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United Nations
Educational, Scientific and
Cultural Organization

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

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

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

ICHARM

Photo caption:

1. "Asian Water Cycle Symposium 2016" (March 1-2, 2016 University of Tokyo) [Photo by Martin Hladik]
2. Lecture on IFAS in 7th seminar by the Japan Society of Hydrology and Water Resources (July 11, 2014 Tokyo)
3. Field trip to Ohkouzu Diversion Channel by ICHARM students (April 28, 2016 Shinano River Ohkouzu Museum)
4. "The Final Workshop on Evidence-based Flood Contingency Planning" (February 17, 2016 Calumpit Municipal Hall, The Philippines)
5. "Training on RRI Model and Storm Surge Model" for trainer candidates (June 15, 2015 DMH, Nay Pyi Taw, Myanmar)
6. 2016 Ph.D. graduate (September 14, 2016 GRIPS, Tokyo)

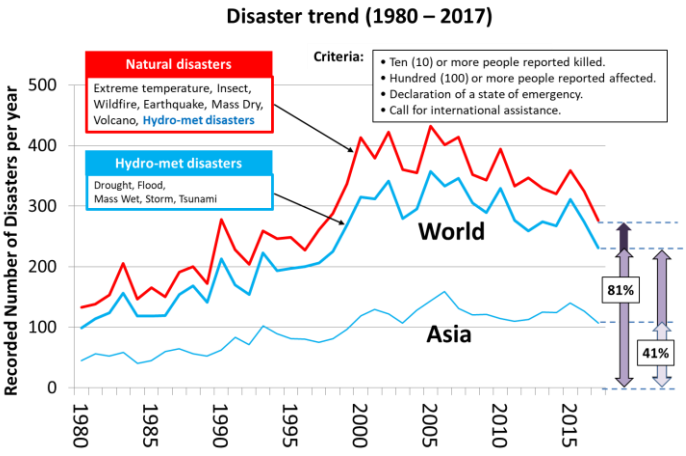
Background

The United Nations Educational, Scientific and Cultural Organization (UNESCO) has been promoting water sciences and technologies and, as part of its effort, encouraging the activities of the International Hydrological Programme (IHP) and the establishment of UNESCO water centers.

The world, on the other hand, is struggling with water-related disasters, such as floods, droughts and windstorms, which have been a primary source of disaster damage worldwide in recent years. After 1980, they account for about 80% of all natural disasters, especially about 40% of them in Asian region.

In the meantime, Japan has a long history of fighting and overcoming water-related disasters, and consequently has a wealth of knowledge and experience, as well as sophisticated technology, in the field. Leveraging this expertise, Japan has been taking the initiative in addressing water-related disasters, which have been increasingly frequent and intense in the world, through participating in the activities of IHP and the World Water Assessment Programme (WWAP) and demonstrating the global leadership by hosting the 3rd World Water Forum in 2003 in Kyoto, Japan.

With its growing presence in the water arena, Japan has further realized global expectations that it should share its long-accumulated expertise with other countries in consideration of their needs and conditions in order to help reduce disaster damage.



produced by ICHARM based on the EM-DAT database

Launch of ICHARM under the auspices of UNESCO

Against this backdrop, a proposal was made to establish a UNESCO water center in Japan. The proposal received widespread support from member countries and UN organizations at the IHP intergovernmental board meeting in September 2004, and was subsequently adopted at the UNESCO general meeting in October 2005. Finally, on March 6, 2006, the International Centre for Water Hazard and Risk Management (ICHARM) was officially established as a UNESCO category II center and a part of the Public Works Research Institute of Japan. The agreement on ICHARM between the government of Japan and UNESCO was renewed on July 23, 2013.

Signing ceremony for the official launch of ICHARM: the representative of the Japanese government (left), UNESCO Secretary-General (center) and PWRI Chief Executive. (March 3, 2006)

ICHARM Director

1st (March 2006- September 2014): Emeritus Professor Kuniyoshi Takeuchi, Yamanashi University *[Photo: Left]*

2nd (October 2014-): Professor Toshio Koike, Tokyo University *[Photo: Right]*

ICHARM opening ceremony (March 6, 2006)

ICHARM Governing Board

Based on the Article 6 of the Agreement, which was renewed in July 2013, stipulates that the ICHARM Governing Board shall meet biennially, instead of former ICHARM Advisory Board. The board is chaired by the President of PWRI. The first meeting of the Board was held on February 25, 2014, the second one on March 3, 2016, and the third one on February 14, 2018.

The governing board reviews the ICHARM Activity Report, and also reviews and adopts the ICHARM Long-term and Mid-term Programme and the ICHARM Work Plan.

ICHARM's institute sign written by the then MLIT Minister

The third ICHARM Governing Board meeting

ICHARM building

Mission

(adopted on March 3, 2016)

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.

Scheme of ICHARM Programme

ICHARM Long-term Programme

(adopted on March 3, 2016)

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

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 disaster risk reduction
5. Support in constructing the applicability of water-related disaster management

(ii) Effective capacity building

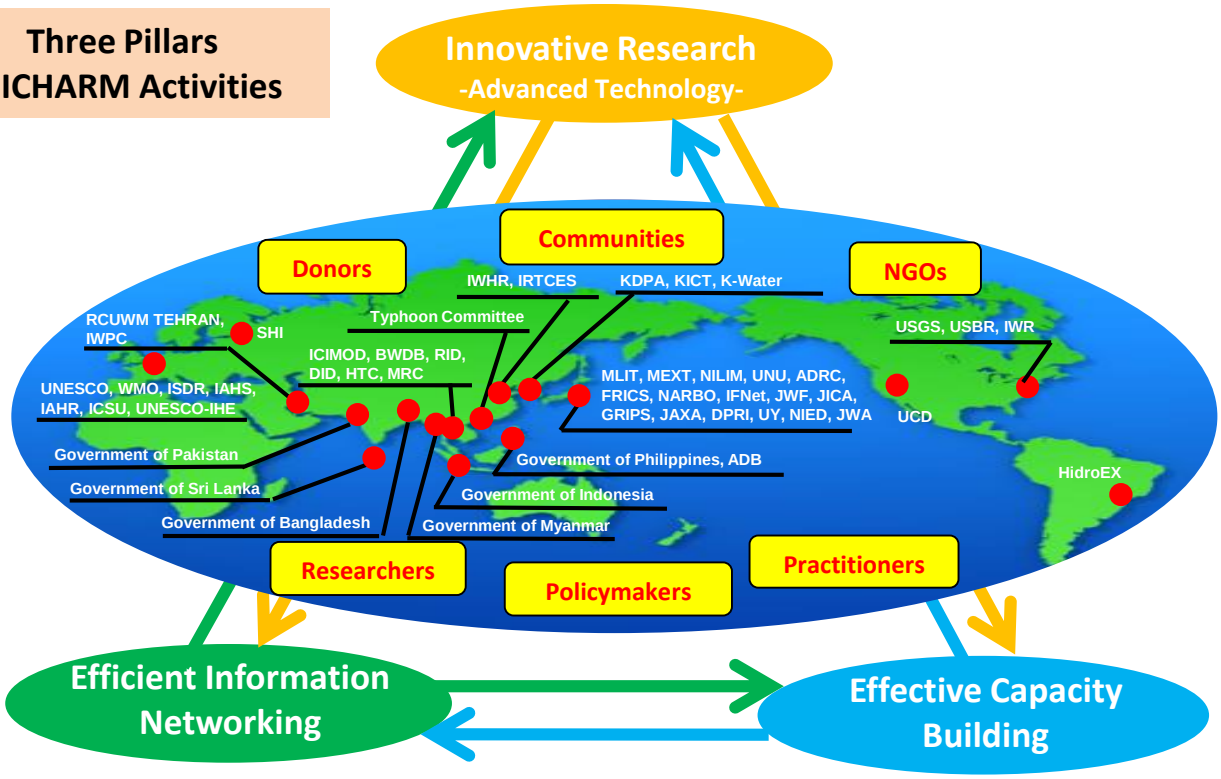
1. Foster the development of solution-oriented practitioners and Training-of-Trainers (TOT) instructors, with solid theoretical and engineering competence who will contribute effectively to the planning and practice of disaster management at any levels, from local to international
2. Build a network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

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

The ICHARM Mid-term Programme and the ICHARM Work Plan are also available at:
http://www.icharm.pwri.go.jp/about/pdf/2016_program_e.pdf
http://www.icharm.pwri.go.jp/about/pdf/2016_work_plan_e.pdf

Three Pillars of ICHARM Activities



Practice of Localism

ICHARM emphasizes localism, i.e., project implementations tailored to local needs and conditions, by creating an efficient worldwide information network based on innovative research and effective capacity building.

Efficient Information Networking

http://www.ifi-home.info/

International Flood Initiative (IFI)

The International Flood Initiative (IFI) is a worldwide framework to promote collaboration in flood management among international organizations such as UNESCO, WMO, UNU and UNISDR. ICHARM has been serving as its secretariat.

On October 31, 2016, IFI hosted a side event in advance of the 8th High-Level Expert Panel on Water and Disaster (HELP), and the participants discussed the implementation strategy and the framework for action proposed to achieve better flood management throughout the world.

The meeting adopted the Jakarta Declaration to facilitate interdisciplinary collaboration to further advance sustainable development and flood risk reduction. Based on the declaration, ICHARM is conducting activities to support countries in the establishment of the "platform" to discuss and formulate strategies for the reduction of disasters in collaboration with other IFI partners. This effort has already started in Asia-Pacific countries such as the Philippines, Sri Lanka, Myanmar and Pakistan, and is expected to expand to other countries.

Group photo of the meeting in Sri Lanka (24th Aug. 2017)

Group photo of the meeting in Myanmar (1st Nov. 2017)

Contribution to Typhoon Committee

The Typhoon Committee is an inter-governmental body under the joint auspices of the Economic and Social Commission for Asia and the Pacific (ESCAP) and the World Meteo-rological Organization in 1968 to promote and coordinate the planning and implementation of reduction measures for human/property damage by typhoons in the Asia–Pacific region.

A chief researcher of ICHARM has been serving as the chairperson of the hydrology working group.

Flood Analysis Systems developed by ICHARM

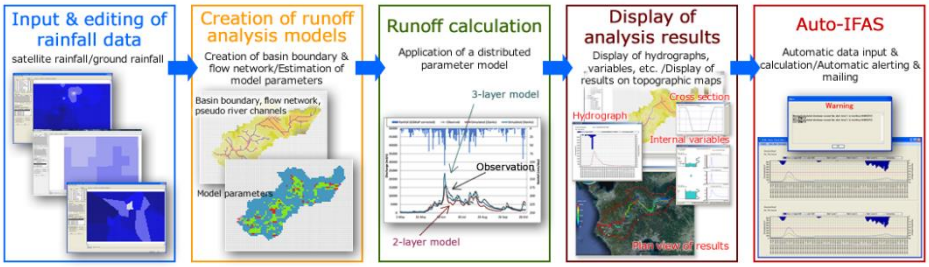
Development and dissemination of Integrated Flood Analysis System (IFAS)

The Integrated Flood Analysis System (IFAS) is designed to help create a runoff analysis model easily by using topographic and land-use data which cover almost the entire globe and are available free of charge via the Internet.

With IFAS alone, users can conduct a series of tasks necessary for runoff analysis including data acquisition, model creation, rainfall-runoff analysis and result display. With an additional module named Auto-IFAS, the system is capable of executing automatic functions such as downloading satellite rainfall information, loading ground rainfall information, performing runoff calculation, and issuing a warning. With these functions, users can built a real-time flood forecasting and warning system though they are minimal for a device with such a purpose.

IFAS with this additional module is very useful even in areas with limited Internet access. It can perform calculation while collecting data regularly according to a predetermined time schedule. In this way, the network and the computer can avoid being overloaded with information processing, which thus enables fast runoff calculation and quick flood forecasting and warning.

The IFAS execute file is downloadable free of charge at:
ttp://www.icharm.pwri.go.jp/research/ifas/



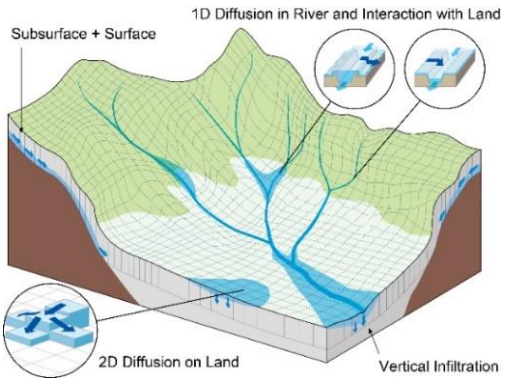
Calculation flow of IFAS

Development of RRI model

To predict the behavior of large-scale inundation in low-lying areas in a short period of time, ICHARM has developed a new numerical model called Rainfall-Runoff-Inundation (RRI) model. The model simulates various hydrologic processes including rainfall-runoff, stream-flow discharge, and inundation over floodplains in an integrated manner.

The RRI model is expected to help assess future flood risk for various regions with different climate conditions, for example, based on climate change projections. Similar to the IFAS system, the model is also applicable to large-scale flood prediction on a near real-time basis by using satellite-based topography, land-use and rainfall information.

The RRI model was awarded for its excellence in 2014 by the Japan Society of Civil Engineers. The ICHARM researcher who developed the model also received 2013 Young Scientists' Prize by the Ministry of Education, Culture, Sports, Science and Technology, and received the 15th Infrastructure Technology Development Award by the Ministry of Land, Infrastructure, Transport, and Tourism in 2013.



Schematic diagram of the RRI model

The RRI model has been available for public use since May 2016 on the website of ICHARM. Download for free at:
http://www.icharm.pwri.go.jp/research/rri/rri_top.html

Field investigations at disaster-affected sites

In recent years, floods and landslides have occurred frequently in many areas throughout the world, causing serious damage in some cases. ICHARM conducts field investigations and analyzes damage, disaster mechanisms and other related factors to make future progress in disaster mitigation and prevention.

Field survey of flood in Sri Lanka (2017. 6)

Field survey of landslide in Kyusyu, Japan (2017. 7)

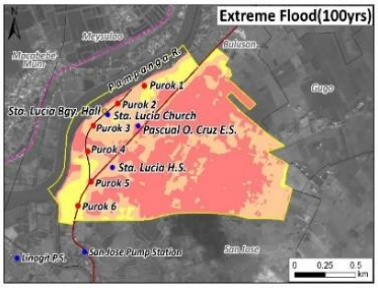
Field survey of sediment erosion in Myanmar (2017. 10)

Research Activities on Risk Assessment and Risk Reduction

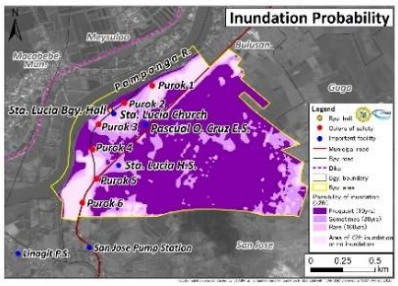
Creation of Community-level Flood Contingency Plans

ICHARM has conducted research activities to support the creation of community-level flood contingency plans based on scientific approaches using the RRI model, while discussing with local government officials and residents in Calumpit Municipality of Bulacan Province in Pampanga River basin of the Philippines.

For these supporting activities, the mayor of Calumpit Municipality issued a letter of appreciation to ICHARM.



Flood Hazard Map for Extreme Flood



Inundation Probability Map

Open discussion with residents

Flood risk assessment and information sharing system

This research explores simple, effective ways to deliver information on flood and landslide risks using RRI and other models. A pilot study has been in progress for twenty districts along the Aga River in Aga Town, Niigata Prefecture, and a flood risk assessment method (named "Flood Chart") has been developed to evaluate flood risks associated with several types of flood hazards using eight assessment indices and RRI model simulations. This method enables each district to understand flood characteristics in their area and plan appropriate flood risk reduction measures.

ICHARM is also providing technical assistance for Aga Town to develop a flood risk information sharing system useful not only at emergency but also in normal times. The system is a portal site designed to be a one-stop information center for users to view all kinds of disaster-related information relevant for Aga residents.

Example of assessment indices

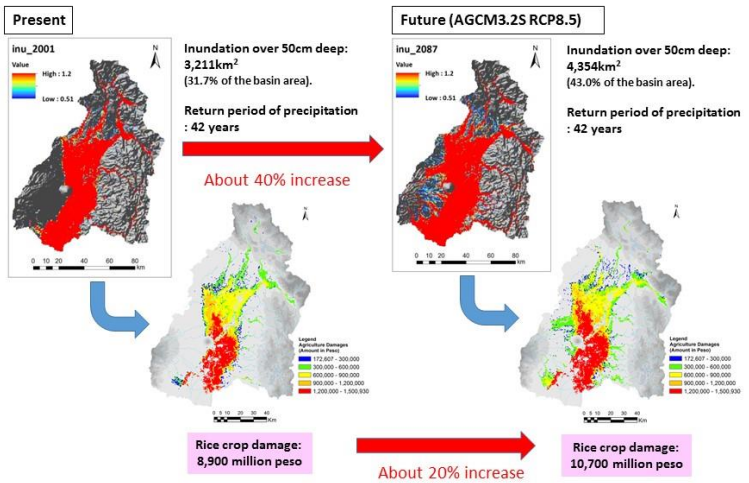
Viewpoint	Index	Risk (Score)	Threshold
① Lead time for evacuation	Duration of the inundation rising from 0.1 to 0.5m	d (0)	(under 0.5m)
		c (1)	6 hours <
		b (2)	3 hours ≦ ≦ 6 hours
		a (3)	< 3 hours
② Evacuation duration	Duration of the inundation remaining over 0.5m deep	d (0)	< 0.1day
		c (1)	0.1day≦ <0.5day
		b (2)	0.5day≦ <1.0day
		a (3)	1.0 day ≦
③ Community Risk for inundation	Maximum inundation depth	d (0)	< 0.1m
		c (1)	0.1m ≦ < 0.5m
		b (2)	0.5m ≦ < 1.7m
		a (3)	1.7m ≦ < 3.2m
		aa (4)	3.2m ≦
④ Risk of evacuation shelters	Maximum inundation depth at evacuation shelters	d (0)	< 0.1m
		c (1)	0.1m ≦ < 0.3m
		b (2)	0.3m ≦ < 0.5m
		a (3)	0.5m≦
⑤ Isolation of district	Maximum inundation depth between district and town office	d (0)	< 0.1m
		c (1)	0.1m ≦ < 0.3m
		b (2)	0.3m ≦ < 0.5m
		a (3)	0.5m≦
⑥ Maximum isolated person by inundation	Non-evacuees who live in area which inudation level is over 50 cm	d (0)	0
		c (1)	< 10 persons
		b (2)	10 ≦ < 50 persons
		a (3)	50 persons ≦
⑦ Affected vulnerable persons by inundation	Vulnerable person who live in area which inudation level is over 30 cm	d (0)	0
		c (1)	< 10 persons
		b (2)	10 ≦ < 50 persons
		a (3)	50 persons ≦
⑧ Waste by flood	Estimated waste ammount existing inundation area over 50cm deep	d (0)	0
		c (1)	< 50 t
		b (2)	50 ≦ < 150 t
		a (3)	150 t ≦

Program for Risk Information on Climate Change (SOUSEI program)

SOUSEI Program for Risk Information on Climate Change
気候変動リスク情報創生プログラム

ICHARM was a member institute of an MEXT 5-year research project, "Program for Risk Information on Climate Change (SOUSEI program)," since 2012. In this project, we worked on the development of a quantitative method to project possible changes in flood/drought risks in Asian river basins due to global warming and to evaluate resulting socio-economic impacts. We projected risk changes based on the fifth-generation of CMIP climate projections with uncertainties.

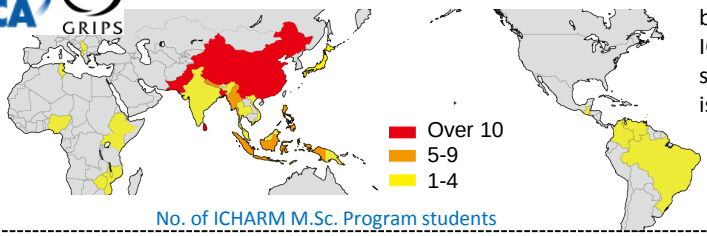
More specifically, we aimed to develop a locally-tailored method to use flood/drought hazard projections based on basin-scale GCM projections calculated with uncertainties, as well as basic technology to evaluate flood/drought risks. The five target river basins selected for this project were those of Indus (Pakistan), Chao Phraya (Thailand), Solo (Indonesia), Mekong (Cambodia), and Pampanga (the Philippines).



Rice Crop Damage Estimation in Pampanga River Basin

Effective Capacity Building

Education and training programs



No. of ICHARM M.Sc. Program students

ICHARM has been providing training programs that empower both individuals and organizations in disaster management. ICHARM also offers post-training follow-up activities, such as seminars for ex-trainees in their countries, to grasp their facing issues and establish new training courses.

1. Short-term training program: Participants learn knowledge and technologies relevant to water-related disaster risk management for a period of several days or weeks. Training courses are typically conducted in cooperation with JICA. We started "Capacity Development for Flood Risk Management with IFAS" from FY2012.

2. M.Sc. program: This one-year M.Sc. program, "Water-related Disaster Management Course of Disaster Management Policy Program," has been provided since 2007 jointly with JICA and GRIPS. The program is mainly designed for administrators in flood management in developing countries. Students attend lectures, practices and field trips in the first half and work on a Master's thesis in the latter half. As of September 2016, a total of 110 students graduated with a master's degree in disaster management.

3. Ph.D. program: Ph.D. program, "Disaster Management Program," has been provided since 2010 in collaboration with GRIPS. As of October 2016, five students are studying at ICHARM.

4. Follow-up activity: Post-training seminars and other workshops and meetings are occasionally organized mainly to support ex-trainees' activities in their countries.

Capacity building session among ex-trainees in AWCS2016 (2016.3)

Graduation ceremony at GRIPS (2016.9)

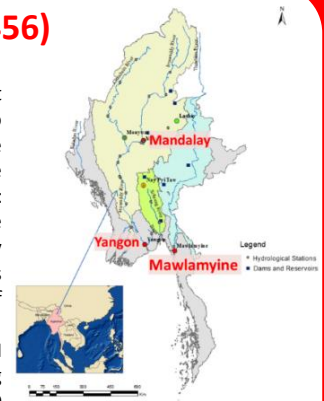
Local Practices

ADB projects (ADB TA-8456)

Cities in Myanmar are expected to be further developed at an alarming rate, and it is a pressing task for the country to strengthen urban functions and train personnel who can be assigned to that mission. In response to this situation, the Asian Development Bank implemented a project, "TA-8456: Transformation of Urban Management," to promote sustainable urban development in Myanmar cities by strengthening the institutional capacity of local authorities in leading the prioritized needs-based provision of essential infrastructure.

ICHARM participated as the project leader in Part II (Flood Management) of this project with CTI Engineering International Co., Ltd., CTI Engineering Co., Ltd., and PASCO CORPORATION. ICHARM was mainly responsible for technical transfer in flood management specifically for the country's three large cities (Yangon, Mandalay and Mawlamyine). The project was conducted from July 2014 to November 2016, during which in cooperation with the 3 private firms, ICHARM led the enhancement of the organizational capacity of the Myanmar government in flood risk reduction by providing them with the knowledge and skill in flood risk assessment and other relevant areas.

For the effective implementation of the project, a collaboration framework was set up by involving national and local agencies; at its core was the Department of Meteorology and Hydrology of Myanmar, networking 14 governmental organizations including the three cities. This framework, through which meetings and workshops were held for stakeholders to share and discuss ideas and problems, was one of the factors contributing to the success of this project.



Locations of the three large cities in Myanmar

Flood hazard map of Yangon (100-year flood)

UNESCO Pakistan project

After the unprecedented floods in Pakistan in 2010, ICHARM conducted a cooperation through UNESCO to provide technical assistance for development of a flood forecasting system in the Indus basin (Indus-IFAS), floodplain hazard mapping and capacity building for the related agencies in Pakistan during 2012 to 2014 (phase 1 project). As a result and successful achievement, Pakistan Meteorological Department (PMD) is providing flood forecast information based on Indus-IFAS on website.

This project is a good example of effective technical transfer by not only supporting in development of a simulation model, but also supporting in the development of competence in understanding of the model and operation of the systems. Since 2015, phase 2 operations has started which includes improvement of Indus-IFAS through integration of the eastern rivers, development of calculation module for melting snow in upstream regions, introduction of new correction methods for satellite-based rainfall data as well as provision of training necessary for flood prediction and river discharge observation using aDcp (acoustic Doppler current profiler).

IFAS training in Pakistan with three graduates from ICHARM M.Sc. Program (2013.8)

Organization

Public Works Research Institute (PWRI)

President

- Tsukuba Central Research Institute
- Civil Engineering Research Institute for Cold Region (CERI)
- Center for Advanced Engineering Structural Assessment and Research (CAESAR)
- Innovative Materials and Resources Research Center (iMaRRC)

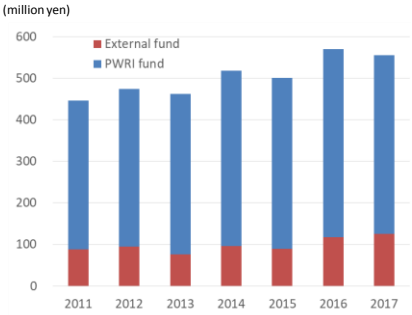
International Centre for Water Hazard and Risk Management(ICHARM)

Director: Prof. Toshio KOIKE

- Deputy Director of ICHARM (Director of Water-related Hazard Research Group)
- Director for Special Research
- Training & Research Advisor

- Chief Researcher (for PR & Training)
- Chief Researcher (for Risk Management)
- Chief Researcher (for Water-related Hazard)
- Chief Researcher (for Special assignment)

Budget



Achievements & Contributions

2006
- 3.6 ICHARM was officially established with Prof. Kuniyoshi Takeuchi as the first director.
- 9.14 Held ICHARM inaugural ceremony & commemorative symposium.

2007
- 10.4 Started an M. Sc. program on water-related risk management with JICA and GRIPS.

2008
- 6.2-7.11 Held a training course, "Comprehensive Tsunami Disaster Prevention," with UNISDR.

2009
- 11.13 Started a ADB joint project, "Capacity Development Technical Assistance (TA7276-REG)".

2010
- 10 Started a doctoral program on disaster management with GRIPS.

2011
- 9.27-29 Hosted an international symposium, "Floods – A global problem that needs local solutions (ICFM5)".

2012
- 1 Started the UNESCO Pakistan Project.
- 6 Started an MEXT SOUSEI project on risk information on climate change.
- 7.10-8.7 Started a capacity development training on flood risk management with IFAS.
- 10.23 ICHARM Director Takeuchi wins the International Hydrology Prize (UNESCO, WMO, IAHS).

2013
- 3.5-6 Hosted a side event at the UN Special Thematic Session on Water & Disasters.
- 7.23 The agreement on ICHARM between Japan and UNESCO was renewed.

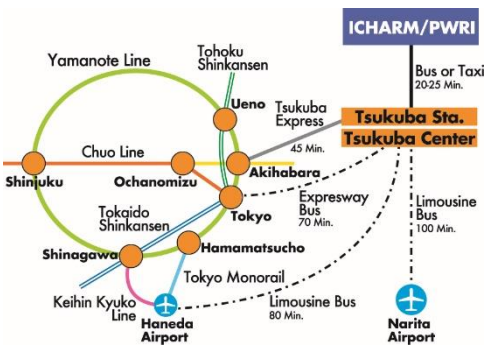
2014
- 2.25 Held the first ICHARM Governing Board meeting.
- 7 Started a ADB joint project, "Capacity Development Technical Assistance (TA8456-MYA)".
- 9.30 Held the International Symposium with GRIPS.
- 10.1 Prof. Toshio Koike took over as the second director.

2015
- 3.14-18 3rd UN World Conference on Disaster Risk Reduction (Sendai)
- 4.12-17 7th World Water Forum

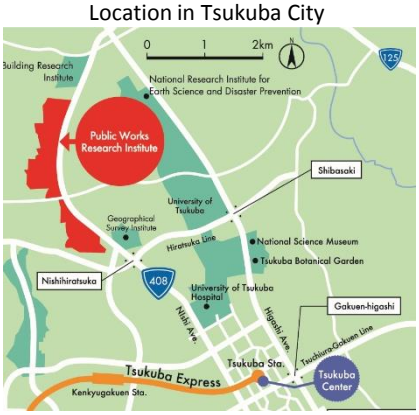
2016
- 3,1-2 Held the Asian Water Cycle Symposium (AWCS) 2016
- 3.3 Held the second ICHARM Governing Board meeting.

2017
- 6 Sent a researcher as a member of the Japan Disaster Relief Expert Team dispatched by the Japanese government to Sri Lanka

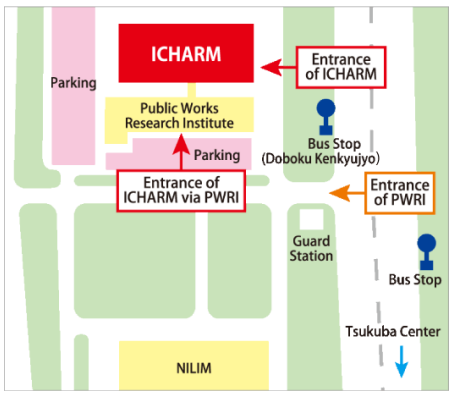
Access



Location in Tsukuba City



Location in PWRI



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