



ICHARM 20th Anniversary Commemorative Volume

-Reflecting on the Past 20, Envisioning the Next 20-

(Tentative version)

2026.6

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



ICHARM 20th Anniversary Publication

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<Preface>



FUJITA Koichi

**President,
Public Works Research Institute (PWRI)**

The International Centre for Water Hazard and Risk Management (ICHARM) under the auspices of UNESCO was established at the Public Works Research Institute in March 2006 based on an agreement between the Japan government and the United Nations Educational, Scientific and Cultural Organization (UNESCO). Since then, ICHARM has served as an indispensable center within PWRI, vigorously pursuing activities that contribute to the prevention and mitigation of water-related disasters, grounded in its three pillars: innovative research, effective capacity development, and efficient information networking.

Building on the achievements presented in the 10th anniversary volume published in 2016, we are now pleased to issue this 20th anniversary commemorative volume, which summarizes the developments and accomplishments of the most recent decade. I would like to take this opportunity to express my sincere gratitude to all those who have extended their generous support to ICHARM's activities.

Over the past twenty years, extreme water-related events have been increasingly frequent in many parts of the world, including Japan, with the resulting damage becoming ever more severe. Today the international community has reached a shared understanding that it is essential to continuously implement comprehensive measures in order to prevent and reduce water-related disasters. At this critical juncture, the global role of ICHARM will only continue to grow in significance.

It is my hope that this commemorative volume will serve as a foundation for reflecting together on the direction ICHARM should pursue in the coming decade.

<Message>



OTA Hiroko

**President,
National Graduate Institute for Policy Studies**

Congratulations on the 20th anniversary of ICHARM's establishment. I would like to express my sincere respect for ICHARM's achievements in building an international network, advancing multifaceted research, and dedicating itself to human resource development in response to increasingly severe water-related disasters, including both floods and droughts.

The National Graduate Institute for Policy Studies (GRIPS) is a graduate university specializing in policy research and education, bringing together policymakers from more than 50 countries. As a key pillar of our educational programs, we launched the Disaster Management Program in collaboration with ICHARM, starting the master's course in 2007 and the doctoral course in 2010. We take great pride in the many outstanding graduates who have gained deep knowledge of both theory and practice and who consistently strive to develop solutions grounded in real-world challenges.

Water, which is essential to both the Earth and human society, must be managed wisely through collective knowledge to ensure sound water circulation and reduce disaster risks. We look forward to ICHARM's continued success, and GRIPS will likewise continue to devote its efforts and creativity to contributing to the development of highly capable professionals in this vital field.



YOSHIKAWA Yoshifumi

**Senior Vice President,
Japan International Cooperation Agency**

On behalf of JICA, I would like to extend my sincere and profound congratulations on the 20th anniversary of ICHARM's establishment.

Since its inception in 2006, ICHARM has made remarkable contributions to the international community through its research, training, and policy recommendations aimed at reducing water-related disaster risks. By accepting many JICA participants into its master's and doctoral programs, and other Knowledge Co-Creation Programs, ICHARM has played an essential role in strengthening capacities in the field of water-related disaster management. We take great pride in seeing these graduates now serving at the forefront of administration and research in their respective countries. We are also deeply grateful for the quarterly Alumni Webinars launched in fiscal year 2024, which share the latest developments and foster exchanges between alumni and current students. In addition, we sincerely appreciate ICHARM's contributions not only to these programs but also to initiatives such as SATREPS.

While countries around the world continue their efforts toward achieving the Sendai Framework for Disaster Risk Reduction and JICA is supporting these efforts, floods and landslides triggered by unprecedented rainfall are occurring with increasing frequency. As ICHARM marks the 20th anniversary, JICA looks forward to further strengthening our partnership with the Center, deepening the practice of "co-creation" and "innovation," and contributing even more to capacity development in disaster risk reduction and to the reduction of water-related disaster risks in developing countries.



HIROSE Masayoshi,

**Vice Minister for Engineering Affairs, Ministry of
Land, Infrastructure, Transport and Tourism
(MLIT)**

On behalf of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), I would like to extend my heartfelt congratulations on the 20th anniversary of ICHARM's establishment.

In recent years, water- and sediment-related disasters have become more frequent and severe around the world. At MLIT, we are accelerating and strengthening the implementation of a basin-wide flood control policy known as “River Basin Disaster Resilience and Sustainability by All” in collaboration with various stakeholders. This policy takes a comprehensive, multilayered approach in which all stakeholders in a river basin are expected to work together to advance disaster prevention and mitigation and ultimately enhance national resilience.

In addition, MLIT is continuing our effort to expand this policy toward more comprehensive water management to address rapidly changing social conditions and increasingly aging water infrastructure. While this approach primarily focuses on water-use and environmental fields, it also calls for the collective efforts of all stakeholders in a river basin.

Furthermore, in March 2026, MLIT formulated its Sixth Basic Plan for Science and Technology Policy. Under the vision of creating an “innovation ecosystem” that drives technological innovation in response to societal change, the ministry is committed to strengthening research and development, accelerating social implementation, and developing the human resources needed to support technology policies, all with the aim of building a sustainable and resilient society and creating a safe, secure, and prosperous future.

For the past 20 years since its establishment, ICHARM has consistently advanced disaster risk reduction efforts on the ground around the world, based on its three core pillars of activity: innovative research, effective capacity development, and efficient information networking. Even within the past decade alone, ICHARM has made significant achievements in these areas. It has been vigorously engaged in cutting-edge research and development, including the Rainfall–Runoff–Inundation (RRI) model, which makes essential contributions to carrying out basin-wide

flood control. It has also assisted countries in Asia and Africa in shaping concrete disaster risk reduction actions through the “Platform on Water Disasters and Resilience” activities, where cross-sectoral stakeholders collaborate. In addition, ICHARM has made major strides in human resource development through its master’s and doctoral programs for government officials from developing countries.

These initiatives align with the direction set forth in MLIT’s Basic Plan for Science and Technology Policy, and, in this sense, ICHARM has become an indispensable center for MLIT’s administrative mission.

In recognition of these long-standing efforts, ICHARM has received various honors, including the UNESCO Contribution Award in June 2025. It is truly encouraging to see ICHARM’s many years of contributions increasingly acknowledged by the international community.

I sincerely hope that ICHARM will continue to further its efforts to reduce water-related disaster risks, in close collaboration with MLIT, and thereby further contribute to the mainstreaming of water-related disaster risk reduction both in Japan and around the world.



MATSUOKA Yuki,

**Head of UNDRR Kobe Office,
the United Nations Office for Disaster Risk Reduction**

On behalf of the United Nations Office for Disaster Risk Reduction, I would like to congratulate the International Centre for Water Hazard and Risk Management (ICHARM) on this occasion of the twentieth anniversary of its establishment. I would also like to express my gratitude for the opportunity given to UNDRR to join the ICHARM Governing Board. For over a decade, I have served as a member of the ICHARM Governing Board, which has provided me with a valuable opportunity to gain a deeper understanding of ICHARM's achievements in research and capacity development that contribute to the implementation of the Sendai Framework for Disaster Risk Reduction.

As emphasized in the Sendai Framework for Disaster Risk Reduction, science-backed evidence for disaster risk reduction (DRR) is of paramount importance. Furthermore, supporting capacity building of developing countries regarding the application of knowledge and technology for disaster risk reduction is crucial. From this perspective, UNDRR wishes to express our respect for ICHARM's research achievements and its capacity development activities in reducing water-related disasters. UNDRR looks forward to exploring further synergies with ICHARM. We also hope that ICHARM's capacity-building programs will lead to the empowerment of more women.

As UNDRR is committed to promoting gender equality in the field of disaster risk reduction, we have consistently advocated within the ICHARM Governing Board for ensuring gender equality within ICHARM's work as well as for incorporating gender statistics into reporting of ICHARM's activities to share its related outcomes. I highly commend the fact that ICHARM has demonstrated certain improvements and reported achievements in the area over the past decade. At the same time, I also look forward to ICHARM continuing its consistent efforts—such as incorporating gender-related targets into its performance indicators—which will lead to further achievements and their dissemination.

There are now less than five years remaining until 2030, when the Sendai Framework for Disaster Risk Reduction will expire. Looking toward 2030 and beyond, UNDRR looks forward to continued collaboration with Japanese stakeholders involved in disaster risk reduction—including ICHARM—as they continue to lead the global agenda on disaster risk reduction.



Expectations for ICHARM graduates as future leaders in global water-related disaster prevention and mitigation

TACHIKAWA Yasuto

Professor, Graduate School of Engineering, Kyoto University

Chairholder, UNESCO Chair on Water, Energy and Disaster Management for Sustainable Development (WENDI)

In the 20 years since its establishment, ICHARM has achieved remarkable outcomes internationally in both research and development, capacity building, and the establishment of information networking.

In particular, in the area of capacity building, ICHARM has operated graduate programs with master's and doctoral degrees in cooperation with the Japan International Cooperation Agency (JICA) and the National Graduate Institute for Policy Studies (GRIPS), and has trained professionals in water-related disaster prevention and mitigation by accepting many international students from abroad. I understand that the number of graduates has reached 226 by 2025.

Human resource development takes time and requires continuous effort. It must have been quite a challenge for ICHARM members to guide international students during their busy work schedule to develop their skills and abilities to the level that would enable them to receive a degree. The fact that ICHARM graduates are returning to their home countries to serve as technical leaders for government agencies and other organizations in developing countries is a great contribution by Japan to mitigate water-related disasters around the world.

I hope that ICHARM will continue to produce excellent human resources and further enhance the reputation of ICHARM and PWRI.

1. ICHARM History -Reflecting on the Past 20, Envisioning the Next 20-

1) Reflecting on the Past 20

ICHARM was established in March 2006 with the mission of "contributing to the mitigation of water-related disasters worldwide by sharing Japan's experiences with water disasters and their countermeasures." Around the same time, climate change became scientifically confirmed, and the increasing severity and frequency of heavy rainfall disasters began to be recognized around the world. Japan, which has actively promoted proactive disaster prevention investment, was no exception. Flood control measures such as river improvement and dam construction have certainly improved flood safety and reduced damage for communities across the country. However, the impacts of climate change have emerged more rapidly than these measures could take effect, and rainfall events exceeding previous assumptions have caused devastating damage almost every year.

Meanwhile, advances in science and technology have led to improvements in methods for estimating the maximum possible floods and the rate at which climate change will intensify floods. Significant progress has also been made in predicting heavy rainfall and flooding. Methods for incorporating this information into life-saving actions and for improving social infrastructure have also been established. Furthermore, in 2015, the Sendai Framework for Disaster Risk Reduction, the 2030 Agenda, and the Paris Agreement were all adopted. In Japan, a new flood control policy, "River Basin Disaster Resilience and Sustainability by All," reflecting these scientific technologies and international agreements, has been developed and put into practice. Additionally, "Integrated River Basin Management for ALL," which aims to "minimize damage from water-related disasters," "maximize the benefits of water," and "maximize a rich environment connected by water," has been established as a national policy.

As described above, the past 20 years of ICHARM's development have coincided with a period during which the intensification of water-related disasters driven by climate change has become widely recognized. During this time, related science and technology have advanced, new international frameworks concerning disaster risk reduction, development and the environment, and climate change have been established, and new water policies have also been introduced in Japan. ICHARM developed the Rainfall, Runoff and Inundation (RRI) model as a flood estimation model, supporting the recovery from the 2010 Indus River flood in Pakistan and the 2011 Chao Phraya River flood in Thailand. We also developed the Water and Energy Budget Rainfall, Runoff and Inundation (WEB-RRI) model, which incorporates the water-energy balance and can seamlessly simulate a range of phenomena from drought to flood, as well as the Rainfall, Sediment and Runoff (RSR) model, which can represent the transport of sediment and driftwood. To account for the localized nature of heavy rainfall, we developed a method that assimilates global data and performs ensemble downscaling of GCMs, and built a system that generates forecasts by combining these outputs with hydrological models. These methods and models have also been linked with dam-operation and agricultural models and are used for hydropower-generation and agricultural planning. Furthermore, we have contributed to strengthening community-level disaster preparedness. By reviewing disaster response efforts with reference to the Standard Operating Procedures (SOPs), we have collected and analyzed cases in which responses did not proceed as intended and developed methods to incorporate these insights into training. We are also developing visualization tools that allow users to experience floods virtually, as well as approaches that support the visualization of "floods in our town."

To ensure that these scientific achievements are effectively implemented in society, human resource development is essential. With support from the National Graduate Institute for Policy Studies (GRIPS), the Japan International Cooperation Agency (JICA), and the Public Works Research Institute (PWRI), ICHARM has accepted experts in the sectors of meteorology, river management, and crisis management from developing countries and has operated master's and doctoral degree programs. Over the past 20 years, 226 graduates have completed these programs and have been active as leaders in their respective countries since returning home. Furthermore, as the secretariat of the International



Executive Director of ICHARM

KOIKE Toshio

Flood Initiative (IFI), which comprises UN agencies, international academic organizations, and leading research institutions, ICHARM has supported the establishment of "Platforms on Water Resilience and Disasters" in various Asian countries. These platforms play a vital role in bringing together diverse sectors involved in water-related disasters and in promoting interdisciplinary collaboration, and the framework is now being expanded to Africa. Additionally, we have conducted training for experts to become facilitators who promote interdisciplinary collaboration in the field of water-related disaster risk reduction using integrated science and technology.

2) Reorganizing the Conceptual Framework

Daily water use, including the supply of drinking water, the provision of water, sanitation, and hygiene services, and the use of water for food and energy production, together with a healthy water environment, is essential for sustaining human livelihoods. A healthy water environment is also a vital element of the natural environment. Daily water use and the water environment shape quality of life, influencing health, education, work, and other aspects of well-being. However, many developing countries are unable to fully enjoy these benefits. Even more developed countries face challenges arising from risks inherent in development, such as social and economic disparities, unregulated land use, and environmental degradation, including biodiversity loss, deforestation, and desertification. Consequently, quality of life declines, and social problems such as poverty, gender inequality, and conflict emerge. Because our societies are shaped by daily water use and the water environment, too little water (drought) leads to water shortages and a decline in water quality, while too much water (floods) results in the loss of functionality in living spaces and areas of economic activity. In both cases, the resulting impacts propagate throughout society, lowering quality of life and exacerbating social problems.

In the field of disaster risk reduction, the magnitude of risk is determined by the hazard and by the vulnerability and exposure of a community to that hazard. It is widely understood that risk can be reduced when the community has a high capacity to cope with disasters. The concept of resilience has also been introduced into disaster risk reduction, emphasizing the strengthening of a community's capacity to absorb external shocks and recover rapidly so that it can restore functions and build back better in a short time even after a disaster occurs. In the case of water-related disasters, vulnerability is deeply related to quality of life, such as health, education, and work, as well as to social issues, such as poverty, gender, inequality, and conflict. Exposure is directly linked to the conditions of living and production spaces. Coping capacity and resilience concern all components of society. Thus, the challenges of development and the environment in the water sector (sustainable development) and the challenges of water-related disasters (disaster risk reduction and resilience enhancement) are deeply interconnected.

In addition to these key elements and concepts, climate change has emerged as a defining impact factor. The IPCC's Sixth Assessment Report states that "It is unequivocal that human influence has warmed the atmosphere, ocean and land," and reports "The frequency and intensity of heavy precipitation events have increased since the 1950s over most land area." Extreme daily precipitation events are projected to intensify by about 7% for each 1 °C of global warming. Once-in-a-decade soil moisture droughts are already increasing in the Mediterranean, South Africa, the Amazon, and Central America, highlighting worsening water scarcity. These trends indicate that "stationarity," which has long been a fundamental premise for water use and water disaster management, has effectively collapsed, and events described as "unprecedented" are likely to occur more frequently. The 2015 Paris Agreement emphasized the importance of promoting both mitigation and adaptation. While the water sector is deeply committed to adaptation, it must also contribute to mitigation through renewable energy development, nature-positive food production, urban regeneration, and conservation of the natural environment.

Figure 1 provides an overview of the points discussed above.

3. Envisioning the Next 20

To address the complex challenges we face worldwide, it is essential to take a holistic view of the entire water problem, collaborate with all stakeholders, and avoid fragmentation. Such an approach will enable us to improve daily water use, conserve natural water environments, and enhance resilience to, and reduce the risks of, water-related disasters during extreme events in a seamless, integrated manner, while recognizing the interconnectedness of each element.

ICHARM has been promoting research to better understand, predict, and manage changing hazards by enhancing

collaboration between meteorology and hydrology to mitigate the risks of water-related disasters. Furthermore, from a crisis management perspective, ICHARM promotes research and capacity building to strengthen response capabilities and improve resilience through effective risk communication. This approach is based on an understanding of societal vulnerabilities and exposure to hazards.

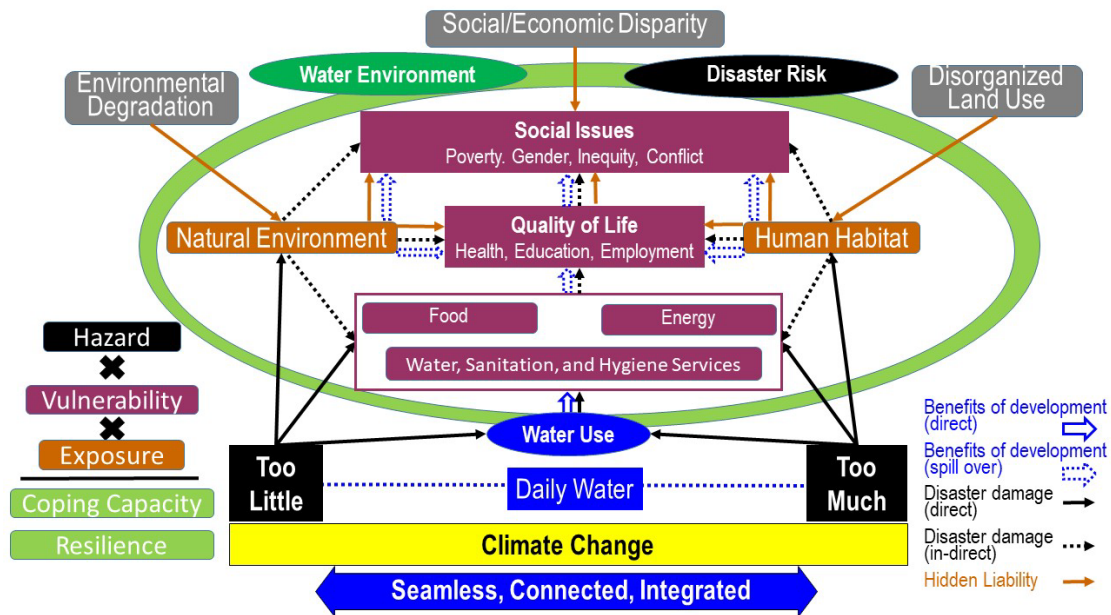


Figure 1 Concept outline

Going forward, it will be indispensable to establish practical governance structures that support the balanced development of social common capital — namely, the natural environment, social infrastructure, and institutional capital — in the context of climate change. Increasing strategic investment based on this interconnectivity will also be necessary, and this can be achieved by making such investment more attractive for committed engagement and funding.

To promote these activities, we will strengthen the following:

1. Development of a system for integrating and sharing scientific and experiential knowledge across various fields, connecting everyday life with extreme times and enabling all stakeholders to reflect this knowledge in their actions.
2. Promotion of science that quantifies and visualizes not only direct benefits and harms but also economic spillover effects and hidden liabilities.
3. Support for capacity development to enhance the science-policy interface, as well as the creation of systems that enable communities, countries, and regions to implement capacity building independently.

Furthermore, ICHARM launched three new courses in 2026 — "Water and Sanitation," "Water and Poverty," and "Water and Peace." These courses address the fundamental challenges underlying water-related disasters, while also highlighting challenges that can be addressed through improving resilience and response capabilities. ICHARM aims to further promote collaboration in research and capacity building in these fields to achieve comprehensive solutions to water-related problems. To realize these goals in society, ICHARM will expand the "Platform on Water Resilience and Disaster" project and initiate concrete activities involving all stakeholders in water-related fields. In addition, ICHARM will scale this new framework beyond the national level to the community and regional levels, including transboundary river basins, cultural spheres, and geophysical common spheres.

ICHARM is committed to collaborating with all stakeholders, both globally and locally, to improve the understanding of water-related disasters, enhance the ability to predict them and implement practical measures to reduce their impact and mitigate vulnerability and exposure. This collaboration will also contribute to advancing sustainable development, addressing water and sanitation challenges, and ultimately achieving poverty eradication and peacebuilding.



TAKEUCHI Kuniyoshi

First Executive Director of ICHARM (2006-2014)
Former ICHARM Advisor,
Professor Emeritus of the University of Tokyo,
Professor Emeritus of Yamanashi University

Congratulations on the 20th anniversary of ICHARM!

On March 6, 2006, I attended the unveiling ceremony of the new nameplate on the freshly completed ICHARM building together with then-President Sakamoto and colleagues from the Public Works Research Institute. A brand-new plaque bearing the handwritten inscription of then-Minister Kitagawa of Land, Infrastructure, Transport and Tourism was displayed, and on the three flagpoles, the national flag, the PWRI flag, and the United Nations flag flew proudly, proclaiming the presence of ICHARM as a UNESCO water centre. I expressed my aspiration “to create a water-related disaster research center that serves the world.”

Twenty years have passed since then.

The aspiration has become a reality. ICHARM has grown into a trusted global hub for research and education, attracting outstanding students from countries across Asia, Africa, South America and beyond, and receiving requests for support from around the world. This remarkable progress has been made possible thanks to the many individuals and organizations that have supported ICHARM. In particular, the establishment of master’s and doctoral programs for young professionals with practical experience, as well as the expansion of our activities from a primary focus on floods to include sediment-related disasters, meteorology, and drought, have become major pillars of our international contribution. Many graduates are now serving as leaders in various organizations worldwide, guiding water-related governance in their respective countries.

Water-related disaster risk management is built upon lessons from the past, scientific and technological advancement, the development of human resources capable of applying that knowledge, and the transdisciplinary collaboration of relevant organizations and communities. By drawing on advanced science and technology, Japan’s accumulated experiences of hardship and perseverance, and disaster-prevention culture that has taken root through those experiences, I sincerely hope that ICHARM will continue to grow and provide guidance for building a resilient society as the world seeks to coexist with climate change and rapid social transformation.



Plaque unveiling ceremony at the ICHARM entrance (far left: Director Takeuchi of the Center at the time (6th Mar. 2006))

2 ICHARM Programme

1) Relationship between the PWRI Mid- to Long-Term Plan and the ICHARM Programme

a) PWRI Mid- to Long-Term Plan

PWRI, a national research and development agency, formulates a mid- to long-term plan to achieve the mid- to long-term objectives assigned to it for a six-year period by the ministers of MLIT and MAFF, in accordance with Article 35-5 of the Act on General Rules for Incorporated Administrative Agencies (Act No. 103 of 1999).

Reference: https://www.pwri.go.jp/jpn/about/outline/chuuki_nendo.html

(1) PWRI 4th Mid- to Long-Term Plan 2016–2022

The PWRI 4th Mid- to Long-Term Plan was formulated by PWRI on March 31, 2016, as a six-year plan covering April 1, 2016, through March 31, 2022, to achieve the institute’s mid- to long-term objectives.

Specifically, taking into account PWRI’s strengths and resources, the following three areas were designated as priorities for focused and intensive research and development:

- ① Realizing a safe and secure society
- ② Strategic maintenance and renewal of social infrastructure
- ③ Realizing a sustainable and vibrant society

ICHARM carried out various research projects under the R&D program “(2) Development of risk-management support technologies for increasingly frequent and severe water disasters in Japan and abroad” to contribute to Priority

①: Realizing a safe and secure society.

In addition, as part of Japan’s international contribution using civil-engineering expertise, the plan also explicitly states that ICHARM will promote, in an integrated manner, research, training, and information-networking activities to prevent and mitigate water-related disasters worldwide, based on an agreement between the Japanese government and UNESCO (the UNESCO agreement).

(2) PWRI 5th Mid- to Long-Term Plan 2022–2028

The PWRI 5th Mid- to Long-Term Plan was formulated by PWRI on March 31, 2022, as a six-year plan covering April 1, 2022, through March 31, 2028, to achieve the institute’s mid- to long-term objectives.

Specifically, taking into account the 2030 emission-reduction targets toward carbon neutrality by 2050 and social trends such as the decline in the working-age population, the following three areas were designated as priorities for focused and intensive research and development:

- ① Building a nation that protects lives and livelihoods from natural disasters
- ② Smart and sustainable management of social infrastructure
- ③ Vibrant, attractive communities and lifestyles

ICHARM implemented various research projects related to the R&D program “(1) Development of basin-scale flood management promotion technologies to address increasingly severe water-related disasters” in order to contribute to Priority ①: Building a nation that protects lives and livelihoods from natural disasters.

As part of ICHARM’s international contributions, the plan stated the following to support the prevention and mitigation of water-related disasters worldwide:

To contribute to the prevention and mitigation of water-related disasters globally, ICHARM will promote, in an integrated manner, research and development, capacity building, and the establishment of international information networks related to water-disaster risk management. To facilitate the application and dissemination of R&D outcomes, ICHARM will actively participate in projects led by international organizations such as UNESCO. For capacity building, ICHARM will collaborate with JICA and GRIPS to implement activities, including master’s and doctoral programs. In addition, ICHARM will work with UNESCO and other international organizations to further strengthen global information networks.

b) ICHARM Programme

Under the UNESCO agreement, ICHARM prepares the “ICHARM Long-Term Programme” (Target period: approximately 10 years), the “ICHARM Mid-Term Programme” (Target period: approximately 6 years), and the “Work Plan” (a two-year activity plan), all of which are subject to review and approval by the ICHARM Governing Board. In addition, ICHARM has formulated the “ICHARM Mission” as an overarching statement. Together, these documents are referred to as the “ICHARM Programme.” The current ICHARM Programme is presented in ANNEX-1.

The UNESCO agreement also requires the “ICHARM Programme” to align with PWRI’s latest mid- to long-term plan. Accordingly, following the adoption of the PWRI 5th Mid- to Long-Term Plan, the ICHARM Long-Term Programme (including the ICHARM Mission) and the ICHARM Mid-Term Programme were revised and approved at the 6th meeting of the ICHARM Governing Board on June 21, 2022. The Work Plan is revised every two years and reviewed by the ICHARM Governing Board at each meeting.

Reference: <https://www.pwri.go.jp/icharm/program/index.html>

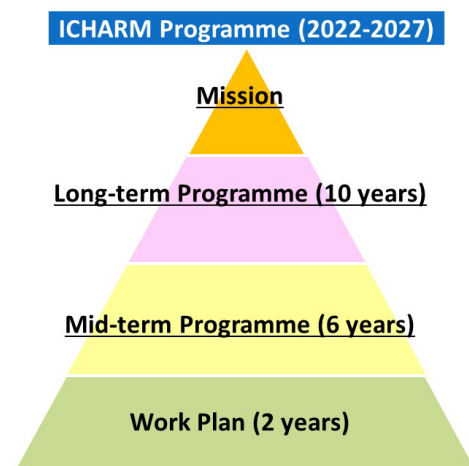


Figure 2-1 ICHARM Programme

2) Water Cycle Integrator (WCI)

a) Background

On September 18, 2020, the Science Council of Japan’s Committee on International Cooperation for Promoting Science-Based Disaster Risk Reduction (Chair: KOIKE Toshio, the executive director of ICHARM) released a proposal titled “Building a sustainable global society by strengthening disaster resilience: Developing an “Online Synthesis System (OSS)” and fostering “Facilitators” to realize consilience.” This proposal emphasizes the following four points:

- ① The scientific community should develop the Online Synthesis System (OSS) to promote DRR and Sustainable Development.
- ② The scientific community should foster Facilitators.
- ③ On-site stakeholders, in cooperation with Facilitators and effectively taking advantage of OSS, should develop integrated scenarios for DRR and Environment/Development and execute concrete measures toward enhancement of disaster resilience and achievement of SDGs.
- ④ International scientific organizations, UN/international agencies and international aid agencies should support the development of the OSS, Facilitators and integrated scenarios for each country and region to take actions.

Reference: <https://www.scj.go.jp/ja/info/kohyo/pdf/kohyo-24-t298-1en.pdf>

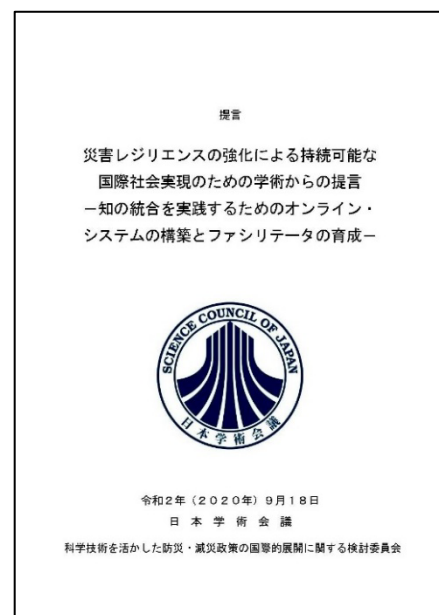


Figure 2-2 “Building a sustainable global society by strengthening disaster resilience: Developing an “Online Synthesis System (OSS)” and fostering “Facilitators” to realize consilience.”

In April 2022, the 4th Asia-Pacific Water Summit was held in Kumamoto City, Japan. ICHARM played vital roles in planning, operating and summarizing a parallel thematic session on “Water and Disaster/Climate Change,” a special session “Showcase,” and an integration session on “Science and Technology.” In particular, ICHARM contributed to

formulating the three major proposals – promoting water-cycle consilience, fostering Facilitators, and adopting an end-to-end approach – as responses to a request from national leaders on how science and technology should support leaders in making transdisciplinary decisions.

b) Concept and Overview

Building on the recommendations and international initiatives described above, ICHARM consolidated the various concepts it has been promoting in Japan and abroad into WCI, and registered it as part of the Water Action Agenda, one of the key outcomes of the UN 2023 Water Conference.

WCI advocates the integration of three elements: knowledge, capacity, and processes.

< Knowledge integration >

WCI promotes “water cycle consilience” by integrating knowledge across water cycle, climate, agriculture, and energy, supported by well-organized observation, modeling, and data and information systems, based on the Open Science policy.

< Capacity integration >

WCI promotes the integration of “Facilitators,” who serve as catalysts capable of providing expert advice in local contexts, grounded in a broad range of scientific and local knowledge about climate change. Facilitators can bridge the gaps between the scientific community and local stakeholders, support education and training, and guide pathways toward practical solutions.

< Process integration >

WCI establishes transdisciplinary frameworks at the local, national, regional, and global levels to connect cutting-edge science beyond disciplines with on-the-ground decision-making and action through an end-to-end approach.

c) Practical Application: Activities in Davao City, the Philippines

One example of WCI implementation can be seen in the initiatives carried out in Davao City, the Philippines. Diverse stakeholders are working together to develop a local OSS by utilizing DIAS and to foster Facilitators. Figure 2-3 illustrates the conceptual design of the OSS flood-forecasting function, which integrates data from multiple fields. For details of these activities, please refer to Section 4-5 4).

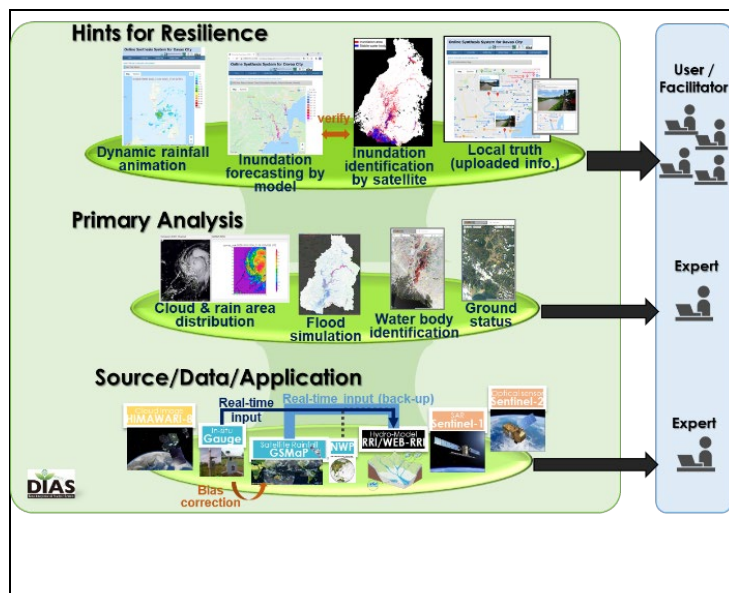


Figure 2-3 Conceptual design of the flood-forecasting function of the OSS developed for Davao, Philippines

d) Input to the UN 2023 Water Conference

At the UN 2023 Water Conference, held from March 22 to 24, 2023, Egypt and Japan co-chaired Thematic Dialogue 3, “Water for Climate, Resilience and Environment.” Among the Key Messages adopted in this session was the positioning of science and technology as a “game changer” for building a resilient post-COVID-19 society, through the realization of water-cycle consilience, the fostering of Facilitators, and the adoption of an end-to-end approach – concepts that ICHARM had consistently advocated in international forums. This recommendation was reported by Prime Minister’s Special Envoy KAMIKAWA Yoko, a member of the House of Representatives, during the plenary session on the final day of the conference.



Photo 2-1 Special Envoy Kamikawa speaking at the plenary meeting [Source: MLIT]

Prior to the conference, ICHARM had compiled the three elements described in 2. Concept and Overview under the name “Water Cycle Integrator (WCI)” and registered it in the “Water Action Agenda.” WCI was mentioned in the summary of the proceedings published by the president of the UN General Assembly after the conference as one of the key messages emerging from the interactive dialogue, helping to promote broader global recognition of the concept.

Key messages emerging from the interactive dialogue (excerpt)

- Establish a Global Water Information System, based on the “Hydrological Status and Outlook system (HydroSOS)” and water reporting, as a prerequisite for improved water management, climate resilience, early warning, and risk-informed decision-making for climate action and disaster risk reduction. This should be among the top priorities of water-related climate action and supported by the Water Cycle Integrator (WCI).

Reference to the Water Cycle Integrator (WCI):

<https://sdgs.un.org/partnerships/water-cycle-integrator-wci>

3. Management

1) Governing Board

ICHARM carries out a wide range of activities as one of the research centers of PWRI, under the agreement concluded between the Japanese government and UNESCO.

In accordance with Article 6 of the agreement, which was renewed in February 2020, ICHARM convenes a Governing Board meeting every year. The governing board is chaired by the president of PWRI and is composed of representatives from UNESCO (on behalf of the director-general), the Japanese government, and organizations related to ICHARM's activities. In addition, MOFA, MEXT, and JICA are invited as observers. Since the 9th Governing Board meeting, all meetings have been held entirely online. The participants of the 9th meeting are listed below:

- KIJIMA Yoko, Vice President, GRIPS, on behalf of Ms. OTA Hiroko, President
 - HIROSE Masayoshi, Vice Minister for Engineering Affairs, MLIT
 - FUJITA Koichi (Chairperson), President, PWRI
 - MATSUOKA Yuki, Resident Representative in Japan, UNDRR Kobe Office
 - Abou Amani, Director of the Division of Water Sciences and Secretary of the Intergovernmental Hydrological Programme, UNESCO, on behalf of Ms. Lidia Brito, Assistant Director-General for Natural Sciences
 - TACHIKAWA Yasuto, Chair Holder, UNESCO Chair on Water, Energy and Disaster Management for Sustainable Development
 - Stefan Uhlenbrook, Director of Hydrology, Water and Cryosphere, WMO
- (Observers)
- Multilateral Cultural Cooperation Division, Minister's Secretariat, MOFA
 - Office of the Director-General for International Affairs, MEXT
 - JICA

The Governing Board is responsible for the following main functions:

1. Reviewing and adopting ICHARM's long-term and medium-term plans.
2. Reviewing and adopting ICHARM's proposed annual work plans.
3. Reviewing ICHARM's annual reports, including its biennial self-assessment reports.

Since 2016, the Governing Board has met as follows: the 2nd meeting on March 3, 2016; the 3rd on February 14, 2018; the 4th on June 2, 2020; the 5th on May 12, 2021; the 6th on June 21, 2022; the 7th on September 6, 2023; the 8th on June 28, 2024; and the 9th on June 23, 2025. At each meeting, the board members provided valuable advice, which ICHARM incorporated into its activities as appropriate.



Photo 3-1 Governing Board members, observers, and secretariat members



Photo 3-2 Governing Board secretariat members

2) Organizational Structure and Staffing

As shown in the figure below, ICHARM is one of the research centers within PWRI, alongside CAESAR and

iMaRRC, and it includes the Water-Related Disaster Research Group. At the same time, it holds a unique status as a UNESCO Category 2 Centre established under an agreement between the Japanese government and UNESCO.

The figure below also shows the staffing structure of ICHARM. At the top is the executive director, supported by two deputy directors, one of whom concurrently serves as the director of the Water-related Hazard Research Group, and the other as the director for special research. The organization also includes one training and research advisor and four research teams, each focusing respectively on water-related disaster research, risk management, training, and international network and public relations.

Each team is composed of a chief researcher, senior researchers, research specialists, researchers, administrative assistants, and research assistants. In addition, ICHARM hosts collaborating researchers, who are formally employed by private-sector and other companies but conduct research activities at ICHARM.

Furthermore, a deputy head and administrators from the PWRI General Affairs Division are assigned to ICHARM to handle administrative tasks related to research and training contracts.

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

The executive director oversees the overall management of ICHARM.

The deputy director assists the executive director in carrying out the responsibilities of the position. In addition, the deputy director, who concurrently serves as the director of the Water-related Hazard Research Group, oversees the group's research and other activities. The Water-related Hazard Research Group is mandated to conduct investigations, testing, research, training, and the development and dissemination 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 associated with water-related disasters
3. Risk management of water-related disasters

The director for special research manages matters related to particularly important research that falls outside the scope of the Water-related Hazard Research Group.

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

The deputy head and the administrator manage administrative work.

The chief researcher, under the direction of the director of the Water-related Hazard Research Group, carries out the work assigned to the group, including investigations, testing, research, and the development and dissemination of civil engineering technologies.

The senior researcher and the researcher perform their respective duties under the supervision of the chief researcher.

The research specialist supports research activities requiring a high level of expertise under the guidance and supervision of the director of the Water-related Hazard Research Group or the chief researcher.

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

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 director of the Water-related Hazard Research Group or the chief researcher to support research and training projects that require a high level of expertise and advanced English language skills.

The administrative assistant provides support to researchers and administrative staff in carrying out their duties.

ANNEX-2 shows the member list of ICHARM in the past 10 years.

The number of ICHARM staff was 38 as of April 2026, including 11 female members. Since ICHARM is a research center of PWRI, which is under the management of MLIT, many of its staff members are seconded from MLIT. In addition, as an international center, ICHARM employs foreign researchers, mainly as research specialists. As of April 2026, there were 8 foreign researchers.

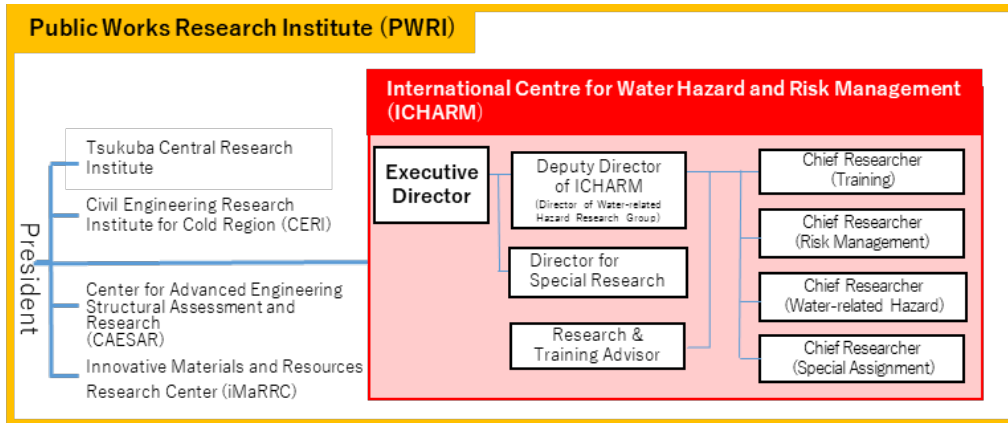


Figure3-1 Organizational Structure and Staffing of ICHARM

4. Innovative research

The ICHARM Programme, which was revised based on PWRI's 5th Medium- and Long-term Plan (2022-2027), 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 interdisciplinary 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.

4.1 Data collection, storage, sharing, and statistics on water-related disasters

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

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

ICHARM continuously collaborates with JAXA to maximize near-real-time freely-available global satellite precipitation products (SPPs) for effective water resources and disaster management in poorly gauged basins (Figure 4-1). We are also studying methods for efficiently bias-correcting SPPs by incorporating ground observation data and methods for designing optimal ground observation networks.

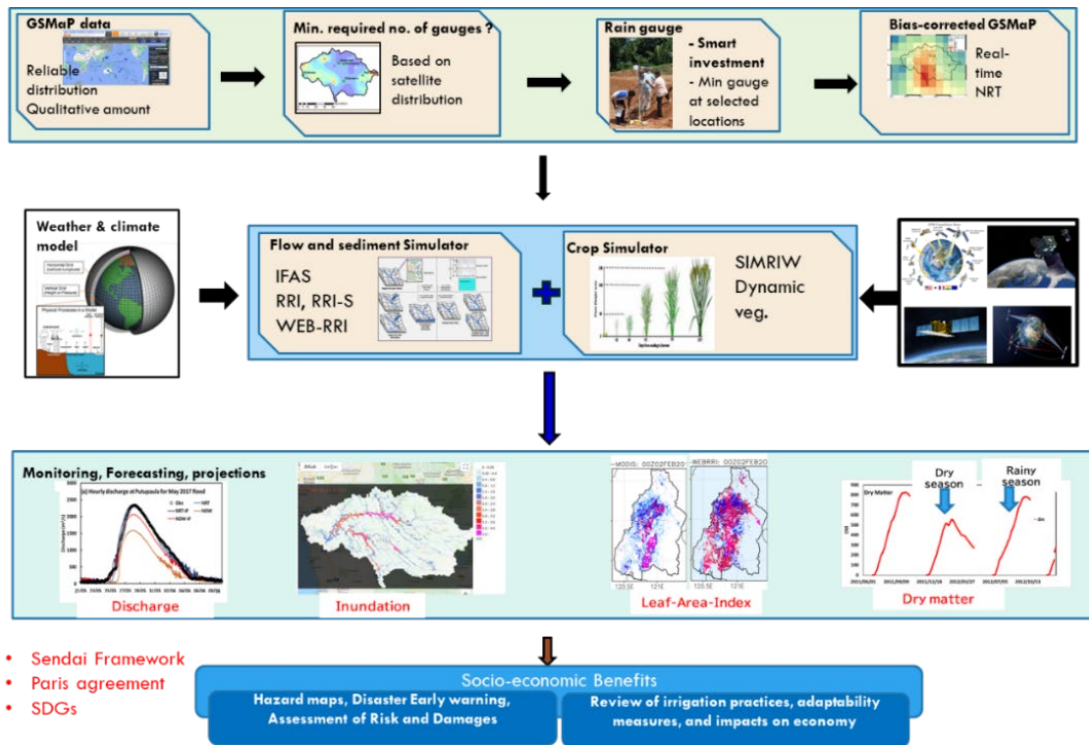


Figure 4-1 A conceptual image of a system for the integrated management of water resources and disasters in poorly gauged basins

2) Field Surveys on Flood Damage in Japan

Heavy rainfall disasters have been occurring almost every year across Japan in recent times. In particular, damage tends to be more severe in events that involve not only flood flows but also slope failures, debris flows, and flooding accompanied by large volumes of sediment and driftwood. To help reduce the impacts of such disasters, ICHARM conducts field surveys and research at disaster sites with the aim of clarifying these complex flooding phenomena and examining effective methods of information dissemination during emergencies. The following section provides an overview of major field surveys.

a) Heavy rainfall disaster in western Japan in July 2018

From July 5 to 7, 2018, continuous rainfall in western Japan triggered numerous slope failures, debris flows, and floods accompanied by massive sediment transport across several prefectures in the Chugoku and Shikoku regions, including Hiroshima, Okayama, and Ehime. These events caused extensive damage, leaving about 230 people dead or missing nationwide. From July 14 to 16, Senior Researcher OHARA Miho and Research Specialists Young Joo Kwak and NAGUMO Naoko conducted a joint field survey with researchers from Utsunomiya University, Shibaura Institute of Technology, and University of Hyogo in affected areas, such as Okayama City and Mabi Town in Kurashiki City, Okayama Prefecture, and Mihara and Onomichi cities, Hiroshima Prefecture. In Mabi Town, they used a drone to observe the inundation caused by a levee breach along the Oda River and examined levee damage along its tributaries. They also interviewed local residents about the situation during the disaster and their living conditions after evacuation. The investigation team confirmed that the maximum inundation depth exceeded the second-floor level of houses in the area.



Photo 4-1 Levee breach along the Oda River (a drone photo taken over Mabi Town, Kurashiki City)



Photo 4-2 Levee breach along the Suemasa River (Mabi Town, Kurashiki City)

b) Typhoon No.19 (Hagibis) in October 2019

On October 12, 2019, Typhoon No.19 (Hagibis) struck the Izu Peninsula and brought record-breaking heavy rainfall over a wide area of Japan. At one location, accumulated precipitation exceeded 1,000 mm. At many locations, mainly in eastern Japan, the 3-, 6-, 12-, and 24-hour precipitation totals reached record highs, causing floods with massive sediment transport, as well as slope failures and debris flows. The disaster caused considerable damage, leaving 102 people dead or missing nationwide. ICHARM conducted field surveys immediately after the onset of the disaster through December in Sano City, Tochigi Prefecture; Aga Town, Niigata Prefecture; and Marumori Town of Miyagi Prefecture.



Photo 4-3 Driftwood accumulated at Tokiwa Bridge



Photo 4-4 Flooding with massive sediment transport in Marumori Town

c) Heavy rainfall over the Kyusyu Region in July 2020

From July 3 to 8, 2020, an active seasonal rain front that stretched from the Kyushu Region to eastern Japan remained stationary, bringing heavy rainfall to western and eastern Japan. In particular, Kyushu experienced record-breaking rainfall from July 4 to 7.

Linear rain bands formed and remained over the Kuma River basin in Kumamoto Prefecture, producing rainfall of over 30 mm per hour for about eight hours. As a result, the four rain-gauge stations along the Kuma River and its largest tributary, the Kawabe River, recorded 6-, 12- and 24-hour rainfall totals exceeding those that triggered the major floods of July 1965 and 1982, both of which caused the worst flood damage in the postwar period. This torrential rain caused record flooding, with water levels at the Hitoyoshi station rising 2.2 m above the previous maximum, resulting in widespread inundation throughout the basin, including downtown Hitoyoshi City.

ICHARM conducted field surveys in and around Hitoyoshi City, focusing on the characteristics of the inundation, the processes of sediment supply from the Kuma River and its tributaries, the particle size of transported

sediment, and the damage at the confluence of the main river and the tributaries.



Photo 4-5 Inundation marks at the Aoi Aso Shrine



Photo 4-6 Investigation of the transported sediment in downtown Hitoyoshi City

3) Field Surveys on Flood Damage abroad

ICHARM has conducted a wide range of field surveys overseas, including a riverbed-material survey in 2017 and a flood-damage survey in 2024 in Nepal; riverbank-erosion surveys from 2017 to 2020 in Myanmar; participation as part of the Japanese delegation in a flood-damage survey in 2017 in Sri Lanka; and a survey of cultural heritage sites affected by the 2022 flood in 2023 in Pakistan. The experience and insights gained from these surveys have contributed directly to ICHARM's research and implementation activities.

The following sections introduce several of the major surveys.

a) Nepal

① Riverbed-material survey

A team of researchers from ICHARM and PWRI conducted a field survey on the West Rapti River in Western Nepal from October 31 to November 5, 2017, to characterize the river's longitudinal grading based on the grain size of riverbed materials. At that time, sediment production was high in the upper reach and no dams had been built along the river, so the sediment produced was transported downstream to the middle and lower reaches. For this reason, the target river was a valuable site for observing longitudinal sediment grading.

This survey was conducted by Research Specialists YAMAZAKI Yusuke, NAGUMO Naoko, and HARADA Daisuke from ICHARM, together with Senior Researcher YOROZUYA Atsuhiro and Researcher KOSEKI Hiroshi from the Hydrologic Engineering Research Team of Hydraulic Engineering Research Group, PWRI. The team also received invaluable support from Mr. Gopal Sharma, a senior divisional engineer with the Water Induced Disaster Management Department of the Ministry of Irrigation in Nepal, who completed ICHARM's master's program in 2016.



Photo 4-7 Field survey on a rubber boat

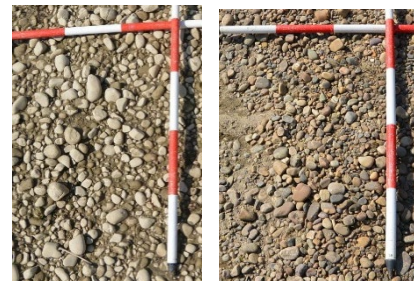


Photo 4-8 River materials collected from the upper (left) and lower (right) reaches

② 2024 flood damage survey

In late September 2024, Nepal experienced its highest rainfall in at least 50 years. Continuous extreme precipitation on September 27-28 caused severe flooding and sediment disasters in 44 districts across the country, claiming at least 249 lives, with 18 people missing and 178 injured, according to the Ministry of Home Affairs. More than 2.5 million people were affected, and the estimated economic loss reached approximately 46.6 billion Nepalese Rupees. The bowl-shaped Kathmandu Valley, where the capital city is located, received 240-350 mm of rainfall in 24 hours.

To understand the characteristics of the 2024 flood and collect damage data, Research Specialist Badri Shrestha conducted field and questionnaire surveys in the flood-affected areas of the Bagmati River basin in November 2024 (Figure 4-2), as part of the JSPS KAKENHI Research (Grant number: 24K07692), in collaboration with local governments of Rautahat District (Madhav Narayan Municipality, Gadhimai Municipality, Rajdevi Municipality, and Durga Bhagawati Rural Municipality) and other related organizations. The collected data and information have been used to develop appropriate flood risk assessment methodologies and to provide science-based solutions for flood disaster mitigation.

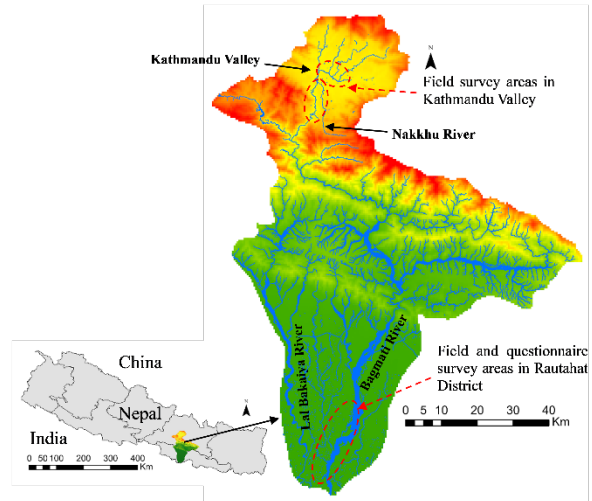


Figure 4-2 Locations of field and questionnaire survey areas in the Bagmati River basin



Photo 4-9,10,11 Discussion and group photos with Mr. Baijnath Prasad Yadav, the mayor of Madhav Narayan Municipality (left and middle photos) and with Mr. Bhikhari Prasad Yadav, the mayor of Rajdevi Municipality (right photo)



Photo 4-12,13,14,15,16 Damaged infrastructure and houses in the Kathmandu Valley

b) Myanmar

The estuary of the Sittang River in Myanmar is highly dynamic, characterized by features such as sandbars and braided channels. The rapid changes occur because both river flow and tidal motion drive active erosion and deposition. In particular, since 2014, the western bank of the Sittang River had experienced significant farmland loss due to riverbank erosion, making countermeasures an urgent priority by the time of our survey.

In May 2017, the Myanmar government requested ICHARM's support in formulating erosion control measures. After discussions, ICHARM decided to conduct joint field surveys with the University of Tokyo, which had prior research experience in Myanmar, to assess coastal areas affected by tidal bores and tidal currents and to examine riverbed and riverbank materials and flow conditions in the Sittang River. Four field surveys were carried out: October 29–30, 2017; February 16–18, 2018; February 21–24, 2019; and February 25–26, 2020.

During the first survey, sediment samples were collected from the riverbed and riverbanks to analyze grain size and other sediment properties. To document the current state of riverbed and riverbank erosion, aerial photographs and videos of representative erosion sites (marked 'H' in Figure 4-3) were also taken using a drone.

During the second survey, an ADCP was used to measure flow velocity, discharge, and river cross-sectional profiles.

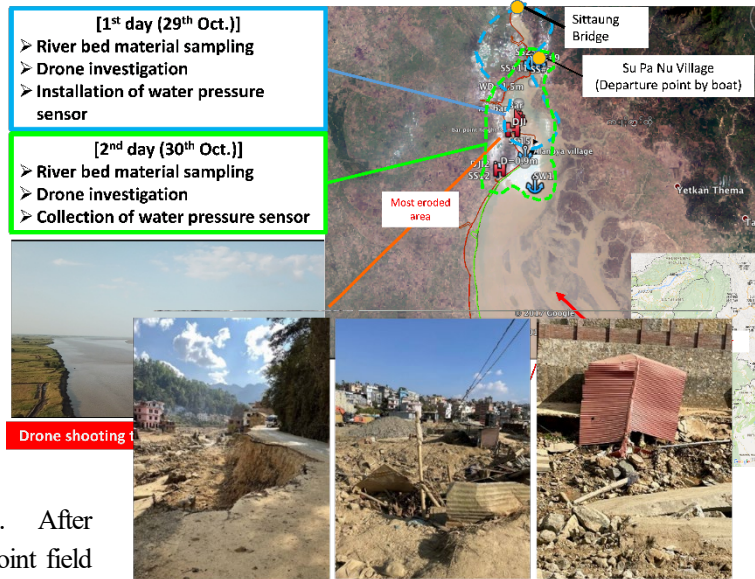


Figure 4-3 Area of the first survey



Photo 4-17 Observed tidal bore

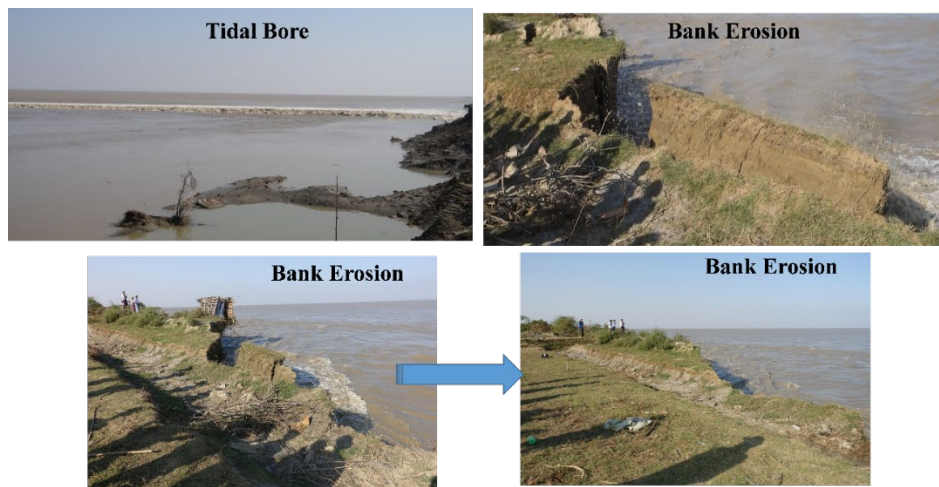


Photo 4-18, 19, 20, 21 Riverbank erosion caused by tidal bores



Photo 4-22 Sample collection and measurement using a ADCP boat

c) Sri Lanka

On May 24, 2017, a rainfall event began in the southern and western regions of Sri Lanka. The event intensified by 9:00 p.m. on May 25 and maintained its intensity until 9 a.m. the following day. During these 12 hours, total rainfall exceeded 500 mm. This unprecedented heavy rainfall caused severe floods and landslides across the affected regions, resulting in devastating damage to lives and property. According to the Sri Lankan government, as of June 3, 2017, 211 people had lost their lives, 96 people had gone missing, and about 704,000 people had been affected.

In response to a request from Sri Lanka, the Japanese government dispatched the Japan Disaster Relief Expert Team (the JDR Team) on June 3. The team consisted of 10 technical experts in flood control, erosion and sediment control, water resources, flood forecasting, and remote sensing, and was tasked with providing technical advice on effective short-, mid-, and long-term measures for flood and landslide control. PWRI also assisted the mission by sending Senior Researcher Mohamed Rasmy. The JDR Team surveyed affected areas, held meetings with relevant ministries, organizations, and stakeholders, and finally submitted a report on the findings and future collaborations between the two countries to the relevant ministries and government officials of Sri Lanka. Senior Researcher Rasmy received an award from Ministry of Foreign Affairs and JICA for his outstanding contribution as a member of the JDR Team dispatched to Sri Lanka.



Photo 4-23, 24 Scenes of field survey

d) Pakistan

This survey was conducted as part of the Japan Consortium for International Cooperation in Cultural Heritage program, commissioned by the Agency for Cultural Affairs of Japan. As one of its annual activities, the consortium carries out one field survey each fiscal year, and for FY2023, it selected a survey on the damage to cultural heritage in Pakistan caused by the torrential rains and subsequent flooding of 2022. The floods, which occurred between June and October 2022, were said to be the worst the country had experienced in several decades, submerging one-third of its land area. Although the country's treasured cultural heritage sites also suffered extensive damage, detailed information on the impacts had not been widely shared in Japan.

To address this, a multidisciplinary survey team comprising experts in archaeology, structural engineering, conservation science, and disaster-risk management was organized and dispatched to Sindh Province. The province, home to numerous cultural-heritage sites including World Heritage properties, sustained particularly severe damage. Senior Researcher Mohamed Rasmy of ICHARM participated as a specialist in flood risk management.

The survey 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, and provided support for documenting and assessing damaged cultural heritage and developing disaster risk management plans. The team of experts produced a technical report entitled "2022 Pakistan Flood: Report on the Damage Assessment of Cultural Heritage in Sindh Province", which is available on the consortium's website:

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

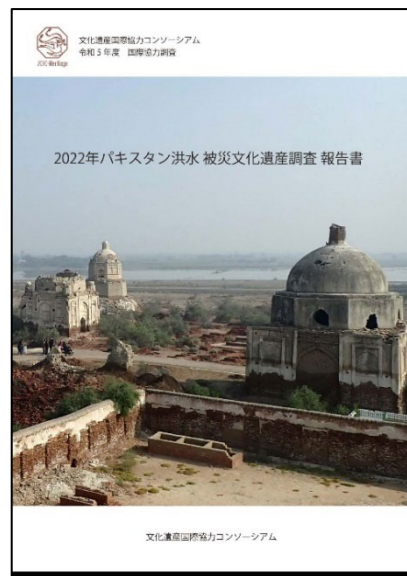


Photo 4-25 Investigation report



Photo 4-26, 27 The ruins (walls, stupa domes, etc.) are being capped with slurry or mud to protect them from extreme climatic and weather conditions.

4.2 Risk assessment on water-related disasters

1) Improvement of future climate projection technology using downscaling of large ensemble GCMs and evaluation of its regional applicability

a) Downscaling

The government of Japan updated the standard rainfall for river management based on climate projection data with a 5-km resolution. The ICHARM research team examined whether this 5-km downscaled data can be applied to small watersheds of 100 km² or less. Results from downscaling JRA3Q reanalysis data to reproduce typhoon-related torrential rainfall indicate that differences between 1-km and 5-km model resolutions are relatively small in the Kannagawa and

Yunishigawa watersheds in the upper Tone River basin. In contrast, model resolution dependence is relatively large in the upper Abukuma River basin and the Yagisawa Dam catchment during the same typhoon event. A similar trend in resolution dependence is seen in the Hakone catchment during a Baiu-frontal rainfall event and the upper Kumagawa basin during a linear-precipitation-zone event. These results suggest that special caution is needed when applying 5-km climate projection data to small watersheds.

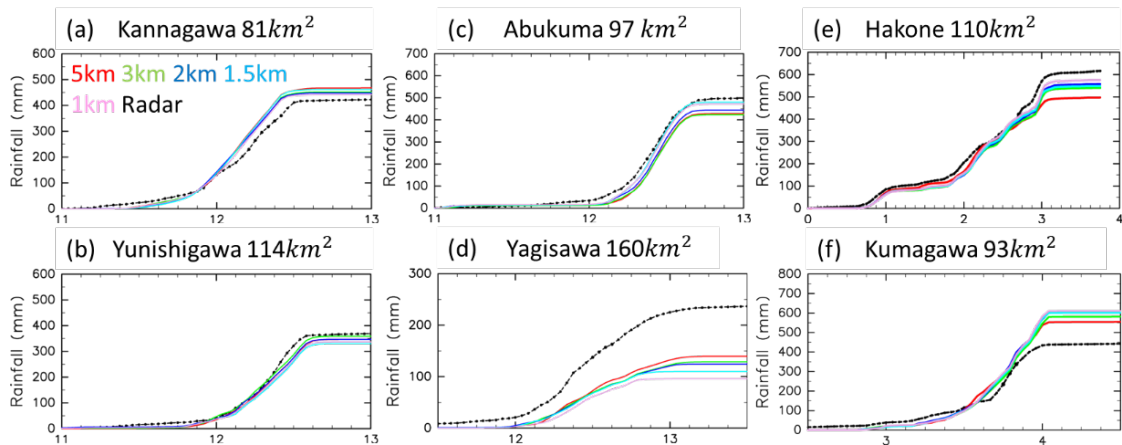


Figure 4-4 Catchment-average rainfall accumulation with different regional model resolutions. Line colors indicate model resolutions of 5 km (red), 3 km (green), 2 km (blue), 1.5 km (sky blue), and 1 km (pink). The black dotted line shows observed rainfall from Analyzed Rainfall provided by the Japan Meteorological Agency. The horizontal axis shows the number of days. Panels (a)-(f) indicate the target catchments and their respective areas.

b) DAD analysis

In the Depth-Area-Duration (DAD) analysis, the team assessed how climate change affects probable maximum precipitation (PMP) using 5-km hourly rainfall data from the d4PDF ensemble dataset. PMP was estimated through the DAD analysis under historical, +2K, and +4K warming scenarios for southeastern and northwestern Kyushu, Japan. The PMP estimation followed five steps: aggregating rainfall data (2–72 hours), selecting annual maximum rainfall, deriving depth-area curves via the Flexible Element Method (FEM), enveloping maximum curves across 720 events, and calculating PMP and change factors. Change factors were computed for durations of 1–72 hours and rain areas of 100, 1000, 10000 km².

Figure 4-5 shows 24-hour PMP change factors, with results indicating that PMP increases up to 1.22 (+2 K) and 1.37 (+4 K) in northwestern Kyushu, and up to 1.13 (+2 K) and 1.26 (+4 K) in southeastern Kyushu. PMP increases with warming, especially under the +4 K scenario, across all rain areas. These findings support updating PMP estimates to improve flood risk management and infrastructure resilience. The study was submitted to *Hydrological Research Letters*.

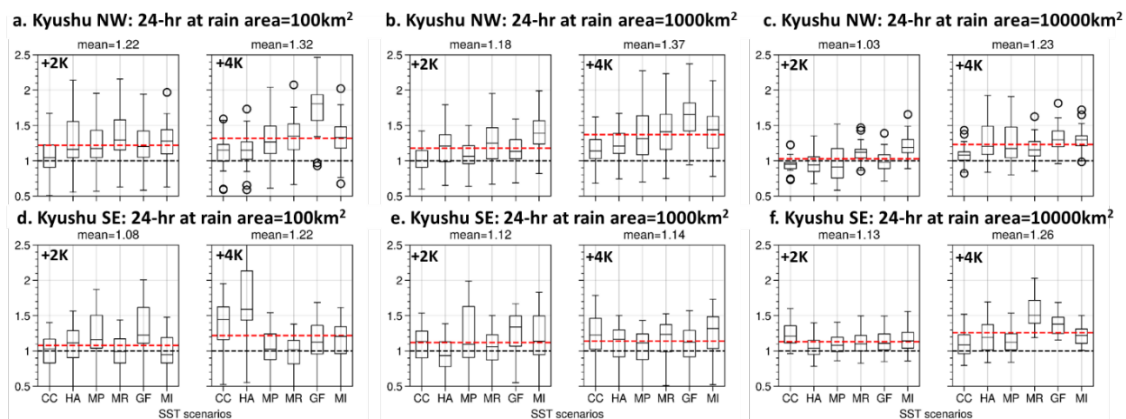


Figure 4-5 PMP change factors for 24-hour rainfall for multiple rain areas (a: 100 km², b: 1000 km², and c: 10000 km²) under the +2 K and +4 K SST warming scenarios for southeastern Kyushu (Kyushu SE) and northwestern Kyushu (Kyushu NW)

2) Drought assessment

a) Development of a drought monitoring and prediction system and agricultural impact assessment

(1) Northeastern Brazil

ICHARM developed a DIAS drought monitoring and prediction system for Northeastern Brazil, based on the Coupled Land and Vegetation Data Assimilation System (CLVDAS) (Figure 4-6). We also developed a method to estimate cashew-nut and feijão-bean yields for the period from 2003 to 2013 using leaf area index (LAI) outputs produced by the developed system for Ceará State, an agriculturally active region. Using these developments, cashew-nut and feijão-bean yields were estimated for the period from 2014 to 2017. The results showed good agreement with agricultural statistical data, with RMSE values below 0.06 t and bias values of 0.03 t.

To improve the spatial resolution of LAI outputs from CLVDAS, we used the WEB-DHM-Veg model, a coupled model integrating the WEB-DHM model and the dynamic vegetation model. We then developed a method to estimate feijão-bean yields using the higher resolution LAI for 16 districts of the Banabuiú River basin, a particularly agriculturally active area in Ceará State, and estimated feijão-bean yields for the period from 2014 to 2017, when a severe drought occurred (Figure 4-7). In this estimation as well, the results showed good agreement with agricultural statistical data, with relative errors below 12%, in most of the 16 districts (Figure 4-8).

Focusing on the mean yields from 2014 to 2017, we found that relative errors were larger in the eastern part of the Banabuiú River basin, which corresponds to the irrigated area. Therefore, we conducted test calculations of the actual amount of irrigation water supplied in 2014 and 2015, and found that irrigation water was supplied at approximately 4.5 mm/sec in 2014 and approximately 3.5 mm/sec in 2015.

In addition, we predicted feijão-bean yields for 2018 using hindcast LAI data of the same year, which were produced by the DIAS drought monitoring and prediction system. The predicted yields indicated that this approach can achieve a level of accuracy comparable to that of real-time monitoring (Figure 4-9). Through this verification process, we confirmed that our drought monitoring and prediction system can be instrumental not only for monitoring and forecasting ecohydrological variables, but also for assessing agricultural impacts and supporting agricultural activities.

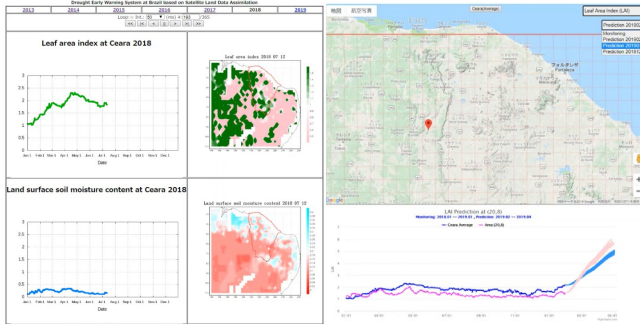


Figure 4-6 DIAS drought monitoring and prediction system for Northeastern Brazil

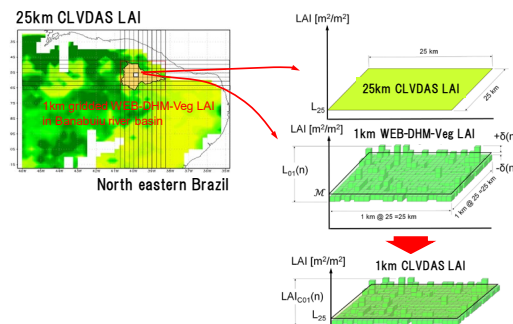


Figure 4-7 CLVDAS LAI High-Resolution Enhancement Method

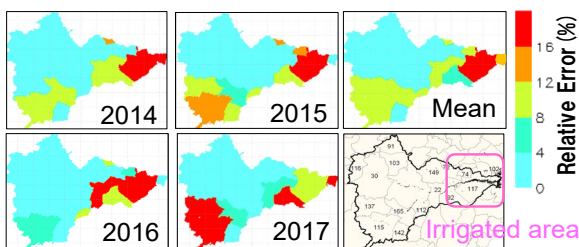


Figure 4-8 Relative error (%) between estimated and statistical yields of feijão beans in 16 districts of the Banabuiú River basin in Ceará state.

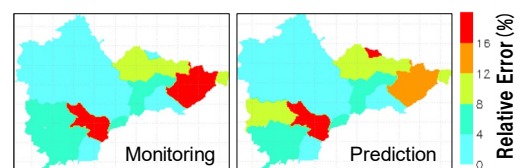


Figure 4-9 Relative error (%) between 2018 hindcast predicted yield and statistical yield of feijão beans in 16 districts of the Banabuiú River basin in Ceará state: (Left) Monitoring, (Right) Handcast prediction

(2) Republic of Ghana

ICHARM developed a DIAS drought monitoring and prediction system for Ghana based on the CLVDAS system (Figure 4-10). Furthermore, we developed a method to estimate corn yields using vegetation-water-content outputs produced by the developed system for 13 districts of Brong-Ahafo State, an agriculturally active region. Figure 4-11 shows the estimated corn yields for these districts. In the ASUNAFO and ASUTIFI districts (blue frame) and the NKORANZA and KINTAMPO districts (orange frame), corn yields are high because vegetation water content is high in both wet and dry years. In contrast, in the WENCHI and TECHIMAN districts (pink frame), corn yields are low because vegetation water content is low in the dry year due to drought impact, while corn yields are high because vegetation water content is high in the wet year. These results indicate that vegetation water content varies among districts due to the spatial distribution of root-zone-soil moisture content, and that corn yields correspondingly vary with this distribution.

Furthermore, we estimated corn yields using vegetation-water-content monitoring outputs for the period 2004 to 2022 and found good agreement with agricultural statistical data, with an RMSE of 2.1 t/ha. In addition, when the 2018 corn yield was predicted using hindcast vegetation-water-content data in 2018, the difference from the agricultural statistical data was only 0.2 t/ha. From these cases, we confirmed that drought assessment and crop-yield estimation and prediction in each district are feasible when district-scale agricultural statistical data are available.

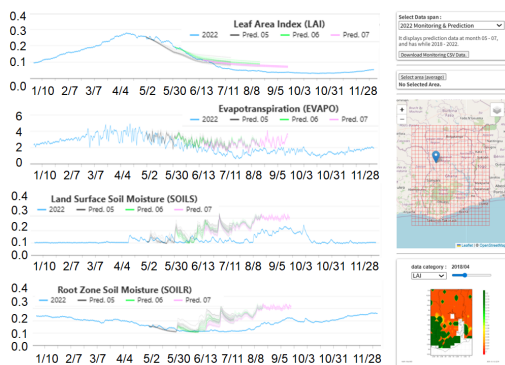


Figure 4-10 DIAS drought monitoring and prediction system for Ghana

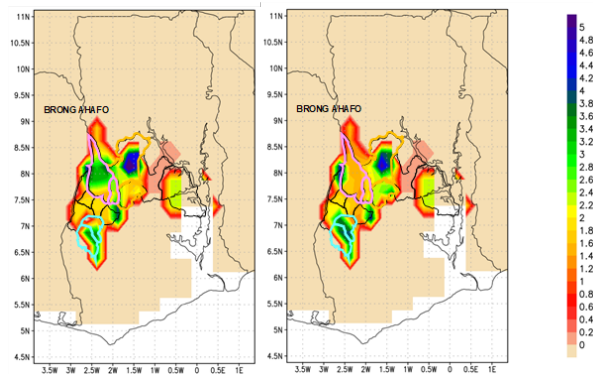


Figure 4-11 Spatial distribution of estimated corn yields in Brong-Ahafo province: Left figure shows humid years, right figure shows dry years. Blue box represents the ASUNAFO/ASUTIFI district, orange box represents the NKORANZA/KINTAMPO district, and pink box represents the WENCHI/TECHIMAN district.

(3) Republic of South Sudan

ICHARM developed a drought monitoring system based on CLVDAS and conducted long-term simulations for the period from 2004 to 2023. We also developed a method for estimating corn and sorghum yields from vegetation-water-content outputs produced by the developed system. The results showed that corn and sorghum yields remain high in Upper Nile, Pibor, and Eastern States, as well as parts of Central Equatoria State, even during drought years because soil moisture is consistently abundant (Figure 4-12a); therefore, the irrigation effect is low (Figure 4-12b). In other areas, yields are low because soil moisture is consistently low (Figure 4-12a), resulting in a high irrigation effect (Figure 4-12b). Yields were estimated to be high in 2021 (Figure 4-13b,c). However, they came closer to FAO statistical yields (Figure 4-13b, c) after setting the estimated yields in harvest areas overlapping with flood inundated zones (Figure 4-13a) to zero. This case demonstrates that agricultural drought can be assessed at the farm level when information on harvest areas and locations is available. It also suggests that drought-related agricultural damage should be evaluated seamlessly together with flood damage.

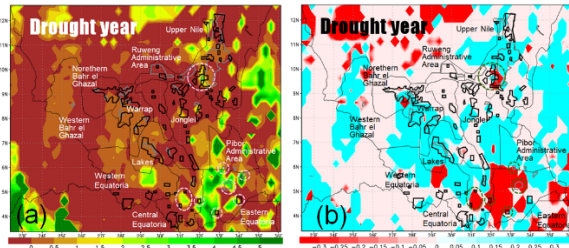


Figure 4-12 (a) Estimated yield ($\times 10^9$ t) and (b) Irrigation effectiveness: Com (gray) and Sorghum (black)

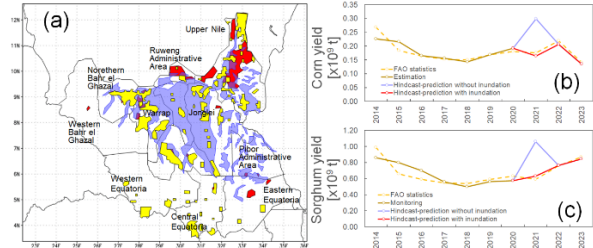


Figure 4-13 (a) Com (red), sorghum (yellow), and 2021 flood inundation area (blue); (b)(c) Estimated com and sorghum yields: (solid brown line) FAO statistical yield, (dashed yellow line) 2014-20 estimated yield, (solid blue line) 2021-23 estimated yield without considering the 2018 flood, (solid red line) 2021-23 estimated yield considering the 2018 flood.

b) Agricultural drought assessment using CLVDAS over the Intertropical Convergence Zone (ITCZ) and the subtropical high region

ICHARM assessed agricultural drought trends for the period from 2004 to 2017 using CLVDAS for six regions (West Africa, Malawi, Northeast Brazil, Jordan, India, and Guatemala) located in the Intertropical Convergence Zone (ITCZ) and the subtropical high region (Figure 4-14). The results showed good agreement in the normalized index (Z-score) between estimated vegetation water content and corn statistical yield. The analysis also indicated that droughts during 2004-2017 could be classified into three types: Type A, occurring in the late period, Type B, occurring in the early period, and Type C, occurring irregularly (Figure 4-15).

We also analyzed atmospheric boundary layer conditions and found that, in Type A, variations in the extent of updrafts in the ITCZ between wet and drought years affect land-surface dryness. In Type B, land-surface dryness is affected by the strength of downdrafts caused by the Hadley circulation. In Type C, drought years occur irregularly due to the combined influence of changes in ITCZ updraft extent (Type A) and the strength of Hadley-circulation downdrafts (Type B) (Figure 4-16).

In addition, we investigated the relationship between drought trends, atmospheric circulation phenomena, and external factors. The results suggested that droughts were associated with severe El Niño events in Northeastern Brazil, Guatemala, West Africa, and India, and with the negative Indian Ocean Dipole mode (IOD) in Marawi (Figure 4-17a). We also identified locust plague as an external factor causing agricultural damage in West Africa and Jordan (Figure 4-17b,c,d).

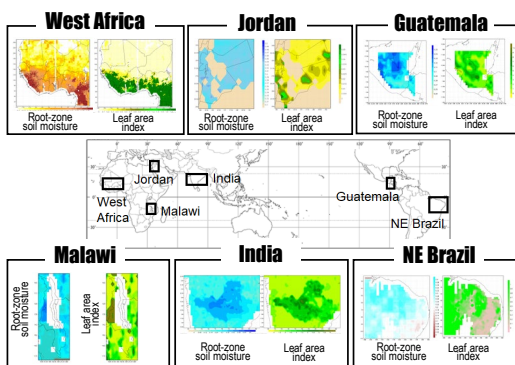


Figure 4-14 Spatial distribution of ecohydrological variables for six regions (West Africa, Malawi, Northeast Brazil, Jordan, India, and Guatemala) in the intertropical convergence zone (ITCZ) and the subtropical high region.

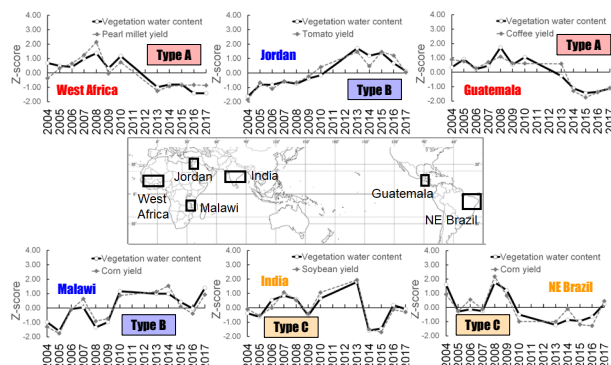


Figure 4-15 Variation of drought trends for six regions in the intertropical convergence zone (ITCZ) and the subtropical high region: the normalized index (Z-score) of estimated vegetation water content (solid line) and corn statistical yield (dashed line) and classification of drought trends (Type A, B, C)

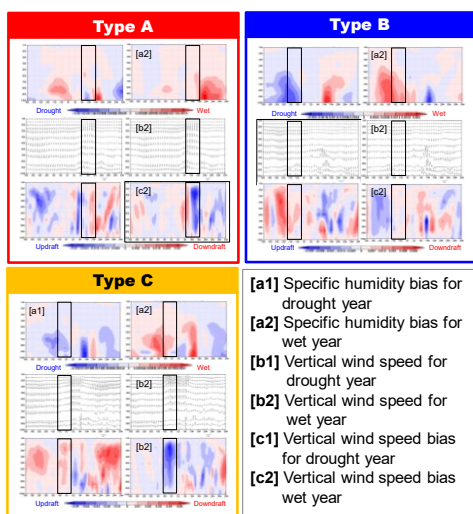


Figure 4-16 Three types of drought (A, B, C)

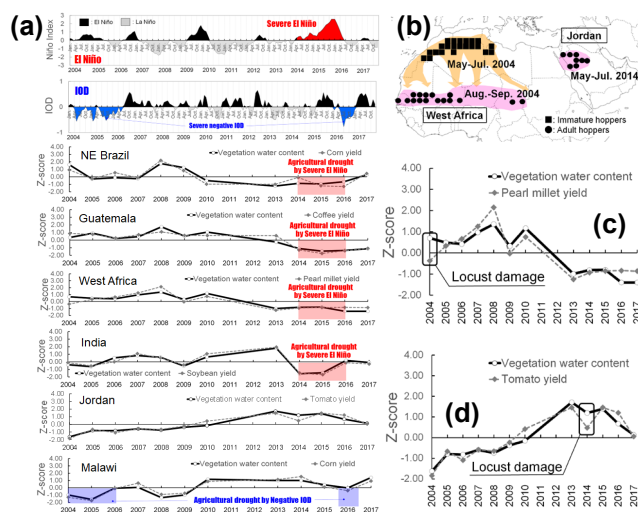


Figure 4-17 Relationship between drought trends and atmospheric circulation phenomena(a), occurrence information of locust plague as an external factor (b), relationship between locust plague and agricultural products damage (West Africa (c) and Jordan (d))

3) Development and Field Application of Optimal Operation Methods for Existing Dams Contributing to Flood Control

a) Background

At the 4th Asia–Pacific Water Summit held in Kumamoto City in April 2022, the Kumamoto Declaration was adopted, calling for a “transformation into quality-oriented societies that are resilient, sustainable, and inclusive.” At the summit, Prime Minister KISHIDA Fumio announced the Kumamoto Water Initiative, which promotes the development of “high-quality dams.” The initiative outlines the development and provision of dam-operation technologies that leverage rainfall observation and forecasting to achieve both climate-change adaptation and mitigation: reducing flood damage during the flood season through pre-release operations, and enhancing water-use and hydropower functions during the non-flood season and after flood events through high-water-level operation.

To establish flood-control functions in water-use dams while improving their water-use performance, it is essential to cultivate personnel capable of making sound operational decisions and to implement an integrated information system to support them. These personnel must be able to accurately interpret wide-area observation and forecast information and transition dam operations seamlessly from normal to emergency conditions.

ICHARM, in collaboration with the University of Tokyo’s Earth Environmental Data Commons, has been conducting, on the DIAS platform, (1) real-time ensemble rainfall forecasting (short-term and seasonal), (2) system development and research, and (3) joint research with the private sector.

This report introduces examples of system development aimed at establishing flood-control functions and improving hydropower performance at hydropower dams, as well as case studies examining optimal dam operation based on short-term and seasonal rainfall forecasts.

b) Case study

To efficiently operate dams within a river basin, i.e., improving power-generation efficiency while also optimizing downstream flood control, it is essential to design a runoff model that can continuously and quantitatively estimate normal flow, peak flood discharge, and snowmelt runoff, as well as evaluate the effects of dam operations. To meet these needs, we developed and applied the Water and Energy Budget-based Distributed Hydrological Model with Snow (WEB-DHM-S).

This model enables highly accurate estimation of river discharge because it can calculate, at each time step, the spatial distribution of initial hydrological conditions (soil moisture, groundwater level, snow accumulation and melt, etc.) at the

land surface, which strongly influence runoff prediction. Building on this capability, we examined optimal dam-operation methods that support both flood control and increased power generation, using inflow forecasts produced by Ushiyama et al.: short-term forecasts (3-km spatial resolution; 39-hour lead time, 1-hour temporal resolution; 32-member ensemble) and long-term forecasts (3-km spatial resolution; 3-month prediction horizon; 13-member ensemble).

The target basin for this study was the Hatanagi No. 1 Dam on the Ōi River in central Japan. Figure 4-18 shows the location map and a photograph of the dam.

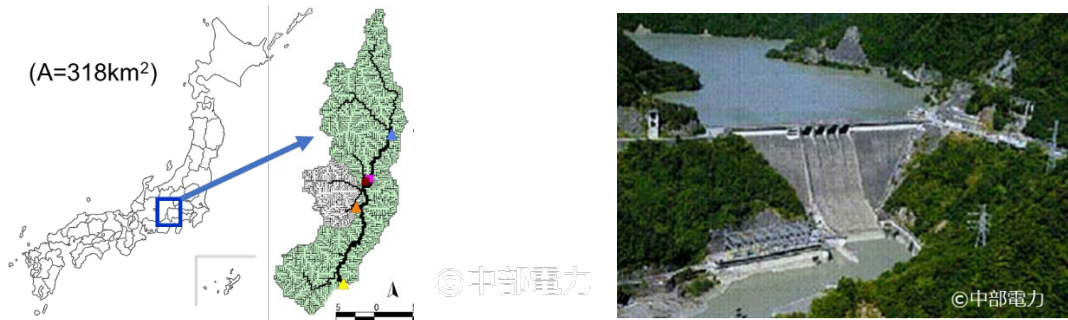


Figure 4-18, Photo 4-28 The location and a photo of the Hatanagi No.1 Dam

① Case study using short-term forecasts

Using ensemble rainfall-forecast data as input, we considered the range of 32 ensemble inflow predictions and set the following operational rules:

1. When prioritizing flood control, use the upper ~25% of the ensemble discharge time series; when prioritizing water retention for power generation, use the lower ~25%.
2. Check whether operating the dam according to existing regulations would result in releases exceeding the maximum safe discharge during the forecast period.
3. Check whether the cumulative inflow during the forecast period would exceed the available storage capacity at the start of forecasting.
4. If either threshold is exceeded, release the excess volume evenly over the forecast period while prioritizing water retention for power generation.
5. If not exceeded, calculate the average of the hourly inflow forecasts for the next 39 hours and use that as the power-generation release for the next hour.

For flood control, we evaluated whether the reservoir water level would remain below the normal water level when the target maximum gate-release discharge during floods was set at 600 m³/s. For power generation, performance was assessed using a “power-generation index,” which incorporates effective head into the power-generation release.

During the warm seasons (July-October) of 2018 and 2019, two flood events exceeding the target maximum gate-release discharge of 600 m³/s occurred: September 30 to October 1, 2018, and October 12 to 13, 2019. Figure 4-19 shows the results of the analysis.

The 2018 case represents a situation in which the reservoir water level was high at the start of forecasting. With the reservoir level already close to the preliminary release level, a pre-release based on the predicted inflow was carried out on the morning of September 29, the day before the flood (pink shading). This timely lowering of the reservoir level (yellow dashed line) enabled the gate-release discharge (pink shading) at the inflow peak (blue solid line) to be kept below the prescribed limit of 600 m³/s. (If no pre-release had been conducted, the gate-release discharge would have exceeded 600 m³/s, as indicated by the orange shading.)

The 2019 case represents a situation in which the reservoir water level was low at the start of forecasting. With sufficient storage capacity available, water was effectively stored in advance up to the normal water level (red dashed line), enabling the gate-release discharge to remain below 600 m³/s.

Regarding power generation, the power-generation index showed an average increase of 12.8% in 2018 and 3.7% in 2019 during the warm season (July-October).

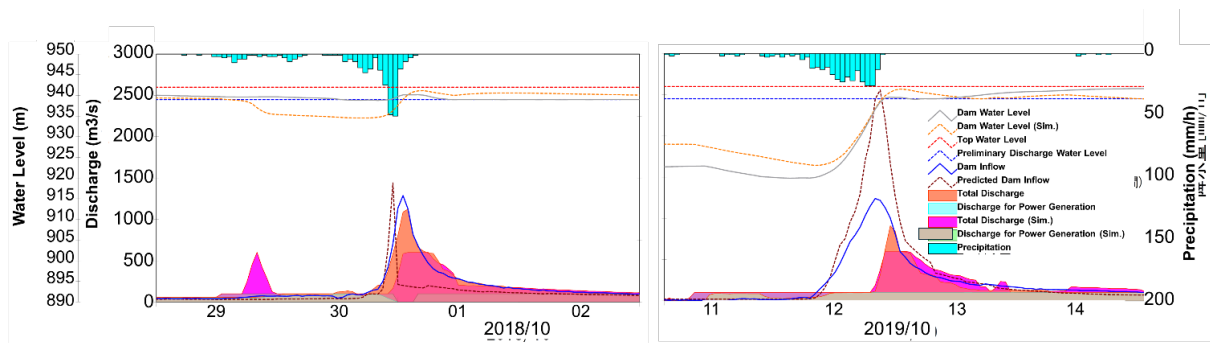


Figure 4-19 Results of the analysis for two flood events used to examine dam operations during floods exceeding the gate-release discharge of 600 m³/s (left: September 30–October 1, 2018; right: October 12–13, 2019).

② Case study using both short-term and long-term forecasts

In addition to the short-term forecasts examined in Section 2.1, we conducted simulations of long-term dam operations using ensemble three-month rainfall forecasts. Short-term forecasts (39-hour ensemble forecasts with 32 members) and long-term forecasts (three-month ensemble forecasts with 13 members) were executed simultaneously.

This case study focused on the one-year period from March 2020 to February 2021. For the short-term forecasts, when the reservoir water level at the time of forecasting was higher than Href (the threshold water level used to distinguish high and low levels), the upper 8 ensemble members (approximately the top 25%) were used. When the water level was lower than Href, the upper 24 ensemble members (approximately the top 75%) were used.

For the long-term forecasts, the analysis was based on the average inflow obtained by dividing the cumulative inflow from the start of forecasting to N days ahead by N. More specifically, the average inflow was examined using three averaging periods (N = 10, 30, and 86 days) in the warm season (May–October) and the cold season (November–April). When the reservoir storage at the time of forecasting exceeded the storage corresponding to Href, the highest inflow ensemble (rank 01) was used; when it was lower, the lowest inflow ensemble (rank 13) was used.

Both the short-term and long-term forecast procedures produced a release value for the next hour (the total of power-generation release and gate release). The larger of the two values was adopted. By varying the averaging period and the ensemble members used, three cases (Cases 1-3) were examined.

| | N [日] | | アンサンブル ル(長期) | 発電量指標 (落差と水量) | 増減 [%] | 年間発電使 用水量[m ³] | 増減 [%] |
|------|-------|------|-----------------|------------------|-----------|-------------------------------|-----------|
| | 暖候期 | 寒候期 | | | | | |
| 実績 | - | - | - | 218,294 | - | 871,517,952 | - |
| ケース1 | N=10 | N=86 | Rank1 or 13 | 214,335 | -1.80% | 900,618,347 | 3.30% |
| ケース2 | N=10 | N=30 | Rank1 or 13 | 231,465 | 6.00% | 897,865,266 | 3.00% |
| ケース3 | N=10 | N=30 | Rank6 | 211,687 | -3.00% | 890,741,812 | 2.20% |

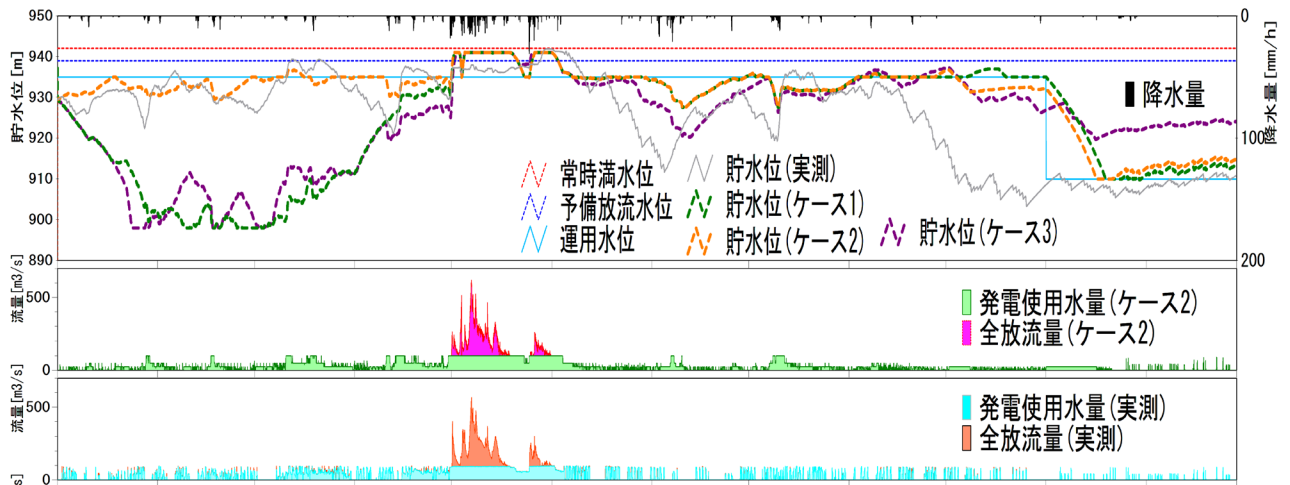


Figure 4-20 Annual operation simulation results for the Hatanagi No. 1 Dam on the Ōi River (March 2020-February 2021)

Table: Comparison of power-generation output for Cases 1-3

Charts: Annual operational water levels (upper chart), and power-generation water-use and release volumes for Case 2 (middle chart) and observations (lower chart).

As a result, we found that Case 2 (orange line), with $N = 10$ days in the warm season and $N = 30$ days in the cold season, achieved a 6.0% increase in power generation compared with conventional operations. In Case 1 (green line), although the annual volume of water used for power generation increased, power generation decreased by 1.8% due to a drop in the reservoir level in April. This drop occurred because using $N = 86$ days includes major rainfall events after the rainy season, leading the system to assume that abundant water would be available and therefore lowering the reservoir level. Case 3 (purple line) resulted in a 3.0% decrease, as it always used rank 6 and performed power-generation-oriented operations regardless of the operational water level, causing the reservoir to fall to its minimum level in late March.

These results demonstrate that running short-term (39-hour) and long-term (three-month) forecasting simultaneously, while appropriately adjusting the averaging period and ensemble ranks used in long-term forecasts according to the season, provides valuable information for increasing power generation. This approach also indicates a clear direction for establishing optimal dam-operation methods that can be applied more broadly.

c) Future Work

In this study, we examined two short-term cases (September 30-October 1, 2018, and October 12-13, 2019) and one long-term case covering the one-year period from March 2020 to February 2021. For wider application, we plan to conduct similar analyses for different periods and to extend the study from a single-dam setting to optimal operation methods that also account for cascade-dam systems.

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4) Rainfall and Sediment-Driftwood Production and Runoff Model (RSR Model):

Process-Based Modeling for Rainfall-Induced Multi-Hazard Events and Sediment Management in River Basins

In recent years, extreme rainfall events have manifested as "multi-hazards," where floods, landslides, debris flows, and driftwood transport interact in complex ways. These intertwined phenomena have led to frequent and severe water-related disasters worldwide, often involving massive quantities of sediment and driftwood. Large-scale landslides and debris flows in mountainous areas supply vast amounts of sediment and driftwood to river channels, causing rapid deposition and driftwood jams in downstream plains and significantly exacerbating inundation risks. Furthermore, long-term issues—such as prolonged turbidity caused by fine sediment runoff from collapsed slopes following heavy rains or earthquakes, and soil erosion on exposed slopes in river basins—have become critical global concerns. Addressing these phenomena requires a holistic scientific approach rather than isolated assessments. To meet these needs, ICHARM has been developing the Rainfall and Sediment-Driftwood Production and Runoff (RSR) model.

The primary strength of the RSR model lies in its integration of multi-hazard processes within a distributed rainfall-runoff framework. As shown in Figure 4-21, the RSR model consists of a distributed rainfall-runoff model (RRI) coupled with a unit river channel model, which handles riverbed elevation changes and sediment transport processes within the river channel network (Figure 4-22 (1)). In hillslope areas, the model incorporates components for landslide occurrence based on stability analysis, debris flow runout processes described by a point-mass system (Figure 4-22 (2)-①), and hillslope erosion caused by surface flow (Figure 4-22 (2)-②). Together, these components enable the model to simulate both short-term and long-term sediment production and transport processes throughout the entire catchment.

Additionally, a driftwood model has been developed to assess sediment-driftwood-flood hazards. Driftwood production is estimated based on the density of standing trees in mountain slope areas, where trees are recruited due to the erosion processes of landslides and debris flows. When debris flows reach a unit channel, driftwood is delivered along with sediment into the river network. To simulate the movement of numerous driftwood pieces during floods, the model describes their behavior as neutrally buoyant particles using advection and storage equations, while accounting for interactions with sediment erosion and deposition.

The RSR model has been applied to various spatio-temporal scales of sediment transport phenomena in many river basins globally. Among these applications, three case studies from Japanese river basins are presented to demonstrate the model's performance and highlight the importance of physical process-based analysis.

1. Abira River Basin (Hokkaido)¹⁾: Figure 4-23 shows the hillslope erosion depth and the unit channels that directly received sediment delivery after a 39-day simulation. The model successfully reproduced observed suspended sediment discharge (Figure 4-24, upper). A comparison with a case excluding hillslope erosion confirmed that fine sediment supplied from upstream hillslopes significantly affects sediment flow conditions in downstream reaches (Figure 4-24, lower).
2. Uchi River Basin (Miyagi Prefecture)²⁾: For the disaster caused by Typhoon Hagibis in 2019, the RSR model reproduced landslides and debris-flow impacts (Figure 4-25). By providing upstream boundary conditions to a 2D depth-integrated water and sediment transport model, the simulation accurately reproduced the deposition depth of inundated sediment in the plain area. The analysis revealed that large sediment volumes from mountainous areas led to rapid bed aggradation and braided channel formation in tributaries.
3. Akatani River Basin (Fukuoka Prefecture)³⁾: In analyzing the disaster that occurred in the Akatani River during the 2017 Northern Kyushu Typhoon, the RSR model was coupled with a 2D model, similar to the previous case study. As shown in Figure 4-26, simulation results clearly demonstrate that accounting for driftwood transport is essential for accurately reproducing the actual inundation area. The analysis confirmed that the flooding was significantly influenced by backwater impacts induced by driftwood blocking bridges.

Built on fundamental physical principles, the RSR model offers exceptional flexibility in synchronizing varying spatial and temporal scales. This adaptability is crucial for addressing both short-term pulse events, such as flash floods, and long-term continuous processes involving basin-scale sediment transport and morphological evolution. The model is freely available via the iRIC software: <https://i-ric.org/solvers/rri-on-iric/>.

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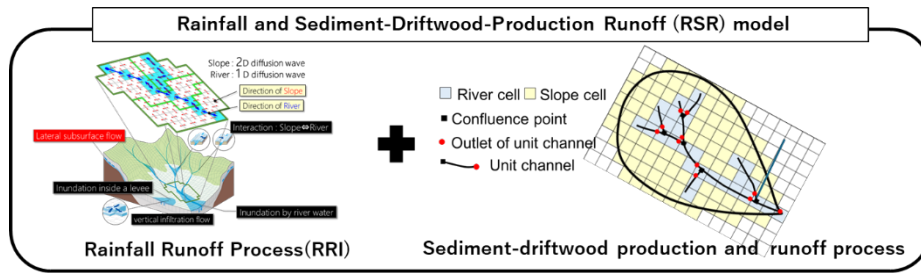
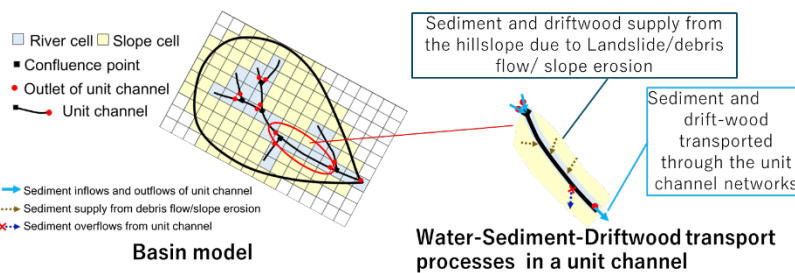


Figure 4-21 The structure of the Rainfall and Sediment-Driftwood-Production Runoff Model (RSR- Model)

(1) Sediment(drift woods) transport processes in channel networks (Unit channel model)



(2) Sediment and drift wood productions in mountain slope area

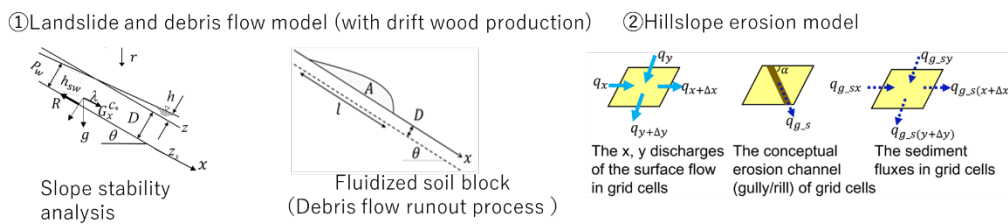


Figure 4-22 Sub-models of the RSR Model

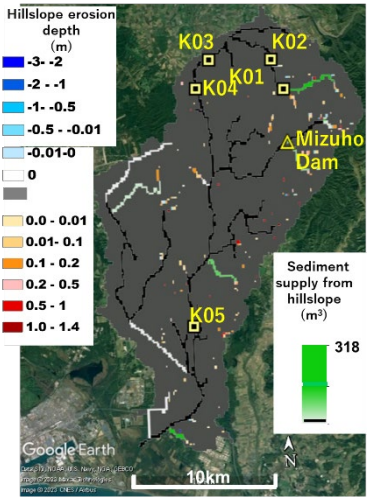


Figure 4-23 The simulation results of hillslope erosion depth and the distribution of direct sediment supply into unit channels

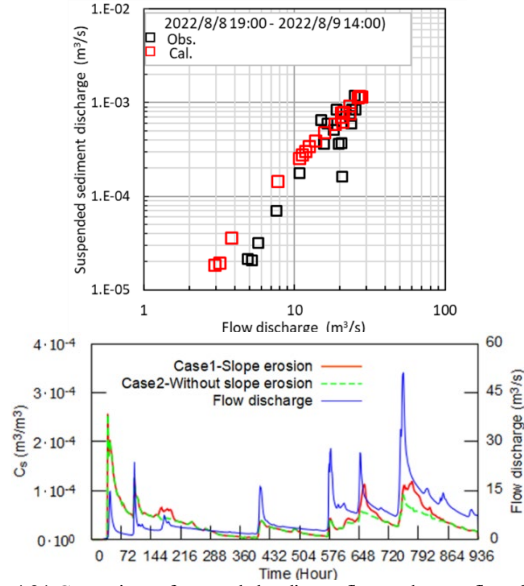


Figure 4-24 Comparison of suspended sediment flow and water flow discharge between calculation and observation at K05 (upper); The influence of fine sediment supply by hillslope erosion on the sediment concentration at K05 (lower).

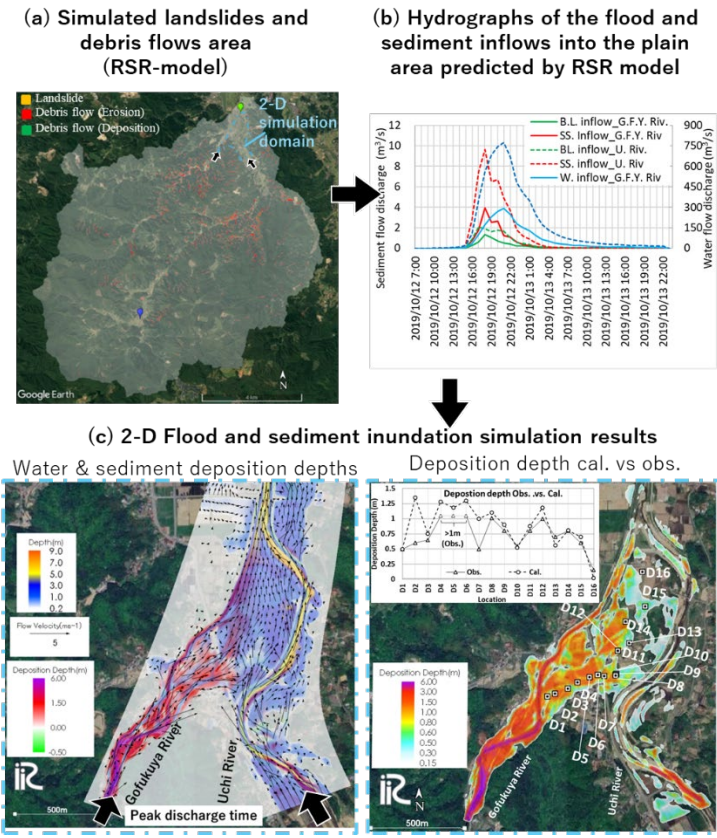


Figure 4-25 Application on rainfall induced multi-hazards disaster -from landslides-debris flows to flood and sediment inundation in- (Uchikawa River Basin, Marumori Town, Typhoon Hagibis, 2019)

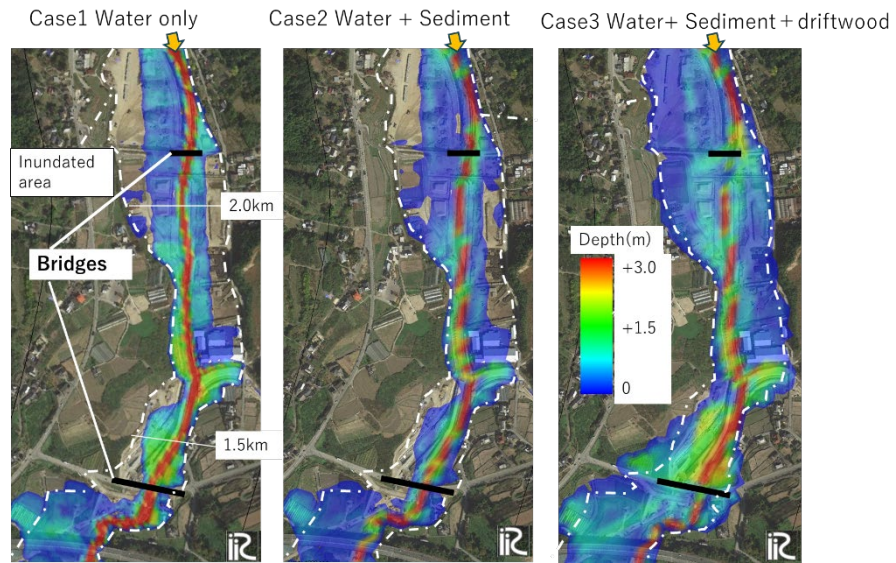


Figure 4-26 Application on rainfall induced multi-hazards disaster -sediment-driftwood-floods- (Akatani River, Nothem Kyusyu Typhoon, 2017)



Dr. EGASHIRA Shinji

Former ICHARM Research & training advisor

Over the ten-plus years, I was engaged in sediment transport research together with international students in the master's and doctoral programs, as well as with researchers, at ICHARM. Many of the students from countries in the Asian monsoon region show strong interest in sediment transport, river morphology, and flood disasters caused by these processes, and many chose these topics for their research. Working with them has given me numerous opportunities to reflect deeply on these issues.

To properly evaluate flood and sediment inundation phenomena, knowledge of suspended-sediment transport processes is essential. Research on suspended sediment has accumulated over three-quarters of a century, and the findings are well documented in books and handbooks. These studies describe suspended-sediment behavior using the advection–diffusion equation that includes a particle-settling term, or equations derived from it. Using these formulations, researchers have discussed equilibrium solutions for suspended-sediment concentration. For example, it is commonly argued that an equilibrium concentration profile is formed when the downward transport of particles due to settling is balanced by the upward transport due to diffusion.

However, these conventional methods for suspended sediment are far beyond our understanding, and for that reason, my colleagues and I have been exploring a more rational approach to describing suspended-sediment behavior. Our idea is to use a three-dimensional advection equation with suspended-sediment source and sink terms to represent suspended-sediment dynamics. When source and sink vectors are introduced, these terms can be evaluated by the positive and negative divergences of these vectors. In other words, the spatiotemporal change in suspended-sediment concentration, dc/dt is explicitly shown to arise from the source-sink processes.

Although the detailed structures of these two terms remain a subject for future research, analyses based on the depth-integrated, two-dimensional advection equation derived from the three-dimensional formulation have already produced meaningful results. These findings have been published in domestic and international journals and have been applied in several PhD dissertations. Such as this, the depth integrated form of the original equation has been accepted. However, the article to describe the original equation has not passed peer review in Japan or abroad, and has faced a complicated situation. The new analytical approach was developed through collaboration with international students and research colleagues, but given these difficulties, I suspect that it has caused considerable inconvenience to many people. I would like to take this opportunity to acknowledge this and offer my sincere apologies.

4-3 Monitoring and prediction of changes in water-related disaster risk -Research Projects on Climate Change-

ICHARM has participated in the following climate change–related research programs led by MEXT.

1) Program for Risk Information on Climate Change (SOUSEI program): 2012–2016

Under this program, research was conducted to develop methods for quantitatively projecting how future risks of floods and droughts will change under global warming, and how these changes may affect society, using CMIP5-generation climate projection data. Within this framework, ICHARM implemented the project “Water-related disaster risk assessment and creation of adaptation information in Asia” as part of Theme D: Precise impact assessments on climate change (Leader: Professor NAKAKITA Eiichi, Disaster Prevention Research Institute, Kyoto University).



This project selected five target basins: the Indus River (Pakistan), the Chao Phraya River (Thailand), the Solo River

(Indonesia), the lower Mekong River (primarily Cambodia), and the Pampanga River (Philippines). For these basins, the project team developed and examined methods for locally applying flood and drought hazard projections based on GCM outputs at the river-basin scale while accounting for uncertainty. The team also developed fundamental techniques for assessing flood and drought risks and conducted assessments of risk changes under climate change. The results showed that, in terms of flood risk assessment, many basins exhibited increases in rainfall, inundation extent, and agricultural damage. For drought risk assessment, some basins showed changes in the timing and duration of the rainy and dry seasons. Further details are available at the following websites:

ICHARM: <https://www.pwri.go.jp/icharm/research/articles/project-sousei.html>

SOUSEI: <https://www.jamstec.go.jp/sousei/eng/index.html>

2) Integrated Research Program for Advancing Climate Models: 2017–2021

This program aimed to support the implementation of climate-change adaptation measures in Asia-Pacific countries by projecting future changes in hazards that trigger water-related disasters in the region, and by establishing a foundation for conducting impact assessment studies in collaboration with local researchers and practitioners. Within this program, ICHARM carried out the sub-project “4.1. Prediction of changes in water-related disaster hazards in Southeast Asia and the Pacific,” which formed part of “4. Hazard assessment in Asian and Pacific countries and international cooperation” (Representative: Professor TACHIKAWA Yasuto, Graduate School of Engineering, Kyoto University), under Area Theme D: Integrated Hazard Prediction (Area Representative: Professor NAKAKITA Eiichi, Disaster Prevention Research Institute, Kyoto University).



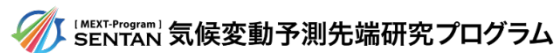
This sub-project focused on the Davao River basin in Mindanao, the Philippines, and river basins in Java, Indonesia. In these regions, the project team conducted water-related disaster risk analyses and, as part of efforts to understand current local needs and capacities for climate-change adaptation and to support the implementation of adaptation measures, discussed action plans with key stakeholders of the “Platform on Water Resilience and Disasters” in each country. Along with these activities, the team also developed the Online Synthesis System for Sustainability and Resilience (OSS-SR), a knowledge-integration platform that brings together data, expertise, information, experience, know-how, and technologies for reducing water-related disaster risks. By using this system as an online learning environment, the team launched a prototype initiative to cultivate facilitators capable of translating the latest scientific and technological knowledge into societal practice.

ICHARM: https://www.pwri.go.jp/icharm/research/articles/project-tougou_j.html

SOUSEI: <https://www.jamstec.go.jp/tougou/eng/index.html>

3) MEXT-Program for the Advanced Studies of Climate Change Projection (SENTAN): 2022-

This program aims to further advance the climate change research promoted by MEXT. It supports research and development to reduce uncertainties of future projections through advances in climate change simulation technologies, to analyze climate change mechanisms, and to improve both the accuracy and usability of climate prediction data. The program manages these research activities in a coordinated manner to generate and provide scientific evidence that can inform effective climate change measures, including adaptation strategies and mitigation efforts towards a decarbonized society.



In 2022, the program established four main research themes. ICHARM participates in Subject D: International cooperation for hazard and risk assessment in the Asia-Pacific region (Representative: Professor TACHIKAWA Yasuto, Graduate School of Engineering, Kyoto University), under Area Theme 4: Development of an integrated hazard projection model (Representative organization: Kyoto University). ICHARM has undertaken tasks focused on the Philippines, including the development of a water circulation model and a locally calibrated OSS-SR.

SENTAN: <https://www.jamstec.go.jp/sentan/eng/index.html>

4-4 Proposal, evaluation, and application of policy ideas for water-related risk reduction

1) Flood Forecasting in Small and Medium-Sized Rivers

a) Introduction

In recent years, increasingly frequent and intense heavy rainfall events have caused significant human and physical damage from water-related disasters in Japan and around the world. In Japan, these impacts are evident not only along major rivers but also along small and medium-sized rivers managed by prefectures and designated cities. Because these smaller rivers have limited basin areas and water levels rise quickly after rainfall begins, it is difficult to secure adequate lead time for residents to make evacuation decisions. In addition, many of these rivers lack sufficient hydrological data, such as water levels and discharge, as well as detailed channel-cross-section information, making it challenging to introduce conventional, highly sophisticated flood-forecasting systems. As climate change driven by global warming is expected to increase the frequency of flooding, the development of water-level forecasting systems that can predict water levels even a few hours ahead has become an urgent priority to ensure safe evacuation.

To address this urgent need, PWRI worked to develop a real-time water-level forecasting system for small and medium-sized rivers, with support from the Cabinet Office's Public/Private R&D Investment Strategic Expansion Program (PRISM) from FY2018 to FY2022. PWRI designed the system to predict when river water levels will reach thresholds requiring resident evacuation up to roughly two hours in advance. Other requirements included applicability to smaller rivers, quick calculations, ease of operation, cost-efficiency, and sufficient accuracy.

A distinctive feature of this research is its strong emphasis on practicality in real-world situations, integrating the entire process – from research and development to on-site demonstration and the preparation of manuals for nationwide deployment – into a single, coherent effort. The following sections provide an overview of the system, and for further details, please refer to the references listed at the end.

b) Overview of the real-time water-level forecasting system

This system consists of the following five main processes (Figure 4-27):

1. Construction of the base model using the RRI_GUI
2. Initial analysis using default parameters
3. Automatic parameter optimization using the SCE-UA method
4. Water-level data assimilation using a particle filter
5. Real-time computation and distribution on the DIAS platform

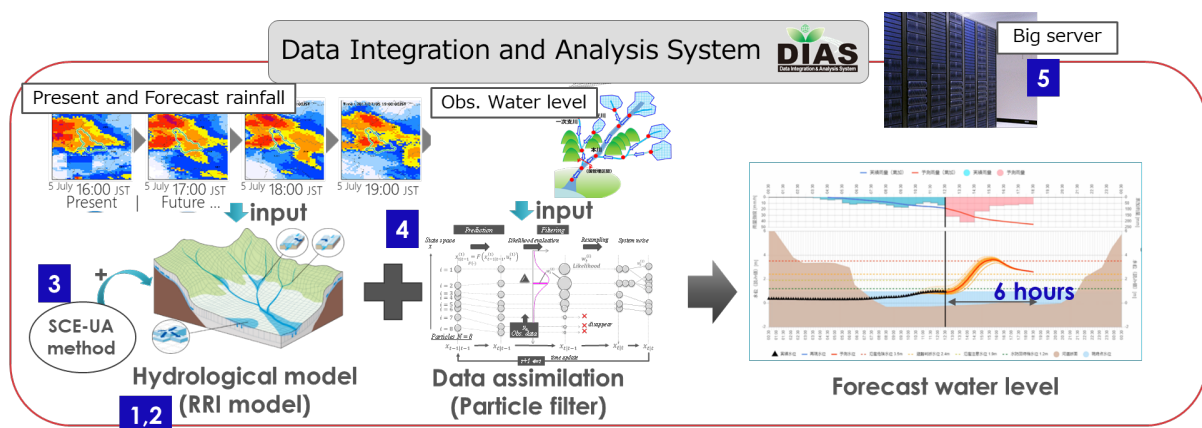


Figure4-27 Outline of main system

For rainfall–runoff analysis, the system adopts the open-source Rainfall–Runoff–Inundation (RRI) model. To make model construction easier – from obtaining terrain and land-use data to building the model itself – we developed a new GUI optimized for compatibility with domestic datasets. The system can use several types of rainfall data provided by the Japan Meteorological Agency, including analyzed rainfall, short-term precipitation forecasts, high-resolution

precipitation nowcasts, and ground-based rain-gauge observations.

In the model constructed for this study, river cross-sections are represented as rectangular channels, and channel width and depth are determined using regime equations. Using this GUI, a base model is constructed for each river. The default spatial resolution of these base models is 5 arc-seconds.

The system conducts an initial simulation using the default parameters and, based on the results, makes adjustments to the H–Q relationship and reviews the rainfall products. The default parameters consist of general values described in the RRI model manual, as well as average values derived empirically from building models for 200 rivers. The purpose of this step is to identify issues that exist prior to parameter calibration by checking, in particular, the consistency of normal water levels during non-rainfall periods and the responsiveness of the hydrograph to rainfall.

In addition, to reduce the time and effort required for model construction, the parameter-optimization method SCE-UA, developed by Duan et al., is incorporated into the RRI model, enabling automatic calibration using multiple flood events. SCE-UA has greatly improved the efficiency of parameter tuning, which previously required specialized expertise and a substantial amount of time.

In this development, we adopted a particle filter for water-level data assimilation, which serves as a core component of the forecasting system.

The RRI model adopted for this development is not designed to consider water and energy balances such as evapotranspiration. As a result, when real-time forecasting is run continuously over long periods, errors in the initial conditions gradually accumulate and can significantly affect the prediction results. To correct these errors, we incorporated a particle filter, a data-assimilation technology, into the RRI model, enabling sequential correction of calculated water levels using observed water-level data.

As the state variable for sequential correction, we selected the slope water depth h_s above the impermeable layer. This choice reflects both the practical difficulty of directly observing soil moisture conditions in real time and the fact that, within the RRI model, the behavior of slope water depth has a strong influence on the resulting river water levels. Meanwhile, some previous studies have reported applications of particle filters to other state variables, such as the storage volumes of channel cells, indicating room for further improvement in the future.

Because small and medium-sized rivers typically have only a single water-level gauge installed, the system uses the gauge location as the evaluation point, and the correction factor is applied uniformly across the entire basin.

The constructed model was implemented on the Data Integration and Analysis System (DIAS), where it automatically retrieves rainfall and water-level observations and performs real-time water-level forecasting every 30 minutes, providing predictions up to six hours ahead. For input rainfall, the system uses analyzed rainfall for the past three hours from the current time and short-term precipitation forecasts for the subsequent six hours, allowing each run to process a total of nine hours of rainfall data.

When evaluating the accuracy of the water-level forecasts produced by this system, it is necessary to distinguish between errors arising from rainfall-forecast uncertainty and those attributable to the model's reproducibility. For this reason, the accuracy assessment also includes analyses in which observed rainfall is used in place of forecast rainfall.

c) Demonstration results and accuracy evaluation

To apply the water-level forecasting system to small and medium-sized rivers with diverse topographic and land-use characteristics, as shown in Figure 4-28, we constructed trial real-time forecasting models for 200 rivers across Japan and conducted accuracy evaluations for 291 flood events. As a result, the system achieved forecasts within ± 50 cm of the flood-danger level (or an equivalent threshold) at least two hours in advance for 75% of the events.

Furthermore, considering that small catchments often have very short flood-response times, we also evaluated performance using the criterion of " ± 50 cm accuracy within each basin's flood-arrival time." The results showed that the system was able to achieve that level of accuracy for a cumulative total of 89% of the events (Figure 4-29).

Figure 4-30 presents an example in which the constructed model was used to perform real-time water-level forecasting during the July 2020 heavy rainfall event. The figure shows the display generated on DIAS, with future water-level predictions added for verification purposes. The target river is a mid-mountain basin with a catchment area of approximately 60 km², about 70% of which is mountainous terrain. As of 1:30 a.m. on July 14, the system predicted

that the water level would reach the flood-danger level at 7:10 a.m., while the actual arrival time was 7:20 a.m., yielding a lead time of 5 hours and 50 minutes.

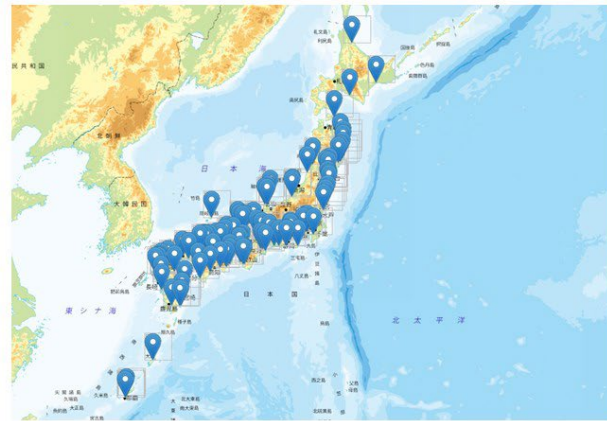


Image of browsing screen of real-time automatic distribution system

Figure 4-28 Location of applied medium-sized rivers

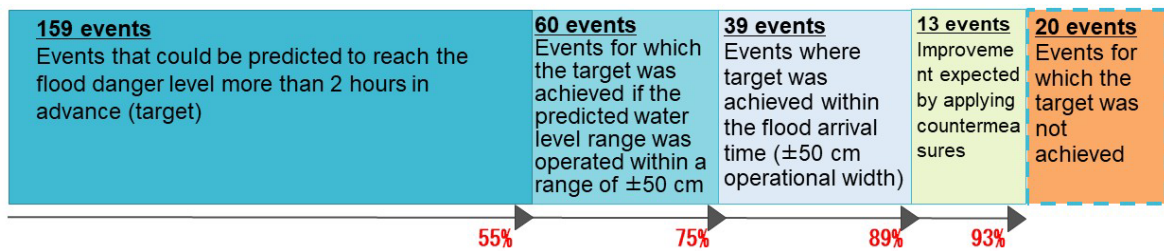


Figure4-29 Result of accuracy check

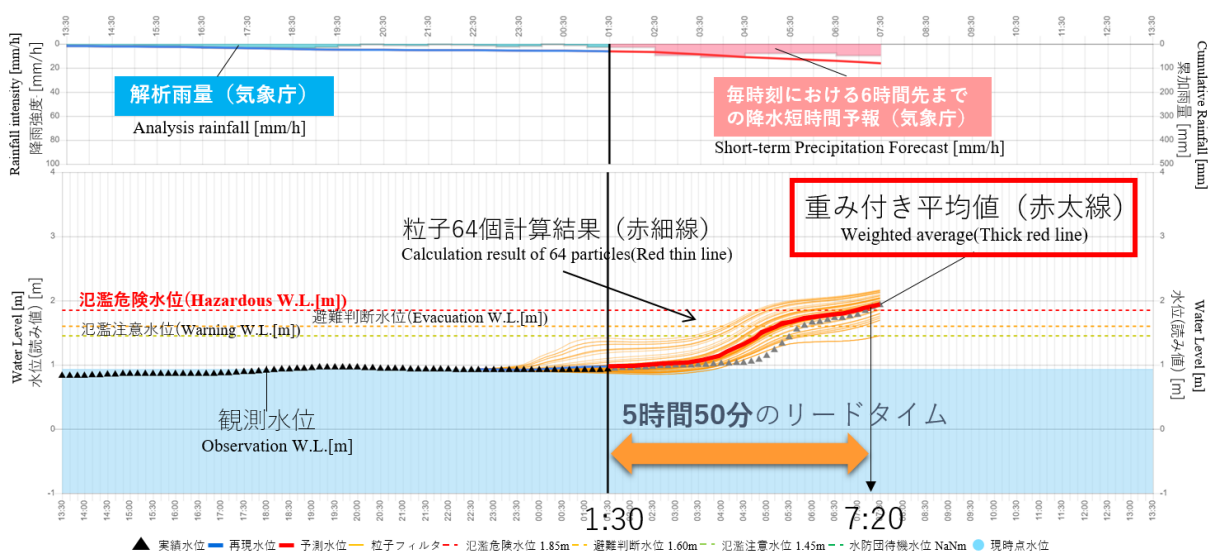


Figure4-30 Real-time water-level forecasting calculation results at 1:30 on July 14, 2020, in a typical mountainous river with a basin area of about 60 km², out of which 70% is in the mountainous area.

d) Development of the model building manual and nationwide deployment

The knowledge gained through the construction and validation of models for 200 rivers was organized into a comprehensive manual for building flood forecasting models for small and medium-sized rivers. The manual outlines a standard model that can be built with only the essential functions, along with a set of optional components, which can be selected according to the characteristics of each river.

For rivers lacking water-level data from past flood events, the manual presents a method for identifying similar basins using principal component analysis based on factors such as catchment area and land-use composition, and then transferring parameters from those analogous basins. It also summarizes recommended approaches for addressing practical challenges encountered in the field, including small catchments, anthropogenic flow fluctuations, and observation stations affected by backwater or tidal influences.

(Manual for Flood Forecasting Model Building for small and medium-sized rivers:

https://www.pwri.go.jp/icharm/research/articles/project-prism_manual_j.html)

e) Conclusion

In this study, we developed a real-time water-level forecasting system that is both easy to operate and highly reproducible by combining the RRI model with automatic parameter optimization using the SCE-UA method and water-level data assimilation using a particle filter. Demonstrations conducted for 200 rivers across Japan showed that the system achieved forecasts at least two hours in advance for approximately 75% of the events, and met the accuracy target for roughly 90% of the events when evaluated against each basin's flood-arrival time.

Moreover, this work extends beyond research and development, providing a foundation for practical implementation in rivers with diverse sizes and characteristics through the development of a manual for model construction and on-site installation. Widespread adoption of this technology in regions with small and medium-sized rivers is expected to support timely evacuation and help minimize flood-related damage.

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MOCHIZUKI Takafumi

Ministry of Land, Infrastructure, Transport and Tourism
Former ICHARM Senior Researcher

Congratulations on the 20th anniversary of ICHARM's establishment.

I was with ICHARM from 2018 to 2023 and was involved in part of the PRISM project, "Development of a Water-Level Information Provision System for Small and Medium-Sized Rivers by Trend Analysis Using Observed Water Levels."

Water-level forecasting technologies play an extremely important role in disaster prevention and mitigation to protect human lives and social infrastructure, especially as water-related disasters become more intense and frequent due to climate change.

At the same time, challenges remain. We have yet to accumulate sufficient data that reflect the impacts of climate change, and we continue to face a shortage of technical personnel. In my view, overcoming these and other related challenges is essential for strengthening disaster-resilience in a sustainable manner.

I look forward to ICHARM continuing to lead global disaster risk reduction by addressing these issues, advancing the use of cutting-edge technologies, promoting their standardization for practical implementation, and driving further innovation.

On the occasion of this significant 20-year milestone, I extend my heartfelt congratulations and wish ICHARM continued growth and success in the years ahead.

2) An Overview of a Development of Methodological Framework for Flood Risk Assessment under Climate and Social Changes at ICHARM

Floods are among the most common water-related disasters in river basins across many countries, causing severe damage such as loss of life and destruction of infrastructure and property. Recently, the frequency and severity of flooding have been increasingly amplified by climate and social changes. Flood disasters are exacerbated by the intensifying impact of climate changes such as occurrence of frequent extreme events, as well as by increased social vulnerability resulting from urbanization, population growth, and inadequate infrastructure. These combined factors can lead to more destructive floods that threaten lives and cause significant economic losses, particularly in flood-prone areas of developing countries, where resources for flood management are limited.

Understanding potential future variations in flood damage due to climate and social changes is crucial for effective flood risk management. Therefore, it is essential to develop robust flood-risk assessment methods and evaluate potential damage and risk levels in flood-prone areas while taking into account the impacts of future climate and social changes. Such assessments support the enhancement of flood management strategies, including the implementation of preventive and adaptive measures, as well as land-use regulations.

In order to enhance future societal management, ICHARM has been actively engaged in the development of robust and innovative methodologies for the assessment of flood risk under changing climatic and social conditions. This article provides an overview of the methodological framework developed at ICHARM for flood risk assessment under these evolving conditions. The framework integrates hydrologic-hydraulic modeling with a flood damage estimation model to generate useful information and science-based practical solutions for disaster risk reduction. A detailed description of the developed methodology and the findings of the flood risk assessment for the Solo River basin in Indonesia, conducted using the developed methodology under scenarios of climate and social changes, are presented below.

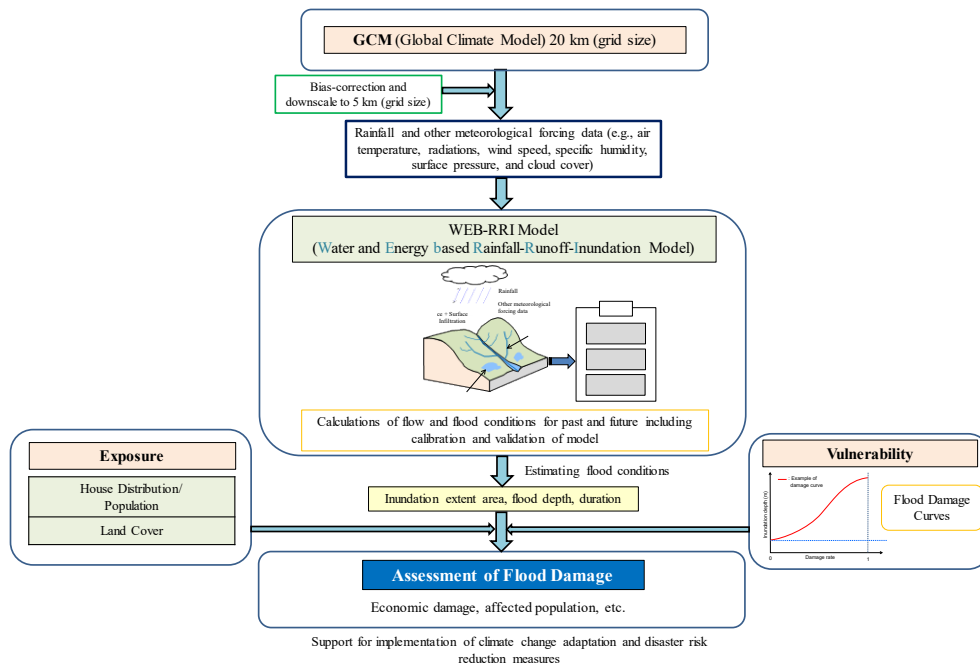


Figure 4-31 Overview of the methodology for quantitative flood damage assessment

The methodological framework was developed by coupling climate model outputs, a water and energy budget-based rainfall-runoff-inundation model, and a flood loss model (Figure 4-31). The method was designed to quantitatively assess flood damage to the agriculture sector and residential areas, under scenarios of climate and social changes (here, social changes refer to land use, land cover, and population). To quantify the damage, flood damage curves were developed for agricultural crops and for residential buildings and contents (Figure 4-32) (Shrestha et al., 2025a, b). Then, flood damage to agricultural crops and residential households was assessed under scenarios of climate and social changes, focusing on the Solo River basin of Indonesia. Figure 4-33 shows the location of the case study area.

This study used MRI-AGCM climate model outputs for the past (1979–2002) and far-future (2075–2098) periods. To account for future changes in paddy-field area when assessing agricultural flood damage, land use and land cover (LULC) changes were analyzed using historical land cover maps, and future changes in LULC were projected based on a learning process using historical maps and static variables. The effects of possible changes in future population growth and development on flood damage to residential households were analyzed using population projections based on shared socio-economic pathways (SSPs). The developed method was first validated for a severe past flood event by comparing calculated results with reported damage data. Flood exposure and damage were then assessed for the past and far-future periods.

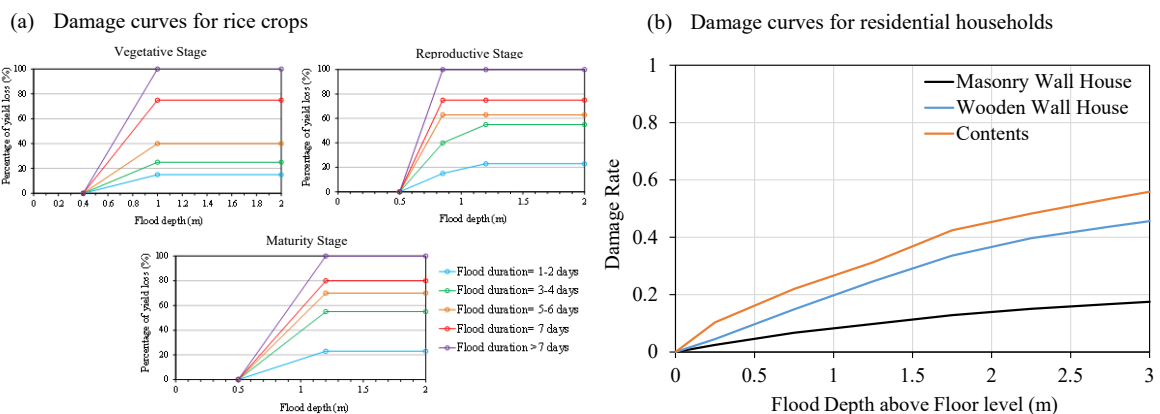


Figure 4-32 Developed flood damage curves: (a) agricultural crops (rice crops) and (b) residential households

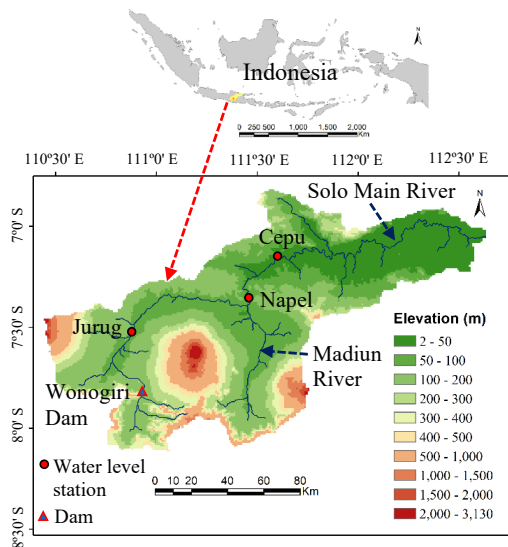


Figure 4-33 Location of the Solo River basin, Indonesia

The calculated flood inundation area and peak inundation volume (flood depth > 0.5 m) for the past period and the far-future period are presented in Figure 4-34. The results indicate that both the inundation area and peak inundation volume are projected to increase in the future due to climate change. Compared with the past period, the future period shows larger inundation extents and higher peak flood volumes, suggesting that a greater area of land will be exposed to more frequent flooding with deeper floodwaters in the future.

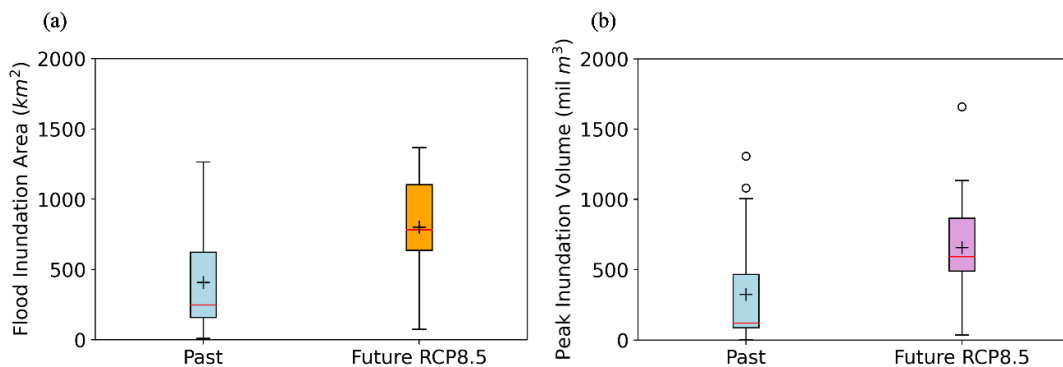


Figure 4-34 (a) Calculated inundation area and (b) peak flood volume for the past period (1979–2002) and the far-future period (2075–2098)

Figure 4-35 shows the calculated flood damage to rice crops and to residential houses and contents for the past and far-future periods (Shrestha et al., 2025a, b). The results indicate that the average annual damage to rice crops in the study area may increase by 93.7% in the future due to climate change impacts alone, assuming no changes in paddy field area (Shrestha et al., 2025a). When both climate change effects and future changes in paddy field area are considered, the average annual damage to rice crops is projected to increase by more than 50%, with the lower percentage increase attributable to a projected decrease in paddy field area. These results suggest that rice production may decrease in the future not only due to climate change impacts but also due to decreases in paddy field area. Rice production may decline by 24.6% in the future due solely to decreases in paddy field area (Shrestha et al., 2025a).

The calculation results also show that future increases in household damage may vary widely depending on future population scenarios. The estimated building and content damage for the far-future period is relatively higher across all future population scenarios than that for the past period with the base-year population. The average annual household damage value may increase by 146% in the future in the case of the base-year population (Shrestha et al., 2025b). The increases in average annual household damage for the far-future period in the cases of SSP1, SSP2, SSP3, SSP4, and SSP5 compared to that for the past period are projected to be 150%, 193%, 259%, 121%, and 146%, respectively

(Shrestha et al., 2025b). Flood damage to residential households is likely to be the most severe in the case of the SSP3 projected population scenario compared with the other future population scenarios.

The developed methodology, which integrates climate model outputs, hydrologic-hydraulic modeling, and flood loss estimation models, can be applied to other areas to quantitatively assess flood damage under changing climatic and social conditions and to evaluate the effectiveness of existing or planned flood preventive measures. The quantitative results of flood damage assessments under changing climatic and socio-economic conditions can be useful to understand future flood damage conditions, which can help implement practical mitigation and adaptation actions in response to climate and social changes. The outcomes of flood damage assessments, obtained by applying the developed methodological framework, provide information on flood hazards and associated damages that can help policymakers and decision-makers formulate policies and strategies for disaster risk reduction.

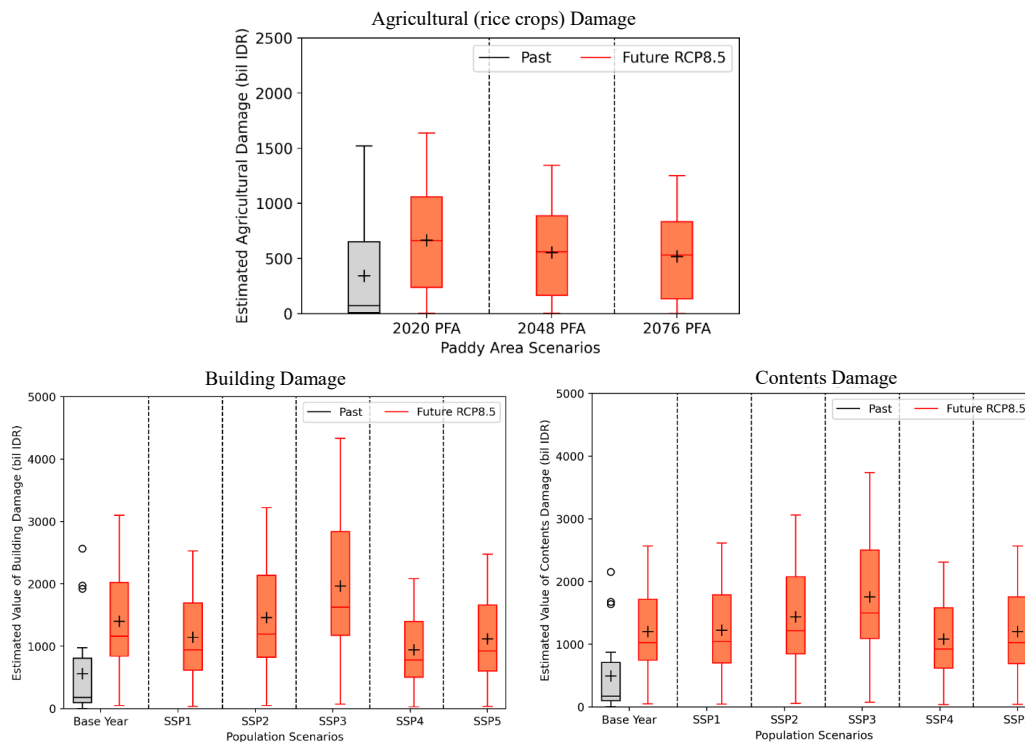


Figure 4-35 Calculated values of agricultural damage, building damage, and content damage for the past and far-future periods (Shrestha et al., 2025a, b).

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4-5 Support in improving the applicability of water-related disaster management

1) Development and Utilization of Disaster-Prevention and Disaster-Information Tools

ICHARM has developed tools to support disaster-prevention and disaster-risk-reduction activities by municipalities in regions where disaster information is limited, such as Japan's mountainous areas and developing countries. These tools include the Flood Risk Profile, which visualizes local vulnerability to flooding, and the ICHARM Disaster Risk Information System (IDRIS), which enables disaster-related information to be shared among disaster-management officials and local residents. Their effectiveness has been confirmed through field application.

a) Flood Risk Profile

In this study, the project team developed the Flood Risk Profile, a tool that identifies the types of hazards to which flood-prone areas are vulnerable and clarifies the specific aspects of that vulnerability. This tool is designed to function as a diagnostic instrument for assessing flood risk in a specific area. Using the RRI model, various hazard patterns – combinations of main-river discharge and rainfall – are prepared, and inundation simulations are conducted. From the resulting inundation extent, depth, and duration, the onset time, depth, and duration of inundation at evaluation points within the target area are calculated.

Next, vulnerability levels (ranks a to d) at evaluation points of the target areas are determined for each of the eight selected evaluation indicators by applying the indicators' threshold values to the calculated results. Based on the scores assigned to each rank, a Flood Risk Profile is generated. For each hazard pattern, the scores across the eight evaluation indicators are then summed to obtain a subtotal risk value. Using these subtotal risk values, cluster analysis is performed to classify the target areas, after which the group with the highest flood risk is extracted to identify flood hotspots.

Table 4-1 Eight evaluation indicators for area risk assessment

| 評価軸 | 評価地点 | 指標 | 評価(ランク) | 閾値 | 閾値の設定根拠 | 指標の算出方法 |
|-----------------|--------|-------------------------------|---------|---------------|--|--|
| ① 避難開始までの余裕時間 | 地区内代表点 | 浸水深が0.1mから0.5mに達するまでの時間 | d (0点) | (0.5mに達しない場合) | RRIモデルによる計算結果 3時間・事前対応が可能となる時間(阿賀町担当者ヒアリングによる) 6時間・阿賀町における将来の独居高齢者の増加を踏まえ、便宜的に3時間の倍の時間として設定 | RRIモデルによる計算結果 |
| | | | c (1点) | 6時間以上 | | |
| | | | b (2点) | 3時間以上6時間未満 | | |
| | | | a (3点) | 3時間未満 | | |
| | | | d (0点) | 0.1日未満 | | |
| ② 避難が必要な期間 | 地区内代表点 | 浸水深0.5m以上の継続時間 | c (1点) | 0.1日以上~0.5日未満 | RRIモデルでの計算値を参考に、地区間相対比較が可能のように設定 | RRIモデルによる計算結果 |
| | | | b (2点) | 0.5日以上~1.0日未満 | | |
| | | | a (3点) | 1.0日以上 | | |
| | | | d (0点) | 0.1m未満 | | |
| | | | c (1点) | 0.1m以上0.5m未満 | | |
| ③ 地区の浸水深さ | 地区内代表点 | 最大浸水深 | b (2点) | 0.5m以上1.7m未満 | 国土交通省マニュアル 0.1m: RRIモデル上で浸水と判断する水位 0.5m: 1階床の高さ 1.7m: 0.5m+1.2m(死亡率が低い安全水位深さ) 3.2m: 0.5m+2.7m(1階部分の高さ) | RRIモデルによる計算結果 |
| | | | a (3点) | 1.7m以上3.2m未満 | | |
| | | | aa (4点) | 3.2m以上 | | |
| | | | d (0点) | 0.1m未満 | | |
| | | | c (1点) | 0.1m以上0.3m未満 | | |
| ④ 避難所の危険度 | 地区内避難所 | 避難所の最大浸水深 | b (2点) | 0.3m以上0.5m未満 | 国土交通省マニュアル 0.1m: RRIモデル上で浸水と判断する水位 0.3m: 自動車が行き困難になる水位 0.5m: 徒歩による移動が困難になる水位 | RRIモデルによる計算結果 |
| | | | a (3点) | 0.5m以上 | | |
| | | | d (0点) | 0.1m未満 | | |
| | | | c (1点) | 0.1m以上0.3m未満 | | |
| | | | b (2点) | 0.3m以上0.5m未満 | | |
| ⑤ 地区と役場支所との交通途絶 | 地区内代表点 | 地区と町役場・支所を結ぶ道路の最大浸水深 | a (3点) | 0.5m以上 | 国土交通省マニュアル 0.1m: RRIモデル上で浸水と判断する水位 0.3m: 自動車が行き困難になる水位 0.5m: 徒歩による移動が困難になる水位 | RRIモデルによる計算結果 |
| | | | d (0点) | 0人 | | |
| | | | c (1点) | 10人未満 | | |
| | | | b (2点) | 50人未満 | | |
| | | | a (3点) | 50人以上 | | |
| ⑥ 浸水最大孤立者数 | 地区全体 | 50cm以上の浸水域に居住し、かつ避難しない人数 | d (0点) | 0人 | 地区間相対比較が可能のように設定 | 下記情報を用いて国土交通省マニュアルにより算出 ・RRIモデルによる計算結果 ・地区別家屋数 ・地区別人口分布 ・避難率(40%と設定) |
| | | | c (1点) | 10人未満 | | |
| | | | b (2点) | 50人未満 | | |
| | | | a (3点) | 50人以上 | | |
| | | | d (0点) | 0人 | | |
| ⑦ 浸水の影響を受ける要配慮者 | 地区全体 | 30cm以上の浸水域に居住する要配慮者の人数 | c (1点) | 10人未満 | 地区間相対比較が可能のように設定 | ・RRIモデルによる計算結果 ・地区別家屋数 ・地区別人口分布 |
| | | | b (2点) | 50人未満 | | |
| | | | a (3点) | 50人以上 | | |
| | | | d (0点) | 0t | | |
| | | | c (1点) | 50t未満 | | |
| ⑧ 洪水後の廃棄物 | 地区全体 | 50cm以上の浸水域に存在する家屋数から推計される廃棄物量 | b (2点) | 150t未満 | 地区間相対比較が可能のように設定 | 下記情報を用いて国土交通省マニュアルにより算出 ・RRIモデルによる計算結果 ・地区別家屋数 |
| | | | a (3点) | 150t以上 | | |

Table 4-2 shows the Flood Risk Profile for the Yazawa district. Profiles were created for 20 districts located along the Aga River in Aga Town, Niigata Prefecture, and cluster analysis was applied to classify them into several groups. As a result, the 20 districts were categorized into the following five groups:

- Group A: Districts with the lowest flood vulnerability
- Group B: Districts with low flood vulnerability but slightly susceptible to localized heavy rainfall
- Group C: Districts particularly vulnerable to Hazard Pattern 4
- Group D: Districts with high flood vulnerability
- Group E: Districts with extremely high flood vulnerability

Based on this classification, those categorized into Group E were identified as flood hotspots among the 20 districts.

Table 4-2 Flood Risk Profile for the Yazawa district

| 外力パターン 評価軸 | 1 | 2 | 3 | 4 | 5 |
|---------------------------------------|----|----|----|----|---|
| ①避難開始までの余裕時間 | b | c | c | c | d |
| ②避難が必要な期間 | b | b | b | a | d |
| ③地区の浸水深さ | b | a | a | aa | c |
| ④避難所の危険度 | d | d | d | d | d |
| ⑤地区と役場支所との交通途絶 | a | a | a | a | a |
| ⑥浸水最大孤立者数 | b | a | a | a | c |
| ⑦浸水の影響を受ける要配慮者 | b | a | a | a | b |
| ⑧洪水後の廃棄物 | b | a | a | a | b |
| リスク小計値 (aa:4点,a:3点,b:2点,c:1点,d:0点) | 15 | 18 | 18 | 20 | 9 |

b) ICHARM Disaster Risk Information System (IDRIS)

In FY2017, ICHARM began conducting a preliminary study in Aga Town on the development of an information sharing system using the “e-Community Platform,” while holding consultation meetings with relevant organizations.

In FY2018, as a prototype of IDRIS, the project team developed the Aga Town Disaster Risk Information System (ARIS), designed specifically for use in Aga Town. After completing the ARIS prototype, they conducted a questionnaire survey with those involved in the town’s disaster management, and confirmed the system’s usefulness for community-level disaster preparedness.

In 2019, to ensure stable operation and wider adoption of IDRIS, the project team reviewed the system’s basic specifications and examined approaches for adapting it to recent web technologies. As a result, they found that stable operation of IDRIS would require shifting away from the e-Community Platform and instead utilizing cloud-service functions. In addition, they adopted a “mobile-first” development policy for the web interface and made major revisions to the IDRIS scree design, prioritizing compatibility with widely used mobile devices such as smartphones. Moreover, through discussions with town officials and residents involved in disaster management, the team redesigned the screen layout and information-display functions so that local users engaged in disaster-related activities can view information in the same sequence they normally follow during flood response operations. The usefulness of these improvements was confirmed through consultations with the town’s disaster-management personnel.

In FY2020, the project team advanced the mobile-first improvements and redesigned the interface using a more user-friendly responsive design. At the same time, in response to the termination of support for the e-Community Platform, they discontinued the development of IDRIS on that platform and shifted to a new system architecture using ASP.NET Core (Microsoft) and a cloud server. The updated version of IDRIS was then applied in Tsuruoka City,



Figure 4-36 Tsuruoka City’s IDRIS for smartphones

Yamagata Prefecture, and further improved as a system for flood-response operation training (Figure 4-36).

2) Collection of Critical Situations during Flood Emergency Response

Some municipalities in Japan conduct after-action reviews following a disaster, prepare review documents (e.g., disaster response review reports), and, in some cases, make them publicly available on their websites. These documents often contain many valuable reflections and proposals for improvement regarding responses that did not go well (what are referred to as “cases of critical situations during emergency response” in this booklet). Such insights are highly useful not only for the municipalities that experienced the disaster but also for others seeking to strengthen their own preparedness and response capabilities.

In fact, many municipalities report similar cases of critical situations. There have been numerous situations in which, had other municipalities known about these cases in advance, they might have avoided the same difficulties. With this background in mind, ICHARM has planned the publication of an easy-to-read booklet that compiles critical situations reported by municipalities, with the aim of preventing the recurrence of similar incidents.

Researchers involved in this project carefully examined disaster response review reports published by municipalities that had suffered major flood damage over roughly the past 20 years. From about 30 publications totaling approximately 2,000 pages, they extracted around 500 cases that offered useful lessons. These cases were then organized into 28 situations that disaster-management personnel are likely to face during an actual emergency.

Using these situations and the lessons learned from past cases, the project team developed a booklet-style training material titled “Collection of Critical Situations during Flood Emergency Response,” designed for individuals or groups to think through what actions and countermeasures would be appropriate in each situation. The booklet was published in June 2020.

In the municipality edition, the team defined “cases of critical situations during emergency response” as situations in which municipal staff find themselves confused, pressured, uncertain, hesitant, or troubled during flood-response operations. They extracted such cases from disaster response review documents (e.g., disaster response review reports) published by local governments and presented representative examples in a two-page spread format. For each case, they also compiled the lessons learned identified in those review documents and introduced them together with the case descriptions.

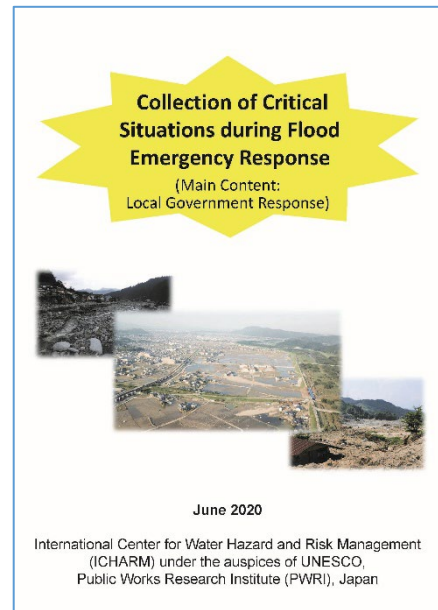


Figure 4-37 “Collection of Critical Situations during Flood Emergency Response”

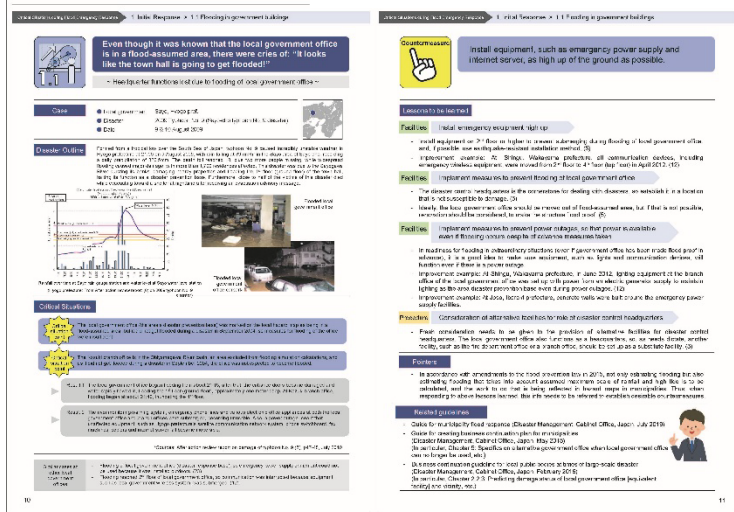


Figure 4-38 Sample page

In June 2021, following the COVID-19 pandemic, the team produced a separate volume with an appendix focusing on local government response under COVID-19. This volume assumes the occurrence of a flood disaster amid concerns about coronavirus infection and presents possible situations and recommended control measures. In preparing the volume, the team referred to various guidelines issued by the Cabinet Office’s disaster management section and the Ministry of Health, Labour and Welfare, as well as “A guideline for the creation of countermeasures against flood disasters during a pandemic situation (COVID-19)” developed by Associate Professor Maki Koyama of Gifu University, Professor Sakiko Kanbara of Kochi University, and others.

This collection was developed as a booklet-style training material so that individuals or groups can think through what actions and countermeasures should be taken in future flood events.

The booklet received the Outstanding Research Award in the General Category (Vitality) in November 2021 from the Research Group for National Land and Infrastructure Technology of MLIT.

From its release in June 2020 through the end of September 2021, the Japanese-language webpage for the booklet received 6,669 visits, while the English-language page received 1,261 visits.

Using this booklet, ICHARM conducted numerous training sessions for municipal staff. An English version was also produced and used in training programs for officials from developing countries, including JICA training courses.



Photo 4-29 Training session in Toyota city



Photo 4-30 Training session for Bhutan officials

<Main training sessions >

- Council for Disaster Reduction during Large-Scale Flooding of the Natori and Abukuma Rivers (July 2021)
- Toyota City, Aichi Prefecture (October 2021)
- National Seminar on Disaster and Crisis Management for Mayors, hosted by the Fire and Disaster Management Agency: “Issuing Timely and Appropriate Evacuation Information” (June 2022)
- Sayama City, Saitama Prefecture (July 2022)
- Saijō City, Ehime Prefecture (October 2022)
- “Key Points of Disaster Response Learned from Case Studies,” Seminar Series for Municipal Staff, hosted by the Fire and Disaster Prevention Science Center (December 2022)
- Municipal Preparedness for Water-Related Disasters: Lessons from Case Studies,” hosted by the National Construction Training Center (January 2023)
- “Learning from Near-Miss Cases in Disaster Response,” JICA Training in Japan for Disaster-Management Officials from Bhutan (November 2023)
- “Municipal Preparedness for Water-Related Disasters: Lessons from Case Studies,” hosted by the National Construction Training Center (January 2024)
- “Realities and Challenges of Disaster Response,” regional training for Tottori Prefecture as part of the Disaster Specialist Training Program, hosted by the Cabinet Office (January 2024)

ICHARM hopes that this publication will encourage municipal personnel involved in disaster management to view disasters not as something distant, but as issues that directly concern them, and to actively strengthen their own response capabilities. We also hope that it will serve as a catalyst for enhancing the overall disaster resilience of local communities.

The Collection of Critical Situations during Flood Emergency Response is available at:

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

3) Post-Disaster Survey on Community Resilience

According to the National Resilience Basic Plan developed by the Japanese government, strengthening national land resilience requires both “the robustness to avoid catastrophic damage” and “the flexibility to recover quickly.” In the case of water-related disasters, it is also possible to take certain measures before damage occurs by using forecast information such as flood warnings. Therefore, in addition to the two elements above, “emergency response actions for disaster damage reduction” play an important role in mitigating impacts. As shown in Figure 1, building a resilient community requires strengthening all three elements through pre-disaster measures so that the social impacts of disasters can be minimized (Ohara et al., 2018).

However, in terms of recovery capacity in particular, the actual conditions observed in past disasters have not been sufficiently documented. To address this, ICHARM conducted questionnaire surveys with businesses in Joso City, Ibaraki Prefecture, which was affected by the 2015 Kanto-Tohoku Heavy Rainfall, and with businesses in Hiroshima and Okayama Prefectures affected by the 2018 Western Japan Heavy Rainfall. These surveys were used to examine the relationship between the extent of damage and the number of days of business suspension.

The project team also conducted a questionnaire survey with residents of Iwaizumi Town, Iwate Prefecture, which was affected by Typhoon No. 10 in 2016, to identify recovery curves for housing reconstruction, daily life, and community activities. Based on these results, they proposed indicators such as the time required to reach 50% recovery, and recommended using the shortening of this period as a target for various disaster risk reduction measures and investments.

a) Survey of businesses in Joso City

(Affected by the 2015 Kanto-Tohoku Heavy Rainfall)

Survey method:

In-person interviews conducted through site visits

(Questionnaires were mailed in advance and collected during the interview.)

Survey cooperation:

Joso City Chamber of Commerce and Industry

Survey period: September 1 to November 30, 2016

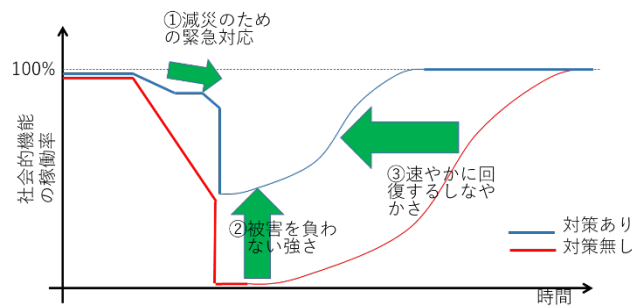


Figure 4-39 Social impacts of water-related disasters, created based on the Cabinet Office’s Business Continuity Guidelines (March 2023) (Ohara et al., 2018)

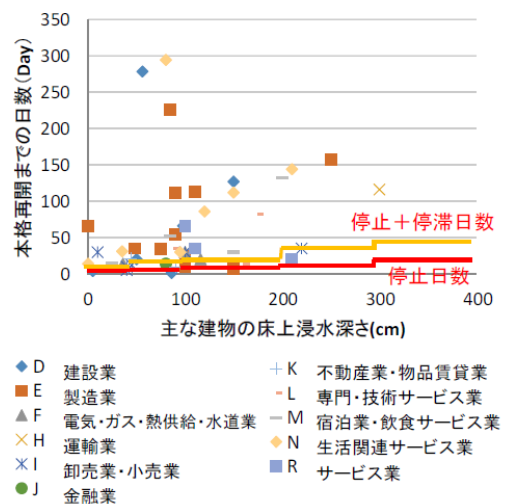


Figure 4-40 Comparison of business suspension and stagnation days between the ICHARM study and the Flood Control Economic Survey Manual (2005) (Ohara et al., 2018)

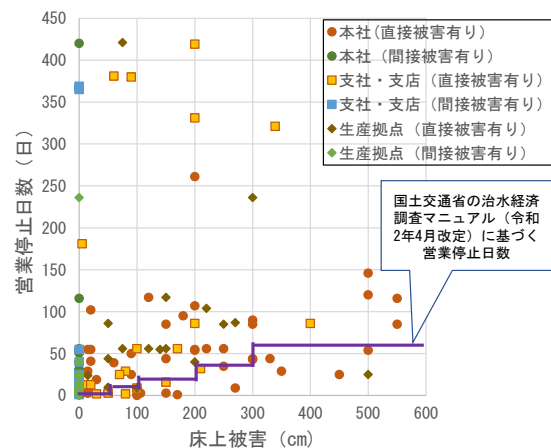


Figure 4-41 Relationship between above-floor inundation depth and business suspension days (Ohara et al., 2021)

Number of businesses surveyed:

60 (56 on the east side of the Kinugawa River, 4 on the west side)

This corresponds to roughly 10% of the 582 businesses on the east side that experienced inundation.

Survey items:

Basic characteristics of each business; conditions at the time of inundation; damage incurred; status of business resumption and continuity; flood control measures before and after the rainfall event

Results: Based on the results of the questionnaire survey in Joso City, the project team studied a new evaluation approach to assess aspects of “resilience in daily life and business activities” that existing methods had not adequately evaluated. This new approach was used to estimate the resilience of affected businesses in the “Technical Study Report on Countermeasures against Giant Disasters that Cause National Crisis,” compiled by the Japan Society of Civil Engineers. It was also used to estimate resilience in the “Simulation Tool for Flood Damage Estimation in Business Activities,” published by the Economic Consortium for Disaster Management, hosted by the Cabinet Office.

b) Survey of businesses in Hiroshima and Okayama Prefectures (Affected by the July 2018 Heavy Rain Disaster)

Survey method:

Mail-based questionnaire

(Follow-up phone calls were made to businesses that did not return the questionnaire.)

Survey period: November 26, 2019 to March 13, 2020

Number of businesses surveyed:

1,994 businesses with 20 or more employees

4,693 businesses with fewer than 20 employees

Total: 6,686 businesses

Number of responses: 1,146 businesses

Results: The project team conducted a questionnaire survey of businesses in Hiroshima and Okayama Prefectures that were affected by the heavy rain disaster in July 2018, and analyzed the impacts of the disaster on their production and sales. The analyses revealed the relationship between the presence or absence of direct and indirect damage and the number of days of business suspension. The results of this research prompted the revision of the Flood Damage Economical Survey Manual in 2020.

c) Survey of households in Iwaizumi Town, Iwate Prefecture (Affected by Typhoon No. 10 in 2016)

Survey method:

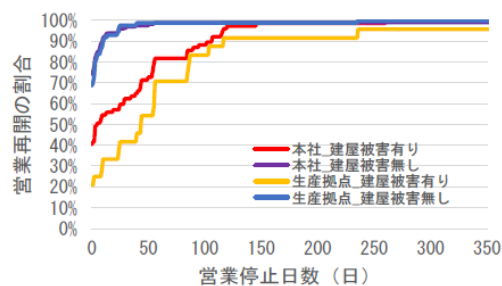


Figure 4-42 Business reopening curves based on whether or not buildings at headquarters and production sites were damaged. (Ohara et al., 2022)

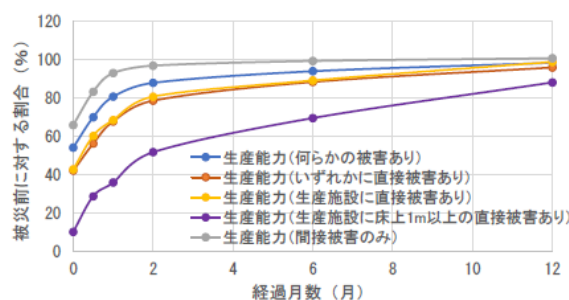


Figure 4-43 Recovery status of production capacity according to the extent of damage (Ohara et al., 2022)

A questionnaire was distributed to all households together with the town's public information bulletin, and responses were collected by mail.

Survey period: December 2019 to late February 2020

Number of households surveyed: 4,159

Number of responses received: 826

Response rate: 19.9%

Results: Although recovery progressed in the order of housing reconstruction, daily life, and community activities, the findings showed that the overall recovery process required a long period of time. A comparison between households whose homes were half-destroyed or more and all surveyed households revealed that the proportion reporting "recovered to pre-disaster conditions" was consistently lower among those with half-destroyed or more severe damage. However, the difference between the two groups was not large, indicating that even households without direct housing damage still experienced significant impacts. More than two years after the disaster, the differences in responses between the two groups had become smaller.

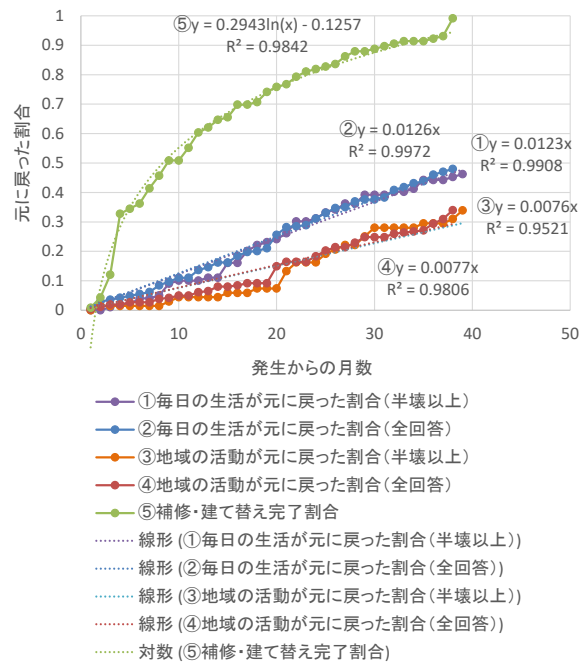


Figure 4-44 Recovery curves of housing reconstruction, daily life, and community activities (Ohara et al., 2021)

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4) Construction of the Online Synthesis System for Sustainability and Resilience (OSS-SR) to realize consilience for basin-wide consensus building and facilitator training

a) Background

In recent years, ongoing climate change and increasing social and economic complexity have caused water-related risks such as floods and landslides to emerge as compound risks. Countries are being called on to advance disaster risk management in an integrated manner with climate change adaptation and sustainable development goals (SDGs), and since the adoption of the Sendai Framework for Disaster Risk Reduction (2015–2030), the priorities of mainstreaming disaster risk management and build-back-better reconstruction have been reaffirmed. Against this backdrop, the Science Council of Japan issued a recommendation in 2020, titled “Building a sustainable global society by strengthening disaster resilience: Developing an “Online Synthesis System (OSS)” and fostering “Facilitators” to realize consilience,” which emphasized the need for an

information infrastructure to support interdisciplinary and transdisciplinary collaboration that responds to on-the-ground challenges. The recommendation called for: (i) the development of an OSS for integrating knowledge to advance disaster risk management and sustainable development, (ii) the training of facilitators, (iii) the development of multi-perspective scenarios that integrate considerations of disaster risk management, the environment, and development, and the implementation of concrete actions, and (iv) support for OSS development, facilitator training, and the formulation of cooperative scenarios and actions at national and regional levels.1)

OSS-SR is a practical knowledge-integration platform that supports consensus building among diverse stakeholders, such as government bodies, researchers, residents, and businesses, by enabling assessment of disaster risks, visualization of future impacts, and comparative evaluation of countermeasure options at the basin scale, while also providing training materials and an exercise environment to support facilitator development. ICHARM has positioned “OSS-SR development” and “facilitator training” as its main research activities, and, in collaboration with the University of Tokyo’s Earth Environment Data Commons, has been developing OSS-SR on the Data Integration and Analysis System (DIAS).

Figure 4-45 provides an overview of OSS-SR.



Figure 4-45 Overview of OSS-SR

b) OSS-SR application cases

(1) Sri Lanka: the Kalu and Mahaweli River basins

In Sri Lanka, floods recur under the influence of the northeast and southwest monsoons and cyclones, and urbanization and land-use changes have further complicated the risk structure.

Under the International Flood Initiative (IFI) platform framework, a locally-tailored OSS-SR was developed for the country’s river basins to provide real-time flood monitoring, forecasting, and information sharing with relevant agencies. For the Kalu River basin (2,766 km²) and the Mahaweli River basin (10,400 km²), the developed OSS-SR automatically updates 72-hour flood forecasts every hour in real time at a 500 m spatial resolution by integrating multiple data sources into the Water and Energy Budget-Based Rainfall-Runoff-Inundation (WEB-RRI) model. These data sources include 1) ground-observed rainfall; 2) cloud and water-vapor distributions from Himawari-8; 3) rainfall distributions based on satellite rainfall estimates (GSMaP NOW); 4) GSMaP NRT rainfall distributions corrected in real time using ground-observed rainfall data; 5) river water levels and flood inundation extents produced by inputting the corrected GSMaP NRT into WEB-RRI; 6) 72-hour rainfall forecasts; and 7) rainfall forecasts.

The OSS-SR is used among national organizations, including the Ministry of Irrigation (IR), the Disaster Management Centre (DMC), the National Building Research Organisation (NBRO), and the Meteorological Department (Met Office).

Figure 4-46 shows an overview of the OSS-SR developed for the Kalu River.

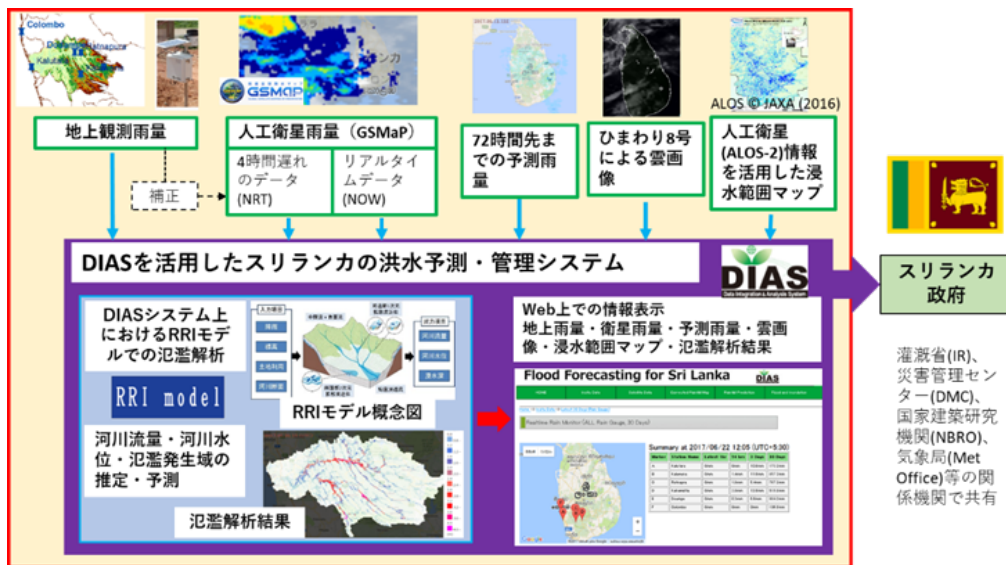


Figure 4-46 Overview of the OSS-SR for the Kelani River

(2) Philippines: the Pampanga River basin

The Pampanga River basin in central Luzon, Philippines, is prone to widespread flooding during typhoons, causing major damage to both agricultural and urban areas. Under the SATREPS Philippine project, OSS-SR has been used for real-time monitoring of rainfall and inundation and for basin-scale flood-risk visualization, including flood-inundation maps that incorporate probabilistic future rainfall projections accounting for climate change; these outputs are shared with relevant agencies.

The Pampanga version of OSS-SR automatically updates multiple datasets every hour in real time at a 500-m spatial resolution. These datasets include: 1) ground-observed rainfall; 2) cloud and water-vapor distributions from Himawari-8; 3) rainfall distribution based on satellite rainfall estimates (GSMaP NOW); 4) river water levels and flood inundation extents produced by running the Rainfall-Runoff-Inundation (RRI) model with ground-observed rainfall data; 5) river water levels and flood inundation extents produced by running RRI with statistically-corrected GSMaP. The system also provides hindcast simulations of past flood events due to Typhoon Ulysses in November 2020, Typhoon Nesat in September 2011, and Typhoon Noru in September 2022, as well as information on inundation under future-climate scenarios in case of 25-, 50-, and 100-year rainfall events.

In addition, e-learning materials and the OSS-SR platform for capacity development have been shared under the HyDEPP-SATREPS project with the University of the Philippines (Los Baños, Diliman, and Mindanao campuses), PAGASA, DPWH, DOST, LLDA, MMDA, and other stakeholders.

Figure 4-47 shows an overview of the OSS-SR developed for the Pampanga River.

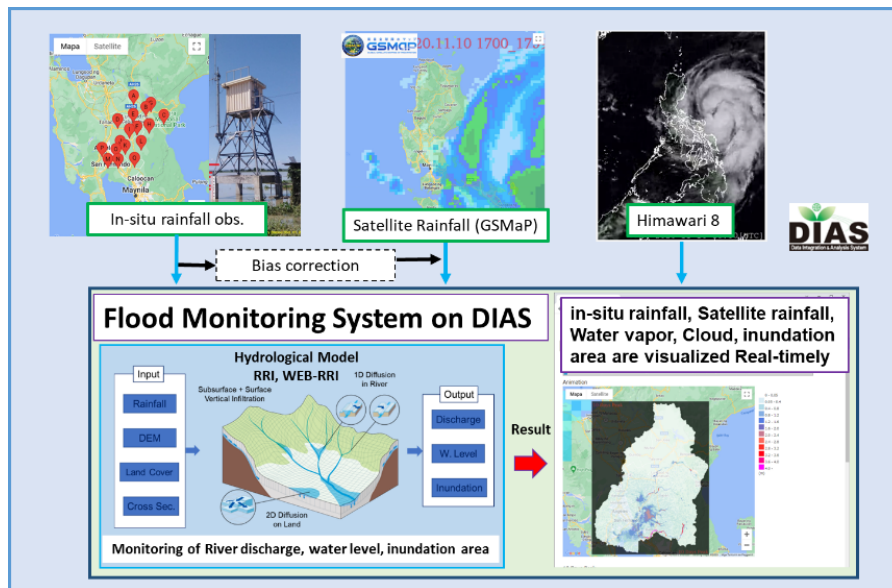


Figure 4-47 Overview of the OSS-SR for the Pampanga River

(3) Philippines: the Davao River basin

The Davao River basin on Mindanao Island, Philippines, faces heightened flood and landslide risks due to steep terrain and rapid urbanization. Under the IFI framework, four multi-stakeholder platform meetings were held with all relevant agencies, including PAGASA, DOST, DPWH, and the University of the Philippines. In collaboration with these local stakeholders, ICHARM conducted various activities, including developing a real-time flood-monitoring and forecasting system using OSS-SR, assessing climate-change impacts, and implementing facilitator training via e-learning.

The Davao version of OSS-SR automatically computes basin-scale river water levels and flood-inundation extents every hour in real time at a 500-m spatial resolution by inputting the following datasets into the WEB-RRI model: 1) cloud and water-vapor distributions from Himawari-8; 2) rainfall distributions based on satellite rainfall estimates (GSMaP NOW); and 3) statistically corrected GSMaP. For flood hotspots (barangays: Ma-A and Mandug), the system updates river water levels and inundation extents – produced by running RRI with corrected GSMaP – every hour in real time at a 40-m spatial resolution. It also provides information on inundation under future-climate scenarios in case of 25-, 50-, and 100-year rainfall events, and offers e-learning materials for capacity development.

ICHARM carries out these projects through strong local institutional engagement. For example, the Davao Regional Development Council adopted Resolution No. 42, formalizing collaboration with ICHARM on OSS-SR development and facilitator training.

Figure 4-48 shows an overview of the OSS-SR developed for the Davao River basin.

(4) West Africa: the Niger and Volta River basins

In West Africa, flood risk is rising while observed data remain sparse in many areas. Under the UNESCO WaDIRE Africa project, OSS-SR is used for real-time monitoring of rainfall and inundation, with outputs shared among related agencies. For the Niger River basin (2,118,000 km²) and the Volta River basin (400,000 km²), the system automatically computes the following in real time every hour: 1) rainfall distributions based on satellite rainfall (GSMaP NOW); 2) rainfall distributions based on statistically corrected GSMaP NRT; and 3) basin- and hotspot-scale river water levels and flood-inundation extents by running the WEB-RRI model with corrected GSMaP. Spatial resolution is 4 km for the Niger River basin, 2 km for the Volta River basin, and 450 m for flood hotspots. The system also provides simulations and maximum inundation depths for historical events at two flood hotspots (the July 2018 flood at Bamako on the Niger River and the October 1970 flood at Mango on the Volta River).

In addition, ICHARM prepared and provided e-learning materials, which are shared among 11 West African countries and relevant organizations such as AGRHYMET, NBA, and VBA.

Figure 4-49 shows an overview of the OSS-SR developed for the Niger and Volta River basins.



Figure 4-48 Overview of the OSS-SR for the Davao River basin

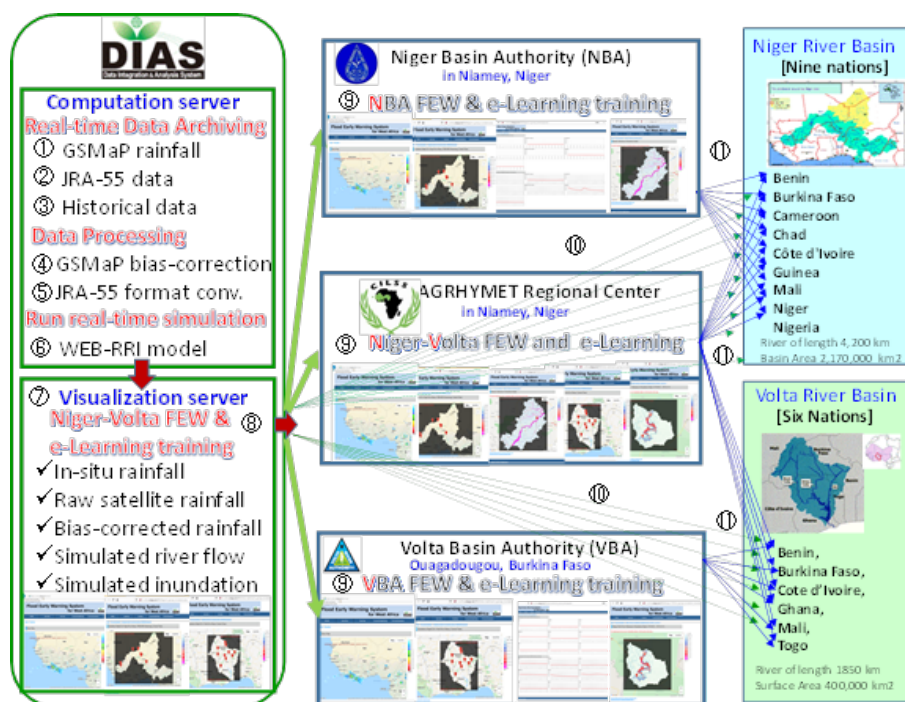


Figure 4-49 Overview of the OSS-SR for the Niger and Volta River basins.

c) Spillover Effects and Future Prospects

The development of OSS-SR provides a framework that integrates cutting-edge scientific insights with diverse forms of locally grounded knowledge, linking “information” to “decision-making” and ultimately to “action” through tools such as flood early-warning systems. This framework enables not only effective disaster response but also proactive preparedness and problem-solving.

Moreover, when combined with capacity-development mechanisms such as e-learning, OSS-SR helps bridge the gap between scientific and technological expertise and local stakeholders and communities for whom such knowledge is not easily accessible or understandable. It does so by offering expert advice that draws, in a transdisciplinary manner, on both scientific

knowledge and the traditional and experiential knowledge accumulated within communities.

One of the most significant spillover effects of this initiative is its strong contribution to cultivating “facilitators” – individuals who serve as catalysts for dialogue among stakeholders with different roles and areas of expertise, helping them jointly identify pathways toward problem-solving.

These approaches build on the achievements accumulated through demonstration studies ICHARM conducted using DIAS and have since been implemented in various projects and policies. They have been applied to the UNESCO Kenya Project, the Ghana Project, and the SATREPS Philippines Project. In Davao, the Philippines, the Regional Development Council adopted Resolution No. 42, endorsing collaboration with ICHARM on these approaches. Together, these cases demonstrate that OSS-SR’s contribution extends beyond the research domain and into real-world policy decision-making and on-the-ground practice, with proven effectiveness.

Looking ahead, ICHARM will continue to draw on the knowledge and experience gained thus far to further promote the deployment of OSS-SR tailored to regional contexts – particularly in Asia and Africa – along with the development of facilitators. Through these efforts, we aim to make an even greater contribution to enhancing disaster resilience and realizing a more sustainable society.

Reference

- 1) the Science Council of Japan recommendation (2020) “Building a sustainable global society by strengthening disaster resilience: Developing an “Online Synthesis System (OSS)” and fostering “Facilitators” to realize consilience
<https://www.scj.go.jp/ja/info/kohyo/pdf/kohyo-24-t298-1en.pdf>
- 2) ICARM Activity Report :
https://www.pwri.go.jp/icharm/about/governingboard/images/8th_governingboard/4_ICHARM_activity_report_all_e.pdf
https://www.pwri.go.jp/icharm/special_topic/20230906_GoverningBoard/4_ICHARM_Activity_Report.pdf
- 3) ICHARM Newsletter
https://www.pwri.go.jp/icharm/publication/newsletter/pdf/icharm_newsletter_issue56.pdf
https://www.pwri.go.jp/icharm/publication/newsletter/pdf/icharm_newsletter_issue72.pdf

5) Development and application of Virtual Flood Experience System (VFES)

a) Background of the development of VFES

With climate change driving an increase in water-related disasters, delays in evacuation during floods have become a serious concern. Because major floods are relatively rare events, the general public often cannot easily imagine the conditions or dangers they would face during such disasters. This lack of intuitive understanding is considered one of the factors contributing to delayed evacuation.

Communicating the risks of water-related disasters before they occur is therefore essential for effective disaster-risk communication. Local governments and river management organizations have been actively promoting such communication by providing hazard maps and encouraging the creation of “My Timeline,” a personalized timeline outlining the actions to be taken during an emergency. To convey these efforts in a clearer and more accessible way, initiatives that visualize flood hazards in relation to residents’ everyday living environments can play an important role.

Recent advances in ICT research and technology have made it increasingly feasible to visualize flood risks. One example is virtual reality (VR), which can be used to let people virtually experience the potential dangers posed by floods, relatively rare events that are therefore difficult for the general public to imagine. However, VR imagery created in past studies and projects often lacks a solid scientific basis, resulting in imagery that is more conceptual than evidence-based.

To address this issue, ICHARM introduced the RRI model and other scientific approaches to reproduce and forecast flood hazards more realistically. These technologies give ICHARM strong potential to overcome the limitations of conventional VR-based flood simulations.

Previous studies and projects have not fully taken advantage of the potential of VR. In addition to its visualization and simulation capabilities, VR also incorporates metaverse-like functions. For example, through avatars (i.e., virtual representations of users), it can enable people to experience others' physical abilities or interact within simulated social environments.

Leveraging these technologies, ICHARM developed and implemented VFES by integrating scientifically grounded flood-hazard reproduction and forecasting methods with the virtual-experience and metaverse capabilities of VR. The following sections present research projects using VFES over the past several years.

b) Development of prototype VFES: Research in Aga Town, Niigata Prefecture, Japan, and Flood-Risk Communication

Typhoon Hagibis (Typhoon No. 19) in 2019 caused severe damage across eastern Japan, particularly in the Kanto region. Significant damage also occurred in Aga Town, Higashikanbara District, Niigata Prefecture, which had been one of ICHARM's research sites. Focusing on the Sanegawajima area of Aga Town, which has repeatedly suffered flood damage throughout its history, ICHARM developed and applied a prototype of VFES and confirmed that the system successfully reproduced flood conditions and contributed to effective flood-risk communication.



Figure 4-50 AVR lesson created in Aga Town (Left: Relying on lessons is dangerous, Right: Don't go back to retrieve forgotten items)

c) Demonstration of VFES's educational potential at the 9th International Conference on Flood Management (ICFM9)

From February 19 to 22, 2023, ICHARM hosted ICFM9 at the Tsukuba International Congress Center. As part of the conference, the public symposium “Can You Survive an Unexpected Flood?: esports@KasenBousai” was held, inviting junior-high, high-school, university, and graduate students from Tsukuba City. They first virtually experienced evacuation during a flood using VFES and then participated in an evacuation competition also using VFES. The students showed strong engagement and enthusiasm throughout the competition. This event clearly demonstrated that VFES can serve as an effective tool for flood-risk education.

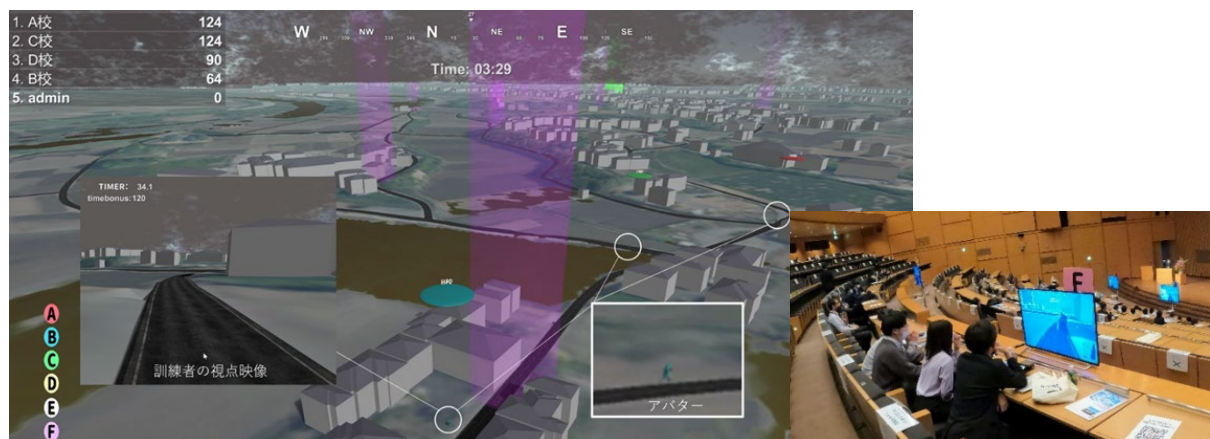


Figure 4-51 Screenshots and images of the venue from the evacuation competition.

d) Development of educational VFES for wider dissemination

After the public symposium at ICFM9, Namiki Secondary School in Tsukuba City, whose students had participated in the

event, requested to continue flood-risk education using VFES. In response, ICHARM proposed a joint development effort to improve VFES, and the school agreed.

Because the prototype VFES requires highly complex programming for its software and high-performance devices that are costly, ICHARM ported VFES functions into Minecraft Education, educational game software. Within this environment, ICHARM led students to recreate urban spaces in flood-prone areas around Tsukuba City and improve the accuracy of spatial information. Through activities such as refining spatial data themselves, students demonstrated that VFES can effectively support sustained, self-directed learning about flood risks among younger generations.

e) Participation in SIP

By FY2024, ICHARM had completed the development of two versions of VFES: one using a game engine and the other using educational software. Starting in FY2024, ICHARM joined the Cabinet Office’s SIP program and was assigned to a sub-project, “Development of a Resilient Smart Network System against Natural Disasters.” SIP requires participating groups to engage not only in research and development but also in the social implementation of the outcomes. ICHARM therefore advanced the social implementation of VFES.

The game-engine version has been applied in many municipalities – Sapporo, Asahikawa, Obihiro, and Memuro in Hokkaido; Jōsō City in Ibaraki Prefecture; Nagano City and Matsumoto City in Nagano Prefecture; Kurashiki City in Okayama Prefecture; and Kurume City in Fukuoka Prefecture – achieving substantial progress in both technological development and dissemination.



Figure 4-52 Recreation of the Kurashiki Bikan Historical district using VFES
(Left: Actual scene, Center: Recreation using VFES, Right: Scene of flooding)

The educational-software version has been further developed with new learning content, and it has been applied to inquiry-based learning on water-related disasters in municipalities, such as Jōsō City in Ibaraki Prefecture and Nagano City and Matsumoto City in Nagano Prefecture. Recognizing the novelty of the educational version, the Cabinet Office invited ICHARM to participate in a side event at the 2025 Osaka Expo. In response, ICHARM developed an Osaka version of the VFES educational software, which was also highly praised.

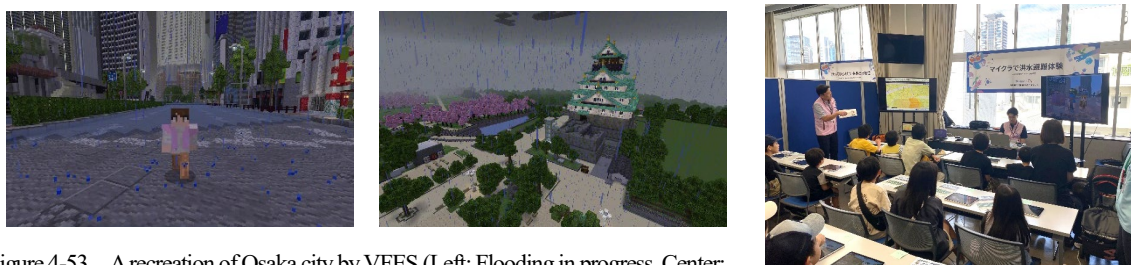


Figure 4-53 A recreation of Osaka city by VFES (Left: Flooding in progress, Center: Recreation of Osaka Castle, Right: Scene from an experience event at the Expo side event)

f) Future prospects for flood risk communication using VFES

Having reached a certain level of technical maturity, VFES now shows the potential to analyze the decision-making processes that lead to “delayed evacuation,” one of the most critical challenges in flood management. In psychological research, analytical methods are generally classified into experimental and observational types, and VFES has the flexibility to support both approaches.

Experimentally, the system can reproduce signs of an impending flood and conditions during a flood in a virtual environment, and record the evacuation behavior of participants. Subsequently, observational approaches, such as questionnaire surveys, can be conducted to analyze evacuation behavior and the decision-making processes behind those behavioral choices.

These two approaches enabled by VFES are applicable not only to understanding people's evacuation behavior but also to analyzing how companies make investment decisions for flood risk reduction. When analyzing individual behavioral choices or corporate investment decisions for flood management measures, it is necessary to develop highly customized versions of VFES that reflect the characteristics of the local community or the specific company.

However, creating such highly tailored versions entirely within research projects would require substantial funding. If local residents themselves could create customized systems for their own communities, flood risk communication using VFES would advance significantly. To achieve this, it is essential to establish a dissemination framework that enables VFES construction by local residents with a certain level of technical skill. Moving forward, promoting social implementation in collaboration with local communities will be crucial.

ANNEX-3 lists peer-reviewed papers published since fiscal year 2016. ANNEX-4 lists the number of published materials including peer-reviewed papers.

For publications other than peer-reviewed papers, please see the following website:

<https://www.pwri.go.jp/icharm/research/index.html>

(2) Practical rather than theoretical

To ensure that the course remains problem-solving oriented, both lectures and exercises place greater emphasis on practice than on theory, preparing students to function effectively in real-world situations.

(3) One-year course

The participants in this course are working practitioners employed in government agencies. For this reason, the course is designed to be completed in one year rather than two, allowing students to obtain their master's degree without being away from their duties for an extended period. The curriculum consists of lectures, exercises, field trips, and individual research (master's thesis).

Table 5-2 presents the breakdown of the curriculum. To ensure a well-balanced understanding of water-related disaster risk management, the curriculum is broadly divided into fundamental and applied components, each of which is further subdivided into management and engineering. In principle, lectures and exercises are taught by ICHARM researchers, but distinguished experts from external organizations are also invited as guest lecturers when necessary. For the master's thesis, students are required to address a topic related to issues in their home countries, with the aim of cultivating professionals who can contribute to planning initiatives for integrated water-related disaster mitigation and management, and who can lead problem-solving efforts after returning home. Classes begin in the second week of October. An overview of the course schedule is shown in Figure 5-1.

In the first half of the course, students focus on lectures and exercises, complemented by several field trips to understand current flood control efforts in Japan.

Field trips are a particularly important component of the course, providing valuable opportunities for students to learn about the history and present conditions of Japan's flood management practices and to consider how such approaches might be adapted to their own countries. Past field-trip destinations include the Watarase River to study its history and the Watarase Retarding Basin; the Kinu River for the coordinated operation of the upper-reach dam system and lower-reach flood-control measures; the Sameura Dam and the Manno Pond for their flood-control and water-use facilities; the Kochi Coast for its multi-layered tsunami-protection system; the Tsurumi River for its multipurpose retarding basin; the Shinano River for the diversion project and upstream erosion-control works related to the Mid-Niigata Earthquake; and the Fuji River for historical flood-control sites such as the Shingen Embankment and Manriki Forest. Students also participate in the Tone River Comprehensive Flood-Prevention Drill. These activities are made possible through the cooperation of MLIT, JWA, and civil-engineering departments of respective prefectures.

At the end of March, a qualification review committee composed of faculty members determines whether each student is eligible to move on in the degree curriculum, based on their coursework performance during the first several months and the results of their mid-term presentation. If a student is judged not to have met the requirements, they must transfer from the degree curriculum to the non-degree curriculum.

In the second half of the course, students in the degree curriculum work on individual research to complete their master's thesis. Students in the non-degree curriculum also conduct individual research, but they complete a report instead, with support from ICHARM researchers.

Since the master's course began in October 2007, a total of 202 students from 40 countries have earned their master's degrees as of September 2025.

Beginning in FY2024, the master's program underwent a curriculum revision. The previous course was reorganized from the perspectives of theory, application, and practice, as shown in the Figure 5-2. In addition, Project Cycle Management (PCM) was incorporated as a credit-bearing component, and students have begun working on transforming the themes of their master's theses into project proposals applicable in their home countries.

Master's course graduates return to their home countries and are active not only domestically but also on the international stage. For example, Samuel Joseph Gama (Malawi, 2016–17) delivered a presentation as a representative of the Malawi government at the United Nations World Water Day event held at the UN Headquarters in New York in March 2023. Sugeeshwara Seenipellage (Sri Lanka, 2009-2010) has been promoted to the additional secretary to the president.



Photo 5-1.2 (Left) Samuel Joseph Gama (second from right) at the United Nations World Water Day event
(Right) Sugeeshwara Seenipellage appears during the ICHARM Alumni Webinar

Table 5-2 Curriculum List

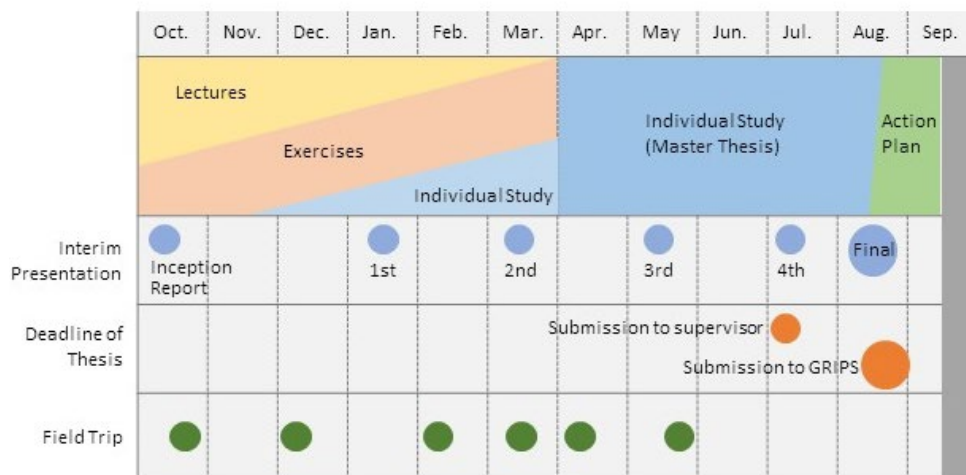
**Academic Year 2025- 2026 Curriculum Master's Programs
(10)-2 Disaster Management Policy Program (Water-related Disaster Management)**

| Category | Course No. | Course Title | Instructor | Term | Credit | |
|---------------------------|------------|---|--|-----------------------|--------|----|
| I Required Courses | new | Water-related disaster comprehensive seminar | Various | Winter through Summer | 2 | 6 |
| | new | Water-related disaster specific seminar | USHIYAMA Tomoki, HARADA Daisuke, OHARA Miho | Winter through Summer | 2 | |
| | new | Project Cycle Management Practice | KOIKE Toshio | Fall through Winter | 2 | |
| II Recommended Courses | DMP2000E | Disaster Management Policies A: from Regional and Infrastructure Aspect | CHIBANA Takeyoshi | Fall | 2 | 16 |
| | DMP2010E | Disaster Management Policies B: from Urban and Community Aspect | TAMURA Hideyuki | Fall | 2 | |
| | DMP2800E | Hydrology | MIYAMOTO Mamoru, KOIKE Toshio, TANAKA Shigenobu | Fall through Winter | 2 | |
| | DMP2810E | Hydraulics | HARADA Daisuke, SHIMIZU Yoshitako, QIN Menglu | Fall through Winter | 2 | |
| | DMP2820E | Disaster Risk Reduction for Hydroclimatic Extremes | KOIKE Toshio | Fall through Winter | 2 | |
| | DMP2870E | Geography on Flood Disaster Management | NAGUMO Naoko, SUGAI Toshitako | Fall through Winter | 2 | |
| | DMP3810E | River Engineering | SHIMIZU Yoshitako | Fall through Winter | 2 | |
| | DMP3820E | Sediment Transport Mechanics | QIN Menglu, EGASHIRA Shinji | Fall through Winter | 2 | |
| | DMP3840E | Control Measures for Landslide & Debris Flow | YAMAGUCHI Shunji, TAKEHI Toshiya, UCHIDA Taro, SUMI Tetsuya, OKAMOTO Atsushi | Fall through Winter | 2 | |
| | DMP2900E | Crisis and Risk Management | OHARA Miho | Fall through Winter | 2 | |
| III Elective Courses | DMP1800E | Numerical Analysis Method and Practice | USHIYAMA Tomoki, RASMY Mohamed, QIN Menglu | Fall through Winter | 2 | 30 |
| | DMP2890E | Hydrological Modeling for Water and Sediment Disaster Management under Climate Change | RASMY Mohamed, SAYAMA Takahiro, QIN Menglu | Fall through Winter | 2 | |
| | DMP3802E | Geographic Information Systems and Remote Sensing Technique | RASMY Mohamed, KAWASAKI Akayuki | Fall through Winter | 2 | |
| | DMP3900E | Field Inspection Study | KOIKE Toshio | Fall through Summer | 2 | |
| | DMP3910E | Open Channel Hydraulics and Practice | Shrestha Badi Bhakta | Fall through Spring | 2 | |
| | | * Selected Topics in Policy Studies I -IV | | | | |

Notes:

1. Graduation Requirements: Students must complete a minimum of 30 credits, 6 of which must come from Category I and 16 of which must come from Category II.
2. Courses offered in the Program are subject to change.
3. * Course Number, Instructor, and Term for the course will be announced later when the course is offered.

Figure 5-1 Overview of the course schedule





At the Kawaji Dam
川治ダムにて



At the Tagawa Sluice
田川水門にて



At the Manno Pond
満濃池にて



At the Yamba Dam
ハツ場ダム

Photo 5-3, 4, 5, 6 Field trip

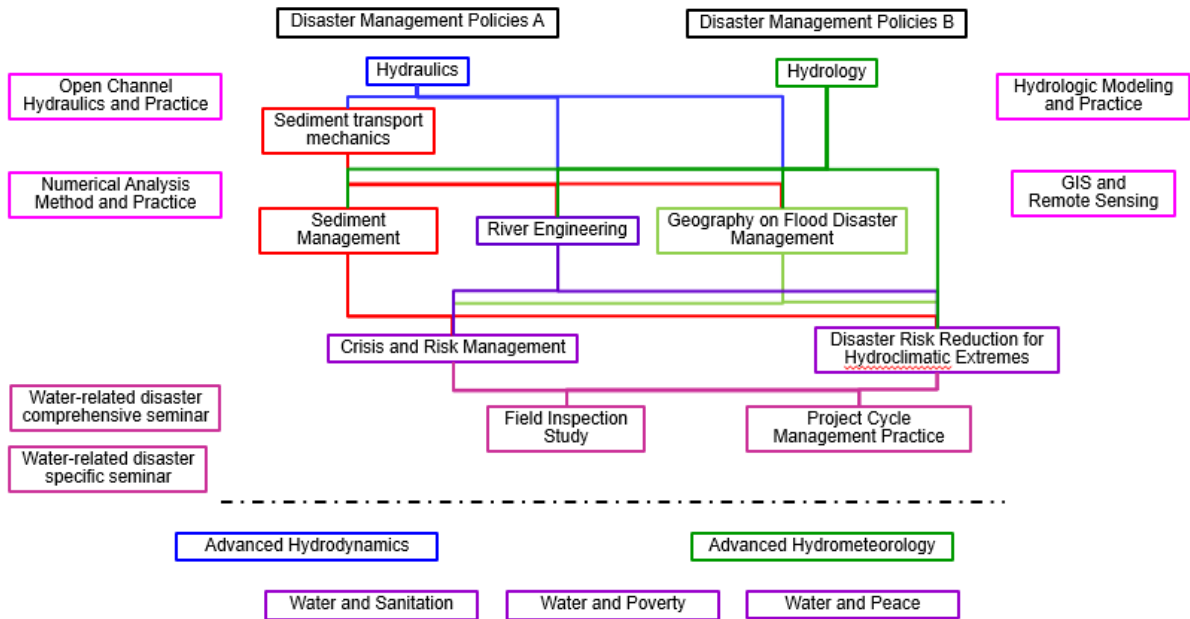


Figure 5-2 Relationship of reorganized curriculum



Students working in groups
グループワークをする様子



Presentation by students
学生による発表



Photo 5-7, 8, 9, 10 Project cycle management exercise

3) Doctoral program

In October 2010, ICHARM and GRIPS jointly launched the Disaster Management Ph.D. Program marking the first such initiative since the establishment of PWRI. The program aims to cultivate professionals who can conduct research on water-related disaster risk management both in Japan and abroad, formulate plans and strategies, and guide other staff in implementing them.

Admission to the program is limited to a small number of highly qualified students who demonstrate both the capability and the motivation to carry out doctoral-level research and to apply the knowledge of water-related disaster risk reduction gained at ICHARM in practical settings. PWRI offers a system in which doctoral students can work as research assistants at ICHARM, providing them with valuable opportunities to gain firsthand experience in disaster-related research and practice.

Following the Sendai Conference on Disaster Risk Reduction held in Japan in 2015, the program also became eligible for JICA scholarships.

As of the end of September 2025, 24 students have earned their doctoral degrees. The doctoral dissertations have been highly regarded, and in both 2024 and 2025, ICHARM doctoral graduates received the GRIPS Deen's Award for two consecutive years.

A new doctoral curriculum was launched in FY2025. In addition to the foundational subjects covered in the master's program, the doctoral program has traditionally offered advanced lectures in hydrometeorology and water dynamics. Building on these "water-related disaster" subjects, new courses have been added on "Water and Sanitation," "Water and Poverty," and "Water and Peace." Through this expansion, the program aims to cultivate leaders who possess a solid grounding in development and international cooperation and who can take a comprehensive perspective in guiding the formulation and implementation of policies for water-related disaster risk reduction and sustainable development at



Photo 5-11 Mr. Sanjeeva receiving Dean's Award

national, regional, and global levels.

In parallel, with the aim of emphasizing the importance of integrating water-related disaster risk reduction with sustainable development and of sharing experiences from these integrated initiatives more widely at the international level, ICHARM will work with HELP and UNCRD to review and restructure the lecture content and research support system to provide a more effective doctoral program.

4) Follow-up activities for graduates

Training and education conducted in Japan alone are not sufficient for solving the challenges that participants face in their home countries. It is essential that their colleagues, supervisors, and even their entire organizations share an understanding of the need to work together on problem-solving. Advice and suggestions provided through follow-up activities after the training in Japan are therefore valuable, as they help participants when they encounter difficulties back home.

Follow-up activities are equally important for ICHARM. They allow us to understand the challenges that participants face when implementing their plans in their own countries, providing crucial feedback for making the training curriculum more useful and practical. For this reason, ICHARM organizes follow-up seminars and similar opportunities almost every year for former participants and their organizations. These activities promote information sharing and network building among participants and help maximize the effectiveness of the training.

Although on-site follow-up activities were suspended in 2021 due to the COVID-19 pandemic, the widespread adoption of online conferencing has since enabled us to hold follow-up seminars virtually. Despite time-zone differences, this format has been well received because it allows graduates from all participating countries to join.

Starting in 2024, ICHARM also launched quarterly webinars in four specialized fields – meteorology, sediment, hydrology, and risk management – bringing together graduates, current students, ICHARM staff, and alumni for technical discussions.

A list of recent follow-up activities is shown in Table 5-3.

Table 5-3 List of Follow-up activities

| | Place | Date |
|------|--|----------------------|
| 1st | Kuala Lumpur, Malaysia | Feb. 7-9, 2007 |
| 2nd | Guangdong, China | Jan. 30-Feb. 1, 2008 |
| 3rd | Manila, the Philippines | Feb. 17-19, 2009 |
| 4th | Hanoi, Vietnam | Nov. 6-7, 2010 |
| | (Jointly with short course "Early warning system for flood disaster mitigation") | |
| 5th | Bangkok, Thailand | Feb. 20-23, 2012 |
| | (Jointly with the Southeast Asia Flood Risk Reduction Forum and workshop) | |
| 6th | Dhaka, Bangladesh | Feb. 13-14, 2013 |
| 7th | Kuala Lumpur, Malaysia | Mar. 10-13, 2014 |
| 8th | Jakarta, Indonesia | Mar. 3-4, 2015 |
| 9th | Tokyo, Japan | Mar. 2, 2016 |
| 10th | Manila and Pampanga, the Philippines | Jan. 31-Feb. 2, 2017 |
| 11th | Yangon, Myanmar | Dec. 13-14, 2017 |
| 12th | Kathmandu, Nepal | Jan. 23-24, 2019 |
| 13th | Colombo, Sri Lanka | Feb. 12 and 14, 2020 |
| 14th | Tsukuba, Japan *online | Feb. 15, 2022 |
| 15th | Tsukuba, Japan | Feb. 22, 2023 |
| 16th | Tsukuba, Japan *online | Feb. 13, 2024 |
| 17th | Tsukuba, Japan *online | Mar. 13, 2025 |

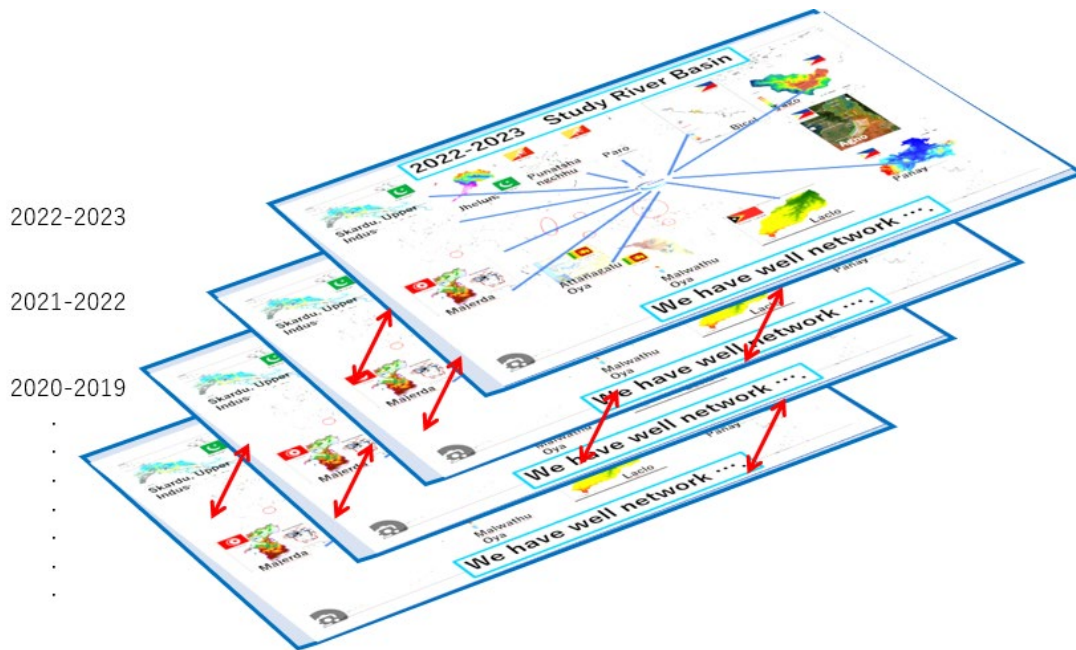


Figure 5-3 Concept for strengthening the ICHARM alumni network across cohorts and borders

5) Internship

ICHARM accepts students and researchers as interns in response to requests from universities and research institutions in Japan and abroad, in accordance with the internship guidelines of PWRI. Internship periods vary by participant, ranging from several weeks to several months. Interns attend lectures and seminars, learn various hydrological and risk-assessment models, engage in discussions with other researchers, and present their research outcomes at the end of their stay.

These experiences have had a positive impact on the interns. Some have gone on to apply the hydrological models learned during their training to conduct research in river basins both in Japan and overseas. The internship program is also beneficial for ICHARM. Thanks to the enthusiasm and dedication of the interns, ICHARM researchers and students gain the privilege and joy of supporting them, while broadening their own perspectives and imagination through the internship experience.

6) Other topics

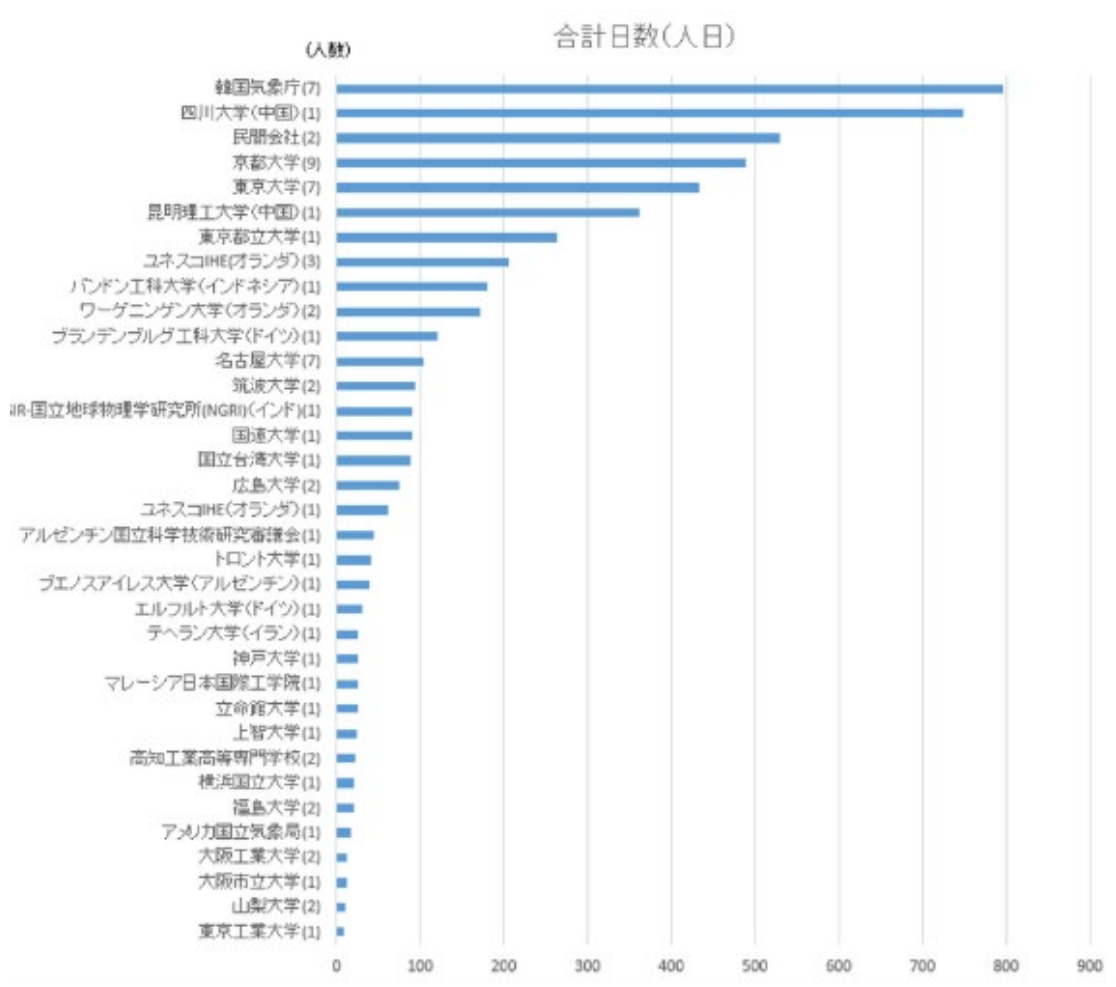
a) Japan Construction International Award

For its long-standing educational activities, ICHARM received the Japan Construction International Award from the Minister of MLIT in the Pioneering Project Activities category. The award recognizes strategic initiatives that contribute to “quality infrastructure” overseas through research and development, capacity building, and other efforts that extend beyond individual construction projects.



Figure 5-4 Certification of the Japan Construction International Award

Table 5-4 Number of interns by affiliation



b) The spirit of Ninomiya Sontoku

ICHARM upholds the spirit of Ninomiya Sontoku as a guiding philosophy for its educational activities. Ninomiya Sontoku was a prominent 19th-century social reformer who revitalized many towns and villages devastated by floods, famine and other hardships through his extensive agricultural knowledge, civil engineering skills and distinctive leadership. In the first half of the master’s program, students visit the Ninomiya Sontoku Memorial Museum in Moka City, Tochigi Prefecture, where they learn about his four core principles: *shisei* (sincerity), *kinro* (diligence), *bundo* (thrift) and *suijo* (self-sacrifice).

Near the end of the master’s program, students vote among themselves to select the recipient of the Sontoku Award, which is presented in recognition of exemplary conduct. The recipient should meet the following criteria:

- 1) Contributed to the smooth operation of the course;
- 2) Helped, supported and cared for others in an altruistic manner;
- 3) Can be relied upon for future network building.



Photo 5-12 Explanation at Museum



Photo 5-13 Sontoku Memorial Museum

c) Cherry-blossom gathering with PWRI executives

To provide an opportunity for interaction between PWRI executives and students, ICHARM has held a “Cherry-Blossom Lunch” every year during the *sakura* season since 2008 (originally started as a tea gathering). Although the event could not be held for about three years during the COVID-19 pandemic, it resumed in 2023. For the students, it has become a wonderful opportunity to enjoy the beauty of spring in Japan.



Photo 5-14 People at the cherry-blossom gathering

d) *Sakura*-tree planting before graduation

Since 2014, it has become a tradition at ICHARM for students completing the master’s or doctoral program to take part in a *sakura*-tree planting ceremony before graduation.

While ICHARM’s staff members may change due to personnel rotations, these *sakura* trees remain standing as a constant presence that will welcome graduates back whenever they return to visit ICHARM in the future.



Photo 5-15, 16, 17 *Sakura*-tree planting

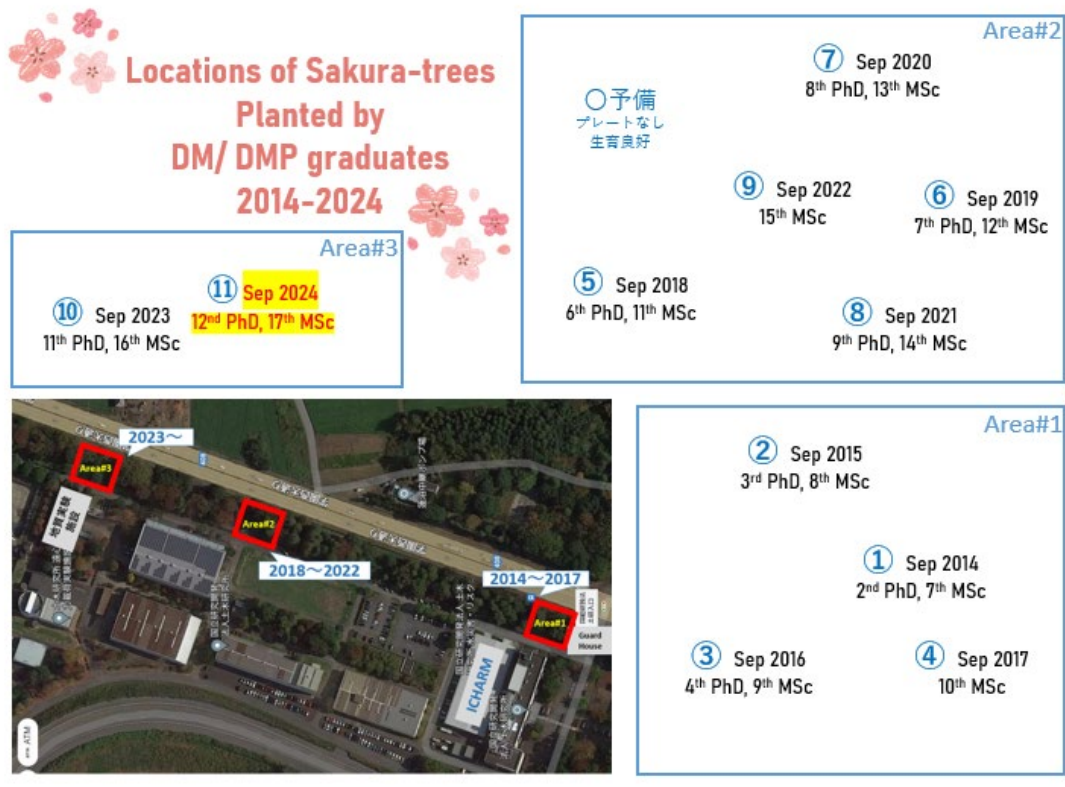


Figure 5-5 Location of Sakura-tree planted by graduates

Three ICHARM graduates kindly contribute their warm messages.

From Tsukuba to Sri Lanka: Where Science Meets Humanity



Dr. Sanjeewa Illangasingha

***Director, Engineering Design and Planning, Mahaweli Authority of Sri Lanka
Board Secretary to the Board of Directors of Mahaweli Authority of Sri Lanka, Sri Lanka***

It is a great honor and privilege to share this message on the occasion of the 20th Anniversary of ICHARM. My journey at ICHARM and GRIPS, which culminated in obtaining my Ph.D. in 2024, has been one of the most transformative and meaningful experiences of my life. ICHARM provided me not only with world-class academic and technical knowledge in hydrology, hydrometeorology, climate change, atmospheric physics, disaster risk reduction, flood management, drought assessment, and integrated water resources planning, but also with a broader vision of leadership, service, and global responsibility. One of the most valuable aspects of ICHARM was the opportunity to learn alongside professionals and researchers from many countries. Through sharing evidence-based research, field experiences, and policy discussions, we developed a deeper understanding of the common challenges faced by vulnerable communities across the Global South, and the innovative solutions needed for a resilient future.

Living in Japan added another priceless dimension to my learning. Participating in Japanese cultural traditions, visiting historical and cultural sites including Hiroshima and Nagasaki and interacting with Japanese communities taught me important values: discipline, punctuality, mutual respect, humility, continuous improvement, and commitment to society. These lessons continue to guide my professional and personal life. Today, as Director of Engineering Design and Planning at the Mahaweli Authority of Sri Lanka, I apply the knowledge, leadership principles, and values gained from ICHARM in national policy-making, technical planning, disaster risk management, and international collaboration.

I sincerely hope ICHARM will continue to inspire, innovate, and develop future global leaders, strengthening safer, more resilient, and sustainable communities worldwide for many decades to come. I also hope ICHARM will continue to lead cutting-edge research, strengthen collaboration between science and policy, and support developing nations in addressing emerging challenges such as climate change, water security, and increasing disaster risks. I believe ICHARM's role as a global bridge between knowledge, practice, and humanity will become even more important in shaping a resilient future for our world.

With deepest gratitude and warm congratulations on ICHARM's 20th Anniversary.



Dr. Malik Rizwan Asghar,

Deputy Director- IT, Pakistan Meteorological Department, HQ office

It is both an honor and a privilege to be part of the 20th anniversary celebration of International Center for Water Hazard and Risk Management (ICCHARM). I often look back on my time at ICHARM and GRIPS as a defining chapter in my personal and professional growth, that not only shaped my knowledge and experience in water hazards and the risk management but also enhanced my vision and strengthened my capacity for critical thinking and impact-based sustainable contribution.

Currently ICHARM is playing a leading research role in water hazard and associated implications. I was fortunate to be in an environment that foster excellence and curiosity to solve complex problems under the guidance and mentorship of esteemed faculty and the collaborative spirit of peers.

One of the great initiatives of ICHARM is the quarterly seminars that are serving as a dynamic platform to share professional experiences and to remain connected with emerging trends regarding hydrometeorology and water related hazards. The initiative is also helping to reduce gaps in academia and real applications.

As we celebrate this remarkable milestone, I congratulate the faculty, administration and fellow alumni to be part of this success. I am confident that ICHARM will continue to play leading role in nurturing talent and takes impactful initiatives for years to come.



Dr. Md. Shahinur Rahman

Executive Engineer (Civil)

Directorate of Planning-2, Bangladesh Water Development Board (BWDB)

I feel deeply grateful and honored to have completed my Master's (2019–2020) and PhD (2022–2025) at GRIPS, ICHARM and PWRI in Tsukuba, with the generous support of JICA. During my Master's, I strengthened my academic foundation, completed my thesis, and experienced Japan's unique harmony of traditional wisdom and advanced disaster management practices. Even during the challenges of the COVID-19 pandemic, we continued learning and adapting to new approaches to resilience. My PhD journey allowed me to transform these lessons into meaningful, evidence-based research addressing complex water-related challenges for the benefit of society.

At ICHARM, I had the rare honor of meeting with Csaba Körösi, President of the UN General Assembly for the 77th session, where I reflected on the importance of equitable transboundary water sharing. I also participated in the 69 JSEC Conference in Toyama, Japan, and the 41 IAHR World Congress in Singapore. These multinational experiences touched me deeply, teaching me that while borders are human-made, our hopes, dreams and challenges unite us as one human family.

I have left a piece of my heart beneath the Graduation Sakura trees of ICHARM and in return, I carry countless unforgettable memories of ICHARM and Japan that will remain alive within me forever. On this special occasion of the 20th anniversary of ICHARM, I extend my heartfelt congratulations and warmest wishes. Wherever life leads me, I will always be proud to be an ICHARM alumnus.

6. Efficient Information Networking

In its long-term program (approximately 10 years), ICHARM defines its information networking activity as follows:

In promoting information networking, ICHARM will continue to update its action plans by identifying, visualizing, and mapping the challenges that must be addressed to achieve the resilience and sustainability goals outlined in the 2030 Agenda, the Sendai Framework, IHP-IX, and the latest government flood control policy, “River Basin Disaster Resilience and Sustainability by All.” We will also continue implementing projects while incorporating research findings and capacity development, making effective use of IFI and other networks.

In line with this policy, ICHARM focuses on the following three areas of activity:

- Accumulate, analyze and disseminate major water-related disaster records and experiences by maintaining and upgrading a worldwide practitioners’ network.
- Integrate interdisciplinary scientific knowledge into a consilience framework for water-related risk management, making it a shared asset of practitioners.
- Mainstream water-related disaster risk reduction by facilitating active collaboration and communication among experts and organizations through sharing cases and findings in water-related hazard and risk management.

Based on this long-term program, ICHARM has actively promoted information networking activities over the past decade through its role as the IFI secretariat. In particular, we have supported various countries in establishing and operating “Platforms on Water Resilience and Disasters.”

Within the Typhoon Committee, a senior researcher of ICHARM has served as the chair of the Working Group on Hydrology and contributed to the committee’s activities by leading discussions in collaboration with MLIT of Japan. By participating in various working-group meetings and working closely with MLIT and other partners, ICHARM has helped advance the mainstreaming of disaster risk reduction worldwide, drawing on Japan’s extensive experience and expertise in disaster management.

Furthermore, as a UNESCO Category 2 Centre, ICHARM has actively contributed to the international hydrological community through a range of activities aligned with the UNESCO IHP-IX: 2022–2029. In addition, by working in partnership with international organizations such as WMO and UNDRR, ICHARM has continued to play an active role in advancing global efforts in the field of hydrology.

Through these activities, ICHARM has worked with countries around the world to put into practice and advance initiatives based on the concept of the Water Cycle Integrator, which we advocate. At the same time, by further strengthening its networks with flood experts and government officials both in Japan and abroad, ICHARM has reinforced effective information networking, one of its three core pillars.

1) International Flood Initiative (IFI)

IFI is a joint initiative carried out in cooperation with international organizations such as UNESCO-IHP, WMO, UNDRR, UNU, IAHS and IAHR. IFI focuses on research, information networking, education and training, community capacity development, and the provision of technical support and guidance. ICHARM has served as the IFI secretariat since the initiative was established.

At the UNESCO-IHP Intergovernmental Council meeting held at the UNESCO headquarters in June 2016, IFI presented its new strategy and implementation plan, outlining five key actions by defining support tools, priority areas, and partner organizations. Building on this, a side event at the 8th HELP meeting, held in Jakarta, Indonesia, in October,

ICHARM's Projects Recently Conducted outside Japan

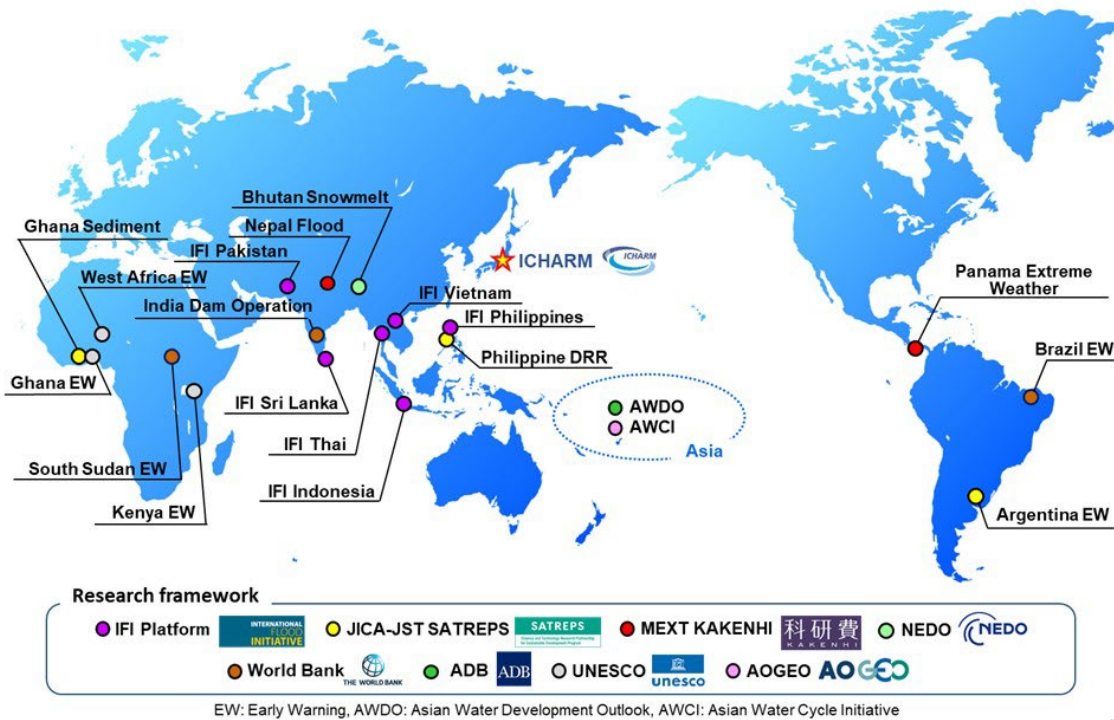


Figure 6-1 ICHARM's Project Recently conducted outside Japan

produced the “Jakarta Declaration,” a statement calling for interdisciplinary cooperation to strengthen flood risk reduction and sustainable development.

The Jakarta Declaration outlines the current situation, future direction, and necessary actions for flood risk reduction and sustainable development. Based on this declaration, activities to establish the “Platform on Water Resilience and Disasters” were launched. The platform serves as a national framework through which government agencies involved in flood management, meteorology and disaster management work together toward shared objectives.

At the 9th GEOSS Asia-Pacific Symposium held in Tokyo in January 2017, an IFI implementation plan workshop was organized as a side event, inviting participants from relevant agencies in Indonesia, Malaysia, Myanmar, the Philippines, Pakistan and Sri Lanka. By promoting a shared understanding of the platform’s importance, IFI was able to take a step toward establishing the platform in these countries. Since then, IFI has supported each country in forming its own platform that brings together water-related government agencies and other stakeholders, and has advanced efforts to address national water issues through providing the outputs from research funded by Japan’s MEXT and organizing high-level meetings and seminars. In 2024, the platform project was also launched in Thailand.

Activities under each platform in Asia are reported at the Asia Water Cycle Initiative session of the annual Asia-Oceania GEOSS Symposium, providing an opportunity for participating countries to share information with one another.

These platforms have actively contributed to a wide range of projects based on each country’s circumstances and needs. The concept of the Water Cycle Integrator, proposed by ICHARM and incorporated into the United Nations’ Water Action Agenda, was also realized through these efforts.

ANNEX-6 shows a list of IFI-related meetings since 2016. The total number of meeting participants, based on available information, is approximately 1,350, demonstrating that IFI networking is well-established worldwide.

2) Typhoon Committee

The Typhoon Committee is an intergovernmental organization established in 1968 and headquartered in Macao. It is

jointly managed by ESCAP and WMO. Its main objectives are to reduce damage caused by typhoons, strengthen cooperation in meteorology, hydrology, and disaster prevention, and coordinate the planning and implementation of typhoon-related measures. Fourteen countries and regions are currently members. From Japan, ICHARM participates alongside the MLIT Water and Disaster Management Bureau, the Japan Meteorological Agency, and others.

The Typhoon Committee meets annually for an annual session, in which member countries gather to report on activities and set future directions. It consists of four working groups: the Working Group on Meteorology (WGM), the Working Group on Hydrology (WGH), the Working Group on Disaster Risk Reduction (WGDRR), and the Training and Research Coordination Group (TRCG). The Advisory Working Group (AWG) oversees these groups and coordinates overall committee activities. Researchers from ICHARM have served as the WGH chair for many years.

At each meeting, ICHARM actively delivers presentations and leads discussions, demonstrating the strong international presence of ICHARM, PWRI, and MLIT. These efforts help strengthen international collaboration and technical exchange among Typhoon Committee members and contribute to Japan’s leadership in hydrology in particular.



Photo 6-1 Participants in the 58th Annual Session (Mar. 2026)



Photo 6-2 Senior Researcher Miyamoto reporting on WGH’s activities

3) Mainstreaming Disaster Risk Reduction in Collaboration with International Organizations

a) Contributions to the United Nations in water-related disaster risk reduction

(1) UN Special Thematic Session on Water and Disaster

The UN Special Thematic Session on Water and Disaster is a high-level international meeting on water and disasters held at the UN Headquarters in New York, convened every two years since 2013. It is organized through cooperation among the UN secretary-general, HELP, national governments, and international organizations. Its objectives include:

- Deepen international understanding of water-related disasters, such as floods, droughts, and storm surges;
- Promote cooperation and partnerships among countries; and
- Call on the international community to take action on water and disaster issues.

At the 3rd UN Special Thematic Session, held on July 20, 2017, a special session on science and technology was convened, co-chaired by ICHARM Executive Director KOIKE Toshio. The session discussed mechanisms for enhancing coordination among various international alliances on water and disasters, including IFI's initiative to establish Platforms on Water and Disasters, as well as research on sediment-related disasters, research foundations for advancing investment and finance, and approaches to addressing compound water-related disasters. Proposals for revitalizing international initiatives were also presented.

At the 4th Special Thematic Session, held on June 24, 2019, Executive Director Koike delivered a presentation during the science and technology session. He emphasized that, because science and technology can offer the knowledge needed to address complex challenges, the science and technology community must serve as a facilitator by building trust-based relationships, clarifying the mechanisms underlying the problems, and presenting feasible solutions.

At the 5th Special Thematic Session, held online on June 25, 2021, ICHARM organized the science and technology panel. Executive Director Koike and Dean Gretchen Kalonji of Sichuan University served as co-moderators. The session opened with remarks by President TANAKA Akihiko of GRIPS, followed by a keynote lecture by Executive Vice President Xu Weilin of Sichuan University. Presentations and a panel discussion were then conducted by five representatives from UNESCO, WMO, UNDRR, CONAGUA, and SEADPRI-UKM. The panelists shared ideas on concrete actions to be taken in the future and how they should be implemented, emphasizing the importance of open science policies, systemic solutions, science-based integrated action, and strengthened cooperation across the science,



Photo 6-3 The Special Session on Science and Technology at 3rd UN Special Thematic Session



Photo 6-4 Presentation by Executive Director Koike at 4th UN Special Thematic Session



Photo 6-5 Participants at 5th UN Special Thematic Session

policy, and implementation communities.

At the 6th Special Thematic Session, held from March 22 to 24, 2023, ICHARM took the lead in planning and organizing the “Science and Technology Panel: Showcases of Science and Technology Application, Connecting, Water, DRR, and Climate Change,” which was convened on March 21 ahead of the main meeting. The panel began with a keynote lecture by Abou Amani, the director of UNESCO’s Division of Water Sciences and the secretary of IHP, who spoke on UNESCO’s cross-cutting approaches to water issues. This was followed by presentations from representatives of Honduras, Malawi, and Japan, as well as from U-Inspire, introducing concrete, science-based examples related to enhancing resilience to water-related disasters and promoting sustainable development.



Photo 6-6 The speakers of the 6th UN Special Thematic Session

Japan’s presentation was delivered by Kumamoto City Mayor ONISHI Kazufumi, who described efforts to conserve groundwater and reduce flood risk in the Shirakawa River in Kumamoto Prefecture. He emphasized the city’s commitment to addressing water issues through “open regionalism” and “collaboration with all stakeholders.” Special Envoy of the Prime Minister of Japan KAMIKAWA Yoko also commented on the value of knowledge integration using satellite data and the importance of local facilitators in building sustainable, resilient, and inclusive societies. Her remarks reaffirmed the significance of ICHARM’s activities in contributing to solutions for global water challenges.

(2)2023 UN Water Conference

The UN 2023 Water Conference was held from March 22 to 24, 2023, gathering approximately 10,000 participants either at the UN Headquarters in New York or online. This was the first UN conference dedicated specifically to water in 46 years, since the Mar del Plata Conference held in Argentina in March 1977. The 2023 conference was convened as the mid-term review of the UN-designated International Decade for Action, “Water for Sustainable Development” (2018–2028), with the aim of accelerating efforts toward achieving SDG 6 and other international water-related goals.



Photo 6-7 Interactive Dialogue 3: Water for Climate, Resilience and Environment

[Photo by MLIT]

On March 23, Interactive Dialogue 3, “Water for Climate, Resilience and Environment,” co-chaired by Egypt and Japan, was convened. ICHARM presented the view it had consistently emphasized in international forums: the importance of positioning science and technology as a game changer for building a resilient post-COVID 19 society by promoting consilience, fostering facilitators, and leveraging an end-to-end approach. The session adopted this perspective as one of its Key Messages. In this way, ICHARM contributed to further mainstreaming water-related disaster risk reduction in the international community.

b) Contributions to UNESCO and international engagement in the water sector through UNESCO

As one of only two UNESCO Category 2 Centres in Japan, ICHARM operates under an agreement between the Japanese government and UNESCO, carrying out a wide range of activities aimed at reducing water-related disaster damage worldwide. These activities are built on three pillars: research, training, and information networking. Accordingly,

ICHARM engages with UNESCO in multiple ways, including contributing to UNESCO’s long-term programmes and implementing international projects funded through UNESCO resources.

(1) Contribution to UNESCO IHP-IX

The UNESCO IHP is the only intergovernmental programme within the UN system dedicated to water-related science, management, education, and capacity development. It was launched in 1975 with the aim of providing a scientific foundation for the optimal management of freshwater resources through international cooperation. In 2019, it was formally designated as an intergovernmental programme and renamed from the International Hydrological Programme to the Intergovernmental Hydrological Programme. Japan has continuously participated in and contributed to IHP activities as a member of the 36-country intergovernmental council.

IHP carries out initiatives aimed at advancing international cooperation to improve knowledge on water, promote technological innovation, strengthen the science–policy interface for achieving water security, and enhance education and capacity development for better water resources management and governance.

IHP develops a strategic plan every eight years, and it is currently implementing its 9th plan (UNESCO IHP-IX: 2022–2029). Under the overarching theme “Science for a Water Secure World in a Changing Environment,” the 9th plan identifies five key water priority areas, listed below. These priorities are intended to support Member States in achieving the 2030 Agenda and the SDGs, particularly the water-related goals, as well as other global frameworks related to water, such as the Paris Agreement and the Sendai Framework for Disaster Risk Reduction.

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 ICHARM Executive Director KOIKE Toshio serves as the chair of one of them: “Hydrological systems, rivers, climate risk, and the water–food–energy nexus.”

(2) Participation in UNESCO-hosted international conferences and symposia

① IFI side event

An IFI side event was held at the UNESCO Headquarters on June 13, 2016, organized by UNESCO, one of the partner organizations of IFI, for which ICHARM serves as the secretariat. The event marked the launch of the new IFI Strategy 2016–2022, which had been developed under ICHARM’s leadership together with IFI partner organizations, and provided an opportunity to discuss its implementation. IFI activities were also reflected in Theme 1 of the 8th IHP Strategic Plan (2014–2021). The side event brought together approximately 70 participants from more than a dozen countries. Following Executive Director Koike’s presentation of the new strategy, representatives from UNESCO, WMO, IAHS, and others discussed how the strategy could be put into practice in line with the SDGs and related global agendas.

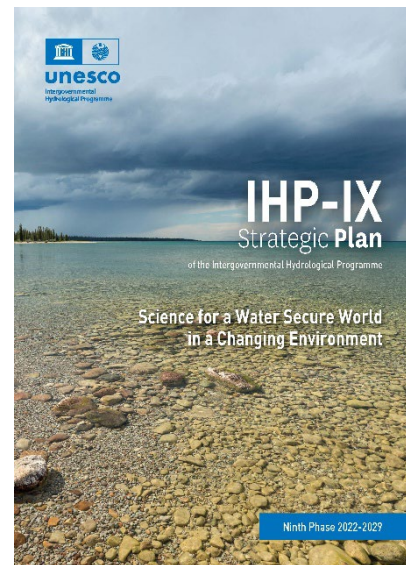


Figure 6-2 IHP-IX Strategic Plan



Photo 6-8 Executive Director Koike (2nd from left) explaining the new IFI strategy 2016-2022

② UNESCO International Water Conference

UNESCO convened its first International Water Conference at the UNESCO Headquarters in Paris, France, on May 13 and 14, 2019, to enhance understanding of the fact that water is connected to all of the SDGs. The conference brought together ministers from around 40 countries and more than 1,000 experts from 126 countries. It consisted of a high-level panel and several thematic sessions. ICHARM co-organized the Water and Disasters Panel on May 13 with HELP.

At the panel, Executive Director Koike delivered a presentation on “The Role of Science and Technology in the Interlinkages among Water, Disasters, and Climate Change.” He introduced the end-to-end approach as a framework for achieving sustainable socio-economic development in the face of water-related disasters and climate variability, highlighted the importance of facilitators who help implement science and technology in society, and presented the online information-integration system that supports these efforts. During the panel discussion, participants reaffirmed the importance of linking water, disaster risk reduction, and climate change, as well as the need to incorporate water and disaster issues into the UN Climate Action Summit.

Following the conference, a UNESCO Water Family meeting was held on May 14, with representatives from more than 20 UNESCO Category 2 Centres and UNESCO Chairs in attendance. From ICHARM, Senior Researcher IKEDA Tetsuya participated and presented updates on the center’s recent activities.

③ International conference on “Climate Risk, Vulnerability and Resilience Building”

Under the auspices of UNESCO, the international conference “Climate Risk, Vulnerability and Resilience Building” was held at the UNESCO Headquarters in Paris, France, from April 19 to 21, 2023. On April 19, Executive Director Koike participated in the panel session “Science-Policy Discussion Panel: Bridging the gap between science and the different scales of decision making for climate risk management,” where he delivered a speech on knowledge-integration systems and related topics. Two ICHARM researchers also gave presentations in other sessions.

Taking advantage of the gathering of climate-change experts from around the world, ICHARM organized a side event titled “Cross-Cutting Research on Hydrological Systems, Rivers, Climate Risk and the Water-Food-Energy Nexus.” Moderated by Abou Amani, the director of UNESCO’s Division of Water Sciences, participants engaged in active discussion and agreed to undertake joint research focusing on Africa, leveraging collaboration among five Category 2 Centres to promote cross-sectoral and integrated multilateral cooperation through water.

④ International Symposium of UNESCO Natural Sciences Sector Category 2 Centres



Photo 6-9 Director Koike made a presentation at the panel discussion



Photo 6-10 Participants discussing in the ICHARM-hosted side event



Photo 6-11 Participants gathering at the symposium venue

The International Symposium of UNESCO Natural Sciences Sector Category 2 Centres was held from May 15 to 17, 2024, in Kuala Lumpur, Malaysia, for the first time in six years. The event was jointly organized by the UNESCO Headquarters and ISTIC, a UNESCO Category 2 Centre (C2C) in Malaysia. Approximately 70 participants attended, including representatives from ICHARM and 30 other C2Cs around the world, as well as the UNESCO Headquarters and local institutions. On the second day, during Session 3, “Water and Disaster Risk Reduction,” ICHARM presented its research on floods and droughts, its doctoral and master’s programs, networking activities such as IFI and the Typhoon Committee, and UNESCO-supported projects in Africa.

⑤ IHP’s 50th anniversary events and a side event hosted by Japan

The year 2025 marked two major milestones for UNESCO: the 60th anniversary of the International Hydrological Decade and the 50th anniversary of the establishment of the International Hydrological Programme, later renamed the Intergovernmental Hydrological Programme. To commemorate these occasions, a series of anniversary events was held at the UNESCO headquarters from June 10 to 13, 2025, with Executive Director Koike and others in attendance.

Executive Director Koike delivered a presentation titled “Together with Africa,” in which he reported on ICHARM’s ongoing research and information-networking activities in the region. The event was well attended by UNESCO officials, including Lidia Brito, the assistant director-general for natural sciences, and KANO Yudai, the ambassador and permanent delegate of Japan to UNESCO, as well as researchers and other stakeholders, and concluded on a high note.

On June 12, Japan hosted a side event under the overarching theme “Frontiers in Hydrology and Their Contributions to Water Security in a Changing World.” Speakers included Executive Director Koike; OKI Taikan, the chair of the Science Subcommittee of the Japanese National Commission for UNESCO and a professor at the University of Tokyo; SAYAMA Takahiro, a professor at the Disaster Prevention Research Institute of Kyoto University; and other experts from Japan and abroad. They presented and exchanged views on the recommendations from the IHP 50th Anniversary Symposium held under the same theme in Japan in March, as well as Japan’s past and future efforts and contributions to IHP.



Photo 6-12, 13, 14 Participants in the side event hosted by Japan

c) Collaboration with other organizations

(1) World Meteorological Organization

ICHARM and WMO have collaborated in a wide range of activities, including the participation of the director of WMO's Hydrology, Water and Cryosphere Division as a member of the ICHARM Governing Board, ICHARM's involvement in WMO-organized events, and the appointment of ICHARM staff as a WMO regional hydrological adviser. In addition, WMO has also taken part in IFI, for which ICHARM serves as the secretariat.

① ICHARM Researcher appointed as a WMO regional hydrological adviser

The 79th session of the Executive Council of WMO, held in Geneva from June 16 to 20, 2025, decided that Senior Researcher MIYAMOTO Mamoru would be appointed as the regional hydrological adviser for Regional Association II (RA II).

WMO divides the world into six regions, each with its own Regional Association responsible for identifying regional priorities and formulating corresponding activities. RA II, which covers Asia and the Middle East, is composed of 35 member countries and territories.

Regional hydrological advisers play an important role by proposing technical and scientific approaches to regional hydrological priorities, strengthening hydrological services in member countries and territories, and promoting hydrology-related programs tailored to regional needs.

As the regional hydrological adviser for RA II, Miyamoto is expected to contribute to a wide range of regional efforts: strengthening collaboration and networking among members, implementing global strategies, advancing hydrological services under climate change, improving early warning systems, and promoting water-related disaster resilience. In particular, he is expected to play a key role as a bridge between technical and institutional practices at the operational level through collaboration with initiatives such as the IFI-led Platforms on Water and Disasters and with the Typhoon Committee.

② Participation in the WMO RA II Coordination Panel on Hydrology and Water Resources

The first in-person meeting of the RA II Coordination Panel on Hydrology and Water Resources (RA II CP-Hydrology) was held in Vientiane, Laos, from October 31 to November 1, 2022, and Senior Researcher Miyamoto participated. Building on the preparatory meeting held online in September, the purpose of the meeting was to formally launch the RA II CP-Hydrology following WMO's organizational restructuring.

At the meeting, hydrology and water resources experts from across WMO's Asia region discussed the work plan and milestones for hydrology-related activities and reached consensus on the implementation plan. They also confirmed that Miyamoto would lead two thematic areas: "Enhancement of Flood Resilience through Platforms on Water Resilience and Disasters" and "Expansion of Integrated Flood Management (IFM) HelpDesk to include Integrated Water Resource Management (IWRM)."

The third meeting of RA II CP-Hydrology was held in Goyang, Republic of Korea, from July 1 to 2, 2024. From Japan, participants included representatives from the MLIT Water Management and Land Conservation Bureau, as well as two researchers from ICHARM: Senior Researcher Miyamoto and Researcher TAKEGAWA Shinya.

On the first day, progress updates were shared by each expert team. In the session, "CPH Project 1 – Promote cooperation in hydrology and water resources among RA II Members and ensure coordination among the hydrology substructures in RA II," Miyamoto presented the achievements to date of two initiatives under his leadership: "Enhancement of Flood Resilience through Platforms on Water Resilience and Disasters" and "Expansion of the Integrated Flood Management (IFM) HelpDesk to include Integrated Water Resources Management (IWRM)." Discussions were held with the WMO Secretariat and other participants on the next steps for consolidating these efforts.



Photo 6-15 Dr. Miyamoto speaking at WMO RA II meeting

(2) Collaboration with UNDRR

ICHARM has maintained a strong partnership with UNDRR through a wide range of activities. The UNDRR representative in Japan has served as a member of the ICHARM Governing Board, and their senior officials have visited ICHARM. ICHARM has also participated in UNDRR-organized events. In addition, UNDRR has been an important member of IFI, for which ICHARM serves as the secretariat.

① Visit by UNDRR officials

On September 22, 2025, a delegation of six UNDRR officials, led by Director Paola Albrito, visited PWRI for a facility tour and an exchange of views. Her visit to Japan was realized as part of the Strategic Invitation Program for Practitioners, promoted by Japan's Ministry of Foreign Affairs. The program invites individuals who currently hold leadership positions or who are expected to play pivotal roles in government, business, academia, and other sectors abroad, with the aim of fostering networks with Japanese counterparts and cultivating future pro-Japan and Japan-knowledgeable leaders.

During the facility tour, the delegation visited the Hydraulic Experiment Laboratory, where Director ITAGAKI Osamu of the River Restoration Research Group provided an overview of the facility and explained the dam model experiments. This was followed by a briefing by Director for Special Research FURUMOTO Kazushi on ICHARM's activities, after which the two sides exchanged views on ICHARM's strategies and the importance of capacity development.



Photo 6-16 Director Albrito (second from left) with an official of Japan's foreign ministry and ICHARM staff

4) Mainstreaming Disaster Risk Reduction through International Conferences

ICHARM has actively contributed to the mainstreaming of disaster risk reduction through international conferences, including hosting and presenting sessions at various international conferences such as the World Water Forum and the Asia-Pacific Water Summit, and in particular, hosting the 9th International Conference on Flood Management (ICFM9) in February 2023, the second such conference held in Japan.

a) World Water Forum

The World Water Forum (WWF) is one of the world's largest international conferences on water, held every three years and co-organized by the World Water Council, an international NGO, and the host country. It brings together a wide range of water-related stakeholders from around the globe to discuss issues such as water-related disasters, sanitation, governance and finance from multiple perspectives. WWF consists mainly of an open forum accessible to all participants, ministerial conferences attended by government representatives, and a large exhibition on water.

Since 2016, ICHARM has participated in the following two WWFs.

○WWF10 (May 2024, Bali, Indonesia)

WWF10, held under the overarching theme "Water for Shared Prosperity," brought together approximately 64,000 participants from 160 countries. ICHARM served as the theme coordinator for Theme 3, "Disaster Risk Reduction and Management," one of the six themes in the Thematic Process. Within Theme 3, five topics were established – integrated flood management, drought management, eco-disaster risk reduction, climate-resilient water infrastructure, and early warning for all – and a total of 22 sessions were organized to address these topics individually, in combination, or in connection with other themes. After the sessions concluded, an integrated session was held, in which all theme coordinators summarized the outcomes of their respective discussions, and the results for Theme 3 were presented at the plenary.

Executive Director KOIKE Toshio and four other ICHARM researchers delivered presentations in sessions related

to climate change and disaster risk reduction, sharing research findings from ICHARM.



Photo 6-17, 18 Presentation by Director KOIKE at the integrated session, Report at overall session

○WWF8 (March 2018, Brasília, Brazil)

WWF8, held under the overarching theme “Sharing Water,” drew more than 120,000 participants from 172 countries. On March 19, a special session titled “High-Level Panel on Water and Disasters,” organized by HELP, was convened. In this session, Executive Director Koike presented global actions on water and disasters, including the “Alliance of Alliances on Disaster Risk Reduction Researches.”

Another special session, “From the 7th to the 8th World Water Forum: Three Years of the Implementation Roadmap,” was held on March 21. In WWF7, ICHARM served as the Champion for one of the key theme of the Thematic Process, “Adapting to Change: Monitoring Risk and Uncertainty for Resilience and Disaster Preparedness,” playing a central role in organizing sessions and synthesizing discussions.



Photo 6-19, 20 (Left) Presentation by Director KOIKE (Right) Presentation by Chief researcher IKEDA

b) ICFM9

The International Conference on Flood Management (ICFM) is held every three years to discuss various issues related to floods and to achieve significant academic and cross-disciplinary changes. ICHARM/PWRI hosted the 9th International Conference on Flood Management (ICFM9) at National Graduate Institute for Policy Studies (GRIPS), and the Tsukuba International Congress Center in Tsukuba, Japan, on February 18-22, 2023 in collaboration with two partner organizations of Japan, the Ministry of Land, Infrastructure, Transport and Tourism and the GRIPS. The high-level symposium was held at the GRIPS on Feb. 18, and the 4-day conference was held in Tsukuba. It has been 12 years since ICHARM hosted the 5th ICFM in Tokyo, Japan, in 2011



The 4-day conference in Tsukuba was attended by a total of 394 flood experts from 41 countries and area (212 from

Japan, 100 from Asia, 78 from the rest of the world, including four unknown). It was consisted of four plenary sessions and 24 parallel sessions, with 143 oral presentations in the parallel sessions and 48 poster presentations. And five special sessions were also held on cross-cutting themes, and eight companies and organizations participated in the technology exhibition to show their unique services and technologies related to flooding. In addition, a public symposium, “Can You Survive Unexpected Floods?” took place on the afternoon of the first day.

The following sections summarize the conference.



Photo 6-21 Group photo by all participants

The opening ceremony began with Professor Slobodan Simonovic, the chair of the ICFM Ad Hoc Committee, who delivered opening remarks on behalf of the organizers. He was followed by Dr. FUJITA Koichi, the president of PWRI, which hosted the conference, and Mr. OKUMURA Yasuhiro, the director of the National Institute for Land and Infrastructure Management (NILIM). Finally, Mr. IGARASHI Tatsuo, the mayor of Tsukuba City, welcomed participants on behalf of the host city. After the greetings, Professor Emeritus of Yamanashi University TAKEUCHI Kuniyoshi was awarded the ICFM Lifetime Achievement Award by ICFM. Professor KOTANI Motoko, the executive vice president for research of Tohoku University, Japan, and the vice president of the International Science Council, delivered the keynote speech online entitled “The responsibility of science, entrusted to us by society.”



Photo 6-22 “ICFM Lifetime Achievement Award”

Technology Exhibition took place in the multi-purpose room, which was also used for participants to have lunch and breaks. Eight private companies had booths to show their unique services and technologies related to flood management. Poster Indexing and Poster Viewing were held for poster presentations on the first and second days of the conference. At the closing ceremony on the final day, Mr. KUSANO Shinichi, the deputy director-general of the Water and Disaster Management Bureau, MLIT, gave the keynote speech, followed by the presentation of the ICFM9 Erich Plate Best Student Poster Award by Professor Simonovic. Next, ICHARM Executive Director KOIKE Toshio presented the draft Statement of ICFM9 to the participants and passed a little torch symbolizing the succession of ICFM to Professor Simonovic. Then, Professor Simonovic and Professor Kovacs, the executive director of the Institute for Catastrophic Loss Reduction (ICLR), announced that ICLR will host ICFM10 in summer 2026.



Photo6-23 “ICFM9 Erich Plate Best Student Poster Award”

On the afternoon of the 21st and 22nd, site visits were conducted with the cooperation of the Japan Aerospace Exploration Agency (JAXA), the National Research Institute for Earth Science and Disaster Resilience (NIED), and three local river offices of MLIT’s Kanto Regional Development Bureau. Blessed with nice weather, ICFM9 completed its four-day schedule successfully.



Photo 6-24 Little “Torch”

For more detailed reports, please visit the websites of ICHARM and ICFM as follows;

- <https://www.pwri.go.jp/icharm/publication/pdf/2023/4441.pdf>
- https://www.pwri.go.jp/icharm/special_topic/20230219_21_icfm9.html
- ICFM: <https://www.icfm.world/ICFM-Conferences/ICFM9>

c) Asia Pacific Water Summit (APWS)

APWS is held to provide heads of government and other top-level policymakers in the region with an opportunity to set a course for sustainable development from the perspective of water, while sharing concrete actions, solutions, and new approaches. APWS is organized by the Asia-Pacific Water Forum Secretariat, with the first summit held in Beppu, Japan, in 2007, and the second in Chiang Mai, Thailand, in 2013.

The third APWS was held in Yangon, Myanmar, from December 11 to 12, 2017. On the afternoon of the 11th, ICHARM co-hosted a session titled “Water and Disasters under Climate Change: From Mountains to Islands” with ICIMOD, SPC, and HELP.

The first part of the conference featured keynote speeches by high-level leaders, including José Ramos-Horta, the senior minister of Timor-Leste (former president and recipient of the 1996 Nobel Peace Prize), and ISHII Keiichi, the MLIT minister of Japan. The second part consisted of country reports from seven Asia-Pacific nations on water and disasters under climate change. The third part was devoted to a panel discussion co-chaired by KOIKE Tosiho, the executive director of ICHARM, and Kyaw Moe Oo, the director general of Myanmar’s Department of Meteorology and Hydrology.

On the afternoon of the 12th, IKEDA Tetsuya, a senior researcher of ICHARM, presented a report on the outcomes of the co-hosted session, followed by the adoption of the Yangon Declaration at the closing ceremony.



Photo 6-25 Japan’s MLIT Minister Ishii making a keynote speech



Photo 6-26 ICHARM Executive Director Koike (first from left) speaking during the panel discussion

The fourth APWS was held in Kumamoto City, Japan, from April 23 to 24, 2022. ICHARM was responsible for planning and managing the Thematic Session “Water and Disasters/Climate Change,” the Special Session “Showcase,”

and the Integrated Session “Science and Technology,” as well as coordinating and compiling the outcomes. In particular, in response to the request made by the heads of state in the Kumamoto Declaration regarding the role that science and technology should play in transdisciplinary decision-making, ICHARM played a pivotal role in consolidating discussions on promoting water-cycle confluence, fostering facilitators, and advancing end-to-end approaches, contributing to the preparation of the Chair’s Summary.



Photo 6-27 ICHARM Executive Director Koike serving as the moderator of the Special Session “Showcase”



Photo 6-28 Participants at the Science and Technology Integration Session



Reflecting on the Vision of Twenty Years Ago

IKEDA Tetsuya

Former Chief Researcher, Former Director for Special Research

I extend my heartfelt congratulations on the 20th anniversary of ICHARM's establishment. I express my deep respect for the dedicated efforts of all those who have proactively carried out activities over these past two decades, as well as everyone who has collaborated and provided support as partners. I am also greatly honored to have been given this opportunity to contribute a column. I was involved in ICHARM's preparatory activities from July 2003 to March 2005, and then primarily worked on international networking and public relations from April 2017 to July 2022. During the preparatory phase, when it was referred to as a UNESCO Centre, the fundamental framework for ICHARM was being discussed. On this 20th anniversary, I look back through a manuscript I submitted to a professional journal at that time.

The Centre's activity theme is water-related disasters and their risk management, with the following three pillar activities envisioned:

- **【Research】** Research on technologies for forecasting, observing, and analyzing hydraulic and hydrological phenomena; technologies for managing water-related disasters in various socio-economic contexts over the world; and technologies for assessing impacts and developing countermeasures related to climate change and other factors.
- **【Training】** Practical and strategic training tailored to field needs, conducted in collaboration with universities and other academic institutions, and capacity development training for researchers and practitioners in the developing countries.
- **【Information Networking】** Establishing information networking with intergovernmental organizations, research institutions, the private sector, etc., and collecting, analyzing, and providing useful information.

It is believed that only through the close interconnection of these three areas could efficient and effective activities be achieved.

What do you think about this?

Even today, 20 years after its establishment, I am deeply impressed that the vision and direction of ICHARM's activities that were designed during the preparatory phase still remain entirely relevant and have not faded in the slightest, reaffirming their enduring validity and accuracy. While activities and their direction will continue to evolve and be updated in response to changing times, I strongly hope that the three pillar activities envisioned from the outset—research, training, and information networking—will continue to be pursued vigorously and create synergic effects among them through the application of a three-in-one approach.

5) Conclusion of Memorandum of Understanding

In order to expand ICHARM's international network, memoranda of understanding were concluded with relevant domestic and overseas organizations. Annex-7 shows a list of memoranda of understanding concluded from fiscal year 2016 to fiscal year 2025.

6) ICHARM Visitor

From fiscal year 2016 to fiscal year 2025, approximately 840 people from 58 countries, including Japan, visited ICHARM to exchange opinions and so on. ANNEX-8 shows the number of participants by year and by country.

7. Local Practices

ICHARM has participated in local projects and implemented activities in cooperation with local administrative and research organizations in order to test applicability of several models developed by ICHARM to local basins. Those projects have been successfully implemented despite difficulties in arrangement with local offices and problems in the actual implementation process.

1) UNESCO Project

a) West Africa: Water Disaster Platform to Enhance Climate Resilience in Africa (WADiRe-Africa)

In recent years, countries across West Africa have repeatedly suffered severe damage, including loss of life, caused by flooding along the Niger and Volta Rivers. These disasters have hindered human security and economic development. In response, UNESCO has identified the urgent need for measures that could be launched quickly, focusing on establishing a flood monitoring and forecasting system covering the Niger River and surrounding areas, and on reducing human casualties by encouraging early evacuation through the timely dissemination of flood information.

ICHARM signed a partnership agreement with UNESCO and established the framework for the “Water Disaster Platform to Enhance Climate Resilience in Africa.” Within this framework, ICHARM worked in collaboration with the UNESCO Intergovernmental Hydrological Programme (UNESCO-IHP), AGRHYMET, and the University of Tokyo’s EDITORIA to develop a flood early warning system (FEWS) on DIAS for the Niger and Volta River basins.

ICHARM also invited experts from AGRHYMET and VBA to Japan to provide training on FEWS and flood risk management. In addition, an e-learning-based capacity-building program was conducted from August 2020 to February 2021. The following provides a detailed report on the WADiRe-Africa project.

A kickoff meeting was held on June 17-18, 2019, in Lomé, Togo, bringing together representatives from the relevant organizations. At this meeting, with ICHARM playing a central role, participants discussed key issues related to data use for flood management at national and regional levels, capacity development, hydrological model development, and platform building, and consolidated them as the “Key Points of the Lomé Declaration.”



Photo 7-1 Kickoff meeting in Lomé, Togo

ICHARM developed the West Africa version of FEWS under this project. This FEWS was designed to automatically calculate and update the following in real time at one-hour intervals: (1) basin-scale rainfall distribution based on GSMaP; (2) basin-scale rainfall distribution based on GSMaP corrected statistically using ground-observed rainfall; and (3) river water levels and flood-inundation extents at flood hotspots using the WEB-RRI model with the corrected GSMaP data. The system also provides forecasts of maximum inundation depth at flood hotspots. Although GSMaP-based rainfall distribution tends to be overestimated in semi-arid regions such as the project area, this issue was resolved by the statistical correction described in item (2).

This locally-adopted FEWS has been made available to 11 West African countries covering the Niger and Volta River basins, as well as to AGRHYMET, NBA, VBA, and other relevant organizations, enabling broad information sharing.

An e-learning-based capacity-development program from August 2020 to February 2021 was conducted to train local officials and practitioners to use FEWS effectively for disaster response.

Though the training, initially planned as an in-person program in West Africa, was later moved online due to the COVID-19 pandemic. In addition, considering local conditions such as unstable internet connectivity and the fact that many target countries are French-speaking, a dedicated site was created on DIAS, from which participants could download pre-recorded training materials in English and French and study offline at their own pace.

The training consisted of two programs: “Training of Experts (ToE)” for representatives of NBA, VBA, and the 11 countries in the two river basins, and “Training of Trainers (ToT)” for participants selected by AGRHYMET from among

the graduates of the ToE training. The ToE training was held four times, with 288 participants, of whom 197 completed the program. The ToT training was held twice, with 44 participants, of whom 30 completed the program.

On December 1, 2021, ICHARM co-hosted an information session on the outcomes of the project with UNESCO. At this session, the ambassador and permanent delegate of Japan to UNESCO delivered opening remarks, and the executive director of ICHARM and experts from VBA, who had come to ICHARM for training under the project, served as panelists and gave presentations.

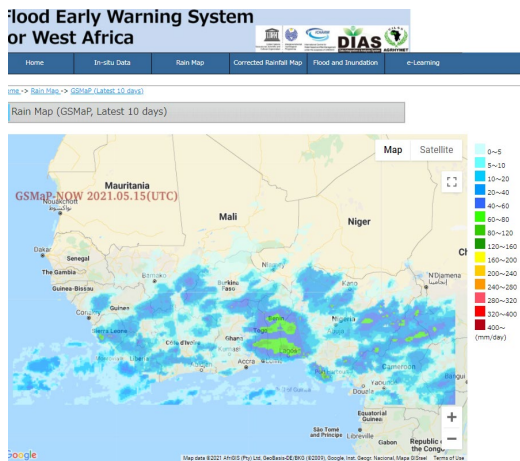


Figure 7-1 GSMaP-based real-time rainfall distribution provided by FEWS

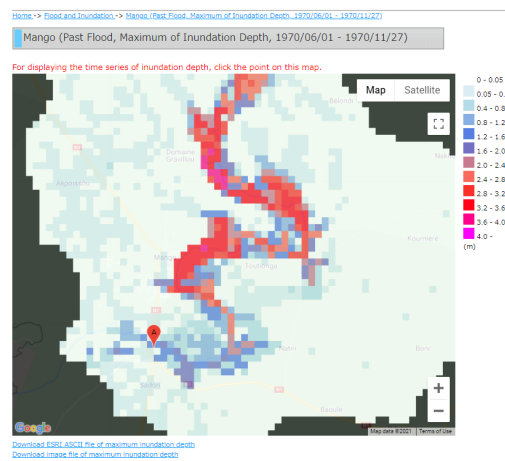


Figure 7-2 Forecasts of maximum inundation depth at flood hotspots

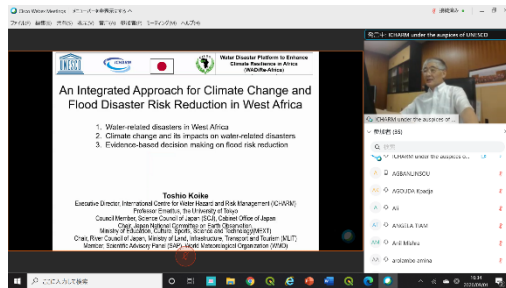


Photo 7-2,3 Pre-recorded e-learning material, Local staff in an e-learning session

*For more information, see the following issues of the ICHARM Newsletter:

- 1) https://www.pwri.go.jp/icharm/publication/newsletter/pdf/icharm_newsletter_issue54.pdf
- 2) https://www.pwri.go.jp/icharm/publication/newsletter/pdf/icharm_newsletter_issue59.pdf

b) UNESCO project “Enhancing flood resilience in Kenya”

Between October 2023 and January 2024, floods linked to the El Niño phenomenon struck Kenya, forcing the evacuation of over 500,000 people and claiming 186 lives. To enhance resilience to such events, ICHARM, in collaboration with the UNESCO Nairobi Office and Kenya’s Meteorological Department and Water Resources Authority, was assigned to implement the Flood Resilience Enhancement Project in Kenya in 2025. In response, we started preparations, including contract negotiations and related arrangements in 2024. In this project, we plan to identify flood hot spots in the Tana River basin and then develop a locally-tailored OSS-SR system with a real-time flood warning function while simultaneously providing facilitator training.

On July 2, an inception workshop was held in Nairobi as a kickoff, where stakeholders discussed specific activity plans. From July 3 to 6, a field visit was conducted to the target watershed, the Tana River, including visits to major meteorological and hydrological observation stations and exchanges of opinions with communities living

along the Tana River.

From October 27 to about two weeks into November, a facilitator training was conducted in cooperation with the University of Tokyo. For the training, one expert each from the Kenya Meteorological Department (KMD), the State Department for Water and Sanitation, the Kenya Electricity Generating Company (KenGen), and the Tana River County Government was invited, aiming to strengthen cross-disciplinary initiatives. Additionally, one instructor and coordinator from the UNESCO Regional Office for Eastern Africa also participated. The training program consisted of introductory lectures and tests on meteorology, hydrology, and disaster prevention, hands-on training, field visits, and group work. In the hands-on training, participants practiced using forecasted rainfall, hydrological modeling, and risk mapping. In the group work, participants designed specific content and structure assuming the implementation of expert training in Kenya.

Furthermore, on December 9, an expert training on the flood early warning system was conducted in Malindi, Kenya, hosted by UNESCO. A total of 38 participants from 16 organizations, including the Kenya Meteorological Department (KMD), the Ministry of Water Resources, and the Kenya Electricity Generating Company (KenGen), took part. In this training, Kenyan experts who had previously received facilitator training in Japan provided instruction.



Photo 7-4 Inception workshop



Photo 7-5 Participants of facilitator training and ICHARM researchers



Photo 7-6 Expert training works



Photo 7-7 Award ceremony of certificate

c) UNESCO project “Development of an integrated early warning system for water-related hazards in Ghana”

The repeated occurrence of floods and droughts in Ghana significantly affects socio-economic activities. A key factor underlying this issue is the lack of adequate data and forecasting capabilities related to hazard. To tackle these challenges, ICHARM joined UNESCO project in collaboration with the University of Tokyo, and developed an Integrated Early Warning System for Floods and Droughts (IEWS) for the Volta River basin downstream, which covers most of Ghana’s territory.

On July 3-4, 2025, Executive Director KOIKE Toshio and Research Specialist NAGUMO Naoko visited Accra, the capital city of Ghana, as part of this assignment. On July 3, the ICHARM researchers met with Mr. Edmond Moukala, the director of the UNESCO Accra office. On July 4, the visiting team exchanged views on the development of the integrated early warning system with representatives from the Ghana Hydrological Authority (HYDRO), Ghana Meteorological Agency (GMet), and Water Resources Commissions of Ghana (WRC). In this meeting, the Ghanaian side showed strong interest in ICHARM’s climate modeling and hydrological simulations considering climate change.



Photo 7-8,9 Meeting with Director Moukala at the UNESCO Accra office, ICHARM researchers with Ghanaian partners after the meeting

In addition, ICHARM provided a training program for governmental officials and researchers in Ghana, in November 2025. This training program included scientific lectures as well as demonstration and hands-on training using the IEWS. The training program composed of preliminary half-day online session and two-day on-site session in Accra. In the on-site session, the lectures of climate change, bias-correction of satellite-based rainfall, rainfall prediction, flood monitoring and prediction, and agricultural drought monitoring and prediction, and the hands-on training for the use of the IEWS were mainly provided. Out of the 20 participants, 16 took the examination to assess their understanding, and all of them successfully completed the training with a score of 80% or higher. The participants requested further advanced training program, and also confirmed to continue discussions toward coordination and collaboration among related organizations, with the support from Japan.

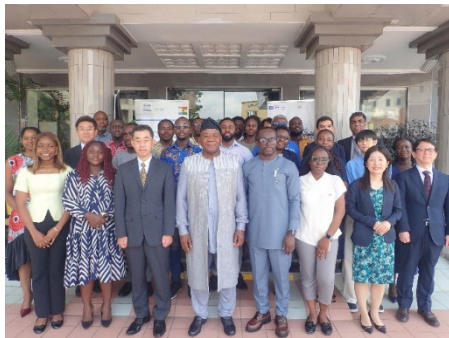


Photo 7-10 On-site training



Photo 7-11 Hands-on training

2) World Bank

a) Brazil: Technical Assistance in Implementing a Pilot of Agriculture Drought Monitoring and Prediction (April 2018-December 2019)

The semi-arid region of northeastern Brazil suffered five consecutive years of drought beginning in 2012, resulting in historically low water levels in major reservoirs. At that time, however, Brazil lacked tools specifically designed to improve the management of agricultural drought. For this reason, the World Bank strongly supported the country's efforts to strengthen knowledge and capacity for advancing water security, with particular emphasis on establishing drought monitoring and prediction.



Figure7-3 Location of Ceará State

In response, the World Bank took interest in ICHARM’s drought monitoring and prediction system and, in April 2018, commissioned ICHARM to carry out a research project on agricultural drought monitoring and prediction in northeastern Brazil.

The project consisted of the following three components:

- 1) Development of a drought monitoring and prediction system for northeastern Brazil
- 2) Development of a drought monitoring and prediction system for Ceará State
- 3) Evaluation of project outcomes to develop strategies for applying the system to other states in Brazil and to countries in the LAC region

In June 2018, the first face-to-face workshop was held in Fortaleza, the capital of Ceará State, with participation from many organizations, including the World Bank, ICHARM, the Ceará State Meteorology and Water Resources Foundation (FUNCEME), the Secretariat of Agricultural Development of Ceará, the Federal University of Ceará, and the University of Brasília.¹⁾



Photo 7-12 The first face-to-face workshop

Among these organizations, FUNCEME possesses high-resolution land-cover data, multi-site ground-based rainfall observations, and other key datasets, and serves as a leading research institution for meteorological drought monitoring and prediction. For these reasons, two of its researchers were recommended by the World Bank and stayed at ICHARM for one month in October 2018 to receive training.²⁾

On March 26, 2019, the second face-to-face workshop was held in Fortaleza (Photo 2)³⁾. At the workshop, ICHARM introduced the drought monitoring system developed for Ceará State and the WEB-DHM model for the Banabuiú River basin, and explained the importance of “science facilitators” in linking the systems developed under this project with individual farmers.



Photo 7-13 The second face-to-face workshop

On June 26, 2019, the Japan-World Bank seminar on water and disasters was held, followed by the Japan-World Bank Deep Dive into Agricultural Drought on June 27 in Washington, D.C. ICHARM presented not only the detailed outcomes of this project but also its past achievements and the latest developments related to its expansion in Africa. These opportunities allowed ICHARM to share the project’s results in depth with World Bank counterparts.



Photo 7-14 Japan-World Bank seminar on water and disasters

Please refer to the chapters 4.2 2) for an overview of the drought monitoring and prediction system developed under this project.

For further details, see the respective issues of the ICHARM Newsletter listed below:

- 1) https://www.pwri.go.jp/icharm/publication/newsletter/pdf/icharm_newsletter_issue50.pdf
- 2) https://www.pwri.go.jp/icharm/publication/newsletter/pdf/icharm_newsletter_issue51.pdf
- 3) https://www.pwri.go.jp/icharm/publication/newsletter/pdf/icharm_newsletter_issue54.pdf

b) India: Technical Support for Advanced Rainfall Monitoring and Prediction with Satellites and Reservoir Inflow

Prediction for Optimized Reservoir Operation”

In Kerala State, India, major floods occurred in both 2018 and 2019. In response to requests from the World Bank and the state government, ICHARM and JWA were commissioned to conduct a project demonstrating the potential for flood management through optimized operation of multipurpose reservoirs. The contract period spanned from January 7, 2022 to March 31, 2023.

This project carried out the following activities:

- i) An overview of the advanced rainfall monitoring and rainfall and reservoir-inflow prediction system for optimizing dam reservoir operations
- ii) Introduction of examples from Japan and/or other countries, along with trial demonstrations of satellite-based rainfall monitoring and prediction in Kerala when possible, or elsewhere if not
- iii) Guidance on a recommended program for developing such an integrated system for Kerala, including required information and data, a proposed schedule, and estimated costs

On January 23 and 25, 2023, a workshop organized by the World Bank was held in Kerala with participation from officials of the state government, World Bank staff, and others. Executive Director KOIKE Toshio and several researchers from ICHARM, along with JWA staff, took part. ICHARM presented Japanese technologies, as well as analysis results of the 2018 and 2019 floods in Kerala using ICHARM’s methods. ICHARM also proposed, as the next step, collaboration among stakeholders based on the five “Co’s”: Co-integration, Co-analyzing, Co-learning, Co-designation and Co-development.



Photo 7-15,16 Presentation by Director KOIKE, Participants in the workshop organized by the World Bank in Kerala



Memories of ICHARM

YOSHINO Hirosato

Director of Research Planning, PWRI

Former ICHARM Senior Researcher

Looking back on my time at ICHARM, I feel it is a truly unique organization, bringing together people with diverse backgrounds and careers – researchers from various countries, government officials, international students, etc.

ICHARM was my first place to work as a researcher, and at the beginning I was so unfamiliar with the research terminology used by my new colleagues and was often unsure about what I should be doing. Gradually, however, I started figuring out that I could serve as a bridge between research and government. Nonetheless, in reality, since I was mostly involved in administrative tasks, such as budgeting and preparing documents, I am afraid that I may have placed extra burdens on fellow researchers. Even so, I really enjoyed my time at ICHARM.

Even after transferring to another research institute, I had continued working on research related to flood disaster mitigation measures by making the most of my experience at ICHARM.

I sincerely hope that ICHARM will continue to grow and contribute to protecting the safety and well-being of people in Japan and around the world.

c) Exchange of Views with the Global Director for Water

On November 20, 2023, Saroj Kumar Jha, the global director of the World Bank’s Water Global Practice, visited PWRI together with two colleagues. They held an exchange of views with President FUJITA Koichi, the director of the International Affairs Office of MLIT, and students enrolled in ICHARM’s educational programs. During the meeting, the global director made the following remarks:

- The World Bank has set a new vision, “World Free of Poverty on a Livable Planet.” It defines a “livable planet” as one where everyone has access to clean water and where irrigation systems are in place to prevent extreme flooding or drought.
- The new vision includes an explicit reference to water – something unprecedented in the World Bank’s history. The organization has identified water security one of its six global challenges and is acutely aware that climate change is intensifying the worldwide crises in water security and access.



Photo 7-17 World Bank officials with ICHARM staff and students

In addition, on January 30, 2024, an online seminar was held for World Bank staff to further promote mutual understanding.

d) South Sudan: Knowledge exchange on flood and drought management between South Sudan and Japan

ICHARM was commissioned for the project “Knowledge Exchange on Flood and Drought Management between South Sudan and Japan” through a single-source contract from the World Bank for the contract period from February 5

to August 31, 2025. The objective was to provide the Ministry of Water Resources and Irrigation and other institutions involved in flood and drought management in South Sudan with the following:

- 1) An overview of science and technology for flood and drought monitoring, forecasting and early warning, including practical examples
- 2) Trial demonstrations of integrated hydrological forecasting and recommendations for developing flood and drought monitoring and early warning systems in selected small river basins in South Sudan
- 3) Knowledge exchange through site visits and workshops in Japan aimed at capacity development for local staff

Regarding capacity development, in August 2025, about 20 trainees from South Sudan and neighboring countries visited Japan to observe flood-control and irrigation technologies in the middle reaches of the Tone River and in the Yoshida River and Naruse River basins in Miyagi Prefecture. ICHARM staff also delivered lectures on topics such as climate change and rainfall forecasting, and Professor HONMA Koki of Tohoku University gave a presentation on the impacts of climate change on agriculture. In addition, hands-on training was conducted using the RRI model to simulate flooding in a tributary of the Nile River near Juba.



Photo 7-18 Training Participants at the Watarase Retarding Basin



Photo 7-19 Training Participants at hands-on training

e) India: Technical Support for Advanced Forecast of Rainfall and Reservoir Inflow for Optimized Reservoir Operation

ICHARM implemented the World Bank–commissioned project “Technical Support for Advanced Forecast of Rainfall and Reservoir Inflow for Optimized Reservoir Operation” in India during the contract period from March 14 to December 31, 2025. The project was conducted in collaboration with JWA and involved the following activities:

- 1) Assessment of the feasibility of introducing an advanced rainfall and reservoir inflow forecasting system and identification of areas for improvement
- 2) Assessment of the feasibility of optimizing reservoir operations by introducing an advanced rainfall and reservoir inflow forecasting system
- 3) Two online knowledge-sharing training sessions on advanced rainfall and inflow forecasting and on integrated reservoir operation systems, as well as hybrid training sessions in Japan that included site visits
- 4) Proposal of a knowledge-exchange program to be conducted jointly with academic and research institutions in India

From May 12 to 16, 2025, Executive Director KOIKE and several ICHARM researchers visited India to conduct a field survey and hold discussions with relevant organizations in order to understand the challenges in dam operation and the needs for flood protection in the Krishna River basin, which spans the states of Karnataka and Andhra Pradesh, and to collect disaster records, observational data, and other information necessary for analysis.

From November 18 to 21, 2025, ICHARM organized site visits and workshops on integrated reservoir operation for dam groups in Japan. The program aimed to strengthen the basic capacity of Indian government officials in dam reservoir management through enabling them to observe Japan’s advanced rainfall forecasting and reservoir operation systems, as well as through technical training provided by ICHARM and JWA. A total of eight participants from the Indian government and the World Bank, along with three from JWA, took part in site visits to dam facilities in the Shikoku and Kinki regions and attended lectures delivered by ICHARM researchers, Professor SUMII Tetsuya of Kyoto University,

and JWA staff on topics such as climate change, rainfall forecasting, reservoir inflow prediction, sedimentation countermeasures, and dam safety management. The delegation also paid a courtesy visit to MLIT.



Photo 7-20 Meeting with the Kamataka Water Resource Department



Photo 7-21 Site visit to the Almatti Dam

3) Collaboration with ADB

a) Implementation of the project “TA-8456: Transformation of Urban Management, Part II: Flood Management”

Due to dynamic social and economic activities in recent years, rapid urban development is expected in Myanmar, creating an urgent need to improve urban functions and strengthen the human resources required to manage them. To support the country in this development process, ADB decided to launch a project to assist the Myanmar government in capacity development for urban management through “TA-8456: Transformation of Urban Management.” Since Myanmar was heavily affected by Cyclone Nargis in 2008, it was also important for the country to enhance its preparedness and response capacity to reduce disaster risks, which could disrupt the future development of its cities. Accordingly, under TA-8456, Part I focused on general urban management, such as water supply, sanitation, waste management, and drainage, while Part II covered flood management.

The main activities under Part II were as follows:

- Hydro-meteorological analysis related to floods and storm surges
- Flood and storm-surge risk assessment
- Capacity development for the Department of Meteorology and Hydrology
- Capacity development for organizations involved in flood and storm-surge risk assessment

With ICHARM supervising and guiding the all activities of Part II, the Part II team implemented flood risk assessment and provided technical transfer to the Myanmar government to help strengthen flood risk reduction capacity in three selected cities: Yangon, Mandalay, and Mawlamyine. The project began in July 2014 and continued for two years and five months, concluding in November 2016. Under Part II, ICHARM established a collaborative framework with the Myanmar government to advance the project in an inclusive manner by holding meetings and workshops with relevant agencies.

The final workshop was held in Nay Pyi Taw, the country’s capital, on May 23, 2016, to present the project’s achievements and discuss the completion of the project activities, including preparation of the final report.



Photo 7-22 Participants in the final workshop



SAWANO Hisaya

Director, Foundation of River & basin Integrated Communications
Former Chief Researcher, Former Deputy Director of ICHARM

During my time at ICHARM, I was involved in a wide range of activities, first as a chief researcher and later as the deputy director. All of these experiences are memorable, but what left the strongest impression on me was the assignments that required repeated field visits and close collaboration with partner governments, such as the flood management project in Myanmar and the development of a hazard map for Calumpit Municipality in the Pampanga River Basin in the Philippines.

Among domestic projects, I vividly recall giving a demonstration of the VR-based flood simulation project in its early stages, during which members of a parliamentary inspection delegation visiting the Public Works Research Institute experienced simulated flood situations firsthand by wearing the VR equipment.

Currently, in addition to my professional duties, I teach university courses. In my lectures, I introduce ICHARM’s work and emphasize to students the importance of understanding local conditions firsthand and of working with local communities to develop measures appropriate to each area.

I sincerely hope that ICHARM will continue to further advance its activities both in Japan and internationally.

b) ADBI-ICHARM Policy Dialogue on Water-related Disaster Resilience under Climate Change

Funded by ADBI, ICHARM co-organized the “ADBI-ICHARM Policy Dialogue Water-related Disaster Resilience under Climate Change” on January 27-28, 2020, at ADBI in Tokyo, Japan. Prioritizing the policy-dimensions of water-related disaster resilience, the dialogue focused on exploring and discussing initiatives and efforts to strengthen governance and investment for water-related disaster resilience under climate change in Asia through transdisciplinary dialogue and collaboration between the science and technology community and other stakeholders, including senior

government officials and experts from international development organizations.

The policy dialogue consisted of four sessions: “Sharing Experiences,” “Strengthening Governance,” “Encouraging Investment,” and “Implementation Design.” In each session, keynotes and presentations were delivered by representatives from IFI platform-project implementing countries (the Philippines, Sri Lanka, Myanmar, and Indonesia) and the experts from the Japanese government or academic organizations. Through discussions among participants, the meeting emphasized that policymakers and experts need to share knowledge to reduce water-related disaster risks under climate change through improved policy coordination, financing and investment, and the application of science and technology.



Photo 7-23 Participants at the Opening plenary

c) Contributions to Asian Water Development Outlook 2025

AWDO aims to track the status of water security and highlight critical water management issues in Asia and the Pacific. ADB has published four editions of the AWDO series since 2007. In preparation for the 2025 edition, ICHARM analyzed climate change impacts on floods and droughts for all 50 countries and economies in the region. Specifically, future changes in rainfall were assessed as hydrological hazards (namely floods), while future changes in the Standardized Precipitation Index were assessed as climatological hazards (droughts). The results were incorporated into one of the five indicators, “Key Dimension 5: Water-related disaster security,” in cooperation with IHE Delft, a partner organization. In December 2025, the final version was presented at the Water and Development Congress & Exhibition, organized by IWA in Bangkok.

<https://www.adb.org/awdo/editions/2025>

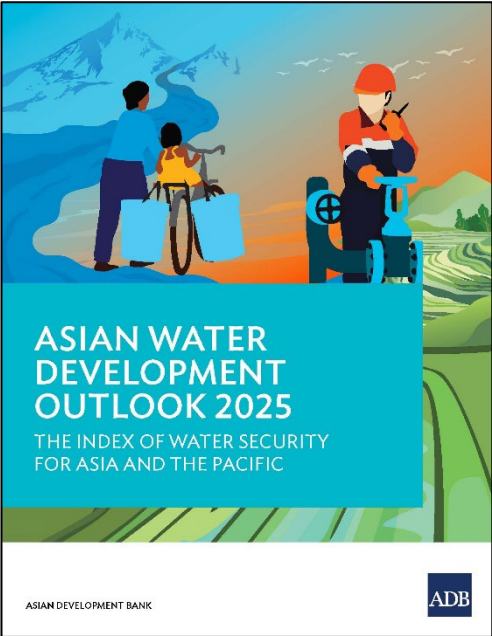


Figure 7-1 AWDO2025

4) SATREPS Project

SATREPS (Science and Technology Research Partnership for Sustainable Development) is a program in which the Japan Science and Technology Agency (JST) and the Japan Agency for Medical Research and Development (AMED), in collaboration with the Japan International Cooperation Agency (JICA), promote international collaborative research between Japan and developing countries to address global challenges.

ICHARM served as the lead research institution in the Philippines (until FY2022) and participated as a collaborating research institution in projects in Thailand, Argentina, and Ghana, conducting practical activities on the ground in cooperation with domestic and international government agencies and research institutions.

a) The Philippines

The Project for Development of a hybrid water-related disaster risk assessment technology for sustainable local economic development policy (HyDEPP-SATERPS)

In the Philippines, the human and economic damage caused by typhoons that occur every year is immense, and repeated damage to social infrastructure such as agricultural production and logistics has serious and long-term impacts on economic activity. In Metro Manila, where assets and capital functions are concentrated, disaster countermeasures are particularly urgent in order to mitigate and reduce economic damage, while water disasters are frequent in provincial cities, and socio-economic development is hindered due to a fragile infrastructure environment. In contrast, although the country is making progress in addressing climate change, concrete measures that contribute to reducing damage at the local level have not progressed. Therefore, it is necessary to promote balanced development throughout the country by promoting damage reduction measures through the creation and implementation of local climate change action plans, improving resilience to water disasters, and thereby promoting sustainable development.

Therefore, this project will promote proactive disaster prevention investment based on scientific knowledge by utilizing a hybrid evaluation model that combines climate change, hydrology, agriculture, and socioeconomic activity models, along with a big data platform. This "end-to-end approach" will consistently link observational and statistical data to the visualization of disaster risk and the effectiveness of disaster prevention investments. Through this, we will make policy recommendations aimed at promoting sustainable development by improving the water disaster resilience of local cities and fostering balanced national development by correcting the further over-concentration in Manila.

The research target river basins are the Pampanga River basin and the Pasig-Marikina River/Lake Laguna basin located on Luzon Island in the Republic of the Philippines. The policy recommendations will be compiled and published as policy recommendation documents for each river basin, with the aim of having them reflected in the policies and plans of central and local governments.

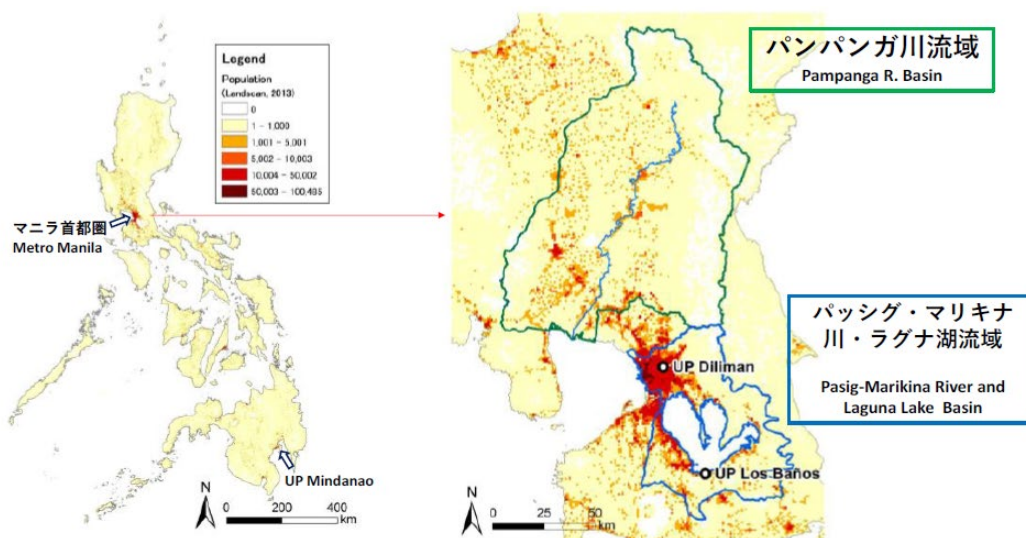


Figure 7-2 Target river basin of HyDEPP-SATERPS

This project was led by Professor Miho Ohara (Center for Integrated Disaster Prevention Information Research, Graduate

School of Interdisciplinary Information Studies, University of Tokyo, and Senior Researcher at ICHARM until March 2023) and Professor Fernando C. Sanchez Jr. (University of the Philippines Los Baños). Participating domestic research institutions included the University of Tokyo, Tohoku University, Kyoto University, Shiga Prefectural University, Nagoya University, and ICHARM. Partner research institutions in the Philippines included the Center for Interdisciplinary Hydrological Studies (UPLB IdSCW) at the University of the Philippines Los Baños, the University of the Philippines Diliman, and the University of the Philippines Mindanao. Cooperating local government agencies included the Philippine Department of Science and Technology's Atmospheric, Geophysical and Astronomical Services Administration (DOST-PAGASA), the Department of Public Works and Highways (DPWH), the Laguna Lake Development Authority (LLDA), and the Metropolitan Manila Development Authority (MMDA).

The project began on April 1, 2020, as a JST project in Japan. However, due to the COVID-19 pandemic, the start of the JICA project in the Philippines was postponed, and activities in the Philippines for five years (until June 2, 2026) commenced on June 3, 2021.

This project is divided into four research groups, each with its own unique activities and deliverables necessary to contribute to the project. The groups are: Group 1: Data Collection and Integration; Group 2: Flood and Drought Risk Assessment using Hydraulic and Agricultural Models; Group 3: Water Disaster Resilience Assessment; and Group 4: Examination of Sustainable Economic Development Scenarios. ICHARM participated in Groups 2 and 3.

The following are the main reports for each fiscal year.

<Fiscal Year 2021>

A kick-off meeting was held on June 30, 2021, and a Joint Coordination Meeting (JCC) by participating organizations from both countries was held online on November 17, 2021. In July-August 2021, e-learning on water disaster risk assessment methods was conducted, with 83 participants and 49 successfully completing the assignments.

On November 5, 2021, approximately one year after the devastating typhoon Ulysses, we held a webinar open to the public, with a total of 243 participants.

<FY2022>

In FY2022, the 2nd Joint Coordination Committee (JCC) meeting was held online on June 10th, and the 3rd JCC meeting was held in a hybrid format (in-person/online) for the first time in Quezon City, Metro Manila, on November 16th.

From July 28th to August 2022, e-learning training on general water disaster risk assessment technology was conducted for staff of collaborating government agencies in addition to the research participating institutions. Of the 93 registered participants, 63 completed Course 1 (Basic course on water disaster risk), 41 completed Course 2 (Hands-on training on flood analysis and hazard/risk mapping), and 53 completed Course 3 (Advanced course on hydraulic/hydrological, agricultural, and economic impact assessment models). 40 participants completed all courses.

During the second training visit to Japan for this project, on February 20, 2023, a "HyDEPP-SATREPS Special Session" was held as one of the special sessions of ICFM9, where research results were presented and opinions were



Photo 7-24 Group photo of the kick-off meeting



Photo 7-25 Group photo at 3rd JCC meeting

exchanged with participants. Dr. Fernando Chinte Sanchez, Jr., the project representative on the Philippine side and Professor at UPLB, and others gave a report on the project's activities. A total of 50 people participated in the session, with 35 attending in person and 15 online.



Photo 7-26, 27 "HyDEPP-SATREPS Special Session" in ICFM9(Left: Group photo, Right: Reporting the project)

<FY2023>

In FY2023, the 4th Joint Coordination Committee (JCC) meeting was held on June 22nd, and the 5th JCC meeting was held on November 20th, both using a hybrid format (combining in-person and online participation).

From July 24th to August 10th, 2023, instruction was provided to trainees who participated in the training program in Japan. Two trainees participated in each of five courses: two short courses on data management and flow rate observation (until August 3rd), and three long courses on hydraulic and hydrological models, flood hazard mapping and assessment, and economic growth forecasting models (until August 10th). A total of 10 people stayed at ICHARM. The format of learning with a supervisor allowed for a deeper understanding of water disaster risk assessment technology compared to the first and second training programs in Japan, making it a fruitful opportunity for members from both countries.



Photo 7-28 Closing session of the training program in Japan

<FY2024>

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



Photo 7-29 The 6th Joint Coordination Committee

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



Photo 7-30,31 Flow measurement training

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

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

<FY2025>

In FY2025, the 8th and 9th Joint Coordination Committee (JCC) meetings were held on June 20 (on-site) and November 12 (on-site and online), respectively. During the meeting, the members reviewed the progress of collaborative research and had discussions for finalizing the research findings.

In June 16, ICHARM members conducted field survey for the river channel and bed materials for tributaries flowing into the Laguna Lake, with researchers and students of University of the Philippines Los Baños, the main counterpart of the project. ICHARM staffs continued regular guidance for the students who joined the survey, and finally 1 master course student and 1 Ph. D. student could finish their educational program in the University of the Philippines, by using ICHARM’s RSR model. In addition, electrical resistivity equipment for groundwater monitoring and aquifer investigation were provided with a training program, and 34 participants could complete the training program.



Photo 7-32 Groundwater measurement training

To facilitate dialogue and gather input from stakeholders in the two target river basins, two workshops were held on September 16 in the Pampanga River basin and on October 27 in the Municipality of Bay in Laguna Province, respectively. Based on the discussions in those workshops, the project members produced policy briefs as final outputs of the project, and held another workshop to disseminate the contents of policy briefs on November 12 in Quezon City in Metro Manila. In addition, the final workshop of the project was held on February 27 in Tokyo, and 13 Philippine invitees were stayed in Japan from February 24 to March 3. During the stay, they visited Osaki City, Miyagi Prefecture from February 25 to February 26 for observing a practical example of “River Basin Disaster Resilience and Sustainability by All” and also went to the Lake Kasumigaura in Ibaraki Prefecture on February 28.



Photo 7-33 Group photo with Osaki city Mayor



Photo 7-34 Final workshop at University of Tokyo

For more details about the project activities, please visit the SATREPS website.

https://www.jst.go.jp/global/kadai/r0109_pilipinas.html

b) Thailand

ICHARM participated in an international research project entitled "Regional Resilience Enhancement through Establishment of Area-BCM at Industry Complexes in Thailand (Principal investigator in Japan: WATANABE Kenji, professor at the Nagoya Institute of Technology)," which was conducted from 2018 to 2024. ICHARM Senior Researcher MIYAMOTO was involved in creating information that companies in industrial parks needed to assess flood risks and plan and implement business continuity management (BCM).

In this project, we first developed a rainfall-runoff-inundation (RRI) model targeting the entire Chao Phraya River basin in Thailand. We also developed a high-resolution inundation analysis model with a 40-meter grid for the Rojana Industrial Park in Ayutthaya Prefecture, which suffered significant damage during the 2011 flood. Then, the two models were connected using the results of the basin-scale model as boundary conditions. Figure 1 shows the inundation area and river discharge simulated by the basin-scale model. The reproducibility of the river flow shows high agreement; although slightly underestimating the inundation area, the simulated results were generally consistent with the range detected by satellites.

After experiencing the 2011 flood, flood walls were constructed around the Rojana Industrial Park to prevent floodwaters from entering the site. The industrial park scale model highlighted the effects of these flood walls, demonstrating that they can effectively protect the industrial park from floods similar to the 2011 flood. However, the simulation also revealed that in more extreme flood scenarios, such as when the maximum historical rainfall occurs simultaneously across all areas in the Chao Phraya River basin, the inundation depth could exceed the height of the flood walls (Figure 2). Like these simulations, we conducted multiple scenario analyses assuming various rainfall patterns, clarifying flood risks for industrial sites, residential areas, and commuting routes by examining the timing of flood onset and cessation, inundation extent, depth, and duration, and the flood control effects and limits of flood walls.

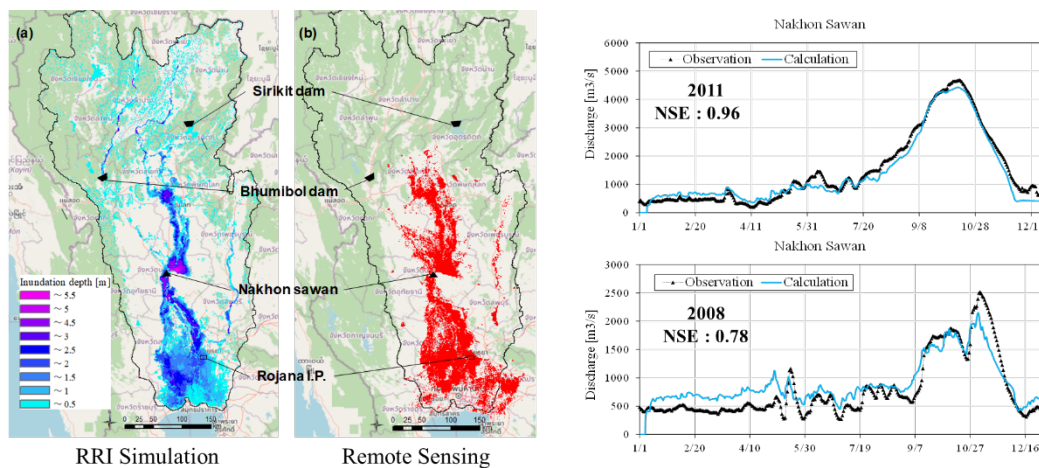


Figure7-3 Results of simulations at the scale of the entire Chao Phraya River basin

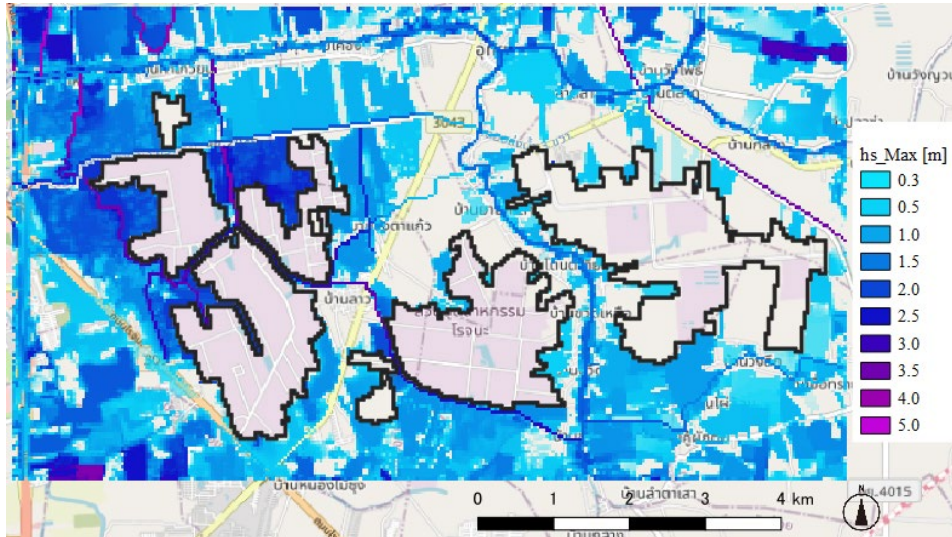


Figure7- 4 Estimated inundation depth in the Rojana Industrial Park

c)Argentine

The Project “Numerical Weather Prediction and Warning Communication Systems for Densely -populated Areas Vulnerable to Meteorological Disasters” (Principal Investigator: Takemasa Miyoshi, Team Director, Predictive Science Research Team, Division of Mathematical Sciences, RIKEN Center for Mathematical Sciences) (JST Research Period: June 1, 2021 to March 31, 2027) aims to develop a total package of observation, prediction, communication, utilization, and action for heavy rain and flood disaster prevention, and to implement it in society targeting the metropolitan areas of Buenos Aires and Cordoba. To this end, the project will develop a meteorological and hydrological observation network and computers, develop prediction and communication systems, provide disaster prevention education to residents, and train specialized personnel. ICHARM, as a joint research institution, carried out the development of a hydrological prediction system in the target river basin and accepted trainees from the partner country's institution.

From September 4 to 15, 2023, sixteen Argentine researchers, including Dr. Celeste Saulo, the director of the National Meteorological Service, who is the incoming secretary-general of the World Meteorological Organization, visited Japan, spending roughly one week each in the Kanto area and Kobe City for research meetings, visits to disaster prevention facilities, and other purposes. On September 4, a joint international symposium was held at the Hitotsubashi Auditorium in Tokyo. Executive Director KOIKE Toshio attended the event and delivered a speech as a guest of honor, along with the ambassador of Argentina, the director general of the Japan Meteorological Agency, the director of the Japan Science and Technology Agency (JST), the director of the Japan International Cooperation Agency (JICA), and the director of RIKEN.

On the morning of the 14th, they visited the Public Works Research Institute (PWRI). After observing its Dam Hydraulic Laboratory, Executive Director Koike briefly spoke about ICHARM’s research and other activities. Then, the visitors tried out a VR flood experience program, following the instructions of Senior Researcher DENDA Masatoshi.



Photo 7-35,36 Group photo at ICHARM

An ICHARM research team of Senior Researcher USHIYAMA Tomoki, Senior Researcher NAITO Kensuke, Researcher YAMASHITA Daiki, and Research Specialist TAMAKAWA Katsunori visited Argentina to attend a Joint Coordination Committee (JCC) meeting, research meetings, workshops and field surveys held over 12 days from July 29 to August 9, 2024. During the trip, the team investigated rivers and sewerage systems in these cities, where the country plans to implement flood control measures, and collected information necessary for building a rainfall-runoff inundation model, such as river cross-sections.



Photo 7-37,38 Researchers at work during the visit to the Sant Domingo River Basin,
Senior Researcher NAITO delivers presentation

From August 22nd to 31st, 2025, Senior Researcher Tomoki Ushiyama and Specialist Researcher Qin Menglu traveled to Argentina. First, they visited Cordoba, one of the target areas, to inspect the river conditions in the urban area. Next, they visited the National Water Institute (INA) in Buenos Aires Province to exchange ideas and inspect the target rivers in Buenos Aires Province.

Although the target rivers in Buenos Aires Province have a small drainage basin of 240 km², the sewage network is intricately intertwined, and there is a need to develop a method for rapidly calculating water flow, including sewage. Based on the discussions held here, they plan to develop a model using ICHARM in collaboration with the Argentinian researchers.



Photo 7-39,40 Research presentation by local researchers at the National University of Cordoba,
ICHARM researchers (second and third from left) at INA

d) Ghana

ICHARM is participating in the SATREPS research project titled “The Project for the Development of Integrated Sediment and Environmental Management Towards Sustainable Conservation, Disaster Risk Reduction, and Livelihood Improvements in Coastal Areas.” Led by Professor TAJIMA Yoshimitsu of the University of Tokyo, the project aims to address coastal erosion challenges in the Republic of Ghana. ICHARM is responsible for developing monitoring and prediction models for sediment

runoff from rivers in the target area.

From September 28 to October 11, 2024, QIN Menglu, a research specialist at ICHARM, visited Ghana as a member of the Japanese research team to discuss and reach an agreement on the project implementation structure with the Ghanaian counterpart, the Cape Coast University Center for Coastal Management (ACECoR: the Africa Centre of Excellence in Coastal Resilience, Centre for Coastal Management), and local partner organizations. In addition to the meetings, the team, in collaboration with ACECoR, visited various study sites, including Volta River reaches downstream of Akosombo Dam and Densu River reaches downstream of Weija Dam, as well as coastal areas, for three days from October 3 to 5.



Photo 7-41 Visiting the lagoon area at the river mouth of the Volta River



Photo 7-42,43 A case of severe coastal erosion (left: October 2022; right: October 2024): A house was isolated from land in the last two years due to coastal erosion in the Volta River coastal area

From August 8 to 14, 2025, Research Specialist QIN Menglu visited Ghana to participate in the field survey and the first Joint Coordinating Committee (JCC) meeting. The field survey was conducted for a total of five days, from August 8 to 11 and on August 13. The project team navigated the estuaries of the Volta and Pra Rivers and continued several kilometers upstream along these rivers, while observing riverbed and riverbank conditions and performing trial bathymetric measurements using sonar sensors,



Photo 7-44,45 Houses destroyed by severe coastal erosion this year; The 1st Joint Coordinating Committee (JCC) Meeting

On October 23, 2025, five people, including Professor Yoshimitsu Tajima of the University of Tokyo, the project leader, Professor Moses Jojo Eghan of the University of Cape Coast (UCC), and Donatus Bapentire Angnuureng, the Ghanaian project manager from ACECoR (Africa Centre of Excellence in Coastal Resilience, Centre for Coastal Management), visited ICHARM.



Photo 7-46 ACECoR researchers (three in the center) with accompanying professors and ICHARM researchers

From February 24 to March 17, 2026, Research Specialists QIN Menglu and ARNEZ FERREL Kattia Rubí conducted an extensive field campaign in Ghana, focusing on the Lower Pra and Volta Rivers. This work was carried out in collaboration with Ghanaian stakeholders from the Africa Centre of Excellence in Coastal Resilience (ACECoR).



Photo 7-47,48 Measurements in the Pra River, ICHARM and ACeCOR members during the measurements



Photo 7-49 ICHARM and ACeCOR members during the measurements

8. Public relations, Outreach

1) ICHARM Newsletter

To widely disseminate information on its research, capacity development, and information networking both in Japan and abroad, ICHARM has published newsletters on a quarterly basis since March 2006. The newsletters are currently distributed to approximately 5,800 registered readers by email and other means, and are also available on the ICHARM website.

Figure 8-1 shows the number of A4-size pages for each issue from No. 8 (published in April 2008). Over its second decade, from FY2016 to FY2025, ICHARM published 40 issues (Nos. 40–79), totaling 1,175 pages. While the issues up to No. 39 (published in January 2016) during the first decade averaged 10.2 pages, the average for the subsequent 40 issues nearly tripled to 29.4 pages, reflecting the substantial enhancement of the newsletter’s content. In recent years, in addition to articles written by ICHARM staff, contributions have also been received from graduates of our educational programs and external experts, helping to ensure a broader range of perspectives.

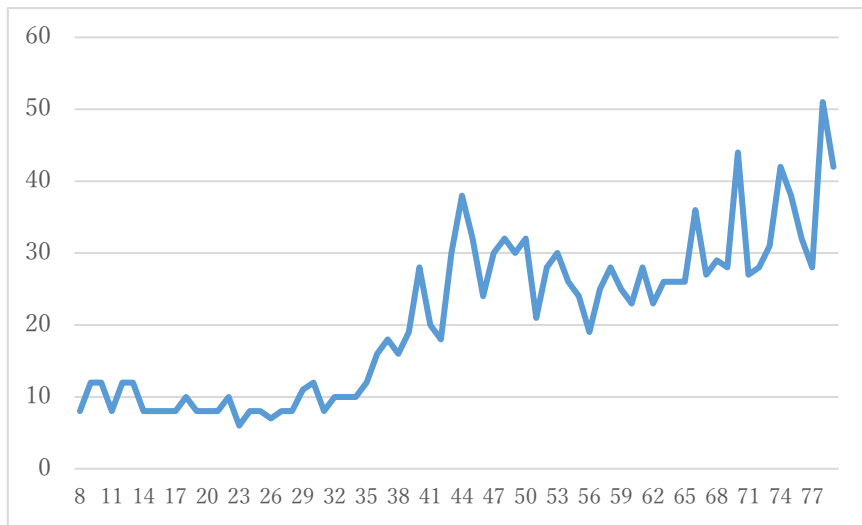


Figure 8-1 Page count progression of each issue of the ICHARM newsletter



Figure 8-2,3 Top pages of No. 40 (left) and No. 79 (right)

2) ICHARM Web site

ICHARM actively disseminates information on its activities and events through its website. Table 8-1 presents the site map as of March 2026.

Table 8-2 also shows the most frequently accessed pages of the ICHARM website from April 2022 to December 2025, the period for which page-level access statistics are available. Although the English top page recorded the highest number of visits (approximately 130,000), pages related to the RRI model also received a large number of accesses.

Table 8-1 Site map of the ICHARM website

| | |
|--|--------------------------------------|
| About us | ICHARMについて |
| Message from Executive Director | センター長からのメッセージ |
| What is ICHARM ? | ICHARM について |
| ICHARM Organization & Staff | 組織 & スタッフ |
| ICHARM Governing Board | ICHARM 運営理事会 |
| ICHARM Programme | ICHARM プログラム |
| Award | 受賞 |
| MoU | 研究交流協定 (MoU) |
| Logo | ICHARM ロゴマークについて |
| Access | アクセス |
| Contact us | 連絡先 |
| News/Topics | ニュース・トピックス |
| Topics | トピックス |
| News | ニュース |
| ICHARM Newsletter | ニュースレター |
| Job information | 職員募集 |
| Activities | ICHARMの活動 |
| Research | 研究 |
| Training | 研修 |
| Information networking | 情報ネットワーク活動 |
| International Flood Initiative (IFI) | International Flood Initiative (IFI) |
| Local practices | 現地実践プロジェクト |
| Outreach | アウトリーチ |
| Movie collection | 動画コレクション |
| Software- IFAS, RRI - | ソフトウェア |
| IFAS | IFAS |
| RRI model | RRI model |
| FDPI | FDPI |
| Help desk | ヘルプデスク |
| Publications | ニュースレター・出版物 |
| ICHARM Newsletter | ニュースレター |
| Brochure | パンフレット |
| PWRI Technical Note | 土木研究所資料 |
| ICHARM 10th Anniversary | ICHARM 10th Anniversary |
| HANDBOOK on LOCAL DISASTER | HANDBOOK on LOCAL DISASTER |
| Books | 書籍 |
| Introductory Poster | 活動紹介ポスター |
| Collection of Critical Situation during Flood Emergency Response | 水害対応ヒヤリ・ハット事例集 |
| Related Links | 関連リンク集 |
| Inquiry | お問い合わせ |

Table 8-2 Frequently accessed pages of the ICHARM website from April 2022 to December 2025

| | URL | ページ名 Name | Total 総数 (2022.4~ 2025.12) |
|----|---|--|----------------------------------|
| 1 | /icharm/index.html | ICHARM | 129,639 |
| 2 | /icharm/index_j.html | 水災害・リスクマネジメント国際センター (ICHARM) | 45,748 |
| 3 | /icharm/research/rri/index_j.html | 降雨流出氾濫モデル (RRIモデル) 概要 | 35,355 |
| 4 | /icharm/research/rri/rri_top.html | RRI model (Download site) | 30,716 |
| 5 | /icharm/about/organization_and_staff_j.html | 組織 & スタッフ | 20,500 |
| 6 | /icharm/publication/index.html | Newsletter | 19,978 |
| 7 | /icharm/publication/technical_note.html | PWRI Technical Note | 17,404 |
| 8 | /icharm/research/rri/index.html | RRI model Introduction | 15,863 |
| 9 | /icharm/training/phd/phd_index.html | Disaster Management Ph. D. Program | 14,411 |
| 10 | /icharm/research/ifas/index.html | IFAS(Integrated Flood Analysis System) | 14,029 |
| 11 | /icharm/about/organization_and_staff.html | Organization & Staff | 13,353 |
| 12 | /icharm/message/index_j.html | センター長からのメッセージ | 12,172 |
| 13 | /icharm/about/index_j.html | ICHARMについて | 12,147 |
| 14 | /icharm/training/master/master_index.html | Master's Course | 10,610 |
| 15 | /icharm/publication/index_j.html | ニュースレター | 10,339 |
| 16 | /icharm/staff/staff_koike.html | Staff - 小池 俊雄 / Koike Toshio | 10,114 |
| 17 | /icharm/research/rri/rri_contract_j.html | RRI model Usage Advisory | 9,922 |
| 18 | /icharm/contact/index.html | Contact | 8,011 |
| 19 | /icharm/access/index_j.html | アクセス | 7,693 |
| 20 | /icharm/training/index_j.html | 研修 | 6,204 |
| 21 | /icharm/topics/index_j.html | トピックス | 5,290 |
| 22 | /icharm/news/index_j.html | ニュース | 4,646 |
| 23 | /icharm/sitemap.html | Sitemap | 2,261 |

3) Outreach activities

ICHARM introduced its various research and development activities by taking advantage of opportunities such as public lectures and open-house events hosted by PWRI. In total, approximately 15,000 people participated.

In addition, from FY2024 onward, when SIP activities were further expanded, ICHARM actively carried out outreach activities featuring demonstrations of the Virtual Flood Experience System (VFES).

a) Outreach activities for experts and researchers

(1) Symposium by PWRI

PWRI organizes several events to introduce its latest research findings to the general public, experts, and businesses. These include the PWRI Lecture, the PWRI New Technology Showcase, and the PWRI New Technology Seminar.

The PWRI Lecture is held annually with the aim of widely sharing research findings and ongoing studies with the public, presented by PWRI researchers in connection with trends in each field.

The PWRI New Technology Showcase is held two to four times a year – annually in Tokyo and every other year in other locations. The event is designed to promote the dissemination of PWRI's research achievements by introducing them through presentations and panel displays to a wide range of engineers involved in the development and management of social infrastructure, while also providing consultation on the application of technologies developed by the institute. The program includes not only presentations on research findings but also special lectures delivered by professors from leading universities and PWRI staff, as well as presentations by MLIT's regional development bureaus.

The PWRI New Technology Seminar is held annually, with themes selected each year based on social needs. The seminar provides information on the latest trends and related technological developments in the field, focusing on PWRI's research activities and newly developed technologies.

ICHARM made use of each of these opportunities to deliver presentations listed in Annex-9.

(2) ICHARM R&D Seminar

ICHARM continuously organizes the ICHARM R&D Seminar as an opportunity for researchers to deepen their knowledge, inviting domestic and international experts in the field of water-related disasters to present the latest research and findings. Since 2016, a total of 18 seminars – from the 56th to the 73rd – have been held, with presentations delivered

by 21 invited speakers, as listed in the ANNEX-10.

b) Outreach activities for the general public

(1) PWRI Open House on “Civil Engineering Day”

November 18 is designated as “Civil Engineering Day” by the Japan Society of Civil Engineers. Around this date each year, PWRI and NILIM hold a public open-house event titled “Civil Engineering Day: Research Institute Open House” to help a wide audience deepen their understanding of PWRI and civil engineering.

ICHARM participated in 2018, 2022, 2024, and 2025 by presenting hands-on demonstrations using VFES.



Photo 8-1 Participants using the Minecraft-based VFES at the PWRI Open House. (November 15, 2025)

(2) Public Symposium: “Can You Survive Unexpected Floods? – e-sports @ KasenBousai –”

ICHARM held a public symposium, “Can you survive unexpected floods?” on February 19, 2023, on the occasion of ICFM9. The symposium featured “e-sports@KasenBousai,” a unique game-style event using VFES, which is currently under development at ICHARM. About 70 people participated, including students from six local schools in the Tsukuba area.



Photo 8-2 Participants competing at e-sports@KasenBousai

For this event, part of the conference room was divided into six sections, each equipped with a computer running VFES and a large monitor. Each team, seated in one of the six sections, operated an avatar in the virtual environment to gather useful information before evacuation and carry out an effective evacuation. The teams competed to earn the highest score.

(3) Exhibition at the “SIP/BRIDGE Future Science Festival”

ICHARM exhibited VFES at the SIP/BRIDGE Future Science Festival, held on September 27, 2025, at the Osaka Science & Technology Center. Visitors were able to experience the Minecraft-based version of the system, which recreated areas of Osaka City.



Photo 8-3 Participants at the SIP/BRIDGE Future Science Festival

(4) Exhibition at Science Agora

The Japan Science and Technology Agency held Science Agora 2025, on October 25 and 26, 2025, at the Telecom Center Building in Tokyo, attracting about 3,800 visitors. At this event, PWRI hosted a seminar titled “How Do We Protect Our Lives and Infrastructure? Solving Challenges through Civil Engineering,” where its researchers introduced their cutting-edge research along with hands-on demonstrations.



Photo 8-4 Participants at Science Agora

An ICHARM chief researcher delivered a presentation titled “Turning Disasters into Personal Concerns through Information and Experience: Initiatives Using the Virtual Flood Experience System,” in which he discussed the recent increase in heavy rainfall events and introduced hazard maps, “My Timeline” (a personal chronological action plan for disaster preparedness), and VFES.

ICHARM also set up a VFES experience booth, where about 20 children tried the Minecraft-based simulation of a flood that occurred in Osaka City, Japan.

(5) National Conference on Promoting Disaster Risk Reduction

The National Conference on Promoting Disaster Risk Reduction is one of Japan's largest disaster-risk-reduction events. Organized by the Cabinet Office and other agencies, it has been held annually since 2016 as a forum where stakeholders from government, academia, industry, and civil society present and exchange information on their ongoing disaster-related initiatives.

On November 6, 2021, ICHARM delivered a presentation on IFI's platform project at an online symposium titled "What Is Resilience to Overcome National Catastrophes in Japan in the 21st Century? Strategy for Establishing Consilience of Knowledge on Disaster Risk Reduction," hosted by the JHoP and the Subcommittee for IRDR of the Committee for Civil Engineering and Architecture. In 2024 and 2025, ICHARM also presented posters featuring VFES.

(6) World BOSAI Forum 2019

The World BOSAI Forum 2019 was convened on November 9-12, 2019, at Sendai International Center in Miyagi, Japan. On the 11th, ICHARM hosted a technical session titled "Contribution from Meteorology, Hydrology and DRR for the Platform on Water Resilience and Disasters."

On the morning of the same day, the Typhoon Committee organized a session titled "Public Understanding on Typhoon and Related Disaster: Lessons Learned from Past Disaster." As the chair of its Working Group on Hydrology, ICHARM Chief Researcher IKEDA Tetsuya reported on the group's activities.

ICHARM also exhibited a poster on VFES, which allows users to experience a flood virtually. The poster included results from a verification test of the system's effectiveness, and visitors were given the opportunity to try the tool and experience a flood in virtual reality.

c) Outreach activities for youth

(1) ICHARM Open Day

The ICHARM Open Day began in 2008, shortly after ICHARM was established, as part of its public outreach efforts, with Founding Executive Director TAKEUCHI Kuniyoshi sending invitations to nearby high schools. Since then, about 100 students from Ibaraki Prefectural Takezono High School and Ibaraki Prefectural Namiki Secondary School have participated in the event each year. The event aims to deepen students' understanding of water-related disasters around the world and to provide opportunities for international exchange. It is held every April to coincide with the Science and Technology Week in Tsukuba City, where ICHARM is based.

This half-day program includes a short keynote session and a poster session in which ICHARM's international students present their home countries and interact with visiting students in English. Teachers have praised the event for its strong educational value, particularly in terms of science learning and English communication.

Post-event questionnaires from participating students included comments such as: "I learned that Japan received support from Southeast and South Asian countries when it regained independence, which helped me understand the importance of mutual assistance between nations." and "I was deeply impressed by the strong commitment of the international students who hope to contribute to their home countries by learning Japan's advanced disaster-management technologies, after recognizing similarities between disasters in their countries and those in Japan. I also felt proud, as a fellow Japanese citizen, of ICHARM's dedication to supporting them and providing meaningful learning opportunities."

(2) Flood disaster learning program at schools

ICHARM conducted its first flood-disaster learning program for junior-high and high-school students around December 2022 by combining "My Timeline" (a personal chronological action plan for disaster preparedness) with VFES, with the cooperation of the Shimodate River Office of the Kanto Regional Development Bureau, MLIT.



Photo 8-5 Panelists in the Technical Session

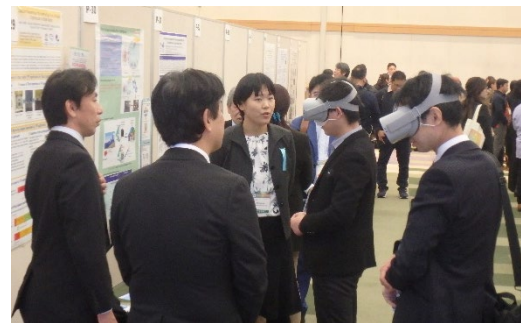


Photo 8-6 Visitors trying VFES during the poster presentation

In the first half of the program, students experienced the dangers of flooding using VFES, either individually or in small groups. This was followed by an explanation and exercise on My Timeline, led by MLIT staff using “Nige-Kid,” a My Timeline planning tool designed for elementary and junior-high students.



Photo 8-7 Local students visting ICHARM for the open day event with ICHARM staff (April 24, 2024)



Photo 8-8 Local students listening to ICHARM international students



Photo 8-9,10 Students listening to instructions (left) and working on My Timeline (right) during the flood disaster learning program

(3) Chibikko Hakase (Little Doctor) Program

The Chibikko Hakase event is a summer vacation program for elementary and junior-high school students across Japan. Research institutes in Tsukuba City open their facilities to young visitors, who can tour the institutes or watch introductory videos and then answer quiz questions in an effort to earn the title of “Tsukuba Little Doctor.”

In 2019 and 2023, ICHARM participated by offering hands-on activities using VFES.



Photo 8-11 Participants in Chibikko Hakase 2023

(4) Disaster management learning program for elementary and junior-high students

ICHARM participated several times in educational programs organized by Shinshu University in Nagano Prefecture, Japan, for local elementary and junior-high school students, including the “Aim for Zero Delayed Evacuation! Disaster-Prevention and Radio-Making Workshop,” held at its Faculty of Engineering. In these programs, ICHARM provided opportunities for students to experience the Nagano version of VFES.



Photo8-12 Participants in the Aim for Zero Delayed Evacuation! Disaster-Prevention and Radio-Making Workshop (July 27, 2025)

d) Outreach activities for Upper house members

Five members of the Upper House visited ICHARM on February 28, 2019, to learn about its activities and exchange views and opinions. The group, consisting of the upper house members who were elected in 2016 and belong to the Liberal Democratic Party, also visited other research institutes around Tsukuba City, where ICHARM is located. At ICHARM, they first listened to short presentations outlining the history and main research projects of ICHARM, such as the development of a flood forecasting system using big data and risk communication theories. As ICHARM is currently developing a new application designed for people to experience a mock flood situation, the visit was a great opportunity for them to try it out. Finally, the upper house members met and talked with foreign researchers and trainees presently working or studying at ICHARM.



Photo 8-13 Group photo

9. Awards

ICHARM's diverse activities in Japan and abroad have been recognized on many occasions. Below are some of the major awards we have received.

Please see the website below for the detailed list of award winners.

<https://www.pwri.go.jp/icharm/award/award.html>

1) UNESCO Long-Term Contribution Award

In 2025, UNESCO marked two major milestones: the 60th anniversary of the International Hydrological Decade (IHD) and the 50th anniversary of the International Hydrological Programme (IHP). To commemorate these occasions, UNESCO hosted a series of celebratory events in Paris, France, from June 10 to 13. During the main event on June 11, ICHARM was honored on stage with a commemorative plaque in recognition of its longstanding global contributions to research, education, and information networking as a UNESCO Category II Centre since its establishment.



Photo 9-1,2 Left: Executive Director Koike Toshio holding the commemorative plaque (from left: Abu Amani, the director of UNESCO Water Science, and the secretary of IHP; Lidia Arthur Brito, the assistant director-general for UNESCO Natural Sciences; and Helmut Habersack, the chairperson of the IHP Council)

Right: The commemorative plaque awarded to ICHARM by UNESCO.

2) NEDO Judges' Special Award

A research team at ICHARM (Lead researcher: Research Specialist TAMAKAWA Katsunori) received the Judges' Special Award in the "NEDO Challenge, Satellite Data for Green Earth" category of the NEDO Prize for New Industrial and Innovative Technologies for fiscal year 2024.

ICHARM submitted a proposal under the theme "Development of Energy Management Infrastructure" with the title "Development of a Real-time Analysis Platform for Snowfall, Snow Accumulation, and Snowmelt: From Japan to the World with High Accuracy and High Temporal and Spatial Resolution."

This prize is a contest-type, prize-funded research and development program that aims to uncover breakthrough ideas that can address future social challenges and foster new industries. The prize committee recognized the ICHARM team for the significant potential of their proposed technology to address future challenges through the use of satellite data.

NEDO Prize for New Industrial and Innovative Technologies

https://www.nedo.go.jp/english/activities/activities_ZZJP_100268.html



Photo 9-3 Research Specialist Tamakawa speaking at the final selection committee



Photo 9-4 The certificate of commendation and the trophy

3) Honorary Professor awarded by IWHR

On October 19, 2023, Executive Director KOIKE Toshio was awarded the title of Honorary Professor from IWHR. According to its official website, IWHR was founded in 1958 and is one of China's leading and largest research institutes in water resources and hydropower. The institute currently has over 1,300 staff members and 32 laboratories across 12 research departments. It also serves as the secretariat of ICFM.



Photo 9-5 Left: Executive Director KOIKE (left) receiving the Letter of Appointment from LIU Yi, the vice president of IWHR and Ph.D. in engineering Right: The letter of Appointment

4) MLIT Japan Construction International Award

The Japan Construction International Award was established in 2017 by MLIT and is presented to selected organizations in the name of the minister. The award recognizes three categories: international construction projects that showcase Japan's strengths; small- and medium-sized construction-related companies that play a leading role in international projects; and pioneering activities that contribute to the realization of quality infrastructure overseas. Through recognizing these efforts and organizations, Japan aims to strengthen the country's competitiveness and support the further overseas expansion of Japanese companies.

At the sixth awarding event held in June 2023, ICHARM, together with GRIPS, IISEE, and JICA, received the award in the category of Pioneering Project Activities for the master's course they jointly manage, the "Water-related Disaster Management Course of Disaster Management Policy Program." This category recognizes strategic initiatives that contribute to quality infrastructure overseas, such as research and development projects and human-resource development programs, going beyond individual construction projects. The four institutions were jointly honored for their collaborative efforts.



Photo 9-6,7 Left: Deputy Director MORI Noriyuki (second from right) with MLIT Minister SAITO Tetsuo (center) and the other award recipients at the award ceremony, Right: The certificate of the award

5) Outstanding Research Award

Senior Researcher OHARA Miho and Chief Researcher FUJIKANE Masakazu were awarded the Outstanding Research Award in November 2021 from the Research Group for National Land and Infrastructure Technology of MLIT.

Award winning paper:

Publication and Use of “Collection of Critical Situations during Flood Emergency Response for Local Governments”

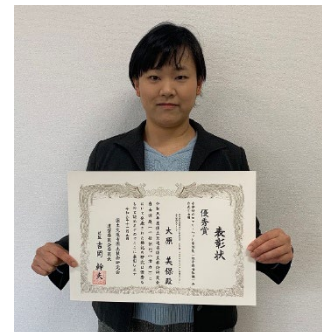


Photo 9-8 Senior Researcher Ohara with the Outstanding Research Award certificate

6) JSCE Best paper award at the Symposium on River Engineering and Good digital Award 2022

Researcher KAKINUMA Daiki, Collaborating Researcher NUMATA Shingo, Senior Researcher MOCHIZUKI Takafumi, Chief Researcher ONUMA Katsuhiro, Deputy Director ITO Hiroyuki, and Executive Director KOIKE Toshio were awarded the Best Paper Award at the Symposium on River Engineering, JSCE, 2022, presented by Japan Society of Civil Engineering (JSCE).

Award winning paper:

DEVELOPMENT OF REAL-TIME FLOOD FORECASTING SYSTEM FOR THE SMALL AND MEDIUM RIVERS

And the Public Works Research Institute and the University of Tokyo won the Excellence Award at the good digital award 2022 from the Digital Agency.

Project title: Development of a system to conduct data assimilation method using observed water levels and provide predicted water levels using forecast rainfall data for small and medium-sized rivers

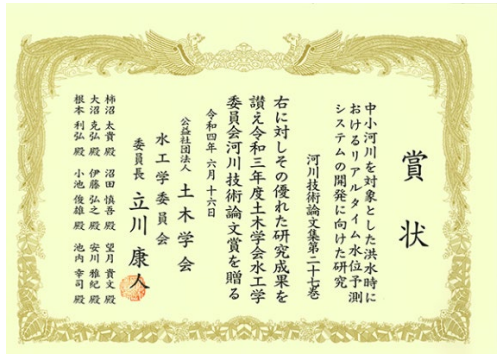


Photo 9-9 JSCE Best Paper Award



Photo 9-10 Good digital award



Photo 9-11 Awardees of JSCE Best Paper Award

7) 2020 JSCE International Lifetime Contribution Award

In June 2021, Executive Director KOIKE Toshio received the JSCE International Lifetime Contribution Award in recognition of his contributions to addressing scientific and social challenges related to water around the world. This award is given to individuals who have made long-term contributions to advancing civil engineering and infrastructure development through international activities.

The executive director has made worldwide contributions for more than 30 years to the development of technologies for observing and predicting global water circulation, from fundamental research to social implementation. The award recognized, among many achievements, his contributions to the development of “Momo 1,” launched in 1987 as Japan’s first marine observation satellite; the development and dissemination of DIAS; and his leadership in large-scale international joint observation and research initiatives, including the establishment of GEO in 2005.



Photo 9-12, 13 Left: Executive Director Koike with the award certificate
 Right: Executive Director Koike (center) with other award recipients

8) Typhoon Committee Dr. Roman L. Kintanar Award

ICHARM was given the Dr. Roman L. Kintanar Award 2020 with the other joint team members, JAXA and IDI, at the 53rd Annual Session of the Typhoon Committee, held online in February 2021.

Dr. Roman L. Kintanar served as the director of PAGASA and was instrumental in establishing the Typhoon Committee with support from ECAFE and WMO. The Dr. Roman L. Kintanar Award is a highly prestigious honor presented to organizations that have made outstanding contributions to advancing the committee’s mission and vision.

ICHARM was highly commended for its contributions to strengthening flood forecasting and management capacities across the 14 committee member countries and regions, through its support for the committee’s Flood Hazard Mapping (FHM) Project and its promotion of satellite products developed and provided by JAXA.

In its final report, published in 2009, the FHM Project was recognized as one of the most successful initiatives ever led by the committee’s Working Group on Hydrology.



Photo 9-14 Senior Researcher Miyamoto delivering an award-winning speech at the 56th TC Annual Session in February 2024

9) 2020 GEO Individual Excellence Award

On November 4, 2020, the winners of the 2020 GEO Individual Excellence Award were announced, recognizing individuals who had demonstrated an exceptional personal commitment to the GEO mission and vision. Executive Director KOIKE Toshio was selected for this award for his considerable contributions to the establishment and expansion of GEO. Together with Mr. ISHIDA Chu, a senior expert at the Satellite Applications and Operation Center of JAXA, he is the first recipient from Asia as well as from Japan.

Executive Director Koike contributed to the establishment of GEO in 2005 as one of the co-chairs of the ad-hoc

GEO, the intergovernmental preparatory body for its creation, and played a leading role in drafting its 10-Year Implementation Plans for 2006-2015 and 2016-2025. In addition, during the five-year period from 2015 to 2020, He guided the formation of a community covering the Asia-Oceania region by establishing the Asia-Oceania Group on Earth Observations (AOGEO). He was also praised for his significant contributions to promoting the Asian Water Cycle Initiative (AWCI). AWCI aims to establish and strengthen platforms for water-related disaster risk reduction in cooperation with Asian countries by combining international networking and earth observation through IFI, for which ICHARM serves as the secretariat, and DIAS, which Japan has been developing as one of its nationally-promoted key technologies.



Photo 9-15 Left: The award certificate, Right: Executive Director Koike with the certificate and flowers

10) The 19th Infrastructure Technology Development Award

ICHARM was awarded the 19th Infrastructure Technology Development Award for the development of the Integrated Flood Analysis System (IFAS) on July 27, 2017, at the Tokyo International Forum in Tokyo, Japan. The award recognizes a wide range of new technologies in the construction industry, both hard and soft, aims to encourage the motivation of technology developers in research and development, and promotes the overall advancement of construction technology standards.



Photo 9-16 At the awarding ceremony (Left: Senior researcher TSUDA, Right: Chief researcher ITO)

11) CommonMP Contribution Award

Senior Researcher KIKUMORI Yoshito received the CommonMP Contribution Award in May 2017. The award was established to commemorate the tenth anniversary of the CommonMP development project, launched in 2007, and recognizes engineers and organizations that had contributed to the operation, development, and dissemination of CommonMP, as well as to promote wider awareness of the project's achievement for further advancement. Senior Researcher Kikumori was selected from among the nominees by the award selection committee. He had been with NILIM since 2007, when the Common MP project began, serving as a member of the project secretariat responsible for developing element models of CommonMP, examining technical specifications for its platform, and



Photo 9-17 Senior Researcher Kikumori (second from right) with the award certificate

managing overall project operations.

10. Evaluation

1) Evaluation by the PWRI External Evaluation Committee

PWRI formulates its medium- to long-term plan based on the medium- to long-term objectives presented by its competent ministers at MLIT and MAFF. After obtaining their approval, PWRI carries out its research and development activities in accordance with this plan.

In implementing its research and development activities, PWRI conducts research evaluations and ensures that the results are appropriately reflected in the selection and execution of research and development projects. These evaluations are carried out by both the Internal Evaluation Committee, composed of PWRI staff, and the External Evaluation Committee, composed of outside experts.

The External Evaluation Committee consists of a main committee and five subcommittees with different areas of focus, such as river engineering, structures and materials, and snow, cold, and other regional issues. Based on the evaluation results provided by these committees, PWRI analyzes and assesses the progress of its initiatives and, when necessary, reviews and adjusts the direction of its activities.

ICHARM has mainly implemented the following research and development programs between 2016 and 2026: “(2) Development of Risk-Management Support Technologies for Increasingly Frequent and Severe Water-Related Disasters in Japan and Abroad” during the fourth medium- to long-term plan period (the six years from April 1, 2016 to March 31, 2022); and “(1) Development of Technologies to Promote Basin-Wide Flood Management in Response to Increasingly Severe Water-Related Disasters” during the fifth medium- to long-term plan period (the six years from April 1, 2022 to March 31, 2028). In both periods, ICHARM received comments and evaluations each year from members of the River Engineering Subcommittee and the main committee of the External Evaluation Committee.

The comments and evaluation results provided by the evaluation committees are published on the PWRI website below:

Fourth plan period: <https://www.pwri.go.jp/jpn/about/hyouka/hyouka04.html>

Fifth plan period: <https://www.pwri.go.jp/jpn/about/hyouka/index.html>

2) Evaluation by the UNESCO Evaluation Mission

ICHARM was established as a UNESCO Category II Centre based on the agreement concluded in 2006 between the Japanese government and UNESCO. When this agreement is renewed, ICHARM is required to undergo an activity evaluation by external experts and UNESCO representatives at least six months prior to the revision.

Accordingly, ahead of the agreement renewals in 2020 and in 2027 (planned), ICHARM underwent evaluations by a UNESCO evaluation mission in November 2018 and February 2025, respectively.

The following comments are extracted from the evaluation conducted in November 2018:

- As a developer of state-of-the-art modelling and risk management tools, ICHARM plays a critical role in conceiving, introducing and implementing advanced technologies and procedures for operational purposes. ICHARM products are increasingly being applied at multiple levels.

- ICHARM has successfully led the development and refinement of the International Flood Initiative (IFI). The IFI initiative and its hydrologic modeling components, Integrated Flood Analysis System (IFAS) and Rainfall-



Photo 10-1 Courtesy visit to PWRI President

Runoff Inundation (RRI) have progressed considerably in recent years. ICHARM has effectively aligned the IFI research outcomes and training with the capacity-development activities both within Japan and in the region.

- ICHARM's research and development activities in the area data collection, storage, sharing and statistics on water-related disasters in the region are to be commended. Among the very tangible outcomes under this activity one can cite ICHARM's role in assisting the Philippines in creating guidelines for effective data sharing of water-related disaster data, including damage to humans, houses, agricultural products and social infrastructure for developing a country-based framework under the IFI.
- Developing the blueprint for the application of water-related disaster management in the region is another notable contribution of ICHARM. We cite its role in providing technical assistance to both Pakistan and Sri Lanka in developing flood forecasting systems in collaboration with the government of each country and through UNESCO and other projects supported by international funding organizations and NGOs. What is most commendable is the hands-on approach ICHARM has taken by working with municipal personnel and communities in developing community-level flood risk contingency plans.
- In the area of education and capacity-development, ICHARM has proven its effectiveness through the delivery of a long-standing masters' degree programme and – more recently – a PhD programme. These programmes have been delivered in cooperation with GRIPS (the National Graduate Institute for Policy Studies in Japan), which serves as the degree-conferring institution.
- ICHARM has demonstrated its commitment to the objectives and goals stated in the Terms of Reference as a Category 2 Centre. It has been consistently present at key IHP events (IHP Intergovernmental Council, IHP Regional Steering Committee, strategic planning meetings, regional UNESCO National Commission consultations), as well as at leading water and disaster sector forums at the global level (Asia-Pacific Water Summit, World Water Forum), often pro-actively organizing sessions and events with participation by IHP Secretariat and networks.
- ICHARM is highly regarded by all the Japanese governmental ministries and agencies we had an opportunity to visit and interview. The strong financial, infrastructure and in-kind supports provided by these agencies is a strong evidence of the value placed on ICHARM and it is clear that its future continuity as a category 2 centre will remain as a highly priority for Japanese government.

The following comments are extracted from the evaluation conducted in February 2025:

- **ICHARM's Performance Meets and Often Exceeds UNESCO Expectations.** The evaluators concur that ICHARM has delivered substantial contributions to water-related disaster risk reduction through research innovation, capacity building, and regional and global cooperation. The Centre has supported decision-making frameworks in multiple countries, including the Philippines, Sri Lanka, Pakistan, India, Timor-Leste, and several African states.
- **A Model of Applied Science for Development.** The Centre's strength lies in its integrative approach combining scientific research with policy advisory, stakeholder training, and real-world application. Flagship tools such as the Online Synthesis System for Sustainability and Resilience (OSS-SR), the WEB-RRI hydrological model, sediment and driftwood transport simulations, and digital twin platforms represent major innovations with significant policy relevance.
- **High Impact Capacity Development Initiatives.** ICHARM's M.Sc. and Ph.D. programmes, in collaboration with GRIPS and supported by JICA, are well-structured and impactful. They prioritize applied skills development for practitioners from developing countries, with over 100 alumni now serving in influential governmental and academic roles. The programme also supports gender inclusion and regional diversification.
- **Clear Contribution to UNESCO's Strategic Goals.** ICHARM has actively contributed to UNESCO's Medium-Term Strategy (C/4) and Programme and Budget (C/5), particularly through IHP-IX. It supports Global Priority Africa and Global Priority Gender Equality through targeted outreach and training. The Centre's role as host of the International Flood Initiative (IFI) and its contributions to the UNESCAP/WMO Typhoon Committee affirm its global influence. A stronger collaboration with UNESCO Field offices including Beijing office would

also give more regional visibility to ICHARM's work and capabilities.

- **Challenges in Long-Term Funding and Institutional Integration.** ICHARM's reliance on project-based funding and a declining core budget from MLIT introduces financial volatility. The contractual status of key researchers also threatens the continuity of knowledge and long-term planning. Domestic integration within Japan's academic and scientific infrastructure remains underdeveloped, despite international acclaim.

- **Strong Governance with Scope for Strategic Enhancements.** The Centre enjoys autonomy and efficient governance under PWRI. Its partnership model is robust, yet strategic adjustments could bolster its presence in Latin America and Sub-Saharan Africa and elevate its scientific publication profile.



Photo10-2 Presentation to UNESCO mission



Photo 10-3 The UNESCO mission reporting on the evaluation outcomes to PWRI President

11. ICHARM Future Vision (ICHARM 20->30)

ICHARM is a uniquely positioned center that embodies two identities: one as a research group within PWRI and the other as an international organization serving as a UNESCO Category II Centre.

Twenty years have passed since its establishment. As we mark this milestone, it is important to reflect on the roles ICHARM has fulfilled to date and, on that basis, consider how we should move forward over the next decade as we take the next step toward our 30th anniversary.

To conclude the 20th anniversary commemorative volume, this chapter presents the “ICHARM Future Vision: ICHARM 20 → 30,” which was developed through several rounds of discussions with current and former staff.

<Innovative research>

- As a research institute, ICHARM has a distinctive mission to accumulate technical expertise over time and ensure its reliable transmission across generations by leveraging approaches different from those of universities. This role of steadily inheriting and passing on technologies and data to the next generation will remain unchanged over the next decade. The vast body of data that ICHARM has handled—from the past to the present, and extending into future projections under climate change—not only forms the foundation of its research but also enhances its value as a knowledge hub that connects domestic and international institutions on an equal footing, and will be effectively utilized over the next decade.
- As a research group within PWRI, ICHARM will continue to advance existing technologies such as the RRI model while actively embracing new technologies, including XR and AI. We will also continue to present the outcomes of hydrological modeling in forms that can be more readily applied to river and flood-control planning, such as real-time forecasts, risk assessments, climate change evaluations, and optimized dam operations. Looking ahead to global water challenges, we also envision expanding into new research domains, including water supply and sewerage systems.
- In line with the “innovation ecosystem” concept set forth in MLIT’s Sixth Basic Plan for Science and Technology, ICHARM will further advance this approach by not only taking the initiative in gathering information and conducting research at ICHARM, but also by strengthening collaboration with other research groups and MLIT offices to integrate technologies and knowledge and deliver them as comprehensive packages.
- Through strengthened collaboration, ICHARM will accurately identify on-the-ground challenges that serve as the starting point for our research, and work toward solving them by continuously cycling between research and field practice. Building on these efforts, we will also more clearly demonstrate how our research can contribute to improving practical operations carried out by MLIT and local governments.

<Effective capacity development>

- ICHARM has provided training and educational programs primarily designed to empower government officials from developing countries. While we have sent many skilled professionals into the world, sustaining capacity development over the next decade will require ICHARM to move beyond the conventional one-way teaching

model and build a two-way learning community where participants, including us, actively engage with and learn from successful practices abroad.

- Building on the widespread, though unintended, global adoption of online and e-learning formats during the COVID-19 pandemic, ICHARM will further strengthen these approaches, establish more diverse modes of learning, and respond to learning needs around the world.
- In the master's and doctoral programs of ICHARM, collaboration with other groups within PWRI has not always been sufficient, partly due to language barriers. By making greater use of JICA's interpretation and translation support, we can open up opportunities for more diverse forms of collaboration. This approach also aligns with the concept of an innovation ecosystem.

<Efficient information networking>

- As a UNESCO Category II Centre, ICHARM will remain an international institution that aligns its activities with UNESCO's priorities. Global water issues continue to evolve, and at this milestone of the 20th anniversary, we will deepen our understanding of the needs and emerging trends of the international community and make strategic efforts to address them.
- As an international institution, ICHARM needs to adopt a multifaceted approach that aligns with the priorities of the United Nations, UNESCO, and other international organizations, rather than focusing solely on the strengths of any single technology. We should flexibly address region-specific water issues and present this approach as an integrated package that combines Japanese principles, systems, and technologies. Furthermore, by integrating it with the component technologies developed by NILIM and other national research and development agencies, we will deliver this approach to the global community as the "Tsukuba Mode."
- ICHARM should enhance its role as a facilitator and strengthen its value by serving as an intermediary that bridges private companies and local governments.

<Management>

- ICHARM should establish a system that supports the development of diverse talent while taking into account regular staff rotations. This includes individuals who excel at leading new initiatives, those who bring valuable perspectives from the humanities, people with strong management skills, and specialists in IT and security.
- ICHARM develops advanced technologies and promotes their use as a national research and development agency. Accordingly, we should establish a system that enables all staff to use our core technologies, such as the RRI model, as a shared language, and to continuously maintain and update them.

<Outreach>

- ICHARM researchers should deepen their engagement with the research community through active participation in academic societies and expand networks that connect both researchers and practitioners, while making full use of existing outreach opportunities such as the PWRI New Technology Showcase and the PWRI Lecture Series.

The 20th anniversary is not an endpoint, but a new beginning. The three pillars that ICHARM has upheld since its founding – innovative research, effective capacity development, and efficient information networking – will only grow in importance as we look ahead to the 30th anniversary. Building on the knowledge and experience accumulated over the past two decades, we reaffirm our commitment to continue taking on water-related challenges and contributing to society both in Japan and around the world.

ANNEX

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ANNEX-2 List of ICHARM staff and tenure

ANNEX-3 Peer-reviewed paper

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ANNEX-5 List of theses by master's and doctoral students

ANNEX-6 IFI History 2016-2025

ANNEX-7 List of MoU agreed during FY2016 to FY2015

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ANNEX-9 List of Presentation of PWRI symposiums

ANNEX-10 List of R&D Seminar

ANNEX-1 ICHARM Programme

Revised on 21st June, 2022

ICCHARM Program

ICCHARM プログラム

1. Mission of ICHARM

The mission of ICHARM is to serve as the Global Centre of Excellence for Water Hazard and Risk Management by, inter alia, observing and analyzing natural and social phenomena, developing methodologies and tools, building capacities, creating knowledge networks, and disseminating lessons and information in order to assist governments and all stakeholders in managing risks of water-related hazards at global, national, and community levels. The hazards to be addressed include floods, droughts, landslides, debris flows, tsunamis, storm surges, water contamination, and snow and ice disasters.

We envision a Center of Excellence housing a group of leading experts, superior facilities, and a knowledge base, which conducts (1) innovative research, (2) effective capacity building, and (3) efficient information networking. Based on these three pillars, ICHARM will globally serve as a knowledge hub for best national and local practices and a policy-making advisor, keeping in mind respect for diversity and inclusion of all stakeholders.

1. ICHARM の使命

ICCHARM の使命は、世界から、国、地域レベルで水関連災害とリスクマネジメントに携わる政府とあらゆる関係者を支援するために、自然、社会現象の観測、分析、手法・手段（水災害のハザード解析や脆弱性把握などリスク評価）の開発、能力育成、知的ネットワーク構築、教訓、情報の発信等を通じて、水関連災害・リスクマネジメントの世界的な中核的研究拠点としての役割を果たすことである。ここでは、水関連災害として洪水、濁水、地すべり、土石流、津波、高潮、水質汚濁、雪氷災害をいう。

ここでいう世界的な中核的研究拠点とは、(1) 革新的な研究、(2) 効果的な能力育成、(3) 効率的な情報ネットワークによって、世界をリードする人材、優れた施設、知的財産を擁する場を意味する。この3本柱によって、ICCHARMは国家、地域における現場実践の知的拠点、及び実社会での政策立案における助言者としての役割を世界において果たす。なお、ICCHARMは多様性を尊重し、全てのステークホルダーの参画を期しつつ活動を推進する。

2. Long-term Programme (around 10 years)

The UN 2030 Agenda for Sustainable Development stresses the transition to a sustainable and resilient path. The UN Sendai Framework for Disaster Risk Reduction highlights four priority areas. Both aim to achieve their goals by 2030. The ninth phase of the UNESCO Intergovernmental Hydrological Programme (IHP-IX), which aims to establish adequate capacity and scientifically-based knowledge for informed decision-making on water management and governance to attain sustainable development and build resilient societies, has identified five priority areas and started activities in research and education, which will continue for eight years until 2029. The sixth Assessment Report of the International Panel on Climate Change addresses linkages between mitigation, adaptation, and sustainable development.

In Japan, in an effort to address increasingly intense water-related disasters as the climate changes, a group of experts recommended reviewing conventional flood control planning based on the findings of advanced climate science and proposed shifting to “River Basin Disaster Resilience and Sustainability by All,” a new flood control approach aiming to enhance communities’ resilience to water disasters and their sustainability. In response to the proposal, the national government has reformed the legal framework and planned investment strategies. River administrators around the nation have started revising long-term river management policies and rewriting mid-term river improvement plans. At the same time, the national government has adopted Society 5.0, a new science promotion policy, creating the Digital Agency and accelerating digital transformation in society.

As one of the research groups of the Public Works Research Institute, which has led technological development to protect human lives and assets from severe water-related disasters for over a century, ICHARM will contribute to achieving “River Basin Disaster Resilience and Sustainability by All” by creating and sharing scientific knowledge to enhance both resilience and sustainability and strengthening society’s disaster coping capacity. In parallel, we will implement the goals of the IHP-IX five priority areas and assist nations around the world in achieving the targets of the 2030 Agenda and the Sendai Framework by enhancing our international information network to better understand water-related disasters in regions and nations, training human resources who can contribute to building a resilient, sustainable society, and sharing scientific knowledge learned from Japan’s experience.

To achieve all these goals, ICHARM will step up innovative research by taking an End-to-End approach, which covers the entire research process from data collection to analysis, assessment and

2. 長期プログラム (およそ10年)

国連2030アジェンダ (SDGs) では持続的かつレジリエントな道筋への移行が強調され、国連仙台防災枠組では災害リスク軽減とレジリエンスの強化のための4つの優先行動が位置付けられており、いずれも2030年を目標としている。UNESCO 第9期政府間水文学計画 (IHP-IX) では、持続可能でレジリエントな社会の構築を目指し、水の管理と統治の意思決定を支援する能力との確立のために、5つの優先領域が設定され、2029年までの8年間の研究・教育活動が開始されている。また、気候変動に関する政府間パネルは、緩和策、適応策と持続可能な開発を連携させることの重要性を指摘している。

我が国では、気候の変化に伴う水災害の激甚化に対応するため、気候の変化に関する最先端の科学技術に基づく治水計画のあり方が提言され、さらには水災害に対するレジリエンスと地域社会の持続性を高める流域全体の取組である「流域治水」への転換が容れられた。これらを受けて、実施のための法整備や投資計画が策定され、全国の河川整備の基本方針の改定作業が始まり、順次実行のための整備計画の策定作業が進められている。同時に、Society 5.0の科学政策が進められ、デジタル庁が創設され、DXが加速されている。

甚大な水災害から人命、財産を守るために、1世紀にわたって技術研究に取り組んできた土木研究所に設置された ICHARM では、水災害レジリエンスと持続可能性の双方の強化を目指す科学的知見の創出と共有、社会的な能力向上を進めて我が国の「流域治水」の推進に貢献する。加えて、国際的情報ネットワーク力をさらに高めて各地域、世界各国の水災害の状況を理解し、水災害にレジリエントで持続可能な社会構築を担う人材の育成と我が国の経験を踏まえた科学的知見の共有を通じて、IHP-IX の5つの優先分野の実行し、各国による2030アジェンダおよび仙台防災枠組の目標達成を支援する。

そこで研究分野では、水災害ハザード、リスクの両面におけるデータの収集から、社会・経済面を含めたリスク評価やリスクの変化予測、さらには実践策の検討や実行を支

prediction of natural phenomena to 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 likely to affect society and the economy, and establishing methods and applications to support on-site policy implementations. We will promote interdisciplinarity by collaborating with a broad range of areas, including water utilization, public sanitation, climate science, urban planning, biology, biodiversity, agriculture, energy, and infection control, as well as by considering new lifestyles and national land development.

ICHARM will also improve its capacity building programs to help local experts further develop capacities needed, for example, to solve problems based on local needs and conditions and form a consensus among various stakeholders. We will provide graduate-level programs to foster practitioners who can understand and create scientific knowledge on water hazard and risk management. We will also offer training for local experts to become "facilitators" who can provide practical ideas on site to improve resilience and sustainability by utilizing the water disaster consilience.

Promoting information networking, ICHARM will continue updating the action plans by identifying, visualizing and mapping challenges to be addressed to achieve the resilience and sustainability goals listed in the 2030 Agenda, the Sendai Framework, the IHP-IX, and "River Basin Disaster Resilience and Sustainability by All." We will also continue implementing projects while incorporating the outcomes of research and capacity building by utilizing the International Flood Initiative and other networks.

(1) Innovative research

1) Data collection, storage, sharing, and statistics on water-related disasters

It is often difficult for developing countries to formulate effective disaster management plans suitable for the characteristics of water-related disasters and local-specific natural and social conditions. This can be attributed to insufficient systems to collect, store, share and statistically process data on disaster damage and hydrological and meteorological events. Recognizing these shortcomings as the most fundamental bottlenecks to promoting disaster risk reduction, ICHARM will implement research on data management technology for water-related disasters as one of its major research themes. In addition, understanding the importance of a cross-sectoral approach in the public sector and active participation of the private sector, ICHARM will integrate

援する一連の研究を高度化するとともに、水利用・公衆衛生分野、気候分野はもとより、都市計画分野、生態・生物多様性分野、農業分野、エネルギー、感染症対策分野との連携をはかり、新たな生活スタイルや国土形成も視野に入れ、水災害のレジリエンスの強化と持続可能な社会の構築に資する科学知を統合する End to End（データの取得から、自然現象の解明・評価・予測、社会・経済への影響評価までの一貫通貫の研究）の実施する。

能力育成分野では、現場の問題事象に即した問題解決能力や、ステークホルダーの利害関係の調整が不可欠であり、水災害ハザード、リスク分野の科学知を習得し、創出する能力を養う大学院教育を行うとともに、水災害のレジリエンスと持続可能性の向上に関わる取り組みを統合的な科学知に基づいて助言するファシリテータを育成する。

情報ネットワーク分野では、2030 アジェンダ、仙台防災枠組、IHP-IX、「流域治水」において、水災害のレジリエンスと持続可能性の課題を見える化しマッピングして、ICHARMの行動目標を随時アップデートする。またIFIの枠組み等を活用することにより、研究分野、能力育成分野と統合・連携し活動を推進する。

(1) 革新的な研究

1) 水災害データの収集、保存、共有、統計化

途上国では被害や気象水文等のデータ収集、保存、共有、統計化が不十分なため、水災害の実態と地域特有の自然、社会条件に応じた合理的な防災計画を作ることが難しい。この点を防災、減災を推進する上での最も根源的な隘路と認識し、ICHARMはデータ管理技術の開発を今後の重要な研究テーマとする。さらに関係省庁の横断的連携や官民による協働が一層必要となっており、ICHARMは分野横断的な情報や知識を統合した水防災・減災のための「知の統合」の構築を図る。

interdisciplinary scientific knowledge to consolidate a consilience for water disaster reduction.

In particular, ICHARM conducts research on technologies to collect and store data and information regarding hazards, exposure and vulnerability and share them among stakeholders while developing and implementing technologies to collect damage data that can be operated at national and local levels. ICHARM will also develop a method for combining local data with satellite observations and numerical model outputs to provide wide-area information in order to encourage nations and regions to store and share information and data. We will provide technical assistance for affected nations to compile highly reliable disaster statistics, to which stakeholders can have access in real time. Moreover, ICHARM will assemble intelligence infrastructure using digital twin technology to integrate and share policies and other information on areas closely related to water disasters, such as urban planning, agriculture, energy, natural environment, and infection control.

ICHARM will continue its contribution to research on data collection, storage, sharing, statistics, and visualization as the most fundamental infrastructure to enhance disaster risk reduction.

2) Risk assessment on water-related disasters

ICHARM has been developing hazard assessment methods separately, such as the Integrated Flood Analysis System (IFAS), the Water-Energy-Budget Rainfall-Runoff-Inundation model (WEB-RRJ), a sediment-driftwood-inundation analysis system, and the Couple Land and Vegetation Data Assimilation System (CLVDAS), and vulnerability assessment methods, such as an economic damage analysis system. However, for all basin stakeholders to understand risks and share information, it is essential to conduct integrated assessments of hazards, exposure and vulnerability and interlink the outcomes with those of impact assessments in such areas as urban planning, agriculture, energy, and natural environment conservation.

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. Additionally, since monitoring methods for the global targets listed in the Sendai Framework have not been established, ICHARM will contribute to developing a globally applicable methodology by conducting case studies and comparing their results.

具体的には、ハザード、暴露、脆弱性に関するデータや関連情報の収集、保存を行い、ステークホルダーとの間で共有する技術を研究するとともに、各国、地域が実行可能な被害データの収集手法を開発して実装を支援する。また、現地データに衛星観測や数値モデルを組み合わせて、より広域のデータや情報を作成する手法を開発し、その結果の各国、地域の保存、共有を促進する。さらに、被災国による信頼性の高い水災害統計の作成を技術的に支援し、関係者によるリアルタイム利用を可能にする。あわせて、水災害対策と深く関わる都市計画、農業、エネルギー、自然環境、感染症対策等の各分野の政策や情報を統合・共有等のできる情報基盤をデジタルツイン上で構築する。

以上により、防災、減災を推進する上での最も根源的なデータ収集、保存、共有、統計化の促進に貢献する。

2) 水災害リスクのアセスメント

ICHARM はこれまで IFAS や RRI、WEB-RRJ、土砂・流木・洪水氾濫、農業的過水監視・予測システム (CLVDAS) などのハザード評価手法や、経済被害等の脆弱性評価手法を個々に開発してきた。しかし、流域の水災害リスクを全ての関係者が理解し共有するためには、ハザード、暴露、脆弱性評価を統合して行うことにより、都市計画、農業、エネルギー、自然環境保全等各分野における影響評価との接続を図ることが求められている。

そこで、水災害評価モデルと関連分野のモデルを結合する手法を開発し、検証するとともに、流域全体での影響を統合的に表す指標の開発を推進する。国内外の複数地域において、地域の個別状況を踏まえた水災害リスクのアセスメントの事例研究を進め、その結果を活用することで、それぞれの地域の特性を踏まえたリスク評価を地域自ら行うことで水災害リスクの軽減に役立てることを支援する。また、仙台防災枠組のグローバルターゲットの計測手法が確立していないことに鑑み、地域適用研究を積み重ね、その相互比較を通して、国際的に利用できる方法論の開発に貢献する。

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| <p>ICHARM will continue creating relevant information and providing support for better communication and understanding of water-related risks.</p> <p>3) Monitoring and prediction of changes in water-related disaster risk</p> <p>Water-related disaster risks change over time as hazards become intense due to climate change and vulnerability increases due to urbanization and infectious diseases spreading worldwide. When risks increase, prevention measures designed based on present risk information may not be effective for future disasters. Furthermore, if the effect of prevention measures to be taken for increased risks is not projected properly, the economic efficiency of disaster-related investment might be underestimated. To avoid such misperceptions, ICHARM will continue research on forecasting future risks while additionally considering their changes observed until the present.</p> <p>We will develop, verify, and improve methods for monitoring and forecasting changes in hazards due to meteorologic conditions with different temporal scales ranging from season to climate change and changes in exposure and vulnerability due to social development and economic changes. Case studies will be conducted using these methods to support local communities in selecting appropriate methods according to their needs and conditions to mitigate future risks by themselves. The methods will be modified with various local adjustments and compared with each other for further improvement to eventually become globally applicable.</p> <p>ICHARM will continue its contribution to effective policymaking for disaster risk reduction as water-related risks are projected to increase.</p> <p>4) Proposal, evaluation, and application of policy ideas for water-related risk reduction</p> <p>Irrationally low priority on investment in disaster risk reduction causes many disasters and disturbs sustainable economic activities in developing countries. Japan, promoting “River Basin Disaster Resilience and Sustainability by All” as its new flood control policy, is seeking a method to explain the relationship between disaster-related investment and regional management. This needs an interdisciplinary approach and collaboration between the public and private sectors, and facilitating these efforts requires illustrating the effectiveness and efficiency of disaster-related investment. To this end, ICHARM will conduct research by proposing and evaluating policies aiming to reduce water-related disaster risks while considering local needs and conditions.</p> <p>The research will seek to increase stakeholders’ understanding of the significance of disaster risk reduction policies to support sustainable development under climate change. It will also analyze concrete policies in terms of suitability to the target, aiming to assist each nation in proposing new</p> | <p>以上により、適切なリスク情報の創出とこれに基づく水災害リスクの理解の促進に貢献する。</p> <p>3) 水災害リスクの変化のモニタリングと予測</p> <p>水災害リスクは、気候変化等によるハザード変化と都市化、世界的な感染症の拡大等による脆弱性の変化などにより、時間の経過と共に変化する。リスクが増加する場合には、現在のリスク情報に基づく防災対策では、将来の災害に適切に対応できない懸念が生じる。また、リスク増加に応じた対策の効果が適切に評価されないこと、防災投資の経済性が過小評価されることにもなる。このため、ICHARM は過去から現在にかけてのリスクの変化を踏まえつつ、将来のリスクの予測につなげる研究を行う。</p> <p>具体的には、季節変化から気候変動の影響までの時間スケールの気象の変化に影響されるハザードの変化と、社会開発や経済変動に伴う水災害の暴露、脆弱性の変化に関するモニタリングと予測の手法を開発、検証、高度化する。また、これを用いて事例研究を進め、それぞれの地域が手法を自ら地域の状況にあわせながら利用して、将来の水災害リスクの緩和に役立てることを支援するとともに、手法の相互比較を通して国際的に活用できる手法を提案する。</p> <p>以上により、水災害リスクの増大を考慮した適切な防災、減災施策の立案に貢献する。</p> <p>4) 水災害リスク軽減の政策事例の提示、評価と適用支援</p> <p>途上国などでは防災投資の優先度が低いため多くの災害を受け、持続的な経済活動の阻害となっている。我が国では、「流域治水」を推進しており、防災投資と地域経営の関連を明らかにすることが重要となっている。これらは、学際的かつ行政と民間が融合した取り組みを必要としている。このため、ICHARM では防災投資の有効性、効率性を明示するため、地域固有の背景を踏まえた水災害リスク軽減のための政策事例を提示し評価する研究を行う。</p> <p>研究では、気候変化の下で、持続可能な開発を支える防災、減災政策の重要性に対する関係者の理解を深めるとともに、各地域の生活様式や社会・経済活動、今後のリスクの変化も考慮した各国の自立的で新しい政策提案を支援するため、政策の具体的な事例</p> |
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| <p>policies independently while considering local lifestyles, socio-economic activities, and future risk changes. ICHARM will also 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.</p> <p>ICHARM will continue supporting local and national governments and funding agencies in active decision making on investment in disaster risk reduction.</p> | <p>を地域への適応度の観点で分析する。また、個々の政策の効果の計測モデルと、各国で適用可能な社会経済の評価手法を開発する。また、地域における合意形成と政策の意思決定を支援する能力開発を行う。</p> <p>以上により、各国と地方の政府や投資機関による防災投資の意思決定に貢献する。</p> |
| <p>5) Support in improving the applicability of water-related disaster management</p> <p>Although some cases have reported that disaster reduction measures were highly effective, other cases have reported unfortunate incidents in which malfunctioning crisis communication caused fatal delays in evacuation.</p> <p>The need has also been pointed out for building a flood-conscious society, in which communities prepare appropriate rescue and recovery schemes even during unexpectedly large-scale disasters and a build-back-better framework based on a long-term regional management plan. This needs technical support to increase the awareness of local governments and residents about disaster prevention and mitigation and for them to create systems to take necessary actions. With a wide understanding of local conventions and human behavior in emergencies, ICHARM will develop, verify, and help local governments and residents plan and implement a wide range of disaster management measures with a good consensus among relevant stakeholders so that measures will maximize their effects during disasters.</p> | <p>5) 防災・減災の実践力の向上支援</p> <p>様々な対策が減災に大きく貢献した事例がある一方で、例えば住民への情報伝達がうまく機能せず避難等が遅れて大きな被害を防げなかった事例なども多く報告されている。</p> <p>また想定を超える災害発生時にも、適切な救援、応急措置をとって速やかに復旧し、地域の長期展望に基づいたよりよい復興が可能な社会を構築する必要がある。そのためには地方行政や市民の防災・減災意識の向上と実践できる体制づくりの支援が必要である。ICHARM では、地域の社会構造や人間の行動様式などを多面的に捉え、災害時に施策の効果が最大限発揮されるよう、関係者の十分な相互理解のもと各種施策の立案から実施、効果の発現に至る手法を開発し、実装を支援する。</p> |
| <p>Such measures will aim to support the effective sharing of information provided from early warning systems and other sources among administrators and residents to facilitate coordinated disaster responses among different sectors. They will also aim to help them with operation continuity planning based on local needs and conditions and interoperability improvement for better collaboration among various administrative functions.</p> <p>ICHARM will support citizens and local governments in increasing disaster awareness and improving their water-related disaster management capabilities.</p> | <p>具体的には、早期警戒システム等から得られる情報を行政、市民間で効果的に共有できる方策を支援し、それに基づき様々なセクターによる災害への連携した対応、地域の実情に合った業務継続計画の策定、各行政機能の効果的な連携体制を構築するための手法の開発、検証を進め、社会実装を支援する。</p> <p>以上により、市民、行政のリスク認識の向上を支援し、実践を通して地域の水災害に対する防災・減災の実践力の向上に貢献する。</p> |
| <p>(2) Effective capacity building</p> <p>1) Foster solution-oriented practitioners and Training-of-Trainers (TOT) instructors who will contribute effectively to the planning and implementation of disaster management with solid theoretical and engineering competence at all levels from local to international.</p> <p>2) Train facilitators to acquire interdisciplinary scientific knowledge related to water-related disaster</p> | <p>(2) 効果的な能力育成</p> <p>1) 国際から地域にいたるあらゆるレベルで、災害リスクマネジメントの計画、実践に実質的に従事し、確固たる理論的、工学的基盤を有して問題解決を行うことができる実務者や指導者の能力育成を行う。</p> <p>2) 水災害対策に関連する学問分野を習得し、関係主体間の議論や合意形成を支援する</p> |

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| <p>risk reduction and the capability to lead consensus building among various stakeholders.</p> <p>3) Maintain and enhance the capacity of local experts and institutions engaged in addressing water-related risks using accumulated knowledge and skills both in research and practice. ICHARM will support a global network of exemplary practitioners involved in water hazard and risk management.</p> <p>(3) Efficient information networking</p> <ol style="list-style-type: none"> 1) Accumulate, analyze and disseminate major water-related disaster records and experiences by maintaining and upgrading a worldwide practitioners' network. 2) Integrate interdisciplinary scientific knowledge into a consilience of water-related risk management as a common asset of practitioners. 3) Mainstream water-related disaster risk reduction by facilitating active collaboration and communication among experts and organizations through sharing cases and findings in water-related hazard and risk management. | <p>ファシリテータの育成を行う。</p> <p>3) 研究活動及び現地実践を通じて蓄積した知見に基づいて水災害対策に取り組み現地専門家、機関の能力の維持と強化を図る。ICHARMは水災害・リスク管理の模範的実務者の国際ネットワークの構築を支援する。</p> <p>(3) 効率的な情報ネットワーク</p> <ol style="list-style-type: none"> 1) 世界の研究者ネットワークを維持強化し、世界の大規模水災害に関する情報、経験を収集、解析、提供する。 2) 学際的な科学知を統合して、水関連リスク管理の「知の統合」を構成して、実務者の共有財産とする。 3) 水関連災害リスク管理の実例と知見の共有により、具体的な協働と連携を支援し、防災の主流化に取り組む。 |
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3. Mid-term Programme (around 6 years)

In order to achieve the Mission in step with the UNESCO IHP-IX and the fifth Medium to Long-term Plans of the Public Works Research Institute (PWRI), ICHARM will conduct the following activities in the next 6 years:

(1) Innovative research

1) Data collection, storage, sharing and statistics on water-related disasters

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.

2) Risk assessment on water-related disasters

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.

3) Monitoring and prediction of changes in water-related disaster risk

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.

3. 中期プログラム（およそ6年）

上記の使命を達成するため、今後6年間に於いて ICHARM は、土木研究所第5期中長期計画や UNESCO—IHP 第9期プログラムに基づき、また関係機関と連携して次の活動を行う。

(1) 革新的な研究

1) 水災害データの収集、保存、共有、統計化

ハザード、暴露、脆弱性に関するデータや関連情報の収集、保存を行い、関連するステークホルダーとの間で共有する技術を研究するとともに、現地で実行可能な被害データの収集手法を開発して実装を支援し、各国、地域が実施するデータの収集、保存、共有の促進を図る。また、各国による信頼性の高い水災害統計の作成を技術的に支援する。

2) 水災害リスクのアセスメント

水災害評価モデルと関連分野のモデルを結合する手法を開発し、検証するとともに、流域全体での影響を統合的に表す指標の開発を推進する。国内外の複数地域において、地域の個別状況を踏まえた水災害リスクのアセスメントの事例研究を進め、その結果を活用することで、それぞれの地域の特性を踏まえたりリスク評価を地域自らの行うことで水災害リスクの軽減に役立てることを支援する。

3) 水災害リスクの変化のモニタリングと予測

季節変化から気候変動の影響までの時間スケールの気象の変化に影響されるハザードの変化と、社会開発や経済変動に伴う水災害の暴露、脆弱性の変化に関するモニタリングと予測の手法を開発、検証、高度化する。また、国内外の複数地域において、これを用いた事例研究を進め、それぞれのステークホルダーが手法を自ら地域の状況にあわせながら利用して将来の水災害リスクの緩和に役立てることを支援するとともに、手法の相互比較を通して国際的に活用できる手法を提案する。

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| <p>4) Proposal, evaluation and application of policies for water-related disaster risk reduction</p> <p>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.</p> <p>5) Support in constructing the applicability of water-related disaster management</p> <p>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 linking administrative functions effectively at all levels.</p> <p>(2) Effective capacity building</p> <p>1) Foster solution-oriented practitioners and Training-of-Trainers (TOT) instructors who will contribute effectively to the planning and implementation of disaster management with solid theoretical and engineering competence at all levels from local to international.</p> <p>In closer collaboration with GRIPS and JICA, ICHARM will continue its master's and doctoral programs in water-related disaster management, as well as short-term capacity development training programs. The programs, particularly at the Ph.D. level, are integrated seamlessly with ICHARM research activities by creating new opportunities for student involvement, supporting mentorship of ICHARM researchers, and offering more flexible and efficient training as a module or package in e-learning or remote style.</p> <p>2) Train facilitators to acquire interdisciplinary scientific knowledge related to water-related disaster risk reduction and the capability to lead consensus building among various stakeholders.</p> <p>It is important to increase the understanding and collaboration of all stakeholders in river</p> | <p>4) 水災害リスク軽減の政策事例の提示、評価と適用支援</p> <p>気候変動の下で適応可能な政策を分析するには、防災政策についてのステークホルダーの理解や、住民の生活、社会経済活動、リスクの変化を勘案した具体的な政策提案が重要になる。そのため、個々の政策の効果の計測モデルと、各国で適応可能な社会経済の評価手法を開発する。また、地域における合意形成と政策の意思決定を支援する能力開発を行う。</p> <p>5) 防災・減災の実践力の向上支援</p> <p>国内外の複数地域において、早期警戒システム等から得られる情報を行政、市民間で効果的に共有できる方策を支援し、それに基づき様々なセクターによる災害への連携した対応、地域の実情に合った業務継続計画の策定、各行政機能の効果的な連携体制を構築するための手法の開発、検証を進め、社会実装を支援する。</p> <p>(2) 効果的な能力育成</p> <p>1) 国際から地域にいたるあらゆるレベルで、災害リスクマネジメントの計画、実践に実質的に従事し、確固たる理論的、工学的基盤を有して問題解決を行うことができる実務者や指導者の能力育成を行う。</p> <p>GRIPS 及び JICA との連携を強化し、博士コース、修士コースを継続し、発展させる。特に博士課程を中心に ICHARM の研究活動と有機的に結びつけ、ICHARM の人材資源も生かし、実践的な知識を提供するとともに、より機能的教材や遠隔研修を活用する。</p> <p>2) 水災害対策に関連する学問分野を習得し、関係主体間の議論や合意形成を支援するファシリテーターの育成を行う。</p> <p>水災害に対する強靱性と持続性を備えるためにはすべての流域の関係者が協力するし</p> |
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basins to build resilience and sustainability against increasingly intense water-related disaster risks. ICHARM will foster facilitators who can integrate and translate interdisciplinary scientific knowledge for all stakeholders to cooperate in building social consensus by employing a cross-sectoral approach in the public sector and encouraging the private sector for active participation.

3) Maintain and enhance the capacity of local experts and institutions engaged in addressing water-related risks using accumulated knowledge and skills both in research and practice. ICHARM will support a global network of exemplary practitioners involved in water-related hazard and risk management.

Offering opportunities to research and practice water-related disaster management, ICHARM will support the graduates from its educational and training programs to become a leader in promoting water hazard and risk management in their own localities. The ICHARM alumni network across the globe has been facilitated through follow-up meetings and created knowledge hubs to contribute to water-related risk reduction around the world.

(3) Efficient information networking

1) Accumulate, analyze and disseminate major water-related disaster records and experiences by maintaining and upgrading a worldwide practitioners' network.

ICHARM, as the global knowledge center for water hazards, will be working closely with the UNESCO IHP, the World Meteorological Organization (WMO), the Typhoon Committee (TC), the International Flood Initiative (IFI), and other domestic and international agencies, exchanging data, information, lessons and ideas regarding water-related disasters. By hosting and organizing International academic meetings, ICHARM will continue offering a place to collect and disseminate the most advanced knowledge for researchers around the world.

2) Integrate interdisciplinary scientific knowledge into a consilience of water-related risk management as a common asset of practitioners.

ICHARM will establish a system to collect accurate data and information by strengthening collaboration with organizations collecting and archiving scientific data, information and knowledge on water-related disasters and nations co-hosting ICHARM's training and research projects. Collected data and information will be sorted out and accumulated as meta-data and integrated into a "consilience of water-related disaster risk management" as a common asset of

くみが必要である。そのため ICHARM は、関係行政機関の横断的な連携や官民協働を指導し、分野横断的な情報や知識を統合した水防災・減災のための「知の統合」に貢献するファシリテータを支援する。

3) 研究活動及び現地実践を通じて蓄積した知見に基づいて水災害対策に取り組み、現地専門家、機関の能力の維持と強化を図るとともに、水災害・リスク管理の模範的実務者による国際ネットワークの構築を支援する。

帰国した修士課程・博士課程の研修生の研究、実践活動の機会を提供し、ICHARM を卒業した研修者が、それぞれの出身地域の水災害リスク管理のリーダーとして活躍することを支援する。具体的には、各国の ICHARM 卒業生をつなぐフォーラムやセミナーを開催しネットワーク構築を図り、世界の水災害リスク管理に貢献する知識拠点を形成する。

(3) 効率的な情報ネットワーク

1) 世界の研究者ネットワークを維持強化し、世界の大規模水災害に関する情報、経験を収集、解析、提供する。

UNESCO-IHP や WMO との連携、IFI や台風委員会の活動を通じて、国内外の関係機関や研究者等との情報共有や意見交換を行う。また国際的な学会等の主催や企画を務めることにより、世界の研究者等の最新の研究成果や知見を集約・発信する。

2) 学際的な科学知を統合して、水関連リスク管理の「知の統合」を構成して、実務者の共有財産とする。

水災害情報やデータベースを収集、整備している機関との連携を図り、精度の高い情報を入手できる体制を構築する。また、ICHARM の研究・研修において各国から収集したデータをメタデータとして整理・蓄積し、これらの科学知の社会実装を支援する。

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| <p>practitioners.</p> <p>3) Mainstream water-related disaster risk reduction by facilitating active collaboration and communication among experts and organizations through sharing cases and findings in water-related hazard and risk management.</p> <p>ICHARM will continue contributing to worldwide efforts in implementing and mainstreaming disaster risk reduction in step with the Sendai Framework and the Sustainable Development Goals (SDGs), both adopted in 2015. By enhancing research, capacity building, and networking, we will continue stressing the importance of water-related disaster risk reduction and promoting the creation of a resilient, sustainable society by involving all stakeholders at local, national, and international levels.</p> | <p>3) 水関連災害リスク管理の実例と知見の共有により、具体的な協働と連携を支援し、防災の主流化に取り組む。</p> <p>2015年3月に開催された第3回国連防災世界会議で採択された仙台防災枠組、2015年9月に採択された持続可能な開発目標 (SDGs) 等を踏まえ、防災に関する総合的な取り組みの実践と防災の主流化への貢献を継続する。また研究、能力育成、ネットワーク活動を強化することにより、水に関する防災・減災の重要性を発信し、地域、国、世界のレベルにおいて、すべての関係者による災害に強い社会づくりを支援する。</p> |
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ANNEX-2 List of ICHARM staff and tenure

| | | | | Male | Female |
|--------------------|--------|--|-----------------|------|--------|
| センター長 | | Executive Director | | | |
| 1 | 小池俊雄 | KOIKE Toshio | 2014.10～ | ○ | |
| 顧問 | | Advisor | | | |
| 2 | 竹内邦良 | TAKEUCHI Kuniyoshi | 2014.10～ 2018.3 | ○ | |
| 研究・研修指導監 | | Research & Training Advisor | | | |
| 3 | 江頭進治 | EGASHIRA Shinji | 2013.7～ 2025.3 | ○ | |
| 4 | 清水義彦 | SHIMIZU Yoshihiko | 2025.4～ | ○ | |
| グループ長 | | Deputy Director | | | |
| 5 | 三宅且仁 | MIYAKE Katsuhito | 2016.4～ 2017.6 | ○ | |
| 6 | 澤野久弥 | SAWANO Hisaya | 2017.7～ 2019.6 | ○ | |
| 7 | 深見和彦 | FUKAMI Kazuhiko | 2019.7～ 2020.3 | ○ | |
| 8 | 伊藤弘之 | ITO Hiroyuki | 2020.4～ 2022.3 | ○ | |
| 9 | 松木洋忠 | MATSUKI Tadahiro | 2022.4～ 2023.3 | ○ | |
| 10 | 森範行 | MORI Noriyuki | 2023.4～ 2025.3 | ○ | |
| 11 | 日下部隆昭 | KUSAKABE Takaaki | 2025.4～ 2026.3 | ○ | |
| 特別調整監・特別研究監 | | Director for Special Research | | | |
| 12 | 今村能之 | IMAMURA Yoshiyuki | 2018.4～ 2019.3 | ○ | |
| 7 | 深見和彦 | FUKAMI Kazuhiko | 2019.4～ 2019.6 | ○ | |
| 13 | 池田鉄哉 | IKEDA Tetsuya | 2020.4～ 2022.6 | ○ | |
| 10 | 森範行 | MORI Noriyuki | 2022.7～ 2023.3 | ○ | |
| 14 | 光橋尚司 | MITSUHASHI Koji | 2023.4～ 2024.3 | ○ | |
| 15 | 福渡隆 | FUKUWATARI Takashi | 2024.4～ 2025.7 | ○ | |
| 16 | 古本一司 | FURIMOTO Kazushi | 2025.8～ | ○ | |
| 上席研究員 | | Chief Researcher | | | |
| ハザード担当 | | | | | |
| 17 | 岩見洋一 | IWAMI Yoichi | 2013.5～ 2017.3 | ○ | |
| 8 | 伊藤弘之 | ITO Hiroyuki | 2017.6～ 2020.3 | ○ | |
| 18 | 大沼克弘 | ONUMA Katsuhiko | 2020.4～ 2022.3 | ○ | |
| 19 | 久保田啓二郎 | KUBOTA Keijiro | 2022.4～ 2025.3 | ○ | |
| 20 | 菊森佳幹 | KIKUMORI Yoshito | 2025.4～ | ○ | |
| リスクマネジメント担当 | | | | | |
| 6 | 澤野久弥 | SAWANO Hisaya | 2014.4～ 2017.6 | ○ | |
| 21 | 徳永良雄 | TOKUBAGA Yoshio | 2017.7～ 2019.3 | ○ | |
| 22 | 藤兼雅和 | FUJIKANE Masakazu | 2019.4～ 2022.3 | ○ | |

| | | | | |
|---------|---------------------|---------|--------|---|
| 23 新屋孝文 | SHINYA Takahumi | 2022.4～ | 2024.6 | ○ |
| 24 栗林大輔 | KURIDAYASHI Daisuke | 2024.7～ | | ○ |

国際普及・広報担当

| | | | | |
|---------|-------------------|----------|--------|---|
| 21 徳永良雄 | TOKUBAGA Yoshio | 2016.4～ | 2017.6 | ○ |
| 25 小林肇 | KOBAYASHI Hajime | 2020.10～ | 2022.3 | ○ |
| 22 藤兼雅和 | FUJIKANE Masakazu | 2022.4～ | | ○ |

特命担当

| | | | | |
|---------|---------------------|----------|--------|---|
| 26 村瀬勝彦 | MURASE Katsuhiko | 2013.8～ | 2016.6 | ○ |
| 21 徳永良雄 | TOKUBAGA Yoshio | 2014.5～ | 2016.3 | ○ |
| 13 池田鉄哉 | IKEDA Tetsuya | 2017.4～ | 2020.3 | ○ |
| 27 岡田智幸 | OKADA Tomoyuki | 2019.10～ | 2020.9 | ○ |
| | | 2024.7～ | | |
| 24 栗林大輔 | KURIDAYASHI Daisuke | 2022.7～ | 2024.6 | ○ |

総括主任研究員

Principal Senior Researcher

| | | | | |
|---------|------------|---------|--------|---|
| 28 千田容嗣 | CHIDA Yoji | 2014.4～ | 2017.3 | ○ |
|---------|------------|---------|--------|---|

主任研究員

Senior Researcher

| | | | | |
|------------------------------|---------------------|---------|---------|---|
| 29 津田守正 | TSUDA Morimasa | 2014.4～ | 2017.9 | ○ |
| 24 栗林大輔 | KURIDAYASHI Daisuke | 2008.4～ | 2019.6 | ○ |
| 30 鷺尾洋一 | WASHIO Yoichi | 2019.7～ | 2021.3 | ○ |
| 31 大原美保 | OHARA Miho | 2014.4～ | 2023.3 | |
| 32 Shrestha Badri Bhakta | | 2015.4～ | 2019.6 | ○ |
| 33 海野仁 | UMINO Hitoshi | 2015.4～ | 2020,12 | ○ |
| 34 Mohamed Rasmy Abdul Wahid | | 2015.4～ | | ○ |
| 35 萬矢敦啓 | YOROZUYA Atsuhiko | 2015.7～ | 2024.3 | ○ |
| 20 菊森佳幹 | KIKUMORI Yoshito | 2016.4～ | 2020.3 | ○ |
| 23 新屋孝文 | SHINYA Takahumi | 2017.4～ | 2018.3 | ○ |
| 36 猪股広典 | INOMATA Hironori | 2017.4～ | 2018.3 | ○ |
| 37 富澤洋介 | TOMIZAWA Yosuke | 2018.4～ | 2021.5 | ○ |
| 38 河元隆利 | KOUMOTO Takatoshi | 2021.6～ | 2022.4 | ○ |
| 39 吉野広郷 | YOSHINO Hirosato | 2018.4～ | 2023.3 | ○ |
| 40 多田智和 | TADA Tomokazu | 2023.4～ | 2024.3 | ○ |
| 25 小林肇 | KOBAYASHI Hajime | 2024.4～ | 2025.3 | ○ |
| 41 望月貴文 | MOCHIDUKI Takafumi | 2018.4～ | 2023.6 | ○ |
| 42 田中陽三 | TANAKA Yozo | 2023.7～ | 2025.6 | ○ |
| 43 白井宏明 | SHIRAI Hiroaki | 2018.4～ | 2018.8 | ○ |
| 44 傳田正利 | DENDA Masatoshi | 2019.4～ | | ○ |
| 45 牛山朋來 | USHIYAMA Tomoki | 2020.4～ | | ○ |
| 46 宮本守 | MIYAMOTO Mamoru | 2022.4～ | | ○ |
| 47 内藤健介 | NAITO Kensuke | 2024.4～ | 2025.2 | ○ |

○

48 武川晋也 TAKEGAWA Shinya 2025.4～ 2026.3

研究員

Researcher

49 小関博司 KOSEKI Hiroshi 2016.4～ 2017.3

46 宮本守 MIYAMOTO Mamoru 2013.11～ 2022.3

50 諸岡良優 MOROOKA Yoshimasa 2019.4～ 2021.4

47 内藤健介 NAITO Kensuke 2021.4～ 2024.3

51 柿沼太貴 KAKINUMA Daiki 2022.4～ 2024.3

52 山下大輝 YAMASHITA Daiki 2024.4～

48 武川晋也 TAKEGAWA Shinya 2024.4～ 2025.3

専門研究員

Research Specialist

45 牛山朋來 USHIYAMA Tomoki 2010.7～ 2020.3

53 長谷川聡 HASEGAWA Akira 2010.7～ 2018.6

54 郭榮珠 Kwak Youngjoo 2010.7～ 2019.3

55 PERERA Duminda 2011.5～ 2017.10

56 GUSYEV MAKSYM 2012.12～ 2022.3

57 山崎祐介 YAMAZAKI Yusuke 2013.8～ 2018.7

58 萩原葉子 HAGIWARA Yoko 2013.12～ 2016.10

59 南雲直子 NAGUMO Naoko 2014.1～ 2023.10
2024.9～

60 LIU Tong 2014.6～ 2018.2

49 小関博司 KOSEKI Hiroshi 2014.11～ 2016.3

61 Karina Vink 2015.3～ 2017.1

62 渋谷欣弘 SHIBUO Yoshihiro 2015.4～ 2019.3

63 筒井浩行 TSUTSUI Hiroyuki 2017.11～

64 原田大輔 HARADA Daisuke 2016.9～ 2025.3

65 玉川勝徳 TAMAKAWA Katsunori 2017.4～ 2025.3

66 Robin Biswas Kumar 2018.11～ 2022.1

67 Ralph Allen ACIERTO 2019.5～

51 柿沼太貴 KAKINUMA Daiki 2019.5～ 2022.3

68 会田健太郎 AIDA Kentaro 2019.7～ 2023.9

69 Naseer Asif 2020.1～ 2021.3

70 Qin Menglu 2020.9～

33 海野仁 UMINO Hitoshi 2021.4～ 2024.3

71 Kattia Rubí Arnez Ferrel 2021.4～

32 Shrestha Badri Bhakta 2021.5～

交流研究員

Collaborating Researcher

72 中村要介 NAKAMURA Yosuke 2017.4～ 2020.3

73 沼田慎吾 NUMATA Shingo 2020.4～ 2023.3

74 小石一宇 KOISGI Ichiu 2024.4～ 2026.3

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ICHARM Research Assistant

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| 66 Robin Biswas Kumar | 2013.10～ | 2016.9 |
| 75 Ahsan Md Nasif | 2013.10～ | 2016.9 |
| 76 Juarez Lucas Andrea Mariel | 2013.11～ | 2016.9 |
| 77 Ghimire Prem Raj | 2014.10～ | 2015.2 |
| 78 Escalona Martinez Rosiret | 2014.10～ | 2017.1 |
| 69 Naseer Asif | 2015.11～ | 2018.9 |
| 79 Mahtab Mohammad Hossain | 2015.11～ | 2018.9 |
| 80 Islam Md Khairul | 2016.11～ | 2019.9 |
| 81 Gul Ahmad Ali | 2016.11～ | 2019.9 |
| 82 Ahmed Tanjir Saif | 2017.11～ | 2020.9 |
| 83 Tedla Mihretab Gebretsadik | 2020.11～ | 2023.9 |
| 84 Ballaran, Vicente Jr. G. | 2022.3～ | 2024.9 |
| 85 Jayasekara Sachintha | 2022.10～ | 2025.9 |
| 86 Serrano Jonathan Suba | 2023.10～ | 2026.1 |
| 87 Bromand Mohammad Tayib | 2023.10～ | |
| 88 Ranapura Dewage Thilini Kausyalya | 2024.10～ | |
| 89 Al-Biruni Abu Raihan Mohammad | 2025.10～ | |

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事務職員**Administrative staff****副参事****Deputy Head of General**

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| 1 齊藤 明美 | SAITO Akemi | 2016.4～ | 2018.3 |
| 2 丸山 修 | MARUYAMA Osamu | 2018.4～ | 2022.3 |
| 3 岩崎 孝広 | IWASAKI Takahiro | 2022.4～ | 2023.3 |
| 4 山口 典子 | YAMAGUCHI Noriko | 2023.4～ | 2024.3 |
| 5 中林 英晃 | NAKABAYASHI Hideaki | 2024.4～ | |

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○**主査・主事・指導員****Chief Staff, Administer**

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|-----------|-------------------|---------|--------|
| 6 白井 隆 | SHIRAI Takashi | 2014.4～ | 2018.3 |
| 4 山口 典子 | YAMAGUCHI Noriko | 2016.4～ | 2017.3 |
| 7 中條 伸二 | NAKAJYO Shinji | 2017.4～ | 2019.3 |
| 8 中郡 哲也 | NAKAGORI Tetsuya | 2017.4～ | 2018.9 |
| 9 中村 友紀 | NAKAMURA Tomonori | 2018.4～ | 2020.3 |
| 10 宮本 淳子 | MIYAMOTO Jyunko | 2019.4～ | 2023.3 |
| 1 齊藤 明美 | SAITO Akemi | 2019.4～ | 2022.3 |
| 11 宮崎 了輔 | MIYAZAKI Ryosuke | 2020.4～ | 2023.3 |
| 12 高堀 幸作 | KOBORI Kosaku | 2023.4～ | 2025.3 |
| 13 大成 梨香子 | ONARI Rikako | 2023.4～ | 2024.4 |
| 14 生尾 祥久 | NAMAO Yoshihisa | 2024.4～ | 2026.3 |
| 15 戸来 優彦 | HERAI Masahiko | 2025.4～ | 2026.3 |

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ANNEX-3 List of Peer-reviewed paper

| FY | 著作名 | 執筆者名 | 書籍名 | 発行所 | 巻号 | 頁 | 発行年月 |
|------|--|---|--|--|---|----------------|-----------|
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| 2016 | Rapid Exposure Assessment of Nationwide River Flood for Disaster Risk Reduction | Y.Kwak, Park, J., Arifuzzaman, B., Iwami, Y., Amirul, Md., Kondoh, A. | The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences (ISPRS Archives) | International Society of Photogrammetry and Remote Sensing (ISPRS) | doi:10.5194/isprs-archives-XLI-B8-1357-2016, 2016 | 1357-1362 | Jun 2016 |
| 2016 | Application of tritium in precipitation and baseflow in Japan: a case study of groundwater transit times and storage in Hokkaido watersheds. | Gusyev M.A., Morgenstern U., Stewart M.K., Yamazaki Y., Kashiwaya K., Nishihara T., Kuribayashi D., Sawano H., Y. Iwami | Conference: River Flow 2016, At St. Louis, Mo. USA, Volume: Constantinescu, Garcia & Hanes (Eds) © 2016 | Hydrol. Earth Syst. Sci. | doi:10.5194/hess-20-1-2016 | | ☑ 2016 |
| 2016 | Development of a system to measure bed forms and vertical velocity profiles in a river channel | H. Koseki, A. Yorozuya, S. Kudo, Y. Iwami, T. Kitsuda | Conference: River Flow 2016, At St. Louis, Mo. USA, Volume: Constantinescu, Garcia & Hanes (Eds) © 2016 | Taylor & Francis Group, London, ISBN 978-1-138-02913-2 | | 1557-1565 | Jul 2016 |
| 2016 | Estimation of discharge in river channel and distributions of water velocity and depth over floodplain | S.Kudo, A.Yorozuya, E.D.P.Perera, H.Koseki, Y.Iwami, M.Nakatsugawa | Conference: River Flow 2016, At St. Louis, Mo. USA, Volume: Constantinescu, Garcia & Hanes (Eds) © 2016 | Taylor & Francis Group, London, ISBN 978-1-138-02913-2 | | 297-305 | Jul 2016 |
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| 2016 | A systematic review of the factors affecting the cyclone evacuation decision process in Bangladesh | Md. Nasif Ahsan, Kuniyoshi Takeuchi, Karina Vink, Miho Ohara | Journal of Disaster Research | Fuji Technology Press Ltd. | | 11 742-753 | Aug 2016 |
| 2016 | 電波式流速水位計の開発 | 萬矢敦啓、墳原学、工藤俊、小関博司、苗田俊治 | 土木学会論文集G (環境) | 土木学会 | | 72 I_305-I_312 | Aug 2016 |
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| 2016 | 領域アンサンブル予報を用いた洪水予測手法の開発 - 平成27年鬼怒川洪水への適用 | 牛山朋來、佐山敬洋、岩見洋一 | 水工学論文集 | 土木学会水工学委員会 | 73,4 | I_193-I_198 | Feb 2017 |
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| 2019 | Assessing Flood Disaster Impacts in Agriculture under Climate Change in the River Basins of Southeast Asia | Badri Bhakta Shrestha, EDP Perera, Shun Kudo, Mamoru Miyamoto, Yusuke Yamazaki, Daisuke Kuribayashi, Hisaya Sawano, Takahiro Sayama, Jun Magome, Akira Hasegawa, Tomoki Ushiyama, Yoichi Iwami, Yoshio Tokunaga | Natural Hazards | Springer, Natural Hazards | | | June 2019 |

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| 2019 | Understanding water circulation with tritium tracer in the Turai-Rajiwadi geothermal area, India | Sitangshu Chatterjee, Maksym Gusyev, Uday Sinha, Hemant Mohokar, Ashutosh Dash | Applied Geochemistry | | | 109 | | August 2019 |
| 2019 | Implications of the Melamchi water supply project for the Kathmandu valley groundwater system | Bhesh Raj Thapaa, Hiroshi Ishidaira, Maksym Gusyev, Vishnu Prasad Pandey, Parmeshwar Udmale | Water Policy | | | 1-18 | | August 2019 |
| 2019 | Formulation of adaptation measures for flood management under the uncertainty of future projection | Hisaya Sawano, Katsunori Tamakawa, Badri Bhakta Shrestha, Tomoki Ushiyama, Maksym Gusyev, Toshio Koike | Proceedings of THA2019 International Conference on Water Management and Climate Change towards Asia's Water-Energy-Food Nexus and SDGs | | | 475-480 | | |
| 2019 | Characteristics of Flood Flow with Active Sediment Transport in the Sozu River Flood Hazards at the Severe Rainfall Event in July 2018 | Daisuke Harada, Naoko Nagumo, Yousuke Nakamura, Shinji Egashira | Journal of Disaster Research (JDR) | | 14, 6 | 886-893 | | September 2019 |
| 2019 | Mortality by Age Group and Municipality in the July 2018 Torrential Rainfall | Miho Ohara, Naoko Nagumo | Journal of Disaster Research | | 14, 6 | 912-921 | | September 2019 |
| 2019 | 粒子フィラタによる水位と河床変動の逐次推定 | 中村要介、池内幸司、小池俊雄、伊藤弘之、江頭進治 | 水工学論文集 | 土木学会水工学委員会 | | 64 | I_205-I_210 | November 2019 |
| 2019 | ブラジル北東域における植生動態 - 陸面結合データ同化手法による長期洪水解析に基づく穀物生産量・必要灌漑水量の推定に関する研究 | 筒井浩行、澤田洋平、生駒栄司、喜連川優、小池俊雄 | 水工学論文集 | 土木学会水工学委員会 | | 64 | I_283-I_288 | November 2019 |
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| 2019 | Lateral and Longitudinal Sediment Sorting in Seri River, Japan | Robin K. Biswas, Shinji Egashira, Daisuke Harada, Yousuke Nakamura | 水工学論文集 | 土木学会水工学委員会 | | 64 | I_895-I_900 | November 2019 |
| 2019 | Flood and Inundation Forecasting in the Sparsely Gauged Transboundary Chenab River Basin Using Satellite Rain and Coupling Meteorological and Hydrological Models | MALIK RIZWAN ASGHAR, TOMOKI USHIYAMA, MUHAMMAD RIAZ, MAMORU MIYAMOTO | Journal of Hydrometeorology | | 20, 12 | 2315-2330 | | December 2019 |
| 2019 | 2017年九州北部豪雨による赤谷川流域の氾濫の実態と地形分類に基づく被災家屋の立地分析 | 南雲直子、江頭進治 | 地学雑誌 | 東京地学協会 | 128, 6 | 835-854 | | December 2019 |
| 2019 | Development of Water and Energy Budget-based Rainfall-Runoff-Inundation Model (WEB-RR) and Its Verification in the Kalu and Mundeni River Basins, Sri Lanka | Mohamed Rasmy, Takahiro Sasyama, Toshio Koike | Journal of Hydrology | | 579, 2019 | 1-20 | | December 2019 |
| 2019 | Preferences for improved early warning services among coastal communities at risk in cyclone prone south-west regions of Bangladesh | Md. NasifAhsan, Amina Khatun, Md. Sariful Islam, Karina Vink, Miho Ohara | Progress in Disaster Science | | | 5 | | January 2020 |
| 2019 | イメージ映像での洪水疑似体験による洪水意識及び減災行動意欲向上に関する考察 | 栗林大輔、大原美保、小藪剛史、澤野久弥 | 日本災害情報学会誌「災害情報」 | 日本災害情報学会 | 18, 1 | 35-45 | | March 2020 |
| 2020 | 2019年台風19号による阿武隈川水系五福谷川における多量の土砂を含む洪水流の特徴 | 原田大輔、江頭進治、柿沼太貴、南雲直子、伊藤弘之 | 河川技術論文集 | 土木学会水工学委員会河川部会 | | 26 | 609-614 | June, 2020 |
| 2020 | 複数洪水イベントの組み合わせによる洪水予測に適したRRIモデルパラメータの最適化手法に関する検討 | 柿沼太貴、中村要介、伊藤弘之、池内幸司 | 河川技術論文集 | 土木学会水工学委員会河川部会 | | 26 | 199-204 | June, 2020 |
| 2020 | Radiative Characteristics at 89 and 36 GHz for Satellite-Based Cloud Water Estimation Over Land | Rie Seto, Kentaro Aida, Toshio Koike, Shinjiro Kanae | IEEE Transactions on Geoscience and Remote Sensing | | 59/2 | 1355-1368 | | February, 2021 |
| 2020 | 地形解析に基づく中山間地河川の土砂輸送過程に関する研究 | 南雲直子、江頭進治 | 地理学評論 | 日本地理学会 | 3/94 | 64-81 | | March, 2021 |
| 2021 | Development of an Integrated Approach for the Assessment ofClimate Change Impacts on the Hydro-Meteorological Characteristics of the Mahaweli River Basin, Sri Lanka. | Hemakanth Selvarajah, Toshio Koike, Mohamed Rasmy, Katsunori Tamakawa, Akio Yamamoto | Water MDPI Open Access Journals | | 13/9 | 1218 | | April, 2021 |

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| 2021 | Drought Monitoring over West Africa Based on an Ecohydrological Simulation (2003-2018) | Hiroyuki Tsutsui, Yohei Sawada, Katsuhiko Onuma, Hiroyuki Ito, Toshio Koike | Hydrology | | 8/155 | 1月16日 | October, 2021 |
| 2021 | A Numerical Study on Bank Erosion of a Braided Channel: Case Study of the "Tangail and Manikganj Districts Along the Brahmaputra River" | Islam Md Masbahul, Atsuhiko Yorozuya, Daisuke Harada, Shinji Egashira, | Journal of Disaster Research (JDR) | | 17/2 | 263-269 | February, 2022 |
| 2021 | Co-Design for Enhancing Flood Resilience in Davao City, Philippines | Miyamoto, M., Kakinuma, D., Ushiyama, T., Rasmay, A.W.M., Yasukawa, M., Bacalitos, D.G., Sales, A.C., Koike, T., Kitsuregawa, M. | Water | | 14/978 | | March, 2022 |
| 2022 | フィリピン共和国の洪水常襲地を対象とした3D浸水ハザードマップの作成と技術の普及 | 南雲直子、大原美保、藤兼雅和、井上卓也、平松裕基、ジャラニラ サンチェズ パトリシア オン | E-journal GEO | | 17/1 | 123-136 | June, 2022 |
| 2022 | A study on availability of ground observations and its impacts on bias correction of satellite precipitation products and hydrologic simulation efficiency | Li Zhou, Toshio Koike, Kuniyoshi Takeuchi, Mohamed Rasmay, Katsuhiko Onuma | Journal of Hydrology | | | 610 1-20 | July, 2022 |
| 2022 | Entrainment of bed sediment composed of very fine material | HARADA Daisuke, EGASHIRA Shinji, Tanjir Saif Ahmed, ITO Hiroyuki | Earth Surface Process and Landforms (ESPL) | | 47/13 | 3051-3061 | October, 2022 |
| 2022 | Development of an Inundation Model for Creating Industrial Park-Scale Risk Information for Area-BCM | Daiki Kakinuma, Mamoru Miyamoto, Yosuke Nakamura, Anurak Sriariyawat, Supattra Visessri | Journal of Disaster Research (JDR) | | 17/6 | 877-888 | October, 2022 |
| 2022 | Assessment of Climate Change Impacts for Balancing Transboundary Water Resources Development in the Blue Nile Basin | Tedla, Mihretab G., Mohamed Rasmay, Katsunori Tamakawa, Hemakanth Selvarajah, Toshio Koike | Sustainability | | 14/22 | 15438 | November, 2022 |
| 2022 | 125河川の水位予測システムを構築する中で生じた問題に関する考察 | 沼田慎吾、柿沼太貴、望月貴文、久保田啓二朗、小池俊雄、池内幸司 | 土木学会論文集B1 (水工学) | 土木学会 | 78/2 | I_397-I_402 | November, 2022 |
| 2022 | 降雨流出応答特性を考慮した洪水予測のための粒子フィルタ適用手法の検討 | 柿沼太貴、沼田慎吾、望月貴文、久保田啓二朗、中村要介、小池俊雄、池内幸司 | 土木学会論文集B1 (水工学) | 土木学会 | 78/2 | I_403-I_408 | November, 2022 |
| 2022 | 濁水によるパナマ運河水位低下の緩和対策に関する基礎研究 | 筒井浩行、Mohamed Rasmay、小池俊雄 | 土木学会論文集B1(水工学) | 土木学会 | 78/2 | I_745-I_750 | November, 2022 |
| 2022 | Effect of suspended sediment on bed evolution in a meandering river of the Bolivian Amazon | Kattia Rubi Arnez Ferrel, HARADA Daisuke, EGASHIRA Shinji | 土木学会論文集B1 (水工学) | 土木学会 | 78/2 | I_883-I_888 | November, 2022 |
| 2022 | フィリピン共和国の2020年台風Ulysses災害を事例にした早期被災者把握における衛星活用の課題検討 | 会田健太郎、大原美保、南雲直子、Patricia Ann JARANILLA-SANCHEZ、久保田啓二朗、新屋孝文 | 土木学会論文集B1 (水工学) | 土木学会 | 78/2 | I_985-I_990 | November, 2022 |
| 2022 | 豪雨時の浮遊砂の流出と河床変動に伴う洪水氾濫 - 白川のヨナ洪水を例に - | 原田大輔、江頭進治 | 土木学会論文集B1 (水工学) | 土木学会 | 78/2 | I_1093-I_1098 | November, 2022 |
| 2022 | BASIN SCALE SEDIMENT TRANSPORT PROCESSES USING RAINFALL SEDIMENT RUNOFF MODEL - A CASE STUDY OF SANGU RIVER BASIN | Md Majadur Rahman, EGASHIRA Shinji, HARADA daisuke | 土木学会論文集B1 (水工学) | 土木学会 | 78/2 | I_1099-I_1104 | November, 2022 |
| 2022 | 平成30年7月豪雨災害での被災事業所の営業再開・生産活動の回復状況の分析 | 大原美保、南雲直子、新屋孝文 | 土木学会論文集B1 (水工学) | 土木学会 | 78/2 | I_37-I_42 | November, 2022 |
| 2022 | Integration of MultiPlatform Data for Developing an Integrated Flood Information System in the Kalu River Basin, Sri Lanka | モハメッド ラスミー アブドゥル フヒド、安川雅紀、牛山朋来、玉川勝徳、会田健太郎、S. Seenipellageka, S. Hemakanth、喜連川優 | Water | MDPI | 15/6 | | February, 2023 |
| 2022 | 水災害分野における研究・研修・ネットワークの三位一体的運用による相乗効果と今後の活動展開の方向性についての考察 | 池田鉄哉 | 水文・水資源学会誌 | 水文・水資源学会 | 36/1 | 63-73 | February, 2023 |

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| 2022 | 最大想定規模の浸水想定区域における土地利用規制別の人口推移と居住誘導に関する研究 - RRIモデルによる農地の宅地化に伴う貯留機能低下の影響分析を通じて - | 野澤千絵、上田聖也、柿沼太貴 | 都市計画報告集 | 日本都市計画学会 | 21/4 | 452-459 | March, 2023 |
| 2023 | A holistic approach for using global climate model (GCM) outputs in decision making | Sanjeeva Ilangasingha, Toshio Koike, Mohamed Rasmy, Katsunori Tamakawa, Hirotsada Matsuki, Hemakanth Selvarajah | Journal of Hydrology | Elsevier B.V. | Volume 626, Part B | 130213 | November, 2023 |
| 2023 | Method to evaluate large-wood behavior in terms of the convection equation associated with sediment erosion and deposition | Daisuke Harada, Shinji Egashira | Earth Surface Dynamics (ESurf) | European Geosciences Union | Vol.11, issue6 | 1183-1197 | November, 2023 |
| 2023 | Feasibility of liquid water path estimation of over land using satellite-based Ka-band passive microwave data | Rie Seto, Toshio Koike, Misako Kachi | IEEE Transactions on Geoscience and Remote Sensing | IEEE | Vol.62 | 1月20日 | December, 2023 |
| 2023 | 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 | 会田健太郎、久保田啓二朗、浅沼順、開発一郎、小池俊雄 | 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 |
| 2023 | 浮遊砂卓越河川における流砂の分級について | 江頭進治、南雲直子、原田大輔、秦夢露 | 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 |
| 2023 | 斜面侵食に着目した流域土砂輸送モデル | 原田大輔、江頭進治、Md Majadur Rahman | 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 |
| 2023 | Assessing the Impact of Climate Change on Flood Inundation and Agriculture in the Mountainous Region of Bhutan | SYLDON Pema, Shrestha Badri Bhakta, MIYAMOTO Mamoru, TAMAKAWA Katsunori, NAKAMURA Shinichiro | Journal of Hydrology: Regional Studies | Elsevier B.V. | No.52 | | January 25, 2024 |
| 2023 | Evaluation of geographical and annual changes in rice planting patterns with satellite images in flood-prone area of Pampanga River Basin, the Philippines | Kohei Hosonuma, Kentaro AIDA, Vicente Ballaran, Jr, Naoko NAGUMO, Patricia Ann Sanchez, Tsuyoshi Sumita, Koki Homma | Remote Sensing | MDPI | No.16 | 499 | January 28, 2024 |
| 2023 | An integrated approach for the climate change impact assessment on the water resources in the Sangu river basin, Bangla-desh | Md.Khairul Hasan, Abdul Wahid Mohamed RASMY, KOIKE Toshio, TAMAKAWA Katsunori | Water | MDPI | No.16 | 745 | February 29, 2024 |
| 2023 | Assessment of flood damage to residential houses and analysis of effectiveness of flood damage reduction measures | Badri Bhakta Shrestha, Abdul Wahid Mohamed RASMY, Takafumi SHINYA | Journal of JSCE | JSCE | Volume 12, Issue 2 | | February, 2024 |
| 2023 | Improving rice crop damage estimation from flooding events using open - source satellite data and UAV image data | Vicente Ballaran, Jr, OHARA Miho, Abdul Wahid Mohamed RASMY, HOMMA Koki, AIDA Kentaro, HOSONUMA Kohei | AgriEngineering | AgriEngineering | No.6 | 574-596 | March 4, 2024 |
| 2024 | Development of a virtual flood experience system and its suitability as a flood risk communication tool | DENDA Masatoshi, FUJIKANE Masakazu | Proceedings of the International Association of Hydrological Sciences (PIAHS) | PIAHS | Volume 386 | | April 19, 2024 |
| 2024 | Methods to create hazard maps for flood disasters with sediment and driftwood | HRADA Daisuke, EGASHIRA Shinji | Proceedings of the International Association of Hydrological Sciences (PIAHS) | PIAHS | Volume 386 | | April 19, 2024 |
| 2024 | Evaluation of satellite precipitation products for real-time extreme river flow modeling in data scarce regions | Mihretab G. Tedla, Mohamed Rasmy, KOIKE Toshio, Li Zhou | Proceedings of the International Association of Hydrological Sciences (PIAHS) | PIAHS | Volume 386 | | April 19, 2024 |
| 2024 | Attributing weather patterns to Davao River extreme rainfall from Reanalysis and GCM | Ralph Allen Acierto, USHIYAMA Tomoki, KOIKE Toshio | Proceedings of the International Association of Hydrological Sciences (PIAHS) | PIAHS | Volume 386 | | April 19, 2024 |
| 2024 | Sediment transport processes in the Sangu River basin using a rainfall-sediment runoff model for sustainable river management | Md. Majadur Rahman, HRADA Daisuke, EGASHIRA Shinji | Proceedings of the International Association of Hydrological Sciences (PIAHS) | PIAHS | Volume 386 | | April 19, 2024 |

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| 2024 | Assessment of flood damage to agricultural crops under climate change scenarios using MRI-AGCM outputs in the Solo River basin of Indonesia | Badri Bhakta Shrestha, Mohamed Rasmy, USHIYAMA Tomoki, Ralph Allen Acierto, KAWAMOTO Takatoshi, FUJIKANE Masakazu, ITO Hiroyuki, SHINYA Takafumi | Proceedings of the International Association of Hydrological Sciences (PIAHS) | PIAHS | Volume 386 | April 19, 2024 |
| 2024 | A Study on Improving Disaster Mitigation Awareness by Simulated Flood Experience Using VR Videos | KOYABU Tsuyoshi, DENDA Masatoshi | Proceedings of the International Association of Hydrological Sciences (PIAHS) | PIAHS | Volume 386 | April 22, 2024 |
| 2024 | Developing a flood monitoring system by utilizing real-time satellite rainfall estimates and water energy budget-based rainfall-runoff inundation model in West Africa | Abdul Wahid Mohamed RASMY, Maksym Gusev, TAMAKAWA Katsunori, OHARA Miho, KOIKE Toshio | Proceedings of the International Association of Hydrological Sciences (PIAHS) | PIAHS | Volume 386 | May 7, 2024 |
| 2024 | Numerical Simulation of River Channel Change in the Suspended Sediment-Dominated Downstream Reach of the Sangu River | Md. Majadur Rahman, HRADA Daisuke, EGASHIRA Shinji | Water | MDPI | Volume 16 | July 8, 2024 |
| 2024 | Investigation of an Ensemble Inflow-Prediction System for Upstream Reservoirs in Sai River, Japan | Katsunori TAMAKAWA, Shigeru NAKAMURA, Cho Thanda Nyunt, Tomoki USHIYAMA, Mohamed Rasmy, Keijiro KUBOTA, Asif Naseer, Eiji IKOMA, Toshihiro NEMOTO, Masaru KITSUREGAWA, Toshio KOIKE | Water | MDPI | Volume 16 | September 11, 2024 |
| 2024 | Assessment of future risk of agricultural crop production under climate and social changes scenarios: A case of the Solo River basin in Indonesia | Shrestha Badri Bhakta, Abdul Wahid Mohamed RASMY, USHIYAMA Tomoki, Ralph Allen ACIERTO, KAWAMOTO Takatoshi, FUJIKANE Masakazu, SHINYA Takafumi, KUBOTA Keijiro | Journal of Flood Risk Management | Wiley | Volume 18 | November 28, 2024 |
| 2024 | Flood direct damage assessment due to Typhoon Ulysses by satellite images | KURIHARA Yuta, MIYAMOTO Mamoru, SUNAKAWA Ryota | International Journal of Disaster Risk Reduction | Elsevier B.V. | Volume 118 | February 15, 2025 |
| 2024 | Flood Exposure Dynamics and Quantitative Evaluation of Low-Cost Flood Control Measures in the Bengawan Solo River Basin of Indonesia | Badri Bhakta Shrestha, Mohamed RASMY, KURIBAYASHI Daisuke | Hydrology | MDPI | Volume 12 | February 17, 2025 |
| 2024 | Assessing climate change-driven social flood exposures and flood damage to residential areas in the Solo River basin of Indonesia | Badri Bhakta Shrestha, Mohamed RASMY, USHIYAMA Tomoki, Ralph Allen Acierto, KURIBAYASHI Daisuke, KUBOTA Keijiro | Modeling Earth Systems and Environment(MESE) | Springer Nature | Volume 11 | February 24, 2025 |
| 2024 | Spatial Analysis of Disadvantaged Population: A Case Study of Flood Exposure in the Itapocu River Basin, Brazil | Rafael Silva Araujo, OHARA Miho, MIYAMOTO Mamoru, TAKEUCHI Kuniyoshi | Journal of Flood Risk Management | Wiley | Volume 18 | March 14, 2025 |
| 2024 | Development of Flash Flood Forecasting System for Small and Medium-Sized Rivers | IKEUCHI Koji, KAKINUMA Daiki, NAKAMURA Yosuke, NUMATA Shingo, MOCHIZUKI Takafumi, KUBOTA Keijiro, YASUKAWA Masaki, NEMOTO Toshihiro, KOIKE Toshio | Journal of Flood Risk Management | Wiley | Volume 18 | March 25, 2025 |
| 2025 | Ecological Land Reanalysis: Vegetation Water Content and Soil Moisture Data by Land Data Assimilation | SAWADA Yohei, FUJII Hideyuki, TSUTSUI Hiroyuki, AIDA Kentaro, SHIMADA Rigen, KACHI Misako and KOIKE Toshio | Geoscience Data Journal | | Volume12, Issue4 https://doi.org/10.1002/gdj3.70025 | August 10, 2025 |
| 2025 | Evaluating future warming impacts on probable maximum precipitation using DAD analysis: insights from 5-km d4PDF ensembles in Kyushu | Ralph Allen Acierto, KOIKE Toshio, USHIYAMA Tomoki, TANAKA Yozo and KUBOTA Keijiro | Hydrological Research Letters | | https://doi.org/10.3178/hrl.25-00003 | August 9, 2025 |
| 2025 | Impact of Urbanization on Flooding and Risk Based on Hydrologic-Hydraulic Modeling and Analytic Hierarchy Process: A Case of Kathmandu Valley of Nepal | Badri Bhakta Shrestha, Mohamed RASMY, TAMAKAWA Katsunori, Sauhardra Joshi and KURIBAYASHI Daisuke | Hydrology | MDPI | Volume 12, Issue 11 https://doi.org/10.3390/hydrology12110283 | October 30, 2025 |
| 2025 | 川幅と流域面積の関係に係る要因分析 | 南雲 直子、江頭 進治、久保 純子 | 地理学評論 | 日本地理学会 | 98巻6号 | 2025年11月 |

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| 2025 | 慣性を考慮した新しい流量流積関係式と浅水方程式に代わる実用的な表現形式の提案 | 小石 一字、山田 正、山田 朋人 | 土木学会論文集 | 土木学会 | 82巻1号 https://doi.org/10.2208/jscej.25-00097 | 2026年1月 |
| 2025 | An integrated framework for strengthening local agriculture drought management | Hassan Haren Hote, KOIKE Toshio, TSUTSUI Hiroyuki and Mohamed Rasmy Abdul Wahid | Water Policy | | Volume 28 Issue 2 https://doi.org/10.2166/wp.2026.144 | February 1, 2026 |
| 2025 | Sediment Sorting Processes Affected by Tidal Currents in the Meghna Estuary | Md. Shahinur Rahman, HARADA Daisuke and EGASHIRA Shinji | Journal of Disaster Research | | Volume 21 (2026) Issue 1 https://doi.org/10.20965/jdr.2026.p0266 | February 1, 2026 |

ANNEX-4 Number of Publication

| ICHARM Newsletter Vol. | Vol.41 | Vol.42 | Vol.43 | Vol.44 | Vol.45 | Vol.46 | Vol.47 | Total |
|---|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|
| A: Peer Reviewed Paper / 査読付論文 | 3 | 9 | 24 | 7 | 2 | 7 | 3 | 55 |
| B: Non-peer Reviewed Paper / 査読無し論文 | 0 | 0 | 0 | 0 | 1 | 3 | 1 | 5 |
| C: Oral Presentation / 口頭発表 | 27 | 14 | 12 | 7 | 15 | 8 | 12 | 95 |
| D: Poster Presentation / ポスター発表 | 2 | 0 | 2 | 1 | 5 | 9 | 2 | 21 |
| E: Paper in technical magazine / 技術雑誌論文 | 1 | 0 | 8 | 0 | 1 | 0 | 0 | 10 |
| F: PWRI Publication / 土木研究所刊行物 | 1 | 1 | 1 | 1 | 0 | 2 | 0 | 6 |
| 合計 Total | 34 | 24 | 47 | 16 | 24 | 29 | 18 | 192 |

| ICHARM Newsletter Vol. | Vol.48 | Vol.49 | Total |
|--|-----------|-----------|-----------|
| 1. Oral presentation (including invited lecture) | 8 | 17 | 25 |
| 2. Poster presentation | 3 | 6 | 9 |
| 3. Journal, etc. | 16 | 6 | 22 |
| 4. Magazine, Article | 0 | 2 | 2 |
| 5. PWRI publication | 1 | 1 | 2 |
| 6. Others | 0 | 0 | 0 |
| 合計 Total | 28 | 32 | 60 |

| ICHARM Newsletter Vol. | Vol.50 | Vol.51 | Vol.52 | Vol.53 | Vol.54 | Vol.55 | Vol.56 | Vol.57 | Vol.58 | Vol.59 | Vol.60 | Vol.61 | Vol.62 | Vol.63 | Vol.64 | Vol.65 | Vol.66 | Vol.67 | Vol.68 | Vol.69 | Vol.70 | Vol.71 | Vol.72 | Vol.73 | Vol.74 | Vol.75 |
|--|-----------|-----------|-----------|-----------|----------|-----------|-----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|----------|-----------|-----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 1. Journals, etc. / 学術雑誌 (論文誌、ジャーナル) | 2 | 9 | 3 | 4 | 4 | 7 | 2 | 2 | 0 | 0 | 3 | 1 | 0 | 1 | 2 | 2 | 2 | 11 | 3 | 0 | 0 | 3 | 9 | 8 | 2 | 1 |
| 2. Oral Presentations (Including invited lectures) / 口頭発表 (招待講演含む) | 18 | 23 | 4 | 4 | 2 | 12 | 1 | 1 | 8 | 5 | 3 | 3 | 2 | 12 | 11 | 4 | 4 | 5 | 39 | 5 | 11 | 6 | 1 | 9 | 6 | 11 |
| 3. Poster Presentations / ポスター発表 | 3 | 2 | 0 | 5 | 0 | 7 | 1 | 0 | 1 | 1 | 0 | 3 | 2 | 2 | 1 | 3 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 8 | 2 |
| 4. Magazines, Articles / 雑誌、記事 (土技資含む) | 0 | 0 | 3 | 0 | 0 | 2 | 11 | 0 | 0 | 0 | 2 | 1 | 0 | 3 | 7 | 1 | 2 | 7 | 2 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| 5. PWRI Publications / 土研刊行物 (土研資料等) | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 3 | 2 |
| 6. Other/ その他 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 合計 Total | 25 | 35 | 10 | 14 | 6 | 28 | 15 | 4 | 9 | 6 | 8 | 8 | 4 | 18 | 21 | 10 | 9 | 23 | 46 | 5 | 13 | 11 | 12 | 17 | 20 | 16 |

| ICHARM Newsletter Vol. | Vol.76 | Vol.77 | Vol.78 | Vol.79 | Vol.80 | Vol.81 | Vol.82 | Vol.83 | Vol.84 | Vol.85 | Vol.86 | Vol.87 | Vol.88 | Vol.89 | Vol.90 | Vol.91 | Vol.92 | Vol.93 | Vol.94 | Vol.95 | Vol.96 | Vol.97 | Vol.98 | Vol.99 | Vol.100 | Total |
|--|-----------|----------|----------|-----------|----------|----------|----------|-----------|-----------|-----------|----------|-----------|-----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----------|----------|-----------|----------|------------|
| 1. Journals, etc. / 学術雑誌 (論文誌、ジャーナル) | 6 | 0 | 1 | 3 | 3 | 1 | 0 | 1 | 2 | 2 | 2 | 11 | 3 | 0 | 0 | 3 | 9 | 8 | 2 | 1 | 6 | 0 | 1 | 3 | 3 | 152 |
| 2. Oral Presentations (Including invited lectures) / 口頭発表 (招待講演含む) | 1 | 4 | 2 | 6 | 2 | 3 | 2 | 12 | 11 | 4 | 4 | 5 | 39 | 5 | 11 | 6 | 1 | 9 | 6 | 11 | 1 | 4 | 2 | 6 | 2 | 369 |
| 3. Poster Presentations / ポスター発表 | 2 | 1 | 1 | 1 | 0 | 3 | 2 | 2 | 1 | 3 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 8 | 2 | 2 | 1 | 1 | 1 | 0 | 78 |
| 4. Magazines, Articles / 雑誌、記事 (土技資含む) | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 7 | 1 | 2 | 7 | 2 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 72 |
| 5. PWRI Publications / 土研刊行物 (土研資料等) | 0 | 0 | 2 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 3 | 2 | 0 | 0 | 2 | 3 | 0 | 29 |
| 6. Other/ その他 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| 合計 Total | 11 | 5 | 6 | 13 | 5 | 8 | 4 | 18 | 21 | 10 | 9 | 23 | 46 | 5 | 13 | 11 | 12 | 17 | 20 | 16 | 11 | 5 | 6 | 13 | 5 | 706 |

ANNEX-5 List of theses by master's and doctoral students

Master's course

| Year | Country | Author | Title |
|-----------|------------------|---|--|
| 2015-2016 | Bangladesh | AHMED Tanjir Saif | SEDIMENTATION AND ITS COUNTERMEASURE AT THE OFF-TAKE AREA OF NEW DHALESWARI RIVER |
| | Bangladesh | HOWLADER Md Mamun | STUDY ON PROACTIVE BREACH OF SUBMERSIBLE EMBANKMENT FOR ITS SUSTAINABLE MAINTENANCE IN HAOR ARREA |
| | Brazil | SAIA ALMEIDA LEITE Francisco | EVALUATION OF FLOOD CONTROL COUNTERMEASURES CONSIDERING CLIMATE CHANGE -CASE STUDY: ITAJAI RIVER BASIN, BRAZIL- |
| | Maldives | MOOSA Fathimath Shaushan | WATER SHORTAGE MANAGEMENT AND ADOPTATION TO CLIMATE CHANGE IN MALDIVES |
| | Myanmar | Myo Myat Thu | ANALYSIS OF FLOODS AND DROUGHTS IN THE BAGO RIVER BASIN, MYANMAR, UNDER CLIMATE CHANGE |
| | Nepal | SHARMA Gopal | Method for predicting sediment runoff processes and channel changes in West Rapti River, Nepal |
| | Pakistan | BILAL Rashid | TRANSBOUNDARY FLOOD FORECASTING THROUGH DOWNSCALING OF GLOBAL WEATHER FORECASTING AND RRI MODEL SIMULATION |
| | Pakistan | KHAN Irfan Ullah | INCORPORATION OF SNOW AND GLACIER MELT PROCESSES IN RRI MODEL FOR ESTIMATING PEAK RIVER DISCHARGES AND INUNDATION ANALYSIS IN NEELUM RIVER BASIN |
| | Philippines | JACELDONE Catherine Guevarra | SEDIMENT TRANSPORT PROCESSES IN MOUNTAIN AREA OF KINUGAWA RIVER |
| | Sri Lanka | BABARANDE GURUGE Thanura Lasantha | Integrated Water Resources Management for Eastern Dry Zone of Sri Lanka |
| | Sri Lanka | SINNAPPOO Kokularamanan | DEVELOPMENT OF A FLOOD FORECASTING AND DATA DISSEMINATION SYSTEM FOR KALU RIVER BASIN IN SRI LANKA |
| | Timor-Leste | DE ARAUJO Antonio | FLOOD RISK INDEX ANALYSIS FOR CUHA RIVER BASIN, TIMOR - LESTE |
| Zimbabwe | RUKARWA Lorraine | DROUGHT AND FLOOD RISK ASSESSMENT ON MANYAME RIVER BASIN, ZIMBABWE UNDER CLIMATE CHANGE | |
| 2016-2017 | Brazil | MIKOSZ Lucas | Sendai Framework Indicators for Disaster Risk Reduction in Brazil: Initial Conditions, Feasibility Analysis and Understanding the Risk |
| | Malawi | GAMA Samuel Joseph | FLOOD HAZARD AND RISK ASSESSMENT UNDER CLIMATE CHANGE IN THE LOWER SHIRE BASIN, MALAWI |
| | Mozambique | LEVI Danyvan Stelio Do Rosario | Development of an Effective Operation of Pequenos Libombos Dam in the Context of Climate Change in Mozambique |
| | Myanmar | Su Su Kyi | Investigating the Impact of Climate Change on Flooding in the Sittaung River Basin, Myanmar |
| | Pakistan | MUHAMMAD Gul | SIMULATING HYDROLOGICAL RESPONSE OF SNOW AND GLACIER MELT AND ESTIMATING FLOOD PEAK DISCHARGE IN SWAT RIVER BASIN, PAKISTAN |
| | Pakistan | JAMAL Habib | TRANS BOUNDARY FLOOD FORECASTING THROUGH DOWNSCALING OF GLOBAL WEATHER FORECAST AND HYDROLOGICAL MODEL SIMULATION |
| | Papua New Guinea | DAGWIN Dagwin Markl | METHOD OF FLOOD HAZARD MAPPING IN UNGAUGED MARKHAM RIVER BASIN IN PAPUA NEW GUINEA |
| | Timor-Leste | DOS REIS HANJAN CORBAFO Letigia | INVESTIGATION OF HYDROLOGICAL RESPONSE OF FLOOD CONTROL SCENARIOS AND ASSESSMENT OF THE EFFECTIVENESS IN COMORO RIVER BASIN DILI, TIMOR-LESTE |

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| | Vietnam | NGUYEN Van Hoang | ANALYSIS OF EFFECTIVE RESERVOIR OPERATION FOR MITIGATING FLOOD DAMAGES IN A VUONG DAM BASIN, VIETNAM |
| | Vietnam | LE Thi Phuong Thanh | STUDY ABOUT COASTAL EROSION IN TIEN GIANG PROVINCE, VIETNAM WITH NUMERICAL SIMULATION |
| 2017-2018 | Bangladesh | HAQUE Md Nazmul | BED FORM AND SIDE BANK EROSION OF PADMA RIVER REACH |
| | Bangladesh | ISLAM Md Rabiul | INVESTIGATING THE IMPACT OF CLIMATE CHANGE ON FLOODING IN THE TEESTA RIVER BASIN, BANGLADESH |
| | Brazil | GALVANESE KUHLMANN Leandro | AN INTEGRATED FLOOD DAMAGE ASSESSMENT IN BRAZIL |
| | Fiji | MATAITOGA Mesake | REGIONAL DISASTER PROFILES IN THE SOUTH PACIFIC REVEALED BY THE SOUTH PACIFIC CONVERGENCE ZONE POSITION |
| | India | VENKATESAN Vasanthakumar | DEVELOPMENT OF SATELLITE RAINFALL BASED APPROACH FOR EFFECTIVE FLOOD DISASTER AND WATER RESOURCE MANAGEMENT IN TRANSBOUNDARY RIVERS -A CASE OF GANDAK RIVER BASIN |
| | Nepal | PANDIT Shambhu Raj | IMPACT OF SEDIMENT SUPPLY CONDITION ON MORPHOLOGICAL CHANGE ALONG LOWER WEST RAPTI RIVER, NEPAL |
| | Nepal | ADHIKARI Bishnu Hari | PREDICTION OF SEDIMENT RUN-OFF PROCESSES IN WEST RAPTI RIVER BASIN, NEPAL |
| | Pakistan | MUGHAL Saqib Jahangir | INTEGRATED WATER RESOURCES MANAGEMENT THROUGH EFFICIENT RESERVOIR OPERATION IN SWAT RIVER BASIN, PAKISTAN |
| | Pakistan | ASGHAR Malik Rizwan | REAL TIME FLOOD AND INUNDATION FORECAST IN TRANS-BOUNDARY RIVER BASIN USING MULTI-MODEL HIGH RESOLUTION PRECIPITATION FORECAST |
| | Philippines | GO OC Sheila Joy | ASSESSMENT OF FLOOD IMPACT ON LOCAL SOCIO-ECONOMIC DEVELOPMENT IN THE DAVAO RIVER FLOODPLAIN, PHILIPPINES |
| | Sri Lanka | MAHESWARAN Myuran | DEVELOPMENT OF EFFECTIVE WATER USAGE PLAN FOR DRY ZONE OF SRI LANKA: CASE STUDY IN MALWATHU OYA BASIN |
| | Sri Lanka | AYASINGHE Roshan Indika | DEVELOPMENT OF AN INTEGRATED RESEARCH METHOD FOR EFFECTIVE WATER RESOURCE MANAGEMENT IN A COMPLEX WATERSHED SYSTEM: THE CASE OF MAHAWELI RIVER BASIN |
| | Tanzania | KIRIWAI John Mathias | EFFECTS OF INFRASTRUCTURE CONSTRUCTION IN FLOOD DISASTER PRONE AREAS CASE STUDY: CONSTRUCTION OF DUMILA-RUDEWA-KILOSA-MIKUMI ROAD |
| Vietnam | DAO Thu Anh | RISK ASSESSMENT OF URBANIZATION PLAN IN MA RIVER BASIN, THANH HOA PROVINCE | |
| 2018-2019 | Bangladesh | JAMAN A F M Tauhid | STUDY ON CHANNEL CHANGES AND BED DEFORMATION IN CONFLUENCE REGION OF GANGES AND JAMUNA RIVERS UNDER DIFFERENT INFLOW CONDITIONS |
| | India | Kale Ravindra Vitthal | DEVELOPMENT OF INTEGRATED HYDROLOGICAL MODELLING FRAMEWORK FOR FLOOD INUNDATION MAPPING IN BRAHMANI-BAITARANI RIVER BASIN, INDIA |
| | Liberia | DAVIS Cynthia Wantee | ANALYSIS OF CLIMATE CHANGE IMPACT USING BIAS-CORRECTED PRECIPITATION IN ST. PAUL RIVER BASIN, LIBERIA |
| | Nepal | ACHARYA Dhaka Ram | INFLUENCE OF SAND BAR BEHAVIOUR ON CHANNEL CHANGES ALONG KALIGANDAKI RIVER, NEPAL |
| | Pakistan | IMRAN Ali | ASSESSMENT OF THE CLIMATE CHANGE IMPACT ON THE FLOOD RISK CHANGE IN CHENAB RIVER BASIN |

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|-----------|-------------|----------------------------------|---|
| | Philippines | VALENCIA Christian Darwin | RRI MODEL-BASED FLOOD EVACUATION TIMELINE OF CITY AND MUNICIPALITY LGUs IN PAMPANGA RIVER BASIN, PHILIPPINES |
| | Sri Lanka | MOHAMED THAJUDEEN Mohamed Zuhail | DEVELOPMENT OF INTEGRATED WATER RESOURCES MANAGEMENT PLAN FOR EASTERN DRY ZONE IN SRI LANKA Case Study: Gal Oya River Basin |
| | Myanmar | Shwe Pyi Tan | DEVELOPMENT OF INTEGRATED WATER RESOURCES MANAGEMENT PLANS OF SITTAUNG RIVER BASIN UNDER CHANGING CLIMATE |
| 2019-2020 | Bangladesh | ISLAM Md Masbahul | A NUMERICAL STUDY ON BANK EROSION OF A BRAIDED CHANNEL: CASE STUDY OF THE "TANGAIL AND MANIKGANJ DISTRICTS ALONG THE BRAHMAPUTRA RIVER" |
| | Bangladesh | RAHMAN Md Shahinur | STUDY ON FLOW PATTERN AND ASSOCIATED BED DEFORMATION IN THE OFF-TAKE REGION OF GORAI RIVER, BANGLADESH |
| | Bhutan | PHUNTSHO Tashi | COMPREHENSIVE EVALUATION OF FLOOD MITIGATION MEASURES BASED ON CLIMATE CHANGE IMPACT ASSESSMENT IN THE WANGCHU BASIN |
| | Bhutan | DORJI Nima | ASSESSMENT OF WATER RESOURCES UNDER CHANGING CLIMATE FOR EFFECTIVE HYDROPOWER AND AGRICULTURE PRODUCTIONS IN PUNA TSANGCHHU BASIN, BHUTAN |
| | Brazil | SILVA ARAUJO Rafael | FLOOD IMPACT ASSESSMENT IN THE ITAPOCU RIVER BASIN, BRAZIL |
| | Brazil | MARTINS AMENO Herman Ziyang | HAZARDOUS AREA RESULTING FROM TAILINGS DAM FAILURE |
| 2020-2021 | Bangladesh | AHMED Farzana | STUDY ON THE MORPHOLOGICAL CHARACTERISTICS OF DAWKI-PIYAN RIVER SYSTEM IN BANGLADESH |
| | Bhutan | TSHEWANG Nedrup | ASSESSMENT OF INTEGRATED WATER RESOURCES MANAGEMENT UNDER CLIMATE CHANGE IN WANGCHU BASIN, BHUTAN |
| | Bhutan | ZANGPO Jamyang | IMPACT ASSESSMENT ON EXTREME FLOODS DUE TO CLIMATE AND SOCIAL CHANGES IN THE AMOCHU BASIN, BHUTAN |
| | Malaysia | Norain Binti Osman | FLOOD DAMAGE INSPECTION METHOD FOR PUBLIC BUILDINGS IN MALAYSIA |
| | Mauritius | KOWLESSER Akshay Prakash | A STUDY ON AN INTEGRATED WATER RESOURCES MANAGEMENT PLAN UNDER CLIMATE CHANGE FOR GRAND RIVER NORTH WEST RIVER BASIN, MAURITIUS |
| | Myanmar | Aye Mon Khaing | METHOD FOR PREDICTING THE SEDIMENT RUNOFF PROCESS DUE TO HEAVY RAINFALL IN THE YAZAGYO RESERVOIR BASIN, MYANMAR |
| | Tonga | AHO Tevita | IMPACT OF CLIMATE CHANGE, SEA-LEVEL RISE IN TONGATAPU, HA'APAI AND ITS EFFECT ON LIVELIHOOD |
| 2021-2022 | Bangladesh | ALAM Md Shariful | NUMERICAL STUDY TO PREDICT SEDIMENT RUNOFF PROCESS IN THE MATAMUHURI RIVER BASIN, BANGLADESH |
| | Bangladesh | HASAN Md Khairul | DEVELOPMENT OF AN INTEGRATED WATER RESOURCES MANAGEMENT PLAN FOR THE SANGU RIVER BASIN UNDER CLIMATE CHANGE |
| | Bhutan | NEOPANEY Megnath | ASSESSMENT OF CLIMATE CHANGE IMPACTS ON EXTREME FLOODS IN THE CHAMKHARCHU SUB-BASIN, BHUTAN |
| | Indonesia | HAFIZH Abdul | ASSESSMENT OF FLOOD RISK AND IMPACT BASED EARLY WARNING SYSTEM IN THE CIDURIAN RIVER BASIN, INDONESIA |
| | Malawi | NDAU Hanke Titus Lloyd | MODELING THE IMPACT OF LAND COVER CHANGE ON FLOOD RISK IN THE LOWER SHIRE RIVER BASIN, MALAWI |

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| | Malaysia | Raja Noraini Binti RAJA YUSOF | CRITICAL RAINFALL CONDITIONS FOR LANDSLIDES OCCURENCES TO DEVELOP WARNING SYSTEM IN CAMERON HIGHLANDS, PAHANG, MALAYSIA |
| | Malaysia | Siti Adabiyah Binti SULAIMAN | PREDICTION OF SEDIMENT TRANSPORT PROCESSES IN THE UPPER KINTA RIVER BASIN, MALAYSIA |
| | Nepal | KHADKA Suresh | ANALYSIS OF WATERCOURSE CHANGE DURING ALLUVIAL FAN FORMATION AND COUNTERMEASURE FOR STABILIZATION OF CHANNEL FLOW IN KARNALI RIVER, NEPAL |
| | Philippines | ABELARDO Ailene | IMPROVEMENT OF FLOOD FORECASTING FOR STRENGTHENING FLOOD RESILIENCE IN THE AGNO RIVER BASIN |
| | Philippines | CABRAL Erwin Rafael | CLIMATE CHANGE AND URBANIZATION IMPACT ASSESSMENT ON INUNDATION CHARACTERISTICS OF LAGUNA DE BAY BASIN |
| | Sri Lanka | IBRA LEBBE Ziyaroun | CREATING AN EFFECTIVE FLOOD MANAGEMENT PLAN TO IMPROVE THE STANDARD OF LIVING WITHIN THE MUDUN ELA BASIN, SRI LANKA |
| | Sri Lanka | PARANAGAMA MANANAGE Aruna Uthpala Samarathunga | A STUDY ON CLIMATE CHANGE IMPACTS ON EXTREME RAINFALL AND FLOOD EVENTS IN THE KALU RIVER BASIN, SRI LANKA |
| | Sri Lanka | SANDRASEGARAM Nerojan | DEVELOPMENT OF INTEGRATED WATER RESOURCES MANAGEMENT FOR EASTERN DRY ZONE IN SRI LANKA UNDER CHANGING CLIMATE: THE CASE OF MUNDENI, MAGALAWADUWAN, AND ANDELLAOYA RIVER BASINS |
| 2022-2023 | Bhutan | Ugyen Phuntsho | BASIN-SCALE SEDIMENT TRANSPORT FOR SUSTAINABLE SAND MINING: A CASE STUDY IN PUNATSHANGCHHU BASIN, BHUTAN |
| | Bhutan | Pema Cheda | DEVELOPMENT OF FLOOD RISK MITIGATION STRATEGIES CONSIDERING CLIMATE CHANGE IMPACT IN THE PARO RIVER BASIN, BHUTAN |
| | Pakistan | Abbas Muhammad YAWAR | STUDY OF MORPHOLOGICAL CHANGES AND EFFECTIVE COUNTERMEASURES BY USING SPUR DIKE FOR RIVER MANAGEMENT: A CASE STUDY AT INDUS RIVER SKARDU GILGIT-BALTISTAN |
| | Pakistan | Muhammad Farooq | INTERCOMPARISON OF CLIMATE CHANGE IMPACT ON RAINFALL CHARACTERISTICS AND FLOOD MITIGATION STRATEGIES IN FOUR MAJOR RIVER BASINS OF PAKISTAN |
| | Philippines | Lady Ella C. Chu | CLIMATE AND DISASTER RISK ASSESSMENT USING HYDROLOGICAL MODELING AND FREQUENCY ANALYSIS APPROACHES FOR MUNICIPALITIES IN THE TAGO RIVER BASIN, PHILIPPINES |
| | Philippines | HORACE HOGAN FRIGILLANA | INUNDATION PROCESSES OF FLOOD FLOW WITH SEDIMENT TRANSPORTATION IN THE AGNO RIVER MIDDLE STREAM, PHILIPPINES |
| | Philippines | Lusabia John Paul Luching | SOCIO-ECONOMIC IMPACT ASSESSMENT OF FLOOD DISASTERS USING HYDROLOGICAL MODELING IN THE PANAY RIVER BASIN, PHILIPPINES |
| | Philippines | Allen B. Orogo | BASIN-WIDE FLOOD FORECASTING WITH NWP MODELS' RAINFALL FORECASTS FOR THE INTERACTION OF TROPICAL CYCLONE-MONSOON EVENTS IN THE BICOL RIVER BASIN |
| | Sri Lanka | JAYATHILAKA Ralapahana Mudalige Charya Prabodha Sri | DESIGN OF ADAPTATION MEASURES BASED ON THE ASSESSMENT OF CLIMATE CHANGE IMPACTS ON EXTREME FLOODS IN THE ATTANAGALU OYA BASIN, SRI LANKA |

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| | Sri Lanka | Ranapura Dewage Thilini Kaushalya | DEVELOPMENT OF AN INTEGRATED WATER RESOURCES MANAGEMENT PLAN INCORPORATING THE CLIMATE CHANGE IMPACT ON THE MALWATHU OYA BASIN, SRI LANKA |
| | Timor-Leste | Ligia Mediadora Amaral Soares | FLOOD INUNDATION ANALYSIS IN LACLO RIVER BASIN MANATUTO MUNICIPALITY, TIMOR LESTE FOR EFFECTIVE COUNTERMEASURES |
| | Tunisia | Housem Youssfi | ASSESSING FLOOD RISK UNDER CLIMATE CHANGE BY DOWNSCALING THE MAJERDA RIVER BASIN SCALE TO A MUNICIPALITY SCALE IN BOU SALEM, TUNISIA |
| | Timor-Leste | Zeferino De Fatima Tilman | FLOOD INUNDATION AND RISK ASSESSMENT IN THE WELOLO RIVER BASIN, TIMOR-LESTE |
| 2023-2024 | BANGLADESH | TABASSUM Khoshnoor | NUMERICAL ANALYSIS OF FLOW PATTERN AND MORPHOLOGICAL CHANGES IN TIDAL REACH OF SANGU RIVER, BANGLADESH |
| | HONDURAS | CABALLERO FIGUEROA Eduardo Jose | STRUCTURAL COUNTERMEASURES PROPOSAL FOR FLOOD DISASTER MANAGEMENT IN THE SULA VALLEY, HONDURAS |
| | INDONESIA | Tanjung Luthfi Azizah | Investigating the Effectiveness of the Present & Future Flood Management Approaches in an Interbasin River Network: The Case of Seluna River System, Indonesia |
| | MALAWI | KACHIGWADA Ephod | A NUMERICAL STUDY ON RAINFALL-INDUCED LANDSLIDES AND DEBRIS FLOW HAZARDS IN NKHULAMBE CATCHMENT AREA |
| | MALAWI | Nkhata Romatchinga | ASSESSMENT OF CLIMATE CHANGE IMPACTS ON EXTREME FLOODS IN RUO RIVER BASIN, MALAWI |
| | MALAWI | Longwe Faith Sekani | Analysis of Effective Flood Mitigation Measures in the Lower Shire River Basin, Malawi |
| | MOROCCO | El Hamri Fatima Ezzahra | FLASH FLOODS IN WADI SYSTEMS AND THEIR IMPACT ON INFRASTRUCTURE A CASE STUDY OF THE UPPER DRAA WADI SYSTEM IN MOROCCO |
| | PAKISTAN | Din Salah Ud | HYDRO-CLIMATOLOGICAL ASSESSMENT IN THE UNGAUGED CRYOSPHERE OF THE KURRAM RIVER BASIN, PAKISTAN* *Scientific journal article in preparation for submission |
| | PHILIPPINES | Maskay Samuel Gat-onen | Integrated Flood Risk Analysis for Riverine Community in Chico River Basin, Mountain Province, Philippines |
| | SRI LANKA | JAYAWARDHANA Mudiyansele Madhura Bandara Jayawardhana | ASSESSMENT OF CLIMATE CHANGE IMPACTS ON EXTREME FLOODS AND LAND DEVELOPMENT IN THE KELANI RIVER BASIN, SRI LANKA |
| | SRI LANKA | Markandu MAURAN | INVESTIGATION OF RIVER-LAGOON-FLOOD NEXUS UNDER CLIMATE CHANGE: THE CASE OF BATTICALOA LAGOON AND CONNECTED RIVER SYSTEM, SRI LANKA |
| SRI LANKA | ABDUL SAMAD Mohamed Ziyath | A STUDY ON THE IMPLEMENTATION OF THE UN EARLY WARNING FOR ALL INITIATIVE: A CASE STUDY IN THE KATTANKUDY URBAN COUNCIL AREA IN BATTICALOA DISTRICT, SRI LANKA | |
| TIMOR-LESTE | Teles Fernandes Simao | Impact of Climate Change on Flooding in the Comoro River Basin Dili, Timor-Leste | |
| 2024-2025 | Bangladesh | Farukuzzaman | NUMERICAL STUDY ON SEDIMENT TRANSPORT PROCESSES AND ASSOCIATED MORPHOLOGICAL CHANGES OF THE TEESTA RIVER, BANGLADESH |
| | Mexico | Ramirez Gonzalez Nina Danae | SUGGESTION OF EFFECTIVE COUNTERMEASURES BASED ON FLOOD IMPACT ASSESSMENT UNDER CLIMATE CHANGE IN THE JAMAPA RIVER BASIN, MEXICO |

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| | Peru | Bautista Mejia Jhon Alex | SEDIMENT TRANSPORT AND THE ASSOCIATED HAZARDS IN ARID RIVER BASINS: A CASE STUDY OF THE CHANCAY HUARAL RIVER BASIN, PERU |
| | Peru | Vidal Moreno James Dean | ENHANCING EARLY FLOOD WARNING IN THE PIURA RIVER BASIN THROUGH A HYBRID APPROACH USING DEEP LEARNING |
| | Philippines | BADUA Dean Aldrene Omo | ASSESSING CLIMATE CHANGE IMPACTS ON RIVER HYDROLOGY AND DAM OPERATIONAL RESPONSES FOR DISASTER RISK REDUCTION POLICY IN THE PHILIPPINES: THE CASE OF AGNO RIVER BASIN |
| | Sri Lanka | LENORA Robolge Ushali Hasinika | DEVELOPMENT OF EVIDENCE-BASED LAND USE POLICY ASSOCIATED WITH EXTREME FLOODS UNDER CLIMATE CHANGE IN THE BOLGODA BASIN, SRI LANKA |
| | Timor-Leste | Pinto Fernandes Flaviana | PROBABILISTIC FLOOD FORECASTING AND EARLY WARNING INFORMATION USING ENSEMBLE TECHNIQUES AND HYDROLOGICAL MODEL SIMULATIONS FOR THE COMORO RIVER BASIN AND URBAN AREA OF DILI CITY, TIMOR-LESTE |

Doctoral course

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|-----------|------------|----------------------------|--|
| 2013-2016 | Guatemala | Andrea Mariel Juárez Lucas | RISK-BENEFIT ANALYSES TO BALANCE FLOOD RISK, LIVELIHOODS AND ECOSYSTEM SERVICES |
| 2013-2016 | Bangladesh | Nasif Md. Ahsan | DISASTER PREPAREDNESS AT HOUSEHOLD AND COMMUNITY LEVELS: THE CASE OF CYCLONE PRONE COASTAL BANGLADESH |
| 2013-2016 | Bangladesh | Robin Kumar Biswas | NUMERICAL PREDICTION OF CHANNEL IN LARGE, BRAIDED RIVERS DOMINATED BY SUSPENDED SEDIMENT |
| 2015-2018 | Pakistan | Asif Naseer | DEVELOPMENT OF AN INTEGRATED HYDROLOGICAL MODELING FRAMEWORK IN MOUNTAINOUS AREAS INCLUDING RAINFALL AND SNOWFALL QUANTIFICATION DERIVED FROM DATA INTEGRATION |
| 2015-2018 | Bangladesh | Mahtab Mohammad Hossain | ASSESSMENT OF SELECTED STRATEGIES TO INCREASE ECONOMIC BENEFITS IN HAOR AREAS IN BANGLADESH |
| 2016-2019 | Pakistan | Ahmad Ali Gul | Fundamental Study for 2-D Numerical Simulation of Channel Changes in Large Rivers Dominated by Fine Sediment |
| 2016-2019 | Bangladesh | Md Khairul Islam | Developing a Methodology for Integrated Flood Risk Assessment in a Transboundary River Basin Using Multi-Platform Data Under Global Change– the Case of the Meghna River Basin |
| 2017-2020 | Bangladesh | Ahmed Tanjir Saif | Numerical Study on Tidal Currents and Bedmorphology in Sittaung River Estuary, Myanma |
| 2018-2021 | Sri Lanka | Hemakanth Selvarajah | A study on climate change adaptation and resilience strategies for optimizing benefits of the Mahaweli River Basin in Sri Lanka. |
| 2018-2021 | Vietnam | Nguyen Van Hoang | Integrated Operation of Reservoirs for Maximizing Hydropower and Reducing Flood Risk |
| 2018-2021 | Japan | Osamu Itagaki | 流域治水の推進に必要な合意形成のための減災対策による被害軽減効果の評価手法の研究 |
| 2020-2023 | Ethiopia | Mihretab Gebretsadik Tedla | A STUDY ON AN INTEGRATED WATER RESOURCES MANAGEMENT PRACTICE FOR SUSTAINABLE TRANSBOUNDARY RIVER BASIN DEVELOPMENT: THE CASE OF THE BLUE NILE BASIN |
| 2020-2023 | Bangladesh | Md. Majadur Rahman | STUDY ON SEDIMENT RUNOFF AND MORPHOLOGICAL CHANGES IN THE SANGU RIVER BASIN, BANGLADESH |

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|------------|-------------|--|--|
| 2021 -2024 | Philippines | Vicente de Guzman Ballaran Jr. | DEVELOPING AN INTEGRATED APPROACH FOR OPTIMIZING THE CLIMATE CHANGE IMPACT ON WATER AND AGRICULTURE NEXUS IN THE PHILIPPINES: THE CASE OF PASIG-MARIKINA RIVER AND LAGUNA LAKE BASIN |
| 2021 -2024 | Sri Lanka | Sanjeewa Punsiri Bandara Illangasingha | A HOLISTIC ANALYSIS SYSTEM TO SUPPORT WATER RESOURCE POLICY DECISIONS UNDER CLIMATE CHANGE) |
| 2021 -2024 | Nepal | Narayan Prasad Subedi | STUDY ON FLOOD HAZARDS WITH SEDIMENT TRANSPORTATION AND ASSOCIATED DAMAGE ASSESSMENT IN THE FLOODPLAIN OF WEST RAPTI RIVER, NEPAL |
| 2022-2025 | Sri Lanka | Jayasekara Sachintha | AN INVESTIGATION OF TROPICAL CYCLONE-DRIVEN EXTREME RAINFALL IN SRI LANKA: HISTORICAL TRENDS AND CLIMATE CHANGE PROJECTIONS |
| 2022-2025 | Pakistan | Hassan Haren Hote | INTEGRATED USE OF SOCIOECONOMIC VULNERABILITY ASSESSMENT AND HAZARD MODELING FOR LOCAL LEVEL FLOOD AND DROUGHT RISK REDUCTION |
| 2022-2025 | Bangladesh | Md. Shahinur Rahman | STUDY ON SEDIMENT TRANSPORT PROCESSES AFFECTED BY THE TIDAL CURRENTS, IN THE MEGHNA ESTUARY, BANGLADESH A Dissertation |
| 2022-2025 | Nepal | Subash Tuladhar | HYDROLOGICAL CHARACTERISTICS OF THE HIGH MOUNTAIN CRYOSPHERE AS A BASIS FOR INTEGRATED WATER RESOURCES MANAGEMENT |

ANNEX-6 International Flood Initiative (IFI) History 2016-2025

| Global/ Country | Year | Date | Title | Venue | Number of Participants | Photo |
|--------------------|------|---------------|---|---------------------------|---------------------------|---|
| Global | 2016 | 13-Jun | Side meeting on new IFI strategy 2016-2022 organized by UNESCO | Paris, France | 70 |  |
| Global | 2016 | 31-Oct | Adoptation of Jakarta Statement at Side event "Flood Resilience under Climate Change is Essential to Sustainable Development" in 8th High-level Experts and Leaders Panel (HELP) on Water and Disasters | Jakarta, Indonesia | ? |  |
| Global | 2017 | 10-Jan | Side event "Implementation Planning Workshop on International Flood Initiative (IFI) in Asia-Pacific" at 9th GEOSS Asia-Pacific Symposium | Tokyo, Japan | 53 |  |
| The Philippines | 2017 | 10-Mar | IFI Coordinating Meeting in the Philippines | Quezon City, Metro Manila | 26 |  |
| Pakistan | 2017 | 12-Apr | IFI Coordinating Meeting in Pakistan | Islamabad, Pakistan | ? |  |
| Myanmar | 2017 | 9-May | 1st High Level Consultation Meeting on IFI Coordination | Nay Pyi Taw, Myanmar | ? |  |
| The Philippines | 2017 | 15-Jun | Meeting for the Platform on Water-related Disasters | Pasay City, Metro Manila | ? |  |
| Global | 2017 | 20-Jul | Special Session on Science and Technology of 3rd UN Special Thematic Session on Water and Disasters | New York, U.S.A. | ? |  |
| Sri Lanka | 2017 | 24-Aug | Plenary Session for the Platform on Water and Disasters in Sri Lanka | Colombo, Sri Lanka | 30 |  |
| Global | 2017 | 8-Sep | IFI special session in ICFM7 | Leeds, UK | ? | |
| Global | 2017 | 18-20, Sep. | Asia Water Cycle Initiative (AWCI) session at 10th GEOSS Asia-Pacific Symposium | Hanoi, Vietnam | | |
| Myanmar | 2017 | 1-Nov | 2nd High Level Consultation Meeting on IFI Coordination | Nay Pyi Taw, Myanmar | 30 |  |
| Global | 2017 | 28-Nov | Technical session in World Bosai Forum | Sendai, Japan | ? | |
| Indonesia | 2018 | January 15-18 | Discussion on Establishment of IFI Platform in Indonesia | Jakarta, Indonesia | - |  |




| | | | | | | |
|-----------------|------|----------------------|---|--|----|---|
| The Philippines | 2018 | February 7-9 | Discussion on Establishment of IFI Platform in the Philippines | Manila, the Philippines | - |  |
| Sri Lanka | 2018 | 28-Mar | 2nd Plenary Session for the Platform on Water Resilience and Disasters in Sri Lanka | Colombo, Sri Lanka | 30 |  |
| Global | 2018 | 11-Jun | Side event "Platform on Water Resilience and Disasters" during the UNESCO-IHP Intergovernmental Council Meeting | Paris, France | ? |  |
| Global | 2018 | May 7-9 | Presentation in WMO Global Conference: Prosperity through Hydrological Services (HydroConference) | Geneva, Switzerland | - |  |
| The Philippines | 2018 | 18-May | IFI Platform Stakeholders' Meeting | Davao, The Philippines | 18 |  |
| Indonesia | 2018 | August 3-8 | Discussion on establishment of IFI Platform | Jakarta, Indonesia | - |  |
| Myanmar | 2018 | 5-Sep | Meeting on "Platform on Water Resilience and Disasters in Myanmar" | Yangon, Myanmar | 10 |  |
| Global | 2018 | October 24-25 | Asian Water Cycle Initiative (AWCI) Session, 12th Global Earth Observation System of Systems (GEOSS) Asia-Pacific Symposium | Kyoto, Japan | ? |  |
| Sri Lanka | 2019 | 18-Feb | MOU with the Irrigation Department, Sri Lanka | - | - |  |
| Sri Lanka | 2019 | February 20 | 3rd Plenary Session for the Platform on Water Resilience and Disasters | Colombo, Sri Lanka | 40 |  |
| Myanmar | 2019 | February 4th and 5th | DIAS training workshop and the 5th Disaster Management Collaboration Dialogue | Yangon, Myanmar | 12 |  |
| The Philippines | 2019 | 7-Feb | 3rd Plenary Meeting of the Platform on Water Resilience and Disasters in the Philippines | Quezon City of Metro Manila, the Philippines | 78 |  |
| The Philippines | 2019 | February | Launch of a real-time flood forecasting system in the Pampanga River basin, Philippines | - | - | |
| Indonesia | 2019 | 5-Aug | 1st meeting for the Platform on Water Resilience and Disasters in Indonesia | Jakarta, Indonesia | 30 |  |

| | | | | | | |
|-----------------|------|-------------------------|--|------------------------|----|---|
| Sri Lanka | 2019 | August 21-22 | Training on climate change prediction model analysis and rainfall-runoff-inundation model | Galgamuwa, Sri Lanka | 25 |  |
| The Philippines | 2019 | 25-Oct | Workshop "Orientation on Climate Change" | Davao, The Philippines | 46 |  |
| Global | 2019 | November 2-4 | Asian Water Cycle Initiative (AWCI) Session, 12th Asia-Oceania GEO (AOGEO) Symposium | Canberra, Australia | 40 |  |
| Sri Lanka | 2020 | 13-Feb | 4th Plenary Session for the Platform on Water Resilience and Disasters in Sri Lanka | Colombo, Sri Lanka | 50 |  |
| Indonesia | 2020 | 26-Feb | Orientation seminar on climate change adaptation | Surakarta, Indonesia | 40 |  |
| Global | 2021 | 26-Feb | Asian Water Cycle Initiative (AWCI) Session, 13th Asia-Oceania GEO (AOGEO) Symposium | (Online) | 60 |  |
| The Philippines | 2021 | April 19 to May 17 | E-learning & Workshop for Fostering "Facilitators" | (Online) | 29 |  |
| Global | 2021 | 29-Oct | Asian Water Cycle Initiative (AWCI) Session, 14th Asia-Oceania GEO (AOGEO) Symposium | (Online) | 50 |  |
| Indonesia | 2021 | October 5 to November 5 | E-learning & Workshops for Strengthening Water-related Disaster Resilience and Achieving Sustainable Development under Climate Change by ALL for Indonesia | (Online) | 35 |  |
| Global | 2022 | 21-Sep | Asian Water Cycle Initiative (AWCI) Session, 15th Asia-Oceania GEO (AOGEO) Symposium | (Online) | 50 |  |
| The Philippines | 2023 | 30-Jun | Online Synthesis System Training in Davao | Davao, The Philippines | 33 |  |
| The Philippines | 2023 | 3-Jul | 4th Platform plenary meeting | Davao, The Philippines | 60 |  |
| The Philippines | 2024 | 24-Jan | MOU with the Davao branch office of the Department of Science and Technology (DOST) and the Davao del Sur State University | (Online) | - |  |

| | | | | | | |
|-----------------|------|------------------|--|------------------------|------|---|
| Sri Lanka | 2024 | 15-Mar | 5th Plenary Meeting of the Platform on Water Resilience and Disasters in Sri Lanka | Colombo, Sri Lanka | 45 |  |
| Thailand | 2024 | 25-Mar | 1st Plenary Meeting of "Platform on Water Resilience and Disasters in Thailand" | Bangkok, Thailand | 81 |  |
| Indonesia | 2024 | 22-Apr | Second High-Level Meeting of the Platform on Water Resilience and Disasters | (Online) | 30 |  |
| The Philippines | 2024 | 30-Aug | e-learning session | Davao, The Philippines | 36 |  |
| Global | 2024 | September 3 to 5 | Asian Water Cycle Initiative (AWCI) Session, 16th Asia Oceania GEO (AOGEO) Symposium | Tokyo, Japan | 62 |  |
| The Philippines | 2025 | February 4 and 5 | Training on the Davao Region Online Synthesis System (DROSS) | Davao, The Philippines | 30 |  |
| Thailand | 2025 | 6-Mar | The second plenary meeting of the Platform on Water Resilience and Disasters | Bangkok, Thailand | 80 |  |
| Global | 2025 | October 15-17 | Asian Water Cycle Initiative (AWCI) Session, 17th Asia-Oceania GEO (AOGEO) Symposium | Bangkok, Thailand | 40 |  |
| Indonesia | 2026 | Feb. 25-26 | Discussion with the Indonesian government to advance IFI Platform on Water Resilience and Disasters in Indonesia | Jakarta, Indonesia | - |  |
| | | | | Participant | 1349 | |

ANNEX-7 List of MoU agreed during FY2016 to FY2015

| | | | |
|-----------|---|---|---|
| 2019/2/18 | Memorandum of Understanding on Joint Research on Water Resilience and Disasters | The Irrigation Department (ID), Colombo, Sri Lanka |  |
| 2019/2/18 | 中山間地における水関連災害リスクに係る調査研究・技術開発に関する連携・協力協定 | 岩手県 岩泉町 |  |
| 2019/10/3 | WEB-RRI SIMRIW-RS 結合モデルの開発利用に関する覚書 | 東北大学大学院農学研究科 | - |
| 2020/3/4 | Collaborative Research Agreement | The University of the Philippines Los Baños (UPLB) | - |
| 2020/9/28 | Letter of Engagement | World Meteorological Organization (WMO) Global Water Partnership Organization (GWPO) | - |
| 2021/8/3 | Memorandum of Understanding on Joint Research on Water Resilience and Disasters | Water Resources Research and Development Centre (WRRDC), Government of Nepal |  |
| 2021/8/6 | 災害情報共有システムに係る技術開発に関する連携・協力協定 | 山形県鶴岡市 | - |

| | | | |
|------------|--|---|---|
| 2022/6/23 | Memorandum of Understandings | UNIVERSIDAD MAYOR DE SANSIMON (UMSS), Bolivia |  |
| 2023/10/16 | Memorandum of Cooperation on Water resilience and Disasters | National Centre for Hydro-Meteorological Network, Viet Nam Meteorological and Hydrological Administration, Ministry of Natural Resources and Environment, Viet Nam |  |
| 2024/1/24 | Memorandum of Understanding on Joint Online Synthesis System (OSS) Deployment for Disaster Resilience and Capacity Development for Water Education | Davao del Sur State College, Department of Science and Technology Region X, the Philippines |  <p>(Source: DOST XI's Facebook)</p> |

ANNEX-8 List of Number of ICHARM Visitor

| | FY 2016 | FY 2017 | FY 2018 | FY 2019 | FY 2020 | FY 2021 | FY 2022 | FY 2023 | FY 2024 | FY 2025 |
|-------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1 Afghanistan | 2 | | | | | | | | | |
| 2 Algeria | | | | | | | 1 | | | |
| 3 Argentine Republic | | | | | | | | 14 | | |
| 4 Bangladesh | 4 | | 11 | 1 | | | 1 | | | |
| 5 Benin | | | | | | | | | 2 | |
| 6 Brazil | | | | | | | | | 20 | |
| 7 Burkina faso | | | | | | | | | 2 | |
| 8 Cambodia | | | | 1 | | | | | | |
| 9 Cameroun | | | | | | | | | 2 | |
| 10 Canada | | | | 1 | | | | | 1 | |
| 11 Chile | | | | | | | 1 | | | |
| 12 China | | | | 27 | | | | | 27 | 24 |
| 13 Comoros | | | | | | | | | | 3 |
| 14 Co-operative Republic of Guyana | | | | 1 | | | 1 | | | |
| 15 Ethiopia | 3 | | | | | | | | | 1 |
| 16 Ghana | | | | | | | | | | 4 |
| 17 Hungary | | | | | | | 1 | | | |
| 18 India | 6 | | | 1 | | | 1 | | | 8 |
| 19 Indonesia | | | 38 | 35 | | | 1 | | | |
| 20 Iran | | 7 | | | | | | | | 7 |
| 21 Italy | | | | | | | | | | 2 |
| 22 Japan | 1 | | | 31 | 9 | 6 | 26 | 11 | 56 | 48 |
| 23 Kenya | | | | 1 | | | | | 3 | 5 |
| 24 Lao People's Democratic Republic | | | | 3 | | | | | | |
| 25 Lebanon | | | | | | | | | | 1 |
| 26 Luxembourg | | 2 | | | | | | | | |
| 27 Macao | | | | | | | | | 2 | |
| 28 Madagascar | | | | | | | | | | 2 |
| 29 Malawi | | | | | | | 1 | | | 2 |
| 30 Malaysia | | | 15 | 15 | | | 26 | 32 | 4 | 21 |
| 31 Mauritania | | | | | | | | | 1 | |
| 32 Mexico | | 3 | | | | | | | | |
| 33 Mozambique | | | | | | | | | 3 | 2 |
| 34 Myanmar | 4 | | | 3 | | | | | | |
| 35 Nepal | | | | | | | | | | 1 |
| 36 Netherlands | | | | | | | 1 | 41 | | |
| 37 Nicaragua | 2 | | | | | | | | | |
| 38 Oman | | | | 1 | | | | | | |
| 39 Republic of Honduras | 3 | | | | | | 1 | | | |
| 40 Republic of Namibia | | 1 | | | | | | | | |
| 41 Republic of Türkiye | | | | | | | 1 | | | |
| 42 Rwanda | | | | | | | | | 13 | |
| 43 Saint Vincent and the Grenadines | | | | | | | 1 | | | |
| 44 Saudi Arabia | | | | | | | | | | 8 |
| 45 South Sudan | | | | | | | | | | 6 |
| 46 Sri Lanka | 2 | | 9 | 1 | | | | | 8 | |
| 47 Switzerland | | | | | | | 1 | | | |
| 48 Taiwan | | | | 10 | | | | | | |
| 49 Thailand | | | | 1 | | | | | | |
| 50 The Philippines | 9 | | | 8 | | | 15 | 15 | | |
| 51 The Republic of Korea | 6 | | 12 | | | | | | 7 | 15 |
| 52 Timor-Leste | | | | | | | 1 | | | |
| 53 U.S.A | | | 2 | 1 | | | | 5 | | 2 |
| 54 Uganda | | | | | | | | | | 1 |
| 55 Uruguay | 2 | | | | | | | | | |
| 56 Vanuatu | | | | 1 | | | | | | |
| 57 Vietnam | | | 10 | 1 | | | | 3 | 1 | |
| 58 Yemen | | | | 1 | | | | | | |
| Unknown | | | | | | | 6 | | 4 | |

ANNEX-9 List of Presentation of PWRI symposium

土研講演会

| 実施年月日 | 開催箇所 | 講演テーマ | 発表者 | 参加者数 | 備考 |
|-------------|------|---|------------|------|----------|
| 2016 10月6日 | 東京 | 新情報技術を活用し水災害の被害軽減に挑む ～水災害軽減に資する洪水予測モデル及び人工衛星を活用した氾濫 水理量推定技術の提案～ | 三宅且仁 グループ長 | 611 | |
| 2017 10月19日 | 東京 | 確実な避難を支援する洪水予測技術 | 澤野久弥 グループ長 | 464 | |
| 2018 10月11日 | 東京 | 世界各地で激甚化する水災害への取り組み | 澤野久弥 グループ長 | 483 | |
| 2019 10月16日 | 東京 | 水災害分野の気候変動影響評価を支える技術開発と適応策実装への 戦略－発展途上国における取組－ | 深見和彦 グループ長 | 478 | |
| 2020 10月21日 | 東京 | 命を守るための水害対策の研究 | 伊藤弘之 グループ長 | 216 | |
| 2021 10月20日 | 東京 | 衛星リモートセンシングと数値シミュレーションの同化による水災 害現象の解明と予測 | 伊藤弘之 グループ長 | 694 | ハイブリッド開催 |
| 2023 10月11日 | 東京 | 中小河川における水位情報提供システムの開発 | 森範行 グループ長 | 767 | ハイブリッド開催 |
| 2025 10月17日 | 東京 | 「災害のジブングト化」に向けた仮想洪水体験システムの取り組み | 栗林大輔 上席研究員 | 1892 | ハイブリッド開催 |

土木研究所 新技術ショーケース

| 実施年月日 | 開催箇所 | 講演テーマ | 発表者 | 参加者数 | 備考 | |
|--------------------|--------|---|---|------------|----------|----------|
| 2016 | 9月6日 | 東京 | 降雨流出はん濫 (RRI)モデル | 宮本守 主任研究員 | 433 | |
| | 11月25日 | 高松 | 総合洪水解析システム (IFAS) | 津田守正 主任研究員 | 234 | |
| 2017 | 7月27日 | 名古屋 | 総合洪水解析システム (IFAS) | 津田守正 主任研究員 | 331 | |
| | 9月5日 | 東京 | 総合洪水解析システム (IFAS) ～IFASキャリブレーターの開発～ | 津田守正 主任研究員 | 501 | |
| 2018 | 11月30日 | 広島 | 降雨流出はん濫 (RRI)モデル | 宮本守 主任研究員 | 216 | |
| | 1月25日 | 福岡 | 総合洪水解析システム (IFAS) | 猪股広典 主任研究員 | 289 | |
| 2019 | 12月19日 | 那覇 | 降雨流出はん濫 (RRI)モデル | 宮本守 主任研究員 | 168 | |
| | 9月26日 | 東京 | 市町村災害情報共有システム | 傳田正利 主任研究員 | 567 | |
| 2020 | 1月30日 | 名古屋 | 市町村災害情報共有システム | 諸岡良優 研究員 | 399 | |
| | 9月30日 | 東京 | 水害対応ヒヤリ・ハット事例集 (地方自治体編) | 大原美保 主任研究員 | 646 | |
| | | | (展示・技術相談) 降雨流出はん濫 (RRI)解析モデル | 柿沼太貴 専門研究員 | | |
| | 12月3日 | 高松 | 降雨流出はん濫 (RRI)解析モデル | 柿沼太貴 専門研究員 | 215 | |
| 12月17日 | 博多 | 水害対応ヒヤリ・ハット事例集 (地方自治体編) | 大原美保 主任研究員 | 243 | | |
| | | 降雨流出はん濫 (RRI)解析モデル | 望月貴文 主任研究員 | | | |
| 2021 | 7月29日 | 大阪 | (特別講演) 治水ルネッサンス－新しい河川像を目指して－ River Basin Disaster Resilience and Sustainability by All | 小池俊雄 センター長 | 224 | |
| | | | 水害対応ヒヤリ・ハット事例集 (地方自治体編) | 大原美保 主任研究員 | | |
| | 9月29日 | 東京 | 降雨流出はん濫 (RRI)解析モデル | 柿沼太貴 専門研究員 | 259 | オンラインのみ |
| | 10月14日 | 広島 | (特別講演) 治水ルネッサンス－新しい河川像を目指して－ River Basin Disaster Resilience and Sustainability by All | 小池俊雄 センター長 | 90 | |
| 降雨流出はん濫 (RRI)解析モデル | | | 柿沼太貴 専門研究員 | | | |
| 12月9日 | 名古屋 | 降雨流出はん濫 (RRI)解析モデル | 望月貴文 主任研究員 | 144 | | |
| 2022 9月27日 | 東京 | 仮想空間における疑似洪水体験を通じた住民の行動選択と意思決定 の分析 ～洪水疑似体験システムの新たな活用例～ | 傳田正利 主任研究員 | 587 | ハイブリッド開催 | |
| 2023 | 7月27日 | 大阪 | 降雨流出はん濫 (RRI)解析モデル | 柿沼太貴 研究員 | 825 | ハイブリッド開催 |
| | 9月27日 | 東京 | 中小河川を対象とした安価・簡便な水位予測技術 | 田中陽三 主任研究員 | 1324 | ハイブリッド開催 |
| 2025 9月25日 | 東京 | 降雨流出はん濫 (RRI)解析モデル | 菊森佳幹 上席研究員 | | | |

土研 新技術セミナー

| 実施年月日 | 開催箇所 | 講演テーマ | 発表者 | 参加者数 | 備考 |
|------------|------|------------------------------|------------|------|----------|
| 2019 6月26日 | 東京 | 災害「我がこと感」を醸成する洪水リスクコミュニケーション | 栗林大輔 主任研究員 | 297 | |
| 2022 6月14日 | 東京 | 降雨流出はん濫 (RRI)解析モデル | 柿沼太貴 研究員 | 796 | ハイブリッド開催 |
| 2023 6月14日 | 東京 | 仮想洪水体験システムの開発と展望 | 新屋孝文 上席研究員 | 690 | ハイブリッド開催 |


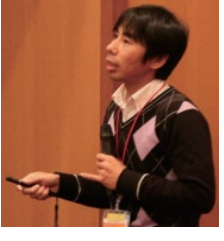

総計

15083

ANNEX-10 List of ICHARM R&D Seminar

| No | Date | Lecturer | Affiliation | Lecturer title | |
|----|------------|------------------------------|---|---|---|
| 74 | 2025,2,28 | Slobodan Simonovic | professor emeritus, Department of Civil and Environmental Engineering of Western University | Water Disasters: Challenges and Opportunities |  |
| | | Liu Yimin | Professor, State Key Laboratory of Numerical Modeling for Atmospheric Sciences and Geophysical Fluid Dynamics | The Tibetan Plateau and Extreme Rainfall Events in East Asia |  |
| 73 | 2024,12,26 | OKA Hiroshi | Former ambassador extraordinary and plenipotentiary of Japan to the Arab Republic of Egypt, the Ministry of Foreign Affairs of Japan | Japan's International Cooperation |  |
| 72 | 2024,7,16 | Kun Yang | Professor, Department of Earth System Science at Tsinghua University | Development of a Regional Climate Modeling System for the Tibetan Plateau |  |
| 71 | 2024,2,14 | YOSHIKAWA Minako | Inviting Professor, Center for Southeast Asian Studies (CSEAS) at Kyoto University | Overview of Center for Southeast Asian Studies (CSEAS) |  |
| | | Faizatul Akmar Abdul Nifa | Associate Professor, Universiti Utara Malaysia | Post-Disaster Socio-Economic Community Empowerment: The Case of Kampung Iboi, Baling, Kedah, Malaysia |  |
| | | Khai Lin Chong | Senior Lecturer, Universiti Utara Malaysia | Bridging the Gap: Converting Flood Simulation Insights into Empowering Community Programs |  |
| 70 | 2023,5,1 | M. Levent Kavvas | Distinguished Professor, University of California, Davis (UC Davis) | Recent Advances in the Estimation of Extreme Precipitation and Extreme Floods – A Physics-based Perspective |  |
| | | ISERI Yoshihiko | Manager of the Hydrology Laboratory, University of California, Davis (UC Davis) | Recent Advances in the Estimation of Extreme Precipitation and Extreme Floods – A Physics-based Perspective |  |
| 69 | 2022,10,11 | András Szöllösi- Nagy | Department of Water and Environmental Policy, National University of Public Service, Budapest, Hungary | THE GLOBAL CHANGES AND THEIR IMPACTS ON THE HYDROLOGICAL CYCLE |  |

| | | | | | |
|----|------------|--------------------------------|---|--|---|
| 68 | 2022,4,26 | Anthony Sales | Regional director, Department of Science and Technology (DOST) Region XI of the Philippines | Innovative multi-stakeholder approach to combat water-hazard and climate change in Davao, the Philippines |  |
| 67 | 2021,11,30 | YOSHINO Naoyuki | Emeritus professor, Keio University Executive director, Financial Research Center | Private Financing in infrastructure by use of spillover tax revenues and its application to the estimates of disaster damage |  |
| 66 | 2021,3,29 | IZUMI Norihiro | Professor, Faculty of Engineering, Hokkaido University | Boundary instabilities observed in rivers |  |
| 65 | 2020,12,1 | NUMADA Muneyoshi | Associate Professor, Institute of Industrial Science, The University of Tokyo | Approach from the disaster management process and development of the BOSS (Business Operation Support System) for the comprehensive disaster management |  |
| 64 | 2019,1,16 | MATSUURA Koï chiro | 8th Director-General of UNESCO | Global trend and Japan |  |
| 63 | 2018,11,15 | Soroosh Sorooshian | Director, Center for Hydrometeorology and Remote Sensing/The Henry Samueli School of Engineering, University of California, Irvine | Climate Variability and The Global Hydrologic Cycle: Efforts in Monitoring, Modeling and challenges in forecast Changes |  |
| 62 | 2018,8,10 | A. W .Jayawardena | Adjunct Professor, Department of Civil Engineering, The University of Hong Kong, Hong Kong | Data driven approaches of Hydrological Modelling |  |
| 61 | 2018,4,10 | Wouter T. Lincklaen Arriëns | CEO and Leadership Coach, TransformationFirst.Asia Pte Ltd in Singapore | Leading Change in Projects: What It Takes |  |
| 60 | 2018,2,15 | András Szöllösi- Nagy | Chairperson of UNESCO-IHP Intergovernmental Council | Water related issues in the world and expectation for ICHARM |  |
| 59 | 2018,2,15 | Blanca E. Jiménez Cisneros | Director, Secretary of the International Hydrological Programme (IHP), Division of Water Sciences, Natural Science Sector, UNESCO | International Hydrological Programme and future collaboration with UNESCO category II center |  |

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| 58 | 2016,12,1 | Srikantha Herath | Senior Advisor, the Ministry of Megapolis and Western Development, Gov. of Sri Lanka | Integrated Flood Control and Water Management in Colombo, Sri Lanka |  |
| 57 | 2016,12,1 | WAKATSUKI Yasutaka | Associate professor, College of Science, Ibaraki University | Incremental dynamical downscaling for probabilistic climate change projection and a dynamical approach for precipitation nowcast |  |
| 56 | 2016,7,21 | Kelly M. Kibler | Assistant Professor, Water Resources Engineering, University of Central Florida | Flow alteration signatures of diversion hydropower: an analysis of 32 rivers in southwestern China |  |

