

Role of Science and Technology for Building Disaster Resilience:

Case Study from the National Research Institute for Earth Science and Disaster Resilience (NIED), Japan

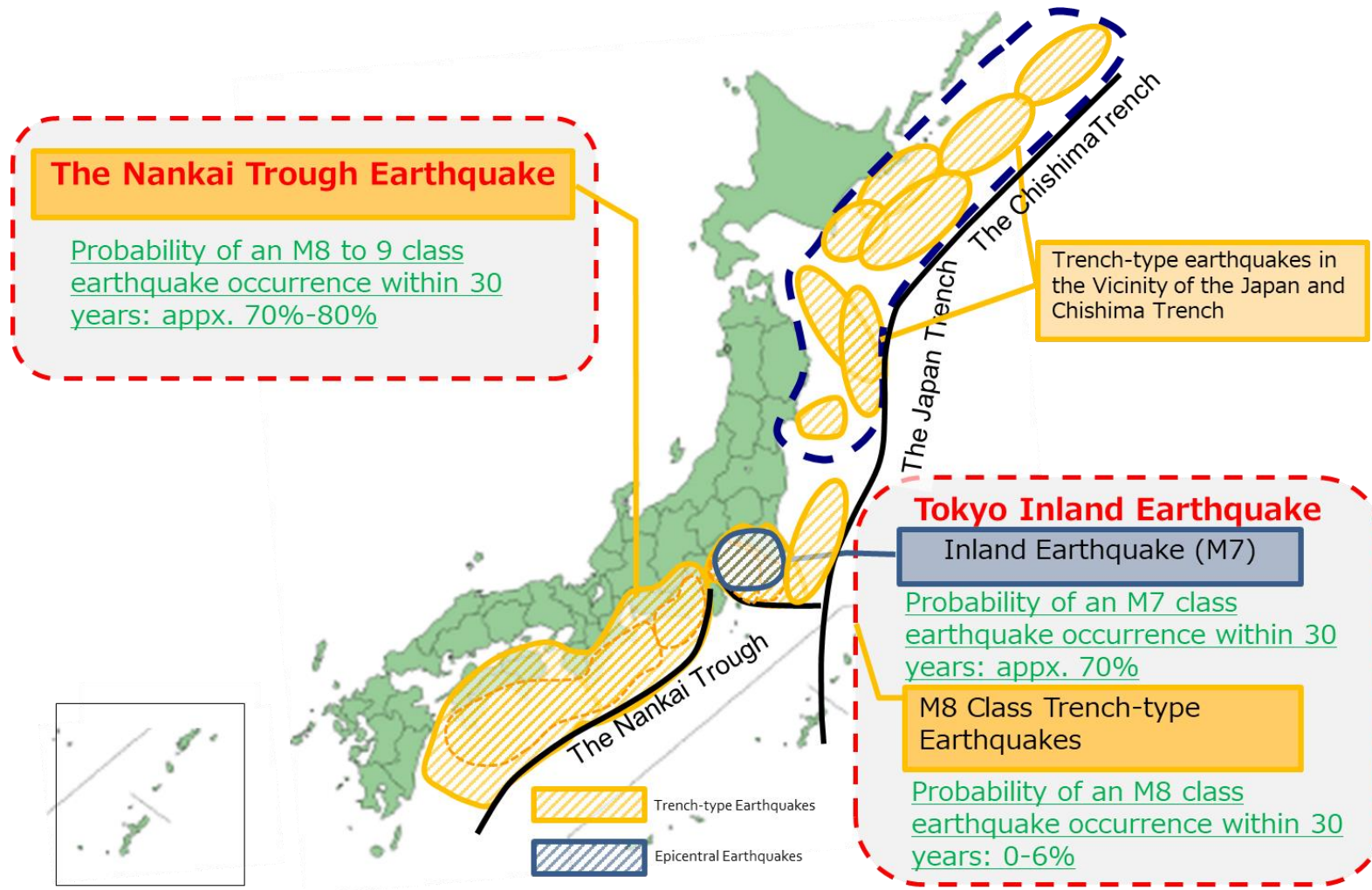
Harnessing STI for Disaster Risk Reduction Workshop | Metro Manila, Philippines

29 February – 01 March 2024

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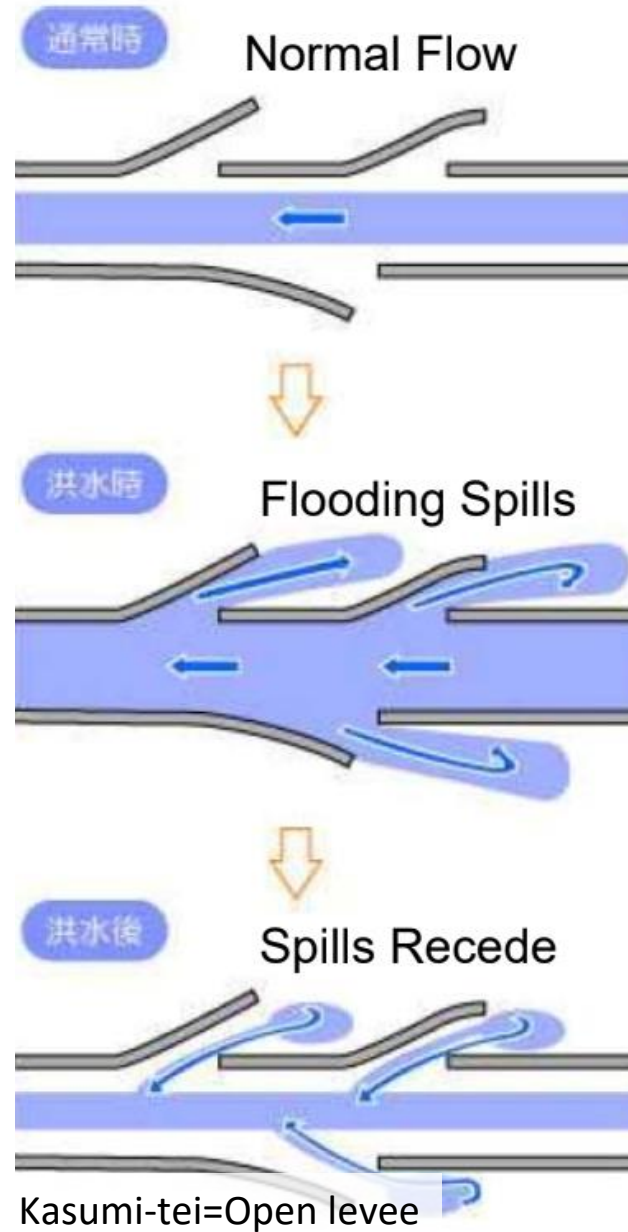
Japan is exposed to diverse range of natural hazards



Anticipated large-scale earthquakes in Japan

Trust in STI has historically driven DRR in Japan

TAKEDA SHINGEN (1521-1573)



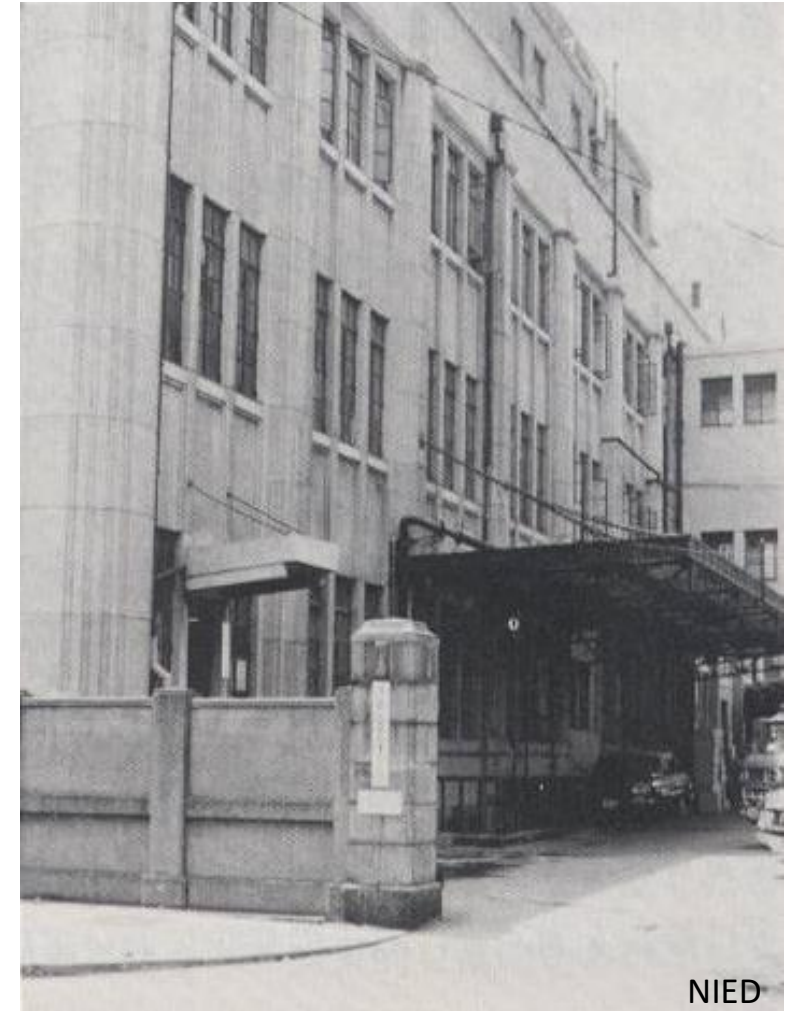
Flood control structures

Modernization of DRR with STI



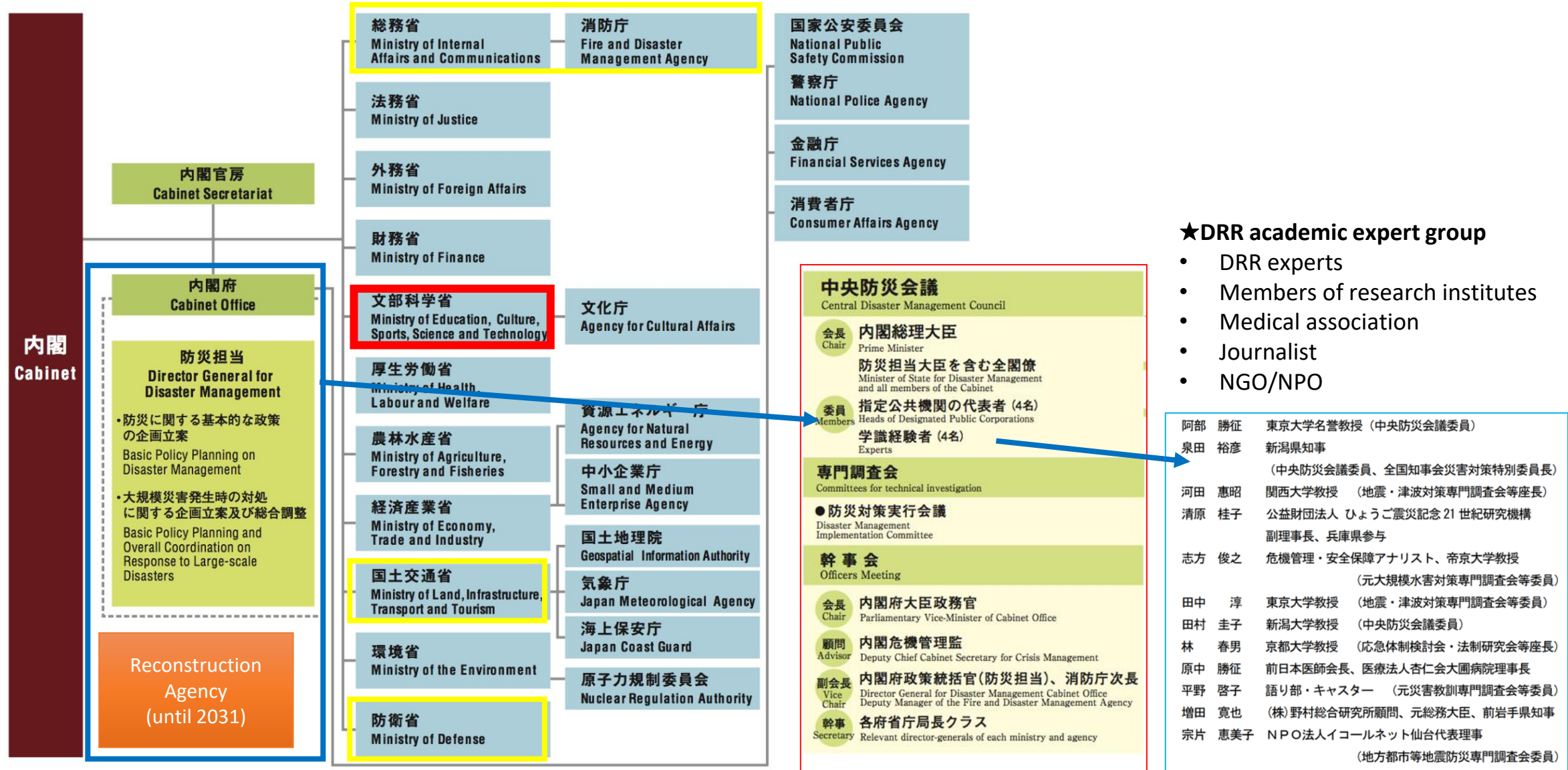
In September 1959, more than 5,000 people were killed or went missing in a major typhoon (Ise Bay Typhoon).

In response, the government enacted the **Disaster Countermeasures Basic Act (1961)** to modernize disaster management in Japan. The establishment of the National Research Center for Disaster Prevention (predecessor of NIED) in 1963 and designation as one of the “Designated Public Corporations” was a significant part in promoting disaster science and technology in this process.



National Center for Science and Technology for Disaster Prevention in 1963 in Ginza, Tokyo

STI in the DRR structure in Japan



SCIENCE FOR RESILIENCE

(Cabinet Office Japan, 2015)

About NIED

Name and	National Research Institute for Earth Science Disaster Resilience (NIED)
President	TAKARA Kaoru
Employees	324 (including 155 researchers) *As of April 1, 2023
Jurisdiction and	Ministry of Education, Culture, Sports, Science Technology (MEXT)



**President
Professor Dr. Kaoru
Takara**

Under the values of “**SCIENCE FOR RESILIENCE**,” NIED looks into multiple-hazards, during all phases of the disaster management cycle (response, recovery, mitigation/risk reduction, preparedness) to advance science and technology for DRR by conducting basic research and fundamental R&D with aim to protect human lives and assets from disasters for realizing a disaster resilient society.



NIED HQ and Research Centers/Facilities

Check this out!



Snow and Ice Research Center, Nagaoka, Niigata



Snow and Ice Research Center, Cryospheric Environment Laboratory, Shinjo, Yamagata



Check this out! 👍



Hyogo Earthquake Engineering Research Center, Miki, Hyogo



★Tsukuba HQ Tsukuba, Ibaraki

Meteorological Observation System



Lifetime of cumulus and cumulonimbus clouds can be observed

Large-scale Rainfall Simulator



One of the world's largest facilities that realistically reproduces torrential rainfall

E-Defense



Three-Dimensional Full-Scale Earthquake Testing Facility

SCIENCE FOR RESILIENCE

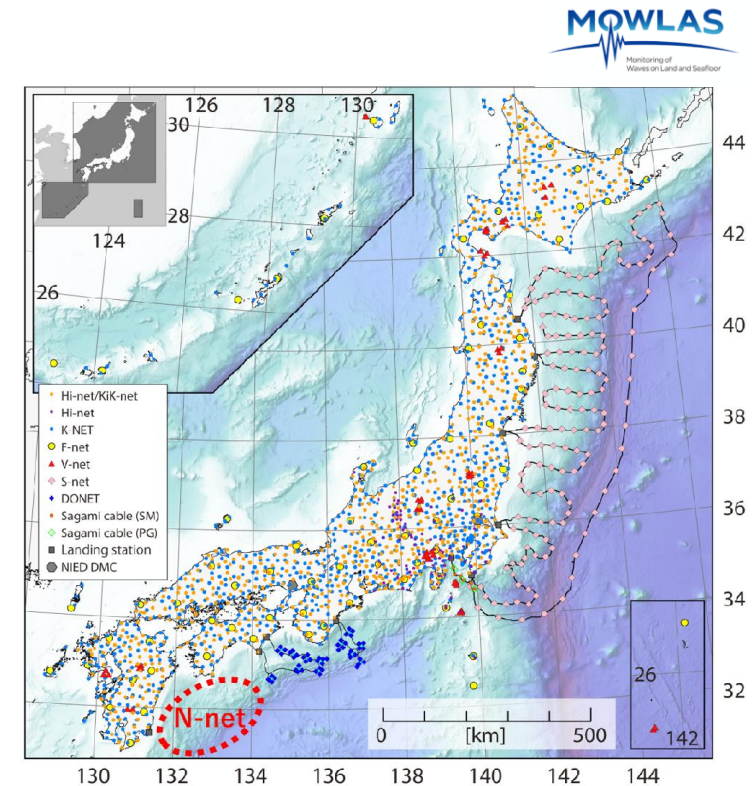
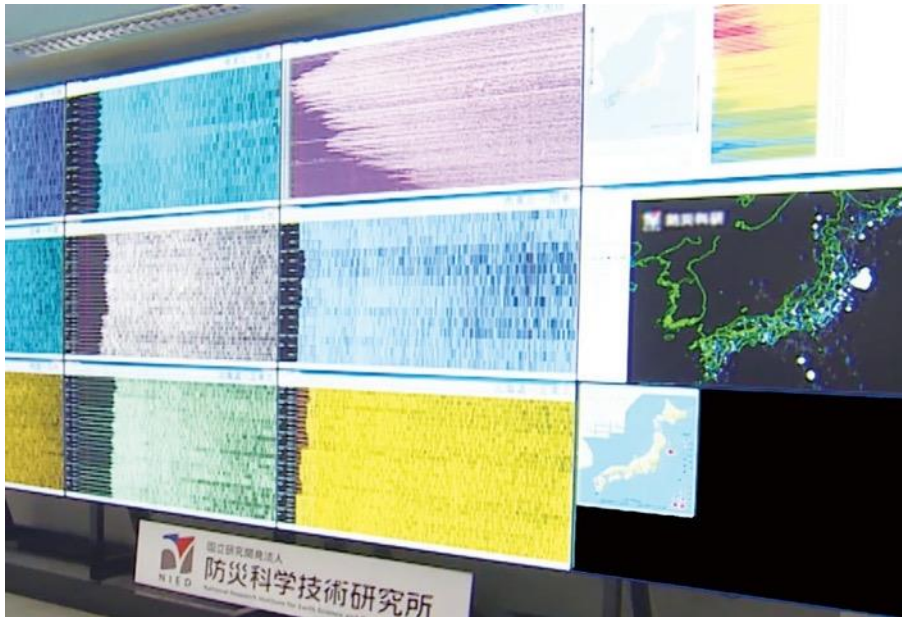


Observation network to support DRR stakeholders

MOWLAS is an observation network for earthquake, tsunami, and volcano around Japan.

After the **1995 Great Hanshin-Awaji Earthquake**, 2,100 seismographs were installed across the country to establish a land-based seismic observation network. When the **Great East Japan Earthquake** occurred in 2011, seismic and tsunami observation network (**S-net**) in the offshore areas of the Pacific Ocean was installed.

Data is shared in real time to the Japan Meteorological Agency (JMA) and other organizations for use in earthquake early warning and tsunami warnings.



Noto earthquake 1 January 2024



(Source: Sankei Shinbun)



(Source: Reuters)

Noto EQ disaster: Supporting DRR with STI

Basic Research Division

Earthquake and Tsunami Research Division

Volcano Disaster Resilience Research Division

Earthquake Disaster Mitigation Research Division

Storm, Flood and Landslide Research Division

Multi-hazard Risk Assessment Research Division

Snow and Ice Research Division

Disaster Information Research Division

Disaster Resilience Research Division

Center for Fundamental Research and Development

Network Center for Earthquake, Tsunami and Volcano

Center for Comprehensive Management of Disaster Information

Center for Advanced Research Facility

Center for Integrated Volcano Research

Collaborative Research Center for Advanced Resilience Technology

★Disaster Communication Operation Center set up at NIED (1 Jan)

- Monitoring and analysis of seismic activities
- Analysis by reproducing seismic motion by E-Defense and estimation of building response using numerical shake table
- Monitoring of landslide and debris flow post-EQ
- Aerial observation of disaster areas and establishing digital archive
- Analysis on distribution and characteristics of liquefaction
- Analysis of compound disaster of EQ and snowstorm
- **Dispatching NIED staff to support Niigata Prefectural Government**
- Integration of information from satellite observations and multiple sensors for real-time assessment
- Information sharing via SIP4D, bosaiXview, ISUT-SITE
- Information sharing to first responders
- Response by local government and inter-municipality support system after the EQ

Noto EQ disaster: Supporting DRR with STI

Portal of consolidated disaster-related information shared to the public:

Disaster prevention cross-view: 2020 Noto Peninsula Earthquake bosai X view®

road condition

Source: [Ishikawa Prefecture](#), Ministry of Land, [Infrastructure, Transport and Tourism](#)

Please note: If road conditions temporarily impassable, a partial detour may be necessary, so please follow local instructions.

Please be careful when passing.

***For the latest information, please also refer to [the Ishikawa Prefecture Disaster Prevention Portal](#).**

***Due to changes in local conditions, the actual situation may differ.**

道路状況

住所または場所の検索

Information panels on the left of the map include:

- 地震発生時の被害状況 (Damage status at the time of the earthquake)
- 震害調査結果 (Earthquake damage survey results)
- 被災状況 (Damage status)
- 被災状況 (Damage status)
- 被災状況 (Damage status)
- 被災状況 (Damage status)

bosai X view

- Road condition
- Living support points
- Activity status of NGOs, etc.
- Damage & loss assessment reports
- Communication infrastructure
- Water supply
- Satellite imagery
- Aerial photos
- Street view in affected areas
- Housing damage
- Temperature/Weather info
- Liquefaction
- Seismic intensity distribution
- Earthquake Rapid Report (J-RIDQ)
- J-SHIS Map (National Earthquake Hazard Prediction Map)
- Multi-hazard map

*The actual website is in Japanese
<https://shorturl.at/AOP37>

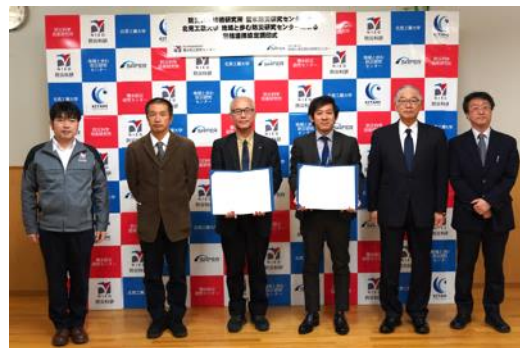
How we deliver STI for social implementation



1. Operation of observation network, advanced research facilities, information dissemination infrastructure



2. Development of information products to disseminate research outputs and application of intellectual properties

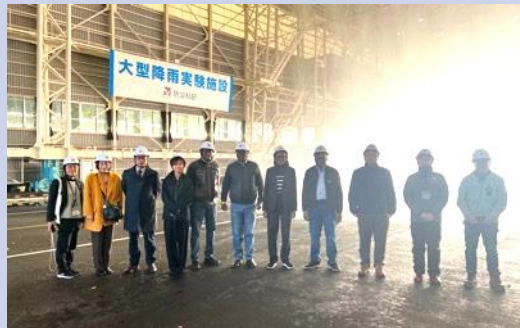


3. Promotion of co-creation by industry, government, academia and private sector

How we deliver STI for social implementation



4. Support to disaster management operation for national and local government

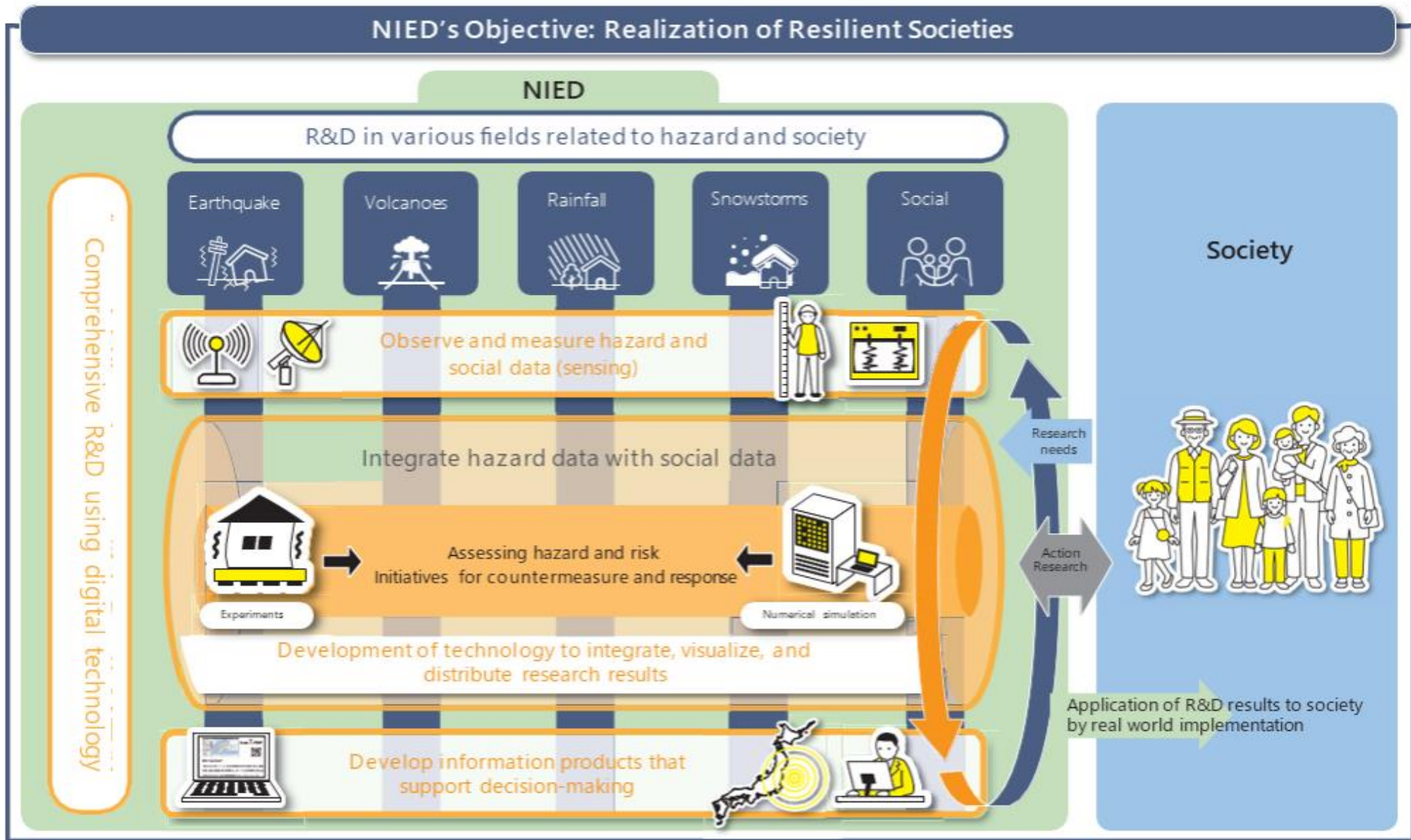


5. Capacity development through training and internship programs

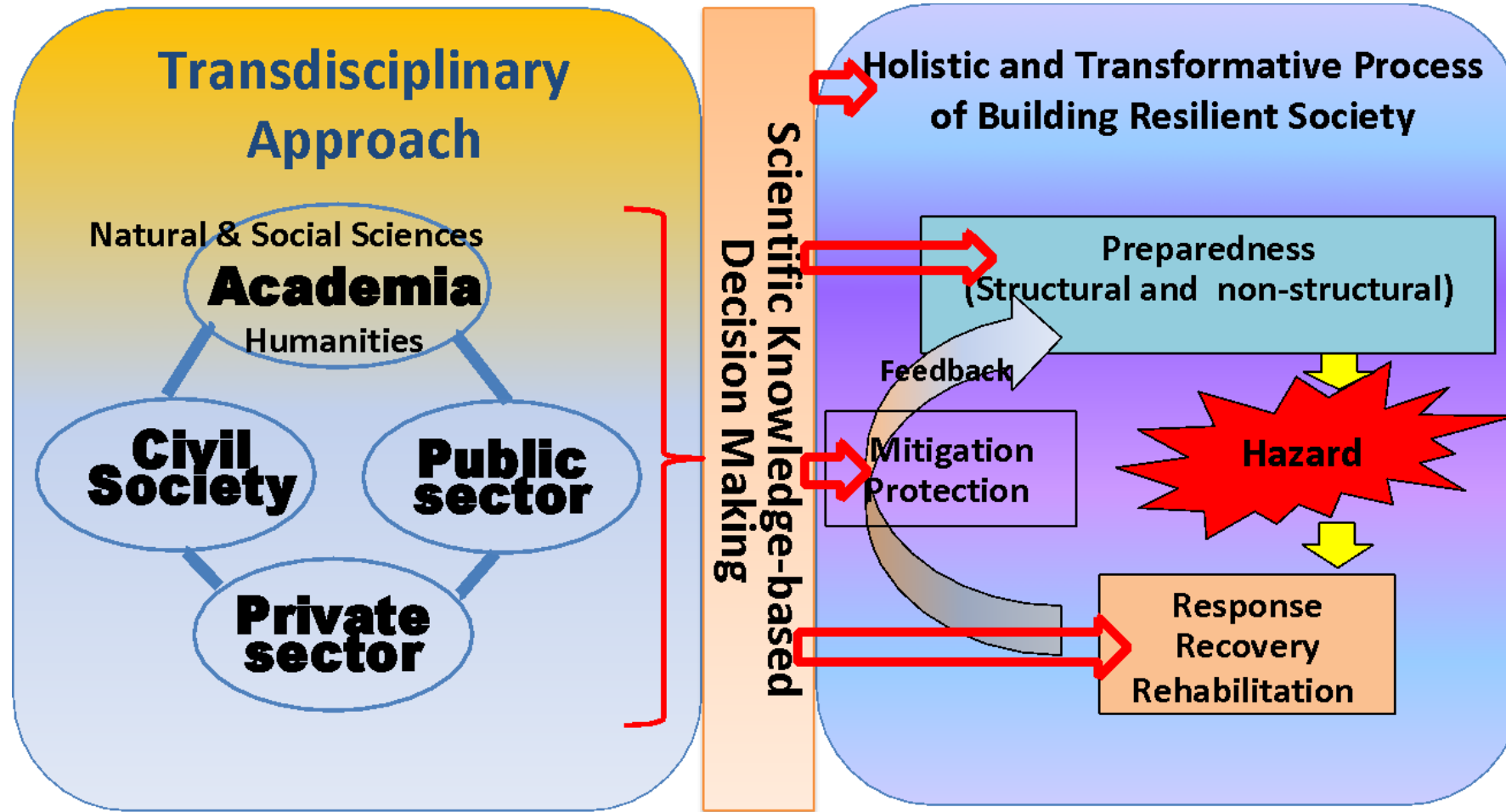


6. International field research and collaboration

NIED 5th Mid-term Goals (JFY 2023-2029)



Recommendation – TDA for DRR



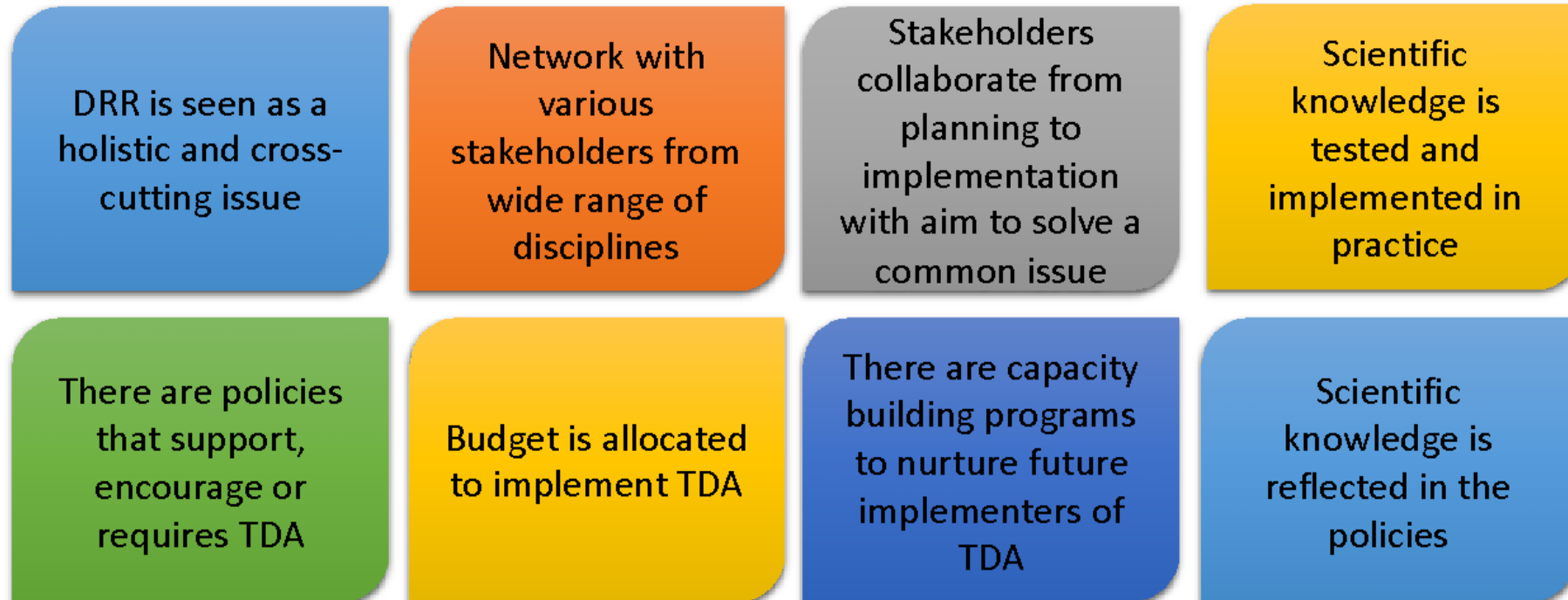
Co-Design, Co-Produce, Co-Deliver, and Co-Implement

Source: TC21 Transdisciplinary Approach for Building Societal Resilience to Disasters, Asian Civil Engineering Coordinating Council (ACECC)

Recommendation – TDA for DRR



8-point check list



Extracted from Matsuura, S. and Razak, K. (2019), "Exploring transdisciplinary approaches to facilitate disaster risk reduction"



SCIENCE FOR RESILIENCE



Large-scale
Rainfall
simulator

E-Defense
Shake table

Earthquake, tsunami, volcanoes, violent winds, heavy rains, snowstorms, floods, and landslides are natural threats that will always exist.

However, at NIED, we believe that disasters can be reduced. Therefore, we are constantly developing technologies and strategies to prepare for and respond to disasters.

With better prediction, smarter prevention, and faster restoration, we aim to protect lives and livelihoods for a sustainable future.



防災科研

Science for Resilience!

