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# ICHARM

# Activity Report

## FY2024

**9th ICHARM Governing Board Meeting**
**June 23, 2025**

**International Centre for Water Hazard and Risk Management**
**under the auspices of UNESCO (ICHARM),**
**Public Works Research Institute (PWRI), Japan**

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Centre
Under the auspices
of UNESCO

ICHARM
International Centre for Water
Hazard and Risk Management
under the auspices of UNESCO

PWRI
Public Works Research Institute,
National Research and Development
Agency, Japan

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## Annex

# Abbreviation

| | |
|---|---|
| ADB | Asian Development Bank |
| AOGEO | Asia Oceania GEO |
| AOP | Annual Operating Plan |
| APWF | Asia-Pacific Water Forum |
| Area-BCM | Area-Business Continuity Management |
| AWCI | Asian Water Cycle Initiative |
| AWDO | Asian Water Development Outlook |
| BCM | Business Continuity Management |
| BCP | Business Continuity Plan |
| BRIDGE | Programs for Bridging the gap between R&D and the IDeal society (Society 5.0) and Generating Economic and social value |
| C2C | Category 2 Centre |
| CALDAS | Coupled Atmosphere and Land Data Assimilation System |
| CLVDAS | Couple Land and Vegetation Data Assimilation System |
| d4PDF | database for Policy Decision making for Future climate change |
| DHM | Distributed Hydrological Model |
| DIAS | Data Integration and Analysis System |
| DENR | Department of Environment and Natural Resources, Republic of the Philippines |
| DOST | Department of Science and Technology, Republic of the Philippines |
| DPWH | Department of Public Works and Highways, Republic of the Philippines |
| DRR | Disaster Risk Reduction |
| DSSC | Davao del Sur State College, Republic of the Philippines |
| EW4All | Early Warnings for All |
| GCM | General Circulation Model |
| GEO | Group on Earth Observations |
| GRIPS | National Graduate Institute for Policy Studies |
| GSMaP | Global Satellite Mapping of Precipitation |
| GUI | Graphical User Interface |
| GWP | Global Water Partnership |
| HELP | High-level Experts and Leaders Panel on Water and Disasters |
| HyDEPP | Hybrid Water-Related Disaster Risk Assessment Technology for Sustainable Local Economic Development Policy under Climate Change in the Republic of the Philippines |
| ICFM | International Conference on Flood Management |
| ICHARM | International Centre for Water Hazard and Risk Management |
| IDR4M | Integrated-System of Disaster Reduction 4(for) Municipalities |

| | |
|---|---|
| IFI | International Flood Initiative |
| IFM | Integrated Flood Management |
| IISEE | International Institute of Seismology and Earthquake Engineering, Building Research Institute |
| IRDR | Integrated Research on Disaster Risk |
| IWHR | China Institute of Water Resources and Hydropower Research |
| IWRM | Integrated Water Resources Management |
| JAXA | Japan Aerospace Exploration Agency |
| JCC | Joint Coordinating Committee |
| JHoP | Japan Hub of Disaster Resilience Partners |
| JICA | Japan International Cooperation Agency |
| JMA | Japan Meteorological Agency |
| JST | Japan Science and Technology Agency |
| JWA | Japan Water Agency |
| LETKF | Local Ensemble Transform Kalman Filter |
| MEXT | Ministry of Education, Culture, Sports, Science and Technology |
| MLIT | Ministry of Land, Infrastructure, Transport and Tourism |
| MOFA | Ministry of Foreign Affairs |
| MoU | Memorandum of Understanding |
| NEDO | New Energy and Industrial Technology Development Organization |
| NILIM | National Institute for Land and Infrastructure Management |
| OSS-SR | Online Synthesis System for Sustainability and Resilience |
| PAGASA | Philippine Atmospheric, Geophysical and Astronomical Services Administration |
| PMP | Probable Maximum Precipitation |
| RID | Royal Irrigation Department, Thailand |
| PWRI | Public Works Research Institute |
| RRI | Rainfall-Runoff-Inundation |
| RSR model | Rainfall-Sediment-Runoff model |
| RSC-AP | UNESCO-IHP Asia-Pacific Regional Steering Committee |
| SAR | Synthetic Aperture Radar |
| SATREPS | Science and Technology Research Partnership for Sustainable Development |
| SDGs | Sustainable Development Goals |
| SIP | Cross-ministerial Strategic Innovation Promotion Program |
| SIMRIW | Simulation Model for Rice-Weather Relationships |
| SPI | Standardized Precipitation Index |
| TC | Typhoon Committee |
| TCFD | Task Force on Climate-related Financial Disclosures |
| UNDRR | United Nations Office for Disaster Risk Reduction |

| | |
|---|---|
| UNESCAP | United Nations Economic and Social Commission for Asia and the Pacific |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UNESCO-IHP | UNESCO Intergovernmental Hydrological Programme |
| UNSTSWD | United Nations Special Thematic Session on Water and Disasters |
| UPLB | University of the Philippines Los Baños |
| VFES | Virtual Flood Experience System |
| VNMHA | Vietnam Meteorological and Hydrological Administration, Ministry of Natural Resources and Environment |
| VR | Virtual Reality |
| WCI | Water Cycle Integrator |
| WEB-DHM | Water and Energy Budget-based Distributed Hydrological Model |
| WEB-RRI | Water and Energy Balance-based Rainfall Runoff Inundation Model |
| WGH | Working Group on Hydrology |
| WMO | World Meteorological Organization |
| WRF model | Weather Research and Forecasting model |
| WWC | World Water Council |
| WWF | World Water Forum |

# 1． Summary

This Activity Report summarizes the main activities carried out by ICHARM in FY2024 (April 2024 to March 2025), the 19th year of ICHARM.

FY2024 is the third year of the 5th Medium- and Long-Term Plan (2022-2027) of PWRI, to which ICHARM belongs, and also the third year of UNESCO IHP-IX (2022-2029).

In FY2024, as the first year of the revised ICHARM Programme, we conducted a broad range of activities, covering research, capacity building, and information networking.

Regarding research, we conducted various studies and projects in Japan and overseas using the end-to-end approach (from data acquisition to the analysis, evaluation, and prediction of natural phenomena to the assessment of their socioeconomic impacts). These activities were funded with operating grants from MLIT and external funds from MEXT, the Cabinet Office, JICA, and other organizations.

Regarding capacity building, we conducted a doctoral program, “Disaster Management Program,” and a master's program, “Water-related Disaster Management Course of Disaster Management Policy Program,” as we did in FY2023. We also held the Follow-up Seminar online.

As information networking activities, we continued supporting, as the IFI secretariat, the establishment and implementation of a “Platform on Water Resilience and Disasters” in several countries. In this platform effort, we introduced the concept of the Water Cycle Integrator (WCI) created by ICHARM and tried to put it into practice through various activities.

We also demonstrated the presence of Japan and ICHARM to the participating countries through the activities of the Typhoon Committee Working Group of Hydrology in cooperation with MLIT. Moreover, we made consistent contributions to UNESCO-IHP. Executive Director KOIKE Toshio chairs one of the cross-cutting working themes of UNESCO-IHP-IX, and ICHARM supported hosting the 50th Anniversary Symposium of the UNESCO IHP in Tokyo.

In public relations activities, the executive and deputy directors delivered lectures and presentations at domestic and international conferences. In addition, we carried out community contribution activities targeting young students and participated in webinars for global practitioners. The latest information on these and other activities was widely disseminated domestically and internationally through our website and quarterly newsletters.

Details of each activity are explained on the following pages.

## 2. Special topics

### 2.1 Improvement of heavy rainfall reproduction

In recent years, there has been a significant increase in the occurrence of linear precipitation bands, a meteorological phenomenon extremely difficult to predict. Our research team has been improving WRF-LETKF, an ensemble rainfall prediction model, to predict this phenomenon better. In FY2023, the team improved the reproducibility of a heavy rainfall event from the linear precipitation band observed over Japan's Kyushu region in 2020 by enhancing the Ensemble Kalman Filter's error covariance inflation. Furthermore, it found that more accurate rainfall forecasting would be possible by assimilating cloud water content and other data using satellite microwaves.

### 2.2 Experiments on driftwood behavior in areas with significant bed deformations

In recent years, phenomena known as "sediment-induced flood inundations," which involve large volumes of sediment and driftwood, have become increasingly frequent. To predict these events and mitigate their damage, there is a need for methods to analyze driftwood behavior in areas with significant bed deformations. Since traditional Lagrangian methods tracking individual driftwood pieces have been proven ineffective for analyzing large quantities of driftwood, we proposed a new method that uses convection and storage equations by treating driftwood pieces as neutral buoyant particles. This method enables the straightforward analysis of driftwood behavior across extensive areas, from driftwood production to flood inundation areas. To validate this method and determine calculation parameters, hydraulic experiments were conducted to study driftwood behavior. The results allowed us to determine parameters related to driftwood erosion and deposition, advancing the development of hazard maps for sediment-induced flood inundations.

### 2.3 Enhancing disaster preparedness using the Virtual Flood Experience System in middle school project-based learning

ICHARM has been actively participating in the "Development of a Resilient Smart Network System against Natural Disasters," a project initiated under the Cross-ministerial Strategic Innovation Promotion Program (SIP) led by the Cabinet Office of Japan. As part of this initiative, we are conducting research and development focused on one of its sub-themes: "Promotion of Disaster Prevention Actions Based on Risk Information." This research specifically focuses on visualizing water disaster risks in an area and examines how this visualization influences residents' behavior. More broadly, it aims to raise public awareness of disaster management by encouraging

Photo 2-1 Senior Researcher Denda (far in the back, beside the screen) guiding students through a project-based learning session.

individuals to view disaster-related issues as personal concerns, even during normal times. (See Section 3.5.2 for details.)

As part of this research, we conducted a project-based learning class with approximately 40 first-year students at the junior high school affiliated with Ibaraki Prefectural Mitsukaido First High School. The class provided students with basic knowledge of floods and disaster risk management. Using Minecraft Education, an educational game developed by Microsoft, the students engaged in hands-on activities in a virtual environment. These included creating townscapes and experiencing simulated floods, allowing them to explore and develop ideas for building disaster-resilient communities. (See Section 3.5.2 for details.)

## 2.4 The third online Follow-up Seminar and the launch of the Alumni Webinar

ICHARM is collaborating with JICA and GRIPS to implement the Master's Program in Disaster Prevention Policy and Water-Related Disaster Risk Management and the Doctoral Program in Disaster Prevention Studies, which have produced a total of 215 graduates to date.

As a follow-up activity for these graduates, ICHRAM has been holding a seminar once a year since 2007. The latest seminar was held on March 13, 2025, as the third online Follow-up Seminar for master's and doctoral program graduates. (See Section 4.3 for details.)




Photo 2-2,3,4,5 (from left) JICA Tsukuba Director General Takahashi, GRIPS President Ota, PWRI President Fujita, and then ICHARM Research and Training Advisor Egashira

Additionally, in FY2024, we began holding webinars covering four fields (i.e., meteorology, sediment, hydrology, and risk management) to share knowledge and information on the latest trends and technological innovations in water disaster management, strengthen the network between previous and current students, and support ICHARM alumni in their activities.


Photo 2-6 Alumni Webinar flier

## 2.5 Revision of master's program curriculum

The ICHARM educational programs have been operated for nearly 20 years since their establishment. During this period, scientific advancements and societal needs have continued to evolve, requiring a generational shift in the programs' faculty. Therefore, we conducted a fundamental restructuring of the master's program curriculum, which was implemented in FY2024.

**Principles:**

- ICHARM's educational programs aim to foster experts who can lead sustainable development in their respective countries. This intention is achieved by promoting self-reliance in reducing water-related disaster risks in developing countries, enhancing their capacity to address local water resource and disaster risk challenges, and driving systemic changes.
- To produce such experts, it is essential to cultivate the ability to understand fundamental principles and generate ideas based on them, as well as to understand a wide range of knowledge from other fields and relate it to one's own area of expertise.
- Furthermore, in the course of this training, through dialogue and collaboration between students and faculty members and among students themselves, we aim to foster a learning environment where diverse challenges and solutions are explored equally. Such an

environment will broaden each individual's capacity to respond to a variety of situations, build mutual trust, and create a network of experts who can rely on each other as valuable assets, ultimately accelerating “co-creation.”

**Revised basic curriculum structures:**

(1) **Fundamental Knowledge Acquisition:** Studies in the fundamental knowledge of hydraulics, hydrology, sediment control, water resources management, meteorology and climatology, geography, urban planning, and risk management.

(2) **Practical Skills Development:** Exercises in observation and data analysis, modeling, geographic information systems (GIS), and understanding field conditions.

(3) **Project Design and Policy Formulation:** Studies in fundamental knowledge and exercises related to project design and policy formulation.

(4) **Thesis Research and Writing:** Through comprehensive exercises and specialized seminars, students will develop presentation, discussion, and scientific writing skills necessary for completing a Master's thesis.

In addition, we will also enhance the coursework offered in the doctoral program.

## 2.6 New developments of IFI’s platform project in the Philippines

ICHARM has continued supporting IFI as its secretariat in the establishment and implementation of a "Platform on Water Resilience and Disasters" in various countries, including the Philippines, Sri Lanka, and Indonesia, in collaboration with their governments and other relevant organizations. In this platform effort, we have assisted these countries in various activities while considering local needs and conditions, based on the concept of the Water Cycle Integrator (WCI), which is the UN Water Conference’s agenda for water actions.

In the Philippines, Davao City has been actively engaged in the platform project. In FY2024, based on Resolution No. 42 of the Davao Regional Development Council and a tripartite agreement involving the Department of Science and Technology and Davao del Sur State University, the city led the development and implementation of the OSS-SR system. In addition, because the Davao region, particularly in Digos City, which borders Davao City, and in the Davao de Oro area, has experienced severe floods and landslide disasters, stakeholders have begun developing the Davao Region’s OSS-SR (DROSS). For this plan, a budget has been allocated for installing a local server at the DENR headquarters. (See Section 5.1 for details.)

## 2.7 UNESCO Evaluation Mission to assess ICHARM's activities

A UNESCO evaluation mission visited ICHARM on February 26-27, 2025, to conduct in-person interviews, a requirement to renew the agreement between UNESCO and the Government of Japan for the continued establishment of ICHARM. The initial agreement, signed in 2006, has been renewed twice, in 2013 and 2020. The current agreement is set to remain in effect until February 2026.

Photo 2-7 The UNESCO mission reporting on the evaluation outcomes to PWRI President Fujita

This mission included two experts as evaluators: Dr. Slobodan Simonovic, a professor emeritus of Civil and Environmental Engineering at Western University, Canada, and Professor LIU Yimin from the Institute of Atmospheric Physics, the Chinese Academy of Sciences. They were accompanied by Dr. Ai Sugiura, a programme specialist for Natural Science at the UNESCO East Asia Regional Office in Beijing.

During their visit, the mission members interviewed ICHARM management, researchers, and students. They also paid courtesy visits to Director-General SAITO Hiroyuki, Water Resources Department, Water and Disaster Management Bureau at the Ministry of Land, Infrastructure, Transport and Tourism, and Deputy Director ONO Kenichi, the Japanese National Commission for UNESCO at the Ministry of Education, Culture, Sports, Science and Technology. At the end of the two-day mission, the evaluators presented their findings to FUJITA Koichi, the president of the Public Works Research Institute (PWRI).

In addition to the in-person interviews, online interviews were conducted in March 2025 with JICA Tsukuba (on March 6, 2025), PWRI (March 6), the World Bank (March 19), and GRIPS (March 25). The final evaluation report was submitted to UNESCO in May 2025, serving as the foundation for their decision on renewing the agreement.

## 3. Research

ICHARM has been conducting “R&D Program 1: Development of technologies to promote basin-wide flood control against severe water-related disasters” under “R&D Theme 1: Contribution to national land development to protect lives and livelihoods from natural disasters” in PWRI's 5th Medium- and Long-term Plan (2022-2027).

Specifically, our research focuses on the following four areas to address increasingly severe water-related disasters in consideration of climate change impacts by developing technologies to support basin-wide flood control, thereby contributing to national land development that protects lives and livelihoods from natural disasters.

1. Predict water-related disaster hazards accurately.
   ・Develop and improve technology to predict future water-related disaster hazards.
2. Minimize inundation as much as possible.
   ・Develop a method to accurately evaluate and implement projects planned to achieve the new flood management policy, “River Basin Disaster Resilience and Sustainability by All.”
3. Reduce exposure to water hazards.
   ・Develop an accurate flood inundation risk assessment method.
4. Strengthen society’s disaster preparedness and resilience
   ・Develop technology to help strengthen society’s disaster preparedness and resilience against water disasters.

In addition, the ICHARM Programme, which was revised based on PWRI's 5th Medium- and Long-term Plan, stipulates the following policy for research activities:

ICHARM will step up innovative research by taking the end-to-end approach, which covers the entire research process from data collection to the analysis, assessment and prediction of natural phenomena to their socio-economic impact assessment, thereby creating a scientific knowledge base, which helps increase communities’ water-related disaster resilience and sustainability. We will conduct more advanced research by collecting data on both water hazards and disaster risks, assessing and predicting risks and their changes, including those related to socio-economy, and establishing methods and applications to support policy studies and implementations. We will promote interdisciplinarity by collaborating with a broad range of areas, including water use, public health, climate science, urban planning, ecology, biodiversity, agriculture, energy, and infectious disease control, as well as by considering new lifestyles and national land development.

In these contexts, ICHARM has been conducting research on the following five themes using the end-to-end approach:

1. Data collection, storage, sharing, and statistics on water-related disasters
2. Risk assessment on water-related disasters
3. Monitoring and prediction of changes in water-related disaster risk
4. Proposal, evaluation, and application of policy ideas for water-related risk reduction
5. Support in improving the applicability of water-related disaster management

The following sections describe the main research activities and achievements.

## 3.1 Collection, storage, sharing, and statistical analysis of water-related disaster data

ICHARM will conduct research on technologies to collect and store data and information regarding hazards, exposure and vulnerability and share them among stakeholders. We will also actively support nations and communities in data collection, storage, and sharing by developing and helping them implement technologies to collect damage data that can be operated by themselves. Technical assistance will also be provided for nations to compile highly reliable statistical data. (Source: ICHARM Mid-term Programme)

### 3.1.1 Support for risk and damage analysis using global observation data

#### a) Development of a system for the integrated management of water resources and disasters in poorly gauged basins

Near-real-time rainfall data with adequate resolutions are a prerequisite for effective water resource and disaster management. However, in many river basins in the world, near-real-time rainfall data are rarely available due to insufficient ground observation networks.

ICHARM continuously collaborates with JAXA to maximize near-real-time freely-available global satellite precipitation products (SPPs) for effective water resources and disaster management in poorly gauged basins (Figure 3-1). We are also studying methods for efficiently bias-correcting SPPs by incorporating ground observation data and methods for designing optimal ground observation networks.

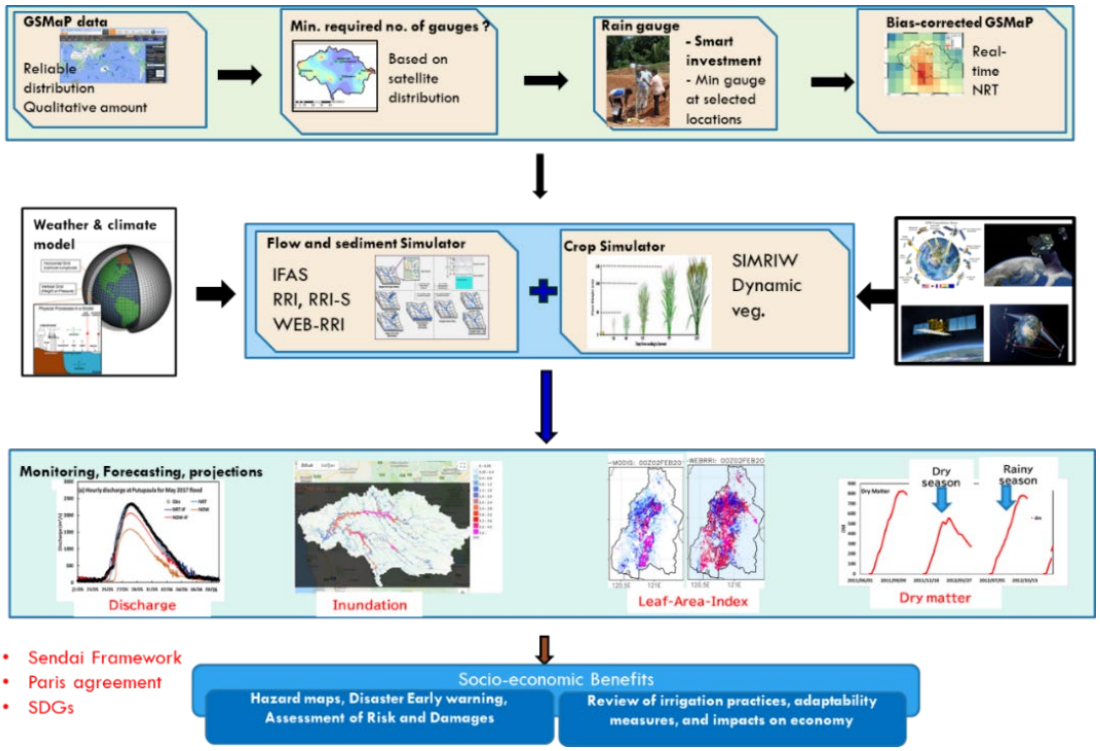


Figure 3-1 A conceptual image of a system for the integrated management of water resources and disasters in poorly gauged basins

b) Flood monitoring system training in the Philippines

ICHARM participates in a project named the "Hybrid Water-Related Disaster Risk Assessment Technology for Sustainable Local Economic Development Policy under Climate Change in the Republic of the Philippines (HyDEPP-SATREPS)" as a collaborative implementation organization. As part of this project, we organized the "Workshop for Interview Survey on Farmer's Disaster Experience" in Candaba Municipality, Pampanga Province, on June 18, 2024, gathering disaster management officers and residents living in flood-prone areas along the Pampanga River. In this workshop, ICHARM researchers explained flood simulations and risk assessments we had conducted, as well as the flood monitoring system we had developed for public use.

Photo 3-1 Workshop

### 3.1.2 Improvement of soil moisture observation resolution using global observation data

In FY2024, our research team succeeded in upgrading the spatial resolution of soil moisture from 2 km to 100 m by utilizing soil moisture products from the SAR radar system with a high spatial resolution (100 m). Furthermore, the team confirmed the functionality of the method they developed

for upgrading the spatial resolution of leaf biomass (25 km spatial resolution from land data assimilation to less than one km) using satellite observation data from the MODIS's visible and near-infrared sensor.

### 3.1.3 Developing an information infrastructure used on digital twins

ICHARM has been actively participating in a project titled "Development of a Resilient Smart Network System against Natural Disasters," initiated under the Cross-ministerial Strategic Innovation Promotion Program (SIP), led by the Cabinet Office of Japan. As part of this initiative, a project team has been conducting research and development focused on one of its sub-themes: "Promotion of Disaster Prevention Actions Based on Risk Information." This research specifically emphasizes the visualization of water disaster risks in an area and how this visualization influences residents' behavior. More broadly, it aims to raise public awareness of disaster management by encouraging individuals to view disaster-related issues as personal concerns, even during normal times. (See Section 3.6.1 for details.)

Photo 3-2 Verification of the reproduction accuracy of LOD3 buildings in Kurashiki City (Left: Actual buildings, Right: Reproduction in virtual space)

The SIP3 program does not stop at research and development, but calls for social implementation, aiming to apply it to the whole of Japan and to make research results more accessible to the general public. One of the challenges in socially implementing the Virtual Flood Experience System is the generation of highly accurate 3D spatial information to construct a realistic virtual space. A representative example of 3D spatial information is the 3D city model in PLATEAU, which is promoted by the Ministry of Land, Infrastructure, Transport and Tourism, but it does not cover the whole of Japan, and it is expected to take some time before 3D spatial information covering the whole country is made public.

Therefore, the project team decided to conduct a case study to deploy a locally tailored virtual flood experience system for cities where PLATEAU's 3D city model is not publicly available. The team selected Kurashiki City, Okayama Prefecture, Japan, among the areas whose PLATEAU model is not available as of March 2025, and used the basic map information as 3D spatial information. Then, they tested the system to examine its applicability toward social implementation.

Finding that many storehouses, which are fireproof and built in a similar style, exist in the city, the team created a standard structure model by making slight modifications and then replicated and placed them in the 3D space. This approach helped expand the 3D space area at low cost and improve realism, achieving a more practical representation of the area than initially expected.

ICHARM is planning to publicize this system on its website for public use, not only on personal computers but also smartphones, tablets, and other internet-accessible devices.

Making the system available on various personal mobile devices allows anyone to try it out casually without participating in special events such as workshops, which we believe will further help increase individual awareness of flood disaster risk.

## 3.2 Assessment of water-related disaster risks

ICHARM will develop and verify a method to combine water-related disaster assessment models with other models. We will also develop an index that can holistically indicate the basin-wide impact of water hazards. Case studies on the risk assessment of water-related disasters will be conducted at multiple locations both in and outside Japan while taking local conditions into account. Necessary assistance will be provided for local communities to perform risk assessments based on their needs and circumstances using the findings of the case studies, thereby achieving disaster risk reduction. (Source: ICHARM Mid-term Programme)

### 3.2.1 Improvement of future climate prediction technology using multiple models and downscaling of GCMs and evaluation of its regional applicability

[Downscaling]

In order to generate climate data that can be used to evaluate the impact of global warming on small basins of 100 $km^2$ or less, the research team analyzed the sensitivity of the high-resolution dynamic downscaling method developed by them. From downscaling calculations of reanalysis data for the upper Tone River basin, we observed almost no dependence from 5 km to 1 km resolutions for typhoon cases when the spectral nudging method, which gives low wavenumber components from the boundary, was used. This result is considered due to the significant effect of the low wavenumber component controlling the total synoptic scale phenomena, such as typhoons.

[DAD analysis]

In DAD analysis, the team assessed how climate change affects probable maximum precipitation (PMP) using 5-km hourly rainfall data from d4PDF ensemble dataset. PMP was estimated through the Depth-Area-Duration (DAD) analysis under historical, +2K, and +4K warming scenarios for Southeast and Northwest Kyushu, Japan. The PMP estimation followed five steps: aggregating rainfall data (2–72 hours), selecting annual maximum rainfall, deriving depth-area curves via the Flexible Element Method (FEM), enveloping maximum curves across 720 events, and calculating PMP and change factors. Change factors were computed for durations (1–72 hours) and rain areas (100, 1000, 10000 $km^2$). Figure 3-3 shows 24-hour PMP change factors, with results indicating PMP increases up to 1.22 (+2K) and 1.37 (+4K) in Northwest Kyushu, and up to 1.13 (+2K) and 1.26 (+4K) in Southeast Kyushu. PMP increases with warming, especially under +4K, across all rain areas. Results support updating PMP estimates to improve flood risk management and infrastructure resilience. The study was submitted to *Hydrological Research Letters*.

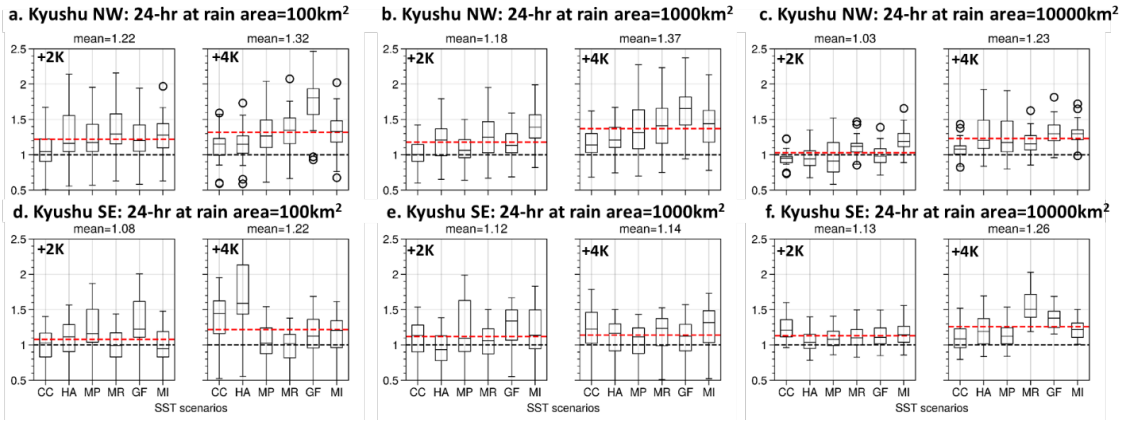


Figure 3-2 PMP change factors for 24-hr duration rainfall for multiple rain-areas (a.100 km$^2$, b.1000 km$^2$, and c.10000 km$^2$) and SST scenarios from the future +2K and +4K climate periods over Southeast Kyushu (Kyushu SE) and Northwest Kyushu (Kyushu NW)

### 3.2.2 Construction of a water cycle model considering basin characteristics and visualization of the effects of basin-wide flood control measures designed by basin stakeholders[1]

Various flood control measures have been studied to achieve basin-wide flood management collectively. Among them are flood damage prevention and mitigation measures for flooding that exceeds the design flood scale set for levee construction. One idea is to reduce the volume of floodwaters by creating overflowing points in flood-prone areas. ICHARM proposed and tested a method to identify appropriate points using public data in an area where large-scale levee breaches had occurred in recent years. The results indicated that the annual average crop damage may decrease even when the overflow frequency increases after setting overflowing points.

### 3.2.3 Development and improvement of an evaluation method for sediment and driftwood laden flood hazards and its application to domestic and overseas cases

ICHARM has been developing a rainfall-sediment-runoff (RSR) model, a tool to simulate sediment and driftwood laden floods using sediment hydraulic models. This model combines rainfall-runoff analysis with slope stability analysis, debris tracking using equations for a point mass system, and sediment and driftwood runoff analysis using a unit channel model in order to analyze water, sediment, and driftwood runoff at any point in a basin. In FY2024, we enhanced the RSR model and applied it to two disaster cases in Japan: sediment and driftwood disasters in the Terauchi Dam basin, which was caused by heavy rainfall in 2017 in northern Kyushu, and the flood and sediment inundation disaster in 2019 in the Uchikawa River basin, which was triggered by a large sediment supply from rainfall-induced landslides and debris flows. Through these applications, we demonstrated that the model enables an integrated analysis of water, sediment, and driftwood transport processes across the entire catchment. Additionally, we developed an interface for the RSR model to make it more easily

[1] Osamu Itagaki, Miho Ohara & Toshio Koike, Study of Flood Damage Reduction by Spillway Installation on a Riverine Levee in a Protected Area, Journal of Japan Society of Hydrology and Water Resources vol. 35, No. 5, 2022

accessible for researchers and engineers.

### 3.2.4 Study on the Practical Application of Driftwood Analysis Using the Advection and Storage Equations

Debris-flows in mountainous areas during heavy rainfall often lead to the simultaneous outflow of large amounts of driftwood, which can exacerbate flood damage. However, conventional Lagrangian-based driftwood analysis methods face difficulties in analyzing the behavior of large quantities of driftwood. Therefore, ICHARM has proposed a new method that treats driftwood pieces as neutral particles and applies the advection and storage equations. This method enables the easy analysis of the movements of numerous driftwood pieces at both catchment and local scales. Additionally, to validate the proposed method and determine appropriate analytical parameters, flume experiments were conducted to examine the behavior of driftwood. As a result, key parameters related to driftwood erosion and deposition were obtained, marking progress toward the development of hazard maps for sediment and flood inundation.

### 3.2.5 Study on adaptation measures using an integrated risk assessment method

#### a) Development and application of a hydrology and crop coupled model

Climate change has led to more frequent flooding and drought, with significant, often devastating, impacts on human lives and the economy, including rice production. These extreme weather events disrupt the agricultural cycle, threaten the water-food security nexus, and highlight the urgent need for effective tools to assess and mitigate these risks. However, many studies have investigated the effects of floods on crop damage using flood simulation models, while few studies have been done on an integrated approach to simultaneously investigate the combined impacts of floods, droughts, and water availability on crop yields under changing climatic conditions. To address this gap, ICHARM has developed a seamless modelling framework for assessing the water-food security nexus under climate change. This framework was applied to the Pampanga River Basin, a region heavily dependent on rice production. The study assessed the impacts of climate change on both hydro-meteorological characteristics (such as rainfall patterns, water availability, and flood risk) and food production. The research used high-resolution (~ 5 km) bias-corrected climate data downscaled from the super high-resolution MRI-AGCM-3.2S model of past and future climate scenarios (i.e., RCP8.5 scenario). A key innovation of this study is the integration of the Water and Energy Budget-based Rainfall-Runoff-Inundation (WEB-RRI) model with the Simulation Model for Rice-Weather Relations (SIMRIW) model. The WEB-RRI model is a sophisticated hydrological tool that simulates evapotranspiration, soil moisture, water flow, runoff, and inundation processes, while the SIMRIW model specifically relates weather patterns, soil moisture, and flood depth and duration to rice crop growth and yield. By coupling these models, the research was able to quantify the effects of climate-induced changes in water availability, floods, droughts, and their combined effects on rice yields in the basin. The coupled

model was calibrated and validated using runoff data, satellite leaf area index data, and reported basin-averaged yield data.

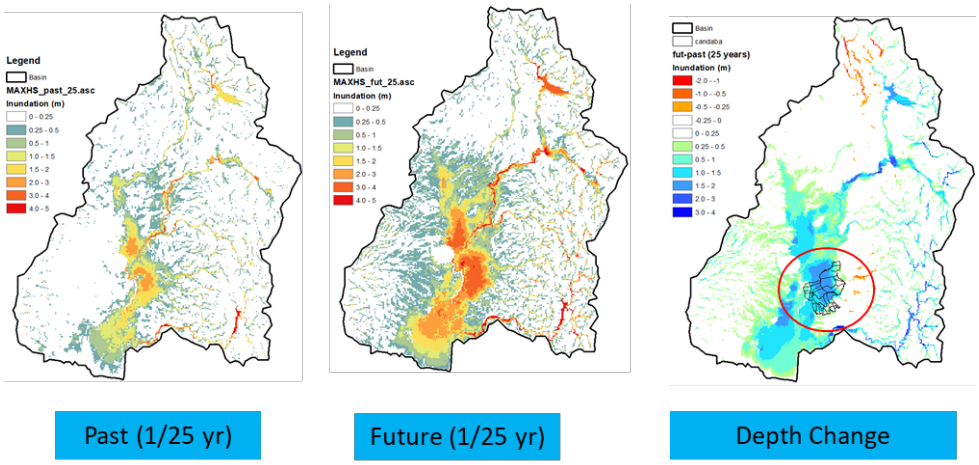


Figure 3-3 Maximum flood inundation depth and extents; a) past climate, b) future climate, and c) changes between past and future climate change impact assessments showed that extreme precipitation (>150 mm/day) will increase by 15% in the future climate and that the increase in extreme flows also lead to an increase in flood depth and inundation extent in the future climate (Figure 3-3), adversely affecting agricultural production in the region.

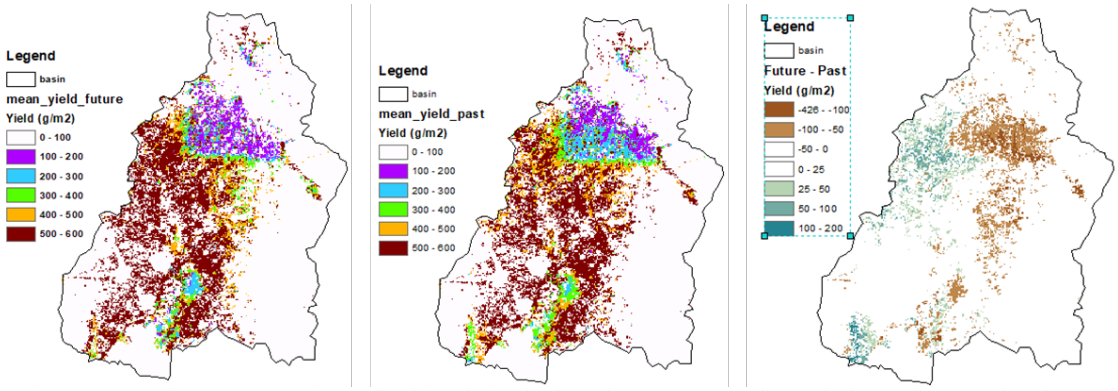


Figure 3-4 Annual average on maximum flood inundation depths and extents; a) past climate, b) future climate, and c) changes between past and future

As shown in Figure 3-4, the rice yield under rain-fed irrigation in the Candaba region, which will experience severe flooding (Figure 3-3), will be reduced by ~ 5% of annual production in the future climate. This study provides a comprehensive, basin-wide approach to understanding the complex interactions between climate change, water resources, and agricultural productivity, and thus helps guide decision-making for sustainable food and water management under future climate scenarios in the Asian region.

## 3. 3 Monitoring and prediction of changes in water-related disaster risks

ICHARM will develop, verify and improve methods for monitoring and forecasting changes in hazards due to meteorological conditions with different temporal scales ranging from season to climate change and changes in exposure and vulnerability due to social development and economic changes. These methods will be applied to case studies at multiple locations both in and outside Japan, and the outcomes will be used to provide support for all stakeholders to select appropriate methods according to their needs and conditions to mitigate future risks of water-related disasters by themselves. The methods will be modified with various local adjustments and compared with each other for further improvement to eventually become globally applicable.

(Source: ICHARM Mid-term Programme)

### 3.3.1 Improvement of the accuracy of several-day-ahead rainfall and flood forecasting (by improving an ensemble rainfall forecasting method)

Rainfall forecasting is an important element directly linked to the accuracy of flood forecasting. ICHARM developed an ensemble rainfall forecasting system and incorporated it into a runoff model to perform more reliable ensemble discharge forecasting. We also applied this approach to estimate the runoff in dam basins to control the discharge of dams, which has eventually led to the development of a system that contributes to increasing hydropower generation and reducing flood risk in downstream areas. Although the ensemble rainfall forecasting system has been proven useful to some extent, its prediction accuracy still needs improving, for example, in predicting rainfall during the linear precipitation zone phenomenon. Therefore, we reviewed the system for more accurate rainfall forecasting. In addition, we conducted joint research with the Meteorological Research Institute of Japan to improve prediction accuracy by assimilating satellite microwave radiometer data. Significant progress has been made from these efforts.

Ensemble rainfall forecasting is achieved using the Weather Research and Forecasting (WRF) model, a regional weather model, and the Local Ensemble Transform Kalman Filter (LETKF) for ensemble initial value generation and data assimilation. In FY2024 we improved the settings of LETKF and further adjusted the perturbations to the lateral boundaries. The improved WRF-LETKF model was applied to a linear precipitation zone case in Kyushu in July 2020 and successfully enhanced the reproducibility of linear precipitation zones.

Furthermore, we reproduced cloud water content and other values using the integrated model coupling WRF with the Coupled Atmosphere and Land Data Assimilation System (CALDAS), which assimilates microwave radiometer data from the AMSR2 satellite into a weather prediction model, and used them for WRF-LETKF. With CALDAS-WRF only, the assimilation effect was short-lived because satellite data were assimilated into the WRF model by a simple method. However, with additional processing using WRF-LETKF, the assimilation effect lasted longer, and the accuracy of rainfall prediction improved.

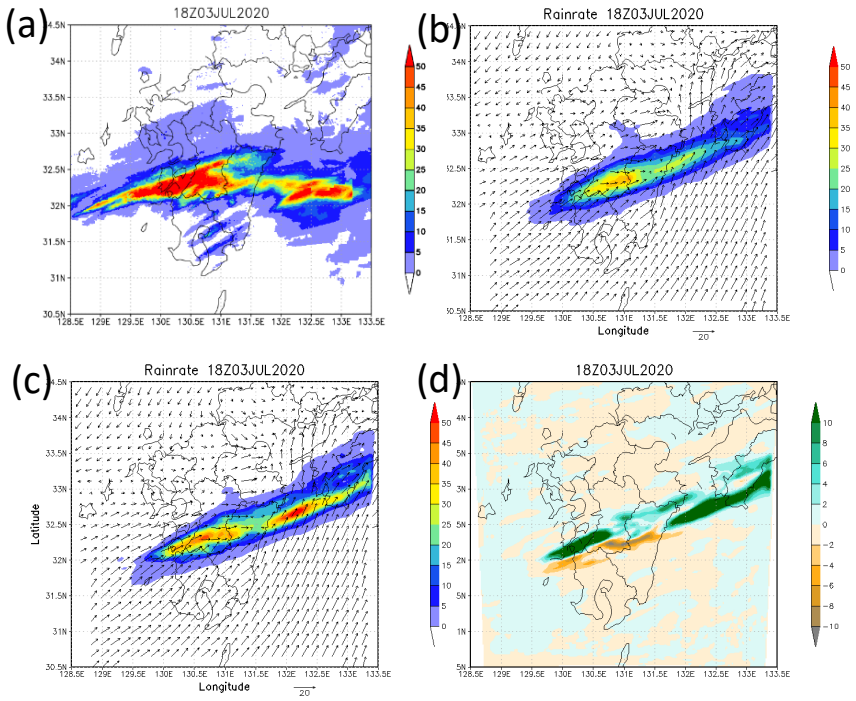


Figure 3-5 Rainfall distributions due to the linear precipitation zone phenomenon at 18:00 on July 3, 2020: (a) observed rainfall, (b) analyzed surface rainfall and wind by WRF-LETKF, (c) analyzed rainfall and wind by WRF-LETKF with cloud water assimilation by CALDAS, and (d) analyzed rainfall improvement by WRF-LETKF with CALDAS assimilation (green indicates an increase).

### 3.3.2 Development of a hydrological model that can represent from low to high water, considering the effects of seasonal and regional factors such as snow cover and melt

For river basins whose modelling requires considering glacier effects and special atmosphere-surface interactions such as those at high elevations, ICHARM explored approaches to refining a hydrologic model (WEB-DHM-S) by incorporating snowfall, snow accumulation, and snowmelt into the water and energy balance at the ground surface.

Specifically, selecting the Chamkharchu basin in Bhutan, located at an elevation of 5,000 to 6,000 m, as the study basin, we 1) investigated its vegetation area at high elevations, 2) adjusted the saturated vapor pressure used in the evapotranspiration calculation to reduce the amount of overestimated evapotranspiration, and 3) employed a more accurate basal flow rate by introducing a glacier model.

A part of these results was applied to Theme 2: Construction of Energy Management Infrastructure of “NEDO Challenge, Satellite Data for Green Earth,” a NEDO Grant-in-Aid Program for Solution Development Using Satellite Data, and to Theme 3: Real-time Analysis of Snowfall, Snow Accumulation and Melting Rate. The proposal, titled “Construction of a Real-time Analysis Platform for Snowfall, Snow Accumulation, and Snowmelt: From Japan to the World with High Accuracy, High Time, and High Spatial Resolution,” passed the first round of document screening and received the Judges' Special Award at the second round of the final selection held on January 23, 2025.

In addition, the protect team began the development of WEB-RRI-S by adding components for snowfall, snow accumulation, and snowmelt runoff to a rainfall-runoff inundation model (WEB-RRI) that takes into account the water and energy balance at the ground surface.

### 3.3.3 Assessment of changes in exposure and vulnerability associated with social changes

ICHARM has participated in a SATREPS project, "Regional Resilience Enhancement through Establishment of Area-BCM at Industry Complexes in Thailand (Principal Investigator: Kenji WATANABE, Graduate School of Engineering, Nagoya Institute of Technology)," which ended in July 2024.

In this project, flood inundation analysis models were developed for the entire Chao Phraya River basin and industrial estates, and the results of these models were verified. These models enabled us to reproduce and predict flood inundations in the whole basin (1 km) and the areas surrounding the Rojana Industrial Estate, the Hi-Tech Industrial Estate, and the Bang Pa-in Industrial Estate. In addition, we created a flood scenario for each design scale (L1), assuming 10-year and 100-year return periods based on the rainfall pattern of the 2011 flood as a benchmark. We also created scenarios for the worst potential future flood (L2), assuming the maximum rainfall pattern in the past based on long-term observational rainfall data at 119 points throughout the Chao Phraya River basin and multiplying it according to each return period, and performed water disaster risk assessment.

In the scenario analysis, the flood risks of business sites, residential areas, and commuting routes were clarified by analyzing the flood onset timing, the inundation depth and duration, the subsidence timing, and the flood control effect and limit values of flood retaining walls. As a result, we confirmed that if the maximum historical rainfall occurs in the whole basin every month, the inundation depth will reach the height of the flood retaining walls. Through analysis considering multiple factors, it is now possible to provide risk information that companies and other organizations can use to discuss the timing of recovery and resumption of operations simultaneously when they make critical decisions, such as suspending operations due to flooding.

Even after the project ended, we continue working with Thai researchers from Chulalongkorn University and other institutions to develop a near-real-time flood forecasting system and technology to improve accuracy through data assimilation.

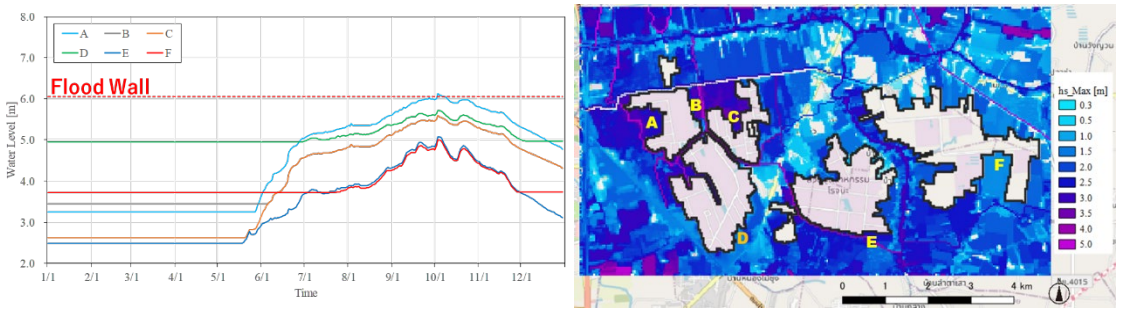


Figure 3-6 Flood depth in case of the maximum monthly rainfall over the whole basin every month

## 3.4 Proposal, evaluation and application of policies for water-related disaster risk reduction

When developing policies that are practical under climate change, it is essential to consider stakeholders' understanding of disaster risk reduction measures, lifestyles, socio-economic activities, and possible changes in disaster risks. To achieve these, ICHARM will develop models to evaluate each policy's outcomes and socio-economic assessment methods applicable to different nations, as well as provide training for strengthening human resources to lead local consensus building and political decision making. (Source: ICHARM Mid-term Programme)

### 3.4.1 Development of OSS-SR for basin-wide consensus building and facilitator training

ICHARM supported businesses in preparing BCM by developing a flood inundation analysis model for industrial complexes and creating and providing detailed inundation information, including the onset, period, and depth of inundation. In FY2023, we also participated in discussions at collaborative workshops for Area-BCM held at each industrial complex.

### 3.4.2 Technological development to support the creation of a virtuous cycle for promoting river basin flood management

In the private sector, due to growing awareness of ESG management (i.e., a management style that emphasizes three elements: environment, society, and governance), there is a growing movement to disclose and evaluate the impact of future climate change on finances and other business aspects, in line with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). The evaluation also includes risk assessment of the physical impact of flooding, and there is a growing need among companies for technical methods for this assessment. By disseminating quantitative risk assessment methods that meet this need, expectations are high for a mechanism to be formed which helps companies self-evaluate the content and volume of flood prevention measures, differentiating themselves from other companies and advancing their efforts competitively.

These changes in awareness and behavior, including among investors, can be a major driving force in promoting basin-scale flood control, Japan's new flood management policy. Thus, in FY2023, ICHARM began research to investigate what changes actually occur among private companies and related investors and what impact they will have on promoting basin-scale flood control.

In FY2024, ICHARM developed a prottype of the water-related risk and resilience evaluation support system and conducted interviews with 13 manufacturers in the Joso City area of Ibaraki Prefecture, Japan, covering topics such as daily business operations, risks they regularly pay attention to, flood control measures, responses during the 2015 Joso flood, and corporate social responsibility. The interviews revealed that while many of them cited staff shortages as a risk, few mentioned natural disasters, including floods, as a significant threat to their businesses. Even companies located in the flood risk zones on hazard maps shared this view. Although the companies know that floods could

cause damage, only a few have put concrete measures in place. Despite the slow movement toward concrete actions, they are aware of the need for them. In fact, some suggested subdividing items classified as depreciable or inventory assets in “A Guide to Flood Risk Assessments for Enhanced TCFD Disclosures” down to the level of general ledger accounts, pointing out that this breakdown would help companies develop a clearer risk profile and facilitate faster decision-making.

This research is being carried out as part of “Building a Smart Disaster Prevention Network,” one of the 14 themes in the third phase of SIP. (See Section 3.6.1 for more information on SIP.)

## 3. 5 Support in constructing the applicability of water-related disaster management

ICHARM will support local governments and citizens at several locations in Japan and overseas in the implementation of means for effectively sharing information from early warning systems and other sources among administrators and residents to facilitate coordinated disaster responses among different sectors. We will also develop, verify, and help them implement methods for preparing operation continuity plans based on local needs and conditions and improving interoperability during disaster response by liking administrative functions effectively at all levels.(Source: ICHARM Mid-term Programme)

### 3.5.1 Development and support for implementation of optimal operation methods for existing dams for better flood management

ICHARM investigated the possibility of using short-term (39 hours) and long-term (3 months) rainfall forecasts for the Oi River Hatanagi First Dam in Japan. Based on the long-term ensemble inflow forecasts obtained by inputting long-term ensemble rainfall forecasts into a hydrological model, we examined multiple cases using different factors, such as the average inflow from the start of prediction, the different number of days to calculate the average for different seasons, and different ranks of ensemble inflow. A one-year case study at a single dam showed that long-term rainfall forecasts can be used to improve dam operations, achieving more hydropower generation and safe flood control. We continued analyzing the dam operation data in the past several decades to find better dam operation methods for multiple years. We also conducted research for another domestic river, the Sai River, using short-term rainfall forecasts to find out whether they can be used to produce accurate ensemble inflow forecasts. The results were also submitted to an international journal, accepted, and published. We have then started a study for optimal dam operations.

### 3.5.2 Towards the social implementation of a virtual flood experience system - Collaboration with flood education for elementary and junior high school students and urban development activities -

The Virtual Flood Experience System developed by ICHARM reproduces the real world in a virtual space and allows participants to experience a flood situation that was visualized based on a hazard map. By using this system, participants can intuitively understand potential flood disaster risk in their area and learn appropriate responses. In addition, since a game engine used for game development was used to build the system, it is possible to apply gamification (a method of applying game components to non-games to increase the motivation of participants). The game-like nature of this system can attract elementary school and junior high school students and the

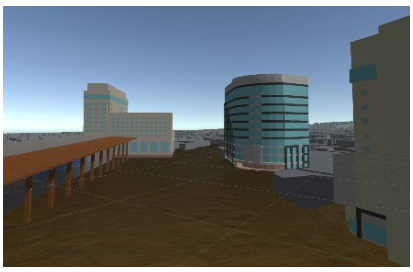

Photo 3-3 Recreating Nagano Station in virtual space

general public who are not usually interested in floods. To test the system, we conducted flood education workshops for elementary school and junior high school students and collaborated for city development with the general public who are usually engaged in fields other than civil engineering.

a) Workshop in collaboration with Shinshu University

On July 20 and August 10 in 2024 in Nagano City, Nagano Prefecture, Japan, ICHARM conducted a two-day workshop for about 20 elementary and junior high school students in collaboration with the Shinshu University River Basin Flood Management Research Center. They provided a disaster education session as part of this workshop, in which the students experienced flood situations reproduced based on a hazard map using the Virtual Flood Experience System. The project team observed the participants actively engaged in the activities, as other students had been in previous sessions. The session received high praise from parents and local media. It was also featured on local television, garnering positive feedback from the public.

b) Middle School Project-Based Learning class in Joso City

As part of the SIP project (See Section 3.6.1), ICHARM conducted a project-based learning class with approximately 40 first-year students at the junior high school affiliated with Ibaraki Prefectural Mitsukaido First High School. The class provided students with basic knowledge of floods and disaster risk management. Using Minecraft Education, an educational game developed by Microsoft, the students engaged in hands-on activities in a virtual environment. These included creating townscapes and experiencing simulated floods, allowing them to explore and develop ideas for building disaster-resilient communities.

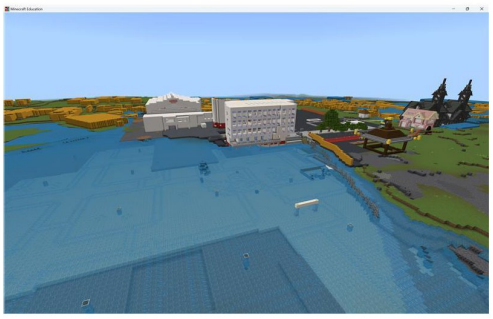

Photo 3-4 School buildings and simulated flooding, recreated using hazard map data in Minecraft.

Photo 3-5 An image of a bamboo grove flood protection wall created by students after group discussions.

The class was structured to combine lectures for acquiring basic knowledge (e.g., the target basin's history, past disasters, and hazard maps) with hands-on activities and group work. Using Minecraft, the students worked on adapting a virtual city recreated by ICHARM in LOD1 (Level of Detail 1: a box-shaped model with flat geometry and uniform height) to reflect the characteristics of their local area. They then reproduced flood situations with estimated inundation areas and water depths in the virtual environment in reference to hazard maps.

Based on their findings, the students discussed how to design a vibrant, disaster-resilient city in groups

and brought their ideas to life within the Minecraft virtual space. Maneuvering avatars (a virtual identity in cyberspace) in simulated flood situations was particularly impactful to the students. Wading in floodwaters helped them intuitively understand risks they may face during flooding compared to reading two-dimensional flood maps.

The inclusion of hands-on tasks and group work, alongside lectures, encouraged students to actively reflect on flood prevention and disaster management. They independently explored additional measures not covered in the lectures, such as bamboo grove flood protection walls, retention basins, and riverbank reinforcements, which greatly enriched their discussions. Some groups even took it further to quantitatively assess the effectiveness of such additional strategies.

To assess the effectiveness of the project-based learning, we conducted behavioral experiments in a virtual environment following the series of activities. Two students who had participated in the class and two who had not were provided with rainfall and water-level information, and their evacuation behaviors were observed. The trained students initiated evacuation earlier, prompting the untrained students to follow. As a result, all four participants evacuated successfully and on time, highlighting the potential effectiveness of this learning approach.

This research project indicates that combining virtual flood experiences with project-based learning can act as a powerful catalyst for encouraging middle and high school students to actively engage with water disaster risks. ICHARM plans to continue collaborating with the junior high school to provide these learning opportunities on a regular basis and to further assess their effectiveness.

c) Disaster education sessions in Matsumoto City

Between July and August in 2024 in Matsumoto City, Nagano Prefecture, Japan, ICHARM collaborated with the city's community development center and secondary school to provide disaster education sessions for about 30 students over four days. The students first learned about local rivers, the Narai and Susuki Rivers in the Sai River basin, including the basin's characteristics and the history of river improvement and local communities, and then experienced simulated flood situations using the Virtual Flood Experience System.

Photo 3-6 Disaster education sessions

As in Joso City, the students actively engaged in the flood disaster learning activities. Staff at the community development center highly praised this attempt as a novel approach to community development and water-related disaster education, and they have decided to continue offering the sessions.

d) Collaboration with urban development in Matsumoto City

ICHARM also collaborated with Matsumoto City to hold urban development workshops for citizens. Through the workshops, we demonstrated the potential of the Virtual Flood Experience System in building an ideal city in virtual space as envisioned by citizens. With the participants, we created "an urban park where a market is held," as proposed by the city for renovating an existing park, as well as the potentially worst flood anticipated in the area. Then, a public symposium was held in collaboration with Shinshu University and the Citizens' Council for Urban Design to discuss the possibility of creating an attractive downtown area that is resilient to flooding.

Through these cases, we confirmed that learning about flooding using the Virtual Flood Experience System is effective for elementary and junior high school students and is a practical tool to discuss community development involving the general public. In the future, we plan to work with education experts to quantify the educational effects of our invention and develop more practical water disaster education programs, advancing further research to realize early evacuation of residents.

### 3.5.3 Research on strengthening society's resilience against flood disasters: Building a semi-automatic updating system for the "Collection of Critical Situations during Flood Emergency Response"

In past activities, ICHARM carefully read 96 disaster response investigation reports prepared by local governments, which included lessons learned from past flood disasters, while searching for descriptions suggesting local government officials' situations, such as "troubled, anxious, confused, uncertain, or worried," in relation to disasters. We referred to such situations as critical situations during flood emergency response, and collected 3,973 cases. These cases were classified into eight stages (phases) from the initial response to the disaster to the opening of evacuation shelters and compiled with the summaries of response efforts, including overview, process, causes, results, and similar cases, as shown in Figure 3-7. The final version was published in June 2020 as the "Collection of Critical Situations during Flood Emergency Response (Local Government Edition)." Using this collection of cases, ICHARM has provided training to local government officials both in Japan and overseas, such as "Learning from Cases: How Municipalities Prepare for Flood Disasters" at the Japan Construction Training Center.

In this study, in order to continue to use the previously created "Collection of Critical Situation during Flood Emergency Response" as an effective training material that is in line with the latest situations, we developed a system that can semi-automatically extract critical cases from the latest disaster response investigation reports and continuously update the training material. This system makes it possible to continue providing effective training to local government officials and others using a collection of cases that always takes into account the latest critical cases regarding disasters.

Specifically, we first created a deep learning model using the BERT model with a database of critical flood response cases previously constructed by ICHARM. We then verified the accuracy of case extraction using the deep learning model. We also developed a case extraction support system that can extract sentences similar to collected cases and present them as candidate cases, aiming to semi-automate the case extraction process. This system uses the classification model of critical flood response cases we developed and is designed to display PDF files of disaster response investigation reports and the potential developments of a critical situation as a result of inference using the model. Figure 3-8 shows display images. The left page shows the original disaster response investigation report. The right page displays the parts of the left page that are inferred to be critical cases (positive cases) and parts that are inferred to be non-critical cases (negative cases), with positive cases highlighted in yellow.

Using this system, we were able to create a system that can extract critical cases semi-automatically, reducing the amount of manual work required for case extraction, and continuously update training materials. By quickly collecting new knowledge from the latest disaster response investigation reports, we believe that this can be reflected in staff training and tabletop exercises.

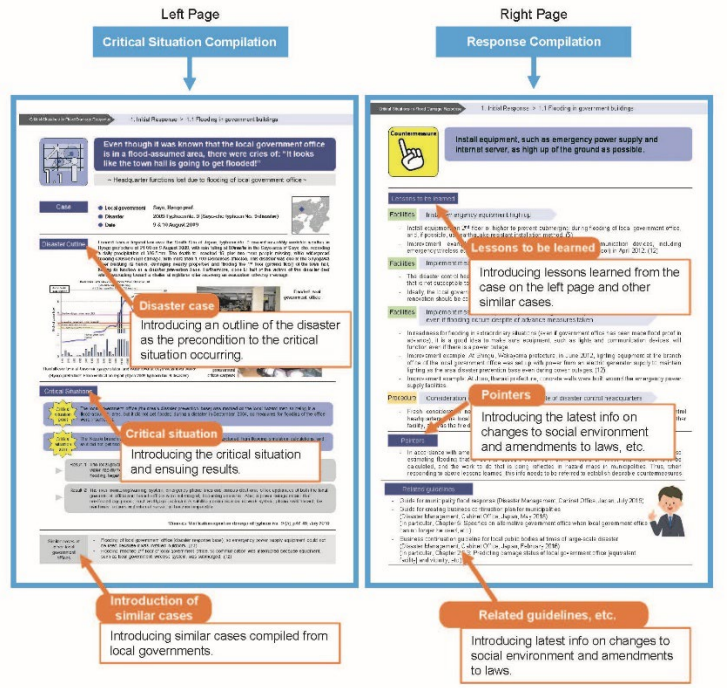


Figure 3-7 Sample pages of the Collection of Critical Situations during Flood Emergency Response (local government edition)

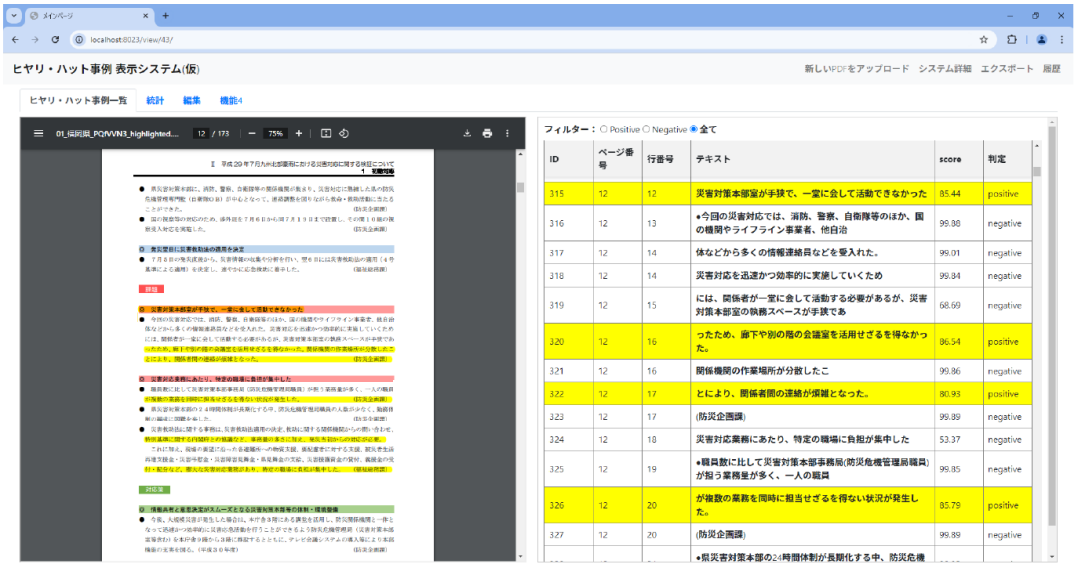


Figure 3-8 Extraction support system display screen

## 3.6 Research funded by external sources

ICHARM's research activities were funded with operating grants from MLIT and funds from external sources, such as MEXT, the Cabinet Office, and JICA. The following sections explain research projects funded by external sources.

### 3.6.1 Cross-ministerial Strategic Innovation Promotion Program (SIP) by the Cabinet Office: Promoting R&D to facilitate disaster damage control behavior through risk communication

SIP is a national project established and operated directly under the Cabinet Office's Council for Science, Technology and Innovation in Japan and managed in a cross-ministerial and interdisciplinary framework to achieve scientific and technological innovation. SIP addresses the most important social problems facing Japan and world-leading issues that can contribute to the resurgence of Japan's economy.

Under the strong leadership of program directors assigned to each research and development project, each project team carries out various tasks using an end-to-end approach from basic research to implementation. In other words, they undertake a project with an overall picture from start to end, including practical application and commercialization of inventions. SIP has entered its third phase, spanning from 2023 to 2027, with 14 projects underway[2].

ICHARM is involved in a project led by Professor YAMADA Tomohito of Hokkaido University. The project aims to find effective ways of utilizing risk information to induce individuals and

[2] https://www8.cao.go.jp/cstp/panhu/sip_english/sip_en.html

businesses to take voluntary actions for disaster risk reduction and prevention. The project is composed of the following three research themes: 1) the development of technology to predict basin-scale windstorm and flood damage; 2) the development of technology to visualize water-related disaster damage; and 3) the development of technology to generate and evaluate real-time disaster risk information that promotes self-directed actions to reduce disaster risks.

ICHARM's contribution is mainly to the second theme. We are assigned to develop and implement technologies that help businesses and other entities quantitatively assess water-related disaster risks to which they may be exposed or that they can reduce by taking control measures. We also explore practical approaches to guiding people to take voluntary risk reduction actions, such as early evacuation, by providing opportunities to experience disaster situations through a virtual flood experience system. (See Section 3.1.3 for specific research and development on the virtual flood experience system and Section 3.5.2 for various educational and workshop activities.)

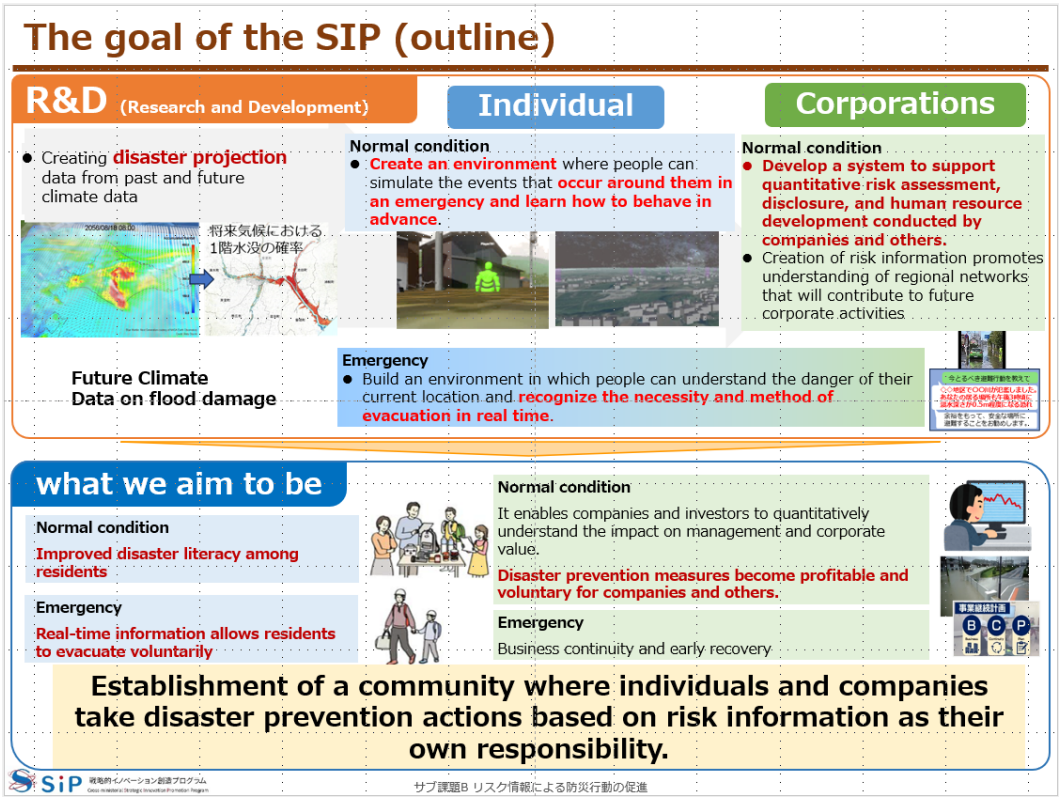


Figure 3-9 Use of risk information to facilitate voluntary individual and corporate actions for disaster risk reduction (a vision of society set by SIP)

### 3.6.2 The MEXT Program for the Advanced Studies of Climate Change Projection (SENTAN)

ICHARM has participated in the MEXT Program for the Advanced Studies of Climate Change Prediction (SENTAN) since FY2022 and has been conducting research on climate change in collaboration with Kyoto University and other organizations. The program is built on the achievements of the Integrated Research Program for Advancing Climate Models (2017-2021) and the Program for Risk Information on Climate Change (2012-2016). The research projects under the program aim to reduce the uncertainty in future predictions by improving climate-change prediction simulation technologies, to increase the understanding of the climate change mechanism, and to advance the integrated research and development of systems for better quality and more effective use of climate prediction data, thereby creating and providing scientific evidence essential to plan adaptation and mitigation measures that help realize a decarbonized society.

ICHARM is assigned to “Task D: Evaluation of hazards and associated risks in the Asia-Pacific regions and the promotion of international cooperation,” led by Professor TACHIKAWA Yasuto of Kyoto University, which is under “Research Area No.4: Development of integrated hazard prediction models.” ICHARM develops and implements a water cycle model in the Philippines and OSS-SR tailored to their local needs and conditions.

In FY2024, we dynamically downscaled the Meteorological Research Institute Atmospheric General Circulation Model (MRI-AGCM 3.2) for the Pampanga River basin and the Pasig-Marikina-Laguna Lake basin in the Philippines. Using these simulations, we analyzed the impact of global warming on rainfall distribution. In the Davao River basin case, we decided to expand the project area to include the basin’s surrounding areas and discussed the future implementation and operation of OSS-SR under the leadership of local agencies, which is part of the preparation for nationwide and worldwide dissemination of this system. (See Section 5.1.1 for more information.)

### 3.6.3 Programs for Bridging the Gap between R&D and the Ideal Society (society 5.0) and Generating Economic and Social Value (BRIDGE)

BRIDGE focuses more on resolving social issues rather than research and development. Following the Integrated Innovation Strategy and other policies that promote science, technology, and innovation, the Council for Science, Technology, and Innovation identifies priority issues, such as business environment improvement, startup creation, and human resource development, and bridges the gap between these issues and innovative technologies created through SIP and other government-led R&D projects so that the inventions can be fully utilized to solve social problems and create new businesses.

In the BRIDGE program, MLIT is assigned to accelerate the nationwide application of the Integrated System of Disaster Reduction for Municipalities (IDR4M). In this effort, ICHARM is in charge of the hazard evaluation task involving the development of a water-level forecasting model required for river water level forecasting.

### 3.6.4 Science and Technology Research Partnership for Sustainable Development (SATREPS)

SATREPS is a collaborative program involving multiple projects launched between JST and JICA or between AMED and JICA to promote international joint research between Japan and developing countries to solve global issues[3].

ICHARM has been participating in projects in the Philippines, Argentina, Ghana, and Thailand as a joint research institute, leading project implementation in collaboration with domestic and foreign government agencies and research institutes. The following summarizes our activities in these countries in FY2024.

a) Philippines: "Hybrid Water-Related Disaster Risk Assessment Technology for Sustainable Local Economic Development Policy under Climate Change in the Republic of the Philippines"[4]

ICHARM participates in the Hybrid Water-Related Disaster Risk Assessment Technology for Sustainable Local Economic Development Policy under Climate Change in the Republic of the Philippines (HyDEPP-SATREPS). In collaboration with joint research institutes from Japan and the Philippines, we are conducting downscaling of climate change models and evaluating water disaster resilience in the Pampanga River basin and the Pasig-Marikina River-Laguna Lake basin.

In FY2024, the 6th and 7th Joint Coordination Committee (JCC) meetings were held on June 20 and March 7, respectively, both using a hybrid format, allowing in-person and online participation. We attended these meetings as project members to review the progress of our collaborative research and discuss its future direction.

Photo 3-7 The 6th Joint Coordination Committee

From May 13 to 16, we conducted flow measurement training for tributaries flowing into Laguna Lake. The training was attended by 27 participants from the Philippines, who learned how to operate ultrasonic Doppler flow meters provided by Japan, as well as methods for data collection and analysis.

[3] https://www.jst.go.jp/global/english/index.html

[4] https://www.jst.go.jp/global/english/kadai/r0109_pilipinas.html

Additionally, in response to local requests, we conducted similar training sessions in the Pampanga River basin on June 17 and 18, and nine participants completed the training.

Photo 3-8,9 Flow measurement training

In mid-July, eight Filipino members came to Japan to participate in the 9th Global Energy and Water Exchanges Open Science Conference held in Sapporo from July 8 to 12. On the 11th, JST and JICA organized a SATREPS Special Session, in which a doctoral student at ICHARM delivered a presentation. During this event period, members from both countries also had a meeting on the 10th and visited Lake Shikotus near Sapporo to inspect the water environment there.

The project is scheduled to continue until June 2026 in close cooperation with the research teams from both countries.

b) Argentina: "Numerical Weather Prediction and Warning Communication System for Densely Populated and Vulnerable Cities"[5]

In SATREPS's Argentina project, "Numerical Weather Prediction and Warning Communication System for Densely Populated and Vulnerable Cities (Principal Investigator: Senior Researcher MIYOSHI Takemasa, RIKEN)," ICHARM is a collaborative research organization working on the development of a hydrologic forecasting system for the project area. In 2024, our research team visited Argentina from July 29 to August 9 and attended a series of activities, including a 12-day joint coordination meeting, research meetings, workshops, and field surveys. During this trip, the team examined the rivers and sewerage systems of two cities in the target flood control areas to collect information on river cross-sections and other information necessary for the construction of rainfall-runoff inundation models, as well as to assess the progress of improvements to observation facilities.

Photo 3-10 Field trip to Argentina and lecture at a university


Photo 3-11 Lecture at the National University of Cordoba

[5] https://www.jst.go.jp/global/english/kadai/r0309_argentine.html

c） Ghana: “The Project for the Development of Integrated Sediment and Environmental Management Towards Sustainable Conservation, Disaster Risk Reduction, and Livelihood Improvements in Coastal Areas”

ICHARM is participating in the SATREPS research project in Ghana, titled “The Project for the Development of Integrated Sediment and Environmental Management Towards Sustainable Conservation, Disaster Risk Reduction, and Livelihood Improvements in Coastal Areas.” Led by Professor TAJIMA Yoshimitsu of the University of Tokyo, the project aims to contribute to coastal erosion control in the Republic of Ghana. ICHARM is in charge of monitoring sediment flow from target rivers and developing a sediment simulation model.

From September 28 to October 11, 2024, ICHARM visited Ghana to discuss and reach an agreement on the project implementation structure with the Ghanaian counterpart, the Cape Coast University Center for Coastal Management (ACECoR: the Africa Centre of Excellence in Coastal Resilience, Centre for Coastal Management), and local partner organizations.

In addition to the meetings, the team, in collaboration with ACECoR, visited various study sites, including Volta River and Densu River reaches, as well as coastal areas, from October 3 to 5. During these site visits, the team selected observation sites to monitor the water level, flow velocity, and sediment transport rate.

On October 7, based on the findings from the field visits, a joint meeting was held to present the project’s objectives and framework to the Ghanaian research partner organizations. Following this, the team visited each research partner organization to sign the Minutes of Meeting (M/M), discuss data sharing and monitoring collaboration with relevant agencies and university experts, and secure their approval.

d） Thailand: “Enhance regional resilience through visualization of disaster risks with industry, government and academia collaboration” [6]

ICHARM participated in a SATREPS project in Thailand, entitled “Enhance regional resilience through visualization of disaster risks with industry, government and academia collaboration (Principal Investigator: Professor WATANABE Kenji, Nagoya Institute of Technology).” Though the project ended in July 2024, ICHARM continues discussions with Thai researchers and practitioners about the formulation of a new framework for activities.

### 3.6.5 World Bank project “Knowledge exchange on flood and drought management between South Sudan and Japan”

ICHARM made a single source contract of the World Bank project “Knowledge exchange on flood and drought management between South Sudan and Japan” for the period from February 5 to June 30,

[6] https://www.jst.go.jp/global/english/kadai/h2908_thailand.html

2025. The project aims to provide the following support to the Ministry of Water Resources and Irrigation (MWRI) and other organizations related to flood and drought management in South Sudan.
(1) An overview of science and technology for monitoring, forecasting, and warning floods and droughts, including case examples;
(2) Trial demonstrations of comprehensive hydrological forecasting and recommendations for developing a flood and drought monitoring and an early warning system for a selected sub-basin in South Sudan; and
(3) Knowledge exchange through field visits and workshops in Japan for capacity building of the organizations' staff.

Regarding the capacity building, ICHARM had prepared a field visit of around 20 trainees from South Sudan and its neighboring countries to Japan between May 19 and 23, 2025, before it was postponed due to political instability in the country. The visit planned to learn flood control and irrigation practices in Kusaki Dam, the Watarase Retarding Basin, the Yoshida River basin in Miyagi Prefecture, etc. and receive operation training of a flood and drought prediction system.

### 3.6.6 World Bank project "Technical Support for Advanced Forecast of Rainfall and Reservoir Inflow for Optimized Reservoir Operation"

ICHARM made a single source contract of the World Bank project "Technical Support for Advanced Forecast of Rainfall and Reservoir Inflow for Optimized Reservoir Operation" for the period from March 14 to December 31, 2025. Prior to this project, Kerala, India, experienced consecutive floods in 2018 and 2019. ICHARM and the Japan Water Agency (JWA) were requested by the World Bank and the local state government to investigate the potential for flood response in 2022. Through two online workshops and a two-day field workshop, ICHARM shared basic knowledge on an optimal operation of water diversion dams. In cooperation with JWA, the expected outputs of ICHARM's assignment are:
(1) Introduction of advanced rainfall and reservoir inflow forecast system and assessment of possible improvement areas;
(2) Assessment of areas for introducing optimized reservoir operations incorporating advanced rainfall and inflow forecast system;
(3) Two online knowledge sharing programs on advanced rainfall, inflow forecasting and integrated reservoir operation systems, and a hybrid program in Japan including site visits; and
(4) A proposal for a knowledge exchange program to be implemented jointly with academic and research institutions in India.

### 3.6.7 UNESCO project "Flood Resilience Enhancement in Kenya"

Between October 2023 and January 2024, floods linked to the El Niño phenomenon struck Kenya, forcing the evacuation of over 500,000 people and claiming 186 lives. To enhance

resilience to such events, ICHARM, in collaboration with the UNESCO Nairobi Office and Kenya's Meteorological Department and Water Resources Authority, was assigned to implement the Flood Resilience Enhancement Project in Kenya in 2025. In response, we started preparations, including contract negotiations and related arrangements in 2024. In this project, we plan to identify flood hot spots in the Tana River basin and then develop a locally-tailored OSS-SR system with a real-time flood warning function while simultaneously providing facilitator training.

### 3.6.8 UNESCO project "Development of an integrated early warning system for water-related hazards in Ghana"

Ghana faces periodic floods and water-related hazards that pose challenges to its socio-economic development. Between 2000 and 2020, the capital city Accra has recorded 17 significant flood events. Under climate change, floods represent a rapidly growing threat in Ghana, posing significant risks due to the lack of adequate forecasting capabilities, quality data, and technical capacity. To tackle these challenges, an integrated early warning system will be developed for water-related hazards to support all stakeholders in adopting end-to-end approaches. ICHARM will establish an Implementation Partners Agreement (IPA) with UNESCO to undertake the tasks described as follows:

(1) Develop a hydro-meteorological modelling system for Ghana's targeted river basins

(2) Establish an integrated early warning system for floods and droughts in Ghana on the Data Integration and Analysis System (DIAS) to consolidate data and deliver accurate forecasts in cooperation with the University of Tokyo

(3) Conduct training on the integrated early warning system and prepare recommendations for developing community support functions

### 3.6.9 Asian Development Bank report "Asian Water Development Outlook 2025"

The Asian Water Development Outlook (AWDO) was first developed in 2007 by ADB with the Asia-Pacific Water Forum (APWF). ADB then published the second (2013), third (2016), and fourth (2020) AWDO editions and is preparing the fifth (2025) edition. AWDO aims to track the region's water security status and highlight important water management issues in the Asia-Pacific region. ICHARM made a contract with ADB to develop the second edition in 2009, and provided technical advice for the third edition. Accordingly, ADB requested ICHARM to draft the AWDO 2025 edition, developing a climate change model for Key Dimension 5 "Water-Related Disaster Security." In cooperation with IHE Delft, which is responsible for updating previous indicators, ICHARM calculated new climate change indicators. The future change in rainfall is used as hydrological hazard, the future change in Standardized Precipitation Index (SPI) as climatic hazard, and the future change in coastal flooding area as meteorological hazard. The average values these indicators were calculated for each country. During the preparation of the report, ICHARM participated in workshops held in Manila on March 3-5 and May 28-29, 2025, to exchange views with ADB experts. The final version

of AWDO is scheduled to be released in December 2025.

## 3.7 Research Meeting

ICHARM has held the Research Meeting roughly once a month since March 2008. Researchers make presentations on their ongoing research to upgrade their research-related skills, learn different perspectives, and practice interactions with other researchers.

In FY2024, the meeting was held 12 times from Nos. 155 to 166, and 24 researchers delivered a presentation.

## 3.8 ICHARM Best Paper Award

ICHARM established the ICHARM Best Paper Award in 2009 to select and honor the best paper of the year among peer-reviewed papers whose first author is an ICHARM researcher.

In FY2024, the following paper was selected for the award, and the ceremony was held on November 5, 2024.

Title: A Holistic Approach for Using Global Climate Model (GCM) Outputs in Decision Making
Authors: Sanjeewa Illangasingha, Toshio Koike, Mohamed Rasmy, Katsunori Tamakawa, Hirotada Matsuki, Hemakanth Selvarajah
Journal: Journal of Hydrology, Elsevier B.V., Volume 626, Part B, November, 2023

Photo 3-12 Awarding ceremony at the ICHARM Auditorium

## 3.9 Field survey of the September 2024 flood disaster in Nepal

In late September 2024, Nepal experienced the highest rainfall recorded in at least the last 50 years. Continuous extreme precipitation on September 27-28 caused severe flood and sediment disasters in 44 districts across the country, claiming at least 249 lives, with 18 people missing and 178 injured, according to the Ministry of Home Affairs. More than 2.5 million people were affected, and the estimated economic loss was approximately 46.6 billion Nepalese Rupees. The bowl-shaped Kathmandu valley, where the capital city lies, received 240-350 mm of rainfall in 24 hours. According to the Department of Hydrology and Meteorology, 25 gauging stations recorded new 24-hour precipitation records on September 28, with the Daman station recording the highest 3-day rainfall of 517 mm.

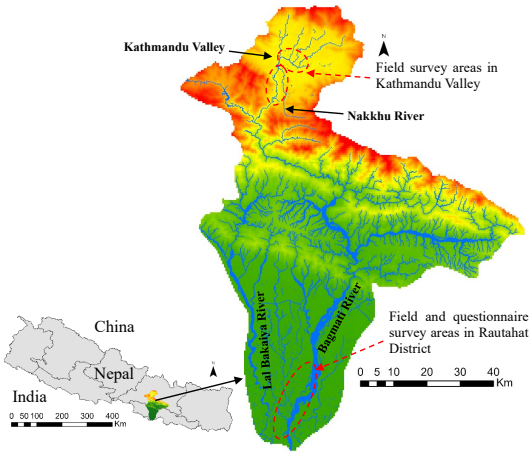


Figure 3-10 Location map of field and questionnaire survey areas in the Bagmati River basin

To understand the characteristics of the 2024 flood and collect damage data, as part of the JSPS KAKENHI Research (Grant number: 24K07692), ICHARM conducted field and questionnaire surveys in the flood affected areas of the Bagmati River basin in November 2024, with collaboration of local governments and other related organizations. To collect flood damage data and socio-economic information at the household level, intensive questionnaire surveys were conducted for local households in the flood-prone areas in the Rautahat district (i.e., the district's three urban municipalities and one rural municipality) (Photo 3-13).

Photo 3-13 Conducting household questionnaire surveys

The damaged or destroyed houses were primarily temporary mud-thatch houses (MT-houses) (Photo 3-14). The research team also observed severe flood damage to rice crops and some damage to sugarcane in the flood-prone areas. Photo 3-15 shows typical and damaged MT-houses along the Bagmati River and its tributaries.

Photo 3-14 A typical MT-house (left) and damaged MT houses

Field observations and discussions with local residents in the flood-affected areas

revealed that the houses along these rivers were directly affected by floodwaters and that the household contents were more significantly affected than the houses themselves.

Observations confirmed that the Nakkhu River, one of the tributaries of the upper Bagmati River, caused significant impact and damage to life and property due to a massive flash flood with sediment-water mixture flows. The channel capacity of the Nakkhu River in the low-lying areas decreased due to riverbed aggradation resulting from a considerable amount of mud and sediment carried from upstream (Photo 3-16), exacerbating the flood's impact.

The collected data and information from the field survey will be used to develop appropriate flood risk assessment methodologies and to provide science-based solutions for future flood disaster mitigation.

Photo 3-15 Damaged infrastructure and houses in the Kathmandu valley

Photo 3-16 Riverbed aggradation in the Nakkhu River

# 4. Training

ICHARM conducts various education and training programs with the aim of not only improving individual problem-solving skills but also improving organizational disaster management capabilities. We also continue providing support for students and trainees who return home after completing programs by holding follow-up seminars, through which we also gain feedback to improve our programs.

The following reports the main training activities in fiscal 2024. ANNEX 1 shows the number of trainees by country.

## 4.1 Doctoral program: Disaster Management Program

ICHARM started a doctoral program, "Disaster Management Program," in 2010 in collaboration with GRIPS to produce experts who are capable of developing policies on water-related disaster risk management and taking the leadership in implementing them. By March 2024, 20 students from nine countries graduated from this program.

Photo 4-1 Entrance ceremony for the 14th batch of doctoral students in October 2024

In October 2024, the 14th batch of three students enrolled in the program. As of March 2025, a total of 10 students are in the program: four in the third year, three in the second year, and three in the first year.

Disaster risk reduction has been one of the most debated water issues worldwide and demands closer collaboration between policymaking and science. In response to this need, JICA has started a new scholarship program for foreign students named "Disaster Risk Reduction Leaders Capacity Development for the Sendai Framework Implementation." ICHARM and GRIPS also cooperate in implementing this program by providing doctoral education to the scholarship recipients. As of March 2025, six out of the 10 doctoral students are using this scheme: three in the third year, one in the second year, and two in the first year.

## 4.2 Master's program: Water-related Disaster Management Course of Disaster Management Policy Program

Since 2007, ICHARM has provided a one-year master's program, "Water-related Risk Management Course of Disaster Management Policy Program (JICA Knowledge Co-Creation Program "Flood Disaster Risk Reduction"), as a joint effort with JICA and GRIPS. This program is targeted at officials of administrative organizations and designed for them to obtain a master's degree within a single year.

In the first half of the course, from October to March, the classes consist mostly of lectures; in the second half, from April to the end, students work on research and graduation theses. In addition, several study trips are conducted during the program for students to visit dam, river, and other management offices around Japan, where they can learn firsthand knowledge and experience in current flood management in Japan from experts of MLIT and other organizations.

Between 2007 and March 2025, 195 students from 38 countries graduated from the master's program.

In September 2024, the 17th batch of 12 students from 9 countries (Bangladesh, Honduras, Indonesia, Malawi, Morocco, Pakistan, Philippines, Sri Lanka, Timor-Leste), who entered the program in October 2023, graduated with a master's degree. In the following month, the 18th batch of 7 students from 6 countries (Bangladesh, Mexico, Peru, Philippines, Sri Lanka, Timor-Leste) enrolled in the program.

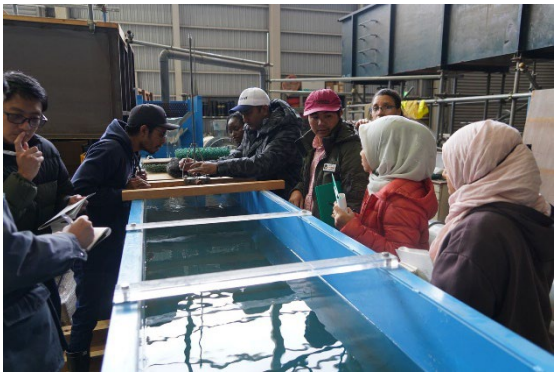

Photo 4-2 Students working on a flume experiment

Photo 4-3 Master's and doctoral students after the graduation ceremony at GRIPS in September 2024

## 4.3 Follow-up Seminar for ICHARM alumni

ICHARM, in collaboration with JICA and GRIPS, provides the master's program, "Water-related Disaster Management Course of Disaster Management Policy Program," and the doctoral program, "Disaster Management Program." These programs have produced 215 graduates in total.

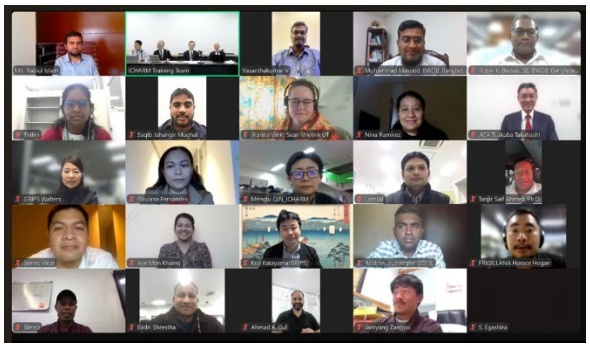

Photo 4-4 Participants in the Follow-up Seminar

We have been conducting the Follow-up Seminar once a year since 2007 for graduates from ICHARM educational and training programs. This event allows us to check how graduates are utilizing the knowledge and skills acquired through the training at ICHARM and to learn about the challenges they are facing in their practices. Such information is used to improve our training programs and research activities.

On March 13, 2025, we held the Follow-up Seminar online for master's and doctoral program graduates. This event was the third one held online and the 17th in total. It was attended by 96 people, including 51 graduates from 23 countries, 11 current students, and the present and previous staff and researchers of ICHARM.

## 4.4 Learning opportunities for students and researchers from external organizations

ICHARM has accepted students and researchers from other organizations in Japan and overseas since its establishment in 2006. In FY2024, we received two interns, one each from the organizations listed below. Their intern period varied from one to several months. They worked on their research themes while getting advice from ICHARM researchers on hydraulic and hydrologic analysis, sediment transport analysis, disaster risk analysis, and other subjects. Figure 4-1 shows the total number of internship days per organization.

- Kyoto University (Japan)
- Ritsumeikan University (Japan)

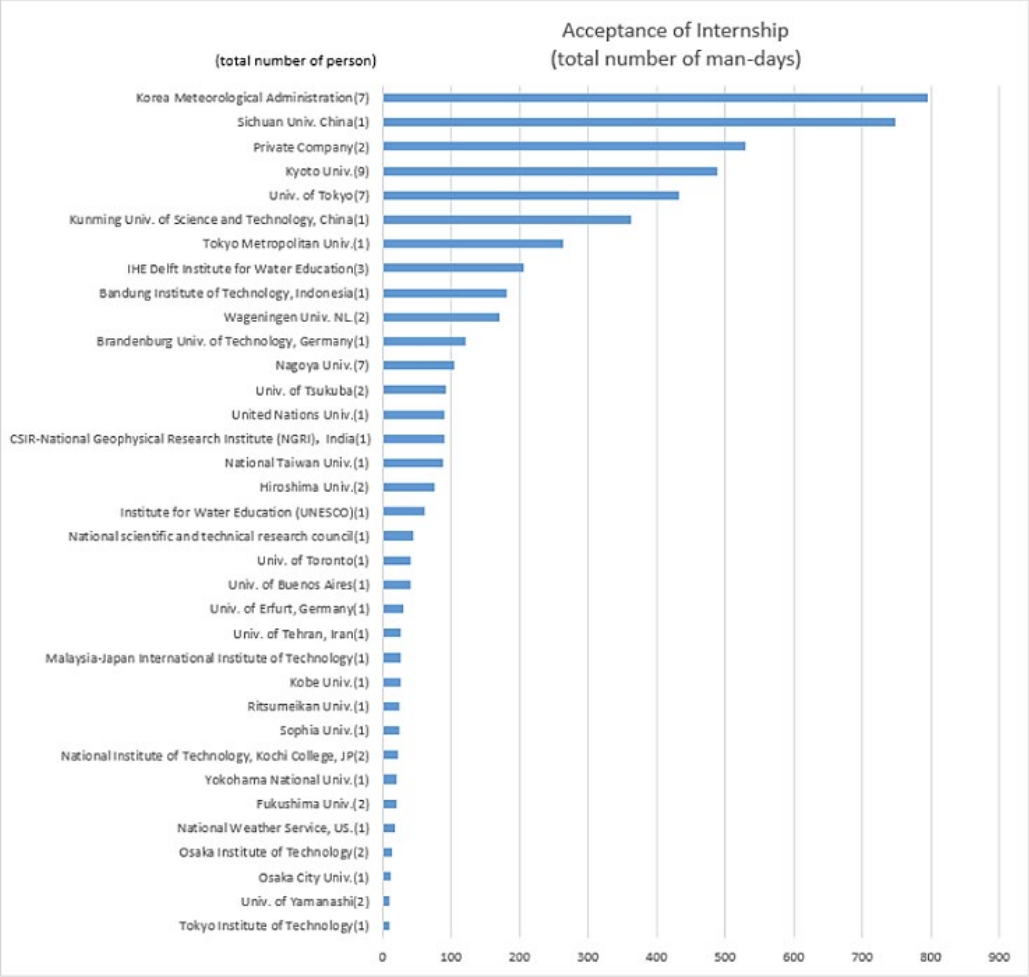


Figure 4-1 The total number of days spent by all interns from each institute between FY2006 and 2024 (person-day)

# 5. Information Networking

In its information networking activities, ICHARM continued supporting the establishment and implementation of the Platform on Water Resilience and Disasters in various countries while fulfilling the responsibilities of the IFI secretariat. In the Philippines, we initiated a project in Digos City, located near Davao, the center of our previous activities. We also started new platform-building projects in Thailand and Indonesia. In addition, in collaboration with MLIT, we contributed to the Typhoon Committee, with our senior researcher chairing its Working Group of Hydrology, and held a side event at an international conference hosted by UNESCO.

Through these activities, we have implemented and promoted initiatives in various countries based on the concept of "Water Cycle Integrator (WCI)" advocated by ICHARM. We also contributed to further networking with flood experts and administrators in Japan and abroad, making significant progress in achieving an effective information network, one of the three principal pillars of ICHARM's activities.

## 5.1 International Flood Initiative (IFI)

IFI, implemented in collaboration with UNESCO and other UN agencies, has been working with government agencies and relevant organizations in the Philippines, Sri Lanka, Indonesia, and other countries to establish platforms on water resilience and disasters. ICHARM, the secretariat of IFI, has been supporting these projects.

Table 5-1 shows activities related to the IFI platforms in FY2024.

Table 5-1 Activities related to the IFI platforms in FY2024

| Country | Date | Activity |
|---|---|---|
| Indonesia | 2024<br>Apr. 22 | Online high-level meeting of the platform |
| The Philippines | Aug. 2 | Consultation on facilitator training |
| The Philippines | Aug. 30 | Davao Online Synthesis System Training Workshop |
| Japan | Sep. 3-5 | 16th Asia Oceania GEO (AOGEO) Symposium |
| The Philippines | 2025<br>Feb. 4-5 | Training on the Davao Region Online Synthesis System (DROSS) |
| Thailand | Mar. 6 | Second plenary meeting of the platform |

These platform projects are conducted based on the WCI concept, which consists of three functions: knowledge integration, capacity integration, and process integration. WCI was proposed by ICHARM and adopted in the Water Action Agenda, a significant outcome of the United Nations 2023 Water

Conference. Its application is expected to be promoted at the local, national, and regional levels through cooperation with UN member countries, UNESCO Category 2 centers, and other organizations.

### 5.1.1 IFI activities in the Philippines

Resolution No. 42, adopted by the Davao Regional Development Council in March 2023, clearly states that Davao City's adaptation to climate change should be promoted in cooperation with ICHARM through the development of a locally-tailored OSS-SR system. Based on this resolution, the Philippines' DOST and DENR are collaborating with ICHARM to advance (a) the development of an OSS–SR and (b) the training of facilitators.

#### a) The development of OSS-SR

For the OSS-SR development, local needs led to the decision to expand the current model, which covers the Davao River basin, to also include the neighboring city of Digos and the Davao de Oro area. In particular, since a landslide in Davao de Oro in February 2024 claimed 98 lives, the addition of a landslide prediction model is being considered. Furthermore, although the existing OSS-SR is operated using DIAS, installing a local server for OSS-SR at the DENR headquarters has been approved, and funding has been secured for this purpose.

#### b) The training of facilitators

As part of the facilitator training program, a series of events were held: a consultation session for facilitator candidates on August 2, 2024; an online training session for new participants on August 30; and on-site hands-on training on February 4–5, 2025. The hands-on training took place face-to-face at DENR's 11th Regional Office for the Davao area, with approximately 30 participants, including government officials, municipal staff, and university representatives. ICHARM researchers, including the executive director, were instructors and covered three themes: (1) science communication, (2) hydrological modeling, and (3) GIS mapping. In addition to the specialized lectures, practical hands-on training sessions were conducted on topics such as assessing climate change impacts using global climate models, developing a Davao Region RRI model, and identifying flood-prone areas through satellite imagery. In the latter half of the training, participants presented and shared the results of their impact assessments and the flood maps created from satellite images. Furthermore, they engaged in active discussions on utilizing this information for disaster management and integrating it with indigenous knowledge and experience. These discussions provided invaluable insights for ICHARM to promote the implementation of ideas and technologies in society.

On February 6, ICHARM staff visited the Davao de Oro area, where a devastating landslide occurred in 2024, to inspect the affected area. In addition, they held discussions at the local DOST office and the municipal government about the need for an early warning system for landslides and

methodologies utilizing the OSS-SR system. The feedback and suggestions from training participants were very detailed and based on real societal needs, giving ICHARM's initiatives a clear regional focus.

Photo 5-1 Participants in the Davao OSS-SR training

### 5.1.2 IFI activities in Indonesia

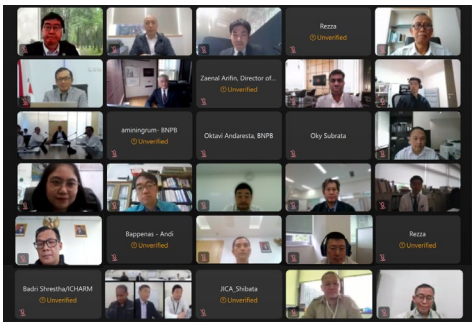

Photo 5-2 Participants in the 2nd High-Level Meeting

The Second High-Level Meeting of the Platform on Water Resilience and Disasters in Indonesia was held online on April 22, 2024. More than 30 participants attended the meeting, including representatives from ICHARM and partner organizations in Indonesia, such as the Ministry of Public Works and Housing (PUPR), the National Disaster Management Authority (BNPB), the Meteorological, Climatological, and Geophysical Agency (BMKG), the Ministry of Environment and Forestry (KLHK), the Ministry of Agriculture (MoA), the Ministry of National Development Planning/National Development Planning Agency (BAPPENAS), and a basin-level organization, Balai Besar Wilayah Sungai (BBWS) Bengawan Solo. The main purposes of the meeting were to (1) review the past IFI activities in Indonesia; (2) share recent activities and issues to be solved in the Solo River basin; (3) report the results of ICHARM's research in the Solo River basin; and (4) discuss collaborative activities and the implementation plan, including designing the pilot projects. At the end of the discussion, the participants agreed to develop a draft of the integrated implementation plan based on inputs provided by Indonesian organizations at the meeting.

### 5.1.3 IFI activities in Thailand

ICHARM participated in the second plenary meeting of the Platform on Water Resilience and Disasters in Thailand in Bangkok on March 6, 2025. This platform project is a cooperative framework aimed at enhancing water disaster resilience through collaboration among stakeholders related to water management in the country. It is supported by IFI and the Typhoon Committee. The meeting was

attended by 80 participants from 17 organizations, including government agencies such as the Royal Irrigation Department (RID) and the Thailand Meteorological Department (TMD) and academic institutions such as Chulalongkorn University, Kasetsart University, and Mahidol University, as well as international organizations such as ESCAP and JICA Thailand Office.

After the opening remarks, ICHARM delivered presentations on global trends in climate change and water management and other related topics, including the platform implementation plan, as well as recent research findings and developments. After the presentations, the participants were divided into five groups, with each setting its primary focus on 1) water, 2) water and energy, 3) water and food, 4) policy scenarios, and 5) decision support, and discussed specific action plans in a workshop format. Each group reported on their discussions afterward in the plenary, and all participants joined a discussion on how to promote collaboration among the five focus areas. The meeting concluded that, based on its outcomes, a detailed action plan should be developed while taking into account the following three key points: 1) identifying new challenges, 2) determining who the actual players are, and 3) outlining how to effectively involve these players.

Thailand has established a highly integrated governance structure for water management through close collaboration among various government agencies. This meeting further clarified the platform project's activities in the country and should help accelerate future progress.


Photo 5-3 The second plenary meeting of the Platform on Water Resilience and Disasters in Thailand

## 5.2 UNESCAP/WMO Typhoon Committee (TC)

The Typhoon Committee is an international organization, established in 1968 by WMO and ESCAP, composed of 14 countries and territories in the Northwest Pacific region. The committee sets five sections: the Working Groups on Meteorology (WGM), Hydrology (WGH), and Disaster Risk Reduction (WGDRR), the Training and Research Coordination Group (TRCG), and the Advisory Working Group (AWG), which governs those four. It aims to minimize typhoon-related damage by enhancing cooperation among members in sharing information and upgrading technical support and

capacity development; for example, improving the accuracy of typhoon forecasting, sharing disaster risk reduction measures, and strengthening regional resilience.

With its senior researcher currently serving as the WGH chair, ICHARM, in collaboration with MLIT, leads the discussions of WGH.

### 5.2.1 The 19th Annual Meeting of the Working Group on Disaster Risk Reduction

ICHARM researchers attended the 19th Annual Meeting of the Working Group on Disaster Risk Reduction (WGDRR) of the Typhoon Committee (TC) in Seoul, Korea, on June 25-28, 2024, hosted by the National Disaster Management Institute (NDMI), the Republic of Korea, and participated in TC's Advisory Working Group (AWG), which was also held on this occasion. About 30 participants joined from 12 nations and territories (China, Hong Kong, Macao, Japan, Lao PDR, Malaysia, the Philippines, the Republic of Korea, Singapore, Thailand, Vietnam, and the United States), ESCAP, WMO, and the TC Secretariat. The representatives from Japan included those from JMA and the Asian Disaster Reduction Center (ADRC), in addition to those from ICHARM.

Photo 5-4 Participants in the 19th Annual Meeting of WGDRR

The WGDRR meeting featured presentations and discussions on the latest progress by international organizations and member countries. They also discussed capacity building and knowledge sharing, and decided to hold a cross-cutting program with WGH in Japan in the fall of 2025.

At the AWG meeting, the participants discussed various agenda items for FY2025, including the 19th Integrated Workshop (IWS) meeting and the establishment of the Typhoon Committee Research Award for Young Scientists. The meeting agreed that the theme of the 19th IWS should be "Strengthening the Value Chain within the UN EW4All Framework for the Typhoon Committee Region."

### 5.2.2 The 13th annual meeting of WGH

ICHARM researchers attended the 13th annual meeting of the Working Group on Hydrology (WGH) of the Typhoon Committee (TC) in Nanjing, China, from October 22 to 24, 2024, hosted by the Nanjing Hydraulic Research Institute (NHRI).


Photo 5-5 Participants in the 13th annual meeting of WGH

About 70 participants gathered from nine countries (China, Japan, Lao PDR, Malaysia, the Philippines, the Republic of Korea, Singapore, Thailand, and the United States) and the TC Secretariat. From Japan, in addition to those from ICHARM, officials from MLIT and the Infrastructure Development Institute (IDI) participated.

At the meeting, the member countries reported on this year's typhoon events and damage. They also presented their efforts related to this year's theme, "Strengthen Standardization for Better National Hydrological Services." Additionally, the meeting discussed the progress and plans regarding the nine Annual Operation Plans (AOPs). ICHARM delivered a presentation on AOP7 "Flood Resilience Enhancement through the Platform on Water Resilience and Disasters." Overall, positive discussions took place to accelerate the progress of international joint projects, including questions from China and Korea regarding the publication of the meeting results and human resource development. The meeting also talked about the future operation structure of WGH and approved that Japan would continue to serve as the chair country and that the current chair and vice chair of WGH, including an ICHARM researcher, would continue to lead the group during the next term of two years.

In the latter half of the meeting, the participants took a tour of NHRI and the Nanjing Research Institute of Hydrology and Water Conservation Automation (NIHWA). While receiving detailed explanations, they particularly showed strong interest in the hydrometeorological observation field and the hydrohill experimental catchment at NHRI, as well as the instruments and monitoring related to flooding at NIHWA.

### 5.2.3 The 19th Integrated Workshop

ICHARM researchers participated in the 19th Integrated Workshop (IWS) of the Typhoon Committee (TC) at Lin-gang Center in Shanghai, China, from November 19 to 22, 2024. In the 19th conference, TC's WGM, WGH, and WGDRR met to report on and discuss the progress of each group's Annual Operation Plan (AOP) and plans for 2025.

The meeting was attended by approximately 160 participants from 11 of the 14 member countries and regions (China, Hong Kong, Macao, Japan, Lao PDR, Malaysia, the Philippines, Korea, Thailand, Vietnam, and the United States), WMO, ESCAP, and TC's secretariat. Japan's delegation included representatives from MLIT's Water and Disaster Management Bureau, JMA, the Infrastructure Development Institute (IDI), Tohoku University, and Kyoto University, in addition to those from ICHARM.

On the first day, three keynote speakers from Japan, including an ICHARM researcher, gave presentations. On the second day, technical presentations were made under the theme of "Strengthening the Value Chain within the UN EW4All Framework for the Typhoon Committee Region." On the third day, each working group had a meeting separately. At the WGH meeting, Hong Kong and Vietnam, which did not participate in the October meeting in Nanjing, reported on the damage situation and response measures regarding the 2024 typhoons. The meeting also discussed the 14th WGH, which is scheduled to be held in Guam in 2025 under the joint sponsorship of Japan and the United States. It also included progress reports on the third phase of the project on the Synergized Standard Operating Procedures (SSOP) and reports on the nine annual operation plans for 2024 and new plans for 2025. On the final day, a plenary session was held after another round of working group meetings, and an ICHARM researcher who currently chairs WGH presented a summary of the WGH activities.


Photo 5-6 Participants in the 19th Integrated Workshop

### 5.2.4 The 57th annual session

ICHARM researchers participated in the 57th annual session of the Typhoon Committee (TC) held in Manila, Philippines, on February 17-20, 2025. Annual sessions are pivotal meetings where all stakeholders gather to review the activities of each working group and make comprehensive decisions.

The meeting was attended by 101 participants, which included representatives from 12 of the 14 member countries and regions (China, Hong Kong, Macao, Japan, Lao PDR, Malaysia, Philippines, Korea, Thailand, Singapore, Vietnam, and the United States), WMO, ESCAP, and TC's secretariat. Japan's delegation consisted of representatives from MLIT's Water and Disaster Management Bureau, JMA, the Regional Specialized Meteorological Center (RSMC), the Infrastructure Development Institute (IDI), Tohoku University, and ICHARM.

On the first day, technical presentations were delivered by RSMC on "Summary of the 2024 Typhoon Season" and by ICHARM on "An Integrated Approach for Effective Flood Management: Real-time Flood Forecasting for Timely Response and Long-term Statistical Analysis of Future Extreme Events."

On the second day, the four working groups reported the review results of their Annual Operation Plans (AOPs) and presented plans for 2026. An ICHARM researcher, the sitting WGH chair, delivered the review and plans of WGH. During the session, chairs of each working group were also appointed, with the ICHARM researcher officially confirmed to continue serving in the current position for FY2026. In addition, the establishment of the "Typhoon Committee Research Award for Young Scientist" was approved.

On the third day, TC's secretariat reported on discussions regarding the naming of the typhoon that caused extensive damage, as well as the budget balance, which was followed by the election of the Advisory Working Group chairmanship. The final day addressed the schedule and location for next year's integrated workshop and annual session.


Photo 5-7 Participants in the 57th annual session

## 5.3 International contribution in hydrology

### 5.3.1 UNESCO Intergovernmental Hydrological Programme IX (IHP-IX)

UNESCO-IHP, established in 1975, is UN's only intergovernmental program dedicated to water-related issues, including science, management, education, and capacity building.

IHP sets a mid-term plan every eight years and is currently in the midst of its ninth plan (UNESCO-IHP-IX: 2022-2029). Under the theme of "Science for a Water Secure World in a Changing Environment," the plan aims to help member countries complete the goals set to achieve by 2030, including the 2030 Agenda, SDGs, especially its water-related ones, and water-related global goals, such as the Paris Agreement and the Sendai Framework for Disaster Risk Reduction. IHP has addressed the following five key water priority areas:

1. Scientific Research and innovation
2. Water education in the Fourth Industrial Revolution including Sustainability
3. Bridging the data-knowledge gap
4. Integrated water management under conditions of global change
5. Water governance based on science for mitigation, adaptation, and resilience

UNESCO-IHP-IX has three cross-cutting working themes, and the ICHARM executive director chairs one of them: "Hydrological systems, rivers, climate risk and water-food-energy nexus."

#### a) International Symposium of UNESCO Natural Sciences Sector Category 2 Centres

Photo 5-8 International Symposium of UNESCO Natural Sciences Sector Category 2 Centres

On May 15-17, 2024, ICHARM attended the International Symposium of UNESCO Natural Sciences Sector Category 2 Centres (C2Cs) held in Kuala Lumpur, Malaysia. The symposium was convened for the first time in six years, this time co-hosted by UNESCO and the International Science, Technology and Innovation Centre for South-South Cooperation (ISTIC). There are 129 UNESCO C2Cs worldwide, of which 64 are categorized in the natural sciences sector. About 70 people participated from 31 C2Cs, the UNESCO headquarters, and local agencies. ICHARM introduced its various activities, including research on floods and droughts, doctoral and master's programs, networking activities such as IFI and the Typhoon Committee, and UNESCO projects in Africa.

b) The 26th session of the Intergovernmental Council of the UNESCO International Hydrological Programme (IHP)

The 26th session of the Intergovernmental Council of the UNESCO International Hydrological Programme (IHP) was held at the UNESCO Headquarters in Paris, France, on June 5, 2024. Prior to the council, on June 3, ICHARM attended a colloquium on the 50th anniversary, where the executive director gave a keynote speech titled “Bridging Science and Society: IHP's Key Role to Well-Informed Climate Change Adaptation.” He introduced three key roles of IHP: promoting consilience on the water cycle, climate, agriculture, and energy; developing facilitators who provide expert advice using scientific and indigenous knowledge; and taking an end-to-end approach that links cutting-edge science across disciplines with on-site decision-making and action. On June 4, the executive director joined a panel discussion and introduced the IFI activities at the UNESCO Category 2 Centers meeting.

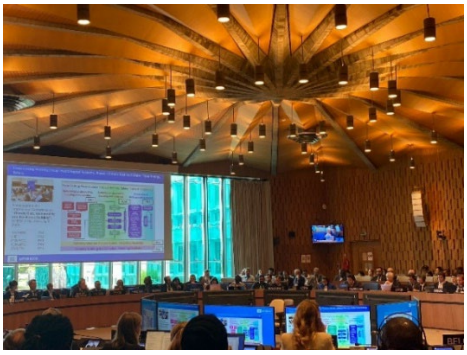

Photo 5-9 Presentation by Executive Director Koike

c) UNESCO IHP Regional Steering Committee for Asia and the Pacific

ICHARM participated in the 31st UNESCO Intergovernmental Hydrological Programme Regional Steering Committee for Asia and the Pacific (IHP RSC-AP) meeting held in Seoul, the Republic of Korea, from October 29 to 31. RSC-AP is a platform where regional IHP member states and Category 2 Centres share their activities and discuss the IHE Strategic Plan. Its meeting is held once a year in one of the member countries. On the first day, participants joined roundtable discussions in five groups to enhance experiences and efforts in tackling water-related disasters in alignment with the 9th Phase of the IHP Strategic Plan (IHP-IX). The results of the roundtable were summarized in “Call to Action: Water-resilient Asia and the Pacific.” During the second day, the IHP member countries and the UNESCO Water Family, such as Category 2 Centres, Chairs, and Networks, shared updates on their activities. ICHARM introduced applications of the WEB-RRI model, master’s and doctoral courses, optimized dam operations, and IFI platforms. On the 3rd day, participants visited the underground floodwater storage tunnel in Seoul City.

Photo 5-10 Report on ICHARM’s achievements

d） 50th Anniversary Symposium of the UNESCO IHP

ICHARM attended the 50th Anniversary Symposium of the UNESCO Intergovernmental Hydrological Programme (IHP) held under the title of "Frontiers in Hydrology and their Contributions to Water Security in a Changing World" at the University of Tokyo Hongo Campus on March 26, 2025. The year 2025 marks 60 years since the launch of the UNESCO-led International Hydrological Decade (IHD) and 50 years since the establishment of IHP. This symposium was organized in this context as an international meeting in preparation for the commemorative symposium scheduled at UNESCO Headquarters in June 2025.

After the opening address, Professor Emeritus TAKEUCHI Kuniyoshi of Yamanashi University, who is also the former executive director of ICHARM and the former chairperson of the IHP Intergovernmental Council, gave a speech representing the guests. In the following session on the "Co-creation of academia and society," ICHAEM researchers delivered presentations on the evolution of hydrology at a turning point and on international cooperation in disaster risk reduction through research and development and human resource development. At the end of the symposium, the participants also discussed the draft policy recommendations in preparation under the executive director's leadership.

Photo 5-11 Participants in the 50th Anniversary Symposium of the UNESCO IHP

### 5.3.2 Collaboration with WMO

ICHARM researchers attended the 3rd Face-to-Face Meeting of the World Meteorological Organization (WMO) Regional Association II (RA II) Coordination Panel for Hydrology (CPH) held in Koyang, Korea, on July 1-2, 2024.

Photo 5-12 Report at WMO RAII CPH

On the first day, each expert team shared the progress of its activities. An ICHARM researcher explained the results of "Enhancement of Flood Resilience through Platforms on Water Resilience and Disasters" and "Expansion of Integrated Flood Management (IFM) HelpDesk to include Integrated Water Resource Management (IWRM)." On the second day, the participants discussed the RA II operating plan and a

working structure in the hydrological field during the next intersectional period (2024-27), with Japan's focus on enhancing disaster resilience under the water-food-energy nexus. ICHARM continues to work on interregional cooperation to reduce water-related disaster risks and increase resilience through an international framework such as WMO RA II.

## 5.4 Other international networking activities

### 5.4.1 The 10th World Water Forum

The World Water Forum (WWF) is one of the world's largest international conferences on water, held every three years under the auspices of the World Water Council (WWC), an international NGO, and the host country. Various stakeholders from around the world gather to discuss water issues from a variety of perspectives, including water disasters, sanitation, governance, and finance.

Photo 5-13 Executive Director Koike reporting the summary of Theme 3 (source: WWF10 official website)

The 10th World Water Forum was held under the main theme of "Water for Shared Prosperity" in Bali, Indonesia, in May 2024. ICHARM coordinated one of the six sub-themes, "Disaster Risk Reduction and Management," listed in the thematic process and reported achievements at sessions related to climate change and disaster risk reduction.

### 5.4.2 Understanding Risk Global Forum 2024

ICHARM participated in the Understanding Risk Global Forum held from June 16 to 21, 2024, in Himeji, Hyogo prefecture, Japan, hosted by the World Bank. Established in 2010, Understanding Risk (UR) is a global community of more than 20,000 active members in the creation, communication, and use of disaster risk information for resilience. Members from the public sector, NGOs, private sector, and academia share knowledge and experience, collaborate, and discuss innovations in assessing and reducing risks.

Photo 5-14 ICHARM exhibition booth

ICHARM held an exhibition booth to promote and extend its international network in research and education activities regarding water-related hazards. Additionally, the executive director hosted a plenary session titled "Bridging Science and Society: The Key to Well-Informed Disaster Risk Reduction (DRR) Decisions to Fight Climate Change." Four panelists, including an ICHARM

researcher and doctoral student, were invited to introduce their innovative research activities and share their ideas of how their work could bridge the gap between the scientific community and society, enabling science-based decision-making and actions to adapt to climate change in terms of water-related risk reduction.

### 5.4.3 Nile Cooperation for Climate Resilience (NCCR) Workshop

ICHARM researchers participated in a workshop held in Addis Ababa, Ethiopia, on July 14-15, 2024. This workshop was organized by the East Nile Technical Regional Office (ENTRO) to primarily discuss the Nile Cooperation Project for Climate Change Resilience (NCCR), aiming to enhance collaboration among Nile Basin countries in managing and developing climate-resilient water resources. The attendees included representatives from various dam-related organizations such as the International Commission on Large Dams (ICOLD), the United States Army Corps of Engineers (USACE), the United States Bureau of Reclamation (USBR), the United States Society of Large Dams, the Canadian Dam Association, and ICOLD Switzerland, alongside those from the Nile River Initiative (NRI) Secretariat, ENTRO, and the World Bank. Representatives from the NRI member countries were also present, contributing to discussions on cooperative efforts in the region.

Photo 5-15 Participants in the Workshop

During the workshop, the participants reviewed the progress of an ENTRO-led project to establish a dam safety training center and develop associated training programs. ICHARM highlighted its initiatives in human resource development and training for government officials in developing countries. Discussions emphasized potential collaboration in meteorology, hydrology, and climate change impact analysis, particularly concerning the planned curriculum and training internships. Additionally, there were discussions on future collaborations, including further training programs and technical activities focused on dam safety. The workshop participants also visited two power generation dams (GIBE3 and Koysha Dams) managed by the Ethiopian Electric Power (EEP), a state-owned company.

### 5.4.4 The Asian Water Cycle Initiative

ICHARM has been taking leadership in the activities of Asia Oceania GEO (AOGEO), which is the first task group of the organization. The 16th AOGEO Symposium was held in Tokyo, Japan, from September 3 to 5, 2024, under the theme of "Creating Earth Intelligence with the Asia Oceania Society." The Asian Water Cycle Initiative (AWCI) session took place on September 4 as one of the Task Groups, attended by 62 participants consisting of 38 online and 24 on-site, including ICHARM researchers. The AWCI session has been used as a meeting opportunity for key stakeholders from the countries participating in IFI's "Platform on Water Resilience and Disasters" project to share and discuss the progress of their efforts and future activity plans.

Photo 5-16 Participants in the AWCI session

The AWCI session moderated by an ICHARM researcher began with a special speech by Professor Sameh Ahmed Kantoush of the Disaster Prevention Research Institute, Kyoto University, followed by country reports from the Philippines, Sri Lanka, Thailand, Indonesia, and Pakistan. Through these presentations, the participants shared each country's efforts in data integration, water-related disaster risk assessment, capacity development and facilitator training, and governance building. Afterward, a professor at the University of Tokyo's Institute for Future Initiatives gave a special lecture on water and poverty. In the afternoon, thematic presentations on the water-food-energy nexus were given by the Ministry of Natural Resources and Environment of Vietnam, the Mahaweli Authority of Sri Lanka, the National Water Resources Department of Thailand, and ICHARM, each introducing their interdisciplinary challenges and initiatives. After these presentations, the participants discussed the outcomes of the session. The discussion results were compiled with input from information science and a session summary prepared by ICHARM for drafting the statement of the 16th AOGEO Symposium.

### 5.4.5 24th International Association for Hydro-Environment Engineering and Research Asia and Pacific Division Congress

Phoro 5-17 Research Specialist Arnez presents her findings

ICHARM researchers attended the 24th International Association for Hydro-Environment Engineering and Research Asia and Pacific Division (IAHR-APD) Congress held in Wuhan, China, from October 14 to 17, 2024. The theme of the congress was "Water for a Changing Future," focusing on discussing adaptation measures to rapid ongoing changes in the world. One of the conference sub-themes addressed critical topics regarding water-related hazards and risk reduction. ICHARM researchers presented findings from their research, "Modeling of water-sediment inundation process incorporating with a rainfall-sediment runoff model" and "Planform evolution of a straight channel with non-uniform sediment." One of them also served as moderator for one of the sessions about "Water-related hazard and risk reduction," where researchers from all over the world shared their research findings on various topics related to floods and their causes and impact on local populations.

In addition, the participants visited the Changjiang River Scientific Research Institute (CRSRI) to view the Changjiang River Flood Protection Physical Model, the largest of its kind, designed to analyze changes in the river flow regime and erosion and deposition processes in the Changjiang River (formerly known as the Yangtze River) after the construction of the Three Gorges Dam.

### 5.4.6 Urban Transitions 2024

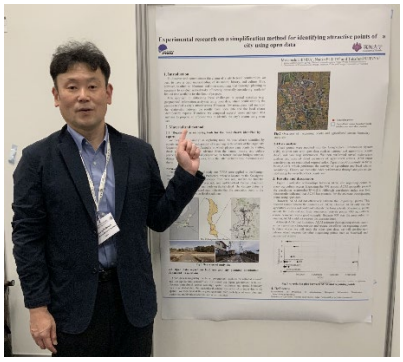
Photo 5-18 Poster session

ICHARM participated in "Urban Transitions 2024 (UT2024)," an international conference held on November 5-7, 2024, in Sitges, Spain. UT2024 gathered researchers and administrators worldwide to discuss community development and transportation issues. At the conference, ICHARM gave a poster presentation on evaluating the effectiveness of water disaster risk communication. It has been studying this theme while joining community development initiatives that Tsukuba City, Ibaraki Prefecture, Japan, has been working on for about two years, aiming at revitalizing its surrounding areas. The conference also aligned closely with ICHARM's research on risk communication using its virtual flood experience system, making it an excellent opportunity to gain insights into the latest trends in community development.

### 5.4.7 Sub-Regional Meeting on Safeguarding Intangible Cultural Heritage in East Asia

Photo 5-19 Participants in the meeting

On November 5 and 6, 2024, ICHARM participated in the Sub-Regional Meeting on Safeguarding Intangible Cultural Heritage in East Asia held in Ulaanbaatar, Mongolia, hosted by the UNESCO Regional Office for East Asia and the International Information and Networking Centre for Intangible Cultural Heritage in the Asia-Pacific Region under the auspices of UNESCO (ICHCAP). Under the theme "The Role and Risks of Intangible Cultural Heritage in the Face of Climate Change," the event brought together experts, researchers, and policymakers from the fields of culture, climate change, and disaster prevention to discuss strategies for strengthening the safeguarding of intangible cultural heritage against the escalating climate change in East Asia. ICHARM introduced interdisciplinary efforts underway in the Philippines and Thailand to address the impacts of climate change and enhance water-related disaster management. Given that floods occurred in Ulaanbaatar in 2023, discussions also took place regarding the potential to initiate efforts to strengthen water disaster resilience in Mongolia.

### 5.4.8 International Conference on Integrated Flood Management Strategy in Hong Kong


Photo 5-20 High-level participants at the opening

ICHARM was invited to attend the International Conference on Integrated Flood Management Strategy on December 3, 2024, in Hong Kong, China, which was co-hosted by the Drainage Services Department (DSD) of the Government of the Hong Kong Special Administrative Region and the Civil Division of the Hong Kong Institution of Engineers. The event brought together four hundred participants under the theme "Building an Adaptive and Resilient City to Safeguard the Public against Flooding under Extreme Weather."

### 5.4.9 Celebration of the first World Day for Glaciers and World Water Day

Photo 5-21 Brainstorming session

ICHARM participated in the joint celebration of the first World Day for Glaciers and World Water Day, held on March 20-21, 2025, at the UNESCO headquarters in Paris, France. With climate change accelerating the rapid melting, shrinking, and disappearance of glaciers and snow cover, the resulting impacts are becoming increasingly severe for downstream regions and their ecosystems. The event was held to address this issue, aiming to strengthen adaptation strategies and foster cross-border cooperation. Additionally, it sought to promote international collaboration in scientific research and monitoring to lay the foundation for the Decade of Action for Cryospheric Sciences (2025-2034).

The brainstorming session for the Decade of Action for Cryosphere Sciences took place during the event. Keynote presentations were delivered on five main themes: 1. Scientific Research: Cryosphere Observation and Modelling; 2. Socio-Economic Impact, Vulnerability and Adaptation; 3. Education and Capacity Building; 4. Policy, Advocacy and Campaign; and 5. Finance. These were followed by expert panel discussions. In addition, 14 parallel side events were organized under the title "International Year of Glaciers' Preservation 2025."

The participants unanimously recognized the critical role of science in addressing cryosphere challenges, highlighting that the melting and reduction of glaciers and snow cover due to climate change are serious problems in water resources management and GLOF（Glacial Lake Outburst Flood)-related water disasters. They emphasized that science must play a vital role in making well-informed decisions grounded in scientific research and technological advancements. Furthermore, discussions stressed the importance and necessity of integrating ground-based observations, satellite observations, and various models to provide more effective early warning information. The importance of integrating the experience and knowledge of indigenous people living in cryosphere regions was also underscored.

## 5.5 Memorandum of Understanding

As part of its international networking activities, ICHARM signed a Memorandum of Understanding with Universidad Tecnológica de Panamá (UTP).

Photo 5-22 The signing ceremony with the Universidad Tecnológica de Panamá

## 5.6 Visitors

ICHARM constantly seeks opportunities to exchange views and ideas with domestic and international organizations to expand and strengthen our global network. In FY2024, we received about 103 visitors from the institutions shown in Table 5-2. Section 5.7.1 and onwards provide more information about visitors.

Table 5-2 Foreign visitors

| Date | Organization | Number of visitors |
|---|---|---|
| 2024 7/16 | Department of Earth System Science, Tsinghua University, China (See 6.3.1) | 1 |
| 7/18 | Sri Lankan trainees<br>・Meteorological Department<br>・Disaster Management Centre<br>・Irrigation Department<br>・National Building Research Organisation<br>・Land Development Corporation  | 8 |
| 7/29 | Department of Hydraulic Engineering, Tsinghua University, China (5.6.1) | 15 |
| 8/27 | Rwandan Delegates<br>・Ministry in Charge of Emergency Management<br>・Rwanda Meteorology Agency<br>・Rwanda Space Agency<br>Paraguayan delegates<br>・Space Agency  | 13 |

| | | |
|---|---|---|
| | ・Creation of the National Service for Plant and Seed Quality and Health | |
| 9/17 | Malaysia-Japan International Institute of Technology (MJIIT) (5.6.2) | 4 |
| 9/24 | Typhoon Committee<br>・Typhoon Committee Secretariat<br>・National Disaster Management Institute (NDMI), Republic of Korea  | 10 |
| 10/30 | Seven African countries (Kenya, Cameroon, Mauritania, Mozambique, Burkina Faso, Senegal, and Benin) (5.6.3) | 21 |
| 10/31 | Hydrology Department, Ministry of Water Resources, China (5.6.4) | 7 |
| 11/22 | State of Rio Grande do Sul, Brazil (5.6.5) | 18 |
| 2025<br>1/17 | Wuhan University, China (6.4.2) | 3 |
| 2/26-28 | ICHARM Evaluation Mission from UNESCO (2.7, 6.3.1)<br>・Department of Civil and Environmental Engineering, University of Western Ontario, Canada<br>・Institute of Atmospheric Physics, Chinese Academy of Sciences<br>・UNESCO Beijing Office | 3 |

### 5.6.1 Students from the Tsinghua University, China

Photo 5-23 Lecture participants

A group of 14 students from the Department of Hydraulic Engineering of Tsinghua University, China, led by Associate Professor Yifei CUI, visited ICHARM on July 29, 2024. The visit was part of their international study trip to learn more about floods and geohazards in Japan. ICHARM welcomed them by providing lectures with Q&A sessions, as well as a research facility tour. Before the lectures, Associate Professor Cui briefly spoke about his research on geohazard mitigation and early warning systems. The series of lectures started with an ICHARM researcher providing an overview of its various activities, followed by others covering a wide range of topics, including “Prediction models of water-related disaster risks: progress, challenges, and future direction,” “Prediction of water, sediment, and driftwood runoff during extreme events using the Rainfall-Sediment-Runoff (RSR) model,” and “Development of CLVDAS-based drought monitoring system.” The interaction was particularly active after the presentation on hazard prediction using the RSR model, which indicated their high interest in floods and geohazards. Then, the students took a facility tour of the Earth Structure Laboratory and listened to laboratory staff explaining their

experiments and equipment.

### 5.6.2 Malaysia-Japan International Institute of Technology

Photo 5-24 Visitors from MJIIT

Four people from the Malaysia-Japan International Institute of Technology (MJIIT) visited ICHARM on September 17, 2024. ICHARM welcomed them by providing lectures with Q&A sessions. MJIIT is an academic institution in Malaysia that provides Japanese-style engineering education. It was established by the Malaysian government in May 2010 based on an agreement between the leaders of Japan and Malaysia, and its main purpose is to promote human exchange and human resource development between Japan and Malaysia. The lectures began with an overview of ICHARM, followed by a series of studies on ensemble rainfall prediction, RRI hydrological modeling, and a virtual flood experience system. During the Q&A session, the visitors asked many questions about the models and system mechanisms used in each study. This event provided a good opportunity to introduce ICHARM's technologies to an academic institution in Malaysia.

### 5.6.3 Ministerial-level delegation from seven African countries


Photo 5-25 Participants including 7 African countries

On October 30, 2024, a ministerial-level delegation from seven African countries (Kenya, Cameroon, Mauritania, Mozambique, Burkina Faso, Senegal, and Benin) visited PWRI, accompanied by African Development Bank (AfDB) officials, to discuss possible cooperation measures between Japan and African countries. The visit was planned with support from AfDB following the technical meeting in June 2024 between AfDB and Japan's MLIT. At PWRI, the 18 participants attended lectures presented by ICHARM and participated in a facility tour.

In a lecture entitled "Climate and Water Resilience and Sustainability in Africa," ICHARM explained its initiatives, such as a project to prevent and mitigate flood damage in West African countries and the OSS-SR system to train facilitators. A doctoral student at ICHARM introduced a transdisciplinary approach to governance and policy for water-related disaster risk reduction in Pakistan. After that, the participants toured the hydraulic experiment facility and received an explanation of the facility, including a dam model experiment and a bridge pier scouring experiment.

### 5.6.4 Deputy Director-General of the Hydrology Department of the Ministry of Water Resources, China

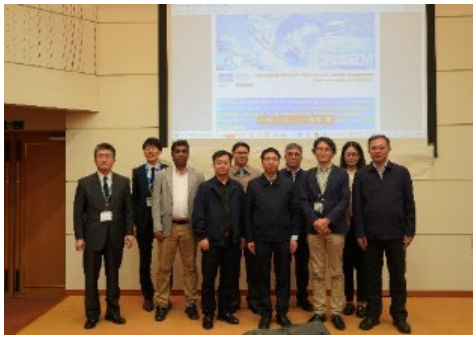

Photo 5-26 Participants from the Ministry of Water Resources, China

A six-member Chinese delegation led by Zhiyu Liu, the deputy director-general of China's Hydrology Department of the Ministry of Water Resources, visited PWRI on October 31, 2024. Their visit was part of their tour to Japan to promote technical exchange between China and Japan. PWRI and ICHARM welcomed them by making presentations with Q&A sessions, such as an overview of ICHARM, research on the RRI hydrological modeling, and research on flow velocity measurement. Showing keen interest in the presentations, the visitors asked many questions regarding the future development of the RRI hydrological modeling and the accuracy of the flow velocity measurement equipment. This event provided a good opportunity for the Chinese delegation to learn about the technologies of ICHARM and PWRI and deepen cooperation with the two institutes.

### 5.6.5 Governor of the State of Rio Grande do Sul, Brazil

Photo 5-27 Participants in discussion

A delegation of 20 representatives from Rio Grande do Sul, the southernmost state of Brazil, led by Governor Eduardo Leite, visited ICHARM on November 20 to explore potential collaborations with Japanese and international institutions specializing in risk assessment and natural disaster management. The governor made a presentation on the worst flood disaster in the state's history, which lasted from April to May 2024. This catastrophic event resulted in 210 casualties, affected 2.4 million people, and displaced 0.6 million individuals. In response to the disaster, the state developed the "Rio Grande Plan," a comprehensive strategy focused on preparation, reconstruction, adaptation, and climate resilience. As part of the discussion, ICHARM presented a case study on the river-lagoon-flood nexus under climate change in Sri Lanka's Batticaloa Lagoon. The study evaluated three policy options for flood management. The delegation expressed keen interest in topics such as data acquisition and its reliability in the case study, as well as the lagoon usage in fisheries and navigation.

# 6. Outreach & Public Relations

ICHARM conducted various outreach and public relations activities for domestic and international audiences. As part of our outreach activities, the executive and deputy directors, as well as other staff members, gave lectures and presentations at many domestic and international conferences. We also organized the ICHARM Open Day for junior high and high school students. By participating in webinars, ICHARM provided information about the latest digital technologies and best practices for committed practitioners worldwide. At the same time, we actively disseminated the philosophy of the IFI platform project and the WCI concept advocated by ICHARM, aiming to expand business opportunities. Moreover, we issued newsletters and updated our website to quickly disseminate the latest information about our activities around Japan and abroad.

## 6.1 Presentations and lectures

At various domestic and international conferences, the executive director and other researchers gave lectures and presentations on topics such as Japan's new flood control management policy, "River Basin Disaster Resilience and Sustainability by All," and climate change adaptation measures. Table 6-1 shows the conferences and other meetings they attended.

Table 6-1 Conferences and other meetings where ICHARM staff delivered presentations

| | Conferences and meetings | Date |
|---|---|---|
| 1 | ICHARM Open Day | 2024<br>April 24 |
| 2 | River flow monitoring training in the Philippines | May 13-17 |
| 3 | International Symposium of UNESCO Natural Sciences Sector Category 2 Centre | May 16 |
| 4 | Training session on "River Basin Disaster Resilience and Sustainability by All," 2024 Advanced Course, MLIT College | May 20 |
| 5 | 10th World Water Forum | May 20-23 |
| 6 | 26th session of the Intergovernmental Council of the UNESCO International Hydrological Programme (IHP) | June 3-7 |
| 7 | River flow monitoring training in the Philippines | June 17-18 |
| 8 | World Bank, Understanding Risk Global Forum | June 18 |
| 9 | Workshop for Interview Survey on Farmer's Disaster Experience in Candaba Municipality, the Philippines | June 18 |
| 10 | 9th Global Energy and Water Exchanges Open Science Conference | July 10-11 |
| 11 | Department of Hydraulic Engineering of Tsinghua University, China | July 29 |
| 12 | Ministry of Infrastructure and Public Services of the State of Córdoba, Argentina | August 1 |
| 13 | National University of Córdoba, Argentina | August 2 |
| 14 | Davao Online Synthesis System Training Workshop, the Philippines | August 30 |
| 15 | Malaysia-Japan International Institute of Technology (MJIIT) | September 17 |
| 16 | Department of Earth System Science at Tsinghua University, China | September 22 |
| 17 | UNESCO Water Family Symposium II/40th anniversary celebration of IRTCES | September 23 |
| 18 | UNESCO International Conference: A Decade of the Sendai Framework for Disaster Risk Reduction – Envisioning the Road Ahead | September 26 |
| 19 | Seminar "Operational Flood Forecasting System and Information Dissemination" | October 2 |

| | | |
|---|---|---|
| 20 | Cairo Water Week 2024, UNESCO Cairo session | October 15 |
| 21 | 24th International Association for Hydro-Environment Engineering and Research Asia and Pacific Division Congress | October 16-17 |
| 22 | Japan-Malawi Hybrid Seminar on Water-related Disaster Risk Management | October 21 |
| 23 | Technological University of Panama | October 21-22 |
| 24 | Ministerial-level delegation from seven African countries | October 30 |
| 25 | 31st UNESCO IHP Regional Steering Committee for Asia and the Pacific | October 30 |
| 26 | Hydrology Department of the Ministry of Water Resources, China | October 31 |
| 27 | Sub-Regional Meeting on Safeguarding Intangible Cultural Heritage in East Asia | November 5 |
| 28 | Seminar for the World Bank experts | November 7 |
| 29 | RRI model training in Lima, Peru | November 18-22 |
| 30 | 19th Integrated Workshop of the Typhoon Committee | November 19 |
| 31 | State of Rio Grande do Sul, Brazil | November 20 |
| 32 | World Science Forum | November 21 |
| 33 | Florida International University International Conference | November 21 |
| 34 | Online Workshop "Bridging Science and Society | November 25 |
| 35 | Webinar "Climate Change and Water Resource Resilience and Sustainability in Zambia" | December 9 |
| 36 | 24th Disaster Risk Management Seminar organized by the World Bank GFDRR Tokyo Disaster Risk Management (DRM) Hub | 2025<br>January 8 |
| 37 | Joint seminar with Wuhan University, China on sediment transportation | January 17 |
| 38 | Training session on "Flood Control - Risk Management, and River Basin Disaster Resilience and Sustainability by All," 2024 | January 22 |
| 39 | Training on Davao Region Online Synthesis System (DROSS) in the Philippines | February 4-5 |
| 40 | Global Citizen Forum on Water and Watersheds for All Lives | February 22 |
| 41 | International Symposium on Water and Disaster for Cooperation and Partnerships | March 5 |
| 42 | 50th Anniversary Symposium of the UNESCO IHP | March 26 |

## 6.2 Youth outreach activities

### 6.2.1 Open Day

The ICHARM Open Day is held every year during the Science and Technology Week in April as one of our community contribution activities, inviting students from local schools and providing them with international exchange opportunities. The 2024 open day was held on April 24, attended by 78 students from Ibaraki Prefectural Takezono High School and Ibaraki Prefectural Namiki Secondary School.

Photo 6-1 Participants in the ICHARM Open Day

The event started with the executive director's presentation. He explained changes in precipitation caused by climate change and provided an overview of ICHARM's various activities to support West Africa in addressing these changes. In the subsequent poster session, local students interacted with ICHARM's graduate program students from 11 countries (Afghanistan, Bangladesh, Honduras,

Indonesia, Malawi, Morocco, Nepal, Pakistan, the Philippines, Sri Lanka, and East Timor), who put up posters showcasing an overview of their countries' conditions, lifestyles, and cultures, along with issues related to water disasters.

The participating students provided thoughtful feedback. One remarked, "I learned that water disasters abroad are even more severe than I expected, and it made me think about what we can do to help." Another commented, "It was fascinating to learn about ICHARM's activities overseas and hear insights from international perspectives. I was delighted to see Japanese technologies, such as dams and levees, in action. Personally, I was impressed by the fact that the term 'sabo dam' is used directly in English. I also enjoyed interactions with people from other countries." Another student noted, "I participated last year, too, and I could really feel the improvement in my English this time."

### 6.2.2 Summer internship

PWRI offers an annual summer internship program for individuals interested in working at the institute in the hope that it will lead to new employment opportunities. As part of this program in FY2024, ICHARM also announced a summer internship opportunity; however, no applications were received.

## 6.3 Sharing the latest knowledge and information on water-related disasters around the world

### 6.3.1 R&D Seminar

The ICHARM R&D Seminar is held on an irregular basis to provide researchers with an opportunity to keep up with the latest knowledge and information by inviting domestic and international experts in the field of hydrology and water-related disasters. In FY2024, three seminars were held and attended by many participants, including those from PWRI and NILIM. (See ICHARM Newsletter Vol. 74, Vol. 75, and Vol. 76 for more information.)

<The 72nd seminar (July 16, 2024)>
Speaker: Kun Yang, professor, Tsinghua University, China
Title: Development of a Regional Climate Modeling System for the Tibetan Plateau

Photo 6-2 Prof. Kun Yang

<The 73rd seminar (December 26, 2024)>

Speaker: OKA Hiroshi, former ambassador extraordinary and plenipotentiary of Japan to Egypt

Title: Japan's International Cooperation

Photo 6-3 Former Ambassador Oka

<The 74th seminar (February 28, 2025)>

Speaker: Slobodan Simonovic, professor emeritus, Department of Civil and Environmental Engineering, Western University, Canada

Title: Water Disasters: Challenges and Opportunities

Speaker: LIU Yimin, professor, Institute of Atmospheric Physics, Chinese Academy of Sciences, China

Title: The Tibetan Plateau and Extreme Rainfall Events in East Asia

Photo 6-4 Prof. Simonovic

Photo 6-5 Prof. Liu

## 6.4 Webinars for global practitioners

### 6.4.1 Seminars on water-related disaster risk management in Malawi and Zambia

The Embassies of Japan in Malawi and Zambia hosted seminars on water-related disaster risk management on October 21 and December 9, 2024, respectively. The seminars commemorated the 60th anniversary of establishing a diplomatic relationship between Japan and each country.

ICHARM was invited to each seminar to deliver an online lecture titled "Climate and water resilience and sustainability" to government officials, experts from international organizations, and university faculty and students. The seminar with Malawian participants was co-organized by the Department of Disaster Management Affairs (DoDMA) and the Malawi University of Science and Technology. The seminar with Zambian participants was co-organized by the Disaster Management and Mitigation Unit and the University of Zambia. Southern Africa suffers from historical droughts, which cause frequent blackouts due to the lack of hydropower and threaten food security. Several alumni of ICHARM's graduate programs participated in the Malawi seminar and offered insights into local disaster management practices.

Photo 6-6 Participants in Malawi's seminar room

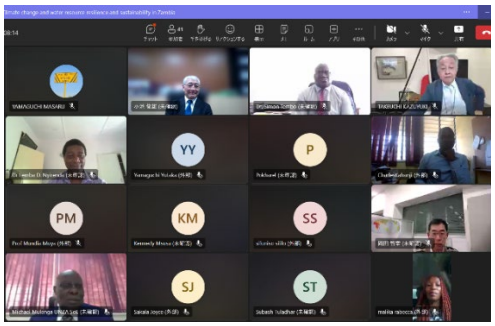

Photo 6-7 Online participants in the Zambia seminar

### 6.4.2 Joint seminar with Wuhan University on sediment transportation

On January 17, 2025, Professor Junqiang Xia, Professor Xiaofeng Zhang, and Associate Professor Meirong Zhou from the School of Water Resources and Hydropower Engineering at Wuhan University visited ICHARM to participate in a joint seminar on sediment transport and related issues with researchers and students of ICHARM.

Photo 6-8 Participants in a joint seminar

During the seminar, Professor Junqiang Xia introduced three of his research group's latest achievements: (1) the numerical simulation of turbidity current formation in the Xiaolangdi Reservoir, located in the midstream of the Yellow River; (2) the development of a bank erosion early warning system for the midstream of the Yangtze River; and (3) the modeling of extreme flooding processes in urban areas.

ICHARM presented its recent study results on the development of the Rainfall and Sediment (Driftwood) Runoff Model (RSR Model). They also showcased its integration with a two-dimensional depth-integrated flow and sediment transport model, with applications of this integrated model to simulate rainfall-induced landslides, debris flow occurrences, driftwood and sediment runoff, and water and sediment inundation processes across entire river basins.

Finally, ICHRAM also brought up issues regarding fundamental theories of sediment transport mechanics, which sparked active and fruitful interactions among participants from both institutions.

This joint seminar provided valuable insights into sediment transportation and its associated issues and hazards, facilitating the exchange of practical techniques to address these challenges and mitigate related hazards.

## 6.5 ICHARM Newsletter

The ICHARM Newsletter has been published four times a year since March 2006 to publicize ICHARM's activities in research, education and training, and local practice projects, as well as a list of published papers. In recent years, in addition to articles written by ICHARM staff, the newsletter includes ones contributed by our educational program graduates and other experts at international organizations in an attempt to gather news from diverse perspectives.

In FY2024, we published four issues of the newsletter from No. 72 to No. 75. The number of readers has reached about 5,500 worldwide (roughly 3,000 in Japan, 2.000 overseas, and 500 unknown). ANNEX 2 lists the articles published in the four issues.


Newsletter
Volume 19 No. 4
Issue No. 75
January 2025
ICHARM
International Centre for Water Hazard and Risk Management under the auspices of UNESCO
Message from Executive Director
Trust and Risk
信用・信頼とリスク

Figure 6-1 The top page of ICHARM Newsletter No. 75

## 6.6 Website

We use the website to provide the public with the latest information on research and project progress, as well as notices of upcoming events. ANNEX 3 provides a list of updates made in FY2024.

Figure 6-1 shows the number of views for each page from April 2024 to February 2025. According to this figure, the page with the most views is the top page of the RRI model (in Japanese), followed by the download page of the RRI model.

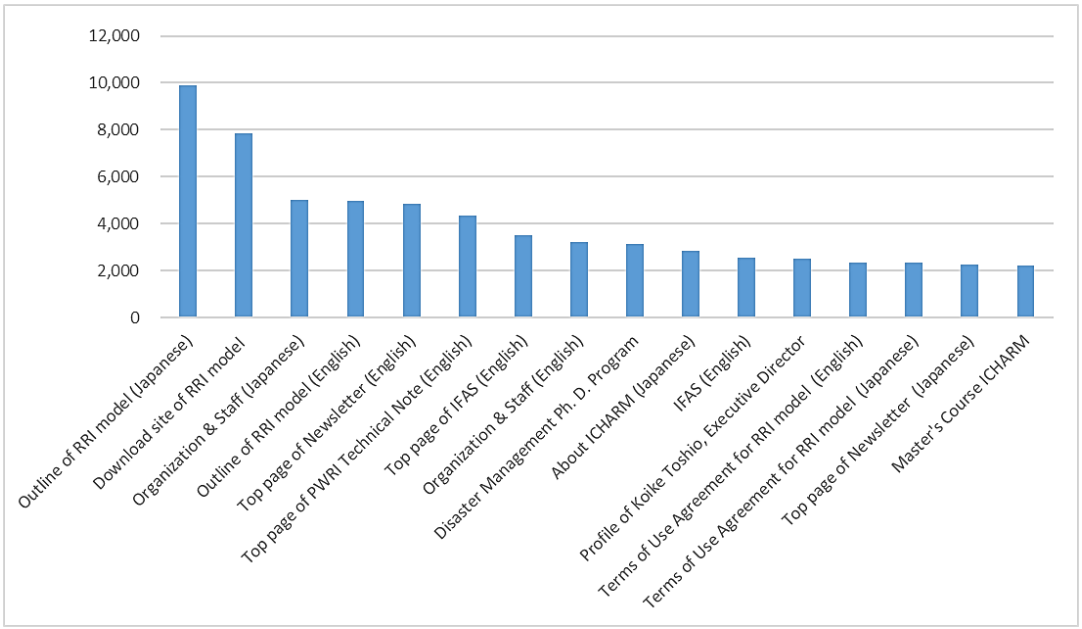


Figure 6-1 The number of views of popular pages on the ICHARM website (April 2024 –March 2025)

## 6.7 Publications

Table 6-2 shows the number of publications during FY2024 in which ICHARM researchers were involved. ANNEX 4 shows the list of research papers and articles.

Table 6-2 Number of publications in which ICHARM researchers were involved

| Category | Number |
|---|---|
| Peer Reviewed Paper | 16 |
| Non-peer Reviewed Paper, Oral Presentation | 28 |
| Poster Presentation | 12 |
| Magazine, Article | 3 |
| PWRI Publication | 5 |

# 7． Awards

On July 10, 2024, Executive Director KOIKE Toshio received the inaugural Global Energy and Water Exchange (GEWEX) Lifetime Contribution Award.

Photo 7-1 Inaugural GEWEX Lifetime Contribution Award

On January 23, 2025, Research Specialist TAMAKAWA Katsunori received the Judges' Special Award in the “NEDO Challenge, Satellite Data for Green Earth” category of the NEDO Prize for New Industrial and Innovative Technologies for FY2024. His model made it possible to estimate snowfall worldwide, including high mountain areas, and predict snowmelt runoff accurately. The prize committee recognized the proposed technology as the significant potential to address future challenges.


Photo 7-2 Presentation by Research Specialist Tamakawa

# 8. Management

## 8.1 Governing Board

ICHARM holds a Governing Board meeting once a year in accordance with Article 6 of the Agreement between UNESCO and the Government of Japan on the Continuation of ICHARM, revised and signed on February 13, 2020.

The 8th Governing Board meeting was held online on June 28, 2024, and was attended by seven board members from Japan and abroad, including PWRI President FUJITA Koichi, who chaired the meeting, as shown in Table 8-1. Observers from MOFA, MEXT, and JICA also participated.

At this meeting, the board first conducted a vote on the rules of procedure for the Governing Board and reviewed the Activity Report, which is a report on the main activities that ICHARM carried out in FY2023. Following this, it reviewed the amendments to the Work Plan, which is the activity plan from April 2024 to March 2026, and it was unanimously adopted.

Table 8-1 List of participants in the 8th ICHARM Governing Board meeting
(organizations in alphabetical order)

| Name | Position Title, Organization |
|---|---|
| OTA Hiroko | President, GRIPS |
| YOSHIOKA Mikio | Vice Minister for Engineering Affairs, MLIT |
| FUJITA Koichi | President, PWRI |
| MATSUOKA Yuki | Head, UNDRR Kobe Office |
| Abou AMANI | Director of the Division of Water Sciences and Secretary of the UNESCO-IHP, on behalf of Acting Assistant Director-General Lidia Brito for Natural Sciences Sector |
| TACHIKAWA Yasuto | Chair Holder, UNESCO Chair on Water, Energy and Disaster Management for Sustainable Development (WENDI) |
| Stefan UHLENBROOK | Director of Hydrology, Water and Cryosphere, WMO |

Photo 8-1 Participants and staff in the 8th ICHARM Governing Board Meeting

Photo 8-2 Secretariat of the ICHARM Governing Board

## 8.2 Organization

The number of ICHARM staff was 42 as of April 2024 and 44 as of March 2025, as shown in Table 8-2. Since ICHARM is a research center of PWRI, which is under the management of MLIT, many of its staff are seconded from MLIT. In addition, as an international center, ICHARM employs foreign researchers mainly as research specialists. As of March 2025, there were nine of them at ICHARM.

The main responsibilities of each position are described below, with reference to PWRI's organizational regulations, circulars, and administrative instructions:

The executive director is in charge of the overall management of ICHARM.

The deputy director assists the executive director in fulfilling its responsibilities. In addition, the deputy director, since also assuming the director of the Water Hazard and Risk Management Research Group, oversees the research and other activities of the group. The Water Hazard and Risk Management Research Group is defined to conduct investigation, testing, research, training, and the development and guidance of civil engineering technologies related to the following matters:

1. International dissemination of technologies for the prevention and mitigation of water-related disasters
2. Hazards by water-related disasters
3. Risk management of water-related disaster

The director for special research manages affairs related to particularly important research that does not belong to the scope of the group.

The research and training advisor provides necessary guidance to researchers and trainees.

The deputy head, the chief staff, and the administer manage the administrative work of ICHARM.

The chief researcher, under the direction of the deputy director, conducts the work that belongs to the scope of the group, including investigation, testing, research, and the development and guidance of civil engineering technologies.

The senior researcher and the researcher conduct their respective duties under the direction of the chief researcher.

The research specialist supports research work requiring a high level of expertise under the guidance and supervision of the deputy director or the chief researcher.

The collaborating researcher is the researcher accepted by PWRI from private companies (consultants, contractors, manufacturers), public corporations, local governments, and other entities. Their compensation and expenses, such as travel expenses, are generally covered by their organizations.

The research assistant is hired from among doctoral students enrolled in the "Doctoral Program in Disaster Management," a joint graduate program of PWRI and GRIPS, and works under the guidance and supervision of the deputy director or the chief researcher to support research and training projects that require a high level of expertise and advanced English language skills necessary to carry out the projects.

The assistant provides support to researchers and administrative staff in the performance of their duties.

Table 8-2 Staff composition of ICHARM

| Position | No. of staff (as of Apr. 2024) | No. of foreign/ female staff | No. of staff (as of Mar. 2025) | No. of foreign/ female staff |
|---|---|---|---|---|
| Executive Director | 1 | | 1 | |
| Deputy Director (Director of the Water Hazard and Risk Management Research Group) | 1 | | 1 | |
| Director for Special Research | 1 | | 1 | |
| Research and Training Advisor | 1 | | 1 | |
| Deputy Head (administrative staff) | 1 | | 1 | |
| Administer (administrative staff) | 2 | | 2 | |
| Chief Researcher | 4 | | 4 | |
| Senior Researcher | 7 | Foreign: 1 | 7 | Foreign: 1 |
| Researcher | 2 | | 2 | |
| Research Specialist | 7 | Foreign: 4<br>Female: 2 | 8 | Foreign: 4<br>Female: 3 |
| Collaborating Researcher | 1 | | 1 | |
| Research Assistant | 4 | Foreign: 4<br>Female: 1 | 4 | Foreign: 4<br>Female: 2 |
| Assistant | 10 | Female: 7 | 12 | Female:9 |
| Total | 42 | Foreign: 9<br>Female: 10 | 44 | Foreign: 9<br>Female: 14 |

* The foreign female staff are counted twice, both as foreigners and as women.

## 8.3 Revenue

ICHARM has two main sources of revenue. One is the operating grants provided by MLIT, the ministry that oversees PWRI, which is used for personnel, research, travel, and other expenses. The other is external funding, which is used for expenses required to carry out specific research projects, including compensation for research specialists and assistants. Such research projects are, for example, those led or commissioned by Kyoto University, the Cabinet Office, or the World Bank, training programs in collaboration with JICA, and SATREPS in collaboration with JICA and JST.

The amounts in dollars are based on an exchange rate of 1 USD = 150 JPY. In FY2024, ICHARM's total revenue was about 511 million yen (3.4 million US dollars), consisting of the operation subsidy of about 355 million yen (2.4 million US dollars) and the external funding of about 156 million yen (1.0 million US dollars). Figure 8-1 shows annual changes in ICHARM's revenue since FY2011. ANNEX 5 shows the financial statement of ICHARM in FY 2024.

The revenue in FY2024 decreased by 221 million yen (about 1.5 million dollars) compared to the record-high revenue in FY2022. There are two main reasons for this decline. First, the PRISM project (2022 budget: 250 million yen, 1.7 million dollars) ended. Second, ICHARM does not receive the SATREP Philippine project fund (2022 budget: 43 million yen, 0.3 million dollars) from JICA because it is no longer the principal organization, as the researcher representing ICHARM for this project moved to the University of Tokyo. However, we have secured two new sources of revenue starting in 2023: the SIP project (budget: 61 million yen, 0.4 million dollars) and the BRIDGE project (budget: 23 million yen, 0.2 million dollars). In FY2024, the budget of the SATREPS Argentina project and the SIP project increased the external fund.

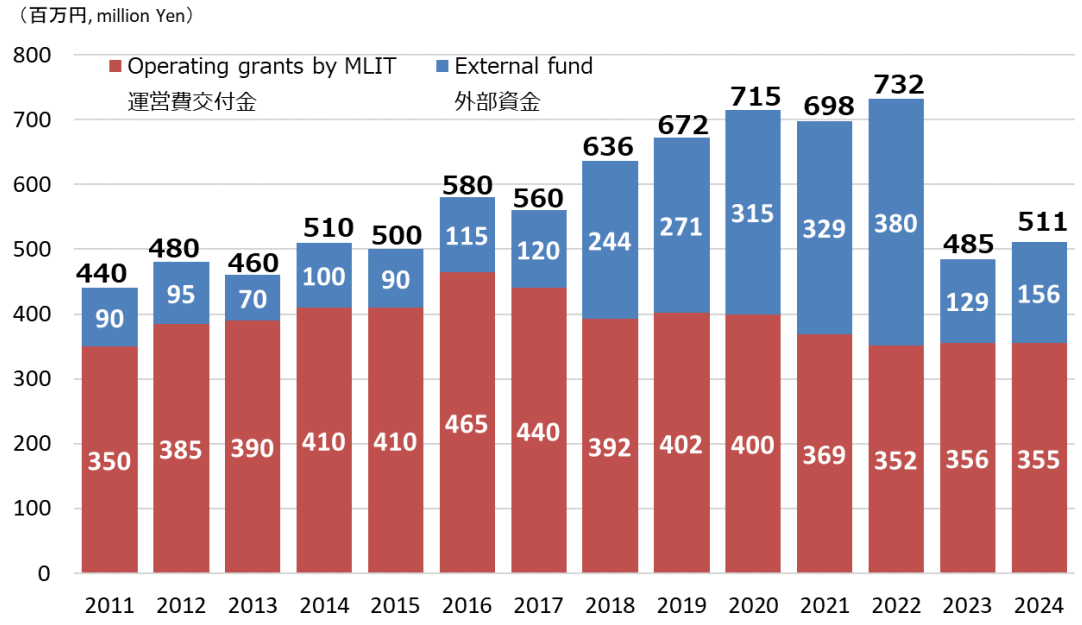


Figure 8-1 Trend of ICHARM revenue from FY2011

# Annex 1 Number of Alumni of ICHARM Training Program

Ph.D. Program "Disaster Management" (as of September 2024)

| Country / Year | Afghanistan | Bangladesh | Bhutan | Bosnia-Herzegovina | Brazil | Cambodia | China | Colombia | El Salvador | Ethiopia | Djibouti | Fiji | Guatemala | Honduras | India | Indonesia | Japan | Kenya | Laos | Liberia | Malaysia | Malawi | Maldives | Morocco | Mauritius | Mozambique | Myanmar | Nepal | Netherland | Nigeria | Pakistan | Papua New Guinea | Philippines | Republic of Albania | Serbia | Sri Lanka | Tajikistan | Tanzania | Thailand | Timor-Leste | Tonga | Tunisia | Venezuela | Vietnam | Zimbabwe | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2010-2013 | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| 2011-2014 | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | 1 |
| 2012-2015 | | 1 | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| 2013-2016 | | 2 | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 3 |
| 2014-2017 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 2015-2018 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | 2 |
| 2016-2019 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | 2 |
| 2017-2020 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| 2018-2021 | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | 1 | 3 |
| 2019-2022 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 2020-2023 | | 1 | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| 2023-2024 | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | 1 | | | 1 | | | | | | | | | | 3 |
| **Total** | **0** | **7** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** | **0** | **0** | **2** | **0** | **0** | **0** | **2** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** | **1** | **0** | **2** | **0** | **1** | **0** | **0** | **2** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** | **0** | **20** |

Master's. Program "Water-related Disaster Management Course of Disaster Management Policy Program" (as of September 2024)

| Year | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2007-2008 | | 2 | | | | 3 | | | | | | | | 1 | | 3 | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | 10 |
| 2008-2009 | | 2 | | | | 2 | | | 1 | | | | | | | 1 | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | 7 |
| 2009-2010 | | 2 | | | | 1 | | | 1 | | | | | | | 3 | 1 | | | | | | | | | 1 | | | | | | 1 | | | 1 | | | | | | | | | 12 |
| 2010-2011 | | 2 | | | | 2 | 1 | | | | | 1 | | | | 1 | | | | | | | | | | 1 | 3 | | | 1 | | | | | | | | | | | | | | 12 |
| 2011-2012 | | 2 | | | | 2 | | | | | 1 | | | | | 2 | | | | | | | | | | | 2 | | | 6 | | 1 | | | 1 | | | | | 1 | | 1 | | 19 |
| 2012-2013 | | 2 | | | | | 1 | | | | | | | | | | | | | | 2 | | | | | 1 | 1 | | 1 | | | 1 | 1 | 1 | | | | | | | 1 | | | 12 |
| 2013-2014 | | 2 | | | | 1 | | 1 | | | | | | | | | 1 | | | | | | | | | 1 | | | | 1 | 2 | | | 2 | | | | | | | 1 | | | 12 |
| 2014-2015 | | 1 | | | | | 1 | | | | 1 | | | 2 | | | 3 | | | | | | | | | 1 | | | | 2 | | | | 2 | | | | | | | | | | 13 |
| 2015-2016 | | 2 | | | 1 | | | | | | | | | | | | | | | | | | 1 | | | 1 | 1 | | | 2 | | 1 | | 2 | | | | | 1 | | | | 1 | 13 |
| 2016-2017 | | | | | 1 | | | | | | | | | | | | | | | | 1 | | | | 1 | 1 | | | | 1 | | | | 1 | | | | | 1 | | 2 | | 8 |
| 2017-2018 | | 2 | | | 1 | | | | | | 1 | | | 1 | | | | | | | | | | | | | 2 | | | 2 | | 1 | | | 2 | | 1 | | | | | 1 | | 14 |
| 2018-2019 | | 1 | | | | | | | | | | | | 1 | | | | | | 1 | | | | | | | 1 | | | 1 | | 1 | | | 1 | | | | | | | | | 7 |
| 2019-2020 | | 2 | 2 | | 2 | | | | | | | | | | | | | | | | | | | | | 2 | 2 | | | 1 | | | | | | | | | | | | | | 11 |
| 2020-2021 | | 1 | 2 | | | | | | | | | | | | | | | | | 1 | | | | 1 | | 1 | | | | | | | | | | | | | | 1 | | | | 7 |
| 2021-2022 | | 2 | 1 | | | | | | | | | | | | | 1 | | | | 2 | 1 | | | | | | 1 | | | | | 2 | | | 3 | | | | | | | | | 13 |
| 2022-2023 | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | 4 | | | 2 | | | | 1 | | 1 | | | 12 |
| 2023-2024 | | 1 | | | | | | | | | | | | 1 | | 1 | | | | | 3 | | 1 | | | | | | | 1 | | 1 | | | 3 | | | | 1 | | | | | 13 |
| **Total** | **0** | **26** | **7** | **0** | **5** | **0** | **11** | **3** | **1** | **2** | **0** | **3** | **1** | **1** | **5** | **9** | **4** | **4** | **0** | **1** | **5** | **5** | **1** | **1** | **1** | **1** | **10** | **15** | **0** | **1** | **19** | **1** | **14** | **1** | **1** | **20** | **0** | **1** | **1** | **4** | **1** | **2** | **2** | **4** | **1** | **195** |

Number of countries with DM & DMP graduates

Volume19, No.1, Issue No.72, April 2024

Volume19, No.2, Issue No.73, July 2024

Volume19, No.3, Issue No.74, October 2024

Volume19, No.4, Issue No.75, January 2025

Volume19, No.4, Issue No.75, January 2025

ANNEX 3: Major updates on ICHARM Website

| | | |
|---|---|---|
| Apr. 2024 | 12 | The DPWH delegation visited ICHARM for effective collaboration |
| | 12 | Typhoon Committee: The 56th Annual Session |
| | 12 | ICHARM activities on flood monitoring, forecasting and early warning activities in Sri Lanka with support from JAXA and DIAS projects |
| | 12 | The 1st Plenary Meeting of “Platform on Water Resilience and Disasters in Thailand” in Bangkok |
| | 17 | ICHARM Organization & Staff is updated |
| | 30 | ICHARM Newsletter Volume 19 No.1 (Issue No.72) is now available |
| May | 1 | "Information Networking" and "Introduction of ICHARM research projects" updated |
| | 14 | "Research" updated |
| | 15 | The 5th Plenary Meeting of the Platform on Water Resilience and Disasters in Sri Lanka in Colombo |
| Jun. | 6 | ICHARM participated in the UNESCO C2Cs symposium |
| | 6 | Second High-Level Meeting of the Platform on Water Resilience and Disasters in Indonesia |
| Jul. | 2 | The activities of ICHARM Team at Understanding Risk Global Forum 2024 (UR24) |
| | 9 | 8th ICHARM Governing Board meeting was held |
| | 22 | The 3rd Face-to-Face Meeting of the WMO Regional Association II Coordination Panel for Hydrology and 1st KIHS Workshop |
| | 22 | Participation in meetings of the Advisory Working Group and the Working Group on Disaster Risk Reduction under the framework of the Typhoon Committee |
| | 23 | ICHARM Executive Director received the title of the first GEWEX Lifetime Contributions Award |
| | 31 | ICHARM Newsletter Volume 19 No.2 (Issue No.73) is now available |
| Aug. | 16 | ICHARM welcomed young visitors from Tsinghua University, China |
| Oct. | 10 | Report on 2020-2021 M.Sc. Program, “Water-related Disaster Management Course of Disaster Management Policy Program” has been published. |
| | 11 | ICHARM welcomed MJIIT members from Malaysia |
| | 11 | Typhoon Committee: The workshop on “Capacity Building/Knowledge Sharing in DRR” |
| | 31 | ICHARM Newsletter Volume 19 No.3 (Issue No.74) is now available |
| Nov | 6 | Local students visited ICHARM |
| | 19 | Visit by water ministers from seven African countries |
| Dec. | 6 | Technical Note of PWRI No.4453 “ICHARM Activity Report FY2023” is now available |
| | 18 | The 13th Annual Meeting of the Working Group on Hydrology of the Typhoon Committee |
| | 18 | ICHARM welcomed Deputy Director-General of Hydrology Department of Ministry of Water Resources, China |
| | 23 | ICHARM is now accepting the application for one Research Specialist position ( Water-related Disaster Research Group ) |
| Jan. 2025 | 6 | The 19th Integrated Workshop of the Typhoon Committee |
| | 31 | ICHARM Newsletter Volume 19 No.4 (Issue No.75) is now available |

ANNEX 4: Publication list

# ICHARM Publication List (April 2024 ~ March 2025)

## A. Peer Reviewed Papers

- DENDA Masatoshi, FUJIKANE Masakazu, Development of a virtual flood experience system and its suitability as a flood risk communication tool, Proceedings of the International Association of Hydrological Sciences (PIAHS), Vol.386, Apr 19, 2024, https://doi.org/10.5194/piahs-386-21-2024
- HRADA Daisuke, EGASHIRA Shinji, Methods to create hazard maps for flood disasters with sediment and driftwood, Proceedings of the International Association of Hydrological Sciences (PIAHS), Vol.386, Apr 19, 2024, https://doi.org/10.5194/piahs-386-159-2024
- Mihretab G. Tedla, Abdul Wahid Mohamed RASMY, KOIKE Toshio, Li Zhou, Evaluation of satellite precipitation products for real-time extreme river flow modeling in data scarce regions, Proceedings of the International Association of Hydrological Sciences (PIAHS), Vol.386, Apr 19, 2024, https://doi. org/10.5194/piahs-386-223-2024
- Ralph Allen Acierto, USHIYAMA Tomoki, KOIKE Toshio, Attributing weather patterns to Davao River extreme rainfall from Reanalysis and GCM, Proceedings of the International Association of Hydrological Sciences (PIAHS), Vol.386, Apr 19, 2024, https://doi.org/10.5194/piahs-386-209-2024
- Md. Majadur Rahman, HARADA Daisuke, EGASHIRA Shinji, Sediment transport processes in the Sangu River basin using a rainfall-sediment runoff model for sustainable river management, Proceedings of the International Association of Hydrological Sciences (PIAHS), Vol.386, Apr 19, 2024, https://doi. org/10.5194/piahs-386-109-2024
- Badri Bhakta Shrestha, Mohamed Rasmy, USHIYAMA Tomoki, Ralph Allen Acierto, KKAWAMOTO Takatoshi, FUJIKANE Masakazu, ITO Hiroyuki, SHINYA Takafumi, Assessment of flood damage to agricultural crops under climate change scenarios using MRI-AGCM outputs in the Solo River basin of Indonesia, Proceedings of the International Association of Hydrological Sciences (PIAHS), Vol.386, Apr 19, 2024, https://doi.org/10.5194/piahs-386-127-2024
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- IKEUCHI Koji, KAKINUMA Daiki, NAKAMURA Yosuke, NUMATA Shingo, MOCHIZUKI Takafumi, KUBOTA Keijiro, YASUKAWA Masaki, NEMOTO Toshihiro, KOIKE Toshio, Development of Flash Flood Forecasting System for Small and Medium-Sized Rivers, Journal of Flood Risk Management, Wiley, March 25, 2025, https://doi.org/10.1111/jfr3.70026

**B: Non-peer Reviewed Paper**

- 龐 朝霞、大原 美保、南雲 直子、田中 智大、本間 香貴、角田 毅、川崎 昭如、Patricia Ann J. Sanchez、フィリピン共和国パンパンガ州カンダバ市における洪水影響と対策に関する意識調査、東京大学大学院情報学環紀要 情報学研究・調査研究編、2025年3月

**C: Oral Presentation**

- 大原 美保、新屋 孝文、Effective Use of Lessons from After-Action Reports of Past Disasters by Local Governments、The 5th ACUDR（第 5 回アジア都市防災 会議）、4 月 26～28 日
- 牛山 朋來、Ralph Allen ACIERTO 、フィリピンとインドネシアの河川流域における d4PDF 大

規模アンサンブル地球規模予測の力学的ダウンスケーリング、気象学会 2024 年度春季大会、日本気象学会 2024 年度春季大会講演予稿集 125 号

- 牛山 朋來、Abdul Wahid Mohamed RASMY、久保田 啓二朗、森 範行、小池 俊雄、瀬戸 里枝、陸域 AMSR2 マイクロ波放射計データ同化による線状降水帯の予測精度の改善、気象学会 2024 年度春季大会 / 日本気象学会 2024 年度春季大会講演予稿集 125 号
- Shrestha Badri Bhakta, Abdul Wahid Mohamed RASMY, SHINYA Takafumi, Building Flood Exposure Assessment using Hydrologic-Hydraulic Model and Google Earth Engine, Japan Geoscience Union Meeting 2024, May 26-31
- SETO Rie, KOIKE Toshio, Feasibility study for estimation of liquid-only water path over land using satellite-based Ka-band passive microwave measurements by synthetic simulations, Japan Geoscience Union Meeting 2024, May 26-31
- Ralph Allen ACIERTO, USHIYAMA Tomoki, KOIKE Toshio, Projected changes to monsoon season heavy rainfall events in Davao River, Philippines and associated weather patterns under global warming, Japan Geoscience Union Meeting 2024, May 26-31
- USHIYAMA Tomoki, Ralph Allen ACIERTO, Dynamic downscaling of d4PDF large ensemble global projections for river basins in Philippine and Indonesia, Japan Geoscience Union Meeting 2024, May 26-31
- 原田 大輔、江頭 進治、秦 梦露、降雨-土砂・流木流出モデルの特性　-土砂粒度分布と流木の時空間変化に着目して-、2024 年度河川技術に関するシンポジウム / 河川技術論文集　第 30 巻
- Vicente Ballaran, Jr, OHARA Miho, Abdul Wahid Mohamed RASMY and USHIYAMA Tomoki, CLIMATE CHANGE EFFECT ON DISCHARGE AND LAKE LEVEL OF PASIG-MARIKINA RIVER AND LAGUNA LAKE BASIN USING DYNAMICALLY DOWNSCALED MRI-AGCM 3.2S GLOBAL CLIMATE MODEL OUTPUT IN A HYDROLOGICAL MODEL, 2024 Symposium on River Technology 2024 年度河川技術に関するシンポジウム / 河川技術論文集　第 30 巻
- HARADA Daisuke、Development of a physics-based rainfall-sediment-wood runoff（RSR）model and its application to flood disasters and sediment runoff from a basin、The 3rd Asia International Water Week、The Asia Water Council、September 24-28, 2024
- NAITO Kensuke, SHINYA Takafumi, Assessing flood risk on local economy focusing on indirect impact through supply chain, The 9th Global Energy and Water Exchanges Open Science Conference 2024 SAPPORO, GEWEX, July 7-12, 2024
- Abdul Wahid Mohamed RASMY, TAMAKAWA Katsunori, KUBOTA Keijiro, KOIKE Toshio, Progress and challenges in monitoring and forecasting flood hazards using multi-platform observations and a hydrological model in developing regions, The 9th Global Energy and Water Exchanges Open Science Conference 2024 SAPPORO, GEWEX, July 7-12, 2024
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- Kattia Rubi Arnez Ferrel, HARADA Daisuke, EGASHIRA Shinji, Bar formation and bank erosion processes with non-uniform sediment, 24th IAHR Asia and Pacific Division Congress (2024), IAHR, October 14-17, 2024
- Ralph Allen ACIERTO, Analysis of extreme-rain-induced flood events in Panama Canal Watershed, The 9th International Engineering, Sciences and Technology Conference (IESTEC 2024) , Panama City, Panama, October 23-25
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- DENDA Masatoshi, Experimental research on a simplification method for identifying attractive points of a city using open data, Urban Transitions 2024, Elsevier, Barcelona, Spain, November 5-7, 2024
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- USHIYAMA Tomoki, Development of regional ensemble prediction system by cloud water assimilation over land from AMSR microwave radiometer, JAXA PI workshop（AMSR3&GCOM-W）, November 20, 2024
- 江頭 進治、土石流と掃流砂と浮遊砂について、2024 年度分野横断型研究集会　地球表層における粒子重力流：理論・実験・観測と防災への応用に向けて、粒子重力流研究会、2024 年 11 月 26 日
- EGASHIRA Shinji, Robin Kumar Biswas, HARADA Daisuke, MIYAMOTO Kuniaki, Responses of bed-slope ratio to bed-load formulas in open channels with abruptly widening /narrowing approaches, The 69th Conference on Hydraulic Engineering, JSCE, Toyama Prefectural Civic Hall, December 2-4, 2024
- Md. Shahinur RAHMAN, HARADA Daisuke, EGASHIRA Shinji, CHARACTERISTICS OF MORPHOLOGICAL CHANGE RESULTING FROM TIDAL CURRENTS IN THE MEGHNA ESTUARY, The 69th Conference on Hydraulic Engineering, JSCE, Toyama Prefectural Civic Hall, December 2-4, 2024
- Narayan Prasad Subedi, OHARA Miho, EGASHIRA Shinji, Damages resulting from floods inundation with active sediment transportation and their assessments in the floodplain of the West Rapti River,

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## D: Poster Presentation

- 南雲 直子、大原 美保、Ballaran Vicente Jr. De Guzman、ルソン島中部の洪水常襲地帯における集落の立地形態、2024 年日本地理学会秋季学術大会、日本地理学会、2024 年 9 月 14～16 日
- USHIYAMA Tomoki, Ralph Allen ACIERTO, Dynamic downscaling of d4PDF large ensemble global projections for river basins in Philippine and Indonesia, The 9th Global Energy and Water Exchanges Open Science Conference 2024 SAPPORO, GEWEX, July 7-12, 2024
- TSUTSUI Hiroyuki, Agricultural drought assessment for drought regions in ITCZ and Subtropical High using the Coupled Land and Vegetation Data Assimilation System (CLVDAS), The 9th Global Energy and Water Exchanges Open Science Conference 2024 SAPPORO, GEWEX, July 7-12, 2024
- Ralph Allen Acierto, KOIKE Toshio, Determining the contribution of climate change on the maximum rainfall in Kyushu using d4pdf large ensemble dataset, The 9th Global Energy and Water Exchanges Open Science Conference 2024 SAPPORO, GEWEX, July 7-12, 2024
- TAMAKAWA Katsunori, KOIKE Toshio, Abdul Wahid Mohamed RASMY, KUBOTA Keijiro, Megnath NEOPANEY, Investigation of satellite precipitation dataset and snow hydrological model in the upper Chamkharchu basin in Bhutan, The 9th Global Energy and Water Exchanges Open Science Conference 2024 SAPPORO, GEWEX, July 7-12, 2024
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- DENDA Masatoshi, KURIBAYASHI Daisuke, KOYABU Tsuyoshi, SHINYA Takafumi, Possibility of educational game software to maintain young people’s longterm interest in water-related disasters, The 9th Global Energy and Water Exchanges Open Science Conference 2024 SAPPORO, GEWEX, July 7-12, 2024
- Shrestha Badri Bhakta, Abdul Wahid Mohamed RASMY, USHIYAMA Tomoki, Ralph Allen ACIERTO, KURIBAYASHI Daisuke, KUBOTA Keijiro, Assessment of Human Flood Exposures and Flood Impact on Residential Households under Climate Change, AGU Annual Meeting 2024, December 9-13
- NAITO Kensuke, Catherine Gigantone, Revealing sediment dynamics in the Laguna Lake, the

Philippines, using high temporal resolution satellite datasets, AGU Annual Meeting 2024, December 9-13

- 傳田 正利、内藤 健介、山下 大輝、福渡 隆、栗林 大輔、水災害被害・影響可視化技術による水災害のジブンゴト化、ＳＡＴテクノロジー・ショーケース 2025、つくば国際会議場、2025 年 1 月 23 日
- 南雲 直子、原田 大輔、江頭 進治、山地河川の土砂輸送能力を評価する地形指標について、日本地理学会 2025 年春季学術大会、駒澤大学 駒沢キャンパス、2025 年 3 月 19 日

## E: PWRI Publication

- 森 範行、江頭 進治、藤兼 雅和、大成 梨夏子、2022-2023 修士課程「防災政策プログラム水災害リスクマネジメントコース」実施報告書、土木研究所資料 第 4450号、2024年7月
- MORI Noriyuki, EGASHIRA Shinji, FUJIKANE Masakazu, ONARI Rikako, OKUBO Masahiko, 2022-2023 M.Sc. Program, “Water-related Disaster Management Course of Disaster Management Policy Program, ”PWRI Technical Note No 4450, July, 2024
- 伊藤 弘之、江頭 進治、小林 肇、宮崎 了輔、2020-2021修士課程「防災政策プログラム水災害リスクマネジメントコース」実施報告書、土木研究所資料 第4452 号、2024年9月
- ITOU Hiroyuki, EGASHIRA Shinji, KOBAYASHI Hajime, Miyazaki Ryosuke, OHKUBO Masahiko, Report on 2020-2021 M.Sc. Program, “Water-related Disaster Management Course of Disaster Management Policy Program” , PWRI Technical Note No 4452, September, 2024
- ICHARM, ICHARM Activity Report FY2023, PWRI Technical Note No. 4453, ISSN 0386-5878, December, 2024
- 水災害・リスクマネジメント国際センター（ICHARM）、ICHARM Activity Report FY2023（日本語版）、土木研究所資料 第4453号、ISSN 0386-5878、2024 年12月

## F: Magazine, Article

- 小池 俊雄、激甚化、頻発化する水害、自治実務セミナー8 月号、pp.2-5、第一法規株式会社
- 小池 俊雄、巻頭言 流域治水は by All、総合土木技術誌土木施工、株式会社オフィス・スペース、2025 年 2 月号
- 小池 俊雄、巻頭言 変革期のダム操作「気候変動への対応」特集号、ダム技術、461 号、pp.1-3、一般社団法人ダム技術センター、2025 年 2 月

## G: Others

None