ICHARM Program

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 help governments and all stakeholders manage 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 people, superior facilities, and a knowledge base which enables conducting i) innovative research, ii) effective capacity building, and iii) efficient information networking. Based on these three pillars, ICHARM will globally serve as a knowledge hub for best national/local practices and an advisor in policy making.

2. Long-term Programme (around 10 years)

ICHARM will engage in the following activities in order to fulfill the Mission, keeping in mind *localism*, a principle that takes into account local diversity of natural, social and cultural conditions, being sensitive to local needs, priorities, development stage, etc., within the context of global and regional experiences and trends:

(i) Innovative research

ICHARM has accumulated a broad range of knowledge and produced high-quality research outcomes to make practical policy recommendations and solve problems in the field of water disaster reduction, including methods for observing, forecasting and analyzing water related disaster hazards and methods for assessing, analyzing and monitoring exposure and vulnerability.

Important global decisions were made and came to fruition in 2015, with the Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework) in March, the Sustainable Development Goals (SDGs) in September and the Paris Agreement on Climate Change (Paris Agreement) in December. These decisions emphasized the current disaster risk reduction on water hazard through a holistic view of the changes in hazards arising from climate change, and in vulnerabilities and exposures arising from societal and environmental problems, and also stressed the importance of future disaster risk reduction through monitoring and prediction of water related hazard risks. Another area commonly pointed out in these agreements is the challenge of building disaster resilient communities, referring to ones practicing the enhancement of disaster preparedness to minimize damage and prevent disasters similar to

previous ones, while, once hit by a disaster, quickly shifting their focus to emergency response efforts and then to restoration and recovery under the concept of "Build Back Better". Additionally, it is worth noting that all these agreements strongly recommend maximizing the role of science and technology in these efforts.

Based on the background above, ICHARM will implement the following research in cooperation with other organizations:

(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 arrange data on disaster damage and hydrological and meteorological events. Recognizing such attributions as the most fundamental gaps in disaster risk reduction, ICHARM will implement research on data collection, storage, sharing, and statistics on water related disasters as one of its major research themes.

ICHARM will conduct research on technologies to collect and store data and information regarding hazards, exposure and vulnerability, and to share them among stakeholders while facilitating national and local efforts to collect, store and share data through developing and applying feasible technologies for data collection and information sharing among stakeholders. ICHARM will also promote such efforts by developing methods of combining local data with satellite observation or numerical model outputs to produce data and information for a wide area that cannot be obtained if a system depends solely on local observation. Technical assistance will be provided in other related areas, for example, for countries to compile highly reliable statistical data and to develop a database for stakeholders to exchange and share data and information in real time.

As such, ICHARM will continue its contribution to disaster risk reduction through the research on data collection, storage, sharing, and statistics as the most fundamental infrastructure.

(2) Risk assessment on water related disasters

ICHARM has been developing technologies and methods for risk assessment of water related disasters as an independent knowledge from each other; for example, hazard assessment technologies such as the Integrated Flood Analysis System (IFAS) and the Rainfall-Runoff-Inundation (RRI) model and vulnerability assessment methods such as an economic damage assessment method separately. However, it is important to effectively integrate the assessment of hazards, exposures and vulnerabilities in order to promote the shared understanding of water related disaster risk among all stakeholders on a basin-wide scale.

ICHARM will develop, verify and improve methodologies to integrate the assessment of hazards, exposures and vulnerabilities. ICHARM will conduct case studies into risk assessment of water related disasters, taking local conditions into account, and use the outputs to assist local communities in their own risk assessment and disaster risk reduction tailored to local backgrounds. Additionally, since monitoring methods for its global targets in the Sendai Framework has not been agreed, ICHARM tries to make a contribution to the development of a globally applicable method by conducting and comparing the results of such local case studies.

As such, ICHARM will contribute to the relevant information creation for supporting risk communication and understanding the risk of water related disasters.

(3) Monitoring and prediction of changes in water related disaster risk

Water related disaster risk changes over time due to the changes in hazards arising from climate change and also the changes in vulnerabilities arising from urbanization. Under such increases in risks, prevention measures based on the present risk information may not be effective on future disasters. Furthermore, without properly estimating the effects of measures planned under the increased risk, the economic efficiency of disaster-related investment might be underestimated. To avoid such misperception, ICHARM will continue research on forecasting future risk derived from the change between the past and the present.

Specific research themes include the development, verification and improvement of methods for monitoring and forecasting changes in hazards due to climate changes with various temporal scales ranging from season to a longer period of time under the influence of climate change, and also include the development, verification and improvement of methods for monitoring and forecasting changes in exposure and vulnerability to water related disasters due to development or social and economic changes. These methods will be applied to case studies, whose outcomes will be used to provide support for local communities to arrange the methods according to their needs and conditions so that they will effectively use the modified methods to mitigate future risks of water related disasters by themselves. The methods with various local adjustments will be further developed and compared with each other, eventually becoming applicable as global standards.

ICHARM will continue its contribution to effective disaster risk policymaking under the increased risk of water related disasters.

(4) Proposal, evaluation and application of policy ideas for water related disaster risk reduction

Irrationally low priority of the investment in disaster risk reduction creates many disasters and disturbs sustainable development in developing countries. ICHARM will propose and evaluate policy ideas for water related disaster risk reduction based on the local backgrounds

in order to visualize the effectiveness and efficiency on investments in disaster risk reduction.

The research includes the analysis on concrete policy ideas in terms of adaptability to the actual field with considering the local lifestyle, socio-economic activities and future changes of risk, and building consensus among stakeholders regarding the significance of disaster risk reduction policies in the context of sustainable development under climate change, to support the formulation of independent and new policy proposal by each country. The research also develops methods and models capable of evaluating the socio-economic effect of individual disaster related policies. Applying the developed risk assessment methods in (2), methods and models for policy evaluation and decision making will be developed, verified, and improved. These case studies will be applied through international projects.

As such, ICHARM will continue its contribution to the decision-making on investments in disaster risk reduction by states and funding agencies.

(5) Support in constructing the applicability of water-related disaster management

Although some cases have reported that disaster reduction measures were highly effective, other cases have also reported on unfortunate incidents in which the malfunction of communicating critical information to residents delayed their evacuation and resulted in a catastrophe. It has also pointed out that communities should take appropriate relief and emergency measures for prompt restoration and better recovery even at the unexpectedly large-scale disaster. This shows the necessity of technical support that local governments and residents should be well aware of disaster prevention and mitigation, and then implement them in practice. With the wide understanding of the structure of local communities and the patterns of human behavior, ICHARM will develop and apply the methods of planning and implementing a wide range of disaster management measures effectively during disasters with consensus building among stakeholders.

ICHARM will support the implementation of means for effectively sharing information from an early warning system and other sources among administrators and residents, and also support the development, verification and application of the collaboration among various sectors for disaster risk reduction, continuity of operations planning based on local needs and conditions, and the improvement of interoperability during disaster responses linking administrative functions effectively at all levels.

As such, ICHARM will continue its contribution to constructing local applicability of water related disaster management through improving practitioners' and people's understanding on disaster risk and their practice.

(ii) Effective capacity building

Local capacity is essential to sound management of water related risks. Through provision of cutting-edge training which emphasizes development and application of advanced knowledge and solutions, ICHARM supports a global network of exemplary practitioners of water related hazard and risk management.

(1) Foster the development of solution-oriented practitioners and Training-of-Trainers (TOT) instructors, with solid theoretical and engineering competence who will contribute effectively to the planning and practice of disaster management at any levels, from local to international.
(2) Build a network of local experts and institutions equipped to address water related risks with accumulated knowledge and applied skill both in research and practice, through trainings on occasion of international projects and education/training activities at ICHARM.

(iii) Efficient information networking

ICHARM's broad knowledge base and primary research findings support powerful and comprehensive opinions which guide water related hazard and risk management solutions from global to local scales.

(1) Accumulate, analyze and disseminate major water related disaster records and experiences through worldwide practitioners' networking.
(2) Mainstream disaster risk reduction policy by facilitating active collaboration and communication within an influential global institutional network, such as the International Flood Initiative, and through dissemination of technical knowledge for water related hazard and risk management.

3. Mid-term Programme (around 5 years)

In order to achieve the Mission, we will focus ICHARM activities collaborated with other organizations in the next 5 years to:

(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, exposures and vulnerabilities in multiple locations both in and outside Japan, and to share them among stakeholders while facilitating national and local efforts to collect, store, and share data through developing and applying feasible technologies for data collection and information sharing among stakeholders. Technical assistance will be provided for countries to compile highly reliable statistical data.

(2) Risk assessment on water related disasters

ICHARM will develop, verify and improve methodologies to integrate the assessments of hazards, exposures and vulnerabilities. ICHARM will conduct case studies in multiple locations both in and outside Japan into risk assessment on water related disasters, taking local conditions into account, and use the outputs to assist local communities in their own risk assessment and disaster risk reduction tailored to local backgrounds.

(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 climate changes with various temporal scales ranging from season to a longer period of time under the influence of climate change, and in exposure and vulnerability to water related disasters due to development or social and economic changes. These methods will be applied to case studies in multiple locations both in and outside Japan, and outcomes will be used to provide support for local communities to arrange the methods according to their needs and conditions so that they will effectively use the modified methods to mitigate future risks of water related disasters by themselves. The methods with various local adjustments will be further developed and compared with each other, eventually becoming applicable as global standards.

(4) Proposal, evaluation and application of policy ideas for water related disaster risk reduction

ICHARM will develop methods and models capable of evaluating the socio-economic effect of individual disaster related policies. These methods and models will be expected to build consensus among stakeholders regarding the significance of disaster risk reduction policies in the context of sustainable development under climate change, and will help develop policies based on local needs and conditions and make decisions on international assistance. Applying the developed risk assessment methods in 3-(2), the methods and models for comprehensive policy evaluation and decision making will be developed and verified.

(5) Support in constructing the applicability of water-related disaster management

ICHARM will support the implementation of means for effectively sharing information from an early warning system and other sources among administrators and residents, and also support the development, verification and application of the collaboration among various sectors for disaster risk reduction, continuity of operations planning based on local needs and conditions, and the improvement of interoperability during disaster response liking administrative functions effectively at all levels in multiple locations both in and outside Japan.

The following research projects (a) - (e) will be set for the maximum reduction in water related disaster damage based on the mid-term research programmes above:

(a) Technology for constantly monitoring, storing and using disaster information
(b) Support system for early warning capable of providing accurate information in a shorter period of time
(c) Assessment and planning technology for appropriate water resources management with insufficient information
(d) Technology for assessing the impact on local communities of water related disasters in flood plains and for evaluating the effect of investments in disaster risk reduction
(e) Technology for the effective use of water related disaster risk information to reduce disaster damage

The relationship between the long-term and mid-term research programmes and the research projects (a) - (e) is shown in Reference 1.

(ii) Effective capacity building

(1) Foster the development of solution-oriented practitioners and those who can provide Training-of-Trainers (TOT) programs with solid theoretical and engineering competence who will contribute effectively to the planning and practice of disaster management at any levels, from local to international.

In stronger collaboration with GRIPS and JICA, ICHARM will continue to build and improve its Master's and PhD programs in Water-related Disaster Management, as well as its short-term capacity development training programs. Training schedules and programs, particularly at the PhD level, will be integrated seamlessly with ICHARM research activities, creating new opportunities for student involvement in a greater scope of research topics and methods, and supporting mentorship from a wider range of ICHARM researchers. New approaches will be explored to offer training programs as a module/package, or through e-learning/remote style that can contribute to more flexible and efficient training.

(2) Build a network of local experts and institutions equipped to address water related risks with accumulated knowledge and applied skill both in research and practice.

As graduates from ICHARM training programs circulate across the globe, carrying with them the skills and knowledge they have acquired in their training, they become water hazard and risk management leaders in their own localities. The next generation of ICHARM capacity

development will continue to support individuals in their pursuit of academic excellence and successful application of learned skills. However, ICHARM will also broaden focus to joint development of individual and institutional capacity, so as to enable supportive spaces in which ICHARM alumni are able to realize their potential. Support of ICHARM alumni networks are a key resource for former participants, which will be encouraged and facilitated through follow-up meetings for former participants and their colleagues, to be hosted within the local offices and agencies that employ ICHARM graduates. Such meetings will help ICHARM to build and strengthen a global network of experts and organizations, to maintain research and training directions which are attuned to the needs of participant agencies, and to continue building capacities and collaborations within key organizations.

(iii) Efficient information networking

(1) Accumulate, analyze and disseminate major water related disaster records and experiences through worldwide practitioners' networking.

ICHARM, as the global knowledge center for water hazards, will develop a database archiving information about water disasters. In order to collect and organize reliable data, ICHARM will strengthen partnerships with centers capable of archiving information related to water disasters. Meta-data collected from countries through ICHARM research and training will be sorted and accumulated as scientific knowledge which will be conductive to allowing appropriate behavior in field.

(2) Mainstream disaster risk reduction policy by facilitating active collaboration and communication within an influential global institutional network, such as the International Flood Initiative, and through dissemination of technical knowledge for water related hazard and risk management.

ICHARM will continue its contribution to worldwide efforts in implementing and mainstreaming disaster risk reduction in step with the Sendai Framework in March and SDGs in December 2015. ICHARM will strive to strengthen partnerships with other organizations, particularly through the International Flood Initiative, for which ICHARM serves as its secretariat. Effective interaction between ICHARM research and training activities will make it possible to engage a broad institutional network and allow appropriate behavior in field regarding water related hazard and risk management.

Reference 1 Matrix of the relationship between the long-term and mid-term research programmes and the five research projects (a) - (e)

Long-term and Mid-term research programmes	Key words	Long term Programme (April 2016- March 2026)					
		Mid-term Programme (April 2016 – March 2021)					Mid-term Programme (April 2021 – March 2026)
(1) Data collection, storage, sharing, and statistics on water related disasters	1) Development of an integrated hazard data production method using on-site observation, satellite observation, and numerical models, including functions for storing and sharing the produced data.		●	●			○
	2) Development of a method for producing information on land use, socio-economic activities, etc., to estimate vulnerability and exposure, including functions for storing and sharing the produced information.	●			●		○
	3) Development and implementation of a method for on-site damage data collection, including functions for storing and sharing the collected data.					●	○
	4) Development of an integrated method for producing damage information using on-site observation, satellite observation and numerical models, including functions for storing and sharing the produced information.						●
	5) Technical assistance in producing, storing and sharing reliable disaster statistics.	●					○
	6) Development of a water related disaster database.						●
(2) Risk assessment on water related disasters	1) Development, verification and improvement of models for flood, inundation, sediment disaster and drought.		●	●			○
	2) Improvement of downscaling and bias correction methods to strengthen the linkage between local- and global-scale data		●				○
	3) Development, verification and improvement of assessment methods for vulnerability and exposure				●		○
	4) Development, verification and improvement of a method for integrated assessment of the overall impact from a series of processes including hazard, exposure and vulnerability.						●
	5) Case studies on the identification of water related disaster risks and possible damage					●	○
	6) International comparison and standardization of water related disaster risk assessment methods						●
(3) Monitoring and prediction of changes in water related disaster risk	1) Development, verification and improvement of a method for monitoring and forecasting changes in hazard due to climate change.			●			○
	2) Development, verification and improvement of a method for monitoring and forecasting changes in vulnerability and exposure due to development						●
	3) Case studies on monitoring and forecasting changes in water related disaster risk			●			○
	4) Study and comparison of international cases on changes in water related disaster risk.			●	●	●	○

Long-term and Mid-term research programmes	Key words	Long term Programme (April 2016- March 2026)					
		Mid-term Programme (April 2016 – March 2021)					Mid-term Programme (April 2021 – March 2026)
(4) Proposal, evaluation and application of policy ideas for water related disaster risk reduction	1) Proposal and evaluation of policy ideas for water related disaster risk reduction based on local backgrounds in order to visualize the effectiveness and efficiency on investments in disaster risk reduction				●	●	○
	2) Development of methods and models capable of evaluating the socio-economic effect of disaster related policies.				●		○
	3) Development, verification and improvement of methods and models for policy evaluation and decision making.				●		○
(5) Support in constructing the applicability of water-related disaster management	1) Development of an early warning system.		●			●	○
	2) Optimization of water management system operation			●			○
	3) Technical assistance in raising disaster risk awareness of residents and administrators (visualization of disaster processes, risk communication)					●	○
	4) Technical assistance in strengthening coordinated disaster response involving different sectors.						●
	5) Technical assistance in development and implementation of a method for local-specific business continuity planning.					●	○
	6) Development and verification of a method for establishing disaster response governance to effectively linking administrative bodies at all levels.				●	●	○
Research projects (a) – (e) of the mid-term research programme.		(a) Technology for constantly monitoring, storing and using disaster information	(b) Support system for early warning capable of providing accurate information in a shorter period of time	(c) Assessment and planning technology for appropriate water resources management [illegible]	(d) Technology for assessing the impact on local communities of water related disasters in flood plains and for evaluating the effect of investments in disaster risk reduction	(e) Technology for the effective use of water related disaster risk information to reduce [illegible]	