

Assessing coastal disaster risk combined with socio-demographic factors toward disaster risk reduction under future scenarios in Japan

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Coastal areas are regularly affected by multiple disasters due to increased exposure of people through intensive urbanization and concentration of population. Center for Research on the Epidemiology of Disasters reported natural disaster caused 262 billion dollars as economic loss and 538 thousand affected people all over the world in 2019. To prepare for future disaster risk under climate and socio-economical change, there is an urgent need for a research assessing potential disaster risk combined with exposure and vulnerability. Here we demonstrate assessing multiple coastal disaster risk under future scenarios toward an effective management at nation-wide scale.

Here we assumed beach loss and inundation area as major hazard. Exposure to the hazard was assessed by population density and intensity of urbanization, coupled with the natural coast rate as vulnerability. For scenario analyses, we adopted several hypotheses (representative concentration pathways, resilience on natural capitals, demographic distribution pattern) to represent future threats on coastal environment in Japan. Based on these future threats, we assessed the cumulative disaster risk on the coast at a 1 km resolution and systematically selected the sites with the higher disaster risk.

Our results showed spatial variations of disaster risk in Japan under the different future scenarios. Throughout the scenarios, the surroundings of megacities such as Tokyo, Nagoya and Osaka had the relatively higher disaster risk due to their higher exposure to hazard, while the western parts such as Shikoku and Kyushu had lower risk despite larger beach loss. Comparing these assessed areas to the distributions of endangered aquatic species, some of them seemed to be overlapped under a population centralized scenario. On the other hand, comparing to some recreational areas such as diving spots and beaches, we could find some gaps around the western islands and Kii peninsula with popular recreational areas. Although they were evaluated the lower disaster risk owing to lower demographic exposure to hazard, their economic loss caused by disaster may not be acceptable. These results implied the necessity for assessment that reflects regional different goals. Further study of the conflicts and synergies among services from the viewpoint of various targets would be beneficial to propose an integrated adaptive management strategy under future scenarios.

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