

## Local and global Activity to contribute the Sendai Framework for Disaster Risk Reduction

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The Sendai Framework for Disaster Risk Reduction (SFDRR) 2015-2030, the successor instrument to the Hyogo Framework for Action (HFA) 2005-2015: Building the Resilience of Nations and Communities to Disasters, was adopted at the Third UN World Conference on Disaster Risk Reduction in Sendai, Japan, on March 18, 2015. The SFDRR outlines seven clear targets and four priorities for action to prevent new and reduce existing disaster risks: (i) Understanding disaster risk; (ii) Strengthening disaster risk governance to manage disaster risk; (iii) Investing in disaster reduction for resilience and; (iv) Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction. They aim to achieve the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries over the next 15 years. The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries.

The group of rounding table for DRR in Miyagi was started in April 2015 just after the UN world conference for DRR to enhance the collaboration among, members of academia, government, private, citizen and mass media and to share the information of each activity once a month. International Research Institute of Disaster Science (IRIDeS), Tohoku University and the office of Sendai city jointly organize the series of lectures in 2016 to understand what is the SFDRR and how we can contribute for it for students, people including workshop for future activities. And statistics. The Global Centre for Disaster Statistic (GGCDS) was established in April 2015. The GCDS creates a unique collaboration among United Nations organizations and other disaster risk reduction (DRR) related institutions, centering on collaboration with the United Nations Development Programme (UNDP). The purpose of the Centre is to support countries to manage disaster risks in their country and contribute to international process on DRR. The GCDS has developed a database on statistical data concerning the Great East Japan Earthquake and Tsunami, hoping that the lessons from the catastrophic disaster will be spread across the world.

キーワード：防災・減災、円卓会議、防災啓発、災害統計

Keywords: Disaster Risk Reduction, rounding table, awareness and public education, Disaster Statistic



# NIED Observation Network for Earthquake, Tsunami and Volcano and Contribution to Disaster Resilience

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The Sendai Framework for Disaster Risk Reduction 2015-2030 was adopted at the Third World Conference on Disaster Risk Reduction held in March 2015. In the framework, priorities for action were addressed to reduce disaster risk and loss for next 15 years. Understanding disaster risk is written as the first priority with the following sentence: To achieve this, it is important for the national and local levels to promote the collection, analysis, management and use of relevant data and practical information. Considering the above action, this presentation will introduce the NIED observation network for earthquake, tsunami, and volcano that is integrally expanded to the land and offshore regions, and use and application of the data.

Based on the lessons learned from the 1995 Kobe earthquake and the 2011 Tohoku-Oki earthquake and tsunami, observation system is essential to obtain the accurate and rapid information for seismic intensity as well as tsunami height and inundation. As the preparedness for forthcoming earthquakes concerned in the Tokyo metropolitan area and along the Nankai Trough as well as volcanos, NIED established the nationwide observation network with more than 2000 stations that covers the land and offshore regions. This unique network consists of various measures to capture diversity of natural phenomena from damaging strong ground motions toward very small earthquake signals, and wave propagation from the other side of the Earth. Various measures are also seen in the observation wells reaching 3500 m in depth, sensors at the dead-end tunnels longer than 50 m, and seismometer and pressure gauge installed along the ocean bottom cable longer than 6000 km along the Japan Trench and the Nankai Trough. Most observation data are open to the worldwide users for disaster resilience and related research. As familiar examples, the data are provided in realtime to the Japan Meteorological Agency for utilization of earthquake early warning and tsunami warning. These observation data are also used for seismic and tsunami hazard assessment such as the National Seismic Hazard Maps in Japan at the national (e.g., the Cabinet Office and the Headquarter of Earthquake Research Promotion) and local government levels. Furthermore, the realtime observation data are used for rapid estimation of disaster. NIED developed and operates test runs J-RISQ (Japan Real-time Information System for earthQuake), in which the number of collapsed building with a resolution of 250 m mesh size were estimated in a few minutes after the 2016 Kumamoto earthquake. The observation data and analyzed information are applied for facilitating the disaster response, and NIED operates crisis response portal sites to disseminate disaster information via websites immediately after the disaster.

In last decades, according to the improvement of observation technology, nationwide dense observation network data are available in realtime with a delay of sub seconds. Utilizing the data are expected to improve seismic and tsunami hazard assessment, disaster risk estimation, managing disaster response and relief activities, and effective recovery from the damage.

キーワード：地震津波火山観測

Keywords: Observation Network for Earthquake, Tsunami and Volcano

## Activities of Japanese Government Committees related to Earthquake Research

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After major devastating earthquakes, the Japanese government has set up committees to promote seismological research and to reduce future earthquake damage. I will review the activities of current government committees related to earthquake research. Two committees, Coordination Committee for Earthquake Prediction (CCEP) and Earthquake Assessment Committee (EAC) for Areas under Intensified Measures against Earthquake Disaster have made efforts to assess possible precursors for large earthquakes with particular emphasize in Tokai region, but such short-term deterministic prediction is now considered difficult in the seismological community. The Headquarters of Earthquake Research Promotion (HERP), established after the 1995 Kobe earthquake, promoted to expand the geophysical observation network, made long-term and probabilistic forecast of earthquakes on active faults and subductions zones, predicted strong ground motion from such earthquakes, and made national seismic hazard maps including probabilistic estimation of ground motion. Earthquake Research Committee (ERC) under HERP made long-term forecast and ground motion prediction for Futagawa/Hinagu faults before the 2016 Kumamoto earthquake, but the results were not fully utilized by local governments or general public to prepare for potential earthquake. Central Disaster Management Council (CDMC) under Cabinet Office has estimated the maximum possible earthquakes along the Nankai Trough and around the Tokyo metropolitan area, estimated the building, human and economic losses from such earthquakes, and made policies to reduce such damage.

キーワード：地震

Keywords: earthquake

## 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 (ICARM 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

## A Modeling Framework for Inland Flood Risk Assessment in Japan

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Flooding has been the most frequent natural disaster that claims lives and imposes significant economic losses to human societies worldwide. Japan, with an annual rainfall of up to 4000 mm is extremely vulnerable to inland flooding with over ¥300bn average annual loss, 60% of which is from Tropical Cyclone(TC) flooding and 40% from non-TC flooding. The focus of this research is to develop: (i) a detailed flood hazard model for Japan, (ii) a vulnerability module that captures damageability of Japan's built environment to flooding, and (iii) an industry exposure data set that has Japan's entire building stock modeled at a very granular resolution.

The flood hazard component consists of three building blocks: (a) a stochastic precipitation model that simulates TC and non-TC precipitation separately and blends the two model outputs in a 10K samples of continuous annual precipitation over Japan, (b) a hydrologic model that takes the precipitation as an input and produces a 10K catalog of extreme peak flows and runoffs and (c) a hydraulic model that transforms the river peak flows to flood depths for each event in the catalog. The hazard component is heavily validated with most of the available meteorological, hydrological and flood map data for Japan.

The vulnerability module consists of functional relationships, also referred to as damage functions that relate hazard intensity to damage in terms of the so called damage ratio - the ratio between loss and replacement value. Damage functions are built separately for building, content and business interruption related losses and for each building construction type, height, occupancy, etc. Once the entire family of damage functions is available, the magnitude of the hazard extracted from the stochastic catalog at each instant in time and at each specific location is linked to a loss estimated as the damage ratio times each building components' replacement value. Finally, all losses in a portfolio are aggregated at different spatial and temporal scales to provide a complete view of risk to the portfolio. To better validate the risk at a country level, an industry exposure database is developed that ultimately represent all potentially affected properties and provides means for assessing the risk for the entire flood insurance industry. The view of risk at prefecture and country level is intensively validated with loss data from major insurance companies and all available government sources.

Keywords: flood risk assessment, property loss estimation

## Improvement of Emergency Response Preparedness for Natural Disasters using Mobile Phone Application

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Rescue work during a disaster is highly affected due to lack of real time information available for rescuers, victims and decision makers. During rescue operations, availability of real-time information on a portable device would prove useful for collecting important data. In present research work, an application has been proposed which has been developed and tested as a GIS-based mobile application on the Android platform with disaster specific software modules. This mobile application is expected to be useful for disaster management teams during the rescue operations for better co-ordination and information exchange. A formal interview and discussions with officials from NDRF (National Disaster Response Force, Govt, of India) helped form an understanding, envisage requirements for the application.

The application titled “BhuNak” (Bhu: Sanskrit word meaning Earth; Nak short for *Naksha* meaning map) exhibits Emergency/Distress Call, Reporting System, Disaster Alerts and Geovisualization as its key features. The application allows field data reporting, sending geo-location SMS, viewing and retrieving weather and location information on the mobile device. The application has been tested for usability, time consumption and accuracy in different field and network availability conditions. BhuNak also has facilities of offline saving of dataset and sending it when communication links are available. Functionalities of the application are designed to successfully address all the phases of disaster. All the data shared between Victims and Rescuers are being saved in central server for data analysis. Decision maker can act as per the situation, can set the priorities and send real time messages and information to rescuers, victims and other agencies like hospitals, police NGOs etc.

Keywords: Disaster Management, Mobile Technology, GIS, Offline data sharing, Geovisualization

**BhuNak Mobile Application**

