International Centre for Water Hazard and Risk Management

ICHARM

under the auspices of UNESCO

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

Mission

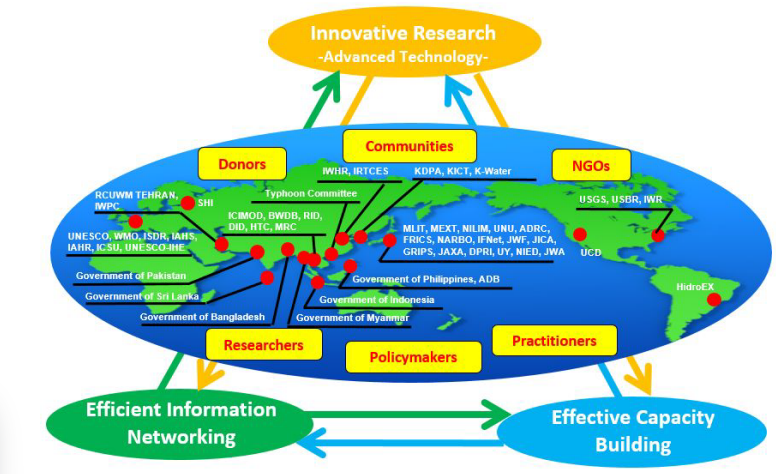
The mission of ICHARM is to serve as **the Global Centre of Excellence** for Water Hazard and Risk Management by, inter alia, observing and analyzing natural and social phenomena, developing methodologies and tools, building capacities, creating knowledge networks, and disseminating lessons and information 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.

(revised on March 3, 2016)

Scheme of ICHARM Programme

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.

Development and dissemination of Integrated Flood Analysis System (IFAS)

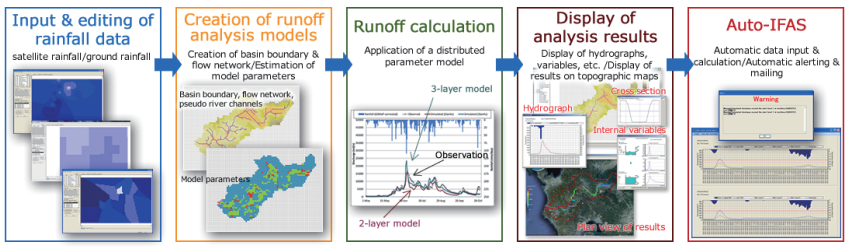
The Integrated Flood Analysis System (IFAS) is designed to help create a runoff analysis model easily by using topographic and land-use data which cover almost the entire globe and are available free of charge via the Internet.

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.

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

Calculation flow of IFAS

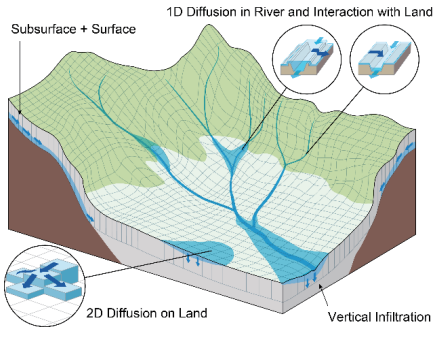


Development of RRI model

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.



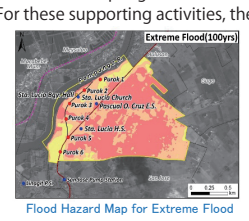
Schematic diagram of the RRI model

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

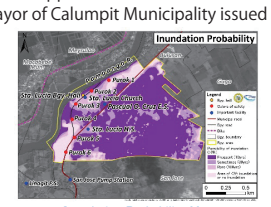
Research Activities on Risk Assessment and Risk Reduction
Creation of Community-level Flood Contingency Plans

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 developing the ICHARM Disaster Risk Information System (IDRIS) to share various kinds of flood information 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.

Example of assessment indices

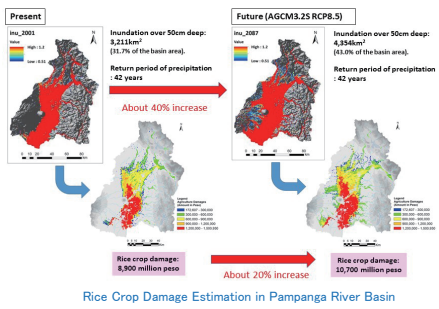
Viewpoint	Index	Risk (Score)	Threshold
① Lead time for evacuation	Duration of the inundation rising from 0.1 to 0.5m	d (0)	(under 0.5m)
		c (1)	6 hours <
		b (2)	3 hours ≤ ≤ 6 hours
		a (3)	< 3 hours
② Evacuation duration	Duration of the inundation remaining over 0.5m deep	d (0)	< 0.1day
		c (1)	0.1day≤ <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

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).

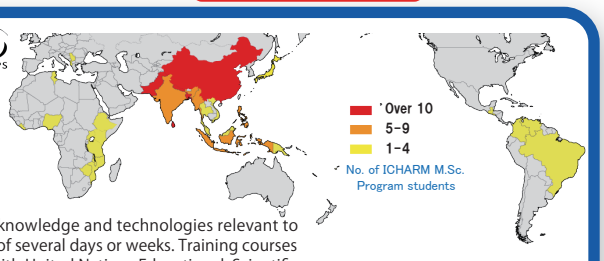


Rice Crop Damage Estimation in Pampanga River Basin

Education and training programs

JICA GRIPS

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.



No. of ICHARM M.Sc. Program students

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 conducted in Japan and abroad in cooperation with United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Bank (WB), Asian Development Bank (ADB) and Japan International Cooperation Agency (JICA).

2. M.Sc. program: This one-year M. Sc. program, "Water-related Disaster Management Course" of "Disaster Management Policy," has been provided since 2007 jointly with JICA and the National Graduate Institute for Policy Studies (GRIPS). The program is mainly designed for governmental officers involved in flood risk management in developing counties. Students attend lectures, hands-on activities, and field trips in the first half of the course, and work on a master's thesis in the second half. As of October 2018, a total of 132 students graduated with a master's degree in disaster management. Currently, 8 students are studying at ICHARM.

3. Ph.D. program: The Ph.D. program, "Disaster Management Program," has been provided since 2010 in collaboration with GRIPS. JICA has recently established a new scholarship for Ph.D. students, and ICHARM and GRIPS have subsequently strengthened the policy study courses in the Ph.D. program this year. As of October 2018, a total of 9 students graduated with a doctor's degree, and 6 students are studying at ICHARM.

4. Follow-up activities:
Post-training seminars, workshops, and meetings are organized mainly to support alumni' s and ex-trainees' development in their counties.

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

Graduation ceremony at GRIPS (2016.9)

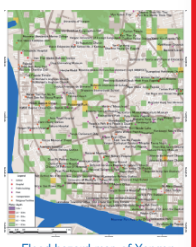
ADB projects (ADB TA-8456)

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 (Return period: 100 years)

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).

Flood hazard map of Yangon (Return period: 100 years)

Contribution to Typhoon Committee

ESCAP/WMO 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.

International Flood Initiative (IFI)

INTERNATIONAL FLOOD INITIATIVE

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

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)

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