Project leaders

Nobuhito Mori (Kyoto University), Mohammad Farid (Bandung Institute of Technology)

Theme 1 : Coastal Monitoring Theme leaders

Nobuhito Mori (Kyoto University)
Professor and Vice-director of Disaster Prevention Research Institute (DPRI), Kyoto University. Honorary Professor, Swansea University, UK.

Mohammad Farid (Bandung Institute of Technology)
Assistant Professor of Faculty of Civil and Environmental Engineering (FTSL), Institut Teknologi Bandung (ITB).

Theme 2 : Multi-hazard modeling Theme leaders

Anawat Suppasri (Tohoku University)
Associate Professor of Tsunami Engineering Laboratory at IRIDeS, Tohoku University.

Abdul Muhari (National Disaster Management Agency)
Head of Center for Data, Information and Disaster Communications (National Disaster Management Agency, BNPB)

Theme 3 : Green infrastructures Theme leaders

Kojiro Suzuki (Port and Airport Research Institute)
Director of Department, Coastal Hydraulic Engineering Department, National Institute of Maritime, Port and Aviation Technology, Port and Airport Research Institute (PARI)

Djati Mardiatno (Gadjah Mada University)
Scientific Board of Disaster Research Centre (PSBA) Universitas Gadjah Mada (UGM) Yogyakarta.

Theme 4 : Consensus building Regional co-creation Theme leaders

Taro Arikawa (Chuo University)
Professor of Coastal Engineering Laboratory at Chuo University.

Dicky Pelupessy (University of Indonesia)
Vice Secretary General of Indonesia Disaster Expert Association (IABI), Chair of Indonesia Society for Disaster Management (MPBI), Member of Expert Panel of Disaster Risk Reduction Center (DRRC) University of Indonesia.

Other support members

Adi Prasetyo (PUPR), Tomohiro Yasuda (Kansai University), Takuya Miyashita (Kyoto University), Syamsidik (USK), Widjo Kongko (BRIN), Gusti Ayu Ketut Surtiari (BRIN), Yuichi Ono (Tohoku University), Daisuke Sasaki (Tohoku University, Chuo University), Shigeru Kato (Toyohashi University of Technology), Masaya Toyoda (Toyohashi University of Technology), Ikuo Abe (Tokoha University)

Toyohashi Tech

常葉大学

Japan Science and Technology Agency

Japan International Cooperation Agency

SATREPS
Science and Technology Research Partnership for Sustainable Development Program

Contact

SATREPS Indonesia BRICC

Project Office
〒611-0011 Gokasho, Uji, Kyoto, Disaster Prevention Research Institute, Kyoto University
URL : https://www.coast.dpri.kyoto-u.ac.jp/satreps_bricc/
E-mail : satreps@oceanwave.jp

SATREPS Indonesia BRICC
2022 – 2026

Outlines

The **Building Sustainable System for Resilience and Innovation in Coastal Community (BRICC) project** (2022-2026) aims for the safety and sustainable development of Indonesian coasts. The project consists of four themes.

1) Coastal monitoring
   Development of monitoring techniques for coastal hydrodynamics, sandy beaches and mangrove forests.
2) Multi-hazard assessment
   Development of methods and assessment for waves, tsunamis and floods.
3) Nature-based solution/Eco-Disaster Risk Reduction (DRR)
   Development of disaster mitigation functions of mangroves and sandy beaches against natural hazards combining grey infrastructure.
4) Build an integrated platform for technology
   Establishment of environmental education and eco-tourism to promote maintenance of green infrastructure, systematization of evacuation planning and education in the hinterland, and consensus building methods based on these methods.

Major target sites are Bali, Ambon and the East Kalimantan

Backgrounds

In recent years, the world has been experiencing frequent and unexpected natural disasters such as heavy rainfall, storm surges, storm waves due to climate change, and tsunamis associated with huge earthquakes. The 2019 Intergovernmental Panel on Climate Change (IPCC) Special Report on the Ocean and Cryosphere (SROCC) and the 2021 Sixth Assessment Report (AR6), in particular, Sea-level rise projections under the high-end greenhouse gas emissions scenario (SSP585) have been revised upward to the upper side to 1.1 m at the end of the century, and future changes in waves and storm surges are reported to have serious impacts on coastal vulnerability. Under these circumstances, it is feared that high waves and storm surges and tsunamis will become a serious challenge in Southeast Asian and South Pacific countries.

Coastal areas are not only the economic base for industry, fisheries, and tourism, but also the foundation for housing, recreation, and other aspects of life, taking advantage of the flat land and rich natural environment. Therefore, it is an internationally important issue to resolve the trade-off between a comfortable society in normal times and a safe and secure society in emergencies against possible natural disasters in the future. Therefore, there is an urgent necessity to establish harmonic coastal defense technologies that aim at the best mix of assessing the intensity of coastal disasters such as storm waves, storm surges, sea-level rise, and tsunamis, reducing vulnerability by constructing defense systems, and maintaining and creating environmental resources in harmony with nature and with local characteristics.

Current situation in Indonesia

Indonesia is a coastal and maritime country consisting of 13,466 islands and has the world' s second longest coastline of approximately 54,000 km. However, protection against natural disasters is insufficient, and in addition to long-term and widespread coastal erosion, recent climate change has increased the vulnerability of coastal areas due to frequent flooding and predicted sea level rise.

In this context, there is a strong need to preserve coastal areas in a way that balances disaster prevention, the environment, and the economy. One example is the measures taken against the earthquake and tsunami in Sulawesi that occurred in 2018. Here, the development of the backlands has been promoted in consideration of the balance between residents who do not want too high embankments and disaster prevention functions such as breakwaters, and it is expected that this kind of initiative will be deployed throughout Indonesia. Coastal erosion caused by high waves is also a major problem in the preservation of coastal areas. In particular, coastal erosion is severe in Sumatra and Bali, where 20% of the coastline is being eroded. In Bali, JICA' s "Bali Coastal Conservation Project" is underway in two phases. In the evaluation of the project in Phase 1, the need for regular monitoring and adaptive management was identified as an issue. Furthermore, the decrease of mangrove forests due to logging, etc. has become more pronounced, leading to further degradation of the disaster mitigation function. Therefore, scientific support for monitoring, erosion mechanism elucidation, long-term forecasting, and erosion countermeasures is considered essential.

Targets of project

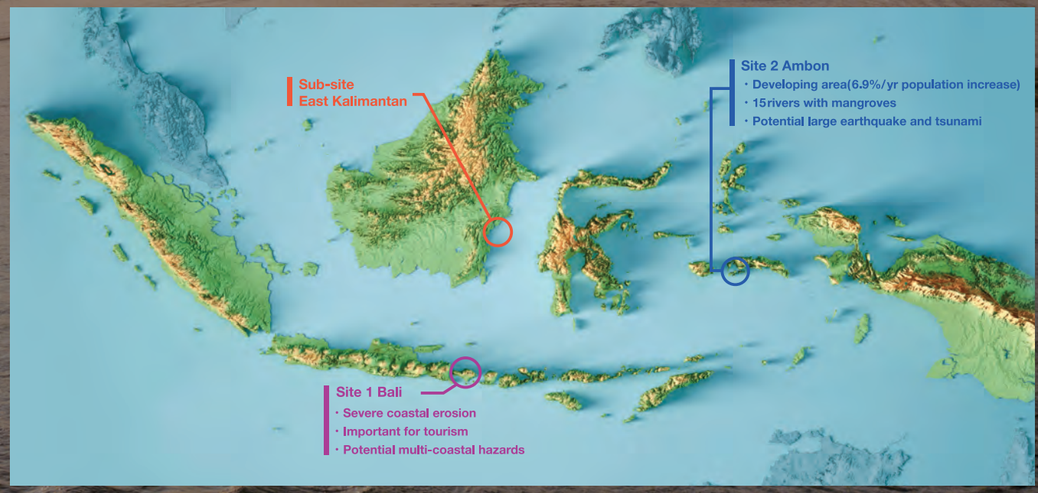
In this project, we will develop a method to improve the defense function of coastal areas based on the latest scientific evidence such as monitoring, modeling, and green infrastructure, and to transfer the monitoring network and analysis technology using the latest technology to improve the defense function of coastal areas in harmony with disaster prevention, environment, and economy. The objective is to realize social implementation of creation in 5 to 10 years. As social implementation based on this scientific data, we will attempt to build a platform for consensus building, and these results will contribute to the realization of a "super-smart society," which is the fusion of cyber and physical space, as a fundamental technology in Japan's 5th Science and Technology Basic Plan.

In order to realize the objectives, this project aims to develop the following three research projects:

1) Transfer of wave observation technology in coastal areas of Indonesia, development of monitoring technology for sandy beaches and mangrove forests.
2) Construction of multi-hazard evaluation methods for waves, tsunamis and floods.
3) Disaster mitigation functions by mangroves and sandy beaches against waves, tsunamis, and floods.
4) Establishment of environmental education and eco-tourism to promote maintenance and management of green infrastructure, systematization of evacuation planning and education for backlands areas,
   and consensus building methods based on these four issues. Build an integrated platform for coastal defense technologies.

Concept

Research sites



Realtime and long-term coastal hydrodynamics and morphology monitoring

Theme 1

►Theme leaders

From Japan

Nobuhito Mori

(Kyoto University)

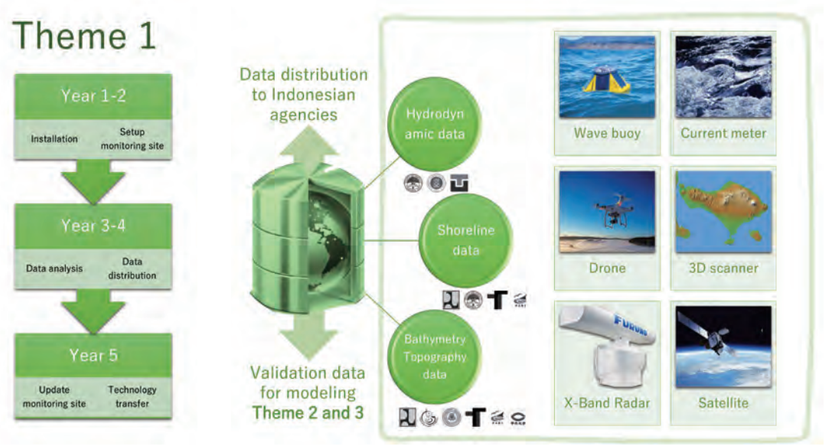
From Indonesia

Mohammad Farid

(Bandung Institute of Technology)

We will construct monitoring bases for waves, beach deformation, etc., and analyze observation data for hazard modeling. In the construction of monitoring bases, natural beaches and beaches where beach nourishment is conducted (nourishing beaches) are selected as model sites, and monitoring bases for waves and beach deformation are constructed. The three goals of this research group are as follows.

- To introduce the latest GPS wave buoys and ultrasonic current meters to the coastal area, and to develop a wave and coastal current monitoring system using these devices, and to establish a monitoring site.
- Development of a real-time monitoring system using high-resolution web cameras, X-Band Radar System, etc., for monitoring high frequency and high resolution wave run-up and topography, and high-resolution topographical surveying and satellite images by airborne and underwater drones for monitoring medium- to long-term changes.
- Archiving and analyzing the results of these monitoring as a database, using them for coastal hazard model development and optimization, and distributing them to Indonesia.



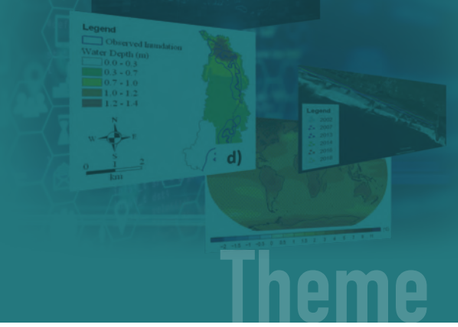
Conceptual Diagrams of Theme 1 Objectives research plan and annual agenda

Leading organizations

Kyoto University

Bandung Institute of Technology

Integrated hazards and risk assessment of compound disaster



Theme 2

►Theme leaders

From Japan

Anawat Suppasri

(Tohoku University)

From Indonesia

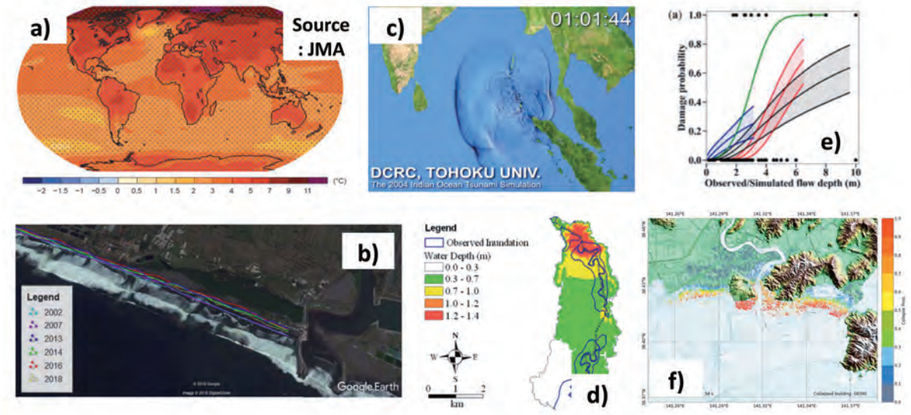
Abdul Muhari

(National Disaster Management Agency)

We will comprehensively evaluate hazard and risk considering sea level rise (due to global warming) and compound disasters (tsunamis (seismic / non-seismic), high waves, swells and river floods). There are four goals as follows.

- Integrate models for numerical analysis of compound disasters developed by Japanese researchers and develop hazard assessment methods.
- Collect several local data for vulnerability assessment.
- Assess risk from disasters along coastal areas using population data, building data and vulnerability functions through numerical simulation in long-term.
- Providing the developed numerical analysis models of various disasters and hazard risk assessment techniques to Indonesian universities such as Bandung Institute of Technology (ITB) and Indonesian government agencies, etc. through seminars in Japan and in Indonesia.

We also plan to practically operate and apply our outputs to Indonesian government agencies through theme 4.



Conceptual Diagram of Theme 2 Objectives

a) Projection of temperature change due to global warming,
b) Coastal erosion in South Java,
c) Numerical analysis of the 2004 Indian Ocean tsunami,
d) Numerical analysis of the Jakarta flood,
e) Various tsunami damage functions,
f) Tsunami damage prediction map

Leading organizations

Tohoku University

National Disaster Management Authority

Eco-DRR/ Nature-based solution

Theme 3

►Theme leaders

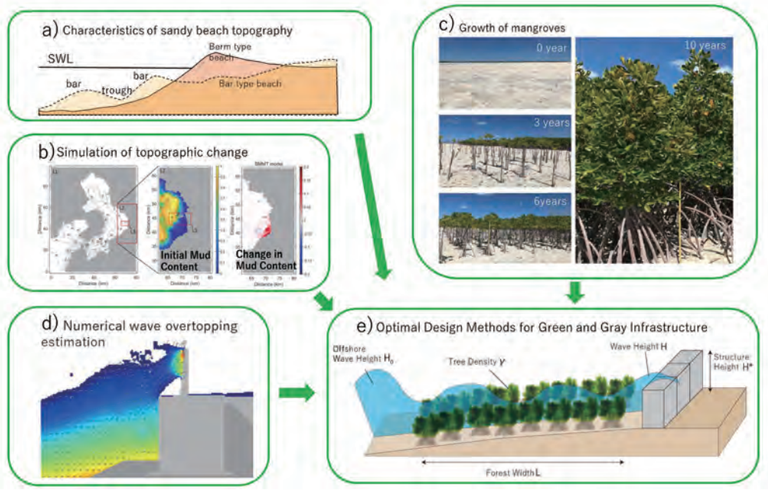
From Japan
Kojiro Suzuki
(Port and Airport Research Institute)

From Indonesia
Djati Mardiatno
(Gadjah Mada University)

The goal is to establish an optimal design method for gray infrastructure that takes into account the time variability of green infrastructure. The three goals of this research group are as follows.

- Literature review and field survey will be conducted to understand the characteristics and distributions of mangroves (Theme 3) and sandy beaches (Theme 1).
- Wave overtopping estimation chart of coastal barriers with green infrastructure from hydraulic and numerical experiments will be developed.
- The draft of guidelines to design optimal green-gray combined infrastructure will be compiled (by considering the hazard scenario from theme 2).

In hydraulic experiment and model development, we will collaborate with the Indonesian side to transfer the technology so that it can be independently evaluated in other regions.



Conceptual Diagram of Theme 3 Objectives
a) Quantification of sandy beach topography characteristics in Indonesia,
b) Beach deformation simulation,
c) Quantification of mangrove and coastal forest characteristics,
d) Advanced numerical wave overtopping estimation,
e) Optimal design of green and gray infrastructure

Leading organizations

PARI Port and Airport Research Institute

Gadjah Mada University

Development of Inclusive and evidence-based decision support platform for resilient coastal society

Theme 4

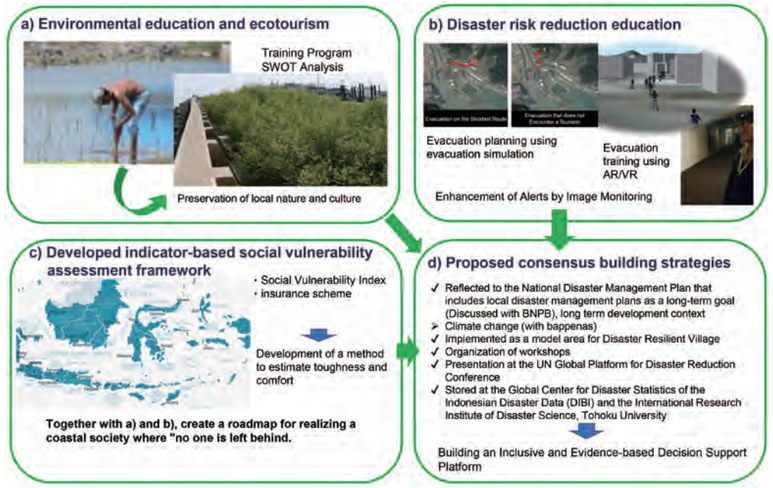
►Theme leaders

From Japan
Taro Arikawa
(Chuo University)

From Indonesia
Dicky Pelupessy
(University of Indonesia)

The aim is to develop a platform for organizing and socially implementing tools not only for disaster prevention, but also for the formation of a resilient coastal society that takes advantage of the characteristics of the region. The four goals of this research group are as follows.

- Establish and conduct an environmental education and ecotourism training, which include planning and implementation of afforestation as well as awareness and education about coastal conservation.
- Construct and conduct a disaster risk reduction education and tsunami evacuation training using the latest science and technology such as augmented reality (AR) /virtual reality (VR).
- Develop indicator-based social vulnerability assessment framework to help policymakers make decisions about policy priorities.
- Codesign consensus building methodologies for coastal community in the evidence-based decision support platform.



Conceptual Diagram of Theme 4 Goals
a) Establishment of environmental education and eco-tourism,
b) Implementation of disaster prevention education using the latest science and technology,
c) Establishment of consensus building methods,
d) Reflection in national disaster prevention plans and educational activities

Leading organizations

中央大学 Chuo University

University of Indonesia