Multilateral Perspective on an Interdisciplinary Framework for Flood Forecasting and Flood Risk Projection: A Comparative Pilot Study

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The Sendai Framework emphasizes the importance of “geospatial and space-based technologies and related services and maintaining and strengthening in-situ and remotely-sensed earth and climate observations” to support national measures for understanding disaster risk and successful disaster risk communication. Moreover, the creation of an improved intergovernmental platform and an interdisciplinary framework is an urgent priority for flood risk reduction in a large river basin. In line with these efforts, the International Centre for Water Hazard and Risk Management (ICHARM under the auspices of UNESCO) has been supporting to provide useful tools such as advanced remote sensing and hydrological model simulations.

In the beginning of a collaborative research project undertaken by Japan, Bangladesh and the Czech Republic, we addressed the necessity of collaboration in the mutual exchange of technical knowledge and skills, including evidence-based data sharing, focusing on disaster risk management and reduction. We also introduced the quantitative assessment of river flood risk with climate and socioeconomic scenarios, representative concentration pathways emissions and shared socioeconomic pathways. The main purpose of the multilateral research was to propose a new interdisciplinary and international framework with an improved forecasting model and a scenario-based projection procedure, including the use of local and global data, for enhancing disaster preparedness of two pilot countries, Bangladesh and the Czech Republic. This new framework was designed to reveal river flood risk through grid-based model simulation with any grid scale. It was applied to three standard operational forecasting schemes focused on respective thematic priorities: (1) The improvement of flood inundation maps (i.e., maps with discharge, depth, velocity) using the results from a rainfall runoff inundation model with in-situ data (rain-gauge and water level) after the validation of inundation with Earth Observation data, i.e., SAR and optical images; (2) advanced flood forecasting using radar- and satellite-observed rainfall currently used for nationwide hydrological observation and for evaluating the level of flood risk; (3) potential economic impact along with the effect of flood hazard and risk. The framework was also applied to three nationwide projection schemes on the same priorities.

With this comparative pilot study on the two representative countries, the preliminary empirical examinations showed the possibility of quantifying nationwide risk despite different complexities. Major risk factors and the magnitude of risk change can be estimated using the interdisciplinary approach and should be investigated to understand local flood risk due to strong regional variability and characteristics such as extreme rainfall and simulated inundation area of a 50-year return period flood.

Keywords: Interdisciplinary framework, Nationwide flood risk, Flood forecasting

