Guide to disaster management measures 2.0

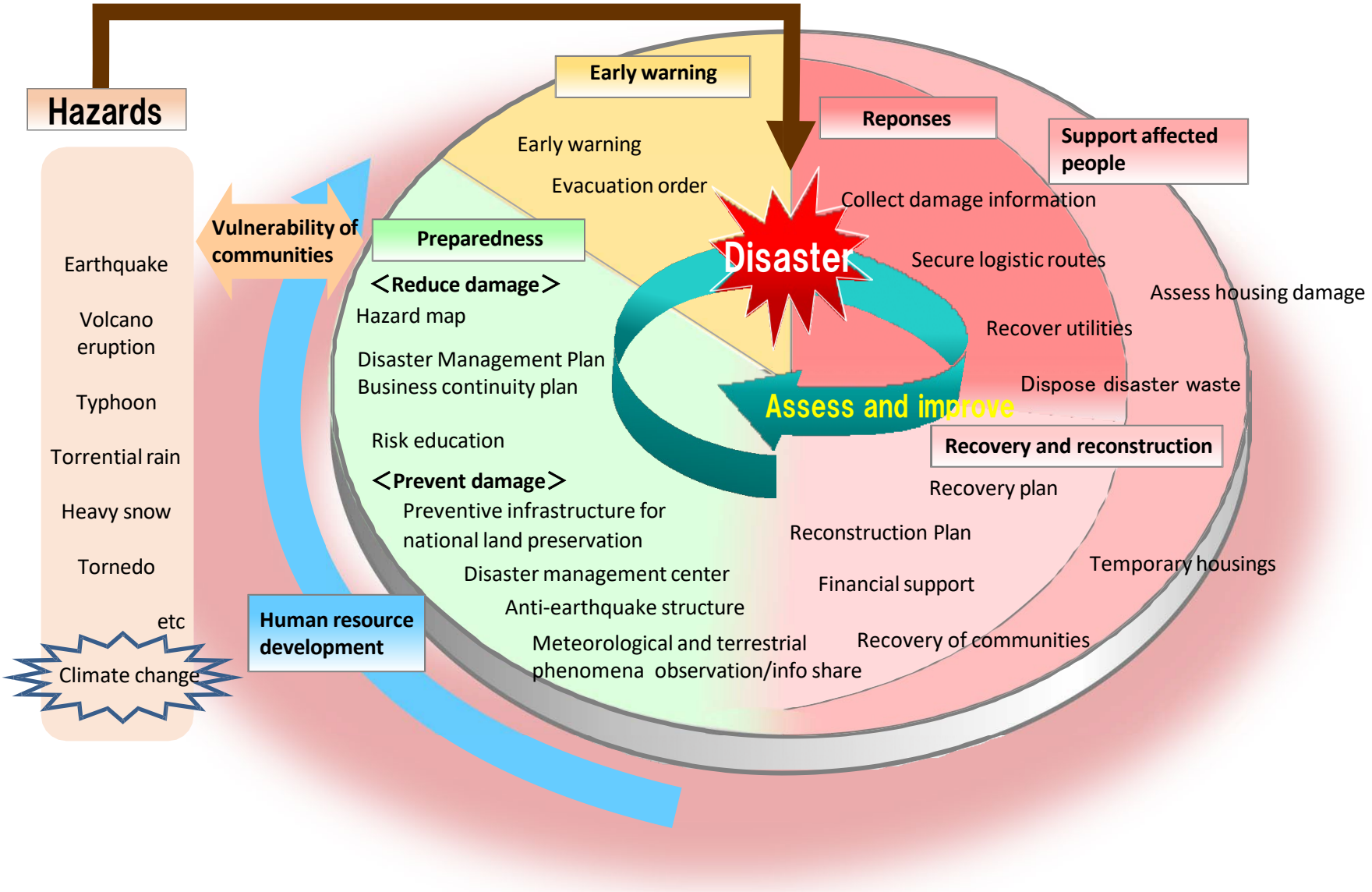
(technologies, know-how, infrastructure, institutions etc.)

in Japan

Structural and non-structural measures : Japanese solutions for disaster management challenges in your country

Cabinet Secretariat, Government of Japan
Disaster Management Bureau, Cabinet Office, Government of Japan

This guide describes experience and knowledge of Japan according to the process of disaster management, including preparedness, response, recovery and reconstruction, focusing on necessary actions for disaster risk reduction and possible technologies that Japan could provide. Please use this brochure for considering possible collaboration from Japan to enhance disaster management.



Disaster management measures in Japan

(technologies, know-how, infrastructure, institutions etc.)

<Notes>
Collaboration for:
- **Earthquake/Tsunami**
- **Meteorological disaster**
- **Any types of disasters**

【Challenges in each phrase】

【Examples of possible collaboration from Japan】

Preparedness

A . Planning

・Develop comprehensive and long-term plans for disaster risk reduction

・Measures based on disaster risks and vulnerability of national land, and social and economical system

A-1 Preparation of disaster risk reduction plans and business continuity plan
A-2 Introduce concepts of disaster risk reduction to master plans including city planning
A-3 Hazard mapping
A-4 Establishing plans related to building national resilience
A-5 Disaster prevention and reconstruction from the perspective of gender equality

B . Investment

・Risk-resilient critical infrastructure

・Develop systems for constant monitoring/information service of earthquake and Tsunami

・Promote seismic reinforcement for houses/buildings and infrastructures

・Develop systems for constant monitoring/information service of weather and river level

・Promote improvement of infrastructures to protect lives/properties from flood due to typhoon/heavy rain or landslide disasters, etc.

B-1 Risk-resilient critical infrastructure
B-2 Earthquake observation equipment
B-3 Seismic reinforcement/quake-proof technologies
B-4 Meteorological and hydrological observation instruments
B-5 Water and disaster management
B-6 Forest conservation works

C . Risk education

・Raise awareness for disaster risk reduction and promote risk education

C-1 Risk education materials, citizens empowerment, training and exercise
C-2 Human resources development
C-3 Raising awareness on national resilience and development of learning materials

Disaster management measures in Japan

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Collaboration for:
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【Examples of possible collaboration from Japan】

Early warning and Response

D. Emergency warning, evacuation support

・Sharing disaster information, communicate to relevant organizations and citizens, early warning

E. Emergency rescue activities

・Rescue/first-aid/emergency medical care for life saving, measures for evacuation sites, providing relief supplies

D-1 Monitoring of Waves on Land and Seafloor (MOWLAS)
D-2 Satellite observation data for emergency responses
D-3 Early warning system (L-Alert)
D-4 Flood forecasting software
D-5 Urgent earthquake detection and alarm system
D-6 Emergency warning broadcast system
D-7 Disaster information management system (DIMS)

E-1 ICT disaster management unit
E-2 Transportable air traffic control (ATC) tower
E-3 Drain pump car
E-4 Remote-operated equipment, unmanned construction
E-5 Early detection and assessment of disaster conditions using drones
E-6 Domestic water security using portable water reclamation system

Recovery and Reconstruction

F. Smooth recovery and reconstruction

・Assistance for formulation of rehabilitation and recovery plan, support for livelihood

F-1 Assistance for formulation of rehabilitation and recovery master plan
F-2 Disaster waste management
F-3 『JOEN』～Salt removal work from farmland～
F-4 Reconstruction of infrastructure -based on build back better（BBB）concept
F-5 Support for house reconstruction -based on build back better（BBB）concept
F-6 Support for livelihood recovery considering victims
F-7 Standby loan for disaster recovery

Japanese Disaster Management Technologies and Know-how by Sector

Phase		Technologies and Know-how	Sector			
			Cities & Housing	Water Management & Land Conservation	Roads	Rail
Preparedness	A. Planning	A-1 Preparation of disaster risk reduction plans and business continuity plan	●	●	●	●
		A-2 Introduce concepts of disaster risk reduction to master plans including city planning	●			
		A-3 Hazard mapping	●	●	●	●
		A-4 Establishing plans related to building national resilience	●			
		A-5 Disaster prevention and reconstruction from the perspective of gender equality	●			
	B. Investment	B-1 Risk-resilient critical infrastructure	●	●	●	●
		B-2 Earthquake observation equipment (GPS buoy system, seafloor observation system for earthquakes and tsunamis of submarine cable type, etc.)	●	●		
		B-3 Seismic reinforcement/quake-proof technologies	●	●	●	●
		B-4 Meteorological and hydrological observation instruments (solid-state weather radar 、3L water level gauge, etc.)		●		
		B-5 Water and disaster management (dam upgrading under operation, river development, etc.)		●		
		B-6 Forest conservation works (construction, forest management for disaster risk reduction, etc.)		●		
	C. Risk education	C-1 Risk education materials, citizens empowerment, training and exercise	●	●	●	●
		C-2 Human resources development	●	●	●	●
		C-3 Raising awareness on national resilience and development of learning materials	●	●	●	●
Early warning and response	D. Emergency warning, evacuation support	D-1 Monitoring of Waves on Land and Seafloor (MOWLAS)	●	●		
		D-2 Satellite observation data for emergency responses	●	●		
		D-3 Early warning system (L-Alert)	●	●		
		D-4 Flood forecasting software	●	●		
		D-5 Urgent earthquake detection and alarm system				●
		D-6 Emergency warning broadcast system (digital terrestrial television broadcasting)	●	●		
		D-7 Disaster information management system	●	●		
	E. Emergency rescue activities	E-1 ICT disaster management unit	●	●	●	●
		E-2 Transportable air traffic control (ATC) tower	●	●	●	●
		E-3 Drain pump car	●	●	●	●
		E-4 Remote-operated equipment, unmanned construction	●	●	●	●
		E-5 Early detection and assessment of disaster conditions using drones	●	●		
		E-6 Domestic water security using portable water reclamation system	●			
Recovery and reconstruction	F. Smooth recovery and reconstruction	F-1 Assistance for formulation of rehabilitation and recovery master plan	●			
		F-2 Disaster waste management	●			
		F-3 『JOEN』～Salt removal work from farmland～		●		
		F-4 Reconstruction of infrastructure - based on build back better (BBB) concept	●			
		F-5 Support for house reconstruction - based on build back better (BBB) concept	●			
		F-6 Support for livelihood recovery considering victims	●			
		F-7 Standby loan for disaster recovery	●			

Any types of disasters

A Planning

Develop comprehensive and long-term plans for disaster risk reduction(DRR)

A-1 Preparation of DRR Plans and Business Continuity Plan(BCP)

Thailand・「Project on Capacity Development in Disaster Risk Reduction」(Technical Cooperation)

- Through strengthening the capacity and functions of the central DRR agencies, Japan supports formulation of the national and local DRR strategies and disaster risk maps, thereby improving their capacity to mitigate, prepare and respond to disaster.

-DRR White Paper
-National DRR Plans
-GIS for hazard information
-Materials for Trainers Training
-Guidebooks for Community based DRR
-Guidelines for DRR Education

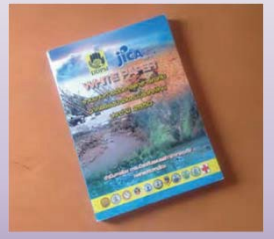
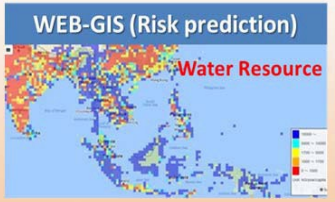


Photo: DRR White Paper in Thailand

Asia-Pacific Climate Change Adaptation Information Platform（AP-PLAT）

- Provide future climate-related risk data and adaptation information based on scientific knowledge
- Contribute for formulation of the DRR planning and BCP in developing countries.



AP-PLAT
Asia-Pacific Climate Change Adaptation Information Platform

Technical assistance for local communities to prepare flood disaster contingency plans (ICHARM)

- ICHARM provides technical assistance for Calumpit, a local town in the Pampanga River basin of the Philippines, to develop disaster contingency plans using flood hazard maps through participation of community members.

※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】, 【Roads】, 【Rail】

Any types of disasters

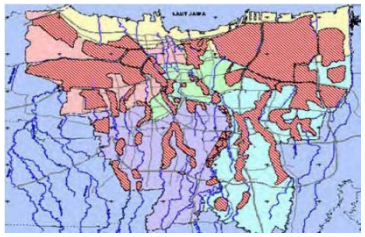
A Planning

Measures based on disaster risk and vulnerability of assessment of national land, and social and economical system

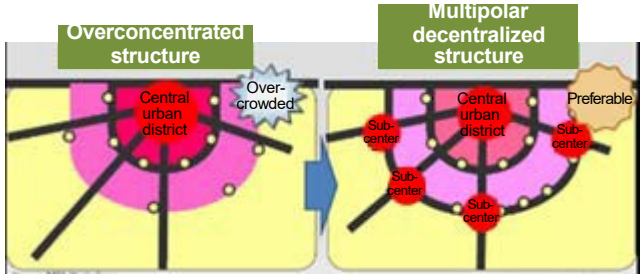
A-2 Introduce Concepts of DRR to Master Plans Including City Planning

Support for Planning Including Master Plans (Technical Cooperation)

- When supporting preparation of urban vision, in addition to analysis of disaster risks, propose reduction of risks caused by disaster in urban structure or improvement of drainage facilities.



Evaluation for area characteristics of flooding



- Too much concentration
- Vulnerability of transferring /transporting at a time of disaster

- Decentralize urban functions
- Secure redundancy for a traffic system

Propose **a multipolar decentralized urban structure** with high tolerance to disasters

※Relevant sectors: 【Cities & Housing】

A-3 Hazard Mapping

Support for Hazard Map Development (Technical Cooperation)

- Japan supports developing countries to be disaster-resistant societies through the development of hazard mapping based on damage estimation methodology and risk assessment.
- Technical assistance for Myanmar's major cities (e.g., Yangon) to create flood hazard maps (ICHARM)
- Technical assistance for Calumpit, the Philippines, to create flood risk maps by linking the height of structures and the propagation of floodwaters (ICHARM)

Good Practice of Developing Hazard Maps

- Based on the lessons from past tragedies such as Chile Tsunami in 1960 and the Great East Japan Earthquake in 2011, Japan has developed Tsunami damage estimation methodologies and risk assessment based hazard map, then support to develop Tsunami resilient societies in the world.

Tsunami Hazard Mapping

Tsunami Inundation in Chile in 2010

When the Tsunami occurred after M8.2 earthquake in Chile on April 2, 2014, the number of victims was minimized (6 persons) as a result of utilizing knowledge from past technical cooperation from Japan.

※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】, 【Roads】, 【Rail】

Any types of disasters

A Planning

Measures based on disaster risk and vulnerability of assessment of national land, and social and economical system

A-4 Establishing Plans Related to Building National Resilience

Based on the “Basic Act for National Resilience Contributing to Preventing and Mitigating Disasters for Developing Resilience in the Lives of the Citizenry,” the **Fundamental Plan for National Resilience** and **regional plans,** etc. have been developed. This Fundamental Plan is renewed approximately every 5 years. Based on recent large-scale natural disasters, 5-year accelerated measures for priority areas have been developed. In the future, it is planned to also develop medium-term plans (mid-term plans).

Support for establishing national resilience plans, including regional plans, such as by providing Know-how
（Seminars, Workshops, Training and etc. provided by the Cabinet Secretariat of Japan)

- Provide know-how on establishing plan to national or local government officials
  - Method of vulnerability assessment of national land, and social and economical system
  - Method of corresponding measures to risk and etc.
  - Policies to promote private sector resilience initiatives (creation of BCP, etc.)

※Relevant sectors: 【Cities & Housing】

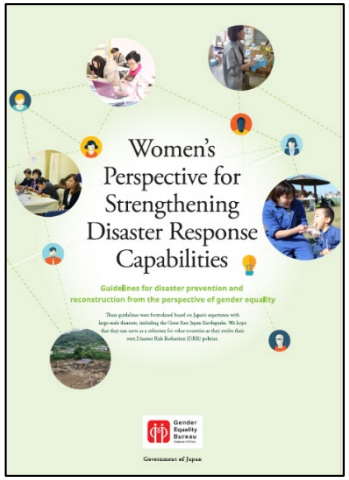
A Planning

Measures based on disaster risk and vulnerability of assessment of national land, and social and economical system

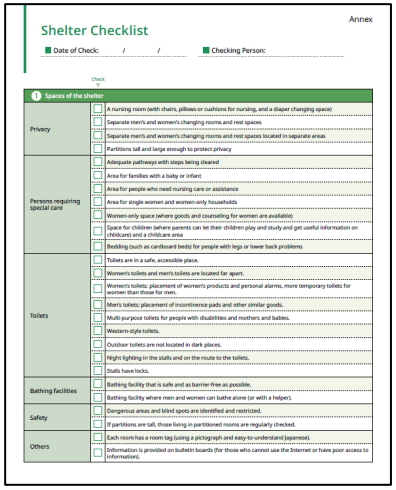
A-5

Guidelines for Disaster Prevention and Reconstruction from the Perspective of Gender Equality

- Based on experience from large-scale disasters, such as the Great East Japan Earthquake, in May 2020 the Cabinet Office created the “Guidelines for disaster prevention and reconstruction from the perspective of gender equality.” The guidelines include information about necessary initiatives at each phase of disaster response (basic policies, preparations during normal times, initial response, life in shelters, and recovery and reconstruction), making it useful as reference for local government employees engaged in disaster response from the perspective of gender equality.
- A stockpile checklist is included in the “Useful Materials” section of the guidelines, which can be immediately used at the site of disasters. By using this check sheet for improving operations/management of evacuation shelters and interviewing evacuees, employees assigned to support evacuation shelters can efficiently promote the improvement the shelter environment.



Pamphlet (English version)- Women’s Perspective for Strengthening Disaster Response Capabilities: Guidelines for disaster prevention and reconstruction from the perspective of gender equality



Check sheet

※Relevant sectors: 【Cities & Housing】

Any types of disasters

Risk-resilient critical infrastructure

B-1 Risk-Resilient Critical Infrastructure

Case example of Risk-Resilient Critical Infrastructure

- The Blue Line subway that opened in 2004 was designed with help from Japan and includes many elements of disaster risk reduction. Since Bangkok is located in a flood-prone area, the subway entrance is located higher than the sidewalk to prevent water intrusion. Also the entrance is equipped with a water shield. Some ventilators are set at a higher position, and a drainage pump is installed.

Subway that is resistant to flood（Photo：Shinichi Kubo/JICA）

When the airports and roads were closed in the 2011 flood, The Blue Line was able to continue to operate even in flooded areas without intrusion.

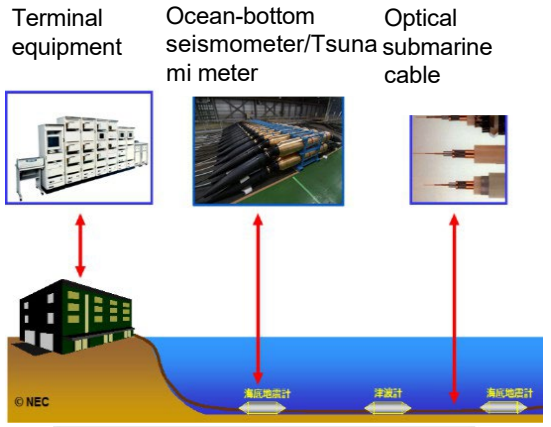
※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】, 【Roads】, 【Rail】

Develop systems for constant monitoring/information service of earthquake and Tsunami

B-2 Earthquake Observation Equipment

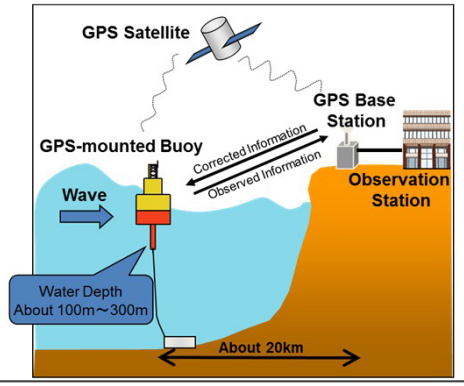
Seafloor Observation System for Earthquakes and Tsunamis of Submarine Cable Type

- The seafloor observation system for earthquakes and tsunamis of submarine cable type makes it possible to observe submarine earthquake activity and associated tsunami activity. Excellent evacuation effect is expected by combining it with an alarm system.



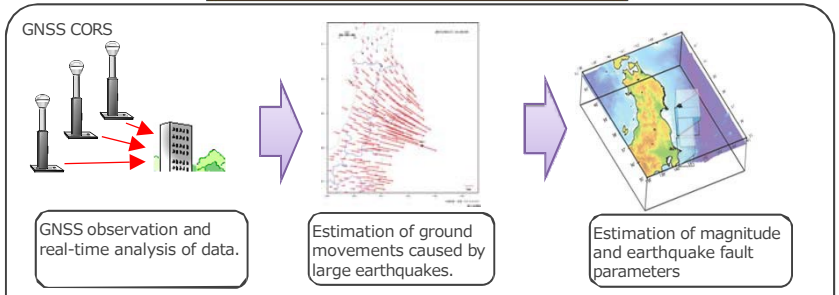
GPS Buoy System

- GPS-mounted buoys can measure offshore waves and tidal levels, including tsunamis, in real-time by using satellite positioning information.



Real-time Analysis System of GNSS CORS (REGARD System)

- The positons of GNSS Continuous Operating Reference Stations (CORS) are precisely calculated and monitored. The system estimates ground movements due to earthquakes, volcanic activities, and plate motions, and contributes to hazard mitigation.



The REGARD system monitors positions of GNSS CORS and estimates ground movements and earthquake magnitude in real-time. The results are expected to improve accuracy of Tsunami simulations especially for earthquakes larger than magnitude 8.

※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】

Promote seismic reinforcement for houses/buildings and infrastructures

B-3 Seismic Reinforcement/Quake-proof Technologies

Seismic Reinforcement / Quake-proof of Bridges

- As a result of damages on bridges in the Great Hanshin-Awaji Earthquake, measures have been promoted in Japan.

Condition of a bridge after the Great East Japan Earthquake (seismic reinforcement was completed)

There was no fall/collapse caused by earthquake vibration on seismic reinforced bridges in the Great East Japan Earthquake. Therefore, utilization of such technology is expected in overseas including know-how of architectural design.

Earthquake-Resistance Wharves (e.g. Jacket Method)

- Jacket pier is constructed by using the jacket type structure which is a space truss of steel pipes fixed to the seabed by steel pipe piles. It has high horizontal rigidity and high earthquake-resistance.

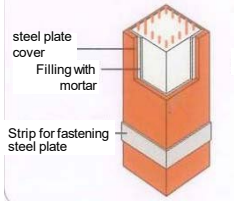
The image of Jacket Method

Thilawa Port, Myanmar (Photo:TOYO Construction Co.,Ltd.)

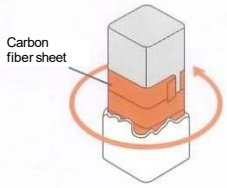
Seismic Strengthening / Isolation-system of Houses/Buildings

- Based on many experiences of disasters in the past, Japan has promoted seismic strengthening measures.

■ Reinforcement of columns

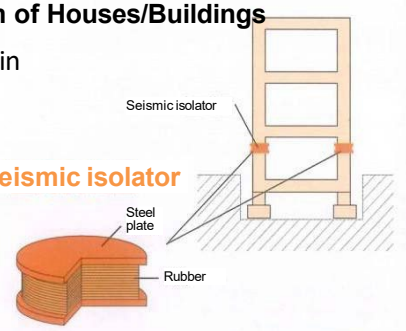


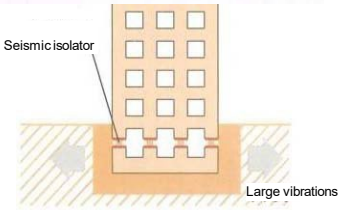
Reinforcement by covering with steel plates



Reinforcement by wrapping with continuous carbon fiber sheet

■ Seismic isolator





In the Great East Japan Earthquake, seismically isolated buildings didn't have damages to the structural frame caused by earthquake motion, and proved the effectiveness to the major earthquake.

※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】, 【Roads】, 【Rail】

B Investment

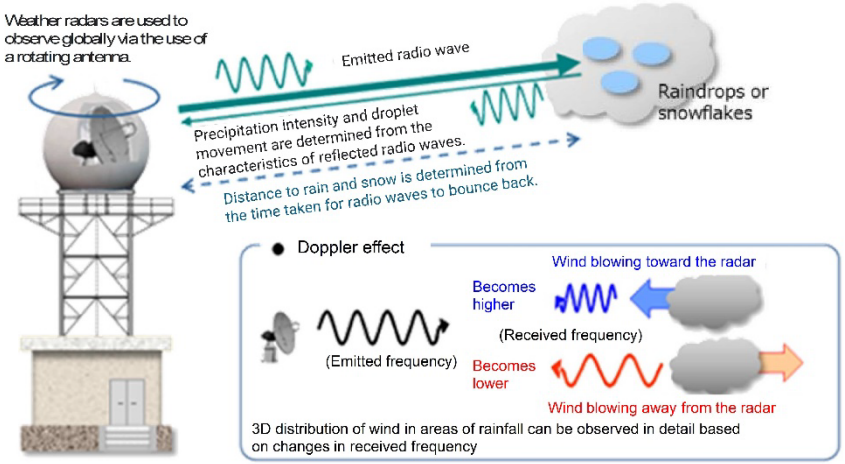
Meteorological disaster

Develop systems for constant monitoring/information service of weather and river level

B-4 Meteorological and Hydrological Observation Instruments

Weather Radar

- Solid-state weather radar features a reduced lifecycle cost, stable operations, and a narrower bandwidth of transmitted radio waves. Additionally, dual-polarization doppler weather radar gives more accurate predictions by better discriminating between rain and snow and estimating precipitation intensity.



Radiosonde

- Advantages of Japanese radiosondes are
  - High observation accuracy,
  - Downsizing and lightening the instrument, and
  - Saving running cost.

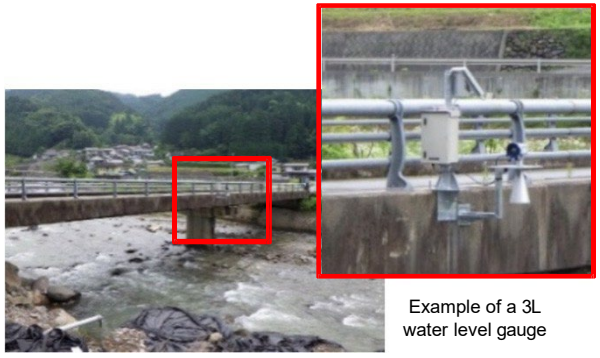
Radiosonde

A radiosonde observes upper atmospheric conditions (e.g., temperature, wind) up to altitudes of around 30 km lifted by a balloon.

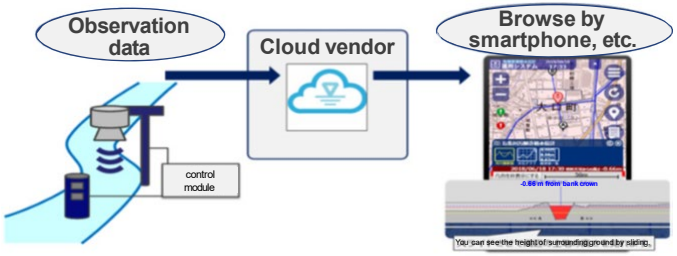
3L Water Level Gauge

- Low Cost (lower cost by 10% than conventional models)
- Long Life (maintenance free for a long term, operable for 5 years or more without power supply)
- Localized (Local river authorities are able to measure and monitor water level on their own)

- It is a lower price water gauge specializing on observation of flooding, which operation and maintenance are simple.
- Additionally, by unifying the central/local information of rivers with a cloud service, water level information service can be browsed by anyone from a smartphone, etc.



Example of a 3L water level gauge



Water level information service using a cloud service

This water gauge was developed as a crisis management type water gauge for small- and medium-sized rivers and mainly installed at areas with high risks of floods. It enables residents to be aware of risks and evacuate voluntarily, measures of software on residents' viewpoint was promoted.

※Relevant sectors: 【Water Management & Land Conservation】

B Investment

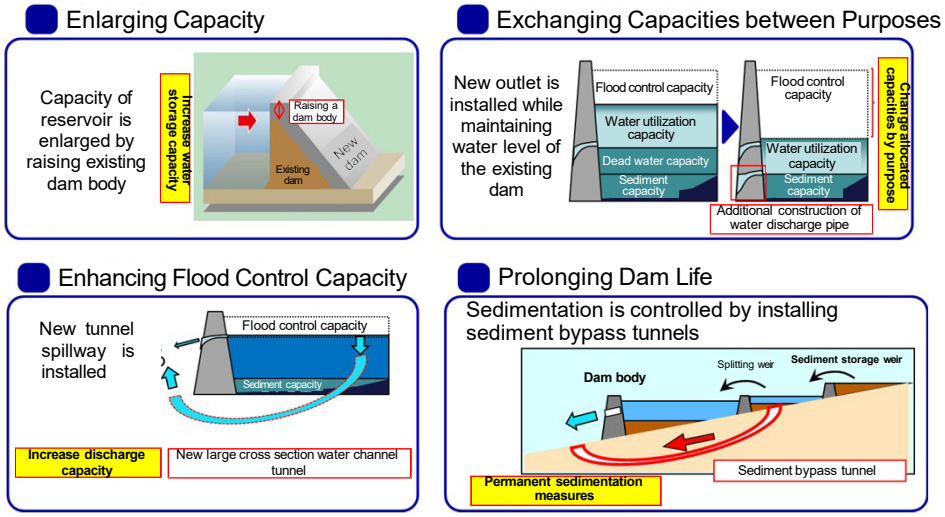
Meteorological disaster

Promote improvement of infrastructures to protect lives/properties from flood due to typhoon/heavy rain or landslide disasters, etc.

B-5 Water and Disaster Management (Dam Upgrading under Operation, River Development, etc.)

"Dam upgrading" to Effectively Use Existing Dams

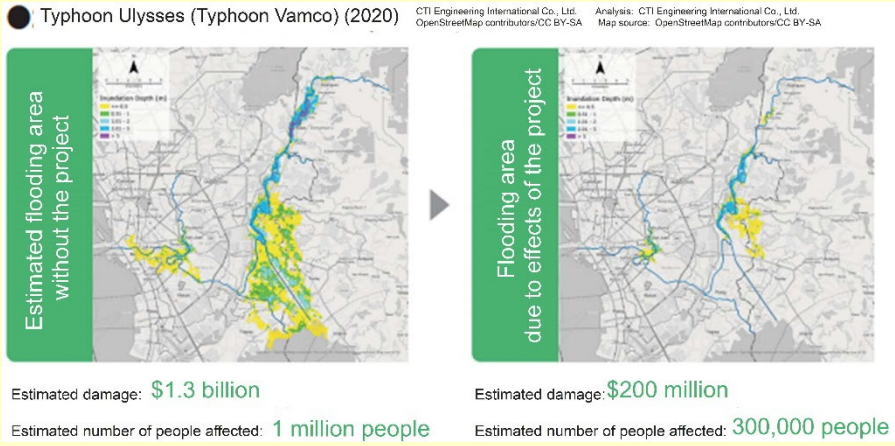
- As a dam body is expected to be healthy almost permanently if it is appropriately constructed and operated/maintained, for existing dams, it is important to utilize effectively and sustainably for a long term.
- There are many actual achievements about dam upgrading which improves functions of existing dams while operating them, environmental and social impacts can be kept to a minimum.
- Understanding issues in watershed areas through dam inspections and sharing such issues with relevant countries, propose the dam upgrading business in combination with a dam inspection system (guidance, criteria, measuring instrument, etc.), as a solution.



Successful Example of Water Control Business

Manggahan floodway reduced damage to central Manila

- The Philippine government established the first specialized flood control department in a developing country in 1999 and in recent years the budget for flood measures has greatly increased. The Manggahan floodway, which was constructed with JICA cooperation, has largely decreased flood damage to central Manila and has played a fundamental role in the city's subsequent development. It has been estimated that Typhoon Ulysses (aka Typhoon Vamco) in 2020 caused 85% less damage as the result of this project.



※Relevant sectors: 【Water Management & Land Conservation】

B Investment

Meteorological disaster

Promote improvement of infrastructures to protect lives/properties from flood due to typhoon/heavy rain or landslide disasters, etc.

B-6

Forest Conservation Works (Constructions and forest management for disaster risk reduction)

Forest Conservation Works: techniques for disaster risk reduction through forest management

(Forest conservation works had been developed as techniques to maintain and improve the function for disaster risk reduction by forest.)

- Restoration and prevention of damaged mountains by forest conservation works.
- Damage control of driftwoods occurred by hillside collapse by a driftwood catching check dam.
- Protection of hinterland from blown sand and wind, and attenuation of tsunami energy by a coastal forest for disaster risk reduction.

Occurrence of a disaster

Completion of restoration works

Situation 22 years after beginning restoration works

Driftwood Catching Check Dam

Coastal Forest for disaster prevention

※Relevant sectors: 【Water Management & Land Conservation】

C Risk education

Any types of disasters

Raise awareness for disaster risk reduction and promote risk education

C-1 Risk Education Materials, Citizens Empowerment, Training and Exercise

Risk Education Materials

- Risk education materials in many languages; The Tale of "Inamura-no-hi" tells the importance of evacuation from tsunami, based on the experience of tsunami evacuation after the Ansei Nankai Earthquake in Hirokawa Village, Wakayama Prefecture.

※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】, 【Roads】, 【Rail】

C-2 Human Resources Development

Training Programs "Knowledge Co-creation Programs"

- Japan invites trainees from developing countries to many programs in such fields as DRR governance and mainstreaming, earthquake, tsunami, flood, hydromet and so on. These programs are conducted with knowledge and experiences on DRR in Japan.

- Management of "International Training on Seismology and Earthquake Engineering (since 1960)" and "Disaster Management Policy Program: Water-Related Disaster Risk Management Course (since 2008)" in collaboration with the Japan International Cooperation Agency (JICA) and the National Graduate Institute for Policy Studies (GRIPS) (ICHARM)

- Management of "Visiting Researcher Program" (since 1960, ADRC)
- Management of "Comprehensive Disaster Risk Reduction " (since 2019, ADRC/JICA)
- Management of "Promotion of Mainstreaming Disaster Risk Reduction toward a More Resilient Society" (since 2018, ADRC/JICA)

※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】, 【Roads】, 【Rail】

C Risk education

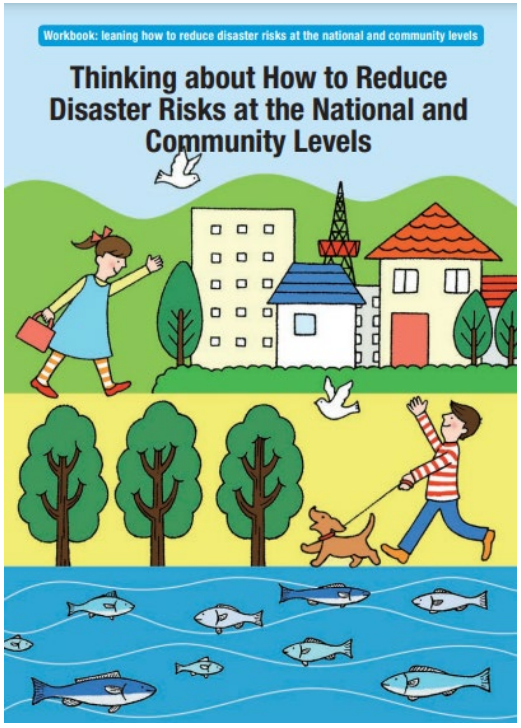
Any types of disasters

Raise awareness for disaster risk reduction and promote risk education

C-3 Raising Awareness on National Resilience and Development of Learning Materials

- A pamphlet has been released to explain the concept of national resilience and show examples in an easy-to-understand manner with the aim of raising public awareness on building national resilience.
- As an initiative for risk communication including disaster reduction education in schools, learning materials were released for use in school classes, etc.

Pamphlet: Creating a disaster-resilient nation



Learning materials: Thinking about How to Reduce Disaster Risks at the National and Community Levels

※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】, 【Roads】, 【Rail】

D Emergency warning, Evacuation support

Any types of disasters (Earthquake, tsunami, volcano)

Sharing disaster information, communicate to relevant organizations and citizens, early warning

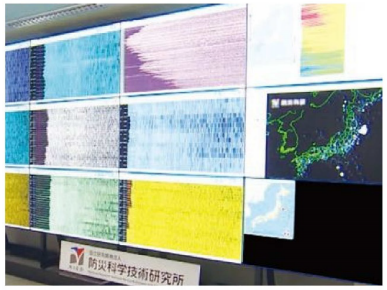
D-1

Monitoring of Waves on Land and Seafloor (MOWLAS) (1/2)

- MOWLAS is a monitoring network that covers the lands and seafloors all over Japan, and can immediately and accurately observe hazard phenomenon of earthquakes, tsunamis and volcanic eruptions in Japan. The observed data is utilized not only for research on natural disaster mechanisms but also for disaster reduction as it is directly provided to central government, local governments and private companies.

地震、津波、火山の観測網「MOWLAS」（陸海統合地震津波火山観測網）
Nationwide observation network for earthquakes, tsunamis, and volcanoes over land and sea

MOWLAS
Monitoring of Waves on Land and Seafloor



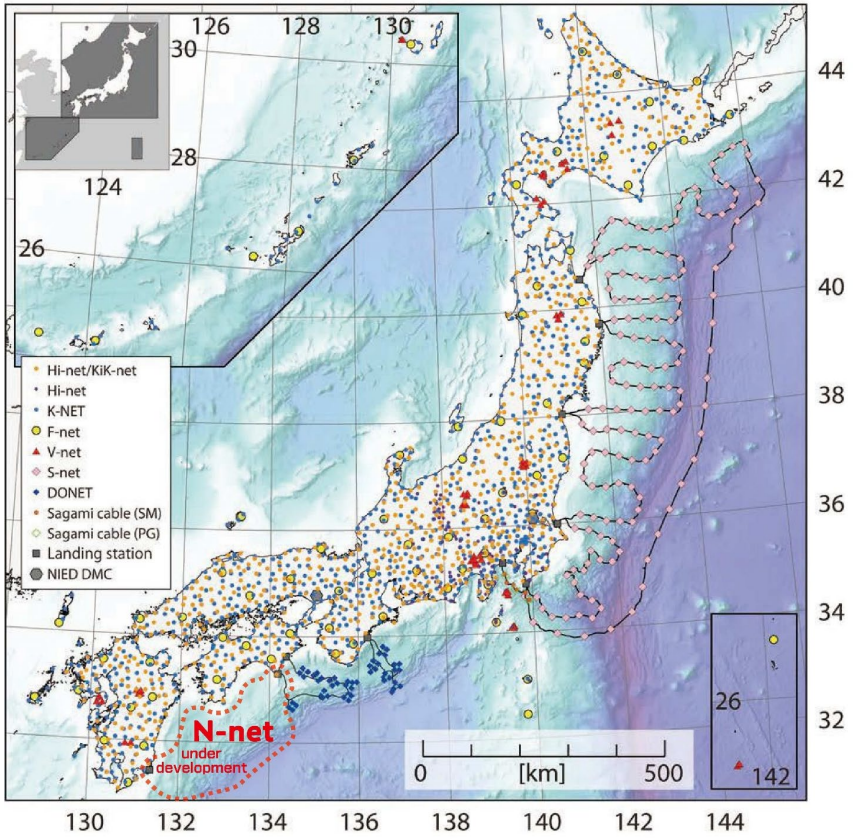
リアルタイムに高品質の観測データを取得

Acquire high-quality observation data in real time

防災科研では日本全国の陸域・海域に張り巡らされた７つの観測網（Hi-net/KiK-net、K-NET、F-net、V-net、S-net、DONET）からなる「MOWLAS」（陸海統合地震津波火山観測網）を運用しています。計2,100以上の観測点が全国の陸域から海域までを網羅し、リアルタイムでデータを取得。観測データは気象庁による緊急地震速報や、地震時に新幹線を緊急停止するシステムにも活用されています。2024年度末には南海トラフ海底地震津波観測網（N-net）も完成予定です。

NIED operates MOWLAS (Monitoring of Waves on Land and Seafloor), which consists of seven observation networks (Hi-net/KiK-net, K-NET, F-net, V-net, S-net, DONET) covering all land and sea in Japan.
Approximately 2,100 observation stations are installed across the entire country and acquire data in real time, also contributing to earthquake early warning system and the emergency stop system for the Shinkansen bullet train in the event of an earthquake.
By the end of FY2024, the construction of Nankai Trough Seafloor Observation Network for Earthquakes and Tsunamis (N-net) is scheduled to be completed.

地震津波火山ネットワークセンター　https://www.mowlas.bosai.go.jp/



※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】

D Emergency warning, Evacuation support

Any types of disasters (Earthquake, tsunami, volcano)

Sharing disaster information, communicate to relevant organizations and citizens, early warning

D-1

Monitoring of Waves on Land and Seafloor (MOWLAS) (2/2)

➢ MOWLAS is a monitoring network that covers the lands and seafloors all over Japan, and can immediately and accurately observe hazard phenomenon of earthquakes, tsunamis and volcanic eruptions in Japan. The observed data is utilized not only for research on natural disaster mechanisms but also for disaster reduction as it is directly provided to central government, local governments and private companies.

Hi-net/KiK-net

高感度地震観測網（Hi-net）は微弱な揺れを観測することができ、約 800 の観測点で構成されている。基盤強震観測網（KiK-net）も併置されている。

Hi-net is a high-sensitivity seismograph network consisting of nearly 800 stations. KiK-net is a strong motion seismograph installed with Hi-net sensors.

K-NET

全国強震観測網（K-NET）は被害が発生するような強い揺れを観測することができ、1,000 以上の観測点で構成されている。阪神・淡路大震災を機に整備された。

K-NET is a strong motion seismograph network consisting of more than 1,000 stations.

F-net

広帯域地震観測網（F-net）は幅広い周期の揺れを観測することができ、全国約 70 カ所に設置されている。

F-net is a broadband seismograph network consisting of about 70 stations nationwide to measure ground motion accurately over a wide frequency range.

V-net

基盤的火山観測網（V-net）は火山噴火予測の実用化と火山防災をめざし、16 火山に整備した観測網である。

V-net is an observation network operated at 16 volcanoes in an effort to develop eruption forecast and volcano hazard mitigation.

S-net

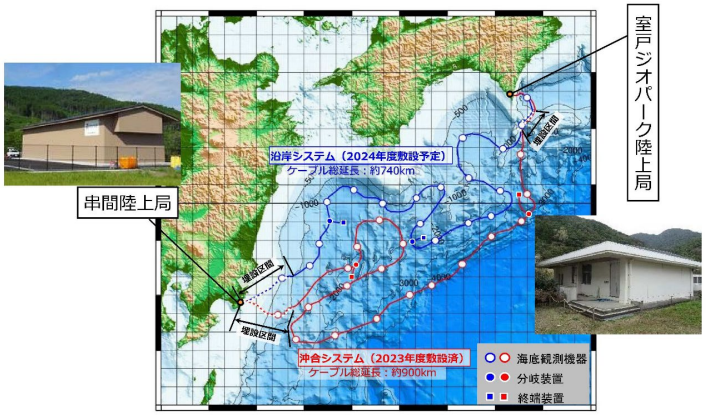
日本海溝海底地震津波観測網（S-net）は太平洋沖の海底に 150 の観測ユニットを設置し、海底地震や津波を観測している。

S-net is an ocean-bottom observation network with 150 observation units to monitor earthquakes and tsunamis occurring around the Japan Trench.

DONET

地震・津波観測監視システム（DONET）は熊野灘から紀伊半島沖の 51 地点で海底地震と津波を観測している。

DONET is an ocean bottom observation network consisting of 51 stations in Kumano-nada and off Kii Channel for monitoring of earthquakes and tsunamis.



N-net（南海トラフ海底地震津波観測網）2024 年度末完成予定

N-net (Nankai Trough Seafloor Observation Network for Earthquakes and Tsunamis) Scheduled to be completed by the end of FY2024

南海トラフ地震の想定震源域のうち、まだ観測網が設置されていない高知県の室戸岬沖から宮崎県沖の日向灘にかけた海域に、南海トラフ海底地震津波観測網（N-net）を構築中で、2024 年度末の完成を目指しています。N-net の構築により、地震動は最大 20 秒程度、津波は最大 20 分程度早く直接検知できるようになると期待されています。

NIED is currently developing a large-scale seafloor observation network of earthquakes and tsunamis within the seismic source region of the anticipated Nankai Trough Earthquake. With the construction of N-net, it is expected that earthquakes and tsunamis can be directly detected up to about 20 seconds and 20 minutes earlier respectively.

※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】

D Emergency warning, Evacuation support

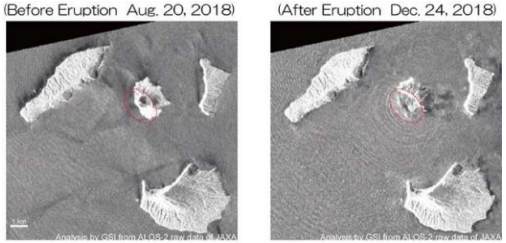
Meteorological disaster
Any types of disasters

Sharing disaster information, communicate to relevant organizations and citizens, early warning

D-2 Satellite Observation Data for Emergency Responses

Response to Natural Disasters - Earthquake, Eruption, Tsunami

- "ALOS-4" was launched in 2024 with improved performance compared with its predecessor "ALOS-2." It features the world's highest resolution and wide-area observation capabilities
- Emergency observation was performed by "ALOS-2" to detect damages caused by the eruption of Krakatau and Tsunami in Indonesia, 2018.



Analysis by GSI from ALOS-2 raw data of JAXA

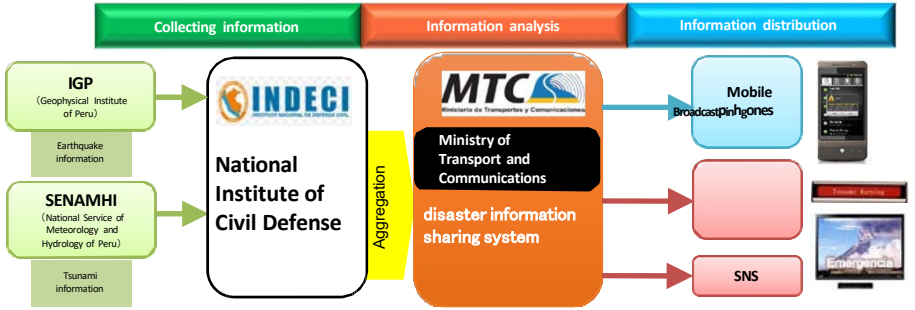
(Left) Before the eruption, (Right) after the eruption. The collapse of south– west part of the island is shown in the red circle (approx. 2km) in the right image.

※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】

D-3 Early Warning System (L-Alert)

- A disaster information sharing system that utilizes the know-how of the L- Alert, a system that collects, analyzes, and distributes disaster information consistently and delivers disaster information quickly and reliably to residents.

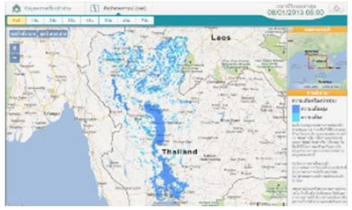
(Model in Peru)



※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】

D-4 Flood Forecasting Software

Project for Comprehensive Flood Management Plan for the Chao Phraya River Basin in Thailand (Technical Cooperation for Development Planning)



Inundation forecasting map

Water level forecasting map

World's first technology that brought the full-scale system to forecast inundation area

- Flood forecasting system was developed for Chao Phraya river basin in Thailand where the great flood in 2011 caused huge damage.
- Development of a flood forecasting and early warning system for the Indus River basin of Pakistan as part of the UNESCO Pakistan project (ICHARM)
- Development of a flood forecasting system for the Philippines and Sri Lanka(ICHARM)
- Development of systems for agriculture drought monitoring and drought seasonal forecasting for Ceará, a northeastern state of Brazil, by using the Coupled Land and Vegetation Data Assimilation System (CLVDAS) backed by the second Advance Microwave Scanning Radiometer (AMSR2) on the Shizuku satellite (ICHARM

※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】

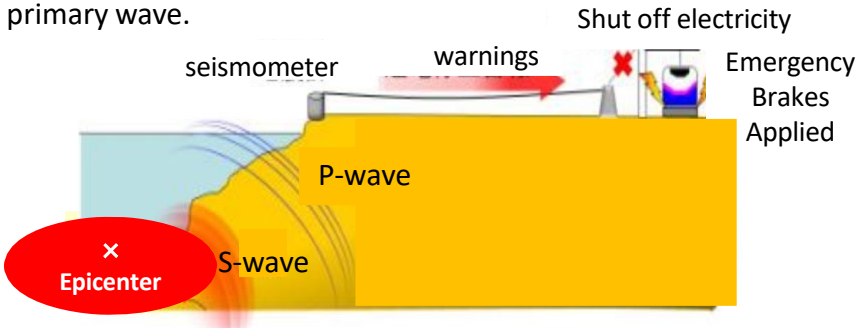
D Emergency warning, Evacuation support

Earthquake/Tsunami
Any types of disasters

Sharing disaster information, communicate to relevant organizations and citizens, early warning

D-5 Urgent Earthquake Detection and Alarm System

➢ Seismometers immediately determine the expected secondary wave and the damage of the earthquake and send out warnings to shut off the electricity supplied to the trains when they detect the primary wave.



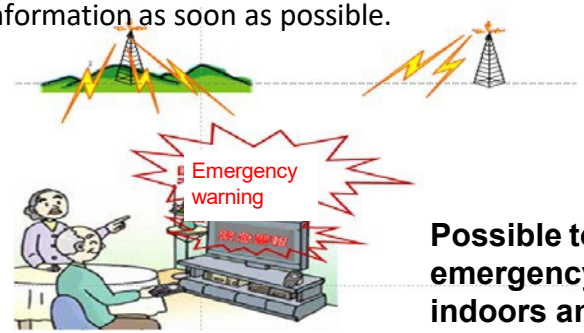
No trains derailed and no passengers got injured due to 2024 Noto Peninsula Earthquake, 2011 Great East Japan Earthquake, or 2016 Kumamoto Earthquake.

※Relevant sectors: 【Rail】

D-6 Emergency Warning Broadcast System

Infrastructure Development for Providing Disaster-related Information

➢ Utilizing terrestrial digital television broadcasting network as the basis for informing the inhabitants of disaster-related information as soon as possible.

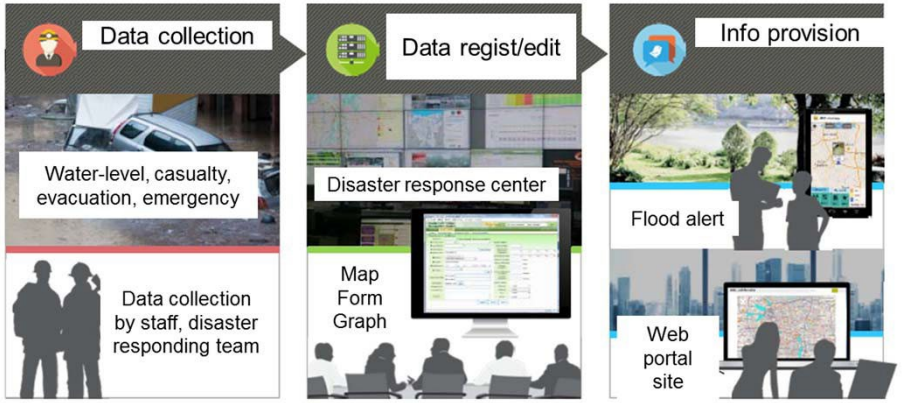


Possible to receive emergency information indoors and outdoors.

※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】

D-7 Disaster Information Management System (DIMS)

➢ Providing geospatial information about disasters. Centrally managing information about disasters to allow disaster response agencies to promptly understand the damage conditions, estimate the extent of damage and provide a bird's eye view at the time of disasters and support decision-making.



※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】

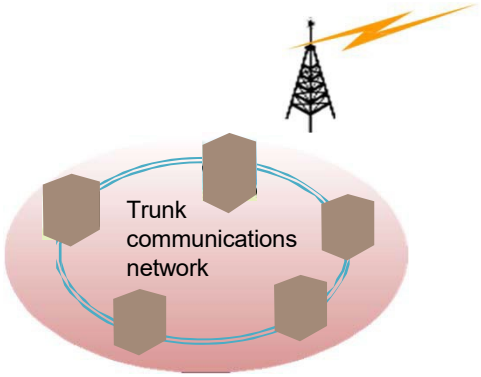
E Emergency rescue activities

Any types of disasters

Rescue/first-aid/emergency medical care for life saving, measures for evacuation sites, providing relief supplies

E-1 ICT Disaster Management Unit

- Incorporating communications equipment, including a power supply, battery, and radio equipment, to build a communications network with ease.
- Used as a communication infrastructure that provides a minimum ICT environment in times of disaster and quickly restores communications.



Miniaturized into a container type, a car type, or an attaché case type and applied to various forms and carried with ease.

Car type

Container type

Attaché case type

※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】, 【Roads】, 【Rail】

E-2 Transportable ATC (Air Traffic Control) Tower

- Used as alternative measures in case of damages of ATC tower caused by unexpected circumstances

Appearance

Inside of the operation room

※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】, 【Roads】, 【Rail】

E-3 Drain Pump Car

- It worked well for water drainage at the Great East Japan Earthquake.

Drain pump car

※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】, 【Roads】, 【Rail】

E-4 Remote-operated Equipment, Unmanned Construction

- During emergency recovery works, utilize remote-operated construction machineries to prevent secondary damages.

※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】, 【Roads】, 【Rail】

E Emergency rescue activities

Any types of disasters

Rescue/first-aid/emergency medical care for life saving, measures for evacuation sites, providing relief supplies

E-5 Early Detection and Assessment of Disaster Conditions Using Drones

- Drones owned by local governments or the cooperation of organization and businesses that own drones are used for early detection of disasters (such as fires) and to assess and share the conditions in hazardous areas.
- The use of drones for cases of wide-spread and numerous landslides and infrastructure damage makes it possible to promptly conduct condition assessment and surveying while protecting the safety of team members.

Landslide disaster survey by drone

3D data collected by drone and made public

Assessing the conditions of mountainside collapse and the surrounding environment

※Relevant sectors: 【Cities & Housing】, 【Water Management & Land Conservation】

E-6 Domestic Water Security Using Portable Water Reclamation System

- More than 98% of water is purified for reuse on site using this water reclamation system.
- Circulating shower systems and handwashing stands using this system can be used without connecting to a sewage system and without being impacted by the surrounding environment. It provides safe, stable water for use for showers, handwashing, and domestic water necessary for disaster relief teams.

Circulating shower system

Circulating handwashing stand

※Relevant sectors: 【Cities & Housing】

※E-5 and E-6 are excerpted from the "Catalog of New, Effective Technologies for Local Government Use Based on Experience from the 2024 Noto Peninsular Earthquake" (June 2024, Verification Team for the 2024 Noto Peninsula Earthquake). For more details see: https://www.bousai.go.jp/updates/r60101notojishin/pdf/kensho_team_catalog.pdf

Any types of disasters

F Smooth recovery and reconstruction

Assistance for formulation of rehabilitation and recovery plan, support for livelihood

F-1 Assistance for Formulation of Rehabilitation and Recovery Master Plan

The Project on Rehabilitation and Recovery from Disaster

- Utilize ODA to support the formulation of a basic reconstruction plan with Build Back Better Concept including countermeasure to flood tide and land use plan.

Formulation of Community Recovery Plan

※Relevant sectors: 【Cities & Housing】

F-2 Disaster Waste Management

- Various kinds of waste which are generated in massive volume all at once delay recovery/ reconstruction. In terms of maintaining living environment, public hygiene and material cycles, swift removal of waste is required. Know-hows and technologies based on Japan's experiences of disaster waste management are able to utilize to solve these tasks.

Disaster waste caused by flood

Intermediate treatment facility of mixture (sorting and crushing)

※Relevant sectors: 【Cities & Housing】

F-3 『JOEN』 ～Salt removal work from farmland～

Restoration of Farmland from Sea Water Flood Damage by Tsunami

- In the Great East Japan Earthquake in 2011, many farmlands were flooded with sea water by tsunami. In order to remove salt content remaining in the soil, the salt removal "Joen" manual was created and salt removal works were carried out. These knowledge and methods can be utilized in the case of tsunami damage in foreign countries as well.

Farmlands flooded by tsunami.
(The Great East Japan Earthquake, Mar. 2011)

・Forming mole drains
・Scattering lime-based soil conditioner

・Filling & stirring with fresh water

※Relevant sectors: 【Water Management & Land Conservation】

F-4 Reconstruction of Infrastructure -Based on Build Back Better（BBB）Concept

- To implement Build Back Better concept, Japan's ODA assist rebuilding resilient infrastructure; school, hospital and dike.

The school is designed to be used for evacuation center in emergency (Phillippines)

Reconstructed elementary school by ODA Grant assistance

※Relevant sectors: 【Cities & Housing】

Any types of disasters

F Smooth recovery and reconstruction

Assistance for formulation of rehabilitation and recovery plan, support for livelihood

F-5 Support for House Reconstruction -Based on Build Back Better（BBB）Concept

- In reconstruction of earthquake damaged houses, Japanese ODA can support formulation of standards and guidelines, through the technical cooperation for enhancement of earthquake resistance.

In the disaster area of the Great Nepal earthquake of 2015, subsidies based on ODA loans were provided for house reconstruction that fulfill the earthquake resistance requirements which promoted reconstruction.

※Relevant sectors: 【Cities & Housing】

F-6 Support for Livelihood Recovery Considering Victims

- During recovery from the 2024 Noto Peninsula earthquake, urgent measures from the perspective of “rebuilding daily lives,” “rebuilding livelihoods,” “disaster recovery” were compiled as the “Package to Support Victims’ Daily Lives and Livelihoods” and reconstruction projects are underway. This information can be utilized in the recovery from disasters in other countries.

In the case of the Yolanda Typhoon of 2013, food processing facilities were reconstructed for the fishery industry, which is the major industry in the affected area.

※Relevant sectors: 【Cities & Housing】

F-7 Standby Loan for Disaster Recovery

- Loan support framework is agreed upon prior to the occurrence of disasters, and once a disaster occurs, loans are promptly executed upon request from the borrowing country (Past borrowers: the Philippines (2023) and Fiji (2019)).
- Policy support was provided to the government of the Philippines (2023) for disaster risk reduction and management. To prepare in advance for increased financial needs during recovery, Japan and Philippines entered into an agreement to facilitate a speedy recovery by allowing the Philippines to request the execution of a loan upon declaring a disaster.

※Relevant sectors: 【Cities & Housing】