Quantifying Weather Controllability and Mitigatable Flood Damage Based on Ensemble Weather Forecast

R&D Theme

Economic Damage Research Team : Estimation of Economic Damage Reduction Effect

Progress until FY2022

1. Outline of the project

The goal of this R&D theme is to develop a technique for estimating the amount of damage caused by floods throughout Japan to calculate the economic damage reduction by controlling the weather. Utilizing government stats and commercial databases, we will develop a new damage estimation model for estimating the amount of direct damages to residential and business properties, as well as the amount of indirect losses and affected population due to suspension of operations. Using the developed model, we seek to calculate damage risks for weather forecasts with and without weather control and to quantify the damage reduction effects.

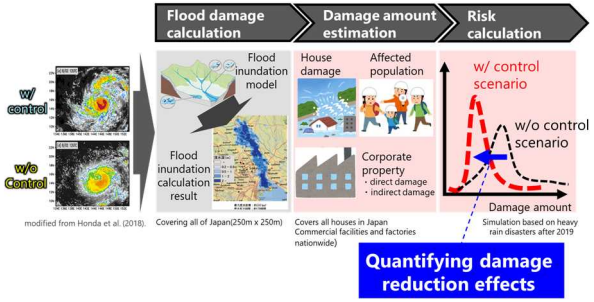

Fig.1 Flow of quantifying damage reduction effect by weather control

Development items include the following
- Creation of exposure data
- Development of damage functions
- Estimating flood damage with ensemble data

2. Outcome so far

[Creation of exposure data]

We built an exposure database for entire Japan, covering the affected population and residential properties. The data used were government statistical information (census data, housing land stats, and housing starts stats) and insurance stats information published by General Insurance Rating Organization of Japan.

- We identified the number of houses and structural classification from housing and land stats, and estimated value of buildings/houses based on construction costs obtained from housing start statistics
- We estimated the value of household goods based on the amount insured for each residential property.

Identified or inferred attribute information is sorted by city, ward, and county.

[Development of damage functions]

For the exposure database mentioned above, we have started creating damage functions to estimate flood damage. A damage function, which is constructed using statistical techniques based on historical damage data or engineering damage assumptions and simulations, expresses the link between the degree of damage and hazard intensity. We also gather official damage data, such as the Fire and Disaster Management Agency's Disaster Information and the MILT's Flood Damage Statistics Survey, in order to explain the precise damage affected by previous floods.

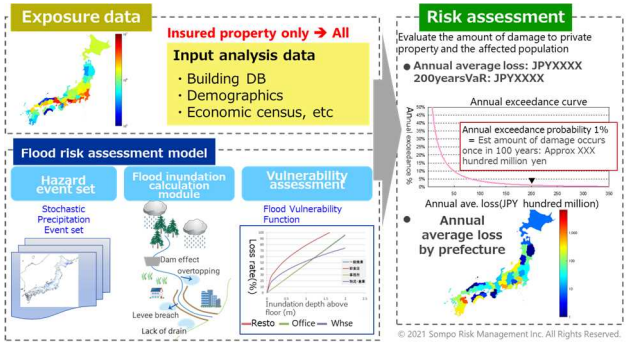

Fig.2 Elements and flow required for damage estimation

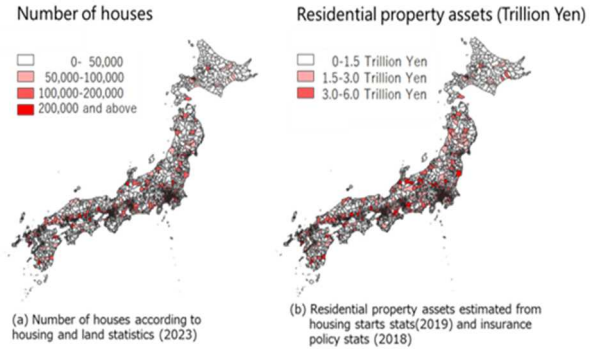

Fig.3 Number of houses and residential property Assets, from e-Stat

3. Future plans

In the future, we promote the development of an exposure database for indirect losses due to the downtime of commercial properties, and we also refer to insurance claims databases for further development of damage functions. Future work will quantify the impact of damage reduction, and evaluate the risk of damage for weather forecasts with and without weather control using the developed damage function.