

Physical Climate Risk and Bank Credit Risk in Japan

-Lessons from the 2022 FSA–BOJ Scenario Analysis
and Recent Evidence from Granular Data-

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The views and opinions expressed in this presentation and paper are those of the speakers and do not necessarily reflect the views or positions of any entities they represent.

From Scenario Analysis to Granular Risk Measurement

1. 2022 FSA–BOJ scenario analysis

- How was physical climate risk linked to bank credit risk?
- What did the exercise reveal about data and methodological challenges?

2. Recent empirical evidence

- How can realized flood risk affect property values beyond directly inundated areas?

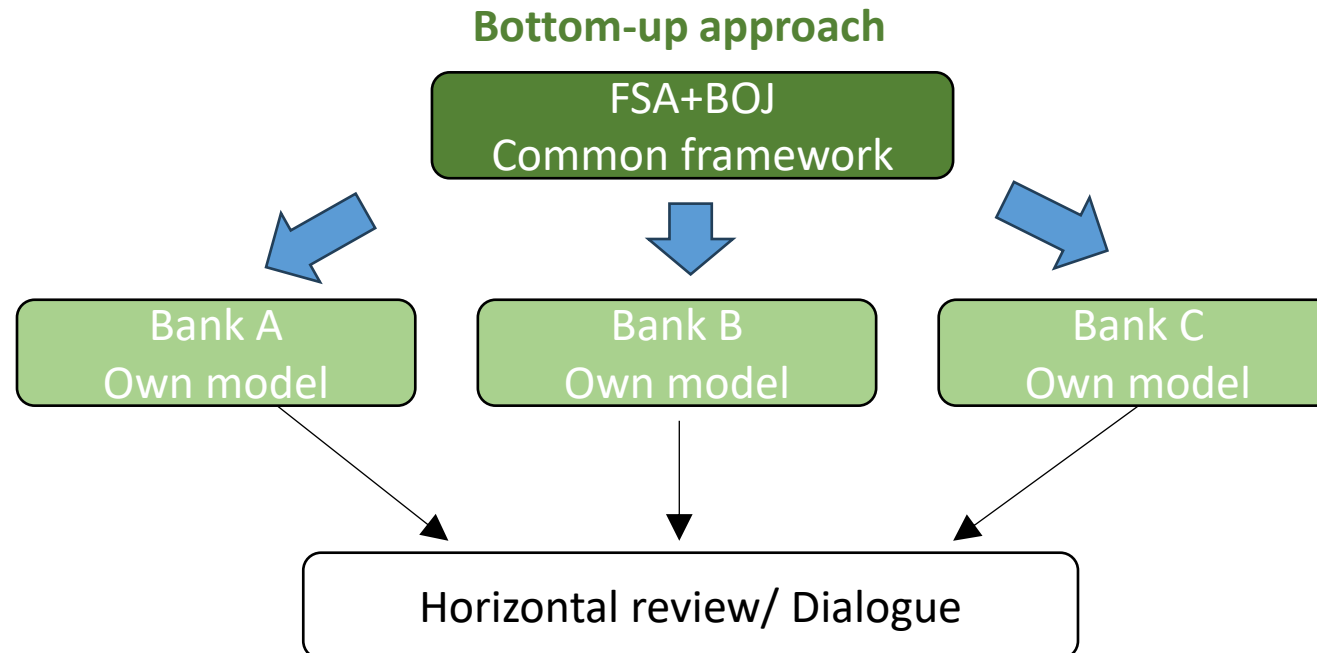
3. Implications

- What remains necessary for more granular physical-risk analysis?

The key challenge is to translate physical hazards into exposures, borrower performance, collateral values, and ultimately credit risk.

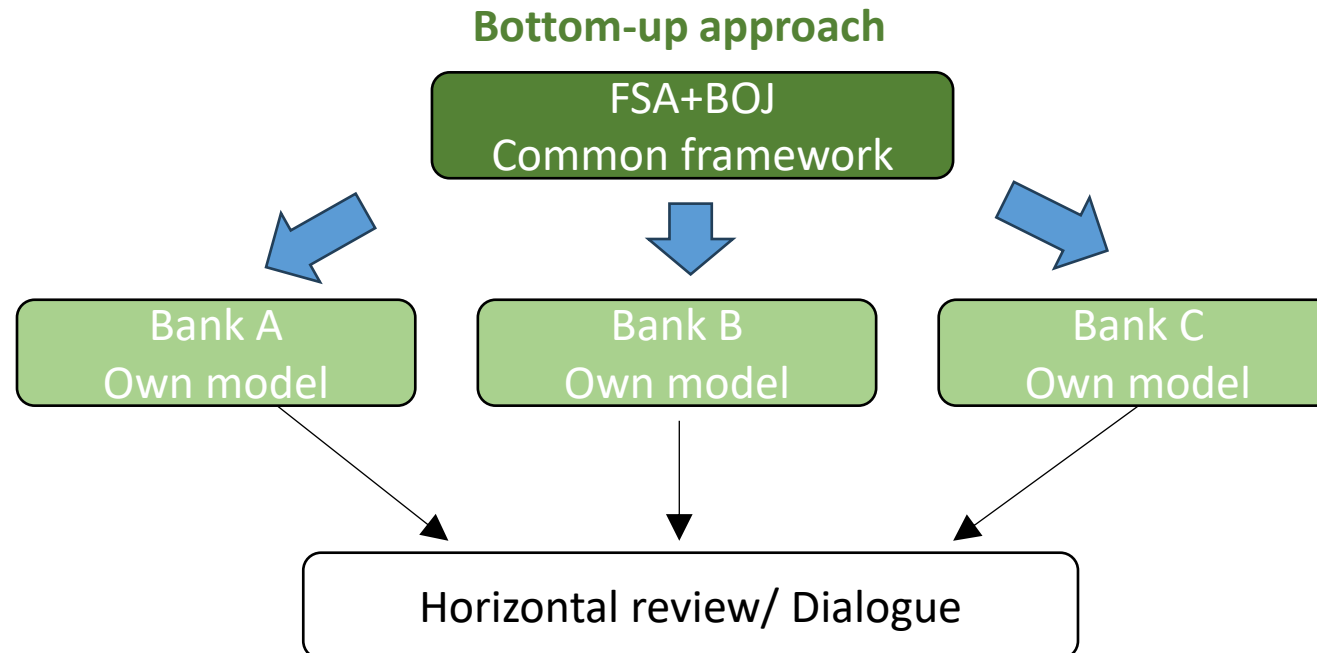
2022 Scenario Analysis

- Conducted jointly by the **Financial Services Agency (FSA)** and the **Bank of Japan (BOJ)** with three major banks and three major non-life insurance groups.
- Used **common scenarios developed by the FSA and BOJ based on NGFS scenarios**.
- Adopted a **bottom-up approach**: the authorities set the basic framework, while participating institutions used their own models.



2022 Scenario Analysis

- The exercise was **not intended to provide a definitive quantitative assessment** of climate-related risks to the financial system.
- **PURPOSE:** Identify data constraints, test analytical assumptions and methods, and clarify issues for future improvement and supervisory dialogue.



2022 Exercise Covered Both Transition and Physical Risk

Transition Risk

- Net Zero 2050 / Delayed Transition / Current Policies
- Mainly 2021–2050

Physical Risk

- **Acute physical risk**
- Net Zero 2050 vs. Current Policies
- Domestic credit exposures
- Analysis through **2050 and 2100**
- Flood damage, business interruption, and — where possible — wind damage

For the rest of this presentation, I focus on the physical-risk component.

Physical Risk: Focus on Acute Flood Risk

Physical risk is generally categorized into:

- **Acute risk:** severe natural disasters such as floods and typhoons
- **Chronic risk:** gradual changes in temperature, precipitation, and sea level

Our analysis for the banks mainly focused on **acute physical risk**.

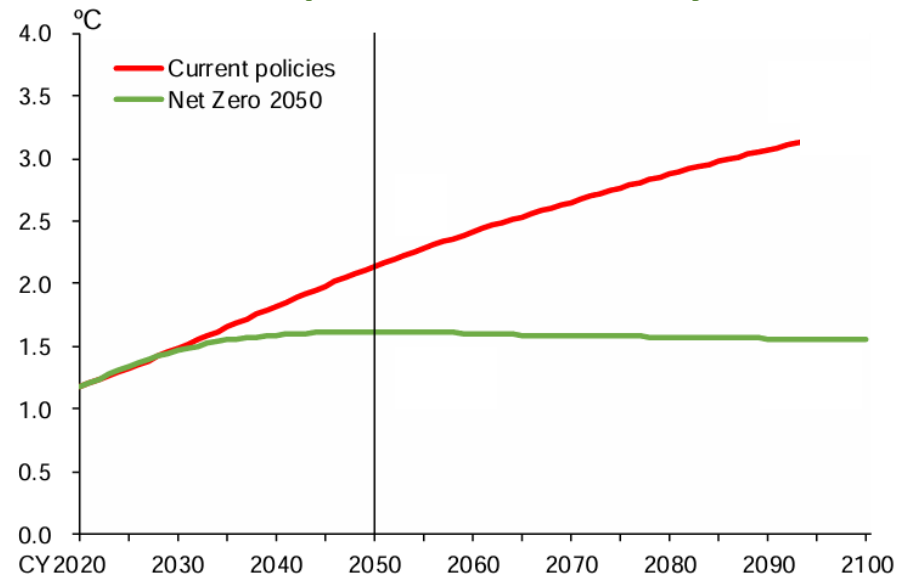
Why flood analysis was central

- Borrower and collateral **locations** could be **linked to available flood hazard information**.
- **Existing flood hazard maps** and **other geographic information** provided relatively granular information on local flood risk.
- The NGFS scenarios provided broader climate and socioeconomic pathways, but not granular, location-specific flood hazard information.

Why Does the Physical-Risk Horizon Extend to 2100?

- The analysis compared the **Net Zero 2050** and **Current Policies** scenarios.
- By 2050, the difference in global mean temperature between the two scenarios remained relatively limited, but it widened substantially in the second half of the century.
- An analysis ending in 2050 may therefore understate the contrast in acute physical risk across scenarios.

Global mean temperature increase by scenario



Source: Pilot Scenario Analysis Exercise on Climate-Related Risks Based on Common Scenarios (FSA and BOJ, 2022)

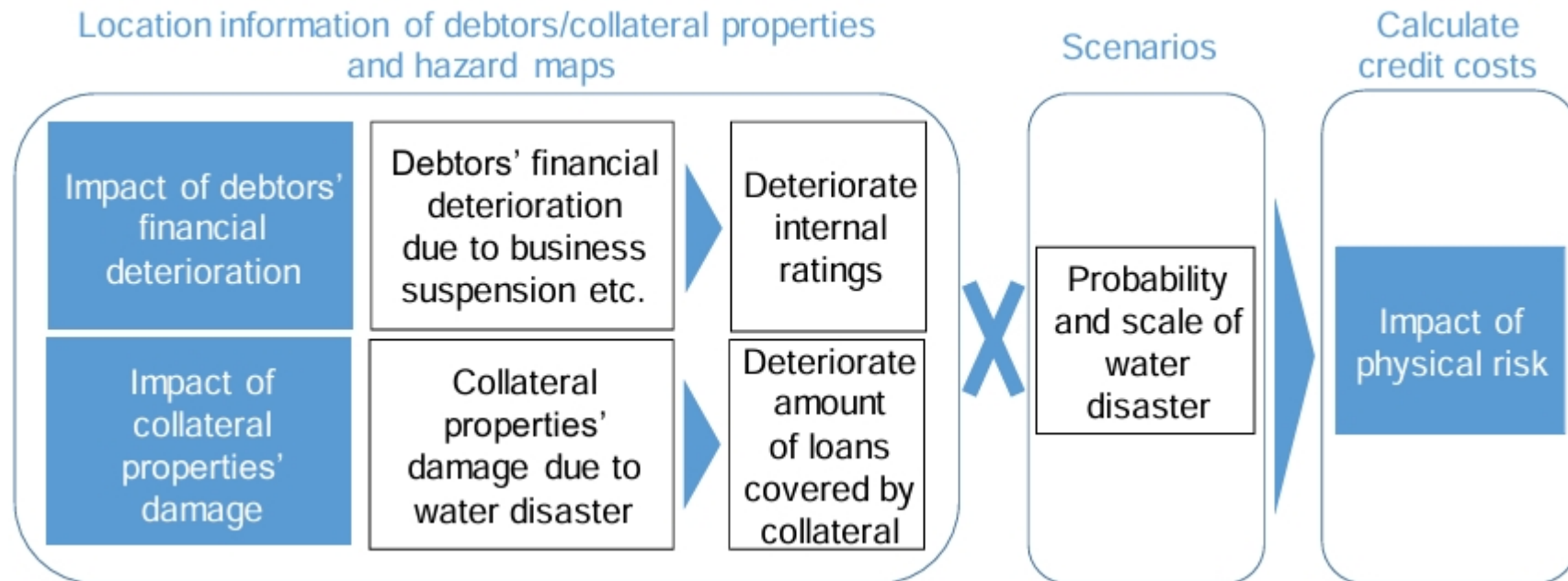
Translating Flood Risk into Bank Credit Risk

1. Borrower channel

- Flood → business interruption → deterioration in borrower financials → rating downgrade → higher credit cost

2. Collateral channel

- Flood → collateral damage → lower collateral coverage → higher loss exposure



Source: Pilot Scenario Analysis Exercise on Climate-Related Risks Based on Common Scenarios (FSA and BOJ, 2022)

Physical damage must be translated into financial variables before into credit risk. 8

What Did the Exercise Find?

1. Business interruption was the main transmission channel

- **Estimated credit-cost increases were driven mainly by business disruptions, with a smaller contribution from damage to collateral.**

2. The horizon materially affected the estimates

- **Average annual increases in estimated physical-risk credit costs through 2100 were substantially larger than those through 2050.**

3. Portfolio geography mattered

- **For one participating bank, credit cost increases tended to be higher in large cities with concentrated exposures.**

Results depended on bank-specific models and assumptions and were not a definitive system-wide loss estimate.

Key Challenges Identified by the Exercise

1. Granular exposure data

- Head-office information alone may not identify the locations that actually drive business interruption.
- Information on **important business facilities** may be insufficient.

2. Model and assumption dependence

- Results varied with analytical models, variables, and bank-specific assumptions.
- Greater **comparability across banks** would facilitate horizontal review and improve the understanding of scenario-analysis results.

Physical-risk analysis requires a consistent link between hazard, exposure location, vulnerability, and financial outcomes.

— **How granular does “location” need to be? —**

2026 BOJ WP: What Happens Beyond the Flooded Area?

Maruyama et al. (2026), “Beyond the Floodplain”

- Studies the effect of **Typhoon Hagibis (2019)** on official land prices.
- Combines granular land-price observations with **inundation maps and hazard-map information**.
- Compares directly inundated parcels with nearby, non-inundated parcels.
- Asks whether price effects extend **beyond the physical inundation boundary**.

Why it matters here

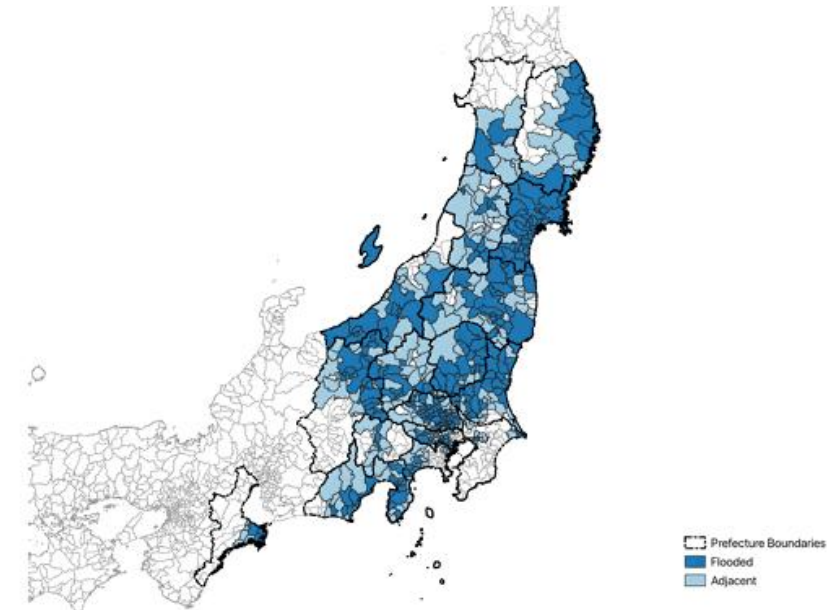
- The paper provides empirical evidence on the location and valuation channel highlighted by our scenario analysis.

2026 BOJ WP: What Happens Beyond the Flooded Area?

Maruyama et al. (2026), “Beyond the Floodplain”

- Examines the effect of **Typhoon Hagibis (2019)** on land prices.
- Combines parcel-level land-price data with **inundation maps and hazard-map information**.
- Compares inundated parcels with nearby non-inundated parcels.
- Asks whether price effects extend **beyond the physical inundation boundary**.
- Provides empirical evidence on how flood risk affects land values and how these effects extend beyond inundated areas

Typhoon Hagibis: Flooded and Adjacent Areas



Source: Beyond the Floodplain : Uncovering the Spatial Spillovers of Land Price Declines after Typhoon Hagibis (Maruyama et al.,2022)

From Scenario Analysis to Granular Risk Measurement

Direct effect

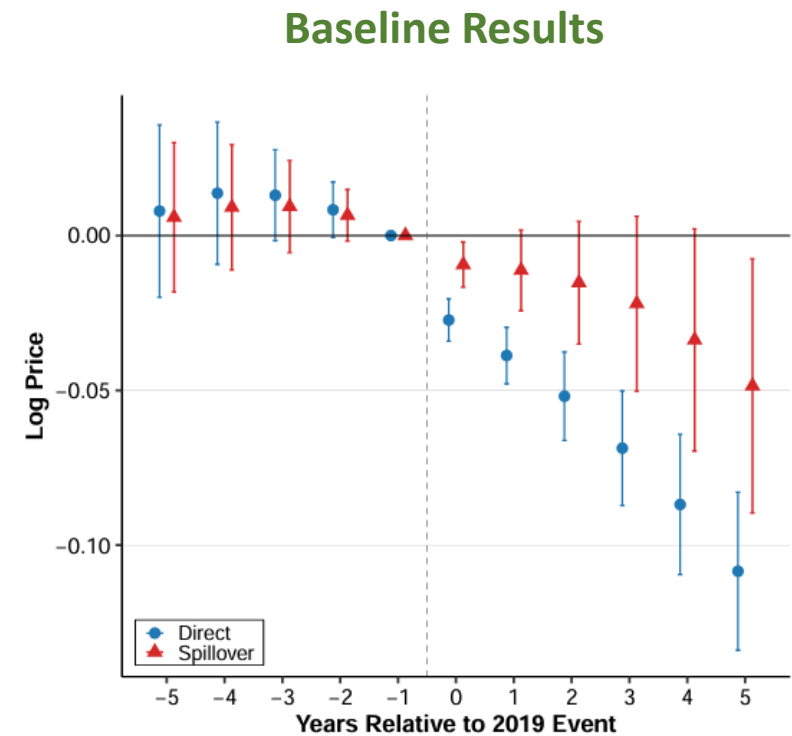
- Land prices in directly inundated areas declined persistently, **falling by about 10 percent after five years.**

Spatial spillover

- Non-inundated parcels within 100 meters of the flood boundary also experienced a **decline of roughly 5 percent.**

Distance

- The paper finds negative effects beyond the inundation boundary, with the spatial effect fading at greater distances.



Source: Beyond the Floodplain : Uncovering the Spatial Spillovers of Land Price Declines after Typhoon Hagibis (Maruyama, Nakamura, Shirai, and Sudo, 2026)