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ICHARM

Activity Report

FY2023

8th ICHARM Governing Board Meeting
June 28, 2024

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
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of UNESCO

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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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Abbreviation

ADB	Asian Development Bank
AOP	Annual Operating Plan
Area-BCM	Area- Business Continuity Management
AWCI	Asian Water Cycle Initiative
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
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
FEWS	Flood Early Warning System
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	a 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
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
NIED	National Research Institute for Earth Sciences and Disaster Resilience
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
RID	Royal Irrigation Department, Thailand
Rijkswaterstaat	Department of Waterways and Public Works
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
TC	Typhoon Committee
TCFD	Task Force on Climate-related Financial Disclosures
UN	United Nations
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 Banos
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
WWF	World Water Forum

１． Summary

This Activity Report summarizes the main activities carried out by ICHARM in fiscal 2023 (April 2023 to March 2024), the 18th year of ICHARM.

The fiscal 2023 is the second year of the 5th Medium- and Long-Term Plan (2022-2027) of PWRI, to which ICHARM belongs, and also the second year of UNESCO-IHP-IX (2022-2029).

In fiscal 2023, as the second 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 the operating grants from MLIT and external funds from MEXT, the Cabinet Office, JICA, and other organizations.

Regarding capacity building, we conducted master's and doctoral programs, as we did in fiscal 2022. The master’s program, “Disaster Management Policy Program,” received the Japan Construction International Award (Pioneering Activity Category) from MLIT. We also held the Follow-up Seminar online.

As information networking activities, we continued supporting as the IFI secretariat on the establishment/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 contribution to UNESCO-IHP. Executive Director KOIKE chairs one of the cross-cutting working themes of UNESCO-IHP-IX, and ICHARM hosted a side event held during a UNESCO-led international conference on climate change.

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, co-hosted an international forum with GRIPS, and participated in and hosted webinars for global practitioners. Furthermore, we held the ICHARM Webinar for the first time in two years. The latest information on these and other activities was widely disseminated domestically and internationally through our quarterly newsletters and website.

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 working on improving WRF-LETKF, an ensemble rainfall prediction model, to predict this phenomenon better. In fiscal 2023, we improved the reproducibility of a heavy rainfall event from the linear precipitation band observed over Japan's Kyushu region in 2020 as a result of the improvements made to the Ensemble Kalman Filter's error covariance inflation. Furthermore, we also found that rainfall forecasting can be improved by assimilating cloud water content and other data using satellite microwaves.

2.2 Study on dam operation methods based on long-term inflow forecasts

Preliminary discharges are one of the dam procedures in which dam managers discharge dam water in advance of a rainfall event to reduce flood risk in downstream rivers. In order to help them perform this operation more effectively, our research team has been developing technology to predict rainfall and flooding several days ahead with high accuracy. On the other hand, we also have been studying dam operation methods according to the levels of prediction accuracy. In fiscal 2023, we investigated the possibility of using long-term rainfall forecasts (3 months) for the operations of irrigation dams; long-term forecasts are difficult to make with high accuracy in terms of rainfall timing and amount compared to short-term rainfall forecasts.

In this research, our research team calculated long-term ensemble inflow to an irrigation dam by inputting long-term ensemble rainfall forecasts into a hydrological model. We used these inflow forecasts to determine an optimal amount of discharge by dividing the total inflow in a prediction period by the number of days included in the period. We examined different discharge patterns by changing the number of days in a prediction period for different seasons or setting different amounts of ensemble inflow according to the dam's water storage at the time of prediction. A one-year case study we conducted for a single dam found that, with optimized dam operations, it is possible to improve flood control and increase power generation. They have started analyzing the dam operation data in the past several decades to find better dam operation methods for multiple years.

2.3 Research and development to facilitate disaster risk reduction behavior through risk communication by participating in the 3rd period SIP program

ICHARM has joined the 3rd period of the Cross-ministerial Strategic Innovation Promotion Program (SIP), "Development of a Resilient Smart Network System against Natural Disasters," which is a government-led program starting in September 2023.

ICHARM takes part in a project led by Professor YAMADA Tomohito of Hokkaido University,

which aims to find effective ways of utilizing risk information to induce individuals and 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 risk and 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 will 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 will also continue to 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. Section 3.6.1 provides more details on this research.

2.4 Disaster Management Policy Program awarded the 6th Japan Construction International Award

The Disaster Management Policy Program, implemented by ICHARM in collaboration with JICA and GRIPS, includes the Water-related Disaster Management Course, conducted by ICHARM, and the Seismology Course, the Earthquake Engineering Course, and the Tsunami Disaster Mitigation Course, conducted by the International Institute of Seismology and Earthquake Engineering (IISEE) of the Building Research Institute. Since the start of the program, a total of 503 people from 66 countries worldwide have completed one of the courses.

Photo 2-1 Awarding ceremony

Photo 2-2 Award certificate

On June 20, 2023, ICHARM, along with GRIPS, JICA, and IISEE, received the Japan Construction International Award (Pioneering Activity Category) for this program from the minister of MLIT. The award recognized the fact that the program has produced so many disaster management experts in developing countries and praised the worldwide recognition that it has earned for its long-term effort to increase expertise in this field in developing countries using Japan's experience and knowledge.

2.5 The 2nd online Follow-up Seminar

ICHARM, in collaboration with JICA and GRIPS, provides the master's program, "Water Disaster Risk Management Course of Disaster Management Policy Program," and the doctoral program,

“Disaster Management Program.” These programs have produced 199 graduates in total.

As a follow-up activity for graduates, ICHARM has been holding an annual meeting since 2007. The 2nd online Follow-up Seminar was held on February 13, 2024. Section 4.4 provides more information on this event.

Photos 2-3, 4, 5 Director General TAKAHASHI of JICA Tsukuba, President OTA of GRIPS,
Director Amani of the Division of Water Sciences, UNESCO

2.6 New developments of IFI’s platform project

ICHARM continued supporting as the IFI secretariat on the establishment/implementation of a "Platform on Water Resilience and Disasters" in various countries, including the Philippines, Sri Lanka, and Indonesia, in collaboration with their government and other relevant organizations. In this platform effort, we have introduced the concept of the Water Cycle Integrator (WCI) created by ICHARM and have been trying to put it into practice through various activities while considering local needs and conditions.

In the Philippines, in addition to Davao City, where we have been implementing the platform project, it has also started in its neighboring city, Digos, in fiscal 2023 after ICHARM concluded a tripartite agreement with a state university and the Department of Science and Technology. We have begun installing OSS-SR and preparing for facilitator training.

In Thailand, the first plenary meeting was organized to launch the platform project on March 25, 2024, with the participation of related organizations and universities. Vietnam has also started preparing to introduce the project.

Section 5.1 provides more information on this topic.

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, we are conducting research focusing on the following four areas in order to address increasingly severe water-related disasters in consideration of climate change impacts by developing technologies to support basin-wide flood control and thereby contribute to national land development for the purpose of protecting 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 as much inundation 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 is rarely available due to insufficient ground observation networks.

ICHARM is continuously collaborating with JAXA to maximize the near-real-time freely-available global satellite precipitation products (SPPs) for effective water resources and disaster management in poorly gauged basins (Fig 3-1.) ICHARM is also studying methods for making effective bias corrections of SPPs incorporating ground observation data and for designing optimal ground observation networks.

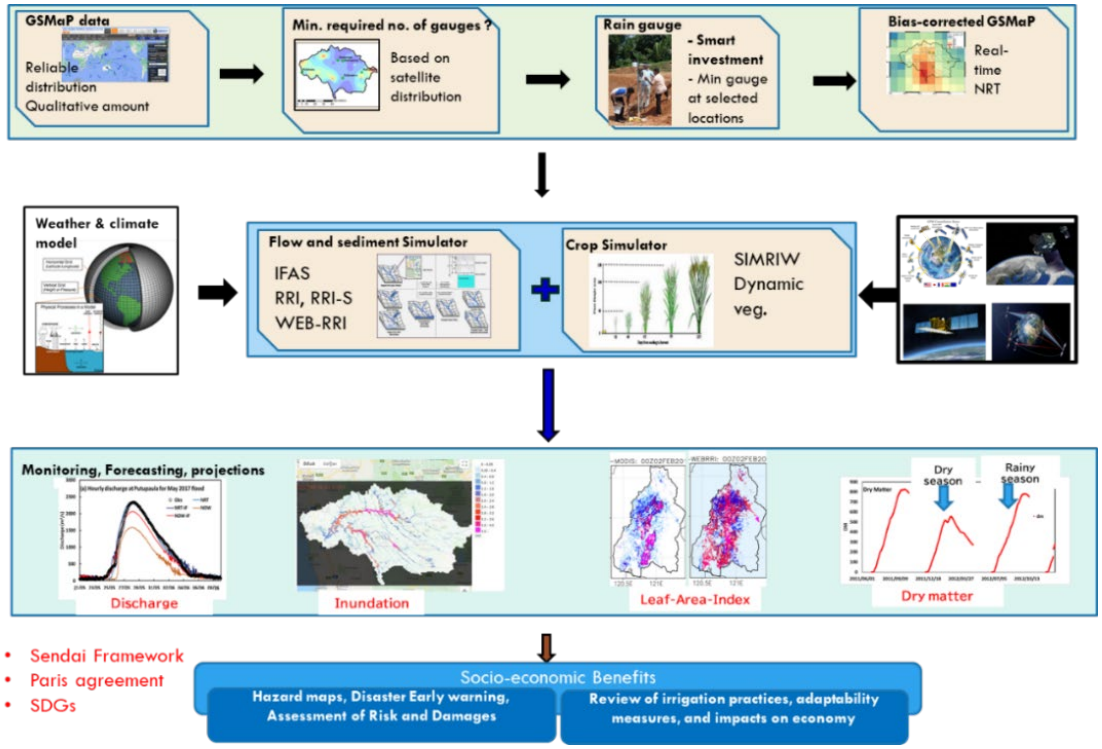


Figure 3-1 A conceptual image of a system for the integrated management of water resources and disasters in poorly gauged basins

b) Flood monitoring system training in the Philippines

Photo 3-1 Workshop participants

ICHARM participates in the HyDEPP-SATREPS project as a collaborative implementation organization. As part of this project, we organized the Workshop on Flood and Agricultural Damage Monitoring Technology for Supporting Rapid Recovery on June 20, 2023, in San Fernando City, Pampanga Province. It was attended by 64 participants, including officers from local governments and related agencies and university officials in the Pampanga River basin. In this workshop, ICHARM staff explained a flood monitoring system and an agricultural damage monitoring system using satellite images, both of which were developed mainly by ICHARM, and then conducted hands-on training on these systems.

c） GEO and GEO Week 2023

GEO and the GEO Week 2023 were held in Cape Town, South Africa, on November 6-10, 2023. The GEO Week 2023 was attended by government officials, researchers, engineers, businesses, and other organizations involved in earth observation from around the world, including GEO member countries and organizations, such as the United Nations and the World Bank.

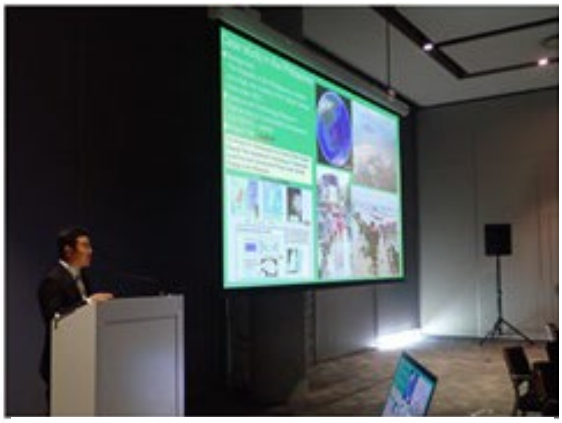


Photo 3-2 Presentation by an ICHARM research specialist

On the 7th, an ICHARM research specialist participated in the Training Workshop of Earth Observations (EO) Solutions for the Early Warnings for All (EW4All) Initiative. He delivered a presentation about the flood early warning system that PWRI and the University of Tokyo jointly developed on the DIAS system for West Africa, Sri Lanka, and the Philippines. He also demonstrated the audience how it works.

Photo 3-3 Participants in the session on November 7

This effort by PWRI and the University of Tokyo, “Flood early warning system supports typhoon response - PROJECT: Data Integration and Analysis System,” drew the attention of the GEO secretariat. Recognized as an outstanding project offering a practical solution using global observation data, the joint project was presented and discussed during Plenary Session 6: GEO achievements (the presentation was done by MEXT staff).

3.1.2 Improvement of soil moisture observation resolution using global observation data

In fiscal 2023, our research team succeeded in upgrading the spatial resolution of soil moisture from 2 km to 100m by utilizing soil moisture products from the SAR radar system with a high spatial resolution (100m).

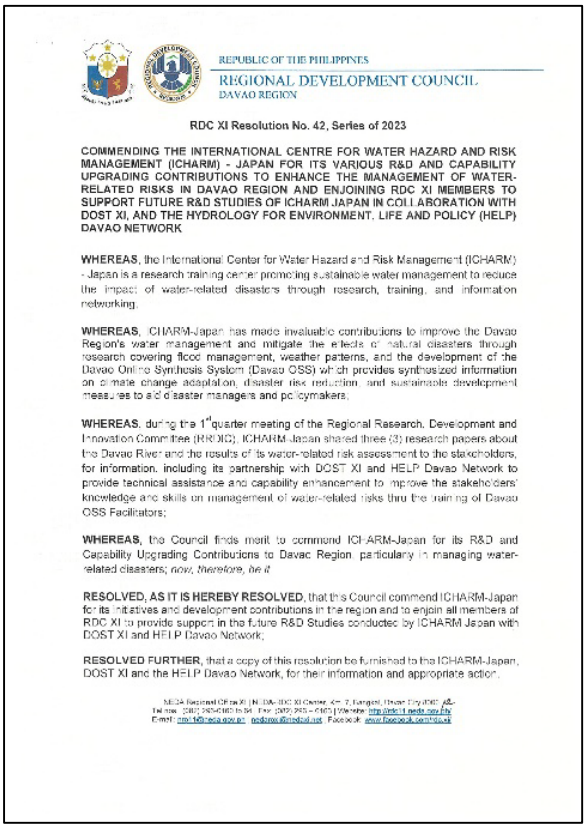
3.1.3 Development of Online Synthesis System for Sustainable Resilience: OSS-SR

OSS-SR has been developed and implemented in Davao City, the Philippines, under the leadership of local agencies and the support of ICHARM. This system is used to disseminate risk information, including real-time flood forecasts, and information about the impacts of climate change.

As a result of discussions with local stakeholders regarding the future operation and maintenance

of OSS-SR, an OSS-SR subcommittee has been established within the Davao River Basin Management Alliance. Furthermore, the Davao Regional Development Council adopted Resolution No. 42, which defines cooperation with ICHARM in developing OSS-SR and facilitator training.

In Japan, in collaboration with Hokkaido University and others, ICHARM has started research and development aimed at creating and implementing risk information that leads individuals and businesses to take voluntary actions, such as early evacuation and pre-disaster preparations, selecting the Kinugawa and Kokaigawa river basins in Ibaraki Prefecture and the Tokachi River basin in Hokkaido as model basins.



REPUBLIC OF THE PHILIPPINES
REGIONAL DEVELOPMENT COUNCIL
DAVAO REGION

RDC XI Resolution No. 42, Series of 2023

COMMENDING THE INTERNATIONAL CENTRE FOR WATER HAZARD AND RISK MANAGEMENT (ICHARM) - JAPAN FOR ITS VARIOUS R&D AND CAPABILITY UPGRADING CONTRIBUTIONS TO ENHANCE THE MANAGEMENT OF WATER-RELATED RISKS IN DAVAO REGION AND ENJOINING RDC XI MEMBERS TO SUPPORT FUTURE R&D STUDIES OF ICHARM JAPAN IN COLLABORATION WITH DOST XI, AND THE HYDROLOGY FOR ENVIRONMENT, LIFE AND POLICY (HELP) DAVAO NETWORK

WHEREAS, the International Center for Water Hazard and Risk Management (ICHARM) - Japan is a research training center promoting sustainable water management to reduce the impact of water-related disasters through research, training, and information networking;

WHEREAS, ICHARM-Japan has made invaluable contributions to improve the Davao Region's water management and mitigate the effects of natural disasters through research covering flood management, weather patterns, and the development of the Davao Online Synthesis System (Davao OSS) which provides synthesized information on climate change adaptation, disaster risk reduction, and sustainable development measures to aid disaster managers and policymakers;

WHEREAS, during the 1st quarter meeting of the Regional Research, Development and Innovation Committee (RRDIC), ICHARM-Japan shared three (3) research papers about the Davao River and the results of its water-related risk assessment to the stakeholders, for information, including its partnership with DOST XI and HELP Davao Network to provide technical assistance and capability enhancement to improve the stakeholders' knowledge and skills on management of water-related risks thru the training of Davao OSS Facilitators;

WHEREAS, the Council finds merit to commend ICHARM-Japan for its R&D and Capability Upgrading Contributions to Davao Region, particularly in managing water-related disasters; *now, therefore, be it*

RESOLVED, AS IT IS HEREBY RESOLVED, that this Council commend ICHARM-Japan for its initiatives and development contributions in the region and to enjoin all members of RDC XI to provide support in the future R&D Studies conducted by ICHARM Japan with DOST XI and HELP Davao Network;

RESOLVED FURTHER, that a copy of this resolution be furnished to the ICHARM-Japan, DOST XI and the HELP Davao Network, for their information and appropriate action.

Figure 3-2 Resolution No.42 adopted by the Davao Regional Development Council stipulating the cooperation with ICHARM

3.1.4 Development of an information platform to operate on a digital twin

Targeting areas such as the Kokaiigawa River basin in Ibaraki Prefecture, Japan, ICHARM developed a method to create a platform for integrating on a digital twin and sharing among stakeholders various types of information, such as ground conditions, artificial structures, urban plans related to flood disaster measures, agriculture, the natural environment, and past disasters. This method was then used to develop a virtual flood experience system, which was then modified for public use by coupling it with educational game software. Furthermore, in cooperation with volunteer junior high school students of the Ibaraki Prefectural Namiki Secondary School, we improved landscape and townscape images in virtual reality settings using the metaverse function of the educational game software. This task was conducted once a month for seven months.

Photo 3-4 A workshop with junior high school students

In addition, to promote the use of the virtual flood experience system in other area, we have started dialogues with local governments' disaster-related sections, residents' councils, and educators.

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 100km^2 or less, ICHARM conducted sensitivity analyses of a high-resolution dynamic downscaling method. The calculation of typhoon cases in the Tone River basin found that resolutions can greatly affect analysis results in the upstream area.

(DAD analysis)

In order to estimate the impact of climate change on maximum rainfall using the rainfall change ratio, ICHARM conducted DAD analysis using d4PDF's rainfall data, taking Kyushu as an example. The results found that the average rainfall change ratio in the 4℃-rise scenario is 1.16 to 1.34 in northwestern Kyushu and 1.07 to 1.31 in southeastern Kyushu.

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

[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

and driftwood laden floods using sediment hydraulic models. This model combines rainfall-runoff analysis with slope stability analysis, debris tracking using equations for a system of particles, and sediment and driftwood runoff analysis using a unit channel model to analyze water, sediment, and driftwood runoff at any point in a basin.

In fiscal 2023, we applied the RSR model to multiple basins and compared the spatiotemporal changes in sediment concentration, grain size distribution, and riverbed fluctuations with local data to study the characteristics of the model. As a result, we confirmed that by considering the supply of fine sediment due to slope erosion, the model can evaluate the suspended sand concentration accurately. In addition, using a two-dimensional planar model, we studied the impact of river excavation on flow and riverbed fluctuations. In Japan, river excavation is planned in many basins after the revision of the basic river improvement policy. Our research has demonstrated the necessity and usefulness of a sediment hydrological model in such projects.

3.2.4 Study on adaptation measures using an integrated risk assessment method

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

Distributed hydrological models (DHMs) capable of simulating water and energy budgets are essential tools for integrated water resources management and water-related disaster risk reduction under a changing climate. ICHARM has developed the WEB-RRI model[1)] to improve the accuracy of low flow estimation, flood onset timing, peak flood discharge, and inundation characteristics under various climatic conditions and projection scenarios. The model has been applied worldwide to various projects, such as flood forecasting and climate change impact assessment.

To simulate vegetation growth and crop yield, we coupled the WEB-RRI model with the dynamic vegetation model and the Simulation Model for Rice-Weather Relations (SIMRIW) in collaboration with the Tohoku University Graduate School of Agricultural Science. We applied this model to the Pampanga River basin in the Philippines and simulated the growth of rice plants. We also developed and verified a function to consider the impact of irrigation systems. Furthermore, we downscaled MRI-AGCM 3.2S for WEB-RRI inputs and calculated future flood conditions in the Pampanga River basin.

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 (improvement of an ensemble rainfall forecasting method)

Rainfall prediction is an important element directly linked to the accuracy of flood forecasting. ICHARM has developed an ensemble rainfall forecasting system and introduced it into a runoff model to perform ensemble discharge forecasting. We have 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 the linear precipitation zone phenomenon. Therefore, we have reviewed the system for more accurate rainfall forecasting. In addition, we are conducting 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 performed by using the Weather Research and Forecasting (WRF), which is a regional climate model, and ensemble initial value generation and data assimilation using the Local Ensemble Transform Kalman Filter (LETKF). We increased the number of LETKF's ensemble members from 51 to 100 and enlarged the localization radius from 300 km to 700 km. The improved approach was applied to a linear precipitation zone case in Kyushu in July 2020 and successfully reproduced the phenomenon as observed, which the previous method could not.

Furthermore, we reproduced cloud water content and other values using CALDAS (Coupled Atmosphere and Land Data Assimilation System)-WRF, 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 was 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.

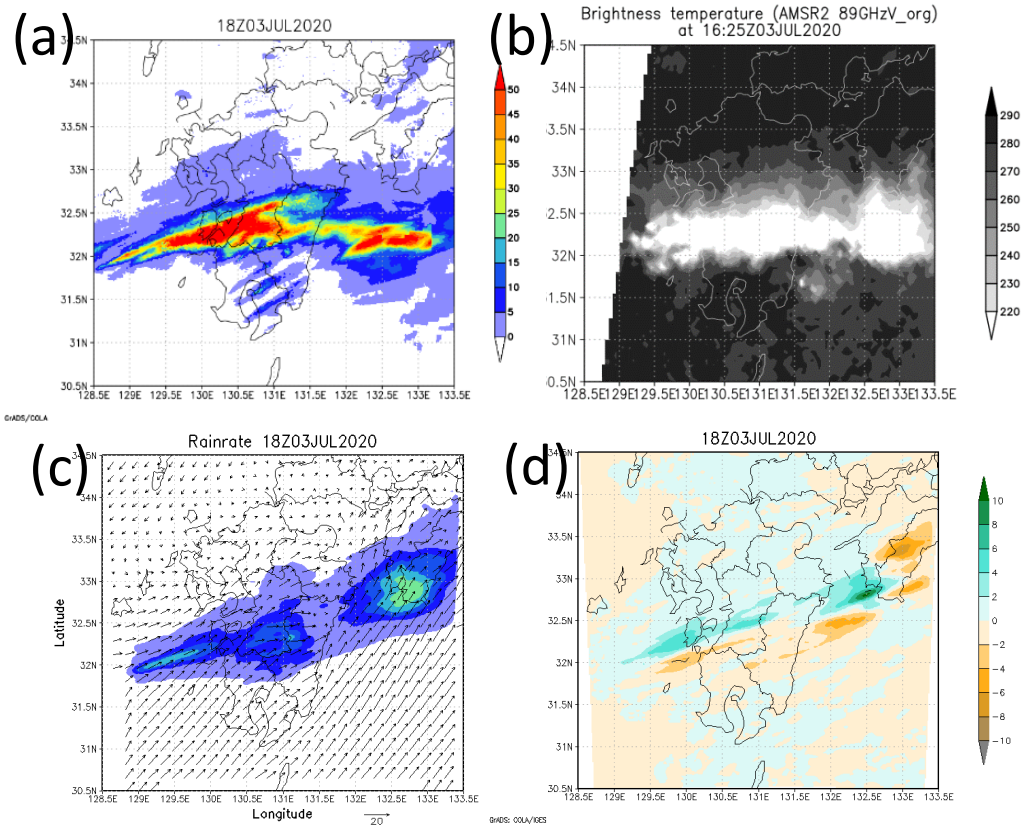


Figure 3-3 Rainfall and temperature distributions due to the linear precipitation zone phenomenon at 18:00 on July 3, 2020: (a) observed rainfall, (b) brightness temperature observed by AMSR2 satellite, (c) ground rainfall by WRF-LETKF, and (d) reproduced rainfall improved by WRF-LETKF with CALDAS assimilation (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

In the case of the Sai River in Nagano Prefecture, Japan, we conducted a hindcast of the ensemble inflow to the dams in two upstream river basins, Takase and Azusa, targeting the large- and small-scale flooding due to the frontal system in August 2021. The results demonstrated that our approach can accurately predict the timing of the peak and the inflow amount. We have also started a similar model development for the Tone River. Furthermore, we constructed WEB-DHM-S without observed flow data for the Kawarada and Machino Rivers in the Noto Peninsula. We also developed and tested a system to estimate snow cover and melt using AMeDAS snow depth data and MODIS snow area data, and confirmed that the system can provide accurate estimations.

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

ICHARM participates 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)," in charge of flood scenario analysis and assessment for industrial complexes, such as Rojana.

In fiscal 2023, ICHARM created future flood scenarios and assessed flood risk. The future flood scenarios were prepared based on two types of flood scenarios. One type assumes 10-year and 100-year design floods (L1) calculated using the rainfall pattern of the 2011 flood as the benchmark. The other assumes the largest floods (L2) estimated based on the rainfall that was calculated for each return period by multiplying the largest historical rainfall calculated using long-term observed rainfall data at 119 points throughout the Chao Phraya River basin. We also prepared the average and largest dam discharges based on long-term data. In the scenario analysis, we assessed the flood risk for industrial sites, residential areas, and commuting routes by analyzing the onset, end, period, and depth of inundation and the flood-control effect and limitation of flood walls.

Our research confirmed that if the largest historical rainfall occurs every month throughout the basin, the inundation reaches the height of the flood walls. With the results, including this, we were able to provide risk information that should be considered for decision-making regarding business shutdowns due to flooding, as well as for recovery and resumption of operations. The models we developed have all been shared with local researchers, and we have already started working on a near-real-time flood forecasting system using the developed models. In addition, we have submitted this research to the Journal of Disaster Research.

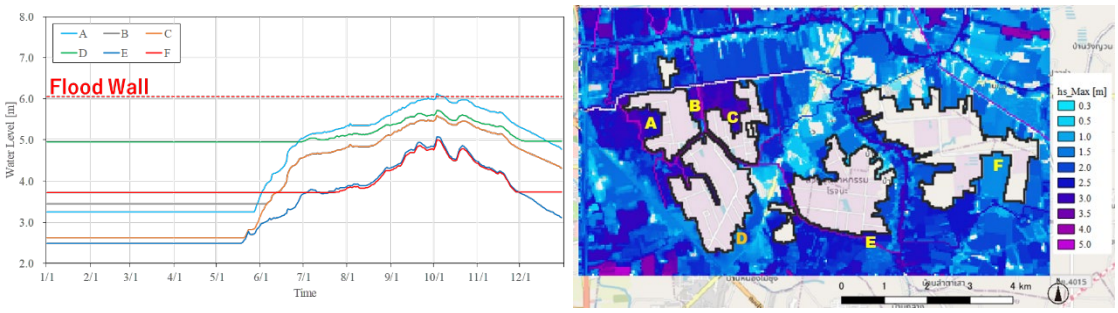


Figure 3-4 Simulated inundation depth as a result of the largest historical rainfall every month over the basin

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 fiscal 2023, we also participated in discussions at collaborative workshops for Area-BCM held at each industrial complex.

3.4.2 Development of technology to support mutually beneficial interaction to promote basin-wide flood management

There is a growing awareness of ESG management (a management method that emphasizes environment, society, and governance) in the private sector. In this trend, businesses have started disclosing the impact of future climate change on their finance and other aspects, as recommended by the Task Force on Climate-related Financial Disclosures (TCFD). In this context, they need to evaluate such impacts, including risks related to physical impacts due to water-related hazards, and thus, there is a growing corporate need for evaluation tools. By providing quantitative risk assessment methods to meet these needs, companies will also be able to evaluate the content and amount of their flood management activities, thereby differentiating themselves from other companies. In this sense, technological development can help create a mechanism in which businesses competitively take necessary measures to adapt to and mitigate the impacts of climate change.

The changes in corporate awareness and behavior, including those of investors, can potentially be a significant driving force in implementing the basin-wide flood management policy. Therefore, ICHARM has begun research since fiscal 2023 to learn what changes are taking place in businesses and investors and what impact these changes would have on promoting this policy.

In fiscal 2023, we collected information on the criteria and frameworks for non-financial disclosure related to climate change and sustainability (such as TCFD) and information on flood risk awareness of mainly large corporations and the financial sector, including investors. We also examined the feasibility of coordination between these trends and basin-wide flood management. In addition, we started developing a system that allows businesses to easily calculate losses caused by flooding under climate change and estimate damage reduction when implementing flood control measures.

ICHARM conducts this research as part of one of the 14 projects set in the third phase of SIP, which

aims to create a smart disaster risk reduction network. Section 3.6.1 provides more information about 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 Support for constructing early warning systems by providing real-time water level forecasts and flood hazard information

a) Development of RRI-GUI with improved compatibility with domestic data

ICHARM has been working on the development of a real-time water level prediction model for small and medium-sized rivers based on the RRI model. As part of this effort, we improved the operability of the graphical user interface exclusively developed for RRI (RRI-GUI) by adding more accurate domestic data and new functions.

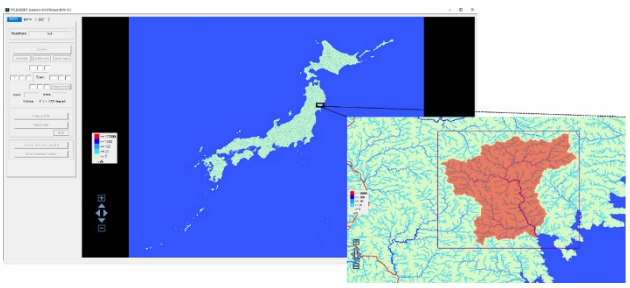


Figure 3-5 RRI-GUI showing the surface flow direction map of Japan and a river basin image extracted from the map

The following sets of data and functions were added to the existing functions.

1. Topographic data: Japan surface flow direction map (resolution: 5 seconds, approximately 150m)
2. Land use data: National numerical information, land-use detailed mesh data (2014 version)
3. Rainfall data: Analyzed rainfall, flash-report analyzed rainfall, high-resolution precipitation nowcast
4. Faster basin extraction function

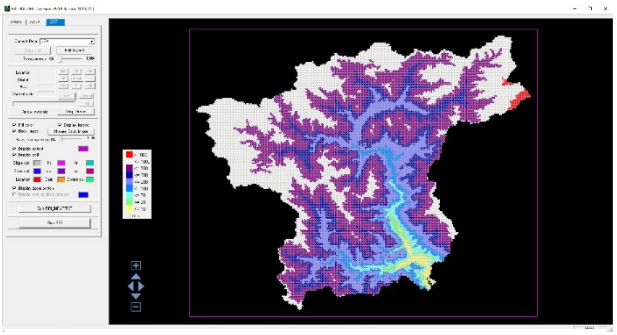


Figure 3-6 RRI-GUI showing a sample DEM data (spatial resolution: about 150 m) extracted from the basin image in Figure 3-5

The improved GUI can model domestic rivers faster and more reliably than before and easily incorporate domestic mesh rainfall.

The new RRI-GUI can be downloaded from the following page:
https://www.pwri.go.jp/icharm/ research/rri/rri_top.html

3.5.2 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 the 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 then analyzed the dam operation data in the past several decades to find better dam operation methods for multiple years and have submitted the findings to an international journal. 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. We have then started a study for optimal dam operations.

3.5.3 Development of VR-based and other technologies for effective risk communication: their potential as flood disaster education tools

To reduce cases where people delay evacuation and encounter dangers during flooding, it is necessary to develop risk communication methods that help municipalities and residents share the sense of urgency posed by flood hazards and lead them to take appropriate evacuation actions. In this context, a recent technological invention is particularly promising. Virtual reality technology creates a cyberspace where users can have various experiences.

Figure 3-7 A bird-eye image of a target area created using educational game software

ICHARM has been developing the Virtual Flood Experience System (VFES) for this purpose by introducing VR technology, which enables people to have a virtual experience in a space created by computers. VFES is programmed to accurately reproduce hills, rivers, buildings, urban topography, and other features, using 3D survey data, and overlay a flood image that is either reproduced or simulated on the top of the previously created geographic image. The system then allows people to experience a virtual flood situation through an avatar, or a “virtual self” created in cyberspace. In this way, VFES enables people to virtually experience flooding that may occur in their residential area

before it actually does. The system also allows people to put themselves in other people's shoes. For example, by setting the avatar to walk as slowly as the elderly, younger people can virtually experience the difficulties the elderly are likely to face during flooding, including evacuation.

In fiscal 2023, we addressed the issue of VFES's monotonous scenery causing confusion for users about their whereabouts in cyberspace. We studied methods for improving the landscape in the system and made and evaluated improvements.

During ICFM9, held in fiscal 2022, ICHARM organized a public symposium where people could try out VFES. Local middle school students were among the participants, many of whom later became interested in joining the improvement effort. To accept many students for this project, we introduced an educational game software to run VFES on inexpensive computers. We also took them for field surveys and discussed with them how landscape improvements should be made. With the students, we concluded that improvements should be made not only to buildings but also to surrounding objects. The improvement project with the students took about seven months using the metaverse function of the educational game software.

We evaluated the effect of the improvements by having middle school students who did not participate in the improvement project try out the upgraded version of VFES. Almost all of them acknowledged the improvement of the VR landscape. When asked what changes they thought were the most effective, about half of them answered the changes to buildings, while the other half said the changes to surrounding objects. Although previous research points out the importance of the authenticity of buildings, our study found that the realism of surrounding objects is equally important.

We also confirmed the potential of educational game software to help communities with effective risk communication. For example, VFES, when easily accessible by this type of software, can maintain public interest in disaster-related issues.

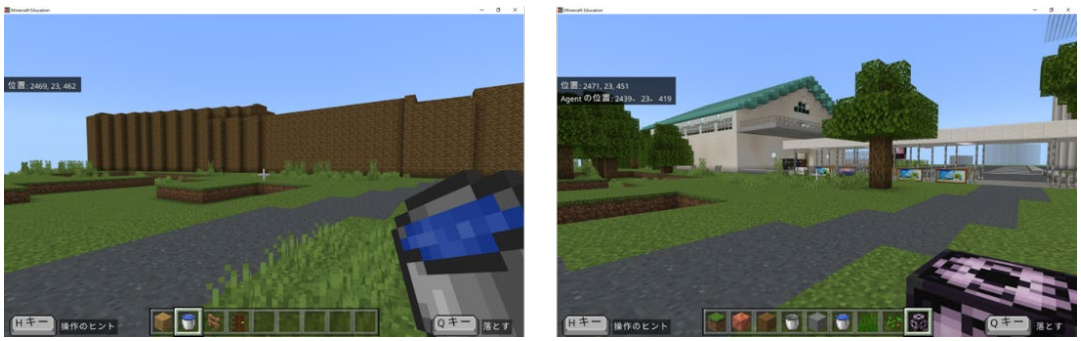


Figure 3-8 VR images of the same location before (left) and after improvements

3.5.4 Aggregation of knowledge for strengthening the disaster response capabilities of local governments and other organizations

ICHARM has posted the "Collection of Critical Situations during Flood Emergency Response" on its website since June 2020, aiming to help improve the disaster response capacities of local governments for more effective management of flood disasters, which frequently occur across Japan

in recent years[2].

Defining critical situations in which local government officers have a hard time making sensible decisions because they panic, don't know what to do, are confused or in dilemma, etc., during an emergency response effort, we collected typical critical situations from the review reports of past flood disasters and summarized as a booklet. Also provided with the booklet is the "Appendix for Local Government Response under COVID-19," which lists possible critical situations and necessary countermeasures during flood emergency response under COVID-19.

In fiscal 2023, Visiting Research Fellow OHARA conducted the following training and lectures for local government officials:

- November 27, 2023: "Learning from Critical Cases during Disaster Response efforts" as part of JICA training for Bhutan's disaster management staff during their visit to Japan.
- January 18, 2024: "Key points of disaster response efforts for municipalities during flooding: Disaster response from start to restoration" as part of the fiscal 2023 workshop hosted by the National Construction Training Center under the theme of "Learning from municipalities prepared for flood disasters."
- January 26, 2024: "Reality and Issues of Disaster Response" at the regional training session in Tottori Prefecture, Japan, held as part of the Cabinet Office Disaster Specialist Training.

Photo 3-5 Bhutan's disaster management staff (right) and a scene during the lecture session

3.5.5 Research on response to water disasters and support and enhancement of measures for early recovery

From the Collection of Critical Situations during Flood Emergency Response, we also selected and categorized cases that occurred during the restoration phase and conducted trend analysis. We found that critical situations during the restoration phase are concentrated on issues related to support for

[2] https://www.pwri.go.jp/icharm/special_topic/20200625_flood_response_collection_e.html

rebuilding the lives of disaster victims, healthcare, supplies and equipment, disaster waste, volunteers, and roads. Our research clarified what categories of issues need more support.

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 is 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 started its third phase from 2023 to 2027, with 14 projects underway[3].

ICHARM has joined a project led by Professor YAMADA Tomohito of Hokkaido University, which aims to find effective ways of utilizing risk information to induce individuals and 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 will 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 will also continue to 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.

There are high expectations for changes in individual and corporate behavior, as they are directly

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

linked to the overall outcomes of the SIP project and the enhancement of regional and national resilience to disasters. At ICHARM, we have started the following two projects in collaboration with other institutes participating in this joint research and development program.

In one project aiming to lead people to take appropriate evacuation actions, we have been working on a virtual flood experience system. This system recreates users' living environment, including topographical features, buildings, and roads, and quantitatively reproduces a flood situation through scientific calculations. Our plan is to apply this system to cities that experienced large-scale water disasters in the past and provide opportunities for residents to virtually experience a flood situation and learn about how to act appropriately, including evacuation. We also plan to conduct experiments in which we will record people's actions during evacuation and analyze their psychology from the data. Our ultimate goals are to have people learn early evacuation and choose appropriate actions according to disaster phases (e.g., taking altruistic actions when there is still plenty of time before evacuation). We also plan to prepare educational resources to help people change their behavior during flooding and disseminate them nationwide.

For businesses and other entities, we aim to create a mechanism to induce them to implement pre-disaster measures, such as formulating BCPs and constructing flood barriers. To this end, we will develop a platform system that corporations and other entities can commonly use in their efforts to quantitatively assess flood risk and resilience in response to the TCFD recommendations and the regulations of information disclosure in the stock market. We will collaborate with consulting firms offering similar services and start working on areas commonly required for development, such as flood hazard information and calculation methods that should be shared as the basis for risk evaluation. In addition, to build a system where a third party certifies the technical validity and quality (e.g., accuracy, variety of condition settings) of the quantitative assessment conducted by businesses, we will sort out the requirements of items and standards for assessment.

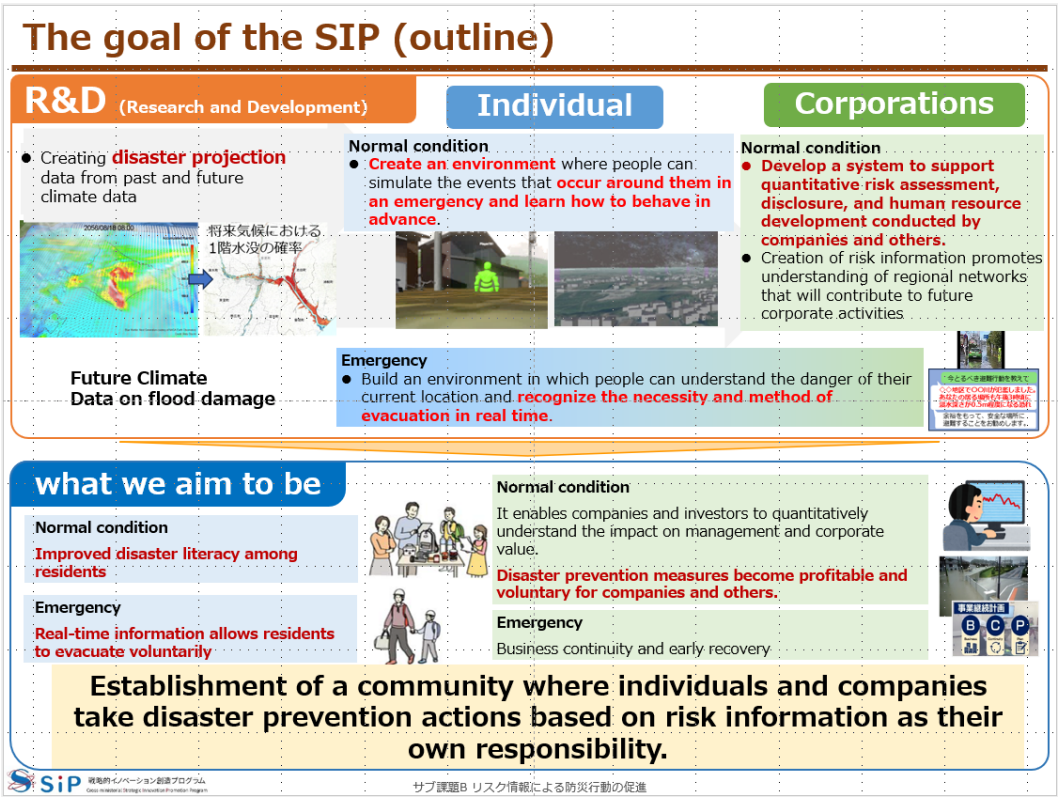


Figure 3-9 Use of risk information to facilitate voluntary individual and corporate actions for disaster risk reduction (a vision of society set by SIP)

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

ICHARM has participated in MEXT-Program for The Advanced Studies of Climate Change Prediction (SENTAN) from 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). Research projects 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 measures and mitigation measures that help realize a decarbonized society.

ICHARM has been assigned to the task D “Evaluation of hazards and associated risks in the Asia-Pacific regions and the promotion of international cooperation” led by Prof. TACHIKAWA Yasuto, Kyoto University, of the research area No.4 “Development of integrated hazard prediction models.” ICHARM implements to develop a water cycle model in the Philippines and OSS-SR tailored to their

local needs and conditions.

In fiscal 2023, for the Solo River basin in Indonesia and the Davao River basin in the Philippines, we dynamically downscaled the data from the ensemble climate prediction database prepared to address global warming and analyzed rainfall data, considering the uncertainty of global climate models. In the Solo River basin case, we also studied drought control in the upstream area. In the Davao River basin case, we expanded the research area 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. Chapter 5.1.1 provides more information about these projects.

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, which must be addressed to ensure that innovative technologies created through SIP and other government-led R&D projects are fully utilized to solve social issues 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 will be 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 launched between JST and JICA and between AMED and JICA to promote international joint research between Japan and developing countries to solve global issues[4].

ICHARM has been participating in projects in the Philippines, Argentina, and Thailand as a joint research institute, implementing projects there in collaboration with domestic and foreign government agencies and research institutes.

The following summarizes our projects in these countries in fiscal 2023.

a) Philippines[5]

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

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

Under the project "Development of a Hybrid Water-Related Disaster Risk Assessment Technology for Sustainable Local Economic Development Policy under Climate Change (HyDEPP-SATREPS) (Principal Investigator: OHARA Miho, professor of the Graduate School of Information Science and Technology, The University of Tokyo)," ICHARM is working with joint research institutes in both the Philippines and Japan to carry out activities such as downscaling of climate change models and evaluation of flood resilience in the Laguna Lake area.

Photo 3-6 The 4th JCC meeting on June 22

Photo 3-7 Closing ceremony at ICHARM on August 10

In fiscal 2023, the 4th Joint Coordination Committee (JCC) was held on June 22, and the 5th JCC in a hybrid format on November 20. As a project member, ICHARM participated in these meetings and discussed the progress of the joint research and the future direction.

From July 24 to August 10, 2023, ICHARM provided different types of training at ICHARM for ten Filipino researchers who visited Japan for this purpose. They were divided into five groups of two to attend one of the five courses on data management, discharge observation, hydrological and hydraulic models, flood hazard mapping and evaluation, and economic growth prediction models. The courses for the first two subjects ended on August 3, and the remaining three on August 10. We assigned a supervisor to each course so that the participants could learn from them the knowledge and skills required for the project. They also went on field studies with their supervisor. The training was fruitful for the researchers in both countries. Learning with a designated supervisor was proven more effective compared with the first and second training sessions, helping the participants achieve a better understanding of flood risk assessment.

The Philippine project will continue until June 2026 as a joint project between the two countries.

b) Argentina[6]

ICHARM has been involved in SATREPS's Argentina project, "Numerical Weather Prediction and Warning Communication System for Densely Populated and Vulnerable Cities (Principal Investigator:

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

MIYOSHI Takemasa, senior researcher, RIKEN)," as a collaborative research organization and working on the development of a hydrologic forecasting system for a target area. In fiscal 2023, a researcher from a national hydrological research institute in Argentina stayed at ICHARM for about 40 days from May 22 to June 30, conducting research on the application of hydrological models to local basins. In September, Argentina's project members visited Japan. They toured various disaster management agencies in Tokyo and Kobe and also visited ICHARM on September 14. On December 7-8, ICHARM researchers participated in a research meeting held by Japanese groups.

Photo 3-8 Argentina researchers at ICHARM on September 14

c) Thailand[7]

ICHARM participates in the SATREPS program in Thailand, "Regional Resilience Enhancement through Establishment of Area-BCM at Industry Complexes in Thailand (Principal Investigator: WATANABE Kenji, professor, Nagoya Institute of Technology)." ICHARM performed the analysis and evaluation of inundation scenarios created for Rojana and other industrial complexes.

3.7 Research Meeting

The Research Meeting has been held roughly once a month since March 2008 for researchers to make a presentation on their ongoing research in order to upgrade their research-related skills, learn different perspectives, and practice interaction with other researchers.

In fiscal 2023, the meeting was held 11 times from Nos. 144 to 154, and 22 researchers delivered a presentation in total.

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 fiscal 2023, the following paper was selected for the award, and the ceremony was held on March 5, 2024.

Title: Entrainment of bed sediment composed of very fine material
Authors: Harada Daisuke, Egashira Shinji, Tanjir Saif Ahmed, and Itoh Hiroyuki
Journal: Earth Surface Process and Landforms (ESPL), Vol. 47, Issue 13, pp. 3051-3061, 2022

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

Photo 3-9 Awarding ceremony at the ICHARM Auditorium

3.9 Cultural heritage damage investigation by 2022 Flood in Pakistan

This investigation was conducted as one activity by the Japan Consortium for International Cooperation in Cultural Heritage, JCIC-Heritage[8]., which is a platform for industry, government, academia, and the private sector to share the latest information on cultural heritage protection among various institutions, organizations, and experts, and to promote international cooperation in an all-Japan manner, with the Tokyo National Research Institute for Cultural Properties serving as its secretariat.

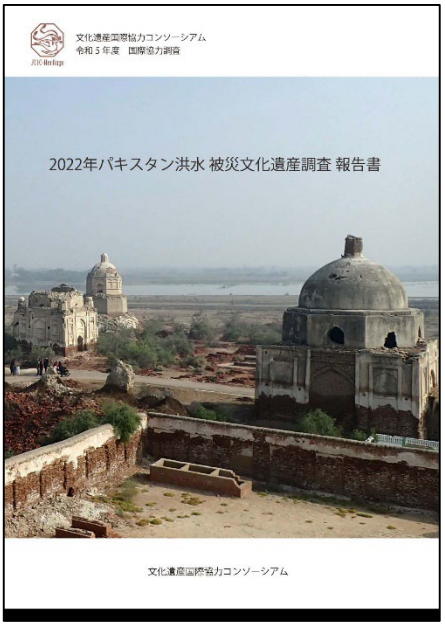


Photo 3-10 Investigation report

It supports the smooth implementation of various forms of cooperation carried out by Japanese experts and organizations. It conducts a wide range of activities to maximize the effects of projects by closely coordinating participating individuals and organizations. For example, the consortium conducts a field investigation every year as part of this effort[9].

In fiscal 2023, the annual field investigation was held to examine the damage to cultural heritage caused by the torrential rainfall and subsequent flooding in Pakistan in 2022. The flood continued from June to October, with one-third of the land said to have been submerged, making it the worst flooding case in decades. Significant damage has also been inflicted on the cultural heritage that the country prides itself on, but the details are not widely shared in Japan. Therefore, the consortium formed a field investigation team consisting of experts from multiple fields, such as archaeology, architectural

[8] https://www.jcic-heritage.jp/en/

[9] https://www.jcic-heritage.jp/en/activities/research/

structure, preservation science, and disaster risk management, and dispatched the team to Sindh Province, which is located in the lower Indus River basin and had severe flood damage along with many cultural heritages, including World Heritage sites. A senior researcher from ICHARM participated as an expert in disaster risk management.

The investigation was carried out from December 20 to 31, 2023. The investigation team inspected World Heritage sites, such as the Mohenjo-Daro ruins and the Kot Diji Fort, provided support for the recording and assessment of damaged cultural heritage, and helped devise disaster risk management plans. During their stay, they also visited the Embassy of Japan, the Sindh Archaeological Department, and others.

This article was made based on the investigation report “2022 Pakistan Flood: Report on the Damage Assessment of Cultural Heritage in Sindh Province”, which is available on the consortium’s website[10].

[10] https://www.jcic-heritage.jp/wp-content/uploads/2024/04/ReportOnDamageToCulturalPropertiesInSindhProvince_JCIC-Heritage.pdf

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 2023. 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 2023, 15 students from seven countries graduated from this program.

Photo 4-1 Participants in the hybrid entrance ceremony for the 13th batch of doctoral students in October 2023

In October 2023, the 13th batch of four students, of which one students dropped out due to personal reason, enrolled in the program. As of March 2024, a total of 10 students are in the program: three in the third year, four 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 2024, five out of the ten doctoral students are using this scheme: two in the third year and three in the second 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 2024, 182 students from 36 countries graduated from the master's program.

In September 2023, the 16th batch of 12 students from 6 countries (Bhutan, Pakistan, the Philippines, Sri Lanka, East Timor, and Tunisia), who entered the program in October 2022, graduated with a master's degree. In the following month, the 17th batch of 13 students from 9 countries (Bangladesh, Honduras, Indonesia, Malawi, Morocco, Pakistan, the Philippines, Sri Lanka, and East Timor) enrolled in the program.

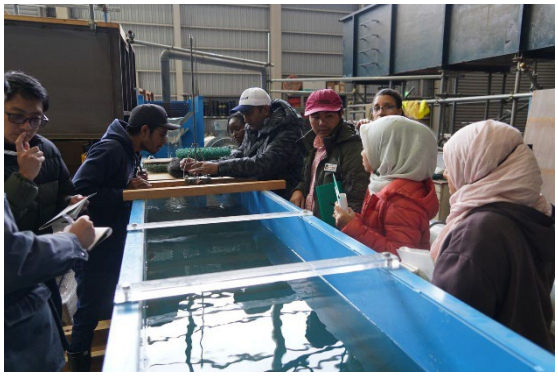


Photo 4-2 Students working on a flume experiment

Photo 4-3 Master's and doctoral students after the graduation ceremony at GRIPS in September 2023

4.3 Trainings officers and facilitators in IFI activities

4.3.1 Facilitator training in the Philippines

With the aim of further utilizing OSS-SR, which is being developed and implemented in Davao City, the Philippines, a workshop for OSS-SR users and managers was held at DENR XI on June 30, 2023. A total of 33 people from various organizations participated.

Photo 4-4 Training in session

During the workshop, ICHARM researchers conducted hands-on lectures mainly on the functions of the DIAS data server, access to

DIAS, and information sharing protocols. In the open forum after the lectures, participants from each organization voiced comments and requests regarding the use of the system for their work and discussed future activities related to the training and implementation of Davao City's OSS-SR, all of which helped clarify the purpose and use of the system. In the closing remarks, Anthony C. Sales, the director of DOST XI, who leads the IFI platform project in the Philippines, emphasized that continuous training of facilitators is important for the successful implementation of OSS-SR, and expressed expectations for continuous support and cooperation by ICHARM in the future.

This workshop was conducted as part of the MEXT-Program for the Advanced Studies of Climate Change Projection (SENTAN).

4.3.2 WEB-RRI model workshops

ICHARM conducts training sessions on the WEB-RRI model in response to requests from various organizations and as part of the short-term training programs implemented by JICA. Table 4-1 shows training sessions we conducted in fiscal 2023.

Table 4-1 WEB-RRI model workshops in fiscal 2023

Conferences, meetings, etc.	Date	Venue	Number of participants
Training on RRI Model - Application to Wadi Flash Floods -	June 8	University of Tlemcen, Algeria	31
JICA training on disaster control measures for and management of infrastructure (rivers, roads, ports), Course A	July 20	ICHARM	6
Training on RRI Model for Bangladesh Water Development Board (BWDB)	November 14	Online	5
JICA training on disaster control measures for and management of infrastructure (rivers, roads, ports), Course B	November 21	ICHARM	5

4.4 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 199 graduates in total.

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.

Photo 4-5 Participants in the Follow-up Seminar

On February 13, 2024, we held the Follow-up Seminar online for master's and doctoral program graduates. This event was the second one held online and the 16th in total. It was attended by 41 graduates from 20 countries and 23 current students from 12 countries. This time, it also aimed to support the career development of current students.

The seminar began with guest greetings from TAKAHASHI Ryo, the director general of JICA Tsukuba, and OTA Hiroko, the president of GRIPS (via a video message), followed by an opening address by FUJITA Koichi, the president of PWRI, representing the organizers. In the keynote speech that followed, Abou Amani, the director of Division of Water Sciences at UNESCO, emphasized that water is the core of SDGs and plays a role in connecting international commitments, such as SDGs and the Paris Agreement. He continued that UNESCO-IHP, which will celebrate its 50th anniversary in 2024, was working on its 9th strategic plan with five priority issues and 23 cross-cutting issues and that UNESCO was advancing the development of early warning systems for floods and droughts in Africa. Then, ICHARM explained a plan to introduce the ICHARM Alumni Meta Database (iAME), an information sharing platform to strengthen alumni activities. We also proposed that webinars such as the seminar should be held regularly. After that, the participants broke up to join one of the four sub-sessions in disaster risk reduction, sediment, meteorology, and hydrology, in which they also discussed how ICHARM's proposals could be achieved.

Photos 4-6,7,8 (from left) Director General TAKAHASHI of JICA Tsukuba, President OTA of GRIPS, Director Amani of the Division of Water Sciences, UNESCO

The 2023 Follow-up Seminar revealed that it can be more than just an opportunity for participants to renew their friendships. This alumni event demonstrated a high potential to update graduates on the latest technology and help them share water-related problems in various places. With these tighter

alumni-alumni and alumni-ICHARM relationships, ICHARM and its graduates can play a vital role in solving local water problems as a significant driving force.

4.5 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 fiscal 2023, we received seven interns, one each from the organizations listed below. They stayed at ICHARM for varying periods, from one to several months, working 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.

- Tokyo Metropolitan University (Japan)
- National Taiwan University (Taiwan)
- Malaysia-Japan International Institute of Technology (Malaysia)
- CSIR-National Geophysical Research Institute (NGRI) (India)
- IHE Delft Institute for Water Education (Netherland)
- University of Buenos Aires (Argentine)
- University of Toronto (Canada)

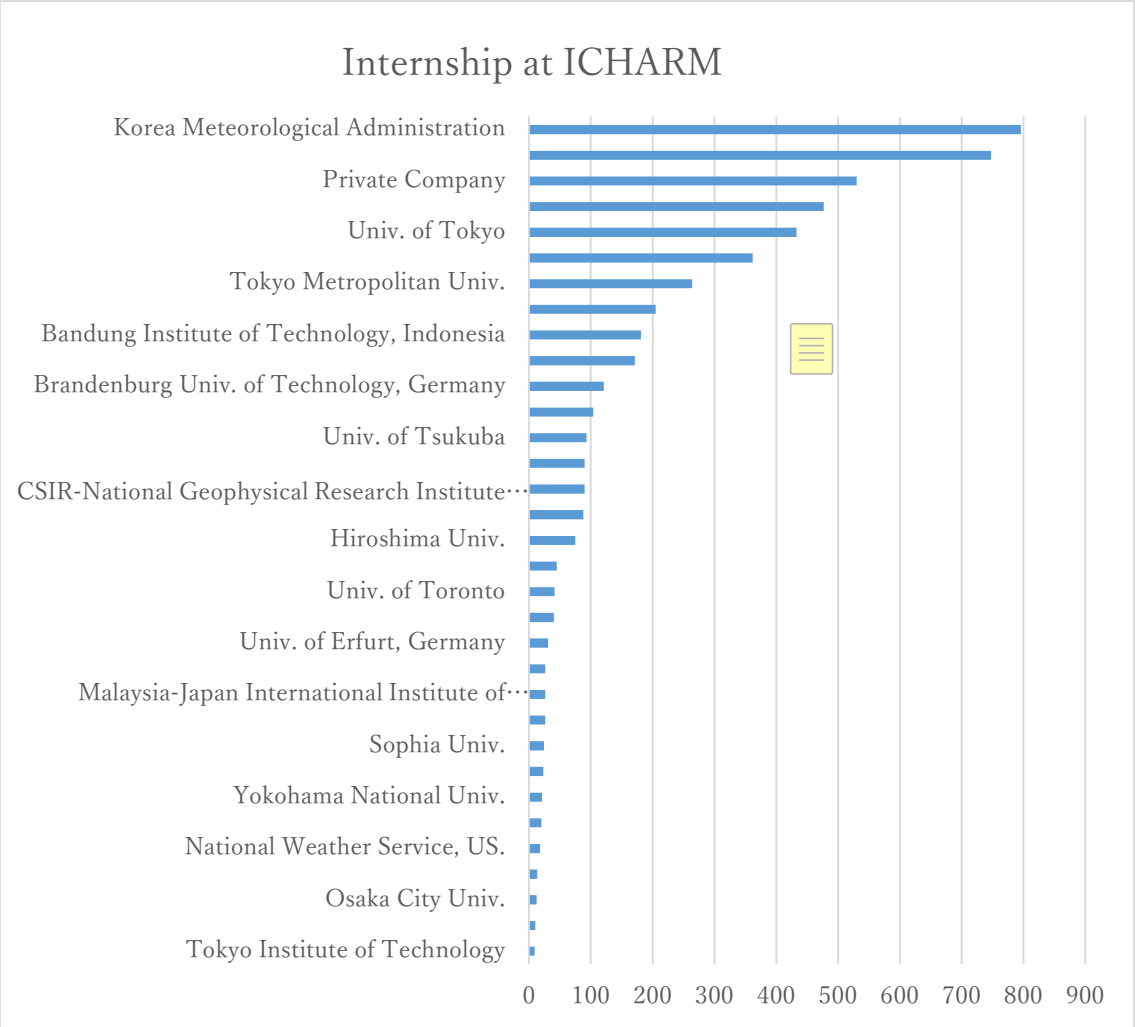


Figure 4-1 The total number of days spent by all interns from each institute between 2006 and 2023

5. Information Networking

In its information networking activities, ICHARM continued supporting establishment/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 Vietnam. 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 the 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 FY2023.

Table 5-1 Activities related to the IFI platforms in FY2023

Country	Date	Activity
Viet Nam	Apr. 25	Meeting with Vietnam Meteorological and Hydrological Administration (VNMHA)
The Philippines	Jun. 28-29	Field survey and meeting with Davao del Sur State College (DSSC)
The Philippines	Jun. 30	OSS-SR training for users and system managers
The Philippines	Jul. 3	Fourth plenary meeting of the platform
Viet Nam	Oct. 26	Memorandum of Understanding with VNMHA on water resilience and disaster
Indonesia	Oct. – Dec.	Online meeting with core organizations in Indonesia

Viet Nam	Jan. 11	Online meeting with Ministry of Natural Resources and Environment, Viet Nam (MONRE)
The Philippines	Jan. 24	Memorandum of Understanding with DOST XI and DSSC
Sri Lanka	Mar. 15	Fifth plenary meeting of the platform
Thailand	Mar. 25	First plenary meeting of the platform

In fiscal 2023, we carried out vigorous activities in Davao City, Philippines, such as holding OSS-SR training for users and system managers on June 30, 2023, and a plenary meeting of the platform project on July 3, 2023. In addition, in order to start initiatives such as OSS-SR development and facilitator training in Digos City, a neighboring city of Davao, we had discussions with high-level officers, including the president of the Davao del Sur State College and the regional director of DOST XI, and concluded a tripartite agreement between these two organizations and ICHARM. Section 5.1.1 provides more information about the activities.

In Sri Lanka, the platform project had a plenary meeting on March 15, 2024, for the first time in four years, where the participants agreed on future schedules and an implementation plan. Section 5.1.2 provides more information about the activities.

Additionally, we have started platform projects in Thailand and Vietnam. For the Vietnam project, we signed a Memorandum of Understanding on water resilience and disasters with the National Center for Hydro-Meteorological Network of the Vietnam Meteorological and Hydrological Administration (VNMHA) on October 26, 2023, and began dialogues with key institutions. In Thailand, we held the first plenary meeting on March 25, 2024, as shown in Section 5.1.3.

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. It is expected that its application at the local, national, and regional levels will be promoted through cooperation with UN member countries and UNESCO Category 2 centers, among others.

5.1.1 IFI activities in the Philippines

a) Discussions in Digos City

On June 28-29, 2023, a team of ICHARM researchers participated in a two-day event at the Davao del Sur State College (DSSC) and other venues to initiate a discussion on developing OSS-SR for Digos City, a neighboring city of Davao, where ICHARM had already implemented OSS-SR.

On the first day, the participants visited barangays (the smallest administrative unit in the Philippines) and DENR XI in Kapatagan to learn about local conditions and challenges. They also had a meeting with Pagobo-Tagabawa, one of the indigenous tribes.

Photo 5-1 A meeting at DSSC
(Source: DSSC Facebook)

On the second day, DSSC President Augie E. Fuentes organized a meeting by inviting ICHARM members, DOST XI Regional Director Anthony C. Sales, DENR officers, the Pagobo-Tagabawa tribal chieftain, and other local stakeholders. In the meeting, ICHARM first made a presentation on the development of the Davao City OSS-SR. Then, an open forum was held to build a cooperative relationship, where the participants discussed various issues, such as sharing information on local water-related hazards and water resources management. Local stakeholders also voiced requests about the Digos OSS-SR project, ranging from content selection to development to implementation. The meeting ended successfully, contributing to creating trust and cooperation among all stakeholders for developing the Digos City OSS-SR.

b) Training for OSS-SR users and system managers

(See section 4.3.1.)

c) The 4th Plenary Meeting of the Platform on Water Resilience and Disasters

The 4th Plenary Meeting of the Platform on Water Resilience and Disasters was held on July 3, 2023, in Davao City, attended by 60 people from water-related disaster management organizations across the country.

Photo 5-2 The 4th Plenary Meeting
(Source: DOST XI Facebook)

The meeting opened with the speeches of the co-chairs of the platform: a video message by DOST Secretary Renato U. Solidum Jr. and greetings by Project Manager Jerry Fano, who is an alumnus of ICHARM M.Sc. program and on behalf of DPWH Senior Undersecretary Emil K. Sadain. They were followed by a lecture on international water management trends by ICHARM Executive Director KOIKE Toshio, a speech delivered by a member of the Mahipus City Council on behalf of Davao City Mayor Sebastian Duterte, and a video message by Kumamoto City Mayor ONISHI Kazufumi. The executive director wrapped up the meeting, summarizing discussions on

future activities, such as the development of OSS-SR and training of facilitators from the following three perspectives: (1) Promoting the deployment of OSS-SR and training of facilitators; (2) Proposing policies for climate change adaptation based on science and technology; and (3) Scaling up the IFI project nationwide and worldwide.

d) Memorandum of Understanding with DOST XI and DSSC

In order to strengthen collaboration between Davao City and ICHARM and expand it to neighboring Digos City by building on previous activities in the Davao project, we signed a tripartite Memorandum of Understanding (MOU) on January 24, 2024, with DOST XI and DSSC. Under this MOU, the three parties will collaborate in designing and implementing the following plans:

Photo 5-3 The MOU signing ceremony
(Source: DOST XI Facebook)

- Implementation of OSS-SR in Davao del Sur Province
- Flood forecasting in the Digos River
- Inclusive water education for diverse groups of residents
- Natural disaster risk management
- Urban planning coupled with natural disaster risk management: case study in Digos City

5.1.2 IFI activities in Sri Lanka

The 5th Plenary Meeting of the Platform on Water Resilience and Disasters in Sri Lanka was held on March 15, 2024 in Colombo, Sri Lanka. More than 45 experts attended the conference, including various Sri Lankan domestic water-related agencies, such as the Irrigation Department, the National Building Research Institute (NBRO), the Disaster Management Center(DMC), the Department of Meteorology (DOM), the Mahaweli Administration Department, and the Sri Lanka Land Development Corporation (SLLDC).

Based on the reports from both sides, all participants discussed the facilitator training and decided that it would be conducted in two phases. They also agreed that Phase I would focus on flood forecasting and early warning systems and also contingency planning and risk mapping based on flood monitoring and forecasting information in the Kalu river basin. Phase II would focus on climate change, including understanding of the mechanism, impact assessment, economic assessment, and adaptation planning for the Mahaweli River and other river basins.

Photo 5-4 The 5th Plenary Meeting

5.1.2 IFI activities in Thailand

On March 25, 2024, the 1st Plenary Meeting of “Platform on Water Resilience and Disasters in Thailand” was held in Bangkok, Thailand. ICHARM has been supporting the country in disaster risk reduction and resilience enhancement through various opportunities, such as the Typhoon Committee and the Science and Technology Research Partnership for Sustainable Development project titled “Regional Resilience Enhancement through Establishment of Area-BCM at Industry Complexes in Thailand” (SATREPS Area-BCM), which is led by Nagoya Institute of Technology. To achieve further cross-sectoral collaboration and implement cutting-edge science in society for these purposes, water-related stakeholders in Thailand have decided to establish the Platform on Water Resilience and Disaster.

The meeting was attended by a total of 81 participants from 16 organizations including the Office of the National Water Resources (ONWR), Royal Irrigation Department (RID), Thailand Meteorological Department (TMD), the Hydro-Informatics Institute (HII), the Department of Climate Change and Environment (CCE), the Department of Water Resources of the Ministry of Natural Resources and Environment (DWR), the Electricity Generating Authority of Thailand (EGAT), the Geo-Informatics and Space Technology Development Agency (GISTDA), the Thailand Department of Disaster Prevention & Mitigation (DDPM), Chulalongkon University, Kasetsart University, JICA Thai Office, and the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP).

In the meeting, participants introduced various activities such as the Annual Operation Plan 7, “Flood Resilience Enhancement through the Platform on Water Resilience and Disasters,” which is one of the activities planned by the Typhoon Committee’s Working Group on Hydrology, SATREPS Area-BCM project, IFI-platforms in other countries. Then facilitated by Executive Director KOIKE, the participants actively discussed scientific topics, such as what data, i.e., satellite, in-situ or other data, should be used for what purposes and what components should be added to the platform activities. At the end of the meeting, the participants agreed that ONWR will lead the development of the

platform implementation plan and that a second meeting will be held once the plan is ready.

Photo 5-5 The 1st Plenary Meeting
(Source: ONWR Facebook)

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 damage caused by typhoons by cooperating 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 Working Group of Hydrology

The 12th Annual Meeting of the Working Group on Hydrology (WGH) of the Typhoon Committee (TC) was held in Bangkok, Thailand, on September 20-22, 2023, co-hosted by the Royal Irrigation Department of Thailand (RID) and MLIT.

The meeting was conducted in a hybrid style, combining both in-person and online participation. About 50 participants joined the event, including those from 10 out of 14 nations and territories (China, Hong Kong, Japan, Lao PDR, Malaysia, the Philippines, the Republic of Korea, Thailand, Vietnam, and the United States), ESCAP, and the TC Secretariat.

At the meeting, the members reported on typhoon events and damage, including their efforts to address them. They also discussed issues related to the meeting theme, “Community Outreach and Multi-stakeholder Engagement: Boosting Early Warning for All.” Additionally, the meeting discussed the progress and plans regarding the nine Annual Operation Plans and the joint development of the third phase of the Standard Operating Procedures (SSOP III). After the meeting, the participants visited RID and joined a field tour of local water-related structures. They received detailed explanations about flood risk reduction measures and monitoring systems in Thailand. The visits provided excellent opportunities for them to reaffirm the importance of international cooperation and information sharing.

Photo 5-6 WGH members

5.2.2 Integrated Workshop and Training and Research Coordination Group Forum

The Typhoon Committee jointly held the 18th Integrated Workshop and the 4th Training and Research Coordination Group Forum from November 28 to December 1, 2023, at the United Nations Conference Center (UNCC) in Bangkok, Thailand. The committee’s four working groups gathered together to discuss typhoon-related research, technical presentations, the progress of the Annual Operation Plans (AOPs), and other agenda items. Approximately 150 people (120 in person, 30 online) participated. Discussions were particularly active on impact-based assessments of typhoon risks and methods of expressing uncertainty; examples such as Japan’s flood risk map particularly attracted participants’ attention. Through this series of meetings, we were able to play a crucial role in strengthening international collaboration and technical exchange and actively enhancing regional ability to respond to damage related to typhoons.


Photo 5-7 The 18th Integrated Workshop

5.2.3 The 56th annual session

The 56th annual session of the Typhoon Committee (TC) was held in Kuala Lumpur, Malaysia, from February 27 to March 1, 2024. Annual sessions are pivotal meetings where all stakeholders of TC's four working groups gather to make comprehensive decisions based on the activities of each working group. The Japanese delegation consisted of 13 members, including representatives from MLIT, the Japan Meteorological Agency (JMA), the Meteorological Research Institute (MRI), the Regional Specialized Meteorological Center (RSMC), the Asian Disaster Reduction Center (ADRC), the Infrastructure Development Institute (IDI), Tohoku University, the Typhoon Science and Technology Research Center(TRC), and two researchers from ICHARM: Senior Researcher MIYAMOTO Mamoru and Researcher KAKINUMA Daiki.

Photo 5-8 The 56th Annual Session

Photo 5-9 Senior Researcher Miyamoto making a speech after receiving the Dr. Roman L. KINTANAR Award

On the first day, after the opening speeches, the Dr. Roman L. KINTANAR Award ceremony was held for the past four years, from 2019 to 2023, during which in-person ceremonies were halted due to the pandemic. ICHARM received the 2020 award for a joint project with IDI and JAXA, for which Senior Researcher Miyamoto gave an acceptance speech on behalf of the project team. On the second day, the four working groups reported the review results of their annual operation plans (AOPs) and presented plans for the following year. Miyamoto, the WGH chair, delivered the review and plans of his working group. The participants also discussed the enhancement of the Standard Operating Procedures for Typhoon Response (SSOP-III). The third day featured financial reports from the TC Secretariat and discussions on deciding the names for typhoons that caused significant damage. The final day addressed the schedule and location for next year's joint working groups and annual session, and TC's important yearly event ended successfully.

Participation in the 56th annual session was an excellent opportunity for Japan, ICHARM, and PWRI to demonstrate their international presence and further contribute to the improvement of regional resilience. The much-awaited face-to-face occasion helped facilitate closer exchanges among

the participants, leading to a deeper understanding and cooperation between various countries. In addition, it even helped enhance collaboration among domestic institutes while sharing technical and other issues.

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) UNESCO international conferences

UNESCO held a hybrid international conference, "Climate Risk, Vulnerability and Resilience Building," at its headquarters in Paris, France, from April 19 to 21, 2023. Executive Director KOIKE Toshio participated in a panel session on "Science-Policy Discussion Panel: Bridging the gap between science and the different scales of decision making for climate risk management" on the 19th and made a speech on the Online Synthesis System (OSS) and other topics. On the afternoon of the same day, ICHARM organized a side event, "Crosscutting Research on Hydrological Systems, Rivers, Climate Risk and Water-Food-Energy Nexus," to discuss issues under the working theme "Hydrological systems, rivers, climate risk and water-food-energy nexus." In this side event, the participants representing five UNESCO Category 2 centers discussed strategies and plans to link cutting-edge science and technology with individual actions and to develop human resources capable of driving such interaction within the interdisciplinary framework of UNESCO-IHP-IX, while considering the 2021 Bonn Declaration and the WCI concept advocated by ICHARM. After the discussion, the representatives agreed to promote interdisciplinary and

integrated multilateral cooperation, with water at the core of their activities.

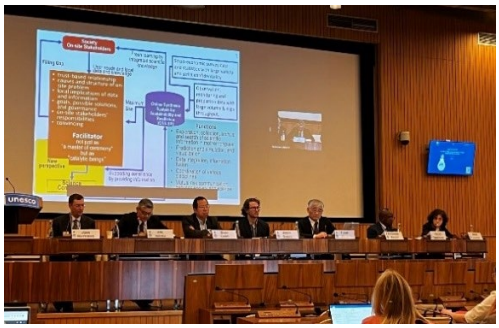


Photo 5-10 Executive Director KOIKE (third from right) at a panel session

Photo 5-11 The side event hosted by ICHARM

b) UNESCO-IHP Asia-Pacific Regional Steering Committee (RSC-AP)

The UNESCO-IHP Asia-Pacific Regional Steering Committee (RSC-AP) was held in Putrajaya, Malaysia, from November 8 to 9, 2023. Deputy Director MORI Noriyuki attended from ICHARM and reported on the current status of its activities and achievements. RSC-AP is convened annually for the representatives of government agencies and UNESCO Category 2 centers in the Southeast Asia and Pacific region involved in UNESCO-IHP to gather and report on their activities and discuss strategic plans.

Photo 5-12 Participants in the session held on Day 1

On the first day, in the second session “IHP RSC-AP’s Impact on Water Science and Governance,” three representatives, the deputy director and two others from the Tonga Ministry of Land and Natural Resources and Malaysia’s Regional Humid Tropics Hydrology and Water Resources Center, made presentations and answered questions regarding the activities of their organizations.

On the second day, the 30th RSC-AP regular session took place. Each participating country presented a country report, followed by reports from UNESCO Category 2 centers and UNESCO Chairs. ICHARM reported on its research, training, and international networking activities, mainly in the previous year, which were in line with the priority items of the UNESCO-IHP-IX.

5.3.2 Collaboration with WMO

In parallel with The Typhoon Committee’s 18th Integrated Workshop, the 2nd meeting of the WMO Regional Association II (RA-II) Coordination Panel for Hydrology was held from November 27 to

December 1 in Bangkok, Thailand. The participants shared the progress of the activities of the individual expert teams and discussed future initiatives. In addition, a joint session took place to promote cooperation between the Typhoon Committee's Working Group on Hydrology and WMO RA-II and agreed on 10 actions to be achieved through the joint effort.

5.4 Other international networking activities

5.4.1 International Conference on Science and Technology for Sustainability 2023: Transforming Society to Become Resilient and Sustainable beyond Catastrophic Disasters

This international conference was hosted by the International Conference on Science and Technology for Sustainability 2023 Sub-Committee of the Science Council of Japan, in collaboration with the Japan Hub of Disaster Resilience Partners (JHoP) and the National Research Institute for Earth Science and Disaster Resilience (NIED) as co-organizers (see section 5.5 for more information on ICHARM, JHoP, and the Science Council of Japan). The event was planned on the occasion of the 100th anniversary of the Great Kanto Earthquake to reflect on Japan's experiences and its accumulated knowledge over the past century, alongside the lessons learned from the experiences of other countries and regions affected by massive earthquakes, violent tsunamis, and giant cyclones. The goal is to share these valuable insights with the members of the international community and hand them down to the younger generation, thereby strengthening international cooperation[11].

Photo 5-13 Executive Director KOIKE explaining the purpose of the international symposium

Photo 5-14 The conference in session

The event set two themes: Theme 1: Experiences of Catastrophic Disasters and Transformation and Theme 2: Pathways to Overcome Catastrophic Disasters. Both sessions included presentations by experts invited from Japan and overseas and panel discussions.

A high-level panel session was held on the afternoon of the second day, moderated by HIROKI Kenzo, a professor of GRIPS, and EGAWA Shinichi, a professor of International Cooperation for Disaster Medicine, Tohoku University. The speakers included Lidia Arthur Brito, the assistant director-

[11] https://www.scj.go.jp/ja/int/kaisai/jizoku2023/index.html

general for natural sciences at UNESCO (online), MIZUTORI Mami, the Special Representative of the UN Secretary-General (SRSG) for Disaster Risk Reduction and the Head of UNDRR (online), and Qunli HAN, the international project office director of Integrated Research on Disaster Risk (IRDR) of the International Science Council (ISC).

The conference adopted “Tokyo Statement 2023: Transforming Society to Become Resilient and Sustainable beyond Catastrophic Disasters,” stating the following among others[12]:

- In order to acquire resilience to overcome catastrophic disasters of the scale estimated by the government of Japan, all stakeholders should continue their efforts not only to prevent damage but also to focus on scientific studies and practices promoting disaster response and recovery.
- All stakeholders fully agree with the measures clearly described in the recommendation entitled "Transforming Society to Become Resilient and Sustainable beyond Catastrophic Disasters," which was issued by the Science Council of Japan on August 29, 2023.

5.4.2 Preparation for 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.

The 10th World Water Forum (WWF10), under the theme “Water for Shared Prosperity,” was held in Bali, Indonesia, in May 2024. ICHARM coordinated one of the six sub-themes, “Disaster Risk Reduction and Management,” listed in the thematic process. Our staff participated in the preparatory meeting held in Bali in mid-October 2023 and led discussions during the meeting. During the forum, they co-hosted and participated as a panelist in several sessions.

5.5 Other domestic networking activities

5.5.1 The Integrated Research on Disaster Risk (IRDR) Subcommittee of the Civil Engineering and Architecture Committee of the Science Council of Japan

The IRDR subcommittee aims to strengthen interaction with stakeholders, practitioners, and aid, academic, and other organizations in Japan and overseas, including the United Nations. It also encourages open and profound discussions on IRDR plans for the following term and leads the initial-phase activities set in the next-term plans.

Executive Director KOIKE and a chief researcher are members of the IRDR promotion group

[12] https://www.scj.go.jp/ja/int/kaisai/jizoku2023/pdf/seimei2023-en.pdf

created under the IRDR subcommittee.

5. 5. 2 Japan Hub of Disaster Resilience Partners (JHoP)

JHoP was established in March 2019 with support from the IRDR Japan National Committee and the IRDR subcommittee of the Science Council of Japan (SCJ), with NIED serving as its secretariat. Currently, 17 organizations, including ICHARM, participate in this project.

JHoP, according to its terms and conditions, aims to form a network of various organizations that cooperate to build science-based, disaster-resilient societies in Japan and overseas. To achieve this goal, JHoP promotes interdisciplinary and trans-disciplinary collaboration. It invites universities, research institutes, and administrative organizations involved in disaster management efforts from various disciplines of physics, engineering, agriculture, social science, psychology, health science, and medicine. It also encourages them to actively demonstrate their research, educational, and practical expertise. JHoP also seeks to develop OSS-SR and foster facilitators as tools that can be effectively applied to DRR, CCA, and SDGs, as proposed in the 2020 SCJ recommendation regarding the realization of a sustainable international community by strengthening disaster resilience.

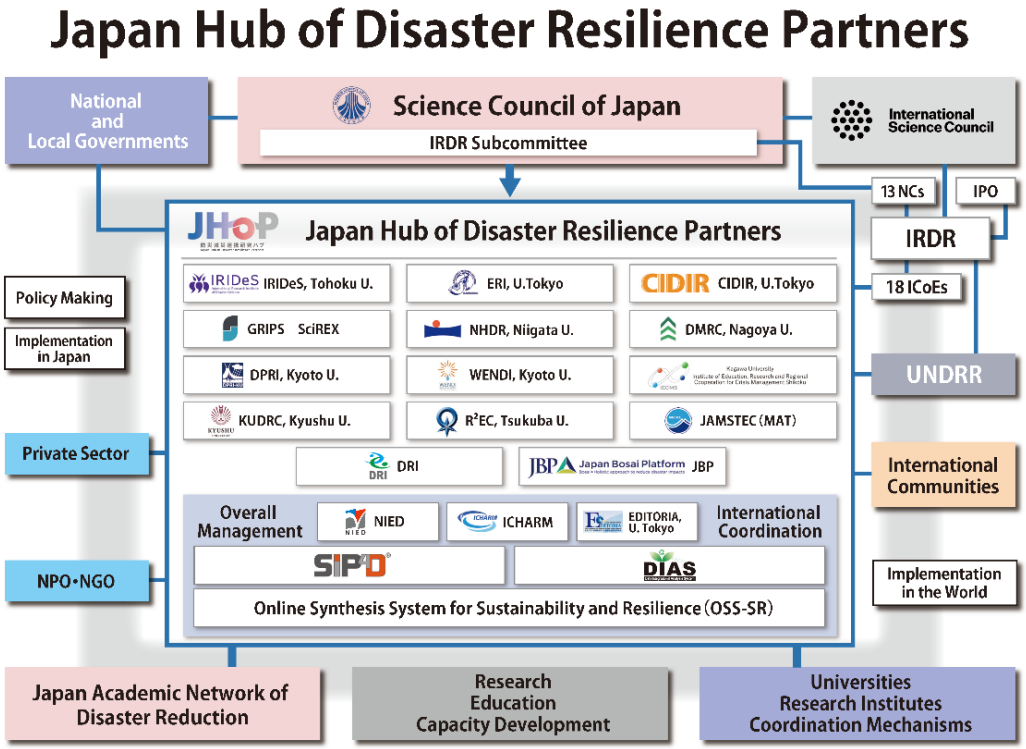


Figure 5-1 A conceptual image of a network for promoting research and capacity development with JHoP at the core of the industry-government-academia-private collaboration[13]

[13] https://www.bosai.go.jp/jhop/en/

5.6 Memorandum of Understanding

As part of its international networking activities, ICHARM signed a Memorandum of Understanding with the following institutes:

- June 30, 2023 IHE Delft Institute for Water Education
- October 26, 2023 Viet Nam Meteorological and Hydrological Administration (VNMHA)
- January 24, 2024 Davao del Sur State College, DOST XI (tripartite agreement)

Photo 5-15 Professor Eddie Moore (left) of IHE Delft

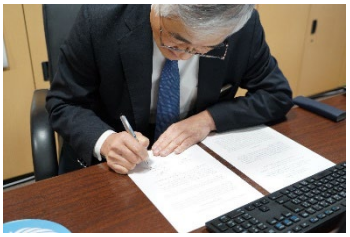


Photo 5-16 Executive Director KOIKE signing the MoU with VNMHA

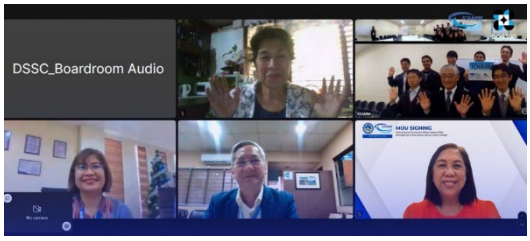


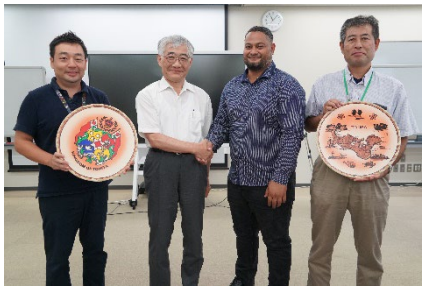
Photo 5-17 The signing ceremony with Davao del Sur College and DOST XI

5.7 Visitors

ICHARM constantly seeks opportunities to exchange views and ideas with domestic and international organizations to expand and strengthen our global network. In fiscal 2023, we received about 110 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
4/25	• Viet Nam Meteorological and Hydrological Administration (VHMHA) 	2
5/1	• University of California, Davis (UC Davis)	2

7/25-8/10	SATREPS project members from the Philippines ・ University of the Philippines Los Baños ・ University of the Philippines Diliman 	10
9/14	SATREPS project members from Argentina ・ National Meteorological Service ・ National Water Institute (INA) ・ CIMA/UBA-CONICE ・ IDIT/UNC-CONICET 	14
9/29-30	・ Ministry of Infrastructure, Building Division, Tonga 	1
10/10	・ Public Works Department, Sabah, Malaysia ・ Institution of Engineers Malaysia, Sabah Branch ・ Malaysia-Japan International Institute of Technology (MJIIT), University of Technology, Malaysia 	30
11/15	Group of young professionals from the Netherland ・ Department of Waterways and Public Works (Rijkswaterstaat) ・ Human Environment and Transport Inspectorate (ILT) ・ Authority for Nuclear Safety and Radiation Protection	40

	・ Ministry of Infrastructure & Water management ・ Netherlands Environmental Assessment Agency (PBL)	
11/20	・ World Bank officials	3
2/14	・ Center for Southeast Asian Studies (CSEAS), Kyoto University ・ Universiti Utara Malaysia	3
3/28	・ Department of Public Works and Highways (DPWH), the Philippines	5

5.7.1 Young professionals from the Netherlands

On November 15, 2023, a group of about 40 young professionals from the Netherlands visited ICHARM and discussed various issues with our staff. They are currently working at five government organizations: the Ministry of Infrastructure and Water Management, the Department of Waterways and Public Works, the PBL Netherland Environmental Assessment Agency, the Human Environment and Transport Inspectorate, and the Authority for Nuclear Safety and Radiation Protection. After our researchers delivered presentations about their research and other activities, Ms. Louise-Ann Zaat of the Ministry of Infrastructure and Water Management spoke about water management in Dutch rivers and future challenges, representing the delegation.

Photo 5-18 Dutch visitors with ICHARM staff

5.7.2 World Bank officials

On November 20, 2023, with support from the Japan Water Forum, three World Bank officials, Mr. Saroj Kumar Jha, the global director of water global practice, Ms. Sarah Nedolast, the program manager of global water security and sanitation partnership, and Ms. Eileen Burke, the global lead of water resources management, visited PWRI. They first exchanged views and ideas with their Japanese counterparts, including the PWRI president, the ICHARM executive director, and the MLIT HQs director. After that, they had a discussion session with 10 doctoral and 13 master's students studying at ICHARM. Five of them delivered a presentation about their research to the officials.



Photos 5-19,20,21 (from left) Mr. Saroj Kumar Jha, Ms. Eileen Burke, and Ms. Sarah Nedolast


Photos 5-22,23 Participants in the meeting (top) and in the discussion session

5.7.3 Department of Public Works and Highways (DPWH)

A group of five representatives from DPWH in the Philippines, led by Project Manager Grecile Christopher R. Damo, visited ICHARM on March 28, 2024, and discussed various issues with its researchers. The Filipino participants found the presentations by ICHARM researchers applicable to their work since the Philippines's topography is somewhat similar to Japan's. They also realized the importance of close collaboration among other domestic agencies, for example, with PAGASA, which manages rainfall data that DPWH needs for its research and other projects.

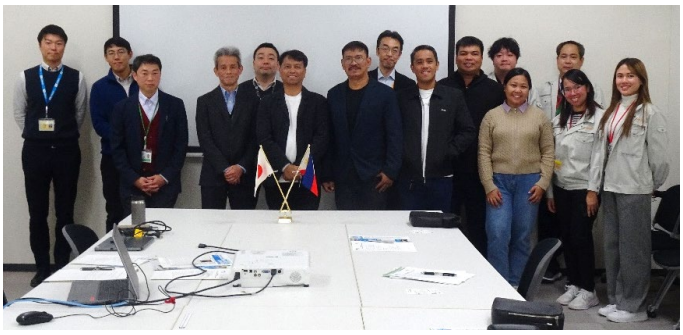


Photo 5-24 DPWH staff with ICHARM researchers

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 and delivered on-demand outreach programs for elementary school students.

Through organizing international forums in collaboration with GRIPS, ICHARM research and development seminars, and on-demand outreach programs, we shared with the general public the latest knowledge and information about water-related disasters around the world.

By participating in webinars hosted by the Asian Development Bank (ADB) and hosting webinars for World Bank staff, we provided information about the latest digital technologies and best practices implemented by ICHARM 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.

We also held the ICHARM Webinar FY2023, the first in two years, for domestic and international students and young researchers to learn about our activities. The event helped them deepen their interest in and understanding of ICHARM.

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 and deputy directors, as well as other staff members, 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	The 4th Summit of the Mekong River Commission (MRC)	April 2
2	Crosscutting Research on Hydrological Systems, Rivers, Climate Risk and Water-Food-Energy Nexus, a side event of a UNEDCO international conference "Climate Risk, Vulnerability and Resilience Building"	April 19
3	Global Conference of Parliamentarians on Population and Development (GCPPD2023) towards the 2023 G7 Hiroshima Summit, Session 1 "World	April 25

	Population hits 8 billion: What's next?" (Asian Population and Development Association)[14]	
4	Training session on "River Basin Disaster Resilience and Sustainability by All," 2023 Advanced Course, MLIT College	May 22
5	Seminar: Applications of High-resolution Rainfall-Runoff-Inundation (RRI) Model in Thailand under the project "Development of Rainfall-Runoff Modelling System and Application of Satellite-based Rainfall"	June 20
6	Regional Workshop on Aligning Climate Change and Disaster Risk Management Actions in South Asia: Overcoming Challenges and Exploring Opportunities	June 27
7	Davao City Water Summit: Where are we now and will be in the future?	July 4
8	Eai-Naruse-Yoshida River Basin Flood Control Symposium	July 5
9	Focus on Japanese solutions, the third session of ADB e-Marketplace 2023	July 25
10	Webinar on Climate Change Projection for Disaster Risk Reduction in Asia Pacific Region: 1st Webinar in FIJI	August 23
11	The 5th MLIT College Kodaira Web Forum: Global Trend of Water-related Disaster Management and Lessons Learned from Field Practices	August 30
12	The 122th GIST Seminar at GRIPS	September 14
13	Regional Action on Climate Change (RACC15)	September 30
14	JICA training course: Planning and Management of National Mapping and Surveying	October 12
15	Area-BCM Project Workshop	October 17
16	Wuhan University	October 18
17	IWHR Global Vision Forum	October 19
18	Greece-Japan Flood Mitigation Online Workshop 2023	October 27
19	The Regional Dialogue Platform in Central America: a forum to further integrate risk management and anticipatory action	November 1
20	The 30th UNESCO-IHP Regional Steering Committee for Southeast Asia and the Pacific	November 8
21	Special Lecture 2023 held by the Diet Members Association for the Promotion of the Japan Sea Coastal Zone and the Japan Sea Coastal Zone Promotion Federation	November 9
22	Research Institute of National Land Policy 2023 Tokyo Seminar on "River Basin Disaster Resilience and Sustainability by All"	November 13
23	An on-demand outreach program on "Efforts and Challenges to Reduce Water-related Disaster Damage around the World" at the Zoshigaya Community Cultural Creation Center	November 8
24	An on-demand outreach program on "Efforts and Challenges to Reduce Water-related Disaster Damage around the World" at Tsukuba City Takezono-nishi Elementary School	December 1
25	International Forum on Drought Disaster Management（Center on Flood and Drought Disaster Reduction	December 5
26	The 68th Hydraulic Engineering Session Agelu Symposium	December 12
27	Special lecture at Reitaku University	December 14
28	Webinar on Climate Change Projection for Disaster Risk Reduction in Asia Pacific Region: 2nd Webinar in NEPAL	January 10
29	Lecture on "River Basin Disaster Resilience and Sustainability by All" in a workshop about "Learning from Municipalities Prepared for Flood Disasters"	January 17
30	WMO Regional Specialized Meteorological Centre Forecaster Training FY2023	January 24
31	The 71st River Training Session in FY2023	January 25
32	ASIA-PACIFIC ECONOMIC COOPERATION (APEC 2024)	February 22
33	Lecture for the delegation of the Uzbekistan Ministry of Water Resources	March 4

[14] https://www.apda.jp/pdf/p02_report/project_gcppd2023_en.pdf

6.2 Youth outreach activities

6.2.1 Open Day

Photo 6-1 Students participating in the ICHARM 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 2023 open day was held in person, the first in four years, on April 24, attended by 104 students from Ibaraki Prefectural Takezono High School and Ibaraki Prefectural Namiki Secondary School.

The executive director gave a keynote lecture titled “Diversity and Interlinkage,” and a doctoral student made a short presentation about his research. Then, a poster session took place, in which master’s and doctoral students from eight different countries (Bhutan, Ethiopia, Nepal, Pakistan, the Philippines, Sri Lanka, Timor-Leste, and Tunisia) spoke about life, culture, and issues regarding water-related disasters in their nations. Feedback from students included comments such as, “All the foreign researchers seemed to enjoy talking about their research, and it made me strongly want to work overseas.”

6.2.2 On-demand outreach programs

Photo 6-2 Students listening to the lecture

On December 1, 2023, a chief researcher visited Tsukuba City’s Takezono-nishi Elementary School and delivered a short lecture entitled “Efforts and Challenges to Reduce Water-related Disaster Damage around the World” for its 130 fifth-grade students. After the lecture, the students answered a simple questionnaire. Of them, 68% found the lecture “Very interesting,” and 26% “Fairly interesting.” When asked about why they chose these answers (they were allowed to select multiple answers), 80% selected “The lecture was very informative,” and 67%, “The lecture included video clips and quizzes.” Overall, their positive responses suggested that the lecture successfully provided the young students with a meaningful learning experience.

6.2.3 Summer internship

PWRI offers the summer internship program annually as a job-hunting event for new staff recruitment. In fiscal 2023, ICHARM accepted three students from the universities listed below. They deepened their understanding of meteorology, hydrological and hydraulic analysis, sediment transport analysis, and disaster risk analysis by receiving advice from our researchers.

- The University of Tokyo graduate school (Japan)
- The University of Tokyo (Japan)
- Fukushima University (Japan)

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 fiscal 2023, two seminars were held and attended by many participants, including those from PWRI and NILIM. For more information, see ICHARM Newsletter Vol. 69 and Vol. 72.

<The 70th seminar (May 1, 2023)>

Speakers:

- M. Levent Kavvas, distinguished professor, Department of Civil and Environmental Engineering at UC Davis
- ISERI Yoshihiko, manager of the Hydrology Laboratory, Department of Civil and Environmental Engineering at UC Davis


Photos 6-3,4 (from left) Distinguished Professor Kavvas and Hydrology Laboratory Manager Iseri

Title:

Recent Advances in the Estimation of Extreme Precipitation and Extreme Floods – A Physics-based Perspective

<The 71st seminar (February 14, 2024)>

Speaker: YOSHIKAWA Minako, professor, Center for Southeast Asian Studies (CSEAS), Kyoto University

Title: Introduction to Center for Southeast Asian Studies, Kyoto University (CSEAS)

Speaker: Faizatul Akmar Abdul Nifa, associate professor, Universiti Utara Malaysia

Title: Post-Disaster Socio-Economic Community Empowerment: The Case of Kampung Iboi, Baling, Kedah, Malaysia

Speaker: Khai Lin Chong, senior lecturer, Universiti Utara Malaysia

Title: Bridging the Gap: Converting Flood Simulation Insights into Empowering Community

Programs



Photos 6-5,6,7 (from left) Professor Yoshikawa, Associate Professor Nifa, and Senior Lecturer Chong

6.3.2 International forums

ICHARM, together with GRIPS, has been conducting research on approaches to managing social infrastructure that is exposed to increasingly severe rainfall and deterioration. As part of this effort, on June 15, 2023, the two institutes jointly hosted a forum to discuss the future of basin-scale flood management and social infrastructure maintenance, addressing recent large-scale flood disasters and social infrastructure accidents. The forum was attended by 60 people in person and 136 online.


Photos 6-8,9 (from left) GRIPS President OTA and Mr. YOSHIOKA, the vice-minister for engineering affairs of MLIT

Photo 6-10 The forum in session

Photo 6-11 Panel discussion

The forum opened with opening remarks by GRIPS President OTA Hiroko and ICHARM Executive Director KOIKE Toshio, followed by remarks by Mr. YOSHIOKA Mikio, the vice-minister for engineering affairs of MLIT, and Mr. ISE Katsumi, the vice president of the East Japan Railway Company.

The forum's second part was titled "Climate Change and Major Flooding: The Severe Floods in Pakistan and Japan's Flood Control in River Basins" and featured two keynote speeches by Dr. Khalid Mahmood Malik, the chief meteorologist of the Flood Forecasting Division, Lahore, the Pakistan Meteorological Department, and Dr. Syed Sanaullah Shah, a risk assessment expert, in place of Dr. Syed

Salman Shah, the director general of the Sindh Province Disaster Management Department, who had to direct emergency response efforts for an ongoing cyclone disaster.

A panel discussion followed, moderated by Professor SUZUKI Hiroto of GRIPS, with Professor NAKAKITA Eiichi, the director of the Disaster Prevention Research Institute, Kyoto University, Professor CHIBANA Takeyoshi of GRIPS, and Professor OHARA Miho of the Center for the Integrated Disaster Information Research, The University of Tokyo, discussing the impact of climate change and how the basin-scale flood control should be carried out, as well as the challenges in communicating information on weather, rivers, and other relevant factors.

6.3.3 On-demand outreach program for Chitosebashi Community School

On November 8, 2023, the director for special research visited the Zoshigaya Community Cultural Creation Center in Toshima Ward, Tokyo, and spoke about global efforts and challenges in mitigating water-related disaster risks for the Chitosebashi Community School consisting of people who live, work, or go to school in the area.

Photo 6-12 Participants listening to the lecture

The audience attentively participated in the two-hour-long session. Some seemed to learn new information by taking a fresh look at the Toshima City Flood Hazard Map, while others asked questions about the definition of the first-class river and whether any flood prevention measures had been in place for the underground shopping center in Ikebukuro. All these indicated that the participants were highly interested in flood disasters.

6.4 Webinars for global practitioners

6.4.1 ADB e-Marketplace 2023

The Asian Development Bank (ADB) e-Marketplace is an annual event cohosted by the partners of the Water Resilience Hub, which is managed by the water sector group of ADB. Stakeholders in the private, government, and academic sectors from ADB's member countries gather and showcase the latest digital technology and best practices to deliver smart, resilient, safe, and inclusive water management and services. The event is also an opportunity to launch collaborative activities with those who have a common interest.

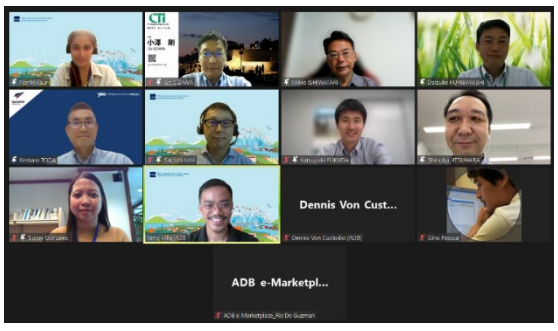


Photo 6-13 Participants in ADB e-Marketplace 2023

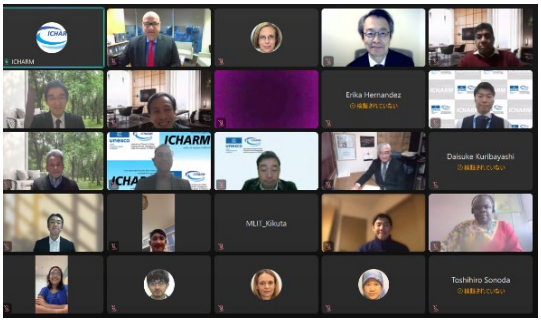
On July 25, 2023, the ADB e-Marketplace held its third session, "Focus on Japanese solutions,"

jointly organized with three Japanese agencies: the Japan Water Forum, the Ministry of Environment, and the Ministry of Trade, Economy and Industry. Six participants gave presentations. From ICHARM, a chief researcher spoke about ICHARM's innovative research, such as a flood forecasting system for small and medium-sized rivers in Japan, a virtual flood experience system using VR technology, and OSS-SR, implemented in Davao City, the Philippines.

6.4.2 Online seminar for World Bank staff

On January 30, 2024, ICHARM held an online seminar to introduce its research and other activities to World Bank staff. Twenty-nine people from the World Bank attended the event. First, ICHARM researchers presented their research, for example, hydrological analysis, which can also contribute to optimizing dam operations, and technologies to help policymakers make informed decisions. The presentations were followed by discussions about the use of satellite data in Africa, where ground data is scarce, the optimization of coordinated operations involving multiple dams, the implementation of a capacity development program at African universities, flood and drought early warning systems for food security, and a new framework for procurement procedures between the World Bank and ICHARM.

Immediately after the seminar, the two parties started a meeting to discuss flood management projects in Africa and India.



Photos 6-14,15 Mr. Saroj Kumar Jha, the global director of water global practice, addressing opening remarks (left) and participants in the seminar

6.5 Webinar FY2023

ICHARM held an online event, the ICHARM Webinar, on January 11, 2024, for the first time in two years. The purpose of this event was to widely disseminate its globally unique activities to students and young researchers at universities and research institutions in Japan and abroad. It was attended by 62 people, including students

Photo 6-16 Participants (on the screen) and ICHARM staff

currently studying at ICHARM. To facilitate participants' understanding of ICHARM and topics of their choice, the webinar consisted of two parts: a plenary session and parallel thematic discussions on meteorology, hydrology, sediment transport and channel changes, and disaster risk communication. In the parallel thematic discussions, the participants joined groups of their choice and had discussions with ICHARM researchers assigned to each group.

6.6 Presentation on ICHARM's research at symposiums held by PWRI

PWRI holds various kinds of symposium, such as "PWRI lectures", "PWRI New Technology Showcase," and "PWRI New Technology Seminar" to introduce and promote PWRI's research results and have consultation for application of the research results.

In FY 2023, ICHARM researchers introduced their research results in the following opportunities shown in Table 6-2. The total number of participants was about 4,700.

Table 6-2 Opportunities in which ICHARM's research results were introduced

Date	Title of symposium	Venue	Number of participants	Title
June 14, 2023	PWRI New Technology Seminar	Tokyo	690 (in parson: 105, Online: 585)	Development and prospect of Virtual Flood Experience System：VFES
July 27, 2023	PWRI New Technology Showcase 2023	Osaka	825 (in parson: 173, Online: 652)	Outline of RRI model
Sep. 27, 2023	PWRI New Technology Showcase 2023	Tokyo	1324 (in parson:251, Online: 1073)	Development of a simple, low-cost flood forecasting system for small and medium rivers
Oct. 11, 2023	PWRI lectures	Tokyo	767 (in parson:139, Online: 628)	Development of a simple, low-cost flood forecasting system for small and medium rivers
Oct. 12, 2023	PWRI New Technology Showcase 2023	Sendai	1118 (in parson: 120, Online: 998)	Outline of Virtual Flood Experience System：VFES

6.7 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 master's program graduates and other experts at international organizations in an attempt to gather news from diverse perspectives.

In FY2023, we published four issues of the newsletter from No. 68 to No. 71. The number of readers has reached about 5,500 worldwide (about 3,000 in Japan, about 2.000 from overseas, about 500 unknown). ANNEX 2 lists the articles published in the four issues.


Newsletter

Volume 18 No. 1
Issue No. 68
April 2023

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

Message from Executive Director

Building Process

"I believe that the building process of a sound water cycle itself can also contribute to peace-building."

This phrase is part of the opening remarks made by Ms. KAMIKAWA Yoko, the special envoy of the prime minister of Japan, as the co-chair of the session at the interactive dialogue on "Water for Climate, Resilience and Environment" at the UN Water Conference 2023 in New York in April 2023.

The United Nations had the plan to hold this conference for the first time in 46 years after the first one in Mar del Plata, Argentina, in 1977. In response, Japan launched concrete preparatory activities in 2019 towards the success of the conference and focused on organizing the 4th Asia-Pacific Water Summit in Kumamoto, Japan, which was defined as one of the regional processes of the conference by a related UN resolution. Around the same time, ICHARM was requested to host the 9th International Conference on Flood Management (ICFM9). Convinced that the event would effectively function as a bridge between the Kumamoto Summit and the UN Water Conference, we accepted the request and proposed that the ICFM9 be held in Tsukuba and Tokyo in February 2023 in collaboration with two partner organizations of Japan, the Ministry of Land, Infrastructure, Transport and Tourism and the National Graduate Institute for Policy Studies.

However, soon after the preparation started, the COVID-19 pandemic broke out, and the summit was postponed by more than one year. Furthermore, just before the summit, which had been rescheduled for April 2022, Russia invaded Ukraine, gravely violating international law. Many people have since been killed. The world has been thrown into a global health, food, and energy crisis. Due to the cumulative impact of these events, complex, cascading, and systemic risks latent in social, economic, and environmental systems have suddenly emerged and threatened human lives and prosperity beyond national boundaries. The world peace has been damaged seriously.

How can the world regain the peace where people people and people-nature relationships thrive in harmony? I kept pondering this question throughout the preparation processes for the Kumamoto Summit, the ICFM9, and the UN Water Conference.

Both society and nature are diverse. Science has yet to fully explain the meaning and value of diverse components in either realm or their linkages. However, as fellow earthlings, we must respect diversity, deepen our understanding of diversity, and make ceaseless efforts to fill gaps among diverse components through dialogues and identify and strengthen their interlinkages. In this context, summits and conferences are invaluable opportunities where we can promote unified collaboration by straining our ears to various voices, drawing on all scientific and indigenous knowledge, creating innovative visions, and co-designing and co-implementing concrete activities.

Ms. Kamikawa's phrase has reminded me of the meaning and significance of key "building processes."

April 28, 2023
KOIKE Toshio
Executive Director of ICHARM

Fig. 6-1 The top page of ICHARM Newsletter vol. 68

6.8 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 fiscal 2023.

Also, the number of views for each page from April 2023 to February 2024 is shown in Figure 6-2. According to this, 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.

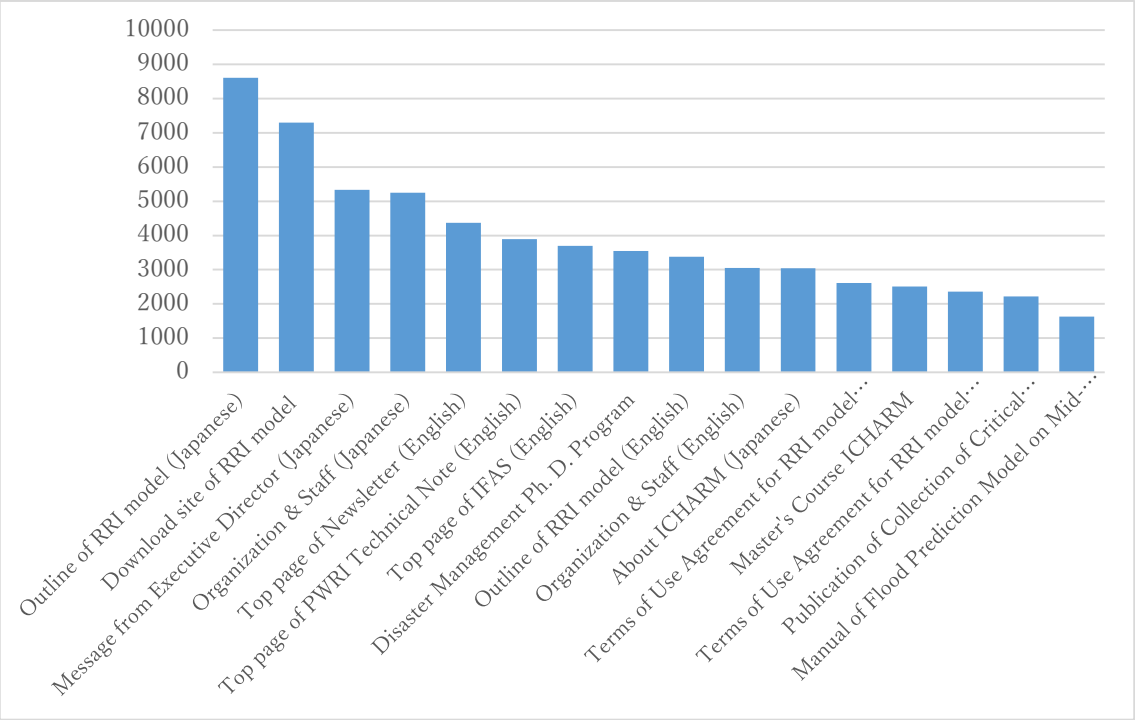


Figure 6-2 The number of views of popular pages on the ICHARM website (April 2023 – February 2024)

6.9 Publications

Table 6-3 shows the number of publications in which ICHARM researchers involved in fiscal 2023. ANNEX 4 shows the list of research papers and articles.

Table 6-3 Number of publications in which ICHARM researchers involved

Category	Number
Peer Reviewed Papers	12
Non-peer Reviewed Paper, Oral Presentation	23
Poster Presentation	2
PWRI Publication	3
Magazine, Article	1

7． Awards

This section presents awards given to ICHARM or its staff in fiscal 2023.

As mentioned in section 2.4, on June 20, 2023, ICHARM, along with GRIPS, JICA, and IISEE, received the Japan Construction International Award (Pioneering Activity Category) from the minister of MLIT for the Disaster Management Policy Program, implemented by ICHARM in collaboration with JICA and GRIPS.

Photo 7-1 Award ceremony


表彰状

第6回 JAPANコンストラクション国際賞
先駆的事業活動部門

ディザスターマネジメントポリシープログラム
国立研究開発法人 土木研究所
水災害リスクマネジメント国際センター（ICHARM） 殿

標記の活動は、海外における我が国企業のプレゼンスを向上し我が国企業による「質の高いインフラ」の実現に寄与するものであることからこれを賞します

令和5年6月20日
国土交通大臣 斉藤鉄夫

6th Japan Construction
International Award
(Pioneering Activity Category)

Presented to
International Centre for
Water Hazard and Risk Management, ICHARM,
under the auspices of UNESCO,
Public Works Research Institute, PWRI

for
Disaster Management Policy Program (DMP)

20 June 2023
Minister of Land, Infrastructure,
Transport and Tourism of Japan
Tetsuo Saito

Photo 7-2 The certificate of the Japan Construction International Award

On October 19, 2023, Executive Director KOIKE Toshio received the title of Honorary Professor from the China Institute of Water Resources and Hydropower Research (IWHR).


聘书
Letter of Appointment

兹聘请小池俊雄教授为中国水利水电科学研究院名誉教授。

We hereby take the honor to appoint Prof. KOIKE Toshio as the Honorary Professor of China Institute of Water Resources and Hydropower Research.

二〇二三年十月十九日
October 19, 2023

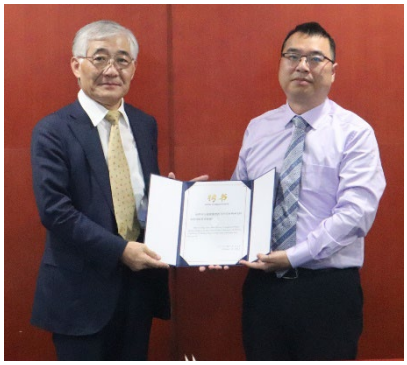


Photo 7-3 Executive Director KOIKE (left) receiving the Letter of Appointment from LIU Yi, Ph.D. in engineering, the vice president of IWHR.

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 7th Governing Board meeting was held on September 6, 2023, in a hybrid format, attended by a total of 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 fiscal 2022. Following this, it reviewed the amendments to the Work Plan, which is the activity plan from April 2022 to March 2024, and it was unanimously adopted.

Table 8-1 The list of participants in the 7th ICHARM Governing Board meeting (organizations in alphabetical order)

Name	Position Title, Organization
Masako KUROSAWA	Vice President, GRIPS, on behalf of President Hiroko OTA
Mikio YOSHIOKA	Vice Minister for Engineering Affairs, MLIT
Koichi FUJITA	President, PWRI
Yuki MATSUOKA	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
Yasuto TACHIKAWA	Chair Holder, UNESCO Chair on Water, Energy and Disaster Management for Sustainable Development (WENDI)
Stefan UHLENBROOK	Director of Hydrology, Water and Cryosphere, WMO, on behalf of Deputy Secretary-General Elena MANAENKOVA

Photo 8-1 Participants and staff in the 7th ICHARM Governing Board Meeting

8.2 Organization

The number of ICHARM staff was 44 as of April 2023 and 43 as of March 2024, 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 2024, 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 do 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 The staff composition of ICHARM

Position	No. of staff (as of Apr. 2023)	No. of foreign/ female staff	No. of staff (as of Mar. 2024)	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	Female:1	1	Female:1
Chief Staff (administrative staff)	1	Female:1	1	Female:1
Administer (administrative staff)	1		1	
Chief Researcher	4		4	
Senior Researcher	6	Foreign: 1	6	Foreign: 1
Researcher	2		2	
Research Specialist	10	Foreign: 4 Female: 3	8	Foreign: 4 Female: 2
Collaborating Researcher	0		0	
Research Assistant	3	Foreign: 3	4	Foreign: 4
Assistant	12	Female: 10	12	Female:10
Total	44	Foreign: 7 Female: 15	43	Foreign: 9 Female: 14

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

<ANNEX>

ANNEX 1: Number of Alumni of ICHARM training program

ANNEX 2: Newsletter contents

ANNEX 3: Major updates on ICHARM Website

ANNEX 4: Publication list

ANNEX 1: Number of Alumni of ICHARM training program

(as of September 2023)

Country / Year	Afghanistan	Bangladesh	Bhutan	Bosnia-Herzegovina	Brazil	Cambodia	China	Colombia	El Salvador	Ethiopia	Djibouti	Fiji	Guatemala	India	Indonesia	Japan	Kenya	Laos	Liberia	Malaysia	Malawi	Maldives	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
Total	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**2**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**2**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**17**

Master's. Program "Water-related Disaster Management Course of Disaster Management Policy Program"

(as of September 2023)

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			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		2		8
2017-2018		2			1							1		1												2			2		1			2		1					1		14
2018-2019		1												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
Total	**0**	**25**	**7**	**0**	**5**	**0**	**11**	**3**	**1**	**2**	**0**	**3**	**1**	**5**	**8**	**4**	**4**	**0**	**1**	**5**	**2**	**1**	**1**	**1**	**10**	**15**	**0**	**1**	**18**	**1**	**13**	**1**	**1**	**17**	**0**	**1**	**1**	**3**	**1**	**2**	**2**	**4**	**1**	**182**

Number of countries with DM & DMP graduates

0 32 7 0 5 0 11 3 1 3 0 3 3 5 8 6 4 0 1 5 2 1 1 1 10 15 1 1 20 1 13 1 1 18 0 1 1 3 1 2 2 5 1 37

JICA training program "Flood Hazard Mapping"

2004						2	2								2			3		2											2					2					1			16
2005						2	2								2			2		2											3					1					2			16
2006						2	2								2			2		2											2					2					2			16
2007						2	2								3			2		3											2			1		3					2			20
2008						1	2											2		2											1					1					1			10
Total						**9**	**10**								**9**			**11**		**11**											**10**			**1**		**9**					**8**			**78**

JICA training program "Local Emergency Operation Plan with Flood Hazard Map"

2009		1	1												2			1							1				1						1	1		1						10
2010		1	2												2			1							1	1			1						1	1		1						12
2011		1	2												2			2							1				1						1	1								11
Total		**3**	**5**												**6**			**4**							**3**	**1**			**3**						**3**	**3**		**2**						**33**

JICA training program "Capacity Development for Flood Risk Management with IFAS"

2012(A)		3															3												2			2							3						13
2012(B)																																										7		7
2013		3															3												2			3							2			3		16
2014		3	3														3												3			3							3			2		20
2015			1	2							1						2								4				2			4			2				2					20
2016			2	1										1			4								2				2			4			2									18
2017				1										1			2								2							2			2									10
Total		**9**	**6**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**2**	**0**	**0**	**17**	**0**	**0**	**0**	**0**	**0**		**0**	**8**	**0**	**0**	**11**	**0**	**0**	**18**	**0**	**0**	**6**	**0**	**0**	**10**	**0**		**0**	**0**	**12**	**0**	**104**

JICA training program "Capacity Development for Adaptation to Climate Change"

2010		**1**													**3**																**1**					**1**					**1**			**7**

UN/ISDR Training course "Comprehensive Tsunami Disaster Prevention"

2008														**2**	**4**							**2**										**3**												**11**

UNESCO Pakistan Project workshop

2012																													6														6
2013																													5														5
2016	2																												2														4
2017	2																												2														4
Total	**4**																												**15**														**19**

Country / Year	Afghanistan	Bangladesh	Bhutan	Bosnia-Herzegovina	Brazil	Cambodia	China	Colombia	El Salvador	Ethiopia	Djibouti	Fiji	Guatemala	India	Indonesia	Japan	Kenya	Laos	Liberia	Malaysia	Malawi	Maldives	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
Total	4	45	18	4	5	9	21	3	1	3	1	3	3	9	30	6	21	15	1	16	2	3	1	1	21	16	1	12	38	1	42	1	1	31	3	1	23	3	1	2	2	26	1	451

Volume18, No.1, Issue No.68, April 2023

Volume18, No.2, Issue No.69, July 2023

Volume18, No.4, Issue No.71, January 2024

ANNEX 3: Major updates on ICHARM Website

Apr.	28	ICHARM Newsletter Volume 18 No.1 (Issue No.68) is now available
	28	Message from Executive Director updated.
May	26	The 70th ICHARM R&D Seminar
	26	ICHARM participated UNESCO's international conference and organized a side event
Jun.	30	ICHARM presented with the Minister of Land, Infrastructure, Transport and Tourism Award for its master's program
	30	Joint forum with GRIPS on social infrastructure comprehensive management
Jul.	4	ICHARM's action commitment "Water Cycle Integrator" globally known through the UN 2023 Water Conference
	18	Memorandum of Understanding on Research Cooperation with IHE Delft extended
	11	ICHARM Organization & Staff is updated
	31	ICHARM Newsletter Volume 18 No.2 (Issue No.69) is now available
Sep.	1	Report on The 9th International Conference on Flood Management (ICFM9) (only in Japanese) updated
	15	7th ICHARM Governing Board meeting was held
Oct.	26	Accepting applicants for Ph.D. Disaster Management Program 2024
	26	RRI-GUI model updated
	31	ICHARM Newsletter Volume 18 No.3 (Issue No.70) is now available
Nov	10	ICHARM Organization & Staff is updated
	28	ICHARM concludes an Memorandum of Cooperation (MoC) on Water Resilience and Disasters with VNMHA
Dec.	5	Invitation to ICHARM Webinar FY2023
	11	ICHARM Executive Director received the title of Honorary Professor by IWHR
	26	Dutch professionals visited PWRI
	26	Outreach program about water-related disasters for fifth-grade students
Jan.	23	World Bank officials visited PWRI
	31	ICHARM Newsletter Volume 18 No.4 (Issue No.71) is now available
Mar.	1	ICHARM held an online seminar with the World Bank
	7	ICHARM Webinar FY2023 was held after a two-year gap
	8	ICHARM held a follow-up seminar for former and current students of its graduate programs
	14	Report on 2019-2020 M.Sc. Program, "Water-related Disaster Management Course of Disaster Management Policy Program" has been published.
	18	ICHARM held the 71st R&D Seminar
	26	ICHARM signed an MoU on joint research with DSSC and DOST XI, the Philippines

ANNEX 4: Publication list

ICHARM Publication List (April 2023 ~ March 2024)

A. Peer Reviewed Papers

- Sanjeewa Illangasingha, Toshio Koike, Mohamed Rasmy, Katsunori Tamakawa, Hirotada Matsuki, Hemakanth Selvarajah, A holistic approach for using global climate model (GCM) outputs in decision making, Journal of Hydrology, Elsevier B.V., Volume 626, Part B, November, 2023
- Daisuke Harada, Shinji Egashira, Method to evaluate large-wood behavior in terms of the convection equation associated with sediment erosion and deposition,Earth Surface Dynamics (ESurf), European Geosciences Union, Vol.11, issue6, pp. 1183-1197, November, 2023
- Rie Seto, Toshio Koike, Misako Kachi, Feasibility of liquid water path estimation of over land using satellite-based Ka-band passive microwave data, IEEE Transactions on Geoscience and Remote Sensing, IEEE, Vol.62, pp. 1-20, December, 2023
- 会田健太郎、久保田啓二朗、浅沼順、開發一郎、小池俊雄、モンゴル長期土壌水分観測データを用いた衛星SAR土壌水分推定アルゴリズムの汎用性向上のための検討、土木学会論文集特集号（水工学）、土木学会、第80巻 16号、2023年12月
- 江頭進治、南雲直子、原田大輔、秦梦露、浮遊砂卓越河川における流砂の分級について、土木学会論文集特集号（水工学）、土木学会、第80巻 16号、2023年12月
- 秦梦露、原田大輔、江頭進治、斜面侵食に着目した流域土砂輸送モデル、土木学会論文集特集号（水工学）、土木学会、第80巻 16号、2023年12月
- 原田大輔、江頭進治、Md Majadur Rahman、浮遊砂が卓越する河川における流路変動の解析、土木学会論文集特集号（水工学）、土木学会、第80巻 16号、2023年12月
- SYLDON Pema, Shrestha Badri Bhakta, MIYAMOTO Mamoru, TAMAKAWA Katsunori, NAKAMURA Shinichiro, Assessing the Impact of Climate Change on Flood Inundation and Agriculture in the Mountainous Region of Bhutan, Journal of Hydrology: Regional Studies, Elsevier B.V., No.52, January 25, 2024
- Kohei Hosonuma, Kentaro AIDA, Vicente Ballaran, Jr, Naoko NAGUMO, Patricia Ann Sanchez, Tsuyoshi Sumita, Koki Homma, Evaluation of geographical and annual changes in rice planting patterns with satellite images in flood-prone area of Pampanga River Basin, the Philippines, Remote Sensing, MDPI, No.16 pp.499, January 28, 2024
- Md.Khairul Hasan, Abdul Wahid Mohamed RASMY, KOIKE Toshio, TAMAKAWA Katsunori, An integrated approach for the climate change impact assessment on the water resources in the Sangu river basin, Bangla-desh, Water, MDPI, No.16, pp.745, February 29, 2024
- Badri Bhakta Shrestha, Abdul Wahid Mohamed RASMY, Takafumi SHINYA, Assessment of flood damage to residential houses and analysis of effectiveness of flood damage reduction measures, Journal of JSCE, JSCE, Volume 12, Issue 2, February, 2024
- Vicente Ballaran, Jr, OHARA Miho, Abdul Wahid Mohamed RASMY, HOMMA Koki, AIDA Kentaro, HOSONUMA Kohei, Improving rice crop damage estimation from flooding events using

open‐source satellite data and UAV image data, AgriEngineering,,No 6, pp.574-596, March 4, 2024

B: Non-peer Reviewed Paper

None

C: Oral Presentation

- Daiki KAKINUMA, Development of a real-time flash flood prediction system using data assimilation for small and medium-sized rivers, International Conference on Climate Risk, Vulnerability and Resilience Buildingm UNESCO, April 19, 2023
- Mamoru MIYAMOTO, Enhancement of Flood Resilience through Platform on Water Resilience and Disasters, International Conference on Climate Risk, Vulnerability and Resilience Buildingm UNESCO, April 19, 2023
- Daisuke HARADA, Shinji EGASHIRA, Method to evaluate sediment-driftwood transport processes with flood runoff in a basin during heavy rainfalls, EGU General Assembly 2023 (Online presentation), European Geoscience Union, April 23, 2023
- Shrestha Badri Bhakta, Abdul Wahid Mohamed RASMY, Takafumi SHINYA, Dynamics of Land Cover Changes and Their Vulnerability to Extreme Flood in the Bengawan Solo River Basin of Indonesiam 日本地球惑星科学連合 2023 年大会, 日本地球惑星科学連合, May 21, 2023
- 原田大輔、江頭進治、降雨-土砂・流木流出モデルに基づくハザード予測に関する研究、2023 年度河川技術に関するシンポジウム、土木学会水工学委員会、土木学会水工学委員会、2023 年 6 月 23 日
- KOIKE Toshio, Promoting water cycle consilience, IUGG Berlin 2023, IUGG, July 11, 2023
- USHIYAMA Tomoki, Mohamed Rasmy Abdul Wahid, Ralph Allen Acierto, TAMAKAWA Katsunori, KUBOTA Keijiro, KOIKE Toshio, Challenges in forecasting heavy rainfall during 2018 and 2019 floods in Kerala, India, ASIA OCEANIA GEOSCIENCES SOCIETY (AOGS) 2023, 20th Annual Meeting, Asia Oseania Geoscienes Society, July 30, 2023
- Mohamed Rasmy Abdul Wahid, USHIYAMA Tomoki, AIDA Kentaro, TAMAKAWA Katsunori, KUBOTA Keijiro, KOIKE Toshio, Challenges in Monitoring and Forecasting Flood Hazards in Developing Countries, ASIA OCEANIA GEOSCIENCES SOCIETY (AOGS) 2023, 20th Annual Meeting, Asia Oseania Geoscienes Society, July 30, 2023
- HARADA Daisuke, EGASHIRA Shinji, Methods to evaluate sediment-driftwood runoff processes during heavy rainfall and its application to the hazard prediction, 40TH IAHR WORLD CONGRESS 2023, IAHR, August 21, 2023
- MITSUHASHI Hisashi, Practical Integration of Science and Technology to Water-related DRR in Cities, International Training Workshop on Smart Cities for Building Inclusive, Resilient, Livable, and Sustainable Cities and Communities in Asia and the Pacific, United Nations Centre for Regional Development (UNCRD), August 31, 2023

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- 下田一太、山田和芳、久保純子、本村充保、南雲直子、藤木利之、森勇一、山口博之、中西利典、カンボジア中部サンボー・プレイ・クック遺跡群の古環境復元調査、日本第四紀学会 2023 年大会、日本第四紀学会、2023 年 9 月 1 日
- NAGUMO Naoko, NAITO Kensuke, QIN Menglu, HARADA Daisuke, YOROZUYA Atsuhiro, EGASHIRA Shinji, The formation and sediment size characteristics of natural levees along an artificial channel, IAG Regional Conference on Geomorphology 2023, International Association of Geomorphologists (IAG), September 12, 2023
- KUBO Sumiko, SHIMODA Ichita, NAGUMO Naoko, FUJIKI Toshiyuki, MORI Yuichi, MOTOMURA Mitsuyasu, So Sokuntheary, YAMADA Kazuyoshi, Geomorphological survey around the World Heritage site of Sambor Prei Kuk, Cambodia: with LiDAR and trench excavations, IAG Regional Conference on Geomorphology 2023, International Association of Geomorphologists (IAG), September 12, 2023
- 大原美保、南雲直子、内藤健介、Shrestha Badri Bhakta、宮本守、新屋孝文、安川雅紀、Patricia Ann J. SANCHEZ、洪水ハザードマッピング・リスク評価技術のための e ラーニングの実践、第 42 回日本自然災害学会学術講演会、日本自然災害学会、2023 年 9 月 17 日
- Kattia Rubi Arnez Ferrel, HARADA Daisuke, EGASHIRA Shinji, Characteristics of bank erosion in meandering river, River, Coastal, and Estuarine Morphodynamics (RCEM2023), September 25, 2023
- 小藪剛史、傳田正利、3 次元測量・3 次元 CAD を用いたオープンデータの補正・統合化による景観再現に関する研究、第 48 回土木情報学シンポジウム、土木学会、2023 年 9 月 28 日
- Kohei Hosonuma, Koki Homma, Vicente Ballaran, Jr., AIDA Kentaro, Tsuyoshi Sumita, Naoko NAGUMO, Detection of rice cropping by SAR imagery in the flood-prone area in Pampanga River Basin, 6th International Rice Research Congress 2023, Philippines, October 16, 2023
- Koki Homma, Kohei Hosonuma, Abdul Wahid Mohamed RASMY, AIDA Kentaro, Vicente Ballaran, Jr., Aurelio A. Delos Reyes Jr., Rubenito M. Lampayan., Tsuyoshi Sumita, Simulation trial of drought and flood damage on rice production in Pampanga River Basin in Philippine, 6th International Rice Research Congress 2023, Philippines, October 16, 2023
- MITSUHASHI Hisashi, Research on flood hazard risk analysis and online synthesis system for sustainability and resilience, Greece – Japan Flood Mitigation Online Workshop 2023, The Greek Government and NIED, October 27, 2023
- 大原美保、会田健太郎、南雲直子、Vicente Ballaran, Jr.、広域水害時の迅速な被害状況把握に向けた Google Earth Engine の活用 ーフィリピン共和国での活用事例ー、日本災害情報学会第 27 回学会大会、日本災害情報学会、2023 年 10 月 28 日
- 光橋尚司、世界の水災害軽減への取り組みと課題、ちとせ橋コミュニティ塾、雑司ヶ谷地域文化創造館、2023 年 11 月 8 日
- Qin Menglu, HARADA Daisuke, EGASHIRA Shinji, PREDICTION OF FLOOD AND SEDIMENT HAZARDS IN WATERSHEDS FOCUSING ON RAINFALL RUNOFF AND SEDIMENT TRANSPORT PROCESSES, 3rd International Symposium of Water Disaster Mitigation and Water Environment Regulation (WDWE2023), November 15, 2023

ANNEX 4: Publication list

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G: Others

None