

**RMS Request for Information Notice Response**

**Climate and Natural Disaster Risk Management at the Regulated Entities**

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2.0 About RMS

RMS is a leading provider of models, software and services that help public and private entities assess, manage, and reduce their exposure to catastrophe risks across the globe. RMS’ scientific and objective measurement of risk facilitates investments needed to reduce the consequence of disasters, promoting resilient societies and sustainable economies.

RMS has shaped the world’s view of risk for over 30 years, leading the catastrophe risk industry that we helped to pioneer. With clients including 85% of the top global 40 global reinsurers, 8 of the top 10 global reinsurance intermediaries and about 75% of Lloyd’s managing agents, RMS provides the current market view of risk for global man-made and natural catastrophe perils. RMS is considered a trusted advisor to the risk management industry and is relied upon to deliver natural, manmade, and climate risk insights.

3.0 Responses to RFI NOTICE Questions

***Section 1: Identifying and Assessing Climate and Natural Disaster Risk***

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

RMS models calculate expected losses from catastrophe events caused by damage to buildings, contents, and business interruption. A catastrophe (CAT) model is the product of several building steps, including creating hazard, vulnerability, and financial modules.

RMS offers the comprehensive global model coverage across nearly 100 countries and territories and would recommend considering the full list of below perils when looking at climate and natural disaster risks.

* **Wind** – including North America hurricane, European windstorms, and typhoons / cyclones in APAC.
* **Severe convective storms risk (hail, straight line wind and tornadoes)** – in North America, Europe, and Australia
* **Winter storm (snow, ice, freeze, wind) -** in North America
* **Flood & Surge** – for the entire US, Europe, and several countries in APAC.
* **Wildfire –** in North America
* **Earthquake** – North America, Caribbean, Central and South America, Europe, APAC including Australia and New Zealand

1. ***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?***

Physical structures are exposed to risks from all climate and disaster perils we model including wind (hurricane), severe convective storm, winter storm, flood, surge, wildfire, and earthquake. The amount of risk exposed from these perils is related to many factors including the building characteristics, specific location, and amount of underlying insurance penetration. From our analysis, perils where there is under-insurance such as US earthquake and US flood risk are the largest drivers of climate and natural disaster risk to institutions with exposure to physical risks through mortgages.

If the 1906 San Francisco earthquake were to reoccur today building losses would be greater than $300 billion. Earthquake insurance penetration (particularly in California) is astoundingly low, and lenders cannot assume insurance will pick up the losses. California has two-thirds of the US earthquake risk while just one-in-ten commercial properties are insured and less than 15% of residential properties have coverage.

Based on what happened after the 1994 Northridge earthquake, we now understand the impact of a major event on a loan portfolio can happen in multiple ways. First, we see direct impacts caused by building damage. We also see secondary impacts on neighborhoods in which a significant portion of the properties are not being repaired and blight sets in leading to “ghost towns”.

Climate risks are changing, and certain areas are becoming more exposed to risks over time – storm surge particularly is an area of concern where we see a long-term increase in risk in certain areas. Flood maps used as a basis for requiring flood insurance are not always high resolution and in past events it has been shown a significant portion of loss from flood has occurred outside of floodplains. With the changing climate flood surge risk could be exacerbated and the likelihood of losses occurring outside of flood zones could increase.

To promote a resilient market, its critical to first understand and quantify current risks related to climate and disaster and to then evaluate how these risks are changing over time. Once a baseline for current risk is created, a delta for how these risks are increasing can be generated. With data about baseline risks as well as climate change risks (where they are, what perils cause this risk, and how big these risks are), policies can then be put in place to mitigate areas most at risks and monitor these risks on an ongoing basis.

1. ***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?***

To fully understand exposure to climate and disaster risks details about underlying physical exposure and locations are needed. The insurance industry has been measuring climate and disaster risks for over 30 years using catastrophe (CAT) models. CAT models are built using multiple components and are specific to each type of risk (peril) and each region. In a CAT model you start with a stochastic event set that defines the probable events that can occur. You then overlay hazard data such as windspeed or flood depth that describes the event and the type of hazard that can occur at the specific location. Finally, you apply a vulnerability function that accounts for the physical characteristics of a property and determines based on the building characteristics and the hazard at the location how much damage could likely occur. The model produces detailed loss output including a full distribution of loss. To accurately model this loss, the details of the specific location as well as assumptions around the physical characteristics of the property are needed. Data such as assumed insurance penetration can then be applied to the loss output to understand the exposure to the mortgage borrower.

Once a benchmark for the current CAT risk is understood it is possible to analyze how the loss will change under certain climate scenarios. RMS produces loss & disruption estimates from 5 to 80 years forward (in 5-year increments) based on 4 RCP scenarios (2.6, 4.5, 6.0, 8.5) and/or a 2o C increase. RMS climate change models are being built for each peril region and we have released the first wave of climate change models which includes coverage in the US.

By understanding the physical locations (addresses) of a mortgage book it is possible to run CAT models to produce both a baseline view of risk as well as a climate change view of risks.

The availability of the physical locations of a mortgage portfolio is key to accurately modeling these risks and the availability of this data can be challenging. Organizations need to consider investor privacy and in some cases the location specific data needed to accurately model physical risks are not fully disclosed.

1. ***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?***

In our experience, participants in the market have used both private and public insurance risk transfer to mitigate climate and natural disaster risks. This includes a variety of private reinsurance transactions to offset climate risks as well as public ILS transactions such as the Sierra Ltd. cat bond. <https://www.artemis.bm/news/mortgage-investor-bayview-returns-for-second-parametric-quake-cat-bond/>

1. ***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?***

As a first step, the FHFA could access the overall exposure of the regulated entities to climate and nature disaster risks. This could include starting with an initial analysis to understand exposure accumulations. Once this is done, the organizations can focus on detailed monitoring in the regions that are driving the most climate and disaster risk. A detailed analysis could take place by collecting the locations of the real estate properties in each portfolio and running portfolio level analysis using CAT models and climate change scenarios. Once an overall quantitative assessment of exposure is done, various options can be explored regarding how best to manage and mitigate these risks.

1. ***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.***

Many of our studies are done using client specific data and are confidential. If there is specific data that would be of value, we are happy to have a conversation directly with the FHFA about producing the relevant data set.

***Section 2: Enhancing FHFA’s Supervisory and Regulatory Framework***

1. ***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?***

The FHFA could make its own assessment of the risk using industry data and default assumptions where possible and make a judgement call on the overall significance of that risk. For example, RMS has available industry and exposure data sets that capture residential and commercial property exposure in the US. By using this exposure data set and applying assumptions around market share and running these over CAT and climate change models, it likely would be possible to produce estimates of exposure to climate and disaster risk for various regulated entities. Based on the output of this study, the FHFA could then make decisions around where to focus and generated more detailed risk assessments.

1. ***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?***

The FHFA could ask for a report to show that each organization understands and is able to quantify their exposure to climate and natural disaster risks. The insurance industry has been assessing and regulating CAT risks for decades and it would likely make sense for the FHFA to work with both private and public professionals in the insurance industry with a background in climate and disaster risk management to assess the practices that are used today to manage insurance risks and carry over those that are most relevant.

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

Prioritization must be assessed on multiple fronts to ensure that people and communities are not over or under impacted by regulatory actions:

* + Geography – regional differences are naturally exposed to varying natural disasters and climate risks. Focusing on areas where the risk is highest provides a starting point for each peril. This could include looking at exposure to earthquake risk on the west coast of the US and exposure to surge risks in coastal areas.
  + Population – the quantity of impacted people must be considered to understand how regulatory actions may affect large groups thus causing local financial hardships, job losses, or other economic impacts
  + Socioeconomic/Demographics – low income and vulnerable communities may often receive less protections from natural disasters or may not have the means (i.e., financial, insurance, etc.) to adequately respond/rebuild after an event
  + Financial Market Impacts – the economic impacts from regulatory actions can inflict long lasting damages (property values, tourist revenue, jobs, etc.) to local communities when climate or natural disasters policies are enforced without consideration

1. ***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?***

No RMS comment.

1. ***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?***

Risks from climate and disaster are spread across multiple providers in the mortgage industry. Wherever organizations are exposed to credit risks they are likely also exposed to climate and disaster risks. Mortgage servicers, mortgage insurers, and investors all currently hold risks associated with climate and disaster and most have not traditionally assessed this risk. At a minimum there should be an acknowledgement of these risks and an assessment of their size.

1. ***What differences between the Enterprises and the FHL Banks should FHFA consider in tailoring its supervision and regulation of each regulated entity’s management of climate and natural disaster risk?***

No RMS comment.

1. ***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?***

Yes – as a first step RMS would suggest focusing an accumulation exercise to understand the current size of the disaster and climate risks. As mentioned above, this could include starting with an initial analysis to understand what locations have exposure to various perils and once this is done, detailed analyses can be completed in the regions that are driving the most climate and disaster risk. CAT models generate results using stochastic event sets that produce full portfolio loss distributions for both the building loss and lender loss perspectives. The stochastic events are a probabilistic forward-looking view of risk. In addition, RMS models allow users to apply specific scenarios (both historic and stress) to show loss output from types of stress events. Both the stochastic loss analysis as well as the stress scenarios can be used to understand risk exposure. It is our view that using the full stochastic event set to assess risk exposure provides the most accurate view of potential loss.

1. ***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?***

Yes, by ensuring that assets included in regulated entities’ portfolios are covered by insurance, the vast majority of catastrophe risk would be removed. In these cases, insurance policies would cover the majority of any losses experienced by asset holders, meaning that they are unlikely to default on mortgages. RMS views the highest levels of uninsured risk for properties exposed to earthquake, and off-floodplain flood risks. By requiring property owners in high-risk earthquake and flood zones to obtain insurance coverage, the risk to the financial entity would be significantly reduced. The impacts to low-income communities would need to be assessed from mandatory insurance to ensure policies are not unfairly targeting groups of citizens.

Secondly financial entities can directly purchase insurance for themselves through the catastrophe bond market. These policies are designed to respond to cases where asset owners have high levels of uninsured risk and can pay-out very quickly a following catastrophe event. An example of a catastrophe bond covering Bayview Asset Management can be found [here](https://www.artemis.bm/news/mortgage-investor-bayview-lifts-second-cat-bond-target-to-200m/).

Catastrophe risk models could be used to price climate and natural disaster risks. Such models are widely used by the insurance industry to price insurance policies, and already have features that would enable financial institutions to price the risk on single properties or a portfolio of properties. These models would necessarily need to price in any owner equity, or insurance coverage purchased by the owner.

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

Regulated entities could think about pricing in climate and natural disaster risk into financing decisions. This could help entities to incentivize the financing of properties in lower risk areas, or for buildings that have construction properties that make them more resilient to catastrophic risk.

1. ***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?***

The models and data exist for shareholders, creditors, CRT, and other investors to understand and exercise market discipline in the form of catastrophe models; however, these models and data are not widely adopted by the market. RMS does not feel that there are any public sources of data that could adequately capture the catastrophic risk from natural disaster events, especially as risk to financial assets should consider presence of insurance as well as any owner equity. Other tools exist that can provide risk-scoring for individual properties; however, these tools are not sophisticated enough to appropriately quantify the risk.

More widespread adoption of catastrophe models would lead to better pricing of risk and could support better market discipline.

RMS cannot comment on the level of disclosure that regulated entities should provide.

1. ***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?***

No RMS comment.

1. ***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?***

Housing policies designed to account for climate and natural disaster risk should take a long-term view of the risk to housing. Risk quantification using catastrophe models allows for multi-year analyses, meaning that cash-outflows associated with repairs from disaster risks can be considered in any housing policy decisions. Any policy decision should be made by both considering the up-front development costs as well as financial costs of disaster over the lifetime of the project. Social implications as a consequence of project development and potential disaster impact should also be considered.

1. ***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?***

No RMS comment.

1. ***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?***

No RMS comment.

1. ***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?***

FHFA could research the impacts of climate change and the possibility that the impacts of disaster events could be exacerbated by future climate conditions.

FHFA could also research the benefits of implementing different building codes or retrofits to improve the resilience of the building stock, and how that leads to a reduction in risk for financial institutions.

***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?***

To best provide guidance on the impact of climate and natural disaster risks, organizations may benefit from:

* + Where: as much information as privacy permits to allow geolocation of the individual risks in their portfolios (coordinates, addresses….) If FHFA is only providing aggregate information, distributions/counts of risks in as high a resolution as FHFA are comfortable with (census tract).
  + What: as much information about the individual risks in an organization’s portfolio as possible (type of occupancy, type of construction, year built, number of stories, floor area, value of property, value of mortgage, year of valuation, loan to value ratio and similar information). If FHFA is only providing aggregate information, distributions/counts of risks in as high a resolution as they are comfortable with (census tract).
  + History: statistics or where/what for risks in the portfolio where loan payments were delayed due to natural perils or defaulted upon entirely. If FHFA is only providing aggregate information, distributions/counts of risks in as high a resolution as they are comfortable with (census tract).

In addition, it would be helpful to have more data on the distribution of LTV ratios at a regional level (e.g., county-level) across the U.S. It would also be interesting to have data on the distribution of building value to overall property value at a regional level.

1. ***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?***

The factors influencing how FHFA may participate with organizations focused on climate and natural disaster can include:

* + Science – what investments are the organizations making to understand today’s existing risk and how are they leveraging ever-changing and improving science to ‘predict’ the likelihood of future climatic events.
  + Industry Expertise – the complexities of the housing market due to geographic, economic, building standards, etc. require partners who understand housing sector dynamics and changing market conditions.
  + Data – accuracy in the contributing sources and modeling techniques used to produce detailed financial metrics will be the critical component of any partner focused on climate and natural disaster risk management.

1. ***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?***

FHFA mandate in terms of focus on the financial stability of the housing sector varies from many of the leading global or Us-based government agencies view of climate and natural disaster risk. Globally, many government organizations can serve as partners to help identify trends in climate, financial, and economic areas to build out the policies necessary to ensure stability to the housing market. By participating in the White House Climate Task Force, FHFA can leverage expertise from other US agencies to understand activities, data, and resources available. In addition, multi-national activities and learnings from the below organizations can serve as influential ways to leverage a growing network of global experts and partners committed to managing climate and natural disaster risk.

* + Intergovernmental Panel on Climate Change, [www.ipcc.ch](http://www.ipcc.ch)
  + United Nations Office of Disaster Risk Reduction, [www.undrr.org](http://www.undrr.org)
  + [New Zealand](https://environment.govt.nz/publications/statement-of-intent-2008-2011/operating-intentions/climate-change/) has taken a leadership role by requiring TCFD reporting across all banks to protect financial investments from future climate risks
  + Wharton Risk Center, [riskcenter.wharton.upenn.edu/](https://riskcenter.wharton.upenn.edu/)

1. ***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.***

FHFA should consider requiring entities to show that they can identify and understand their risk from natural disaster events. This could involve stress tests to simulate potential disaster outcomes, or identification of the most material perils. Entities should also be able to explain which steps, if any, that they are conducting to help reduce overall levels of risk.

1. ***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 others?***

FHFA should be aware of similar efforts from international programs such as TCFD and the Bank of England PRA stress-tests. Awareness of these programs would enable FHFA to understand the types of reporting frameworks that financial institutions globally are adopting and learning lessons from these programs to enhance any efforts supported by FHFA.