit the utility of quantitative methods, and qualitative methods may be more appropriate.

14. Are there alternative risk mitigation strategies, including but not limited to insurance or insurance-based financial instruments, that could transfer risk from the regulated entities' portfolios or products or assist with the market pricing of climate and natural disaster risks?

There are numerous methods for transferring risk, some of which have been mentioned in previous responses. A popular method and one growing in prevalence among public entities is the issuance of catastrophe bonds. These solutions allow entities to access protection against a portion of their risk. The catastrophe bond or insurance product effectively serves as an insurance policy protecting the entity against a shock. If an event of a certain pre-defined size or loss of a given amount occurs, the sponsoring entity receives the investors' capital. If no event meeting the pre-defined conditions occurs during the duration of the bond, investors receive their investment in addition to the premium paid by the entity, or a coupon. These bonds or insurance products can be structured to trigger based on event parameters such as the earthquake moment magnitude at a given geography, the loss experienced by the sponsor, an industry loss estimate, or a modeled loss performed by a catastrophe modeler such as AIR.

15. How might the regulated entities support their housing finance missions while minimizing the impact of climate and natural disaster risk?

The regulated entities should ensure they have a thorough understanding of their portfolios and specifically strive to collect data on the assets underlying loans and mortgage-backed securities. By collecting and standardizing data collection, the entities can seek to accurately quantify the risk today, and understand the threats posed to their portfolios in the future. A robust data-driven approach to risk management should help ensure a more sustainable future for their businesses and the housing finance market.

Beyond quantifying the potential impacts of climate and natural disasters, FHFA and the regulated entities can also seek to minimize these impacts by fostering home ownership more broadly and encouraging or incentivizing good building practices and construction in lower risk areas. FHFA and the regulated entities could also contemplate encouraging managed retreat from high to lower risk areas through rate incentivization or policy.

16. Market discipline could potentially supplement FHFA's supervision and regulation of the regulated entities' climate and natural disaster risk appetite and management. Market discipline depends in part on the information that is available to shareholders, creditors, and other counterparties. Is the existing publicly available information sufficient for shareholders, creditors, CRT and other investors, and other counterparties to understand and exercise market discipline over a regulated entity's appetite for and management of climate and natural disaster risk? If not, what changes are needed? Should each regulated entity be required to disclose additional information, including but not limited to the extent to which its underwriting practices take into account climate and natural disaster risk?

FHFA should ensure the regulated entities are aligning and adhering to the emerging best practices in the market. There has been an increased awareness by some market participants and a growing focus across industries on environmental, social, and corporate governance (ESG) and the disclosure of risk. It is likely that access to disclosed information will be uneven and the data collection disjointed, at least in the short term, until methods and data mature. FHFA could establish the framework and guidelines to ensure consistent data collection and management to

enable more effective use. While these assessments are in the early stages, FHFA is well positioned to chart a robust data disclosure framework and risk management strategy to navigate the evolving risk landscape going forward.

17. What, if any, additional periodic or episodic reporting requirements for the regulated entities should FHFA consider to improve the publicly available information on the regulated entities' management of climate and natural disaster risk?

FHFA should gain an understanding of the exposed assets by type or geography and require an accumulation of exposed assets under a 100% loss scenario for each peril or across perils. Understanding additional information about the underlying assets, such as their location, outstanding loan balance, terms, and property-specific building characteristics would assist in most accurately assessing the overall riskiness of the lender's portfolio and broader vulnerabilities the regulated entities face. Regular updates of this information (e.g., on an annual basis) should be a goal. FHFA can look to the Federal Insurance Office's Terrorism industry reporting of U.S. Own Risk and Solvency Assessment (ORSA) as suitable examples.

18. Policies to manage climate and natural disaster risk could increase the cost of housing, making it more difficult for lower income households in some areas to obtain affordable housing. Are there policies the regulated entities could pursue to mitigate such adverse effects for lower income households in vulnerable areas without undermining efforts to manage climate and natural disaster risk?

The regulated entities might consider offering low interest loans or credits for specific homeowner mitigation or other steps towards increasing their resilience to shocks. On the mitigation side, this could be done similar to how insurers develop rating plans inclusive of mitigation credits. FHFA could encourage the offering of lower rates to well-mitigated properties and communities that participate in programs like the [Community Rating System \(CRS\)](#), a voluntary incentive program encouraging floodplain management above the standards required by the National Flood Insurance Program (NFIP). Finally, to ensure lower income households in vulnerable areas are not left behind, FHFA might seek to promote risk pooling across geographies or foster community-based insurance programs to cover underinsured assets.

19. Minority borrowers exhibit higher rates of delinquencies for longer durations following natural disasters. Are there policies the regulated entities could pursue to mitigate such adverse effects for minority borrowers exposed to climate and natural disaster risk?

Similar to an exposure management exercise an insurer undertakes to balance the risk to a given peril and across perils, the regulated entities could employ strategic underwriting approaches to balance riskier properties at higher rates of delinquency with those less vulnerable. The regulated entities could additionally seek to incentivize risk mitigation practices to minimize the impacts of disaster-related shocks and decrease the likelihood of default.

This concern generally parallels similar questions around the affordability of flood insurance and builds on the previously mentioned assertion that redlined communities from decades ago are in many cases those most prone to flood risk. If lenders establish a better understanding of their

exposure to risk, they should be able to take better calculated risks and mitigate the adverse effects for minority borrowers.

20. What type of organizational structures should FHFA and the regulated entities consider adopting for themselves to support the management of climate and natural disaster risk?

As mentioned in previous answers, establishing basic governance frameworks similar to those an insurance company would employ could be a good step towards effectively managing risk. The National Association of Insurance Commissioners (NAIC), for example, has established [guidance of enterprise risk management](#) and solvency surveillance frameworks that may provide a good starting point.

21. What specific issues or topics should FHFA consider for future research on climate and natural disaster risk to the regulated entities and the national housing finance markets?

First, FHFA should assess the data available today internally and with the regulated entities. In addition to ensuring adequate understanding of the geographic extent of the underlying assets, it will be important to consider the risk to those assets today from natural disasters, and the future risks posed by climate change. As mentioned previously and in the subsequent response, FHFA should promote the importance of thorough data collection and the establishment of standardized frameworks. It is important to quantify the risk before one can appropriately manage the risk, particularly in areas exposed to numerous perils. This physical risk quantification can be done in parallel to exploring the questions of equity in lending practices, lower-income and minority accessibility, and the encouragement of insurance purchasing.

22. What data or housing market information would be beneficial for FHFA to make available, to the extent permitted by privacy considerations, to researchers and other interested parties to support the assessment of climate and natural disaster risk to the regulated entities or the national housing finance markets?

Providing information on the underlying assets making up the mortgage portfolios would allow a bottom-up modeling of the risk from a range of perils and an accurate assessment of the overall risk to those portfolios. Details on the loan balances, terms, and relevant insurance coverage could be coupled with the building characteristics to best estimate the risk of default. This combination of property-specific data with an assessment of the risk posed by disasters would enable a comprehensive data-driven approach to managing the housing finance market's exposure into the future.

23. What factors should FHFA consider in determining whether to formally participate in or informally partner with organizations or groups focused on climate and natural disaster risk management?

In addition to the quantification of disaster and climate risk to the regulated entities, FHFA might consider partnerships or engagement with risk management specialists. As discussed previously, (re)insurers have been refining risk management strategies for decades, and there are numerous parallels between their considerations and those in the housing finance sector. FHFA might also explore the transferring of risk currently held by the regulated entities to reinsurers or investors via the capital markets. There are existing and emerging methods of risk

transfer that could support the coverage of default risk to mitigate the extent of shocks following large events.

24. Are there existing or potential government agencies or programs that FHFA could partner with to enhance the Agency's supervision and regulation of climate and natural disaster risk to the regulated entities?

- Federal Insurance Office (FIO) or International Association of Insurance Supervisors (IAIS)
- Federal Reserve
- FEMA
- HUD
- NAIC
- State Agencies (e.g., NYDFS)

25. What, if any, other enhancements should FHFA consider to its supervision and regulation of each regulated entity's management of climate and natural disaster risk? Other enhancements could include but need not be limited to: (i) regulatory capital requirements or other loss-absorbing capacity requirements that ensure each regulated entity has the capacity to absorb impacts of climate and natural disaster risk; (ii) disclosure requirements to provide shareholders, creditors, CRT or other investors, and other counterparties with appropriate information about a regulated entity's climate and natural disaster risk; and (iii) changes to FHFA's supervisory program to enhance examination of or reporting on each regulated entity's infrastructure and processes for identifying, assessing, mitigating, and monitoring the regulated entity's management of climate and natural disaster risk.

This list seems sufficient.

26. To what extent, if any, should FHFA support efforts to develop standards of classification and data reporting on climate and natural disaster risk to the financial performance of companies, such as those by the Sustainability Accounting Standards Board, domestic and foreign government agencies, or other

Broader data collection and adherence to established guidelines can improve risk quantification and increase investor comfort with the risk. Standard formats and frameworks should also be encouraged to promote efficiency, consistency, and common understanding.

The Task Force on Climate Related Financial Disclosure (TCFD) is among the most widely used. Many groups, including the NAIC, CDP, Sustainability Accounting Standards Board, Climate Disclosure Standards Board, and others have developed procedures, implementation guides and questionnaires aligned to the TCFD framework.