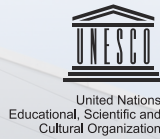
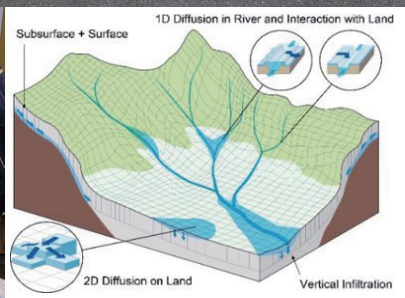


# ICHARM

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

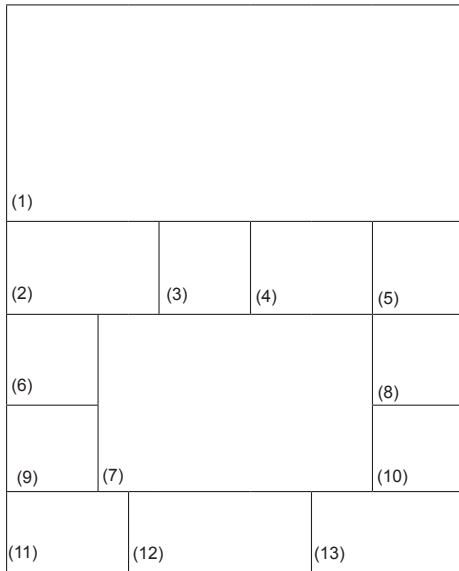


## 10th Anniversary since 2006





Photos on the cover:



- (1) The ICHARM building and its main entrance, remodeled from the Soil Mechanics Laboratory. Construction took place from August 2004 to September 2005.
- (2) The agreement signing ceremony among UNESCO, the government of Japan and PWRI. Left to right: Permanent Delegate of Japan to UNESCO, Ambassador Teiichi Sato, Director-General of UNESCO Koïchiro Matsuura and Chief Executive of PWRI Tadahiko Sakamoto. (March 3, 2006)
- (3) Shiro Hishinuma, the first Ph.D. awardee from ICHARM/GRIPS Disaster Management program. (September 17, 2013)
- (4) The 3rd Follow-up Seminar at Manila, Philippines. (February 17, 2009)
- (5) A schematic diagram of the Rainfall-Runoff-Inundation (RRI) model.
- (6) PWRI Chief Executive Taketo Uomoto (center) and ICHARM Director Kuniyoshi Takeuchi (right) submit the final project report to ADB-RSDD Director-General Seethapathy Chander. (March 12, 2013)
- (7) Graduating students huddle their hands around the memorial plate for long-term friendship after the memorial cherry tree planting ceremony near the ICHARM building. (August 30, 2016)
- (8) Graduate students pose for a photo with a statue of Kinjiro Ninomiya at Sontoku Museum in Tochigi, Japan. (September 10, 2013)
- (9) ICHARM Director Toshio Koike at Asian Water Cycle Symposium 2016 in Japan. (March 1-2, 2016)
- (10) Graduate students enjoy cherry blossoms while having lunch near ICHARM every April. (April 6, 2015)
- (11) An evacuation drill conducted for a community in the Solo River basin, Indonesia, during the ABD TA7276 project.
- (12) UNESCO-IHE Rector András Szöllösi-Nagy and ICHARM Director Kuniyoshi Takeuchi shake hands to share the joy of receiving the International Contribution Award by the Japan Society of Civil Engineers at the same time. (May 29, 2008)
- (13) An open discussion conducted with local residents at Calumpit City, Philippines, during a community-level flood contingency planning project (January 13, 2016)

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# ICHARM 10th Anniversary

published by

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

### Synopsis:

The International Centre for Water Hazard and Risk Management (ICHARM) was established in March 2006 as a UNESCO Category 2 Centre under the auspices of UNESCO in accordance with the agreement between the government of Japan and UNESCO. ICHARM focuses on research, capacity development, and information networking as three principal areas of its activity, and has served the world as the Global Center of Excellence in water hazard and risk management through numerous projects.

This 10th anniversary publication is produced to record the progress of ICHARM over the last decades and inform more people in the world about ICHARM and its activities.

Keywords: ICHARM, UNESCO, Category 2 Centre, Innovative research,  
Effective capacity building, Efficient information networking





# Foreword

## **Irina Georgieva Bokova**

- Director-General, United Nations Educational, Scientific and Cultural Organization (UNESCO)

Water stands at the heart of the new global agenda – including the 2030 Agenda for Sustainable Development, the Sendai Framework for Disaster Risk Reduction, and the Paris Climate Agreement.

Together, these chart a new pathway to a more sustainable and just future for all women and men and for the planet. This must include new forms of cooperation to overcome the challenges of water-related disasters and diseases, which take 6 to 8 million human lives every year, striking hardest the poorest and most vulnerable.

Since its establishment in 2006 as a Category 2 Centre under the auspices of UNESCO, the International Centre for Water Hazard and Risk Management – ICHARM – has gone from strength to strength, working with UNESCO’s International Hydrological Programme, to bolster the capacity of countries in addressing water-related hazards, by creating and sharing new knowledge, methodologies and tools.

I saw this for myself in 2010 when I flew to Pakistan with UNESCO flood management experts after the country was struck by devastating floods. ICHARM collaborated

promptly with UNESCO to strengthen capacity in Pakistan, upgrading its flood early warning system and providing training to ensure proactive and integrated flood management.

Cooperation between UNESCO and ICHARM reaches across the board, from technology transfer and capacity-building to addressing integrated water-related disaster risk management in Member States – notably, to implement the eighth phase of the International Hydrological Programme’s ‘Water Security: Responses to Local, Regional and Global Challenges’ (IHP-VIII 2014-2021).

In this spirit, I wish to congratulate ICHARM, its staff and partners, for their accomplishments over the last decade and their commitment to the goals we share. On this 10th anniversary, I wish to express special thanks to the Government of Japan for its financial and technical support, which has been so important for the success of ICHARM. Working arm-in-arm, I look forward to ever deeper cooperation in taking forward the new global agenda.





# Foreword

## Keiichi Ishii

● Minister 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 10th anniversary of the establishment of ICHARM.

ICHARM was established in March 2006 under the auspices of UNESCO as a research center housed in the Public Works Research Institute, and has since played the role of a global center of research in water-related hazard and risk management under the superb leadership of the inaugural director, Professor Kuniyoshi Takeuchi, and the succeeding director, Professor Toshio Koike.

Taking a retrospective look over the past 10 years, the world has experienced unspeakable calamities that we have never come across before including tremendous disasters such as the Great East Japan Earthquake with subsequent gigantic tsunamis and extreme meteorological events such as the Millennium Drought in Australia. As many point out the impact of global warming in such harsh natural events, we probably need to remind ourselves that natural hazards have become something we cannot cope with using what we have learned before.

A challenging time like this one requires research that is innovative and practical, and that is where Japan's expertise in disaster

management can contribute in order to ensure a safer living environment worldwide. In the effort of solving various water issues both at home and abroad, ICHARM has pioneered advanced flood simulation models and made remarkable achievements in collaboration with UN and other international organizations. In response to the Kinugawa River flood due to extreme rainfall over the Kanto and Tohoku regions of Japan in 2015, MLIT has produced a policy report, "Vision to Rebuild Flood-Conscious Society." This is part of Japan's effort in the reduction of water-related disaster risk, which, I believe, matches with ICHARM's mission to reduce such disaster risk on a global scale.

Capacity development is also one of the key activities of ICHARM. Many from developing countries have participated in its training or educational programs, and over 400 participants have completed either training or graduate-level programs. With the expertise they acquired at ICHARM, many of them are now holding responsible positions in their governments. A network of such individuals who spent time learning and living in Japan is an irreplaceable asset for Japan.

I sincerely hope that ICHARM will continue making contributions to further progress in water-related disaster risk reduction by bridging between Japan and the world and orchestrating the global effort in this field.





# Preface

## **Taketo Uomoto**

- President, Public Works Research Institute (PWRI)

The International Centre for Water Hazard and Risk Management (ICHARM) celebrated its 10th anniversary in March 2016. Based on the agreement between the Japanese government and UNESCO, ICHARM was established in March 2006 within the Public Works Research Institute as a UNESCO category II center under the auspices of UNESCO to promote research, capacity development, and information networking for the prevention and mitigation of water-related disasters on a global scale.

While conducting numerous investigation and research projects on a wide range of issues regarding water-related disasters, ICHARM has also been engaged in efforts to prevent and mitigate floods, droughts and other water-related disasters that occur around the world. Moreover, education and training have been an important part of its activity. The center provides various learning opportunities for disaster management practitioners overseas. Over the last 10 years, more than 100 foreign practitioners have studied as students of the joint graduate programs that ICHARM organizes with the National Graduate Institute for Policy Studies (GRIPS) of Japan,

and earned a master's or doctoral degree in disaster management.

ICHARM has done a great work in technological development, too. An international center of this kind is rare elsewhere in the world. One example is an advanced flood forecasting system. With this system, flood forecasting is possible even in areas with limited ground observation data by using satellite rainfall information as a means of interpolation. Such technological contributions by ICHARM are highly appreciated around the world. Many foreign engineers who participated in ICHARM's educational programs learned the workings and operation of such technologies, and today play a leading role in disaster management in their home countries by utilizing the expertise they acquired in Japan.

Preventing and mitigating water-related disasters are critical issues for the future development of the world. Better disaster management will certainly bring many people a safer life and make substantial contribution to the world. The Public Works Research Institute will continue providing utmost support for ICHARM to achieve further development in the coming decades.



# Preface

**Toshio Koike**  
● Director, ICHARM

Over a decade ago the International Centre for Water Hazard and Risk Management (ICHARM) was established at the Public Works Research Institute (PWRI) in Japan with the clear purpose to reduce water-related disaster risks through research, education and training, and international networking. As the succeeding director of ICHARM, following the founding director, Professor Kuniyoshi Takeuchi, I would like to first extend my sincere thanks to all the people who have committed themselves to each process of ICHARM's growth, including concept integration, organization, implementation, planning and operation. Owing to such great efforts made by our predecessors, ICHARM is now working as one of the world's leading organizations in the field of water-related disasters. Expectations to ICHARM are now increasing, especially under the three global agendas, the Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework), the Sustainable Development Goals (SDGs), and the Paris Agreement on Climate Change (Paris Agreement).

It seemed fitting to pause at our tenth

anniversary, inviting international leaders and bringing together colleagues and graduates to consider the current status of water-related disasters, to identify issues to be solved with high priority, to review what we have done and have not yet done, and to integrate discussions and dialogues about the future direction to take for reducing water-related disaster risks. We started this process at the Asian Water Cycle Symposium 2016 in Tokyo in March 2016. With this memorial publication, it is our great pleasure to have invaluable and encouraging messages from the founders, supporters and contributors. Our colleagues have reviewed and summarized past activities and achievements under the supervision of Prof. Takeuchi. I myself contributed a chapter to show the direction of the road ahead.

Through this publication, let us share with people around the world our experience on research, education and training, and international networking in the field of water-related disasters. It would be my great joy if this publication could work as leverage for further promoting the reduction of water-related disaster risks worldwide.





# Message

## **András Szöllösi-Nagy**

- Chair, Intergovernmental Council of the International Hydrological Programme (IHP) of UNESCO

Discussions started right after the 2nd World Water Forum, held in The Hague, The Netherlands, to significantly reinforce IHP's delivery capacity in the light of the growing pressures on water all over the world. That was the time when the notion of a "looming water crises" emerged. Particular interest was raised in water related uncertainties and risks with a view to channel the relevant efforts of IHP into building up a global institution that would provide global leadership in water hazard and risk management. I was at the time the Secretary of IHP and had a great deal of contacts with Japanese hydrologists in order to ask their advice with respect to the development path IHP ought to take in water risk management. As Japan was a leading force in this area, it came naturally that Japan is the best place to establish a research and education facility that could serve the relevant global capacity development needs, provided that the political recognition and leadership is there.

In March 2000 Mr. Koïchiro Matsuura, then Director-General of UNESCO, attended the 2nd World Water Forum and met several world leaders there to discuss emerging water issues and into what direction IHP ought to go. Needless to say that without Mr. Matsuura's vision IHP would have not received the very significant reinforcement that it did during the first decade of the new century. He strongly backed the idea that water should be a principal prior-

ity in UNESCO's science programmes and acted accordingly with the governing bodies of the Organization.

In running up to the 3rd World Water Forum, that was to be held in Kyoto in 2003, a number of preparatory activities were held in Tokyo with high level representatives of the River Bureau of the Ministry of Land, Infrastructure and Transport (MLIT) that culminated in a meeting held during the Forum in Kyoto between the Director-General and Mr. Kouki Chuma, the Senior Vice minister of MLIT. I was privileged to be present at the meeting and saw the visionary leadership on both sides that boded well for future IHP work in water risk management. A principal understanding was born right there that Japan will host a UNESCO center devoted to water risk management, particularly those of rare but disastrous short lived catastrophes such as flash floods.

Water-related disasters of devastating magnitude, such as the Indian Ocean tsunami in 2004, Hurricane Katrina in 2005 and the terrible landslide in the Philippines, have been occurring in various locations of the world. The number of disasters as well as the extent of their damages and impact have been increasing, therefore, Japan's generous offer to contribute to solve these challenges from the global point of view based on its accumulated knowledge and experience was welcomed by all.

After some serious preparatory activities ICHARM was inaugurated on March 6, 2006, and the work started immediately in Tsukuba where the Public Works Research Institute hosted the new UNESCO facility.

We have witnessed that ICHARM provided very significant and timely contributions over the past decade to Asia and to the globe in general in disaster mitigation.

This message would not be complete without paying tribute to the outstanding col-

leagues without whom there would be no ICHARM. Particular thanks are due to the leadership of MLIT, to Mr. Sakamoto, then director of the PWRI, Kuniyoshi Takeuchi sense, the first ICHARM director, Gene Stakhiv, the first Chair of the Governing Board, Akira Terakawa san, my colleagues then at IHP who helped a great deal to establish ICHARM: Messrs. Toshio Okazumi, Yoshiyuki Imamura, Toshihiro Sonoda, Janos Bogardi and many others who helped in this wonderful venture. Thank you all.

In closing, I wish many similarly successful decades for ICHARM to come.



On the occasion of the 2nd Advisory Board Meeting on October 1, 2008, Mrs. Judith Nem's, a prominent geometric artist and wife of Dr. András Szöllösi-Nagy, kindly donated her brilliant piece to ICHARM. The

piece is named as "Tsukuba" and hung on the wall of the entrance hall of ICHARM. She says:

*"What makes an artwork a recognizable entity and how does this really happen? How can one reach that with the strict rules of geometric art? For this is an area that contains an infinite variety of possibilities and, exactly for this, threatens with the chance of getting astray. Here, the definition of a system, with its own strict rules to be established by the artist, helps. It does not work without a system.*

*The "Tsukuba" series follows exactly this pattern where the colors were inspired by the color of water in different situations."*

Indeed, ICHARM needs inspiration from all realities of the world.





# Message

## Tadahiko Sakamoto

- Advisor, Nippon Koei. Co., LTD.
- Former Chief Executive, PWRI

I served as the Chief Executive of the Public Works Research Institute for 9 years, namely 2001 to 2010. During my term of 9 years, I had experienced lots of difficult situations, such as a budget cut of PWRI, a merging with Hokkaido Development Research Institute and so on. But the most important and difficult experience was an establishment of ICHARM.

In March 2003, the 3rd World Water Forum was held in Kyoto, Japan. At that time, Mr. Koichiro Matsuura, then Director-General of UNESCO visited Japan and had a meeting with Mr. Kouki Chuma, Senior Vice to Mrs. Chikage Ogi, then Minister of Land, Infrastructure, Transport and Tourism. Mr. Matsuura was enthusiastic in water related problems. Because he believed that a rapid increase of world population will cause very severe problems in the field of foods, clean water and energy supply as well as water related disasters.

He thought water related problems are essential for UNESCO activities. So Mr. Matsuura requested Mrs. Ogi to make a further contribution to UNESCO in the field of water hazard mitigation. As you know, the Ministry is responsible in the field of water hazard mitigation and PWRI is also responsible in the field of water hazard mitigation research. As a result, PWRI was ordered to establish a UNESCO Research Center by the Ministry.

In the process of establishment of ICHARM,

we encountered unexpected difficulties. Officers of the Ministry of Finance did not permit to increase the budget of PWRI. They said it is free for you to expense PWRI budget for ICHARM but PWRI budget will not be increased. So I ordered a budget cut of other research groups in a storm of opposition. ICHARM building was an originally research laboratory for soil mechanics with one story, high ceiling and crane systems. We rebuilt the laboratory for ICHARM building with two stories and seismic resistance. The fund was the budget cut and patent fees of other research groups.

We also encountered unexpected difficulty in consulting with UNESCO. At first we thought we are requested to establish a UNESCO Center. But officers of UNESCO said your proposal to establish a UNESCO Center will be severely checked in accordance with UNESCO guidelines. They offered no fund except the name of UNESCO Center. Anyway ICHARM was established in March 2006, just 3 years after the meeting of Mr. Matsuura and Mr. Chuma, and we obtained the name of ICHARM under the auspices of UNESCO.

Simultaneously the establishment of ICHARM, Professor Kuniyoshi Takeuchi was appointed the Director of ICHARM after consultation with UNESCO. And Professor Toshio Koike succeeded the position in 2014. They are both famous and academic worldwide in the field of water problems. Now I am much pleased to hear that ICHARM is actively contributing to water related problems in the world.



# Message

## **Koïchiro Matsuura**

- Former Director-General, UNESCO

On the occasion of the 10th anniversary of ICHARM, I wish to extend my wholehearted congratulations to all those who have been involved in managing the Centre over the last ten years, in particular to the first Director, Professor Takeuchi, and to the current Director, Professor Koike. I am aware of the fact that ICHARM is one of the most successful Category II centres under the auspices of UNESCO in the field of water. And I note with appreciation that its budget and staff have been increasing, which is undoubtedly one of the reasons for the success of ICHARM.

I vividly recall the ceremony held at UNESCO Headquarters in March 2006 where I signed with Ambassador Sato and Dr. Sakamoto, who represented the Japanese government, the Agreement to establish a new Category II centre with the three major pillars of research, information networking and training in the area of water-related disasters. Thanks to its two Directors and its staff, ICHARM has produced remarkably positive results in these three domains.

I sincerely hope that ICHARM will continue to flourish in these three key fields, in collaboration with other institutes and organizations in Japan and elsewhere.





# Message

## **Takashi Shiraishi**

● President, National Graduate Institute for Policy Studies (GRIPS)

I would like to congratulate the International Centre for Water Hazard and Risk Management (ICHARM) of the Public Works Research Institute (PWRI) on this occasion of the tenth anniversary of its establishment.

Since 2006, the National Graduate Institute for Policy Studies (GRIPS) has been collaborating closely with ICHARM, along with the International Institute of Seismology and Earthquake Engineering (IISEE) of the Building Research Institute (BRI) and the Japan International Cooperation Agency (JICA), to offer and promote the Master program in Disaster Management Policy as part of our joint contribution to the capacity-building of developing countries to train professionals and government officials to cope with natural disasters.

In this program, students are trained in seismology, earthquake engineering, tsunami disaster mitigation, and water-related disasters. Students acquire the basic knowledge necessary for disaster risk management, learning not only the theoretical underpinnings of disaster management policies, but also glean insights from comparative cases, including Japanese policies and systems, in order to work out their own policy proposals in light of the local conditions and systems of their own countries.

GRIPS and ICHARM have also worked closely to create a Ph.D. Program in Disaster Management in 2010 to train professionals who will be in leadership positions in the planning and implementation of national and international strategies in the field of water-related risk management.

GRIPS has been offering Master and Ph.D. courses for mid-career officials in important policy areas such as disaster management policy, macro-economic policy, policy analysis, development policy, security and foreign policy, and science, technology and innovation policy. GRIPS has also gone into partnership with government agencies and think-tanks to offer degree programs and train students from more than eighty countries.

The Disaster Management Policy Program is one of our most important degree programs and has been attracting promising students. The more stellar the achievements of these graduates as policy professionals and the more they contribute to their policy communities and the world, the better the reputation of GRIPS and ICHARM will be and the better and more competitive the students we will recruit.

It is my sincere hope that both GRIPS and ICHARM will continue to recruit top students, train them well, and nurture their careers in the years to come.



# Message

## **Shinichi Kitaoka**

● President, Japan International Cooperation Agency (JICA)

On behalf of the Japan International Cooperation Agency (JICA), I would like to extend my heartiest congratulations to ICHARM for its 10 outstanding years of tireless effort and resounding success in the area of disaster risk management. Working with ICHARM has been a great honor, and we at JICA are delighted to have established with it an ideal collaboration for helping developing countries to understand and mitigate the perils posed by natural calamities.

Given Japan's own vulnerability to natural disasters, assistance toward their reduction and management is one of JICA's long-standing priorities. As ICHARM is the "Global Center of Excellence" for water hazard and risk management, its expertise is a great resource for our agency's operations.

An element of our collaboration with ICHARM is the provision of a Master's Degree Course on "Flood Disaster Risk Reduction." From 2007 to 2015, more than 100 JICA trainees from 28 countries have graduated from this specialized course, which is run by ICHARM. One unique aspect of this course is that trainees learn about basic and essential technologies developed in Japan throughout its modernization and that in turn can be applied to devise practical solutions in developing countries. This is crucial when considering that developing countries very often face budget and human resource constraints. I would like to thank ICHARM for its great work to accumulate and extend Japan's technical heritage for such a noble objective.

As it works at the leading edge of analysis and research on water-related disasters, I would like to point out that ICHARM's expertise also has been applied to resolve concrete and pressing issues on the ground. In 2011, ICHARM formulated the basis of the Comprehensive Flood Management Plan for the Chao Phraya River Basin in Thailand following a major flood there the same year. In fact, the ICHARM Rainfall-Runoff-Inundation Model underlying this Master Plan comprises the core part of the most advanced flood forecasting system, projecting not only discharge and water levels but also the flood inundation area one week ahead of time. Hence, this robust forecast enables industrial companies in the affected area to prepare for floods more effectively. As a testimonial to its value, a new governmental committee chaired by Thailand's Prime Minister has decided to implement the Comprehensive Flood Management Plan for the Chao Phraya River Basin. Indeed, this is just one of the many examples of developing countries benefitting from and appreciating ICHARM's expertise.

Last year, at the UN World Conference on Disaster Risk Reduction, the international community adopted the "Sendai Framework for Disaster Risk Reduction 2015-2030." To achieve the provisions and goals set forth in that praiseworthy framework, I strongly believe that ICHARM's role will, and must, become more significant.

Finally, I would like to extend my sincere gratitude to ICHARM for all its efforts to date in reducing water-related disasters in developing countries. I also look forward to further strengthening our fruitful partnership in the years to come.



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# List of Acronyms

<b>ADB</b>	Asian Development Bank
<b>APWS</b>	Asia Pacific Water Summit
<b>APWF</b>	Asia Pacific Water Forum
<b>AWCI</b>	Asia Water Cycle Initiative
<b>AWDO</b>	Asia Water Development Outlook
<b>BfG</b>	German Federal Institute of Hydrology
<b>BRI</b>	Building Research Institute
<b>CLRI</b>	Institute for Catastrophic Loss Reduction
<b>DIAS</b>	Data Integration and Analysis System
<b>DMH</b>	Department of Meteorology and Hydrology, Myanmar
<b>ESCAP</b>	Economic and Social Commission for Asia and the Pacific
<b>FDPI</b>	Flood Disaster Preparedness Indices
<b>GRIPS</b>	National Graduate Institute for Policy Studies
<b>GSMaP</b>	Global Satellite Mapping of Precipitation
<b>HELP</b>	High-level Experts and Leaders Panel on Water and Disasters
<b>IAHS</b>	International Association of Hydrological Sciences
<b>IAHR</b>	International Association for Hydro-Environment Engineering and Research
<b>ICFM</b>	International Conference on Flood Management
<b>ICHARM</b>	International Centre for Water Hazard and Risk Management
<b>IFAS</b>	Integrated Flood Analysis System
<b>IFI</b>	International Flood Initiative
<b>IIASA</b>	International Institute for Applied Systems Analysis
<b>IHP</b>	International Hydrological Programme
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>JAXA</b>	Japan Aerospace Exploration Agency
<b>JICA</b>	Japan International Cooperation Agency
<b>NILIM</b>	National Institute for Land and Infrastructure Management
<b>MEXT</b>	Ministry of Education, Culture, Sports, Science and Technology
<b>MLIT</b>	Ministry of Land, Infrastructure, Transport and Tourism
<b>MRI</b>	Meteorological Research Institute
<b>NAMRIA</b>	National Mapping and Resource Information Authority
<b>NARBO</b>	Network of Asian River Basin Organizations
<b>NASA</b>	National Aeronautics and Space Administration
<b>PAGASA</b>	Philippine Atmospheric Geophysical and Astronomical Services Administration
<b>PMD</b>	Pakistan Meteorological Department
<b>PWRI</b>	Public Works Research Institute
<b>RETA</b>	Regional Technical Assistance
<b>RCUWM</b>	Regional Centre on Urban Water Management
<b>RID</b>	Royal Irrigation Department
<b>RRI</b>	Rainfall-Runoff-Inundation
<b>SRTM</b>	Shuttle Radar Topography Mission
<b>SUPARCO</b>	Pakistan Space and Upper Atmosphere Research Commission
<b>UN</b>	United Nations
<b>UNDP</b>	United Nations Development Programme
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization
<b>UNISDR</b>	United Nations Office for Disaster Risk Reduction
<b>UNSGAB</b>	United Nations Secretary-General's Advisory Board
<b>UNU</b>	United Nations University
<b>WCDR</b>	World Conference on Disaster Reduction
<b>WMO</b>	World Meteorological Organization
<b>WSDAC</b>	Centre for Water for Sustainable Development and Adaptation to Climate Change
<b>WWAP</b>	World Water Assessment Programme
<b>WWF</b>	World Water Forum

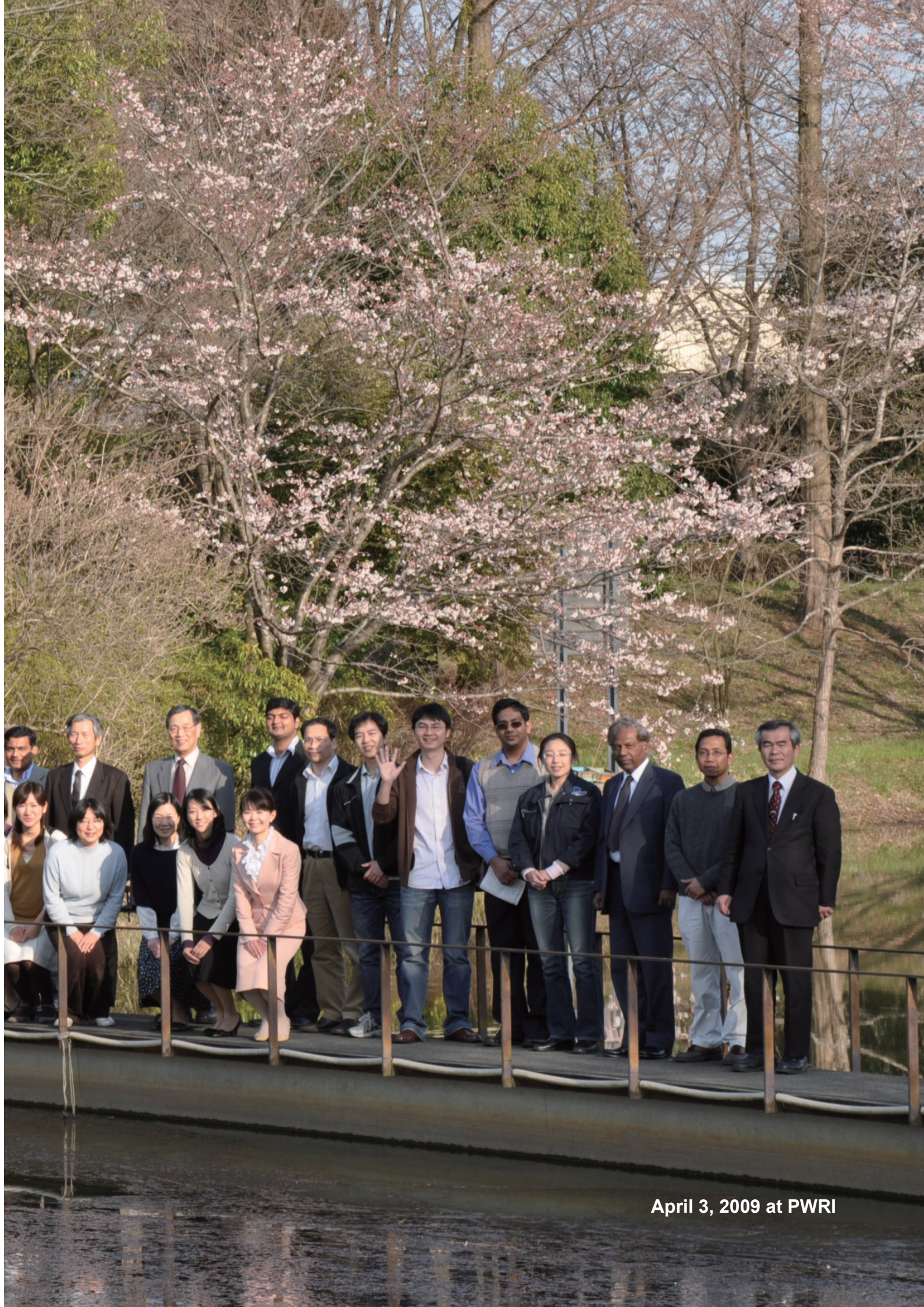




# 1 Progress of ICHARM over 10 Years







April 3, 2009 at PWRI



# 1 Progress of ICHARM over 10 Years



**Kuniyoshi Takeuchi**  
● Advisor, ICHARM  
● Founding Director, ICHARM

ICHARM was founded on March 6, 2006, and it is the 10th anniversary this year. Our achievements over the decade owe a great deal to generous support and cooperation from many individuals and organizations that share our mission and passion to solve global water issues. We would like to express our deepest gratitude for all who supported us.

The last 10 plus years of ICHARM may be divided into the four phases: the preparatory phase covering the

period from the third World Water Forum (WWF) to its inauguration; the start-up phase from the inauguration to the formation of the basic structure of our principal activities; the progress phase during which we strengthened the activities; and the start of the 2nd period of ICHARM from October 2014 with new director Dr. Toshio Koike. I would like to review our activities in those phases with the box messages contributed from key individuals for this anniversary publication to share their fond memories about ICHARM.

## Preparation

In March 2003 at the Ministerial Conference of the third WWF in Kyoto, Dr. Koïchiro Matsuura, the Director-General of UNESCO\*, made an announcement: "We have agreed with the Japanese government to set up an international water-related disaster research center in Japan." To most people concerned, it was this time when the idea of ICHARM was made known to them. I later heard that the final agreement had been made at the meeting held on the previous day between the Director-General and Mr. Koki Chuma, the Vice Minister of Land, Infrastructure, Transport and Tourism (MLIT), but very few in the MLIT's River Bureau seemed to have been aware of it.

\*Hereafter, organizations and the positions and titles of individuals in this section were those that were used at that time.

The establishment of a water-related disaster research center in Japan was initially conceptualized due to a growing concern on water-related disasters throughout

the world and international expectations for Japan to contribute its advanced science and technology to disaster reduction. In addition, Japan had been demonstrating a strong international leadership in the world's water community since the involvement in the second WWF in the Hague in 2000, contributing to the launch of the World Water Assessment Program (WWAP) led by UNESCO and making the offer for hosting the third WWF in Kyoto, Osaka and Shiga Prefectures in 2003. In such an environment, the idea that some kind of centre should be created to maintain Japan's contribution to the world even long after WWF3 came to fruition, thanks to the tremendous effort from the strong-willed leaders, Dr. Koïchiro Matsuura, Director-General of UNESCO, and Dr. András Szöllösi-Nagy, Director of the Division of Water Sciences, UNESCO, together with Mr. Yoshiyuki Imamura, who were at UNESCO IHP at the time on temporary assignment from MLIT.

Around that time, many water-related (Category II)

centers under the auspices of UNESCO were set up and started their activities mainly in developing countries, including the Regional Humid Tropics Hydrology and Water Resources Center for South-East Asia and the Pacific (HTC) in Malaysia, the Regional Centre for Training and Water Studies of Arid and Semi-Arid Zones (RCTWS) in Egypt, and the Regional Centre on Urban Water Management (RCUWM) and the International Centre on Qanats and Historic Hydraulic Structures (ICQHHS) in Iran. Between 1998 and 2002, I was deeply involved in discussions on such projects as the Chair, as well as the Vice-Chair, of the Intergovernmental Council of International Hydrological Programme (IHP) of UNESCO, and witnessed the strong strategic development of regional activities led by the IHP, which Dr. Nagy had wished to see for years. From 2000 onwards, the initiative spread to developed countries, resulting in the creation of the Centre for Water Law, Policy and Science in the United Kingdom and the European Regional Centre for Ecohydrology (ERCE) in Poland, for instance. It was only natural that a proposal was concurrently made to establish a UNESCO Category II Centre on water-related disasters in Japan.

Subsequent to discussions about where in Japan the UNESCO Center should be established, the Public Works Research Institute (PWRI) was chosen to host

it. As a result, the Secretariat for Preparatory Activities of UNESCO-PWRI Center (Preparatory Office) was set up at PWRI in April 2004, and worked for two years till March 2006 when ICHARM officially started its operation. During that preparation phase, PWRI CEO Dr. Tadahiko Sakamoto, Preparatory Office Director Mr. Akira Terakawa, and Mr. Imamura of UNESCO IHP undertook difficult ground work for the foundation of the center. In the IHP Intergovernmental Council meeting held in September 2004, in which the proposal for establishment of the center was submitted to UNESCO, PWRI hosted a reception featuring Japanese cuisine where UNESCO's senior officials, ambassadors from various countries, and many other people concerned celebrated the proposed plan.

Around the same time, CEO Dr. Sakamoto invited me to be the founding director of ICHARM, and I felt that it was a great honor, considering my long-term involvement in IHP activities in Southeast Asia and the Pacific, as well as at the global level, and accepted it without hesitation. As I had one more year left until retirement from Yamanashi University in March 2007, arrangements were made for me to serve both for ICHARM and for the university during the first year.

It was May 2003, only two months from the



## 10 years make an epoch

### **Akira Terakawa**

- *Director, Research Division I, Foundation of River & Basin Integrated Communications*
- *Former Director, Secretariat for Preparatory Activities of UNESCO-PWRI Centre*
- *Former Deputy Director, ICHARM*

I, with 6 colleagues, was ordered on April 1st, 2004 to be in charge of preparatory activities to set up UNESCO category 2 centre in PWRI for the first time in Japan. Our original office was a small meeting room on the 7th floor of NILIM main building. We decided to periodically issue a newsletter in Japanese and in English to inform the situation of preparation to the concerned persons inside and outside of Japan. When I look back these newsletters, the days 10 years ago hot revive.

We, at first, promoted the preparation with the English abbreviated name 'CHARM', which, we received comments from the UNESCO Headquarters, was overlapped with another existing program and should be changed. After consulting with Dr. Sakamoto, then the Chief Executive of PWRI, we decided to add 'I' (of International) to the head and changed to 'ICHARM'. The logo mark of ICHARM was publicly invited and decided by the vote of the concerned persons from 3 pre-screened plans. ICHARM office space was prepared by largely repairing the existing building for comprehensive soil experiment laboratory, under the strong leadership of Dr. Sakamoto and with great support and cooperation from all of the research groups, which I can never forget in my life. It is also a good old memory, at the occasion of the second Advisory Board Meeting in October 2008, oil painted art donated by the wife of Dr. András Szöllösi-Nagy, then the Director of Water Science Division of UNESCO, was decorated at the stairs landing of the entrance space of the office building.

In March 2006, Prof. Takeuchi was invited to be the first Director of ICHARM and we started 'research, training and information networking activities in a combined manner to prevent/mitigate water related disasters in the world', which I, still remember, repeated to announce in Japanese and in English many times in various occasions.

Ten years later, tremendous effort of ICHARM members, with receiving support of so many people, made ICHARM famous world-wide both in name and in activities outcome, which I really am glad to see from outside.



announcement of Director-General Matsuura, when I was first invited to PWRI to talk about how to prepare for the establishment of a UNESCO center. I stressed that the new center should become an international research hub that could take the global leadership in water science and technology. I expressed my hope that the center should grow to be as competent as the world's leading national hydrology research institutes in the United States and Europe. I also addressed that to achieve all this would require an array of excellent researchers, pointing out that the center should offer a research environment attractive enough to receive such researchers and that

English must be the common language in the center. The other point I stressed was that to improve disaster reduction practices in any country, capacity development is a must where the centre should make a major effort to contribute. In March 2005 and January 2006, we held international workshops on flood management, and collected opinions of participants from overseas and Japan as to what expectations they had for the new center. Many participants expressed strong expectations for the centre to make contributions that could meet local needs and that could improve local capacities.

## Start-up

On March 6, 2006, ICHARM was inaugurated with a tape-cutting ceremony held in front of the new ICHARM building, which had been prepared by remodeling one of the laboratories of PWRI. We barely made it before the fourth WWF, held in Mexico City.

The first task of ICHARM was to formulate its activity policy. By then, the Preparatory Office had done an excellent job on identifying the general mission and the basic activities. Our mission had been clearly stated in the name of the center, "International Centre for Water Hazard and Risk Management," and the basic activities had also been concisely expressed as three pillars

of activities, i.e., "research, training, and information networking". Yet it was a difficult task to design concrete action plan and strategies to implement those. Considering a wide range of input from various occasions including the pre-inaugural international workshops, all ICHARM researchers participated in discussions on what to achieve and how. As a result, we reached agreement on practical objectives that ICHARM should become a global center of excellence with capabilities to lead international research, act on localism by responding to actual needs of localities, and reduce scientific gaps in developing nations by integrating research with capacity development.



### For better technological transfer, better thought for well-being needed

**Shigenobu Tanaka**

- Professor, Disaster Prevention Research Institute, Kyoto University
- Former Deputy Director, ICHARM

It was one year after the Indian Ocean Tsunami, which took lives of more than 200,000 people, when I was transferred to PWRI to take charge of tsunami training. I was appointed to be the chief researcher in charge of capacity building on March 6, 2006.

ICHARM had already started its operation consisting of three pillars: innovative research, capacity building and information networking. The centre was asked to conduct capacity building programs to show developing countries how a disaster prone country had been successful in disaster risk reduction.

I happened to know a book, "The Greatest Legacy (1897)," by Kanzo Uchimura. It says that civil engineering work is one of the important things to hand over but the most important is education and/or thought to bring people up. I was convinced that the work to pass down basic thoughts from the experienced to the young is so important and that there should be key lessons to share in Japanese history.

One such lesson is in "A Living God," a book about Goryo Hamaguchi. He not only saved village people from tsunami in 1854 by leading evacuation with the lights of fire but recovered the devastated village by constructing a tsunami embankment. Another is in "Representative Men of Japan (1908)", also written by Kanzo Uchimura in English to introduce Japan to the world. It consists of stories about five Japanese men. One of them is Sontoku Ninomiya, who contributed a great deal to reconstruction of many exhausted villages in eastern Japan. I believe his way of thinking is very helpful in our life even now, especially in difficult situations.

Technological transfer alone is not enough: we also need to transfer thought for better well-being. I wish that Japan and Japanese are always respected as a front runner in disaster risk reduction.

ICHARM's objective was stated as :

*To serve as the Global Center of Excellence to provide and assist implementation of best practicable strategies to localities, nations, regions and the world to manage the risk of water related hazards including floods, droughts, landslides, debris flows and water contamination.*

In addition, localism was set as ICHARM's most important challenge and defined as :

*Localism is 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.*

They served as the basic policy of ICHARM with considerable elaboration of the objective statement on the occasion of the first Governing Board in February 2014.

In the field of research, ICHARM applied for "FY2006 5-year Research Program: Innovative Program of Climate Change Projection for the 21st Century" (Kakushin program) offered by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), proposing a research project, "Assessment of the impact of climate change on flood disaster risk and its reduction measures over the globe and specific vulnerable areas," and our plan was accepted. Under the leadership of Dr. Akio Kito, Division Director of the Meteorological Research Institute (MRI), ICHARM made full organizational efforts for the success of this project, including those of the team led by Mr. Kazuhiko Fukami, Chief Researcher of ICHARM. Our goal was ambitious, probably a little too ambitious to complete within five years; we could only focus on the Asian region and could not get much

research on disaster countermeasures. Nevertheless, we could achieve some important results, such as a bias correction method for climatological projections, a global run-off simulation system, and local case studies on the flood risk assessment in Cambodia and Nepal.

In the field of training, ICHARM successfully implemented a flood hazard mapping course that started in FY2004 by the PWRI Hydrology Research Group, ICHARM's forerunner, as a group training program of the Japan International Cooperation Agency (JICA), accepting 16 trainees from 8 Asian countries. In October 2007, a year and a half after the foundation of ICHARM, the one-year master's program, "Disaster Management Policy Program: Water-related Disaster Management Course," started as a collaboration of the National Graduate Institute for Policy Studies (GRIPS), JICA and ICHARM. This initiative came from the commitment of ICHARM to becoming an international organization that could foster global leaders in water-related disaster management, just like UNESCO-IHE in the Netherlands, which also offers water education programs. The master's program made a smooth start despite a relatively short period of preparation, thanks to the approval and support of PWRI CEO Dr. Sakamoto and Prof. Shigeru Morichi of GRIPS. Actually, a trusted communication between Prof. Morichi and I, who were classmates at the University of Tokyo, helped a lot with such an early installment of the graduate-level program.

In designing the educational programs, we owed much to Prof. A.W. Jayawardena, Research and Training Advisor of ICHARM, who had a good sense of wit and discipline from his experiences at the Oxford University and Hong Kong University, and Dr. Shigenobu Tanaka,



February 8, 2008 at Bogra city, middle reaches of Jamuna River in Bangladesh

Chief Researcher (now a professor of Kyoto University), who provided trainees with good knowledge in Japanese culture and lifestyle. Dr. Tanaka introduced the philosophy of Sontoku Ninomiya\* to training programs; he thought that it is important for trainees to keep Sontoku's values and ideas in mind when they work for their countries. We even created the "Sontoku Award" to honor an individual who was the most willing to selflessly work for the whole during the training with an award certificate and a miniature statute of Sontoku. The award has since continued and widely familiarized as one of the traditions of ICHARM.

\*Sontoku Ninomiya, also known as Kinjiro Ninomiya, was a prominent Japanese agro-reformer, philosopher and moralist in the 19th century who guided many local communities out of poverty by teaching the importance of generosity, hard-working, frugality and other values to create a better future.

There are other traditions too in the educational programs. One is the cherry blossom viewing event. This event first started from a suggestion by PWRI CEO Dr. Sakamoto. Every spring, the event is held near our building, in which students, researchers and senior officials get together and have lunch under cherry blossoms in full bloom. This has been a great opportunity for everybody to get to know each other. Until 2011, when a traditional Japanese style house in PWRI's premises was not yet damaged by the Great East Japan Earthquake, we enjoyed viewing cherry blossoms around a pond near the house, took photos on the bridge over the pond against full blossoms, and attended a tea ceremony in the house, hosted by Ms. Mikiko Nakamura, an office assistant of ICHARM and an experienced tea master. It is very unfortunate that the house is no longer available after the earthquake although the events continue elsewhere.

## Progress

Following the master's program, the doctoral program started in October 2010 with the research assistantship offered for doctoral students by PWRI. In this assistantship, students help researchers of ICHARM with research activities, through which they can not only learn but also contribute to practical application of advanced science and technology to actual cases. The doctoral course is expected to play a significant role in ICHARM's innovative research. To date, ICHARM has produced 110

master's and 7 doctoral degree holders, and the network of those graduates has continued expanding all over the world, forming a powerful liaison for ICHARM to further promote local practices.

Hoping to keep a close tie with and among alumni, we have started another tradition of planting a young cherry tree since 2013, when Dr. Nario Yasuda was the



### Founding the Master Program of GRIPS and ICHARM

#### **Shigeru Morichi**

● *Professor and Director, Policy Research Center, GRIPS (National Graduate Institute for Policy Studies)*

We are excited to have the ten years anniversary of ICHARM. Congratulations!

In mid of 1990's, Prof. K. Takeuchi, my classmate of Tokyo University, visited my office in Tokyo Institute of Technology to ask me about EASTS (Eastern Asia Society for Transportation Studies) which we founded in 1994. He had already so many experiences of the activities and contributions in his field for Asian Region, however he felt strongly that the additional efforts for the capacity buildings in Asia was needed and that he should contribute for the education. The appointment of Prof. Takeuchi as the director of ICHARM almost ten years later was a great decision for the future experts in Asia, for ICHARM and for himself.

The Disaster Management Program in GRIPS had been started with the cooperation of the Building Research Institute, MLIT as the master degree program for earthquake proof related training of BRI. I was the first program director, therefore Prof. Takeuchi requested me to open the similar program in GRIPS for ICHARM. Then the existing DMP was expanded to include the Water Related Disaster Course.

Many experts in Asia had been educated in the training program of Delft University. However the natural conditions of the water related disasters in Asia are different from it in Europe, and it is desirable to educate in different region and to expand the chance for young experts in Asia and other regions. That might be the reason to start ICHARM of UNESCO in Japan.

The outcome of ICHARM and the DMP has been more than expected by the huge efforts of lecturers, trainees and staff. I believe the educated experts will improve the disaster proof system in each country.

I wish the continued success of the research and education of ICHARM.



Deputy Director of ICHARM. Every year when a class of students graduates, a young cherry tree is planted with a sign indicating the graduating class stood next to the tree. This way, each tree becomes a symbol of unity that reminds them of the sense of comradeship with fellow alumni whenever they visit ICHARM. I really hope that the tradition will continue for the next decade and many more.

Our collaboration with the Asian Development Bank (ADB) also started in this phase. In pursuit of challenges to practice ICHARM's localism, I visited ADB in August 2009 to request starting a partnership project with ICHARM. As a result, both sides agreed to implement a joint research project, "Regional Technical Assistance (RETA), Supporting Investment in Water-Related Disaster Management," which focused on the assessment of flood risk in the Mekong River basin, the installment of an early warning system in the Solo River basin, the assistance in flood management policy making in Bangladesh, etc. The project was originally planned for the period of 2009-2011, which was subsequently extended till February 2013. I attended the signing ceremony with PWRI CEO Dr. Sakamoto in November 2009.

Since PWRI had had no experience with joint research funded by an international organization before, Mr. Katsuhito Miyake, ICHARM Chief Researcher in charge of this project, encountered difficult problems due to the differences between the two organizations in administrative technicalities regarding contracts and budget implementation. Despite such difficulty, ICHARM could produce epoch-making research results. One was the advanced development of the Integrated Flood Analysis System (IFAS), which had already been in progress before the official launch of ICHARM, and another is the development of the Rainfall-Runoff-Inundation (RRI) model, which was proposed by ICHARM Researcher Dr. Takahiro Sayama and finally put in operation around 2010. Both developments not only greatly contributed to the project, but also became key instruments of ICHARM for research and local assistance for early warning and risk assessment practices, as well as in education programs for students to work on their graduation theses. Moreover, such tools have been tried to be installed in the basic flood risk management system in Indonesia and other nations. In March 2013, when the ADB project finally ended, I visited the ADB headquarters at Manila again with Dr. Taketo Uomoto, PWRI CEO after Dr. Sakamoto, to deliver the final results of the research.

ICHARM made a major contribution to UNESCO's emergency efforts in response to devastating floods that took place in the Indus River in 2010. It was the first case for UNESCO to take such action. Following the visit of Secretary-General of the United Nations, Dr. Ban-Ki Moon, to the affected area at the early stage of the floods, Director-General of UNESCO Dr. Irina Bokova



visited Japan and called for assistance in providing flood inundation prediction for its advancement, and subsequently in the installment of flood forecasting and warning systems. The press conference was held to announce that ICHARM and the Japan Aerospace Exploration Agency (JAXA) would accept the request. This resulted in UNESCO's Pakistan project, "Strategic Strengthening of Flood Warning and Management Capacity of Pakistan," which started in 2011. ICHARM has provided a wide range of support in this project from research to capacity development training. As part of the project, Pakistani engineers and officials were invited to ICHARM master's program to strengthen their capabilities to operate the systems effectively. Now the project is in its second phase.

When a devastating flood occurred in the Chao Phraya River in 2011, ICHARM conducted simulation using the RRI model and issued press releases on how the flooding might spread, or recede, over various parts of Thailand in the following month. This helped the country a great deal to perform effective flood management. Building on this experience, it later developed a smartphone-based information distribution system with JICA's support to provide the public with flood inundation information in a timely manner.

At 2:46 p.m., March 11, 2011, the Great East Japan Earthquake suddenly struck Japan. It was a mega-earthquake that no one at ICHARM had ever experienced. The roofs and building trembled, and documents on the desks and bookshelves scattered all over the floor. People in the office went under the desk, shaking in shock and fear. I hurried out the moment the tremors stopped, and another wave of quakes soon started. I was surprised to see the dogwood trees along the roadside shaking wildly as if moving laterally from side to side. My mobile phone was initially in service but got disconnected in a few minutes. After a while, all staff other than those in charge of emergency like this was told to go home, and I too left the office for home. On my way, no traffic lights were on, and back at my place, the electricity was all out. After the initial confusion, all ICHARM members gradually started doing whatever they could do to help the situation and the recovery and



reconstruction efforts in their own ways by participating in research, field investigations, committees and community activities.

The great earthquake cast a long shadow over our preparation for the 5th International Conference on Flood Management (ICFM5), originally scheduled to be held at the International Congress Center in Tsukuba, Japan, the city where ICHARM is located. Many who were planning to attend the meeting from overseas expressed grave concern regarding the location of the conference, which was relatively close to Fukushima, where a nuclear accident occurred immediately after the earthquake. Some even suggested that it be postponed until safety was confirmed. After a lot of discussions, however, we came to a conclusion: if there is ever a right time for a disaster conference, it is now. We changed the location from Tsukuba to Akihabara in Tokyo and held the conference as scheduled. The conference was successful, attended by Crown Prince Naruhito and 450 people from 41 countries. We owed this success very much to the participants who came all the way to make presentations and discussions and all ICHARM staff who worked hard for the event, especially Dr. Kenzo Hiroki, Research Coordinator for Water Disaster Risk Management, and Dr. Ali Chavoshian, Research

Specialist, for their immense dedication and leadership.

ICHARM has been participating in various international activities with particular commitment to such global efforts as the International Flood Initiative (IFI), IHP, the Typhoon Committee, WWF, HELP, ISDR and IRDR. IFI is an important global initiative with high worldwide expectations, which was inaugurated in the presence of the top executives of UNESCO, WMO, UNISDR and UNU at the Third UN World Conference on Disaster Reduction held in Kobe, Japan, in January 2005. I was one of them at the memorable inauguration ceremony as the Chair of the Japan National Committee for the IHP. As soon as ICHARM was officially established, it was assigned to the secretariat of IFI. This assignment was a great honor and a turning point: ICHARM became an official contact office for UN organizations, which has since given the institute an opportunity to play a vital role in demonstrating global leadership in disaster management. ICHARM convened an IFI session at ICFM4, 5 and 6, held in Toronto, Tokyo and Sao Paulo in 2008, 2011 and 2014, respectively, and led the policy making process of the organization. With ICFM7 scheduled in 2017 in Leeds, UK, ICHARM is again planning to convene a major IFI session with many partners to present an innovative strategy.

### Start of the 2<sup>nd</sup> Period

In October 2014, Professor Toshio Koike of the University of Tokyo took over the office of the Director of ICHARM

(he assumes both posts for the time being), and with his leadership, ICHARM has entered a new phase. I am



February 9, 2008 at a port located in the south of Dhaka, Bangladesh

so happy to see ICHARM already making remarkable progress in many areas. Activities of ICHARM's pillar strategies have been strengthened and expanded, strategic schemes have been improved, more roles with greater responsibility have been accepted, and research has been more productive.

The practice of localism, which stresses the importance of translating research findings to local efforts in water-related disaster risk reduction, has continued to be a priority for ICHARM. The centre has also been playing the role of a global opinion leader creating international opinion towards the realization of the common goals set globally for further reduction of disaster risk. Among those efforts, the strong leadership in IFI and the considerable contribution and dedication to UNESCO and ADB projects deserve special recognition. Moreover, in 2015, ICHARM played a major role in organizing scientific input to inform the decision-making processes regarding the Sendai Framework for Disaster Risk Reduction, the UN Sustainable Development Goals, and the Framework on Climate Change.

ICHARM has been very lucky in many ways. Expectations, both domestic and abroad, have given us a strong motivation to tackle challenging water issues. Water professionals and organizations have always watched over us with great patience and kindly guided us to grow to be a capable, reliable institute. ICHARM started with only 15 people, but has grown to

have nearly 50 members. That is not all; the number of graduates from the educational programs and those who once worked with us has totaled to be almost 150, each of whom is what we call an "ICHARM Ambassador," a strong supporter for ICHARM. They include Dr. Ali Chavoshian, a former ICHARM Research Specialist and now the Director of the UNESCO Regional Centre on Urban Water Management (RCUWM), Mr. Nikola Zlatanovic, a graduate of ICHARM master's program and now the Deputy Director of the Centre for Water for Sustainable Development and Adaptation to Climate Change (WSDAC), and Dr. Nasif Ahsan, a graduate of ICHARM Ph.D. course and now a professor of Economics Discipline, Khulna University, Bangladesh. I am really happy to see many "ambassadors" like them assuming important positions and fulfilling serious responsibilities in their home countries. Moreover, I feel equally happy that long-term research outcomes are finally taking shape as our flagship technologies, which have been making remarkable contributions in disaster management around the world.

However, ICHARM does not bask in the warm glow of the last 10 years; the situation is constantly changing both at home and abroad. Under the fresh leadership of Director Koike, ICHARM has renewed its commitment to the achievement of its mission and continues performing remarkable work to help reduce disaster risk around the world. For ICHARM to succeed in this challenge, I would like to ask your continued support and cooperation for the next decade and many more to come.



## How ICHARM was born

### **Yoshiyuki Imamura**

- *Professor, Organization for Research Initiatives, Advanced Science and Innovative Research Center, Yamaguchi University*
- *Former Chief Researcher, ICHARM*

I am filled with deep emotion to hear that ICHARM celebrates its 10th anniversary and see its great achievements and development as a person involved in the establishment of the ICHARM when I was in UNESCO.

The idea of creating a UNESCO Water Center in Japan was born when Dr. András Szöllösi-Nagy (Director of the Division of Water Sciences, UNESCO) and I (Programme Specialist of Division of Water Sciences and World Water Assessment Program (WWAP) secretariat) had relaxed breakfast time in January 2003. It was during our stay in Japan to participate in preparatory meetings for the Third World Water Forum (WWF3). We foresaw that UNESCO would have great success at the WWF3, and our idea was that we should create a tangible output that would contribute to the international community as a legacy of the WWF3 instead that the WWF3 would end with just an event.

This idea was born because two of us actually felt that Japan was increasingly showing a greater contribution to international water communities, such as the development of the WWAP established through Japan's leadership and the WWF3 hosted by Japan.

We proposed the idea to the Ministry of Land, Infrastructure and Transport, Japan. In UNESCO, Mr. Koichiro Matsuura, Director-General of UNESCO, had given a principle priority to 'water.' He showed favor to the vision and announced it in his keynote speech of the ministerial conference at the WWF3 in March 2003. The new water center was to be established as the first one in Japan approved by the UNESCO General Conference. However, we had to overcome unprecedented difficulties towards the es-

establishment.

I was asked to advise about where to set up the new center. I recommend the Public Works Research Institute (PWRI), which was just founded as an independent administrative agency, because the institute had a wealth of knowledge and experiences in the field of hydrology and water resources management and had high degree of flexibility to carry out international activities. My advice was accepted, and the preparation of establishing the center started. A preparation team led by Mr. Akira Kitagawa, PWRI Research Coordinator, was established in the PWRI. Together with them, I visited UNESCO-IHE, which was just established as a UNESCO category-I center and other international water institutes, and collected information on those institutes. The information contributed to formulate the framework of the new center, and the concept to focus on water hazard and risk management on which Japan had advantages, was formed.

At the 32nd General Conference of UNESCO in September 2003, the Government of Japan officially announced that the government was preparing to establish an international center.

In January 2004, the PWRI organized an international meeting at Tsukuba in Japan, inviting Ing. Victor Pochat and other regional representatives of the IHP Inter-governmental Council, and relevant UN agencies (WMO, ISDR, etc.) in order to form an international network and gain international inputs and supports from the preparatory stage. At the meeting, the direction of the new center was further developed, receiving advice from international participants.

At the IHP Bureau meeting in April 2004, a basic plan of establishing the center was proposed, and the proposal indicated that research, training, and information networking would be the three pillars of the new center's activities. In addition, a preparatory office for the new center was established within the PWRI headed by Mr. Akira Terakawa, under the leadership of Dr. Sakamoto, President of the PWRI.

In order for the center to lead the international water-related disaster agenda, the PWRI contributed to preparing the chapter 10 (risk management) of the United Nations World Water Development Report (WWDR) 2nd edition. Further, it was decided that the center served as the secretariat of the International Flood Initiative (IFI), which was formally launched by UNESCO, WMO, ISDR, UNU, and IAHS at the World Conference on Disaster Reduction (WCDR) at Kobe, Japan, in January 2005. As results of those activities initiated before the establishment of the center, more and more organizations expressed their supports to the creation of the center.

Although the preparation for the establishment seemed to be progressing, there was a risk that some groups or communities suggested limiting the geographical scope of new center to the Asian region. However, thanks to Prof. Takara of Kyoto University, Dr. Carlos A. Fernandez-Jauregui, Deputy Director of WWAP secretariat, and their friends and colleagues, both the Asia-Pacific and Latin American regions proposed resolutions to support the ICHARM establishment. Then, it became clear that ICHARM was expected to be a global center.

During the Inter-governmental Council of UNESCO in September 2004, the PWRI hosted a reception, and many participants including ambassadors to UNESCO and UNESCO's senior officials attended the reception. The momentum towards the establishment of ICHARM was further developed. On the following day, Dr. Sakamoto presented the plan of ICHARM establishment at the council, and almost all the representatives from member states and international organizations expressed their favor to the plan, reflecting the magnitude of international expectations for the establishment. It was a memorable moment that was felt to last forever. A resolution to support the establishment of ICHARM was then adopted.

After the approval, the critical challenge was how to comply with the legal systems between the Japanese government and UNESCO, having a completely different legal system to each other. We had this concern from early stage of the preparation when we collected and analyzed the information on UNESCO-IHE and other centers. I myself intensively examined and consulted the issue with my colleagues, but it was not easy to find a solution. Mr. Yuzuru Imasato, Minister of the Japanese Permanent Delegation to UNESCO and Ms. Yuki Daijo of the UNESCO Legal Department greatly contributed to solve the issue, and finally, the solution was found. Following the approval at the 171th UNESCO Executive Board in April 2005, the establishment of ICHARM was officially approved at UNESCO's 33rd General Conference in October 2005.

It took only two years or so since the birth of the original idea of ICHARM until the official approval of ICHARM establishment, receiving great international expectation. I would like to underline that this successful establishment was came true owing to joint efforts of all the involved people under the great leadership of Mr. Matsuura, Director-General of UNESCO and Dr. Sakamoto, PWRI's President.

(The titles of the people referred here are the ones at that time.)





March 6, 2006



January 30, 2017

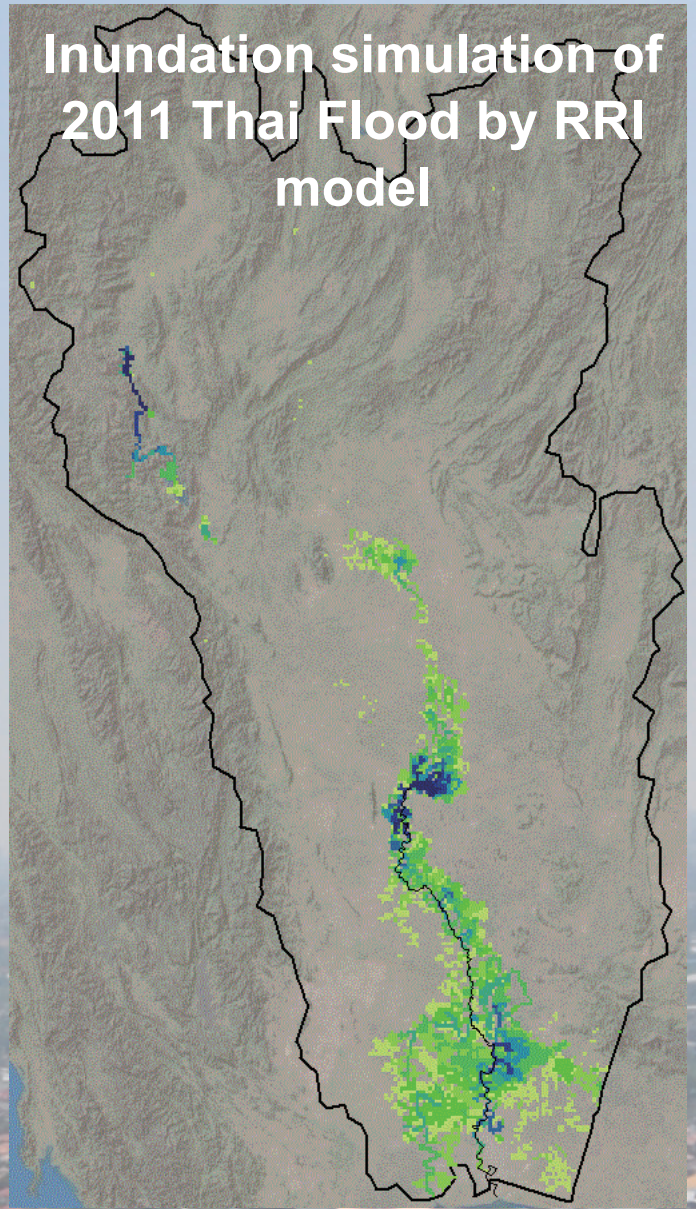


# 2 Research





# Inundation simulation of 2011 Thai Flood by RRI model



2011 Thai Flood



## 2 Research

ICHARM has conducted research and development of technologies that effectively assist local engineers and practitioners in mitigating water disasters. At its core are risk assessment and models to forecast and simulate water disaster hazards such as floods and droughts. Development of flood forecasting models is particularly important for the Asian monsoon region in predicting flood disasters and determining the cropping time for rice cultivation. Flood and drought simulation models can be an instrumental tool that provides basic information

needed to assess climate change impact on river flow and flood inundation, evaluate risks such as vulnerability, comprehensive flood control and management plan, and estimate the effect of project investment. This section describes the IFAS and RRI models, which ICHARM has developed and provided to support local practice over the past 10 years, along with the research history of risk management.

### 2-1 Integrated Flood Analysis System (IFAS)

ICHARM has developed the Integrated Flood Analysis System (IFAS) based on the distributed hydrological runoff model (multiple-layer tank model) of the Public Works Research Institute under the concept of addressing issues in developing flood forecasting models, particularly in developing countries.

ICHARM has also provided a number of training courses on IFAS to broaden the number of users and implemented flood forecasting systems (early warning systems) in individual rivers through projects in order to contribute more to the mitigation of water disasters in the world.

In developing IFAS, ICHARM considered the following issues commonly faced by developing countries:

- (1) No observation data such as rainfall, water levels, and flow rates have been accumulated, and no real-time observation networks have been in place. Consequently, there are no sufficient data available for developing and operating a model.
- (2) Commercial runoff models are often costly, requiring a budget for development and operation.
- (3) To ensure simple, effective use of the system by users in public offices, the models installed in IFAS should be equipped with an interface to enable easy input and output and visual functions to display simulation results.
- (4) The models should not be a black box. They should be mechanically simple, and equipped with functions to adjust parameters, which allow users flexibility in system operation by calibrating parameters according to characteristics of individual river basins.

- (5) To develop and operate models effectively, the capacity of engineers should also be developed and thus training is indispensable.

To meet these challenges, ICHARM determined the concept of IFAS development and operation based on the following considerations:

- (1) A distributed hydrological model, capable of estimating the spatial distribution of model parameters from global data, should be the primary choice to be installed in IFAS, since the application of such a model to IFAS has become possible with the advent of powerful computers. Although its resolution and accuracy are still limited at present, the model should be set up and operated in a way to maximize its capacity by using global data and near-real time satellite-based rainfall data. In addition, the model should be designed to improve simulation accuracy by using ground data when available since they are more accurate than satellite data.
- (2) Free software should be developed to allow free downloading of executable files from the website.
- (3) Graphical User Interface (GUI) should be equipped to enable easy input and output operations. In addition, by using a geographical information system (GIS), the system should be capable of the creation and display of graphic charts showing spatial and temporal distributions of flow rates, rainfall, parameters, river channel networks, and terrain.
- (4) The parameters will be provided in default values, but should be manually adjustable. Land-use classification and the definition of river channels should also be customizable.

- (5) An instruction manual should be prepared and extensive training courses should be provided in cooperation with JICA.

The distributed hydrological runoff model, the main engine of IFAS, is based on the model developed by the Public Works Research Institute since the 1980s (the three layer tank model for flood and drought analysis ver.1 and two layer tank model for flood analysis ver.2, both using the kinematic wave model for river channel flow). To add GUI functions to this model, a joint study with nine private consultant firms was conducted for three years between 2005 and 2007. Thereafter, ICHARM continued the improvement and expansion of its functions, and in 2008 established a runoff simulation system that was able to download satellite precipitation data (See Figure 2-1-1).

IFAS has been used in the Solo River in Indonesia since 2009 and the Cagayan River in the Philippines since 2012 under the ADB project (TA7276) to simulate flood runoff, and eventually the complete system was installed

in the basins. In 2011, ICHARM released IFAS (ver. 1.3 $\beta$ ) on the website (<http://www.icharm.pwri.go.jp/research/ifas/index.html>), which incorporated an automatic warning function (Auto-IFAS) to automatically simulate and alert at a preset flow rate (water level). Since 2012, IFAS has been introduced as the Indus-IFAS, a UNESCO project of the Indus River basin flood analysis system in Pakistan. In 2014, with improved operability, IFAS (ver2.0) was released. In 2016, as an achievement of the SATREPS project, IFAS-based flood forecasting models were developed in the Kelantan River and the Dungun River in Malaysia. Currently, ICHARM is working on the development of a snow melt calculation module and the optimization of parameters. On the other hand, as IFAS is equipped with a function to set flow rates in dam operation, various simulations are possible. Ground rainfall data, if not available, can be substituted by data from radars or satellites. Satellite-based observation data have bias and require correction. Recently, a near-real time correction method using ground rainfall data has been proposed and is expected to improve simulation accuracy even in regions without sufficient ground data.

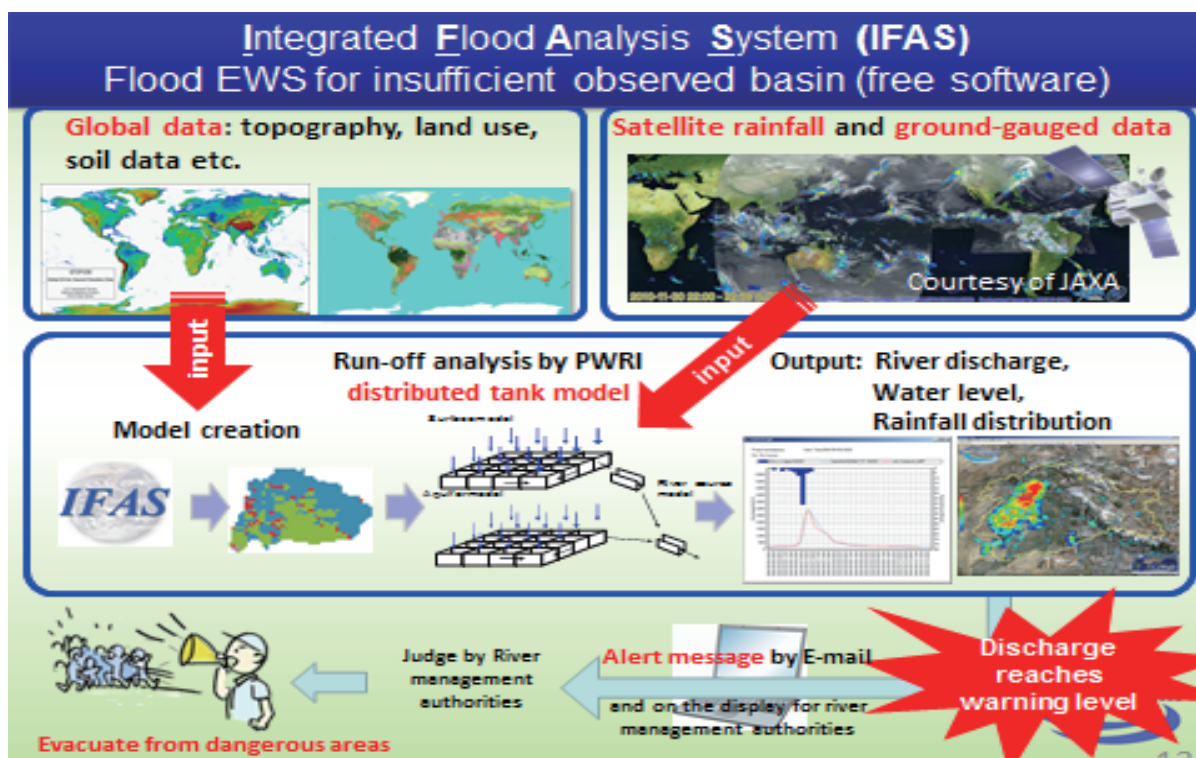


Figure 2-1-1 IFAS structure

Although the structure of IFAS's flow calculation model is user-friendly both mechanically and operationally, ICHARM provides IFAS training workshops in Japan in cooperation with JICA and regional training seminars in ASEAN and Arab countries. More than 1,100 participants of 53 countries (Photo 2-1-1, 2-1-2) have so far participated. Intensive training programs through individual projects are also conducted. In Japan, in cooperation with the Ministry of Land, Infrastructure, Transport and Tourism, ICHARM has validated the flood forecasting model of IFAS for accuracy in typical river basins. It also held workshops at the Japan Society of



Photo 2-1-1 IFAS training (for ASEAN, Jakarta, 2014)



Civil Engineers and the Japan Society of Hydrology Water Resources, and develops element models for Common MP (a Japanese version of the water-related simulation software shared platform).

ICHARM will continue improving the capacity and operability of IFAS and providing support for engineers and practitioners to sharpen the skill for more effective operation of the system.



Photo 2-1-2 IFAS training work by Bengawan Solo River Basin Agency (2-4 March, 2010)

(Written by Yoichi Iwami)



### Memory of development of IFAS...

**Tomonobu Sugiura**

- *Manager, First Operation and Management Division, Ikeda Integrated Operation and Management Office, Japan Water Agency*
- *Former Senior Researcher, ICHARM*

It is an honor for me that a new version of IFAS has been continuously developed. When I was in charge of its development, the idea of a flood forecast using the satellite-based rainfall data was considered as an innovative method. However, while it had the great advantage that covered all over the world with the same accuracy and resolution including the developing countries with poorly observed rainfall data, its intensity and volume in a flood were basically underestimated. Therefore, we always wondered how it would be corrected. We understood that further improvement was necessary, but decided to finally correct it based on a time variation of the rainfall intensity and launched the version 1 of IFAS with the correction function at that time.

I hope that IFAS will be improved further and will contribute to activities of the ICHARM.

## 2-2 Rainfall-Runoff-Inundation (RRI) model

Comparable to IFAS, the other key technology of ICHARM is the Rainfall-Runoff-Inundation (RRI) model developed by Dr. Takahiro Sayama, currently an Associate Professor at Kyoto University, during his tenure in ICHARM. This model simultaneously analyzes the hydrological processes from rainfall to runoff to flood inundation in a river basin, eliminating two-stage simulation employed in conventional flood analysis models in which a river channel runoff model first calculates the flow rate and then a flood inundation model uses it as the boundary condition for further calculation.

An event that had a great impact during the development of this model is the 2011 Thailand Flood along the Chao Phraya River. At that time, Japanese diplomatic missions and companies operating in Thailand tried to figure out the entire scale of the flood based on limited information. However, since satellite-based information was limited in its observation frequency, the temporal change of the flood was difficult to predict. Therefore, despite the strict time constraints, ICHARM hurried the development of the RRI model and developed a 1-2-km grid model for

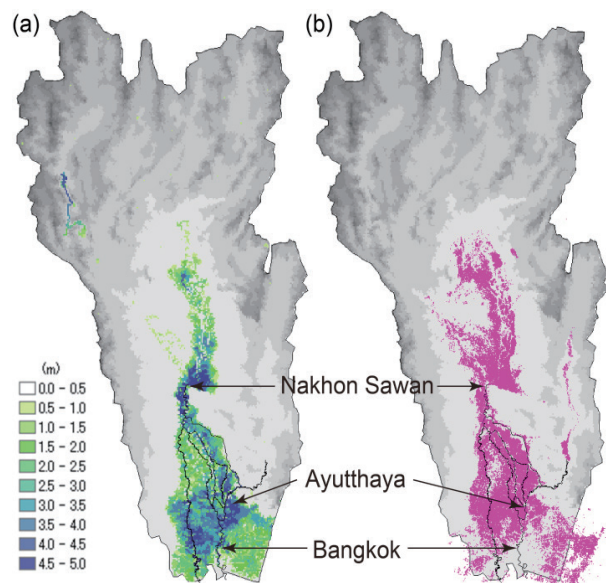


Figure 2-2-1 Results of emergency simulation for the Chao Phraya River (Left: (a) RRI, Right: (b) Satellite observation)

the Chao Phraya River basin. The flood movement was sequentially analyzed as emergency simulation, and the results were published in cooperation with the Ministry of Land, Infrastructure, Transport and Tourism (Figure 2-2-1).

The development of the RRI model and provision of emergency information were highly appreciated, and the developer, Dr. Takahiro Sayama, was awarded by the Minister of Education, Culture, Sports, Science and Technology in the science and technology field in 2013 (Young Scientist Award), the Ministry of Land, Infrastructure, Transport and Tourism in 2013 (15th Infrastructure Technology Development Award), and the Japan Society of Civil Engineers in 2014 (Best Paper Award).

The unique features of this model include: (1) flood simulation in lowlands by using a 2D diffusive wave approximation model; (2) simple expression of hydrological processes such as vertical infiltration

flow in plains and lateral infiltration flow in mountains, evapotranspiration, and impacts of dams; and (3) high-speed and reliable numerical computation incorporating the Step Runge-Kutta Method, which automatically varies time steps and parallel algorithms using Open MP. This model, as well as IFAS, can use global data and satellite-based rainfall data (Figure 2-2-2).

The real-time flood forecasting system incorporating the RRI model was installed in the Royal Irrigation Department (RID) in Thailand in 2013, as part of JICA's flood management project in the Chao Phraya River after the 2011 floods.

The Indus-IFAS developed under a UNESCO Pakistan project also uses the RRI model for flood simulation over the lower Indus River. Thus, the Indus-IFAS becomes a coupling model taking advantages of the two powerful components: IFAS for high-speed simulation of runoff in upstream mountains and RRI for flood inundation simulation in downstream rivers.

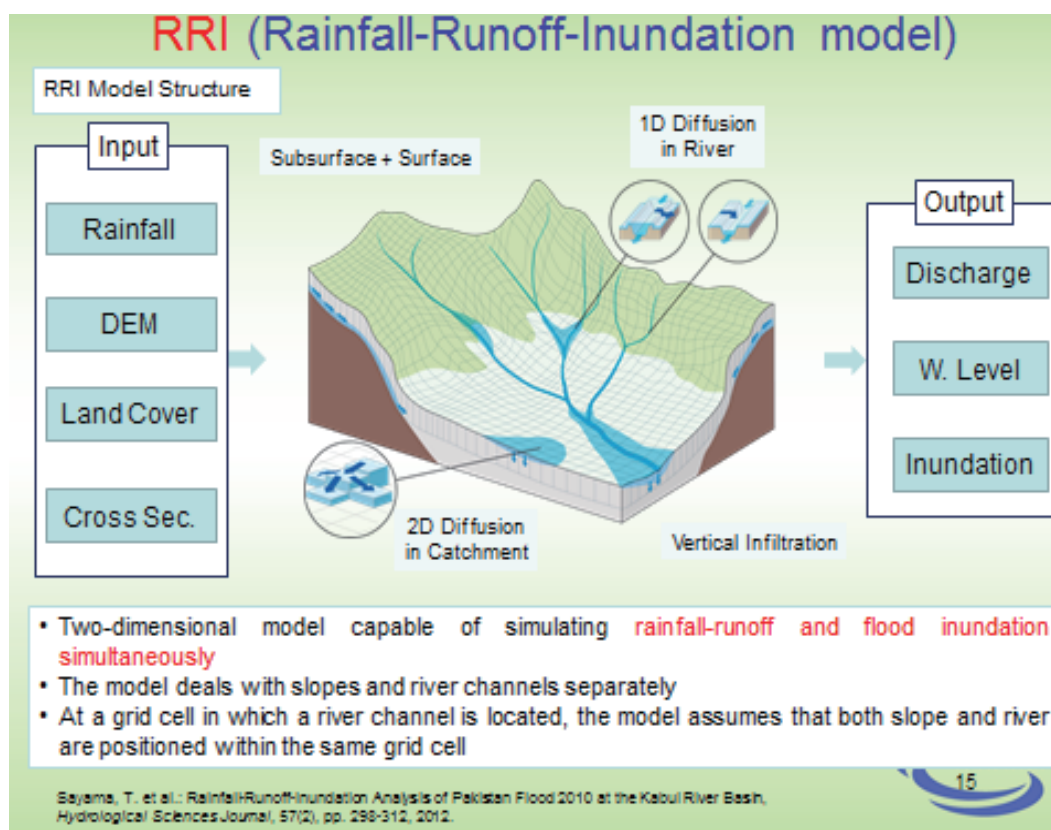


Figure 2-2-2 RRI model

RRI has been used in flash flood analysis in the Kabul River and in flood inundation analysis of the Chikusa River in Hyogo Prefecture as a verification tool for flood events. ICHARM also undertakes research to improve accuracy for forecasting the temporal development of a flood from rainfall to inundation by feeding the RRI model with ensemble information based on numerical weather forecasts targeting domestic river basins.

To further expand and disseminate the RRI model, ICHARM started the development of GUI in 2014 for easy input and output, and released it with an execution program on its website in 2016 ([http://www.icharm.pwri.go.jp/research/rri/rri\\_top.html](http://www.icharm.pwri.go.jp/research/rri/rri_top.html)). The RRI-GUI is also used to learn the operation of flood simulation models in training held as part of the ADB project in Myanmar and also as part of the JAXA-SAFE project (2016) for the Kalu Ganga River basin in Sri Lanka.



The RRI model is useful also as a tool that can provide basic information for estimating flood risk in a river basin because the model is capable of flood simulation. Aga Town in Niigata Prefecture has been studying ways to present flood risk from RRI simulation, which should be easy to understand for disaster management personnel. Further, under the Program for Risk

Information on Climate Change (Sousei Program) (2012-2016) sponsored by the Ministry of Education, Culture, Sports, Science and Technology, ICHARM is currently conducting the flood inundation analysis (Figure 2-2-3) and flood risk assessment in present and future climates using the RRI model for five typical river basins in Asia. The use of the RRI model has been expanding since its launch.

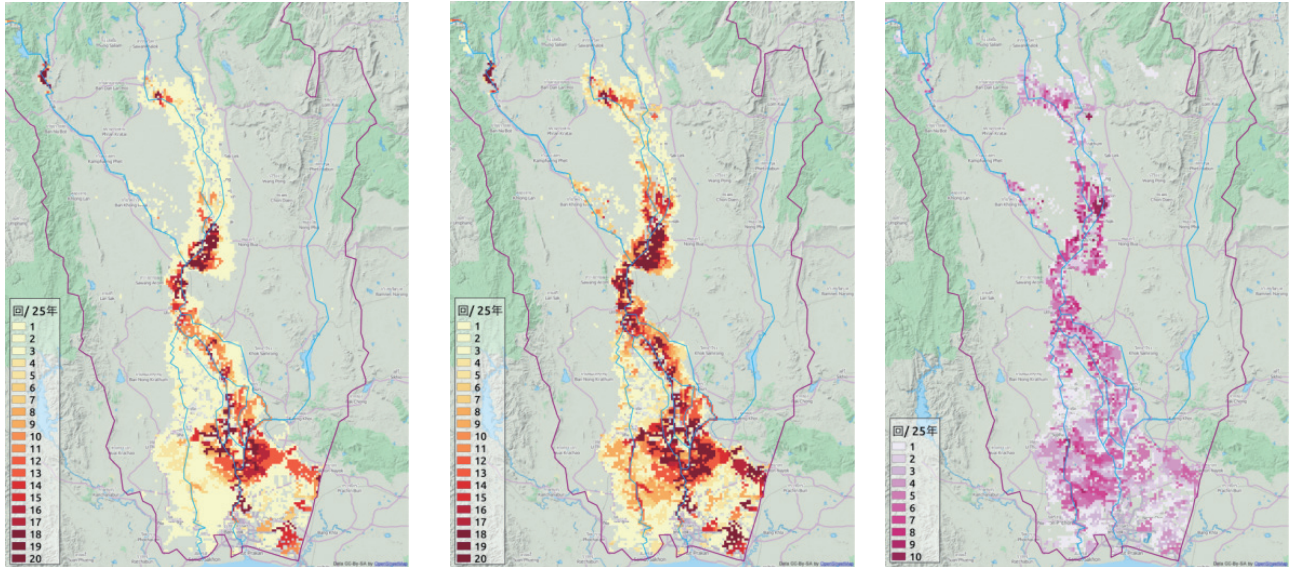


Figure 2-2-3 Inundation frequency analysis in Chao Phraya river basin for 25 years between present and future climate by using MRI-AGCM 3.2S  
Left: Present(1979-2003), Center: Future(2075-2099), Right: Change (F-P)

ICHARM has also focused its support on training for the RRI model. The IFAS training by JICA in 2016 included the RRI training. Also, the training for Arab countries includes introduction and practice of the RRI model. With development of GUI, the base of RRI users is expected to expand further. In addition, to study adaptation measures against climate change and analyze the phenomena of extreme external force exceeding the design scale, the needs for flood simulation using the RRI

model are expected to increase, including applications to small and medium-sized rivers in Japan. As mentioned earlier, the RRI model uses approximation of the diffusive wave to perform simulations efficiently; thus it is suitable for the analysis of low, flat land, but has limitations in the representation of complicated flood hydraulic phenomena such as those around building structures. Further studies are needed for the model to produce more accurate simulation results by reflecting detailed cross sections of



### Hoping the day real-time inundation prediction by RRI model enables early evacuation

**Takahiro Sayama**

- Associate Professor, Disaster Prevention Research Institute, Kyoto University
- Former Senior Researcher, ICHARM

When flooding occurs, the information of current situation on inundation extent and depths is perhaps the most essential for emergency responses and evacuations. Existing flood forecasting, however, typically focuses only on river water levels and cannot predict flood inundations.

The original concept of the RRI model was to simulate large scale flooding such as the ones in Thailand in 2011 and Pakistan in 2010 by simulating rainfall-runoff and inundation in an integrated manner. Now we demonstrate the model also in Japanese river basins by reflecting more detailed cross sections and radar rainfall information to achieve the real-time flood inundation predictions including overtopping from tributaries at the river basin scale.

We hope one day real-time inundation information can be displayed on our mobile devices together with evacuation related information.

rivers in simulation and considering combinations with sewerage/drainage networks and pump drainages in city areas. The model should also be verified for applicability to hydraulic phenomena not only in the Asian monsoon area but also in arid regions. RRI users are encouraged to use the model at their disposal, which should motivate further improvement in the future. ICHARM is fully

open to active discussions with a wide variety of users to enhance the capacity of the RRI model. Currently ICHARM is also working on coupling the RRI model with WEB-DHM (water and energy budget-based distributed hydrological model) to include initial conditions of soil moisture in simulation.

(Written by Yoichi Iwami)

## 2-3 Risk management research

ICHARM studies specific and practical risk reduction countermeasures by connecting hazard analysis conducted by the Water-related Disaster Team to disaster risk assessment by the Risk Management Team. The Risk Management Team has been conducting research activities on disaster risk assessment and disaster risk reduction methodologies using hydrological simulation models such as the RRI model.

In its initial stage from 2006 to 2010, ICHARM collected information on water related disasters, and then analyzed, arranged and introduced them to flood practitioners as reference for flood management activities. Since 2011, ICHARM has promoted activities for water-related disaster risk reduction in Japan and abroad by setting up the Risk Management Team.

The Risk Management Team conducts various research activities based on the following three pillars:

- **Evidence-based Activities:** Analyze local data and information, assess risks and formulate risk reduction countermeasures appropriate to local conditions and realities. External funding is also actively utilized.
- **Collaboration with other research institutions and governmental agencies:** Cooperate with universities, research institutes, and government agencies that are responsible for disaster risk reduction to comprehend the needs and promote research activities in Japan and abroad.
- **Active public relations:** Publicize research results actively by giving presentations at various international conferences and publishing literature in cooperation with international organizations.

Research activities on risk management conducted by ICHARM in the past decade are classified into the following 4 categories:

- (1) Promote understanding of water-related disaster situations around the world and their generating mechanisms
- (2) Share knowledge and experience of disasters and lessons learned that are collected, arranged and analyzed
- (3) Assess water-related disaster risk using simulation models

- (4) Propose water-related disaster risk reduction countermeasures based on risk assessment

In the past 10 years, ICHARM has widened its area of activities from (1) to (4). The following section describes the outline of each category.

### (1) Promote understanding of water-related disaster situations around the world and their generating mechanisms

To understand water-related disaster situations around the world, ICHARM used the global disaster database EM-DAT to conduct basic analysis regarding flood vulnerability of each country. Using the results, ICHARM identified countries that were considered to be the most vulnerable to water-related disasters and gathered as much detailed information as possible through local interviews, and arranged and classified the information into four categories of hazard, local characteristics, damage, and countermeasures.

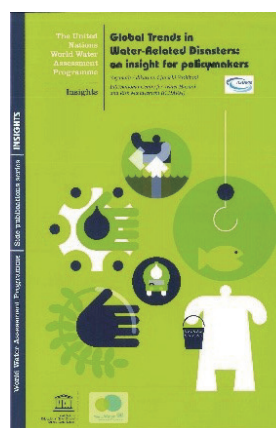


Figure 2-3-1 Global Trend in Water-Related Disasters: an Insight for Policymakers

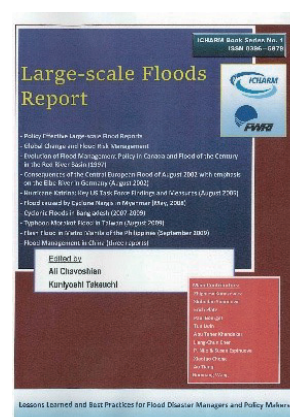


Figure 2-3-2 Large-scale Floods Report

In addition, based on the EM-DAT database, ICHARM analyzed disaster occurrence trends in perspective of disaster types and regions to prepare basic reference materials for policymakers. These results were summarized and published as a supplementary reading material of the UN 2009 World Water Assessment Programme (WWAP), entitled "Global Trend in Water-



Related Disasters: an Insight for Policymakers” (Figure 2-3-1). To promote policymakers’ understanding on flood countermeasures, ICHARM asked the world’s flood experts to make reports on 10 large-scale floods in the world, which was published as Large-scale Floods Report in 2010 (Figure 2-3-2).

## (2) Share knowledge and experience of disasters and lessons learned that are collected, arranged and analyzed

On March 11, 2011, Japan experienced the Great East Japan Earthquake, which caused the devastating disaster by tsunamis. This tragedy highlighted the necessity of accumulation and transfer of disaster experiences in order to enhance preparedness for the reduction of disaster risks. As one of the activities to share knowledge of natural disasters around the world, including those by tsunamis, among people from children to the elderly, ICHARM published “World Handbook on Local Disaster Management Experiences” in 2013, a handbook with illustrations and photos to visualize disaster generation mechanisms, response measures, and disaster experiences (Figure 2-3-3). This handbook was distributed on the occasions of various international activities by ICHARM and welcomed with high regard.

In 2011, the same year as the Great East Japan Earthquake occurred, Thailand experienced a huge flood in the Chao Phraya River Basin, which caused a large impact on manufacturing supply chains, not only in Thailand but also around the world. In 2012, ICHARM started a investigation on the chain flood damage of industrial sector through literature research and several local questionnaire surveys. The collected information through the questionnaire surveys was sorted out into nine lessons and published as the PWRI Technical Note No. 4322 “Lessons Learned from the Flood Disaster in Industrial Estates/Parks/Zones in Thailand, in English and Thai,” in 2016 (Figure 2-3-4). The survey findings and lessons were shared among Thailand Government officials (Ministry of Industry), offices of industrial estates, and the Japanese Chamber of Commerce and Industry in Bangkok. The reports were appreciated as

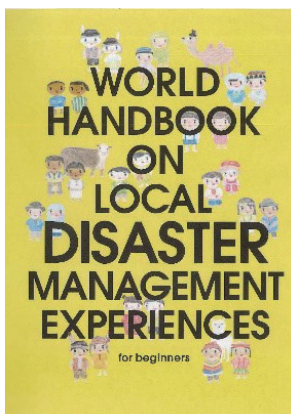


Figure 2-3-3 ICHARM World Handbook on Local Disaster Management Experiences

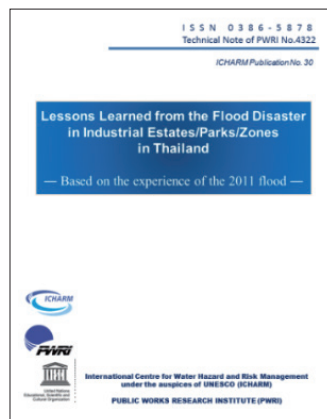


Figure 2-3-4 Lessons Learned from the Flood Disaster in Industrial Estates/Parks/Zones in Thailand

valuable materials because the number of people who experienced the actual flood decreases year by year.

## (3) Assess water-related disaster risk using simulation models

While learning about the situation of water-related disasters in the world, ICHARM has launched research to develop a technique to assess various risks of water-related disasters. In 2008, ICHARM formulated the World Flood Risk Map based on the data sets published by international organizations such as the United Nations and the World Bank.

Flood hazard maps are important tools to show and share the results of flood risk assessment. ICHARM has conducted interviews with government officials of Asian countries (those who returned to their countries after participation in ICHARM training programs in Japan) to investigate the current efforts of map preparation in Asia. The contents that should be included in hazard maps were also investigated through interviews and reported in the PWRI Technical Note No. 4164, “Progress Report on Flood Hazard Mapping in Asian Countries”, in 2010.

ICHARM conducted flood risk assessments of Asian countries as a partner organization of the Asian Development Bank (ADB) in charge of the chapter of Key Dimension 5 “Resilience to Water-related Disasters” in the 2013 edition of AWDO (Asia Water Development Outlook), which is issued by ADB every three years. ICHARM also proposed a methodology to analyze effects of water-related disaster countermeasures by using flood simulation models in a report issued by the World Bank.

In 2012, ICHARM participated in the Research Program for Risk Information on Climate Change (Sousei), a research and development program sponsored by the Ministry of Education, Culture, Sports, Science and Technology, targeting five river basins in Asia (Pampanga River in the Philippines, Solo River in Indonesia, Lower Mekong River, Chao Phraya River in Thailand, and Indus River in Pakistan).

In this program, ICHARM conducted flood hazard analysis using flood simulation models such as the RRI model and daily discharge analysis using the BTOP model to assess flood and drought risk and create information on risk change under climate change in the future. Especially for flood disaster risk assessment, ICHARM developed a flood damage curve for rice crops by combining the statistics collected from Bureau of Agricultural Statistics of the Philippines (2013) with the plant height data from IRRI (2009) (Figure 2-3-5). This method is used to assess risk change under climate change. This research was implemented in cooperation with the governments of Asian countries by sharing information.

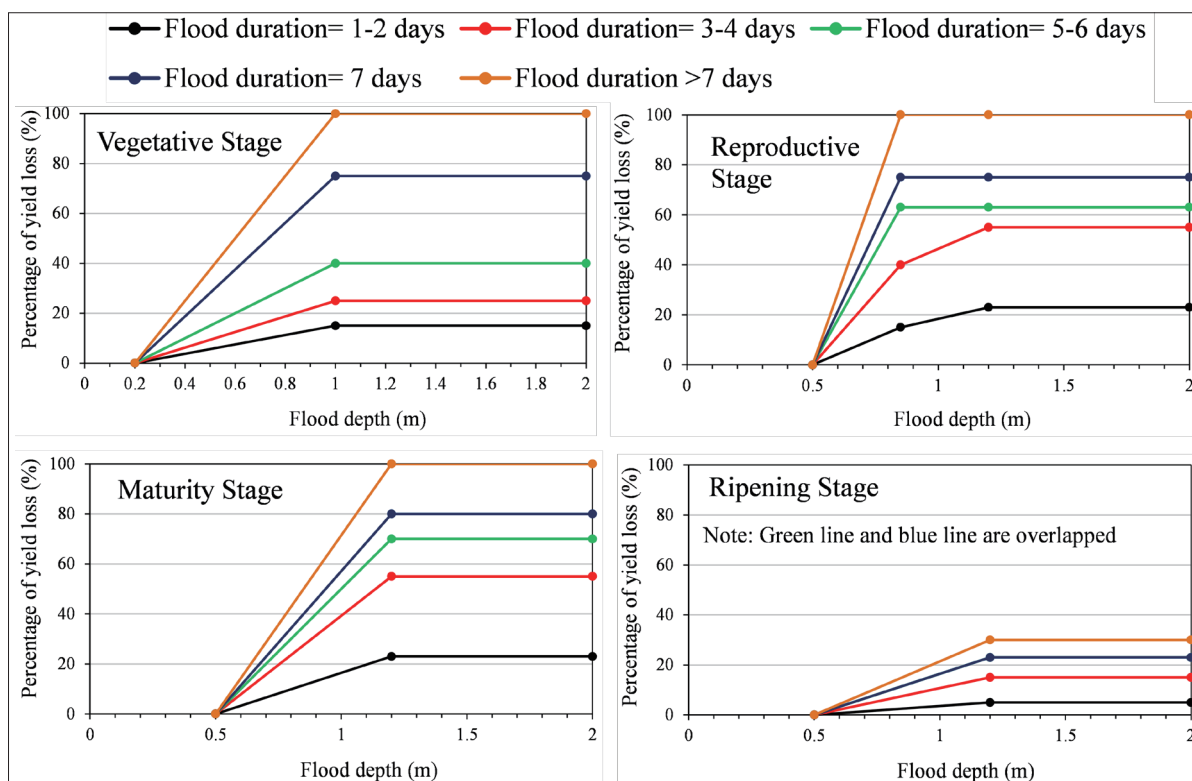


Figure 2-3-5 Flood damage curve for rice crops by ICHARM

**(4) Propose water-related disaster risk reduction countermeasures based on risk assessment**

In 2009, to help municipal officials understand the municipality's weakness in disaster management and assist them in the improvement of local disaster management capacity, ICHARM conducted research on risk assessment methods on local disaster management capacity and developed the Flood Disaster Preparedness Indices (FDPI), which was released in 16 languages on ICHARM's website (Figure 2-3-6). A part of this research was conducted as an annual action plan of the Working Group of Hydrology of the ESCAP/WMO Typhoon Committee, and the final report on the research was published in English (Figure 2-3-7).

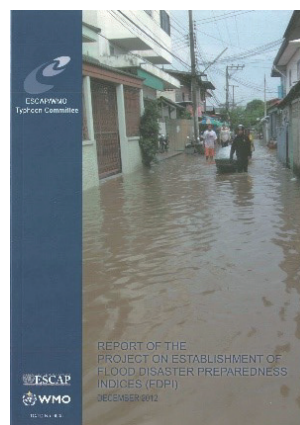


Figure 2-3-7 Project on Establishment of Flood Disaster Preparedness Indices (FDPI) Report



Figure 2-3-6 Website of FDPI

In 2014, ICHARM conducted another research project on the development of a flood risk assessment method using the RRI model, targeting rivers in mountainous areas where, unlike large rivers, information for disaster management is limited and flood forecasting is not available, in order to create information for local municipal officials and residents to practice disaster management activities. This project also targeted developing countries where meteorological and hydrological information is also limited.

In Japan, the Agano River was selected as the study river for this research, and a survey was conducted at Aga Town in Niigata Prefecture, where serious flood damage occurred recently (Photo 2-3-1), by interviewing



officials of Aga Town, the Regional Development Bureau of the Ministry of Land, Infrastructure, Transport and Tourism, local river office, Niigata Prefecture, and local residents in order to understand the actual situation and the needs of the local government and residents. Based on this survey and application of the RRI model (Figure 2-3-8), ICHARM developed flood risk assessment methods, “Flood Diagnostic Chart” for understanding the flood vulnerability of each district of Aga Town and “Flood Hot Spots” for identifying districts of high risk that may require particular precautions. These methods are expected to help municipal officials without adequate experience of disasters to perform disaster management activities effectively. The research activities are still in progress and now in the process of developing techniques for real-time disaster risk assessment and information sharing systems.



Photo 2-3-1 Flood damage in Aga Town (July 30, 2011)

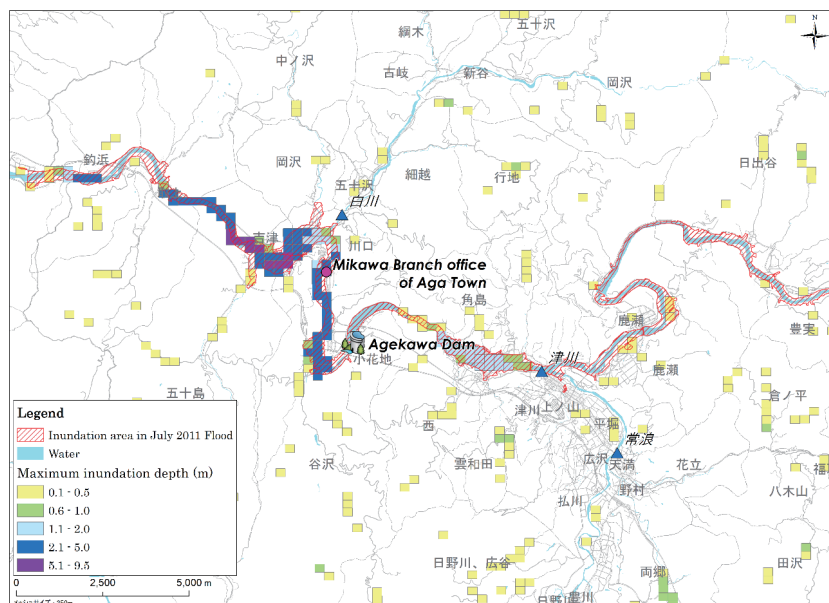
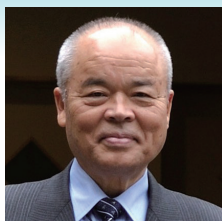


Figure 2-3-8 Calculated inundation area along Agano River by RRI model



### For effective disaster management in Aga Town by ICHARM's research

**Toshiro Kanda**  
 ● Mayor, Aga Town, Niigata Prefecture

Aga Town is located in the eastern part of Niigata Prefecture and the third largest town in the prefecture with the Agano River running right through it. Having abundant forests and the tributaries and valleys of the Agano River, the town enjoys the warmth and bounty of nature all through the year.

On the other hand, Aga Town has suffered from floods many times since a long time ago, including the latest one in July 2011 having caused serious flood damage to the area. Since then the construction of levees has been in progress as a flood prevention measure. The town needs to plan additional measures to prevent and mitigate flood damage by raising the awareness of its administrative offices and residents towards disaster risk so that they will be able to take appropriate action in the face of disaster. To this end, the town has started research in 2014 on disaster risk using the RRI model in collaboration with ICHARM to establish a system that will contribute to facilitating more effective mitigation and evacuation based on research findings.

In the Philippines, ICHARM conducted a research project to support the formulation of community level flood risk management plans (flood response plans) at Calumpit Municipality in the Pampanga River Basin, based on the result of scientific analysis (hazard maps, a time line of inundation) using the RRI model and discussions with local government officials and residents.

ICHARM's research activities are not limited to floods. After the 2004 Indian Ocean tsunami, ICHARM conducted research on tsunami disaster mitigation methods and tsunami risk assessment. ICHARM also conducted research on the assessment of sediment disasters risk using satellite precipitation data.

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As mentioned above, risk management research of ICHARM generally starts with collecting information from disaster-affected areas in Japan and abroad. Based on such information as field evidence, ICHARM develops research activities in order to assist the world's efforts in the formulation of risk reduction strategies suitable for the local situation. ICHARM will continue practicing this localism approach in cooperation with governments and institutions in Japan and abroad, and actively publicizing the achievements.

*(Written by Hisaya Sawano and Daisuke Kuribayashi)*



# Principles of Disaster Management

Kuniyoshi Takeuchi

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





# 3 Training and Education



December 12, 2011 at ICHARM auditorium



## 3 Training and Education

To respond to large-scale water-related disasters such as floods, it is essential to enhance not only the capacity of individual members of disaster management organizations but also the capacity of the entire organization they belong to. ICHARM, by focusing on the importance of capacity development from its conceptual stage, has positioned training and educational activities as one of the pillars of its activities. The personal and organizational networks across countries developed through training and educational activities are undoubtedly long-lasting, indispensable assets for ICHARM as an international organization.

Therefore, ICHARM has contributed to the development of both individual problem-solving capacity and organizational disaster management capacity through its training and educational activities. In principle, ICHARM holds seminars for former trainees every year in one of their home countries to support their subsequent activities and understand issues they face in their efforts, based on which ICHARM has improved its training programs. Most training activities of ICHARM have been provided to local engineers and practitioners engaged in river management and water resources development, who have some field experience after graduating from



### May the 'charm' of ICHARM remain forever!

#### A. W. Jayawardena

- Adjunct Professor, Department of Civil Engineering, The University of Hong Kong
- Former Research and Training Advisor, ICHARM

It is with great pleasure that I write this short message in the ICHARM 10-year anniversary commemorative publication, which I believe is a follow-up of the symposium held during March 1-2, 2016. I joined ICHARM on July 21, 2007 and left on September 30, 2012 after serving as the Research and Training Advisor for 5 years, 2 months and 10 days, a total of 1899 days. It is not a long time in one's life but not a short time in one's twilight years. In addition to experiencing life in Japan, which was memorable, ICHARM provided me with an opportunity to share what I have learned and experienced in my own professional and academic life with trainee participants from different countries.

ICHARM, established under the auspices of UNESCO, is one of 81 Category 2 International and Regional Centres and Institutes of which 49 are science related and 26 water related. ICHARM is listed under both disciplines. In its 10-year history, ICHARM, with the support and collaboration from PWRI, JICA and GRIPS has made its mark internationally as a centre of learning for water-related disaster management. Through the dedicated hard work of all members, ICHARM has moved from strength to strength and now stands taller than other similar Centres and Institutes in the world. Much of the credit for the internationalization should go to the Founding Director Professor Kuniyoshi Takeuchi who steered it from the inception and, who also inspired me to join ICHARM.

During my term at ICHARM, in addition to teaching all batches, I had the opportunity to individually guide 20 graduate students from Bangladesh, China, Ethiopia, Fiji, India, Nepal, Sri Lanka, Thailand and Tunisia towards their graduation. I consider it as a knowledge sharing experience as I also at times learned from them.

ICHARM also provided opportunities for the trainees to experience life in Japan, to be exposed to various infra structural measures to mitigate water-related disasters and to master presentation skills. One of the unforgettable experiences during my stay in Japan was when the Tohoku Earthquake struck Japan on March 11, 2011 and the aftermath that followed. We were at the tail end of a field visit to Kansai area at that time. The trainees had the first taste of a major earthquake and subsequent aftershocks. This incident also provided us an opportunity to witness the solidarity in Japanese communities when faced with disasters.

As the world moves forward, there is the inescapable competition in every aspect of life. Education is no exception. The value added to graduates, the international recognition of the degrees awarded, the ranking of universities etc. are some of the challenges that all educational institutions have to face worldwide. ICHARM may also have to face such challenges sooner or later and I hope and wish that quality is not compromised for quantity in addressing them.

Finally, I wish ICHARM success in every sense in the years to come. May the 'charm' of ICHARM remain forever!





Program”, since 2010. It is intended to produce disaster management experts who can take the leadership in research and train other researchers.

**3. Short-term training programs and workshops (a few days to a few weeks):**

Various short-term training programs are conducted in cooperation with JICA, UN/ISDR, UNESCO, and the University of Tokyo.

**4. Follow-up activities:**

ICHARM holds seminars for former participants in its training courses to follow up their subsequent activities

and understand issues they face in their home countries.

**5. Workshops on IFAS and the RRI model (a few days to a week):**

ICHARM also holds workshops and lectures on its principal hydrological models, the Integrated Flood Analysis System and the Rainfall-Runoff-Inundation model, during the training in Japan or overseas.

**6. Internship for foreign researchers and students from Japan and abroad**

The following section outlines each activity.

**3-1 M.Sc. program, "Water-related Disaster Management Course of Disaster Management Policy Program"**

To cope with increasingly frequent water-related disasters in recent years, it is urgently needed to foster experts in water-related disaster management in many countries. Experts need a wide range of knowledge for disaster risk management from both technical and social viewpoints, for preparedness, restoration, and rehabilitation.

With this background, ICHARM, in cooperation with GRIPS and JICA, has offered a one-year M.Sc. program, "Water-related Disaster Management Course of Disaster Management Policy Program," since 2007. This course aims to foster solving-oriented practitioners who have solid theoretical and engineering bases, and who can plan and practice flood management within the framework of integrated water resources management at all levels, from national to local.



Photo 3-1-1 Lecture by Professor Shoji Fukuoka of Chuo University (October 29, 2010)

The course primarily focuses on the following three points since the target population of this course is practitioners involved in disaster management;

**1 "Problem solving-oriented"**

This course is designed to be not “a course in which students are somehow forced to study” but “a course in which they independently think and find solutions to issues of their interest.” One of the graduating requirements of this course is to write a master’s thesis on an issue to which each student identifies and finds a



**ICHARM -Leading centre on water hazard risk management in UNESCO family-**

**Shahbaz Khan**

● Director, Regional Science Bureau for Asia and the Pacific, UNESCO

It is my great pleasure to congratulate ICHARM for its 10th anniversary and for ICHARM achievements during this period. In particular I would like to congratulate ICHARM for its contributions in delivering actively as a member of Japan National Committee for the International Hydrological Programme, the programme phase VII and now phase VIII. Among other activities, I would like to underline the valuable global capacity building efforts of ICHARM through its Master programme in Water related disaster management and as the Secretariat of the International Flood Initiative. ICHARM Master Programme is contributing in a fundamental manner to building Asia and the Pacific region capacity in water related disasters resilience and actively reducing water-related disasters risk in the region. This Master programme is also an essential component of the successful delivery of both Phases 1 and 2 of the UNESCO project “Strategic Strengthening of Flood Warning and Management Capacity of Pakistan” supported by the Japanese government. ICHARM is providing a holistic view on disaster management in general as well as helping build high proficiency in hydrological modelling and satellite based rainfall estimates. As a UNESCO Category 2 water centre, ICHARM has been the leading centre on water hazard risk management in the UNESCO water family. I wish ICHARM a very successful continuation.

solution by him/herself. Such assignment helps students develop the capacity to formulate integrated flood mitigation plans and also will help them address other issues at home.

**II "Practical rather than deep-theoretical"**

To make the course solving-oriented, lectures and exercises put more stress on practice than theory to prepare students to be fully functional in actual situations.

Table 3-1-1 Breakdown of the course curriculum

Category		Course No.	Course Title	Principal Instructor
Basic Study	Management Basis	DMP 2000E	Disaster Management Policies A: from Regional and infrastructure Aspect	Prof. Ieda (GRIPS)
		DMP 2010E	Disaster Management Policies B: from Urban and Community Aspect	Prof. Sunohara (GRIPS)
		DMP 2820E	Basic Concepts of Integrated Flood Risk Management (IFRM)	Prof. Takeuchi (ICHARM)
	Engineering Basis	DMP 1800E	Computer Programming	Assoc. Prof. Ushiyama (ICHARM)
		DMP 2800E	Hydrology	Prof. Koike (ICHARM)
		DMP 2810E	Hydraulics	Prof. Egashira (ICHARM)
Application	Management Application	DMP 2870E	Urban Flood Management and Flood Hazard Mapping	Prof. Tanaka (Kyoto Univ.)
		DMP 2900E	Socio-economic and Environmental Aspects of Sustainability-oriented Flood Management	Assoc. Prof. Ohara (ICHARM)
		DMP 3900E	Site Visit of Water-related Disaster Management Practice in Japan	Assoc. Prof. Shibuo (ICHARM)
	Engineering Application	DMP 2890E	Practice on Flood Forecasting and Inundation Analysis	Assoc. Prof. Sayama (Kyoto Univ.) Assoc. Prof. Rasmy (ICHARM)
		DMP 3802E	Practice on GIS and Remote Sensing Technique	Assoc. Prof. Yorozuya (ICHARM)
		DMP 3810E	Flood Hydraulics and River Channel Design	Prof. Fukuoka (Chuo Univ.)
		DMP 3820E	Mechanics of Sediment Transportation and Channel Changes	Prof. Egashira (ICHARM)
		DMP 3840E	Control Measures for Landslide & Debris Flow	Prof. Kondo (President, Sabo & Landslide Technical Center)

In this sense, field trips are a crucial part of the course.

**III "One-year master's course"**

The target population of this course is incumbent practitioners working in administrative organizations. For that reason, the course is designed for them to earn a master's degree within a single year rather than the usual two years so that they do not have to be absent from work too long.

The curriculum of this course consists of lectures, exercises, field trips, and individual study (master's thesis). Table 3-1-1 shows the breakdown of the curriculum. The curriculum is largely divided into basic study and application, each of which is subdivided into management and engineering, to learn water-related disaster risk management in a well-balanced manner. In principle, the lectures and exercises are conducted by ICHARM researchers. Occasionally, however, prominent experts from external organizations are invited to provide lectures.

In writing a master's thesis, students are required to study a theme related to problems of their countries, so the course is expected to develop human resources capable of developing plans for comprehensive water-related disaster mitigation and prevention and contributing to the promotion of problem-solving practice in their home countries after returning home.

The lectures start from the second week in October. Figure 3-1-2 shows the outline of the course schedule.

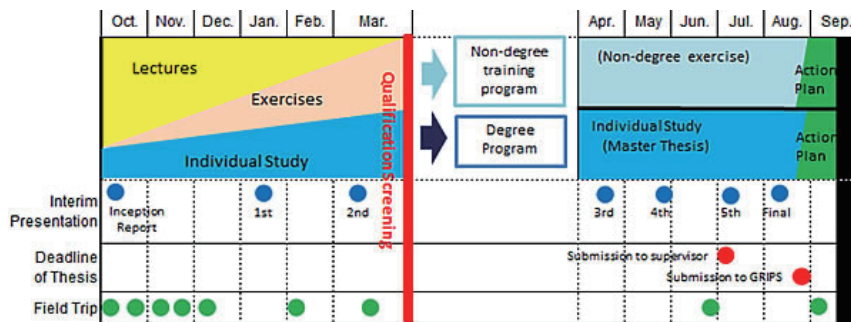


Figure 3-1-2 Outline of the course schedule



**Knowledge and networking in the 1st M.Sc. Program**

**Ye Li-Li**

- Director, General Office of Department of Safety Supervision, Ministry of Water Resources, Beijing, China
- Alumna, M.Sc. course, ICHARM

I was honored to be a student of Comprehensive Disaster Management course at ICHARM in 2007-2008 and was very happy with the knowledge gained from the lectures and field trips. The training also provided networking opportunities for our 11 member team from different countries to share experiences. The trainers were highly experienced professionals in their respective fields. Training was well organized and trainers and facilitators did their best to provide the most relevant knowledge to trainees within the course duration. Arrangements made for our team were commendable and the knowledge gained from the training helped me with my work and advance my career.



In the first half of the course, the students mainly attend lectures and exercises and take several field trips to study flood control countermeasures in place.

At the end of March, the qualification screening committee, composed of faculty members, will decide whether students are qualified to continue the course based on the performance of the course work and interim presentations the students have done during the initial months. If a student is evaluated not to meet the requirements, he or she has to switch from the degree program to the non-degree training program.

During the second half of the course, the students in the degree program will work on their individual studies to complete a master's thesis. The students in the non-degree training program work on their individual studies to complete reports with the help of ICHARM researchers.

The program started in October of 2007 and entered its 10th year in October of 2016. Since its opening, the program has attracted students from 31 countries and graduated 110 students with a master's degree in disaster management. Annex listed the titles of master's degree theses of all graduates. Many graduates of the master's course, including a deputy director of a UNESCO category II center in Serbia, have been working at local counterpart organizations, and some even support ICHARM in projects currently in progress in their countries. The program functions as one of the essential driving forces to promote ICHARM activities worldwide. ICHARM will continue improving this master's course for further sophistication and effectiveness.

For more information about this program, please refer to a PWRI Technical Note which summarizes each year's implementation results:

[http://www.icharm.pwri.go.jp/publication/technical\\_note.html](http://www.icharm.pwri.go.jp/publication/technical_note.html)



Photo 3-1-2 The first class of graduates of the master's program in disaster management (with graduates of the building research institute course) (September 17, 2008)

### 3-2 "Disaster Management Ph.D. Program"

In October of 2010, ICHARM and GRIPS jointly launched a Ph.D. program, "Disaster Management Ph.D. Program". This was the first challenging attempt of its kind since the establishment of PWRI. The

purpose of this program is to develop human resources who are able to educate other researchers, formulate plans and strategies in water-related disaster risk management at home and abroad, and lead other



#### M.Sc. Course Alumni experiences and testimonials

**Nikola Zlatanović**

- Deputy Director, The Centre for Water for Sustainable Development and Adaptation to Climate Change under the auspices of UNESCO, Serbia
- Alumnus, M.Sc. course, ICHARM

In 2012-2013, I had the great opportunity to attend the Water-Related Disaster Management Program, jointly organized by GRIPS and PWRI/ICHARM, through the support of the JICA, and graduate with the class of 2013. During the one-year master's course program, I was able to refresh my knowledge of flood-related engineering sciences, as well as learn many new concepts of disaster management and gain new insights and different points of view from ICHARM and GRIPS professors, research staff and my fellow international student colleagues. Since I have returned from Japan to my previous post at the Institute for the Development of Water Resources in Serbia in 2013, I have been continuously applying much of what I have learned at ICHARM in all areas of flood management, including integrated flood risk management (IFRM), sediment transport and debris flow, hazard and risk mapping, hydrological modelling, etc.

members in actually executing such plans. Enrollment for this program is limited to a few eligible students with ability and motivation to complete doctoral level research and translate the knowledge of water-related disaster risk reduction acquired at ICHARM into action. So far, seven students have graduated with a doctoral degree. ANNEX listed the titles of doctoral degree theses of all graduates.

In addition, PWRI offers the assistantship for doctoral students to work at ICHARM as research assistant, which provides a great opportunity for them to have first-hand experience in disaster management research and practice.



Photo 3-2-1 Three Ph.D. graduates in the fourth year class (at GRIPS, September 14, 2016)

### 3-3 Short-term training programs

#### 3-3-1 JICA training

##### a) Training program on flood hazard mapping (2004-2008)

After the establishment of the Secretariat for Preparatory Activities of UNESCO-PWRI Centre in April of 2004, they decided to launch JICA training as a preparatory activity prior to the official establishment of ICHARM. The training

plan was discussed in detail between the secretariat and JICA, and secretariat staff was dispatched to the Philippines, Laos, and Thailand to exchange opinions with related international organizations.



#### Looking forward to working with other alumni in the world!

##### **Shiro Hishinuma**

- Associate Senior Staff, Water Resources & Energy Dept., NIPPON KOEI CO., LTD.
- Alumnus, Ph.D. course, ICHARM

Congratulations on the 10th anniversary of ICHARM! All of my experience during the Master's and Ph.D. programs form the basis to work as an international consultant for disaster and risk management projects. I appreciate my supervisors, researchers and staff of ICHARM. They kindly supported and encouraged me to complete the programs. I wish ICHARM will continue to provide students with opportunities to acquire fundamental knowledge and practical skills in disaster management. As one of ICHARM alumni, I'm looking forward to working for disaster risk reduction with other alumni scattered around the world!



#### Various Japanese practices and stories by Ph.D. Program

##### **Karina Vink**

- Postdoctoral Researcher, Global Research Center for Environment and Energy based on Nanomaterials Science (GREEN), National Institute for Materials Science (NIMS)
- Former Research Specialist, ICHARM
- Alumna, Ph.D. course, ICHARM

As the second doctoral student to graduate from the program jointly offered by ICHARM and the National Graduate Institute for Policy Studies, I am grateful to have had the chance to experience the various Japanese practices and stories on the management of floods and other natural hazards firsthand. Through the international atmosphere cultivated at ICHARM I have built an expansive network of water professionals and look forward to future collaborative projects to reduce disaster risks, as well as continuous knowledge sharing. I am honored to have partaken in this unique and prestigious program and fondly remember all the friendly and supportive people involved. Let's make a safer future together!





Photo 3-3-1-1 Participants in the first opening ceremony of the JICA training program (January 31, 2005, at JICA Tsukuba)

Through this preparation process, they found that developing countries in general were not be able to implement sufficient structural measures for flood risk reduction due to limited hydrological and meteorological data, budget, and human resources, and realized that such countries should urgently prepare non-structural measures that could be easily implemented and would effectively reduce flood risk. The secretariat concluded that they should organize a training program on flood hazard mapping, and designed a one-month program in which participants would be able to learn flood hazard mapping from theoretical backgrounds to actual production. The training was specifically for practitioners and engineers of central and local government organizations who were engaged in flood risk management or river management at local or national levels.

With these preparations beforehand, on January 31, 2005, the first JICA training on flood hazard mapping started for eight East and Southeast Asian countries. This training was the first such training for which ICHARM comprehensively organized everything from

planning to execution, including training details.

The training was attended by a total of 78 trainees from eight countries (China, Cambodia, Indonesia, Laos, Viet Nam, Thailand, the Philippines, and Malaysia) as listed in Table 3-1 over the five years.

One of the distinctive features of this training was Town Watching, in which training participants in groups walked around an actual town, such as Kurihashi Town of Saitama Prefecture and Ise City of Mie Prefecture, to study the area from viewpoints of flood hazard mapping. This activity was very effective for participants to acquire practical knowledge on the production and use of flood hazard maps. Town Watching is still practiced as a core activity of the training provided by ICHARM.



Photo 3-3-1-2 Participants with city officials in the Town Watching exercise at Ise City (November 24, 2005)

For more information, please refer to PWRI Technical Note No. 4137, JICA Training Course, Flood Hazard Mapping (in Japanese) and PWRI Technical Note No. 4162, Report on 2004-2008 JICA Training Course, Flood Hazard Mapping (in English).

### b) Training on local disaster management planning with flood hazard maps (2009-2011)

When the training program on flood hazard mapping ended after five years as planned, ICHARM decided to build on the achievement from the previous training program and conduct a training program on local emergency operation planning with flood hazard maps for three years, not only targeting the Asian region but also all over the world. The program was designed to develop a plan for local disaster management by combining disaster prevention structures, flood hazard maps, and flood forecasting systems in order to contribute to regional disaster management and emergency response.

In the first year, the training was conducted for senior managers. Participants formulated the three-year training plan for their countries and selected candidates who should participate in the training in each of the next two years. Second-year participants learned techniques



Photo 3-3-1-3 PCM exercise (November 19, 2009)

necessary to create flood hazard maps, and third-year participants formulated an action plan to implement the disaster management plan developed for their country. The training was attended by 33 trainees from 10 countries (Bangladesh, Bhutan, Indonesia, Laos, Myanmar, Nepal, Pakistan, Sri Lanka, Tajikistan, and Thailand), with some exceptions in which participating countries could not send ideal participants for the intent of this program.

Project cycle management (PCM) exercises started from this training to help participants improve their problem-solving skills. Through the exercises, they learned to systematically analyze conditions in their countries, identify institutional problems and issues, and come up with solutions.

### c) Training on capacity development for flood risk management with the Integrated Flood Analysis System (IFAS) (2012-2014 & 2015-2017)

Due to limited budget and human resources, it is often difficult for developing countries to implement structural measures. Thus, it is particularly important for them to develop non-structural measures, such as a flood forecasting systems and flood hazard maps, including effective use of them. This requires efficient cooperation among personnel in charge of meteorology, river management, and disaster management, but it is often not very easy for developing countries to achieve.

In 2008, however, ICHARM developed the Integrated Flood Analysis System (IFAS), a possible breakthrough of this situation. The new system is a hydrological analysis model that can use satellite rainfall data for runoff calculation. It has since been improved for better accuracy and tested for applicability through applications to actual rivers, such as the one to the Solo River basin of Indonesia in a project funded by the Asian Development Bank.

To stress the importance of coordination, this training was planned for personnel working for flood vulnerable areas in developing countries, particularly those selected from different areas of expertise in meteorology, river management, and disaster management. It was designed for participants with different expertise to cooperate with each other and strengthen the overall flood management capacity of the target area. They learned the effective use of IFAS and Japan's disaster management plans including actual cases of flood management. Based on that, they developed a local flood management plan for the target flood vulnerable area of their country.

To produce as much synergies as possible with JICA flood-related projects underway, or scheduled, in developing countries, this program had the following two distinctive features:



**Nwabueze Ibeneme**

● Engineer, Anambra-Imo River Basin Development Authority (AIRBDA), Nigeria

#### IFAS will save a lot of lives and properties

May I use this medium to congratulate ICHARM for its 10th anniversary. The level of achievements made by this noble organization with respect to time is quite enormous.

The holistic approach employed by ICHARM authority in training their trainees which includes lectures, field trips, presentations, group discussions coupled with the conducive learning environment and experienced tutors made learning very easy, attractive and interesting. My interpersonal and communication skills had a great lift during my IFAS training in ICHARM due to the unique approach they employ in teaching.

The invention of IFAS model is a welcomed development that brings hope to flood prone areas in the world because it is a tool that helps to mitigate the risks associated with flooding due to its early warning system. In order words, the application of IFAS model will save a lot of lives and properties during flooding. Kudos to ICHARM for working so hard to produce such a great model.

As an IFAS trainee, I am sure ICHARM is a great center for excellence while the application of IFAS model will go a long way to reduce losses in any case of flooding.

Thanks.



- Targeted basin areas were selected from those related to JICA projects, and
- Trainees were sent by organizations related to JICA projects, and each of them had to be from a separate organization with a different responsibility of meteorology, river management, or disaster management.

Consequently,

- Trainees were able to relate the training to future activities at home and create a more detailed action plan, and
- Trainees responsible for the same basin were able to build a close tie, both personal and institutional, and thus influence a positive effect on the promotion of domestic training among local experts and organizations.

The training targeted not only Asian but also African countries. As a result, up to 2016, a total of 94 participants from 12 countries (Bangladesh, Bhutan, Bosnia and Herzegovina, Djibouti, India, Kenya, Myanmar, Nigeria, the Philippines, Sri Lanka, Thailand, and Viet Nam) participated in the program.

Besides the above-mentioned three training programs, ICHARM also conducted a JICA short-term training program in February 2011, “Capacity Development for Adaptation to Climate Change”. The total number of participants in these training programs has now reached 212 from 20 countries. The training program on flood hazard mapping started with eight Asian countries in January 2005, and has now expanded to 20 countries around the world, contributing to the mitigation of water-related disasters in each country.



Photo 3-3-1-4 IFAS exercise (July 31, 2012)

### 3-3-2 Follow-up activities

Training and educational activities in Japan alone can hardly solve problems in a country. Colleagues and superiors of a trainee, and even the entire organization to which he belongs, need to share the recognition that they all have to work on problems, and additional advice through follow-up activities can be useful when they face difficulties. Follow-up activities are equally important for ICHARM. They can be an excellent information source for ICHARM to learn issues that the trainees face when implementing their plans at home and make the training curriculum more informative and practical for new trainees. In this regard, follow-up activities after the regular training courses are important for former trainees as well as for us, training organizers.

and their organizations to promote information sharing and networking among them and maximize the effect of the training. Table 3-3-2-1 shows the list of follow-up activities conducted recently.



Photo 3-3-2-1 Participants with ICHARM researchers in the seminar on sediment hydraulics and river management in Bangladesh (February 13, 2013)

Therefore, almost every year, ICHARM holds follow-up seminars and other opportunities for former trainees

Table 3-3-2-1 List of follow-up activities

Date	Activities	Place	Participants	Joint organizers
February 7-9, 2007	Seminar	Kuala Lumpur, Malaysia	30, including 17 ex-trainees	JICA, Department of Irrigation and Drainage (DID), Malaysia
January 30 -February 1, 2008	Seminar	Guangzhou, China	28, including 12 ex-trainees	JICA, Office of the State Flood Control and Drought Relief Headquarters, China
February 17-19, 2009	Seminar	Manila, the Philippines	31, including 15 ex-trainees	JICA, Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)
November 6-7, 2010	Seminar	Hanoi, Viet Nam	37, including 9 ex-trainees	Institute of Meteorology and Hydrology in Hanoi, Viet Nam, UNESCO Jakarta Office
February 22-23, 2011	Seminar and interview	Bangkok, Thailand	4 ex-trainees	Economic and Social Commission for Asia and the Pacific (ESCAP), JAXA
February 13-14, 2013	Seminar	Dhaka, Bangladesh	22, including 11 ex-trainees	Bangladesh Water Development Board (BWDB)

March 10 and 12, 2014	Interview	Kuala Lumpur, Malaysia	2 ex-trainees	Malaysian Meteorological Department, Department of Irrigation and Drainage Malaysia
March 3-4, 2015	Seminar	Jakarta, Indonesia	More than 10, including 4 ex-trainees	Indonesian Ministry of Public Works and Housing, Water Resources Department, JICA Indonesia Office
March 2, 2016	Session in the AWCS Symposium	Tokyo	9 ex-trainees	Asian Water Cycle Symposium 2016

### 3-3-3 Training funded by other international organizations

#### a) Training on comprehensive tsunami disaster prevention funded by UN/ISDR (2008)

On December 26, 2004, an earthquake occurred off the coast of Sumatra, and the subsequent tsunamis in the Indian Ocean caused extensive damage with more than 220,000 deaths in the coastal countries. In response to this catastrophe, the training funded by the United Nations Office for Disaster Risk Reduction (UNISDR) was held from June 2 to July 11, 2008, to share Japan's experience from the tsunami disaster for 11 participants from four countries on the Indian Ocean coast – India, Indonesia, Maldives, and Sri Lanka. The participants included heads of the organizations promoting tsunami prevention measures and government officials in equivalent positions.

Tsunamis cause a disaster with extensive damage, but because a tsunami disaster occurs only once in several decades or centuries, measures against it are often neglected. Therefore, instead of teaching the significance of tsunami preventive measures such as massive floodgates and seawalls, this training focused on raising public awareness for disaster management, particularly in developing countries where disaster management was often postponed due to limited financial and human resources.

For more information, please refer to PWRI Technical Note No. 4113 UN/ISDR Comprehensive Tsunami Disaster Prevention Training Course implementation reports (in Japanese) and PWRI Technical Note No. 4114, Report on UN/ISDR Comprehensive Tsunami Disaster Prevention Training Course (in English).



Photo 3-3-3-1 Training participants with local residents after discussions at Horaikan Inn in Kamaishi City (June 22, 2008)

#### b) Short-term workshop on capacity development for integrated flood risk management in Pakistan funded by UNESCO (2012 and 2013)

This workshop was conducted as part of a project funded by the Japanese government through UNESCO, for strategic strengthening of flood warning and management capacity in Pakistan, after a large-scale flood disaster occurred in Pakistan in 2010 (Refer to Chapter 5-2). The program invited 11 senior- and junior-level government officials from Pakistan in 2012 and 2013.

Many participants appreciated the contents of this well-organized workshop. They also made positive comments on river management in Japan and also mentioned retarding basins such as the one in Watarase, saying

that retarding basins can be an effective flood control measure for the Indus River basin.



Photo 3-3-3-2 Participants in the 2012 short-term workshop with the PWRI executives (May 15, 2012)



### 3-3-4 International summer program

ICHARM in cooperation with the University of Tokyo held an international summer program on sustainable water management in an era of big data in 2015 and 2016. This program was planned based on the recognition of the importance of the effective use of big data (massive amount of diverse data) and the need for sustainable water resource management from an interdisciplinary perspective. A total of 50 persons attended the program. Contrary to participants in conventional ICHARM programs, who were mainly government officials from developing countries, the participants in this program were students, both undergraduate and graduate, and young experts of various nationalities.

The program consists of lectures, practical training, and field trips, all of which were arranged for the participants to use various data and data integration functions from the Data Integration and Analysis System (DIAS) provided by Japan to enhance the capacity to solve water-related issues from an interdisciplinary perspective. The participants, individually or in groups, worked on actual problems by focusing on the enhancement of disaster resilience under climate change, the improvement of the coping capacity for future disaster risks, and the consideration of disaster risks in creation of social policies and a safer and more diverse environment.



Photo 3-3-4-1 Participants and instructors in the summer program after the closing ceremony (August 7, 2015)

### 3-3-5 IFAS and RRI workshops

ICHARM released the Integrated Flood Analysis System (IFAS) Ver. 1 in 2008. Since then, ICHARM has conducted IFAS-related workshops in short-term training programs and the master's course conducted by ICHARM, as well as at local workshops in foreign countries by dispatching ICHARM researchers in response to requests from foreign organizations. The number of IFAS trainees in the workshops from 2007 to 2015 has reached 1,140 from 51 countries (the number in 2007 was from the participants in the training conducted prior to the official release of IFAS). IFAS has been increasingly widely used not only in Asia but also around the world.

The Rainfall-Runoff-Inundation (RRI) model is also expanding its applications around the world. In March 2016, the Philippine Atmospheric Geophysical and

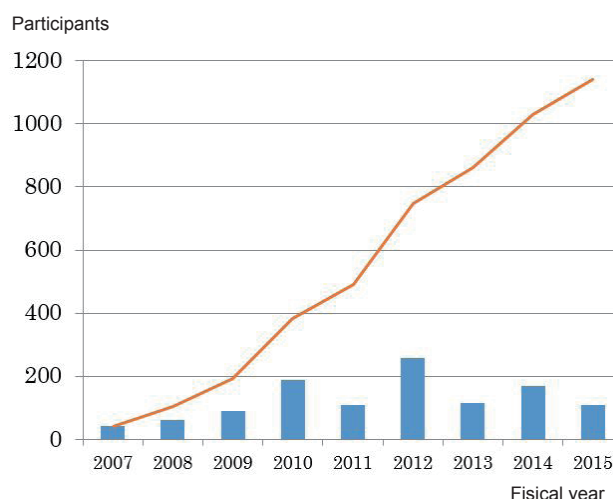


Figure 3-3-5-1: The number of IFAS trainees

Astronomical Services Administration (PAGASA) held a workshop on practical application of the RRI model in the Philippines. The workshop focused not only on learning how to use the RRI model but also producing RRI instructors who can teach fellow engineers. The workshop is taught not only by ICHARM researchers but also by master's course graduates and government officials who learned the RRI model at ICHARM.

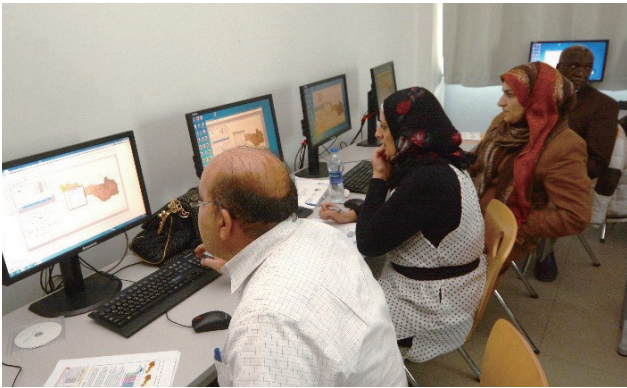


Photo 3-3-5-1 IFAS workshop organized by UNESCO Cairo Office (December 2015)

As mentioned at the beginning of this chapter, ICHARM has conducted its research and educational activities since its establishment, based on the recognition that both individual and organizational capacity needs to be strengthened to operate effective disaster management. In this workshop, former trainees that studied at ICHARM teach their colleagues. Ten years after its establishment, the philosophy of ICHARM has finally started taking root in some countries.



Photo 3-3-5-2 RRI workshop organized by PAGASA (March 2016)

### 3-4 Internship

ICHARM accepts students and researchers in Japan and abroad as interns upon request from universities and research institutes in compliance with the internship guidelines of the Public Works Research Institute. The periods of internship vary individually from a few weeks to several months. Between 2006 and 2015, around 20 interns studied at ICHARM; half of them were from Japanese organizations and the rest from foreign universities and corporate research institutes, for example, in the Netherlands, Korea and Iran.

Although they need to cover all expenses staying in Tsukuba with funding from their affiliations or international donor organizations, interns are given

access to all benefits that help them pursue their research interest, including attending lectures and seminars, studying different types of hydrological models and risk assessment models, and opportunities of presenting their research results at the end of their internship for discussion with other researchers.

This opportunity has had a positive effect on interns. Some of them actually apply the hydrological models they studied to their study river basins, Japanese or abroad, in research. The internship is beneficial to ICHARM, too. Thanks to motivated and enthusiastic interns, researchers and students of ICHARM have the privilege and joy of helping them and broadening their own imagination and views.



#### What I learned in my internship program of ICHARM

**Yeseul CHO**

● Yonsei University

● Former Internship Student

It was a great opportunity for me to participate in an internship program for ICHARM, where I gained various experiences in study. During the six-month, I learned a lot of things, including the Grid Analysis and Display System and the Rainfall-Runoff-Inundation model, and I had a chance to listen to lectures by great professors. I researched about investigation of climate change impact assessment on water resources of the Andong-dam basin, South Korea, under IPCC CMIP-5 scenarios using Tokyo University's Data Integration and Analysis System and the RRI model. All persons at ICHARM always helped me to concentrate on research and guide me with useful and technical advices. I am sincerely grateful to ICHARM's staffs and I hope you all the very best for the future.



### 3-5 Educational and cultural experience events

Beside the training and educational activities explained so far, ICHARM holds annual events for local school

students and foreign students to have unique educational and cultural experiences.

#### 3-5-1 ICHARM Open Day

For junior and high school students in Tsukuba City to learn about ICHARM and current water issues, ICHARM has held the ICHARM Open Day every April since 2008, as a commemorative event for its official establishment on March 6 and the World Water Day on March 22.

The event consists of the presentation session, in which selected ICHARM foreign researchers and graduate students explain water issues of the world and their countries, and the poster session, in which local students have chance to talk to many ICHARM foreign researchers and graduate students in person about their countries. The Open Day also provides good opportunities for local students to experience English communication with non-native English speakers. After the event, many of them comment, "It was great fun speaking with many foreigners," or "Topics were sometimes too difficult, but I enjoyed all presentations."



Photo 3-5-1-1 Local students listen to a presentation (2016)



Photo 3-5-1-2 High school students listen to a master's student at the poster session (2016)

#### 3-5-2 Japanese cultural experience for foreign researchers and students

##### a) Tea ceremony

To provide foreign researchers and students with a chance of experiencing Japanese culture, ICHARM held a tea ceremony from 2008 to 2012, which was led by

female staff members of ICHARM to demonstrate tea preparation and experience tea drinking manners.



Photo 3-5-2-1 Left: Ms. Nakamura instructs how to make Japanese tea; center and right: Students taste tea and sweets (both in 2012)



## b) Cherry blossom viewing

Tsukuba is famous for cherry blossoms, especially along the Sakuragawa River, upstream of which is the birth place of a Noh song, Sakuragawa. As beautiful as Hojo or Sakuragawa Bank, PWRI has many cherry trees on its premises and presents beautiful scenery in April. Taking this nice opportunity, ICHARM holds a short walk tour during the lunch time for foreign researchers and students to spend time together with Japanese staff while enjoying cherry blossoms. The president and

executives of PWRI also join the tour, which gives a good opportunity for researchers and students to socialize with each other. This event is particularly refreshing for master's course students, as well as a good chance to experience traditional Japanese culture first hand, since it is around this time that they usually finish the first half of the curriculum in March and start working on their thesis.



Photo 3-5-2-2 April 6, 2015

## c) Visit to Ninomiya Sontoku Memorial House and Sontoku Award

Ninomiya Sontoku was a great philosopher and practitioner in many fields, particularly in politics, economics and agriculture in the late Edo Era. He is well known for advocating the Hotoku Philosophy in governing a nation and providing relief to people and leading agricultural restoration policies. This philosophy was also highly appreciated by Uchimura Kanzo, another famous philosopher in the Meiji Era. As human empowerment is at the core of ICHARM's international contribution, we have introduced it in our educational programs, for students should know it as spiritual foundation for their action.

ICHARM believes that understanding of this philosophy will lead them to understanding of the significance of frugality on a daily basis for emergency and the importance of self-help, mutual support and



Photo 3-5-2-3 Ninomiya Shrine (September 10, 2013)

public assistance, which underlies Japan's disaster management. To provide opportunities to understand this philosophy, each training program includes a visit and study tour of Sontoku-related places, such as the



Ninomiya Sontoku Memorial House (Moka City, Tochigi Prefecture) and Aoki Weir (Sakuragawa City, Ibaraki Prefecture) for which Sontoku led a reconstruction project.

The best students in the master's course in the first and the second year were given "Outstanding Award". In

the third year, the Sontoku Award was introduced, and has since given to the student who is mutually selected among students as the most self-devoted to the class. In addition, the Best Research Award was created to show appreciation for the student with the most excellent master's thesis, given in the name of GRIPS and PWRI. ANNEX includes the names of the winners of these awards.

#### d) Commemorative tree planting by students in master's and doctoral courses

Since the 7th class of the master's course (2013-2014), commemorative tree planting has been conducted by students in the master's and doctoral courses. The trees

grow and serve as a good reminder of the years of study to former students, when they visit ICHARM again in the future.



Photo 3-5-2-4 September 3, 2014



Photo 3-5-2-5 August 12, 2015

The uniqueness of ICHARM's training and educational programs lies in the development of both individual and organizational capacity for effective disaster management. In this regard, it is delightful to see former trainees after returning home hold workshops and give lectures to share what they have learned in Japan with

their colleagues and lead local research institutes and government offices.

ICHARM will continue collaborating with associated agencies inside and outside Japan to enhance its educational and training activities.

*(Written by Yoshio Tokunaga and Daisuke Kuribayashi)*





# 4 Information Networking







September 12, 2013 at Nairobi



# 4 Information Networking

## 4-1 International Flood Initiative (IFI)



**INTERNATIONAL  
FLOOD  
INITIATIVE**

The International Flood Initiative (IFI) is a joint initiative organized by UNESCO (IHP), WMO (CHy), UN/ISDR, UNU in collaboration with international organizations such as IAHS, IAHR, ICHARM, CLRI etc. IFI was officially launched in January 2005 at the second World Conference on Disaster Reduction (WCDR) in Kobe, Japan.

ICHARM has been serving as the IFI Secretariat, providing various supports such as maintaining IFI website (<http://www.ifi-home.info/>) and promoting information networking among IFI-related and other organizations.

### Objectives

The overall aim of IFI is to build capacity in countries to understand and better respond to floods by taking advantage of their benefits while at the same time minimizing their social, economic and environmental risks.

### Governing Structure

IFI started with the two-committee system comprising the advisory committee (AC) and the management committee (MC). AC consisted of UN organizations whose member countries were supposed to provide advice on the management of the initiative while MC consisted of organizations which actually perform the work of the initiative. In 2013, however, they merged into MC as UN organizations' secretariats are indispensable in management of the initiative and such distinction is impractical.

- **IFI Advisory Committee (IFI-AC)**

UNESCO (IHP), WMO (CHy), UN/ISDR and UNU

- **IFI Management Committee (IFI-MC)**

IAHS, IAHR, IIASA, ICLR and other interested organizations

- **IFI Secretariat**

PWRI/ICHARM under the auspices of UNESCO, Tsukuba-Japan



### **IFI is a key mechanism that enables progress in integrated flood management**

**Johannes Cullmann**

● *Director, Water and Climate Department, World Meteorological Organization (WMO)*

ICHARM is 10 years old this year. I sincerely thank the initiators of ICHARM, especially Professor Takeuchi and his co-founders for the timely and important idea to establish this center under the auspices of UNESCO. My thanks also go to the Japanese Government for taking forward risk management, one of the most important issues in sustainable development. ICHARM has provided methodological advances in risk assessment and management. Its specialists have trained numerous experts around the world and have thus significantly contributed to solving risk related challenges. ICHARM is also home of the secretariat of the International Flood Initiative. This initiative is a key mechanism that enables progress in integrated flood management. Over the years, IFI partners greatly contributed to change the path from a negative, reactive approach in flood management to a positive, proactive view on how we can benefit from floodplains whilst protecting them at the same time. ICHARM is a motor of cooperation on local, regional and global scales. This is thanks to the dedication of all the excellent experts that have worked for ICHARM and that are steering its course today. Thanks a lot to all of you!

## History

**January 2005:** IFI's official launch was convened in Kobe, Japan, by Director of Water Science Division of UNESCO Dr. András Szöllösi-Nagy, in the presence of Director-General of UNESCO Dr. Koïchiro Matsuura, Secretary General of WMO Dr. Michel Jarraud, Director of UNISDR Office Dr. Salvano Briceno, and Rector of UNU Prof. Hans JA van Ginkel.

**January 26, 2007:** The first meeting of IFI's Advisory Committee and Management Committee (AC/MC) was held at WMO in Geneva. The IFI draft plan was officially adopted at the meeting. The IFI Pamphlet (<http://www.ifi-home.info/IFI-pamphlet.pdf>) was produced in September 2007 based on this agreement.

**May 5, 2008:** The second IFI Meeting (AC/MC) was held at ICLR in Toronto, Canada, on the occasion of the 4th International Symposium on Flood Defence (ISFD4), which later changed to the International Conference on Flood Management (ICFM). ICHARM organized the IFI plenary session at ISFD4 on flood preparedness.

**July 14, 2008:** The IFI website ([www.ifi-home.info](http://www.ifi-home.info)) designed and hosted by ICHARM was launched.

**January to May, 2010:** A series of IFI e-meetings were held to promote IFI actions including preparation for ICFM5.

**September 27, 2011:** ICHARM, as ICFM5 Secretariat, organized the 5th International Conference on Flood Management (ICFM5) in Tokyo from September 27 to 29. More than 450 participants from 41 different nations participated in the conference. IFI organized the plenary session 1 "Flood Forecasting and Early Warning Systems," which was chaired by Dr. Avinash Tyagi of WMO at the U-Thant Hall, United Nations University.



Photo 4-1-1 Plenary session 1 at ICFM5, Tokyo, September 2011

**November 13, 2012:** A pre-AC/MC meeting was held in Geneva on the occasion of WMO CHy-14 attended by Dr. Bruce Stewart, the Director of Hydrology and Water Resources Program (HWR) of WMO, Dr. Blanca Jimenez-Cisneros, the new Secretary of International Hydrological Program (IHP) of UNESCO and others. As an IFI revitalization plan, the IFI flagship project was



### IFI, one of the most successful initiatives of IHP

#### **Blanca Jiménez-Cisneros**

● *Director, Division of Water Sciences and Secretary, International Hydrological Programme of UNESCO*

It is with great pleasure that we celebrate the long-lasting cooperation between ICHARM and UNESCO's International Hydrological Programme (IHP). ICHARM has been strongly contributing to IHP's Strategic Action Plans, including the eighth IHP phase "Water Security: Responses to Local, Regional and Global Challenges (IHP-VIII 2014-2021)".

The International Flood Initiative (IFI), is one of the most successful examples of IHP's flagship initiatives. IFI, in cooperation with its partners among them World Meteorological Organization (WMO), the United Nations Office for Disaster Reduction (UNISDR), United Nations University (UNU) as well as several non-governmental associations and institutes, has been strengthening the capacity in numerous countries to better understand and respond to floods to minimize their social, economic and environmental risks, while maximizing their beneficial effects.

ICARM is playing an essential role in moving forward the activities of IFI by serving as its technical secretariat since its establishment, and by leading the revision of IFI's strategy in line with the 2030 Agenda for Sustainable Development, the Sendai Framework for Disaster Risk Reduction and the Paris Agreement on Climate Change.

ICARM has also very effectively cooperated with IFI through many projects, to the benefit of IHP's Member States. One example is the joint IHP-ICARM project in Pakistan, funded by the Government of Japan. It improves the flood forecasting and early warning systems and conducts risk mapping of flood plains along the Indus River, following the devastating 2010 floods.

I wish to express my sincere appreciation and congratulation on the tenth anniversary of ICHARM and I look forward to further cooperation between IHP and ICHARM.



proposed by the Secretariat of IFI, i.e., ICHARM, and discussed.

**February 7-8, 2013:** As an output of the pre-AC/MC meeting held on November 13, the IFI Planning Workshop took place on February 7-8, 2013, at the UNESCO headquarters in Paris. The MC and AC members as well as observers were invited. The main outcome was the agreement on drafting a concept note for the first IFI flagship project, which was finalised and finally agreed on by all members in February 2013. The IFI flagship project was entitled "To support benchmarking flood risk reduction at global, national and local levels".

**March 2013:** The IFI flagship project was launched at the side event of the Special Thematic Session of the UN General Assembly (UNGA) on Water and Disasters at the UN headquartes in New York after presented by Dr. Blanca Jimenez-Cisneros, the Secretary of IHP, UNESCO, and Dr. Bruce Stewart, the Director of HWRP, WMO.

**September 12, 2013:** The UNESCO Strategic and High Level Meeting on Water Security and Cooperation was held in Nairobi, Kenya. At the session on Theme 1 "Water Related Disasters and Hydrological Changes" of IHP-VIII for the period 2014-2021, the IFI flagship project was discussed and agreed to be included under Theme 1 with ICHARM assigned to act as the focal point.



Photo 4-1-2 UNESCO Strategic and High Level Meeting on Water Security and Cooperation in Nairobi, Kenya, September 12, 2013

**August 2014:** The roadmap for the IFI flagship project, "To support benchmarking flood risk reduction at global, national and local levels," was drafted, and as the first implementation action, Dr. Johannes Cullmann fo German IHP at BfG, Koblenz, sent Ms. Anne Gädeke to ICHARM to jointly produce a flood hazard map of the Rhine River. She joined ICHARM on August 21, 2014. The roadmap was articulated around four major steps: 1) flood hazard assessment, 2) exposure assessment, 3) assessment and benchmarking of vulnerability, current coping capacity, building resilient communities and preparedness, and finally 4) disaster risk assessment.

**September 16, 2014:** ICHARM as the IFI secretariat organized the IFI special session at the 6th International

Conference on Flood Management (ICFM6) in Sao Paulo, Brazil, and invited session speakers from BfG, the China Institute of Water Resources and Hydropower Research in China, the U.S. Army Corps of Engineers in USA, IFI-LAC with the Secretariat in Mexico, the World Meteorological Organization Headquarters in Geneva, and the UNISDR Brazil office. The session was well attended with over 200 participants and was an occasion for passionate discussions over flood issues and challenges at local, regional and global levels. It created a new thrust for the IFI flagship project.



Photo 4-1-3 Preliminary session on the IFI at ICFM6, Sao Paulo, Brazil in September 2014

**October 21, 2015:** ICHARM in collaboration with IFI co-organized a plenary session entitled "Preparatory Process for the International Initiative on Water and Disaster in the Asia Pacific Region" during a UNESCO international symposium, "Integrated Actions for Global Water and Environmental Sustainability," in conjunction with the 23rd meeting of the International Hydrological Programme Regional Steering Committee for Southeast Asia and the Pacific (IHP RSC SEAP). Based on the valuable inputs from UNESCO, ADB, RCUWM-Tehran/IDI and ICHARM/IFI participants, Prof. Toshio Koike, Director of ICHARM, summarized the session, emphasizing the practice for Integrated Flood Management (IFM) through sharing information and knowledge with practitioners. The session was concluded on the need to further discuss a financing mechanism and the network mobilization of science and research in future regional events.



Photo 4-1-4 Preliminary session collaborated with IDI, Indonesia, October 2015

**March 1, 2016:** The conference entitled "Flood Session: Towards IFI-AP and GEO Water" was held in collaboration with the Asia Water Cycle Initiative (AWCI) and the Network of Asian River Basin Organizations (NARBO) during the Asia Water Cycle Symposium (AWCS2016) in Tokyo, Japan, on March 1-2, 2016. Following the reports from AWCI and NARBO members,

ICHARM organized three parts: “3.2 Flood Early Warning System”, “3.3 Flood Disaster Risk Reduction” and “3.4 End-to-End Action Plan: IFI-AP deliberations”.

**June 13, 2016:** UNESCO organized a side event, “New Strategy for IFI, A Challenge by Hydrology responding to Sendai Framework, SDGs and Paris Agreement,” during the 22nd session of the Intergovernmental Council of the International Hydrological Programme (IHP-IC) at the UNESCO headquarters in Paris, France. The meeting celebrated the launch of the new IFI strategy (IFI strategy 2016-2022) and provided an opportunity to discuss its implementation.



Photo 4-1-5 left to right: Director Toshio Koike (ICHARM) , Dr. Blanca Jimenez-Cisneros (UNESCO), Dr. Johannes Cullmann (WMO), Dr. Christophe Cudennec (IAHS) at UNESCO, Paris, June 2016

(Written by Ali Chavoshian, Ai Sugiura and Mamoru Miyamoto)



### A message for 10th Anniversary of ICHARM

**Ali Chavoshian**

- Director, Regional Centre on Urban Water Management (RCUWM-Tehran) under the auspices of UNESCO
- Former Research Specialist, ICHARM

I have had the privilege of working at ICHARM for five years from 2007 to 2012 and I have never feel disconnected with ICHARM. It is my great pleasure to write a few words in the occasion of 10th anniversary.

I think ICHARM is a unique place to build your network, learn about international water family and eventually grow-up your career. I could remember clearly that I had a meeting with the CEO of PWRI as the host of ICHARM in the very first day of my work at ICHARM back to August 2007. Dr. Sakamoto told me ICHARM is a place to grow-up and build your future career. It is true! ICHARM helped me shape my career and professional life. I really appreciate everything ICHARM has taught me.

ICHARM is a successful story for many other international centers and also with no doubt it is a global center of excellence in the field of water-hazard and risk management. I believe both previous and present director of ICHARM as great scientist and leader played an important role to achieve success. Congratulations to all wonderful members of ICHARM and wish you all the best in the next decade of activities!

## 4-2 High-level Experts and Leaders Panel (HELP) on Water and Disaster

HELP, originally started as HLEP (High-Level Experts Panel), on Water and Disaster was created in 2007 upon request of the UN Secretary General’s Advisory Board (UNSGAB) on Water and Sanitation in order to enhance support in the area of water and disasters. HELP was chaired by H.E. Dr. Han Seung-soo, former Prime Minister of the Republic of Korea. ICHARM Directors Prof. Kuniyoshi Takeuchi and later Prof. Toshio Koike have been serving as one of 21 experts of the panel. After serious and devoted efforts of the panel, HLEP created the report “Water and Disaster,” which was launched during the 4th World Water Forum in Istanbul in 2009. This report is an action plan committed by the participating panel members. Among 40 actions planned, the ones more closely related to ICHARM’s mission were Action 2 on flood hazard mapping and early warning and Action 30 on effectiveness identification of disaster

prevention measures and development of preparedness indices, for which the International Flood Initiative (IFI) was requested to take the lead. HELP has been a very special activity in which ICHARM has been involved as it connects ICHARM with high-level leaders of UN and related organizations. Dr. Kenzo Hiroki, Principal of ICHARM and now Sherpa of the United Nations and World Bank High Level Panel on Water, has been leading the HELP program from the beginning and his contribution has been remarkable.

A wake-up call for HELP came on March 11th, 2011. Great East Japan Earthquake reminded the group that even most advanced and prepared societies against disasters can be easily overwhelmed by natural elements. Dr. Han Seung-soo, Chair of HELP, led the group to affected areas of GEJE one month after the



event. The visit further galvanized its actions. The group transformed itself by inviting more ministerial-level members and high-class advisors under newly adopted TOR. Since then, HELP have taken a series of actions with tangible outputs. The UN Special Thematic Sessions co-organized by UN Secretary-General and HELP in 2013 and 2015 were epoch making as the first events dedicated to water and disasters in the UN history. HIH Crown Prince of Japan and the Prince of Orange (now His Majesty King of the Netherlands) gave keynote addresses in the Sessions. HELP Flagship documents (vol. 1 and vol. 2) compiled good practices and lessons on mega floods and droughts. HELP position papers

on key issues such as climate change and urban development have been announced in critical events such as COP21 and Habitat III giving impact on global discussion process. The group has embarked upon a new initiative to establish global principles/guidelines on financing and investing in infrastructure on water-related DRR in which ICHARM is expected to play a central role. HELP will continue galvanizing governments, international communities, and stakeholders so that they can do more to address the issue of water and disasters, and take its own actions to produce concrete results at global, country and community levels.

*(Written by Kuniyoshi Takeuchi and Kenzo Hiroki)*

## Congratulatory message at the 10th anniversary of ICHARM



### **Kenzo Hiroki**

- Executive Vice President, NEWJEC Corporation
- Sherpa, the United Nations-World Bank Group High Level Panel on Water
- Former Principal, ICHARM

Let me, first of all, express my heart-felt congratulation to the 10th Anniversary of ICHARM that have made breath-taking achievements since its establishment.

“Water is life, but water is also threat to life.” Late Mr. Ryutaro Hashimoto, former Prime Minister of Japan and the first Chair of UN Secretary-General’s Advisory Board on Water and Sanitation (UNSGAB), sent out this message to international community when he recommended establishment of High Level Experts and Leaders Panel on Water and Disasters (HELP) in Hashimoto Action Plan. The message is still truthful and vibrant as witnessed in recent water-related disasters such as Great East Japan Earthquake, Typhoon Hynan in the Philippines, Hurricane Katrina and Sandy in the US and the Caribs, and recurrent floods in Eastern and Central Europe.

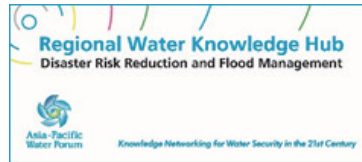
After having been engaged in establishment of ICHARM, I was appointed as Head of UNSGAB Secretariat in 2005 to serve Mr. Hashimoto, HRH Prince of Orange, the second Chair, and HIH Crown Prince of Japan, Honorary President. Back in Japan, I continued my humble contribution to global water and disaster as, inter alia, Coordinator of HELP and Principal of ICHARM. I was lucky that I could work in tandem with ICHARM for these ten years towards the common goal of reducing risk of water-related disasters everywhere.

Honestly speaking, the issue of water and disasters was barely visible in international discussion in early 2000s. You may notice that the word “water and disaster” was non-existent in most of important UN documents in those periods or before. The issue would have been still marginal today if groups like UNSGAB, HELP and ICHARM did not exist. Relentless efforts by those groups and their leaders enabled globally raised awareness on criticality of water and disaster issues for future of humanity. It is remarkable that water and disaster issues are squarely addressed in recent international agreements and commitments as in Agenda 2030, Sendai Framework, and most recently, new International Decade for Action “Water for Sustainable Development”.

ICHARM has played important role for advancement of global agenda for water and disasters in three fronts with tangible achievements. One is raising global awareness as already mentioned. The second is developing new practical technology such as IFAS and RRI model which have already been widely used in many countries and regions. The third is helping developing countries and communities through technical assistance and knowledge sharing in, e.g., Indonesia, the Philippines, Myanmar, Thailand and Pakistan. ICHARM has effectively used raised global awareness on the issue of water and disasters to propel their momentum as if a migrant bird uses strong tailwind to cross ocean. I expect ICHARM will grow into a core piece institution in international community for creation and dissemination of practical science and technology on water and disasters.

We have been successful in raising global awareness on water and disasters during the first ten years of ICHARM. However, the next decade is critical for real success and failure for our cause as we have to turn raised awareness into concrete actions. I sincerely hope ICHARM steadily grow and accelerate its actions towards our common goal of disaster-free society for the benefit of the people, especially the poor.

### 4-3 APWF Regional Water Knowledge Hub



At the first Asia Pacific Water Summit (APWS1) held in December 2007 in Beppu, Japan, ICHARM undertook the responsibility for leading one of the three priority themes: Water-related Disaster Management. As a major outcome of the Summit, it was agreed that Regional Knowledge Hubs (KHs) be established in order to contribute to meeting various needs in the water sector.

Following this agreement, ICHARM became one of the first KHs in the Asia-Pacific region on June 26, 2008, on “Disaster Risk Reduction and Flood Management”. As

a KH, ICHARM is expected to promote local application of high value-added know-how and research results in order to realize water security in the Asia-Pacific region.

ICHARM has since been contributing to solving various water-related problems in the Asia-Pacific region through deepening the level of collaboration with its fellow KHs, and ADB. One of such manifestations is the agreement with ADB to implement Regional Technical Assistance projects, which are detailed in section 5-3.

*(Written by Katsuhito Miyake)*

### 4-4 Typhoon Committee

The Typhoon Committee (TC) is an inter-governmental organization under the joint auspices of the World Meteorological Organization (WMO) and the Economic and Social Commission for Asia and the Pacific (ESCAP) to achieve the mission of reducing damage due to typhoons. This 49-year-old international committee consists of 14 member countries and territories in Southeast and East Asia, including China, Hong Kong, Japan, the Republic of Korea, Laos, the Philippines, Thailand, Cambodia, Malaysia, Vietnam, Macao, the Democratic People’s Republic of Korea, Singapore, and the United States. It has three main working groups respectively in charge of meteorology, hydrology, and disaster risk reduction. Although geopolitics in the Asian

regions has been increasingly difficult, TC has been able to convene its general assembly and integrated workshop annually with a good turnout of experts and representatives to promote and coordinate various projects.

ICHARM has sent its researchers mainly to the Working Group of Hydrology (WGH) upon the request from the Water and Disaster Management Bureau of the Minister of Land, Infrastructure, Transport and Tourism. Since 2010, four chief researchers of ICHARM, Katsuhito Miyake, Toshio Okazumi, Minoru Kamoto, and Yoshio Tokunaga, have chaired the WGH and coordinated projects proposed by member countries and territories.



Photo 4-4-1 The participants of the 5th WGH Meeting of the Typhoon Committee in Seoul, Korea on September 2016



ICHARM has also played an important role in TC activities. The centre has been leading the development and dissemination of flood risk reduction indices to evaluate and strengthen the disaster preparedness of each member country and territory. It was also involved in some other research projects such as the prediction of debris flows and shallow landslides by the use of satellite rainfall data and the assessment of climate change impact on selected river basins in Asia.

In recent years, TC members have started showing more interest in sharing knowledge and information on effective dam operation including preventive measures for flash floods and droughts in addition to flood risk management. Since ICHARM has long studied this area both in Japan and overseas, it should be able to provide useful advice to the members in close consultation with the government of Japan.

(Written by Yoshio Tokunaga)

## 4-5 International contributions by networking activities

Besides the International Flood Initiative (IFI) and the participation in the Typhoon Committee, ICHARM has devoted itself to increasing its presence in various international arenas, as well as strengthening networks with water experts and practitioners and international organizations through different channels presented below:

### A: World Water Forum

The World Water Forum (WWF) was originally proposed by the World Water Council, a France-based international NGO, and has been held every three years. It is one of the largest international events in which experts in water-related fields gather from all over the world and discuss and exhibit global water issues to find their solutions. The forum addresses a wide range of topics such as domestic water, agriculture, environment, integrated water resources management, night-soil treatment, wastewater treatment, energy and disaster.

ICHARM hosted sessions and events and sent its researchers for presentations at the fifth, sixth and seventh World Water Forum held in March 2009 in Istanbul, March 2012 in Marseille, and April 2015 in Korea, respectively. ICHARM was a major contributor particularly in the seventh forum in charge of one of the main themes, “Adapting to change: Monitoring risk and uncertainty for resilience and disaster preparedness,” under a grand topic on water security for all people. Several ICHARM researchers including ICHARM Director Toshio Koike played a key role in planning and hosting seven sessions on water-related disaster risk management.



Photo 4-5-1 Director Koike chairs at the final session of WWF7  
(Source: JWF)

### B: UN Special high-level session on water and disasters

ICHARM strived to increase its international presence and expand a professional network with other organizations through various UN conferences under the leadership of Dr. Kenzo Hiroki, the former Research Coordinator for Water Disaster Risk Management of ICHARM and a special adviser to the United Nations Secretary-General’s Advisory Board (UNSGAB). On March 6, 2013, the first special high-level session on water and disasters was convened by the UN Secretary General with support from UNSGAB and the High-level Experts and Leaders Panel on Water and Disasters (HELP). The second meeting was held on November 18, 2015, in which ICHARM hosted a technical session on science and technology, “Science and Technology to Advance DRR on Water,” and ICHARM Director Toshio Koike served as moderator.

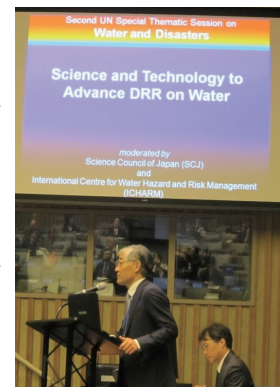


Photo 4-5-2 Director Koike moderates the technical session on science and technology

### C: Third UN World Conference on Disaster Risk Reduction (Sendai, March 2015)

The UN World Conference on Disaster Risk Reduction is a UN-hosted conference to develop an international disaster risk reduction strategy. The third meeting was held in Sendai, Japan, from March 14 to 18, 2015, gathering experts and representatives from 187 countries, almost all UN member states. The conference adopted the Sendai Framework for Disaster Risk Reduction as the new international disaster risk reduction strategy to replace the Hyogo Framework for Action. In addition, ICHARM Chief Researcher Hisaya Sawano participated as one of the panelist in a working session, “Risk Identification and Assessment.”



Photo 4-5-3 Mr. Sawano, Chief Researcher, participates as a speaker in the working session (Second from the right)

#### D: International symposiums and conferences hosted by ICHARM

ICHARM has organized international symposiums and conferences almost every year since its official establishment to keep track of the latest global trends on water-related disasters, disseminate its research achievements, and strengthen its worldwide network.

The following lists major meetings hosted by ICHARM:

- November 6, 2007, ICHARM Quick Report on Floods (Tsukuba, Japan)
- September 30, 2008, ICHARM International Symposium "Local Practices of Integrated Flood Risk Management under Changing Natural and Social Conditions" (Tokyo, Japan)
- December 10, 2009, ICHARM Quick Report on Floods (Tsukuba, Japan)
- September 28, 2010, ICHARM International Symposium "Floods - A global problem that needs local solutions" (UNU at Tokyo, Japan)
- September 30, 2014, ICHARM International Symposium "Together with the people coping with increasing water-related disasters in the world" (GRIPS at Tokyo, Japan)

#### E: International symposiums and conferences co-hosted by ICHARM

ICHARM has also co-hosted international symposiums and conferences with other organizations as follows:

- December 3-4, 2007, 1st Asia-Pacific Water Summit (Beppu, Oita, Japan)
- September 27-29, 2011, 5th International Conference on Flood Management (ICFM5) (Akihabara, Tokyo, Japan)
- May 19-20, 2013, 2nd Asia-Pacific Water Summit (Chiang Mai, Thailand)
- March 1-2, 2016, Asia Water Cycle Symposium (AWCS2016) (Hongo, Tokyo, Japan)

*(Written by Daisuke Kuribayashi)*

## 4-6 ICHARM Advisory Board and Governing Board

#### A: ICHARM Advisory Board

ICHARM, established under the auspices of UNESCO, was required to have a biennial advisory board meeting, in which the board reviewed the draft work and budget plan and the report on activities during the previous two years. The board members asked questions and gave advice to help ICHARM take necessary action effectively with a clear vision. The board member lists are shown in ANNEX.

- September 15, 2006, 1st Meeting
- October 1, 2008, 2nd Meeting
- September 29, 2010, 3rd Meeting

#### B: ICHARM Governing Board

In accordance with the revision of the agreement on ICHARM between UNESCO and the Government of Japan in July 2013, the ICHARM Governing Board was organized to replace the ICHARM Advisory Board. The Governing Board, which comprises seven members including the president of PWRI, examines and adopts the "Rule of Procedure", the "ICHARM Long-term and Mid-term Programmes", "ICHARM Work Plan", and reviews the "ICHARM Activity Report". The board member lists are shown in ANNEX.

- February 25, 2014, 1st Meeting
- March 3, 2016, 2nd Meeting

*(Written by Daisuke Kuribayashi)*



# 5 Local Practices







October 2, 2012



# 5 Local Practices

## 5-1 ADB projects

### 1 Technical Assistance for Supporting Investments in Water-Related Disaster Management (ADB TA-7276)

ICHARM, under the partnership agreement concluded with the Asian Development Bank (ADB) in November 2009, implemented an ADB project, “Technical Assistance for Supporting Investments in Water-Related Disaster Management (TA-7276),” in Asia. The project aimed to create and provide flood risk information by developing an early warning system and contribute to the mitigation of flood disasters. ICHARM implemented and managed the entire project by mobilizing its resources, while ADB financed necessary expenses for the activities of TA-7276 and employed international consultants, who conducted field surveys under the instruction of ICHARM. The project consisted of the following two components:

- (1) In-country project support component, in which each country conducted a project on its own theme, and
- (2) Program quality support component, in which participating countries cooperate to promote the sharing of technology within the region.

The project lasted for three years and four months until March 2013 after the conclusion of the agreement.

(1) The in-country project support component was implemented in Bangladesh, Indonesia, the Philippines

and the Lower Mekong Basin (Cambodia) (Figure 5-1-1). In Bangladesh, a national policy roadmap was created to develop a flood early warning system. In Indonesia, a flood early warning system using IFAS was developed for the Solo River basin and technical assistance was provided for community-based disaster prevention activity. In the Philippines, flood conditions were analyzed using IFAS, and training programs were conducted for local engineers to learn how to operate IFAS to (a) identify the causes of floods, (b) understand the mechanism of floods, and (c) provide additional information that supplements the existing systems in the Pampanga and Cagayan river basins (Figure 5-1-2). In the Lower Mekong Basin, quantitative assessment was conducted on flood vulnerability of agriculture and

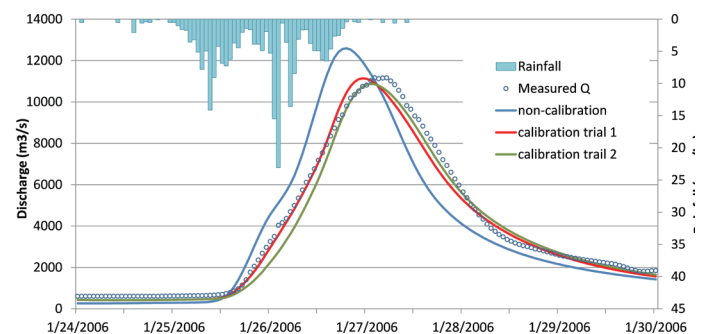


Figure 5-1-2 IFAS results at Gamu Station, Cagayan River basin, the Philippines

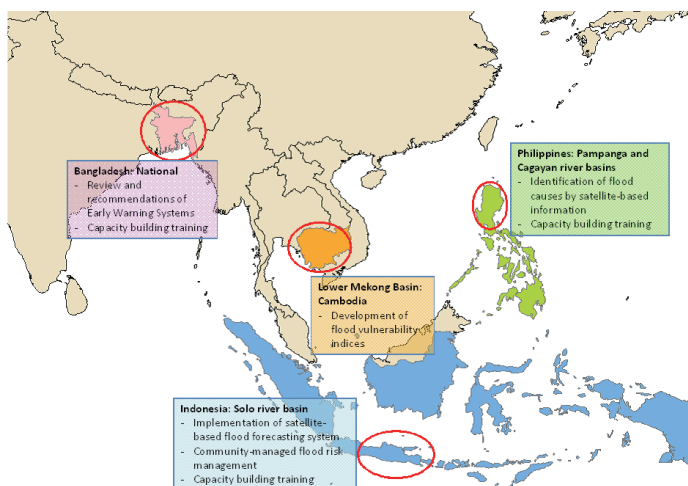


Figure 5-1-1 In-country project support



Photo 5-1-1 Signing ceremony of ADB TA-7276: ADB Director-General of the ADB Regional and Sustainable Development Department Yao (left), PWRI Chief Executive Sakamoto (center) and Director Takeuchi (right) on November 13, 2009

housing.

Regarding the program quality support component, knowledge sharing workshops and IFAS training were held at various locations.

In implementing this project, it was noticed that basic meteorological data, such as rainfall, river water level, and flow level, and topographic data were not sufficiently available, particularly in developing countries. Therefore, in this project, satellite rainfall data (such as GSMaP) and satellite topographic data (such as SRTM) were used to supplement the lack of basic data. As a general rule, we start a project like this one with investigating the characteristics of the project area and the past events of flood and inundation, and based on the results, develop a system and assess flood risk in cooperation with local engineers. In Bangladesh, we organized a series of consultation meetings with related

organizations to discuss and confirm the contents of the national roadmap developed for the implementation of a flood early warning system. In Indonesia, we took a participatory approach involving local communities. In the Philippines, we calculated and compared flood analysis results using ground and satellite rainfall data with local engineers to deepen their understanding of the simulation model. In Cambodia, based on the local characteristics of agriculture and housing, we assessed their flood damage. In addition, we also conducted activities to develop proto-type water-related disaster risk index (WRDRI). The TA-7276 project was the first internationally-funded project for ICHARM to extend its technical cooperation to other countries. Through the implementation of this project, ICHARM expanded its range of activities and established a good relationship with each participating country, which has led to further cooperation.

## 2 Transformation of Urban Management in Myanmar - Part II (Flood Management) (ADB TA-8456 Part II)

Due to dynamic social and economic activities in recent years, rapid urban development is expected in Myanmar, creating an urgent need for improving urban functions and strengthening human resources to manage them. To help the country with this development process, ADB decided to proceed with a project to assist the Myanmar government in capacity development for urban management through "TA-8456: Transformation of Urban Management." Since Myanmar suffered heavily from Cyclone Nargis in 2008, it was also important for Myanmar to improve its preparedness and response capacity to reduce disaster risk that may interrupt the future development of their cities. Therefore, in TA-8456,

Part I covered the efforts for general urban management such as water supply, sanitation, waste management, and drainage, while Part II covered the efforts in flood management. ICHARM was responsible for the overall technical management in Part II of the project. Other members of Part II included CTI Engineering International Co., Ltd., CTI Engineering Co., Ltd., and PASCO CORPORATION. With ICHARM supervising and guiding the all activities of Part II, the Part II Team implemented flood risk assessment and technical transfer to the government of Myanmar to assist the country in improving the flood risk reduction ability of three selected cities; Yangon, Mandalay, and Mawlamyine (Figure 5-1-3). The project began in July 2014 and lasted for two years and five months until November 2016. In Part II, ICHARM established a collaborative framework with the Myanmar government to advance the project in an inclusive way by holding meetings and workshops with relevant agencies. The framework consisted of the Department of Meteorology and Hydrology, Ministry of Transport and Communications as the main counterpart and 13 other government organizations involved in flood risk management including the three cities. The project first conducted field survey, data collection, questionnaire survey (needs assessment) with relevant agencies to understand the local situation before arranging specific activities. The main activities of the project were as follows:

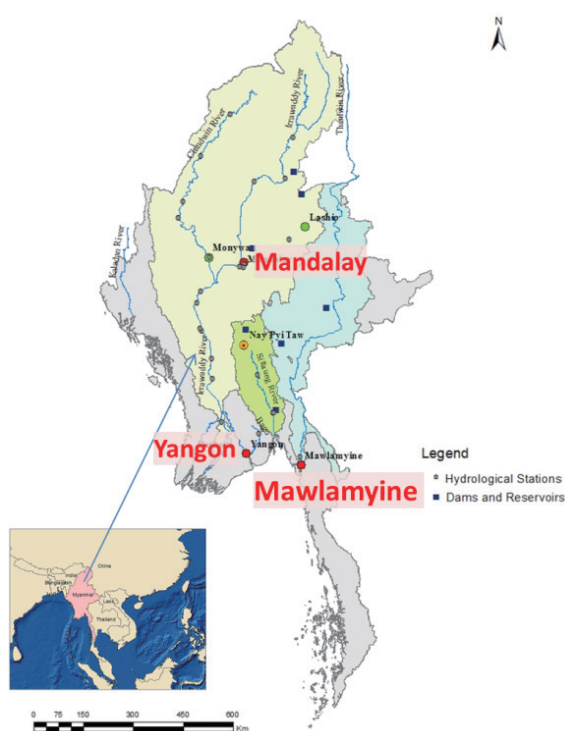


Figure 5-1-3 Target cities of TA-8456 Part II in Myanmar

- 1) Hydro-meteorological analysis related to floods and storm surges,
- 2) Flood and storm surge risk assessment
- 3) Capacity development of the Department of Meteorology and Hydrology, and
- 4) Capacity development of organizations relevant to flood and storm surge risk assessment.



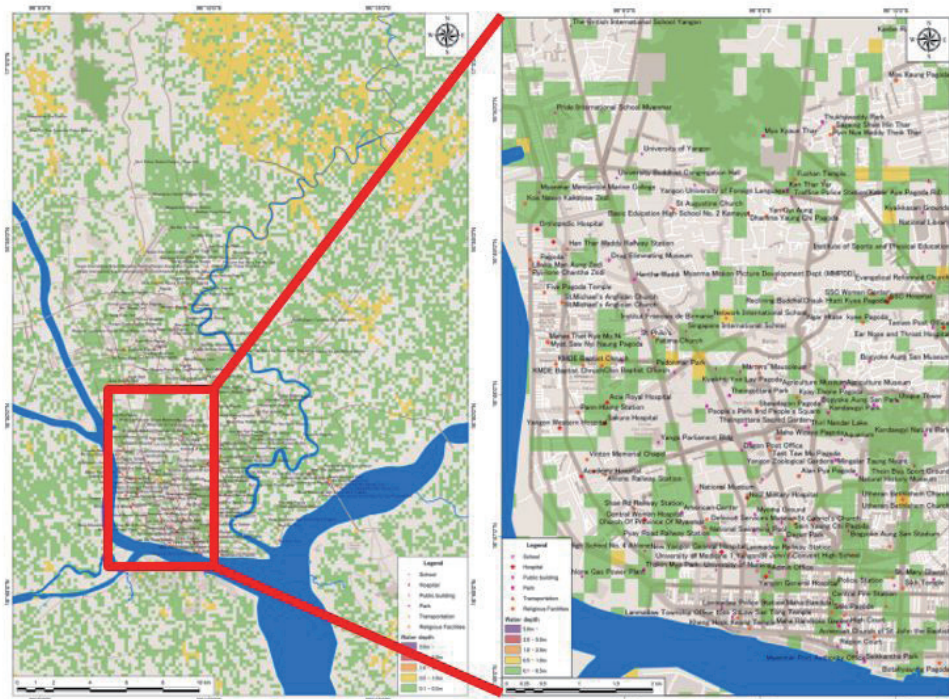


Figure 5-1-4 Flood hazard map of Yangon, Myanmar, for a 100-year flood (green: 0.1-0.5 m, yellow: 0.5-1.0 m)



## Looking forward to a long-lasting and enhanced contribution of ICHARM to the world's efforts in disaster risk reduction

**Hrin Nei Thiam**

● *Director-General, Department of Meteorology and Hydrology, Ministry of Transport, Republic of the Union of Myanmar*

I am pleased to deliver this message for ICHARM's 10th Anniversary. We're really honored and proud to have this opportunity. We are also looking forward to a long-lasting and enhanced contribution of ICHARM to the world's efforts in disaster risk reduction after this memorable milestone.

Nowadays, water related disasters, including droughts, landslides, flash floods and riverine floods, are threatening to many countries every year and increasing by the effect of climate change, growth of population and human activities; therefore water management and disaster mitigation might be needed more than the last century. Knowledge and experience about comprehensive risk management are needed for vulnerable countries to reach the goal of disaster prevention and mitigation plans.

As a response to the worldwide need to properly prepare for and react to water-related disasters, ICHARM's research, training and information networking activities have been contributing to strengthening local practices on reducing water-related disaster risks in the world.

In Myanmar, capacity development is needed to promote sustainable urban management against water related disasters. Therefore ICHARM has supported the Myanmar Government through the technical assistance project of "Transformation on Urban Management Part II: Flood Management (ADB TA-8456)" with specific focus on flood and storm surge risk assessment for three cities, namely Yangon, Mandalay and Mawlamyine. This project has contributed to enhancing the capacity of officers to conduct hazard and risk analysis and produce hazard maps as essential input for flood management in Myanmar.

Now, the time is to take action for water-related disaster mitigation under the cooperation and coordination of the implementation network formulated under this project. We appreciate the contribution of ICHARM and want to collaborate continuously to strengthen the disaster risk reduction activities in Myanmar.

In Activity (1), hydro-meteorological analysis related to flood and storm surges, the Rainfall Runoff Inundation (RRI) model developed by ICHARM was adopted for flood inundation simulation. Myers formula was employed for estimation of distribution of air pressure that was used as the basic information for storm surge simulation. The challenge in building an analysis model in Myanmar was, just like the one in TA-7276, the lack of topographic data and observed rainfall and water level data. Therefore, insufficient data was supplemented with data publicly available on the internet, such as rainfall data around the world, topographic data, and land cover data published by the Japan Aerospace Exploration Agency (JAXA), the National Aeronautics and Space Administration (NASA), and other international agencies.

In Activity (2), flood and storm surge risk assessment, major floods in recent years were simulated using a model developed in hydro-meteorological analysis. Inundation due to a 100-year flood was also simulated to create a flood hazard map (Figure 5-1-4). By using a risk indicator capable of showing damage on rice plants according to inundation depth and duration, flood damage to agriculture (rice crops) was also assessed for the past largest flood case and a 100-year flood case. ICHARM held workshops in each target city to exchange opinions regarding the developed flood hazard maps, and the collected opinions were reflected in the subsequent revision of the maps.

In Activity (3), capacity development of the Department of Meteorology and Hydrology, ICHARM compiled



Photo 5-1-2 Meeting with DMH staff



Photo 5-1-3 RRI Model training

the recommendations for future actions, such as the expansion of meteorological and hydrological observation systems and the utilization of satellite information, based on the current activities and roles of the department in the national development plan. ICHARM also conducted a series of training programs on the RRI model and the storm surge model from an introductory level to an advanced level for young engineers in the Department of Meteorology and Hydrology. The advanced-level training was specifically provided for selected candidates of DMH, who were expected to become trainers on the RRI Model and the storm surge model in the future (Photo 5-1-3). As a result, 10 candidates were trained as trainers, who independently planned and conducted capacity development training on the RRI Model for other members of DMH and related organizations in July 2016. Upon request from the Irrigation and Water Utilization Management Department, Ministry of Agriculture, Livestock and Irrigation (IWUMD), the representatives of IWUMD also participated in all training programs on the RRI Model and the storm surge model. ICHARM also organized a training program on flood risk assessment for DMH and IWUMD officers.

In Activity (4), capacity development of the organizations relevant to flood and storm surge risk management, ICHARM conducted workshops for central and regional organizations engaged in flood and storm surge risk management other than the Department of Meteorology and Hydrology. In those workshops, we introduced the effective use of flood hazard maps for better emergency response by relevant organizations and more appropriate land use planning. We also explained the method to estimate flood-induced agricultural damage using risk indicators. With this method, the effect of disaster prevention investment can be quantitatively evaluated as reduced damage; thus, the importance of stable investment in disaster prevention can be clearly understood by the general public.

In flood response, basic information was created to understand the situation by collecting and analyzing hydro-meteorological information and evaluating disaster risk caused by a flood. In this project, ICHARM provided technical assistance to improve the capacity of the Department of Meteorology and Hydrology, the three major cities, and other relevant organizations to properly produce, correctly understand, and effectively use such information. This project was primarily targeted for Myanmar, but we hope it will be a good example for similar projects in other Asian countries as it addresses many issues commonly existing throughout the region.

*(Written by Hisaya Sawano)*



## 5-2 UNESCO Pakistan project

In late July to August 2010, Pakistan experienced unprecedented floods. The interaction of two low pressure systems produced torrential rain over the Indus basin, causing 160,000 km<sup>2</sup> of flooded area, US\$10 billion of direct damage, and 1,985 deaths according to the Annual Flood Report 2010 (MOWP, Pakistan Government).

ICHARM dispatched its researchers to join a UNESCO field investigation team at the end of August, while also studying ways of technical assistance for the mitigation of future disaster damage. At the end of June 2011, the Japanese government approved JICA's financial contribution to UNESCO to start the Project on Strategic Strengthening of Flood Warning and Management Capacity of Pakistan. In response to the request from UNESCO, ICHARM concluded a contract with UNESCO, in which the centre was assigned to provide technical assistance in Pakistan in the following three tasks (Phase 1: 2012-2014):

- 1) Development of a flood forecasting system covering a large part of the Indus River basin,
- 2) Implementation of floodplain hazard mapping for the lower Indus River, and
- 3) Provision of capacity building training for Pakistani personnel.

ICHARM worked on the first task in cooperation with Pakistan Meteorological Department (PMD), and developed Indus-IFAS, a flood forecasting and early warning system that uses global data and covers the upper Indus and Kabul rivers. Indus-IFAS was then tested for its capabilities, its parameters were tuned, and its accuracy was verified through the simulation of several flood events. The Indus-IFAS system is uniquely designed to have two advanced simulation models: the IFAS model for quick runoff simulation of the upstream and midstream parts of a basin and the RRI model for flood simulation of the midstream and downstream parts. With these two models set to cover a basin from upstream to downstream, they can relay the flow rate for simulation from one to the other efficiently. The system was also equipped with several technological ingenuities currently available. It allows users to use either ground or satellite rainfall data, and to use the flow rate observed upstream as the boundary condition to minimize errors caused by the uncertainty of rainfall data due to the insufficient density of ground observation points and the influence of snowmelt and glaciers melt in high mountains upstream.

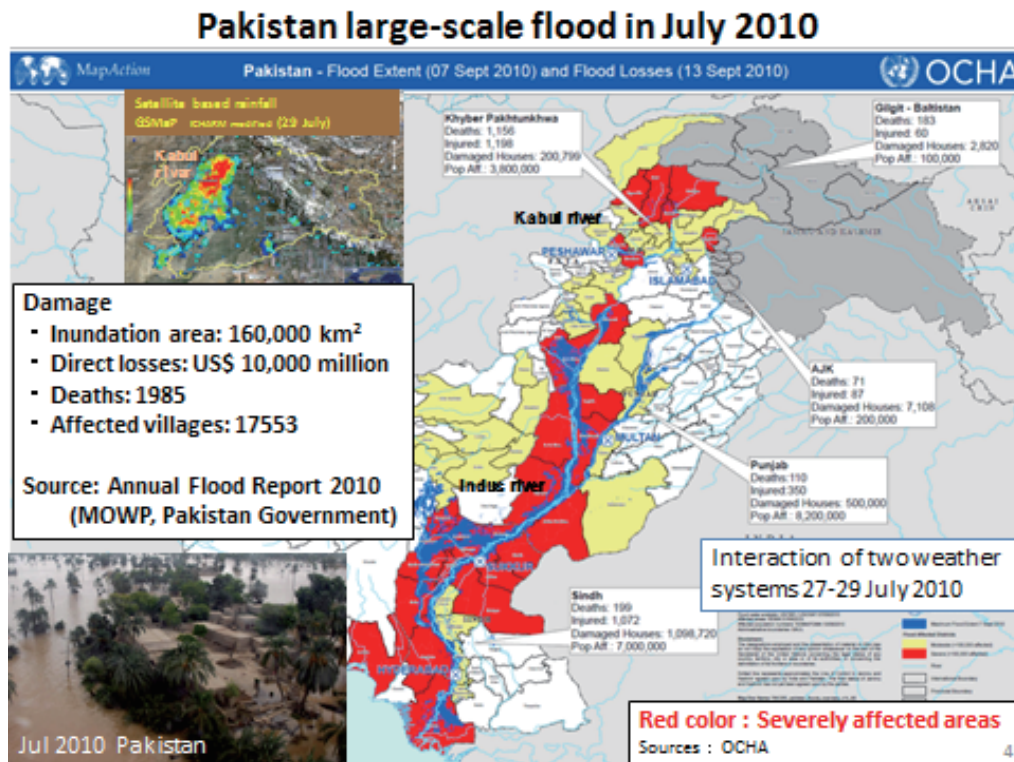


Figure 5-2-1 Overview of the 2010 Pakistan flood

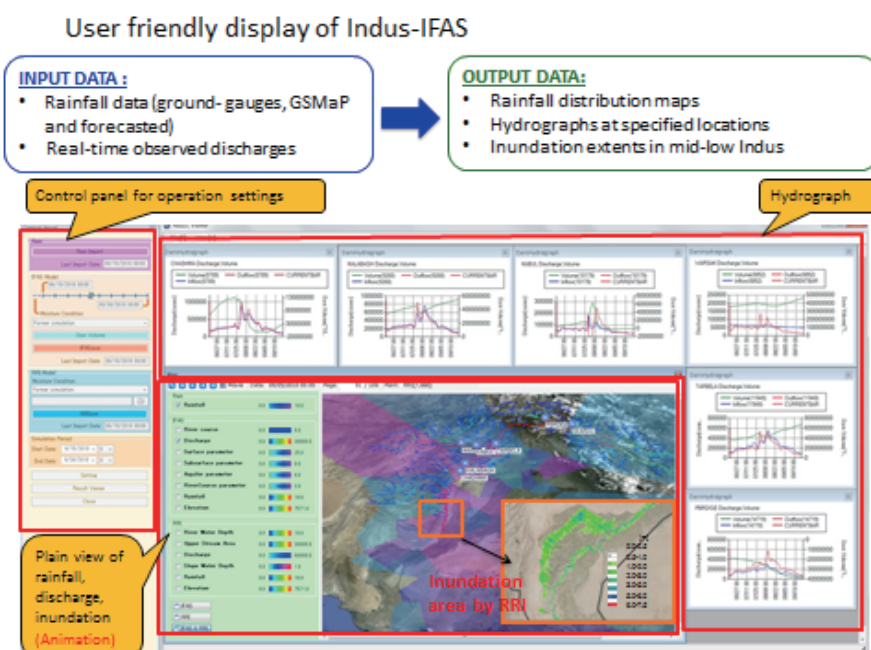


Figure 5-2-2 Sample screen of Indus-IFAS



## Engaged in Pakistan project: from ICHARM to UNESCO

### **Ai Sugiura**

- Programme Specialist, Science Policy Capacity Building, UNESCO Regional Science Bureau for Asia and the Pacific, UNESCO Office Jakarta
- Former Research Specialist, ICHARM

I had the privilege to work in ICHARM as Research Specialist coordinating the JICA funded UNESCO project “Strategic Strengthening of Flood Warning & Management Capacity of Pakistan-phase 1” from May 2011, just after the devastating earthquake, until August 2014. My prime motivation in joining ICHARM was the fact it was a UNESCO category 2 water centre and that it was in Japan as although a Japanese citizen, I had never lived in my own country. Coordinating the project under the leadership of Chief and Senior researchers in ICHARM was a valuable experience at so many levels. First my international background, communication skills were fully capitalised on, not just in English but in Japanese also. In addition to strengthen my own technical, modelling and hydrological skills, I had the great honour to participate in linking two countries, Japan and Pakistan. The link was and still is hydrological, technical and most importantly through profound mutual respect between the committed and passionate field officers of both countries who are now all friends. I am now part of the team in UNESCO Regional Science Bureau for Asia and the Pacific in Jakarta responsible for the implementation of the second phase of this project and its smooth implementation so far lies definitely on the great foundation laid during phase 1 through the tremendous efforts from all partners in Pakistan and in Japan including ICHARM.



## Learning at ICHARM was a lifelong experience

### **Atif Irshad**

- Meteorologist, Pakistan Meteorological Department (PMD)
- Alumnus, M.Sc. course, ICHARM

Within a short time since its establishment, ICHARM holds a special reputation globally in imparting knowledge relating to water induced disasters. I was lucky enough to have a chance of learning at ICHARM in the session 2011-2012. The learning at ICHARM was a lifelong experience, it has deep impact on my profession life and a way of thinking about managing water related extreme events. Since after graduation from ICHARM, I am directly involved in flood forecasting and early warning.

Here I am proud to share that, on account of hydrological models learnt at ICHARM, we successfully predict some big and small flood events well before arrival and consequently saved many lives.



The second task was performed by ICHARM and the Pakistan Space and Upper Atmosphere Research Commission (SUPARCO). The joint effort made it

possible to display flooded areas simulated by the RRI model on the GIS of SUPARCO.

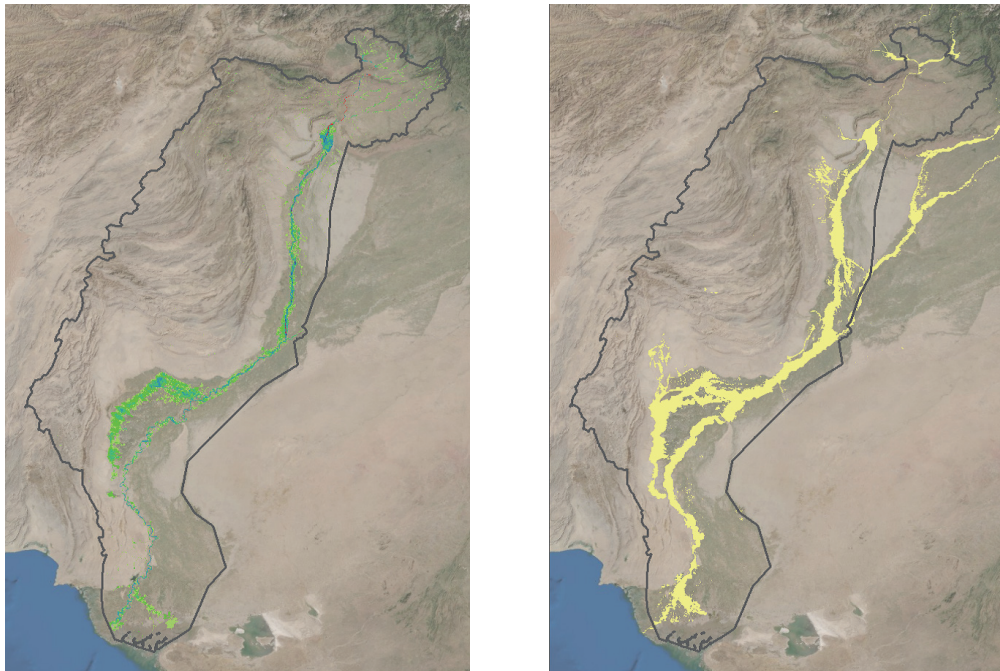


Figure 5-2-3 Peak flood inundation by RRI (green) and MODIS image (yellow)

To achieve the third task, ICHARM accepted six trainees from Pakistani governmental agencies to the master's course managed by ICHARM in collaboration with GRIPS. The participants studied practical techniques needed to mitigate flood disaster damage and acquired

master's degrees. ICHARM also provided managerial training in Japan by inviting 11 government officials from Pakistan. ICHARM provided many other workshops and local training to strengthen knowledge and skill required for the operation of Indus-IFAS.



Photo 5-2-1 International workshop in Pakistan

Consequently, PMD has become able to provide flood forecast information based on Indus-IFAS simulation on their website. This project is regarded as a successful case of effective technical transfer in that it provided essential support not only for the development of a simulation model, but also for the development of capacity needed to deepen the understanding of the model and the operation of the system.

Since 2015, the project has started Phase 2 operations. Phase 2 includes the following tasks:

**a) Improvement of Indus-IFAS through:**

- 1) Integration of the eastern rivers of Indus (Punjab region), part of which has been using old models, into the coverage of Indus-IFAS,
- 2) Development of a calculation module for snowmelt in upstream mountains,
- 3) Development of a rainfall data input function that allows users to selectively use different sets of rainfall data acquired in different methods when performing simulation for a river basin, and
- 4) Introduction of new correction methods for satellite-based rainfall data.

**b) Capacity development through:**

- 1) Provision of technical training for flow rate observation using acoustic Doppler current profilers, and
- 2) Provision of training necessary for flood forecasting of the Indus River.

ICHARM hopes for further enhancement of flood management capacity of Pakistan through this project.



Photo 5-2-2 Indus-IFAS training at PMD

*(Written by Yoichi Iwami)*

## 5-3 Research activity on community-level flood contingency planning in the Philippines

As we described in Chapter 2-3, in compliance with our three principles for research, i.e. evidence-based local activities, collaboration with other research institutions and governmental agencies, and active public relations, ICHARM's Risk Management Team conducts research on risk assessment and risk reduction measures, based on the results of runoff and inundation analysis using RRI and other models. This section introduces community-level flood risk contingency planning (flood response planning) in the Philippines, based on flood and inundation simulation using the RRI model. It was conducted from 2014 to 2016 as part of the PWRI project research.

The target area was Calumpit Municipality in Bulacan Province of the Pampanga River basin, Luzon Island, the Philippines, one of the most flood-prone areas in Asia. Among the flood-prone areas, Calumpit Municipality is particularly conscious about disaster prevention. In 2014, based on the Philippine's disaster prevention act, Republic Act No. 10121, the municipality created its own contingency plan to address water-related disasters. This plan specifies the actions to be taken by each department of the municipality, assuming a flood equivalent to the one caused by Typhoon Peding in 2011, one of the largest typhoons in recent years. The municipality also has its own unique community-based warning system, "Colors of Safety Markers", in which 190 utility poles in the area are painted in different colors every two feet for residents to identify the state of inundation and take voluntary action for evacuation. In addition, the municipality encourages its 29 communities to prepare a contingency plan of their own. Our investigation, however, discovered that these community-based disaster response plans remained quite basic in content. Therefore, we decided to provide technical assistance for the communities in creating more advanced flood contingency plans, including

flood hazard maps and inundation charts to show its time-series change. We conducted flood inundation simulation and flood risk assessment, and proceeded with the project through discussions with residents and municipality officials.

A flood contingency plan was produced in the following six steps:

### **Step 1. Understanding current conditions:**

We surveyed the current situation of the study area, including the past flood history and damage data, topography, land use, distribution of population and buildings. In addition to the collection of past data accumulated by the municipality, we conducted joint sample surveys with municipality officials on the floors, roofs, and inundation height of sample houses in each community, and also held interviews with residents regarding their actions during a flood.

### **Step 2. Risk identification:**

We conducted flood inundation analysis using the RRI model and created flood hazard maps that reflect the experiences of residents. We also created inundation charts to show how soon important locations, such as the representative points of each community and the city hall, may be inundated, considering different inundation scenarios. In addition, we created above-floor-level inundation probability maps (risk map) using the average floor height surveyed in Step 1 as the threshold.

### **Step 3. Local impact analysis:**

Based on the maps and inundation charts, we held workshops in two communities in July 2015 to exchange opinions and identify issues, concerning communications, evacuation, houses, drinking water and food, medical care, traffic, and others, which could be



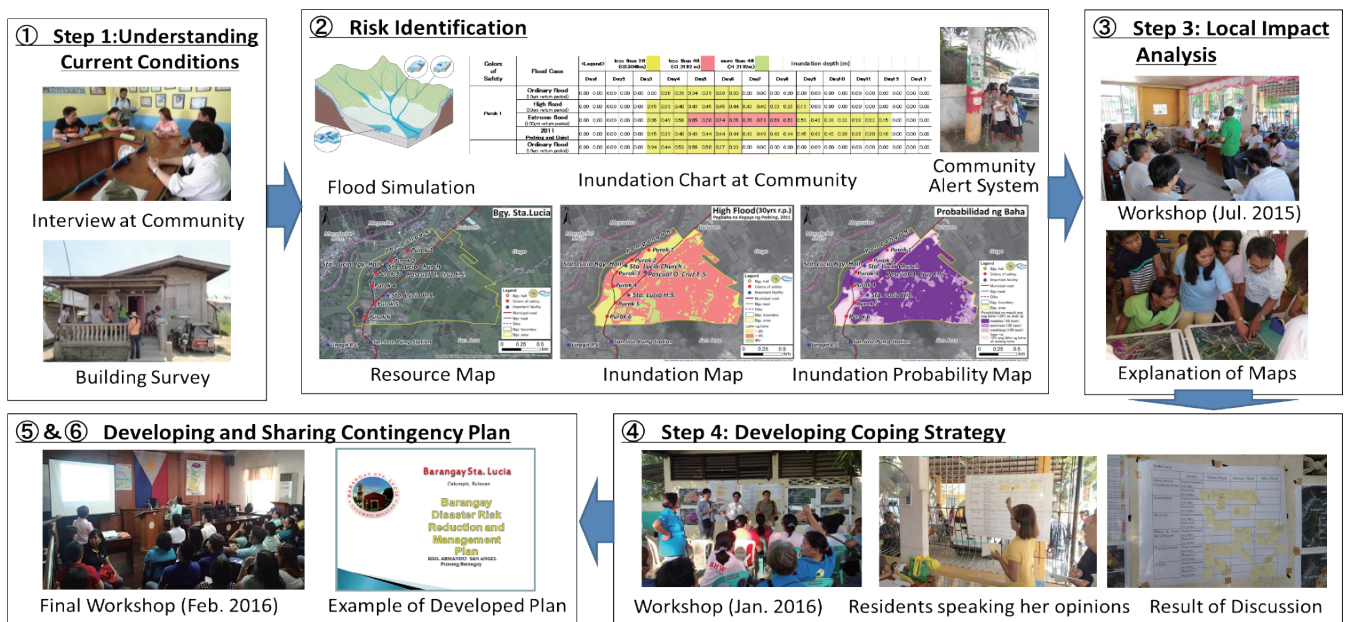


Figure 5-3-1 Activities in Calumpit Municipality, the Philippines

potentially caused by floods with return periods of 10, 30, and 100 years.

**Step 4. Developing a coping strategy:**

At the workshops held in two communities of Calumpit Municipality in January 2016, we sorted out strategies, based on the results from Step 3, for the communities to practice in normal times and during and after a flood to keep the functions of the communities in operation.

**Step 5. Developing a contingency plan:**

Based on the activities up to Step 4, each of the two communities created a risk contingency plan, including flood hazard maps, above-floor level inundation probability maps, resource maps, inundation charts, and a contingency plan.

**Step 6. Sharing the contingency plan:**

To share the method for contingency planning conducted in Step 4 and Step 5, we held the final workshop in February 2016 by inviting all concerned parties from all communities in the municipality as well as municipal and provincial officials responsible for disaster management. We held lectures on the results of flood inundation simulation and the method for creating a flood contingency plan, while the two communities, which had experienced the actual creation of a contingency plan, introduced their risk contingency plans. During the workshop, we provided all 29 communities in the municipality with copies of flood hazard map, above-floor level flood probability map, and resource map created in Step 2. As the project had drawn a lot of public attention, the workshop was attended by more than 100 people.

Recognizing that collaboration and coordination among the central and regional governments are essential in flood inundation simulation and data collection to promote the efforts in other flood-vulnerable areas in the Philippines, ICHARM held another workshop in February 2016 in Metropolitan Manila, to share the planning method used by ICHARM and the issues discovered in its implementation. The meeting gathered about 30 national government officials in charge of disaster management.

ICHARM activities in Calumpit Municipality were conducted in cooperation with the Municipal Disaster Risk Reduction and Management Office (MDRRMO) and the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA). The flood inundation simulation used Interferometric Synthetic Aperture Radar (ifSAR) DEM data with 5 m mesh, obtained under MoU with the National Mapping and Resource Information Authority (NAMRIA). In the meantime, the maps and charts created based on the flood inundation simulation results were expressed in an easy-to-understand manner for local residents and translated into a local language (Tagalog) after several discussions with local communities.

For these activities, a certificate of appreciation was presented from Calumpit Municipality Mayor Jessie P. De Jesus to ICHARM researchers engaged in this project. ICHARM continues its efforts in disseminating the flood contingency planning to other countries and regions by preparing manuals, holding workshops, and inviting disaster management officials of central and regional governments.

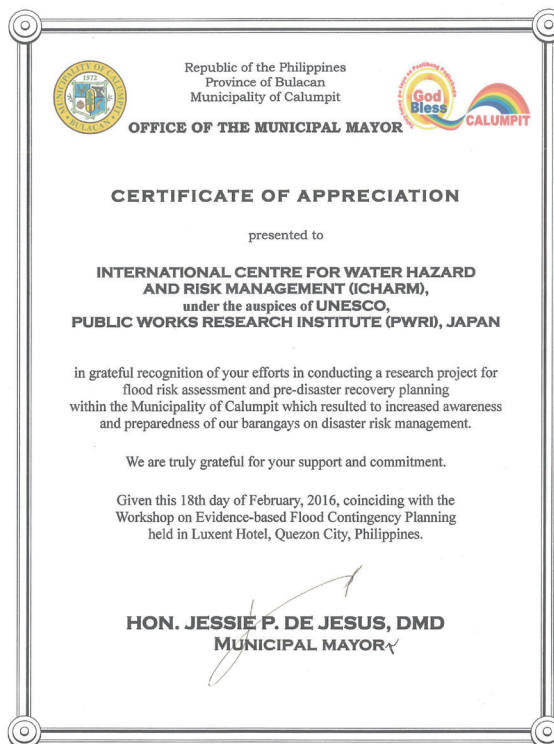


Photo 5-3-1 (top left) Presentation of the certificate of appreciation from the Mayor of Calumpit;  
Photo 5-3-2 (right) Certificate of appreciation; Photo 5-3-3 (bottom left) Workshop participants

(Written by Miho Ohara)



## Calumpit thanks ICHARM for technical assistance in flood contingency planning

**HON. JESSIE P. DE JESUS**

● *Municipal Mayor, Calumpit, Bulacan, Philippines*

The project conducted by ICHARM in the Municipality of Calumpit, Bulacan in February 2016 was a tremendous boost to the specific barangays, notably barangay Bulusan and Barangay Sta. Lucia, during the implementation of an Evidenced-based Contingency Planning Workshop. Through this approach, the 2 barangays are now in better positions to prepare and cope with problems during flooding situation. They have updated their barangay disaster risk reduction and management plans through proper preparation and development of their risk identification and impact analysis processes, their updated contingency plan better defined early warning systems, and their better-articulated procurement plans.

The ICHARM project also contributed to the Municipal Disaster Risk Reduction and Management Office's search for newer and better knowledge and technical inputs and techniques in its role in assisting the local barangays which do their own specific flood contingency planning. The barangays are now better acquainted and sensitive with their understanding of their natural and social environments. The basic six steps of contingency planning learned from this 2-barangay "pre-disaster recovery planning project" was a useful input to an overall re-thinking of contingency planning at the municipal level.

The flood hazard and risk assessment in the Pampanga river basin, Philippines, was another important discussion that provided clarified data and knowledge about how the river basis really affects our local areas. The resulting flood hazard assessment for the municipality of Calumpit has also become the basis for planning mitigation steps and processes applicable to the different barangays directly and immediately affected by monitored water levels at the basin system.

Certainly, ICHARM is on the right track in accomplishing it's purpose for which it was created.

More power to ICHARM!



## 5-4 Research programs on climate change by MEXT -KAKUSHIN and SOUSEI-



The “Innovative Program of Climate Change Projection for the 21st Century (KAKUSHIN Program)” was launched in April 2007 and continued till March 2012 as a 5-year program funded by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). This program was carried out in a highly extensive research framework led by several research institutes such as the Meteorological Research Institute (MRI) and Kyoto University. Using data generated with an ultra-high resolution atmospheric model developed by MRI, global warming prediction was conducted for the near future (about 30 years later) and the end of the 21st century (about 100 years later).

ICHARM participated in the research task of "Evaluation of Flood Risk Impact and Disaster Mitigation Measures for Global and Specific Vulnerable Areas due to Climate Change", and assigned to evaluate the impact of climate change on flood risk in specified vulnerable areas and the world. Based on data from MRI-AGCM 3.1S and 3.2S, which is a cutting-edge atmospheric general circulation model developed by MRI, ICHARM forecasted changes in flood risk and studied countermeasure scenarios.

In this process, ICHARM gained much of its research assets on which the centre still relies today, such as a scale-free global river channel network, bias correction technology, and distributed hydrological models. Several new researchers specializing in meteorology, GIS, etc. joined ICHARM to carry out the KAKUSHIN program, and contributed greatly to widening the range of ICHARM research activities.

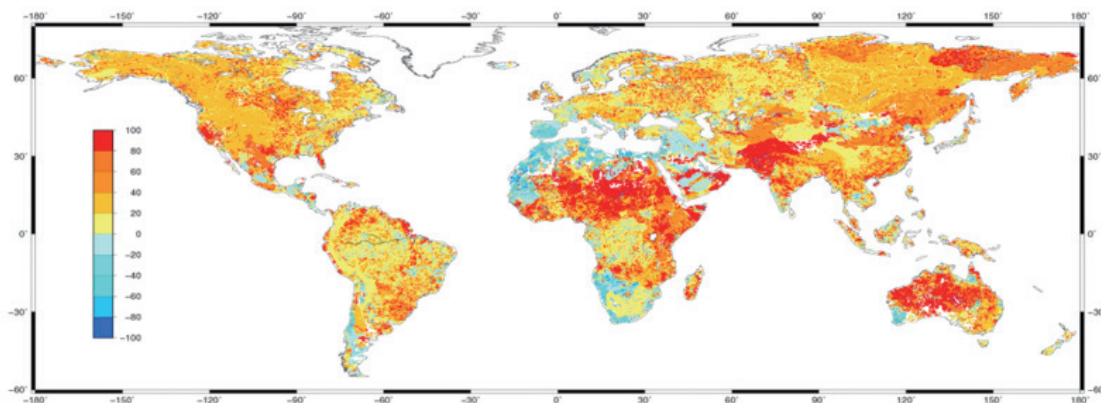
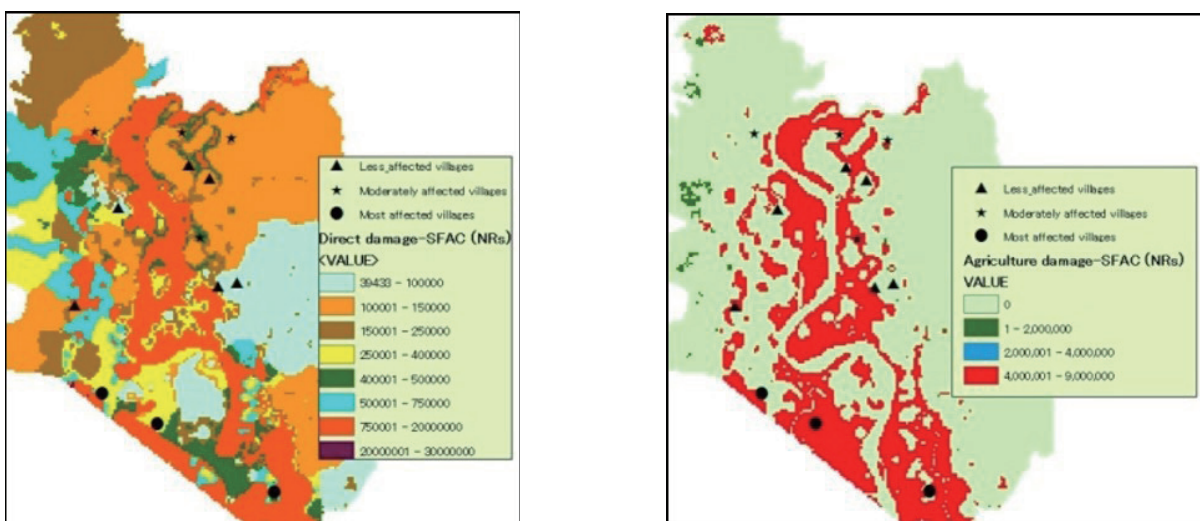


Figure 5-4-1 The rate of change in extreme flood discharge (annual maximum daily discharge with a 50-year return period) due to bias-corrected rainfall from the present to the end of the 21st century



(a) Prediction of house damage

(b) Prediction of agricultural damage

Figure 5-4-2 Estimation of damage in 2085 considering social economic development in the Lower West Rapti River in Nepal



After the completion of the KAKUSHIN Program, ICHARM also participated in the "Program for Risk Information on Climate Change: SOUSEI," which started in April 2012 as a successor 5-year program to the KAKUSHIN Program.

ICHARM was mainly responsible for a research task named "Water-related disaster risk assessment and creation of adaptation information in Asia", targeting 5

major river basins in Asia. The task involved various steps such as statistical and dynamic downscaling of MRI-AGCM 3.2S, bias correction, statistical analysis of present and future climate, and assessment of flood and drought risk in the target river basins. The project ended in fiscal year 2016. The findings from ICHARM's assignment will be compiled and published in early 2017 with achievements from other institutions,.

ICHARM is determined to continue tackling climate change-related research by further utilizing big data for future climate models and by improving modelling technology for the assessment of future socio-economic changes and other purposes.

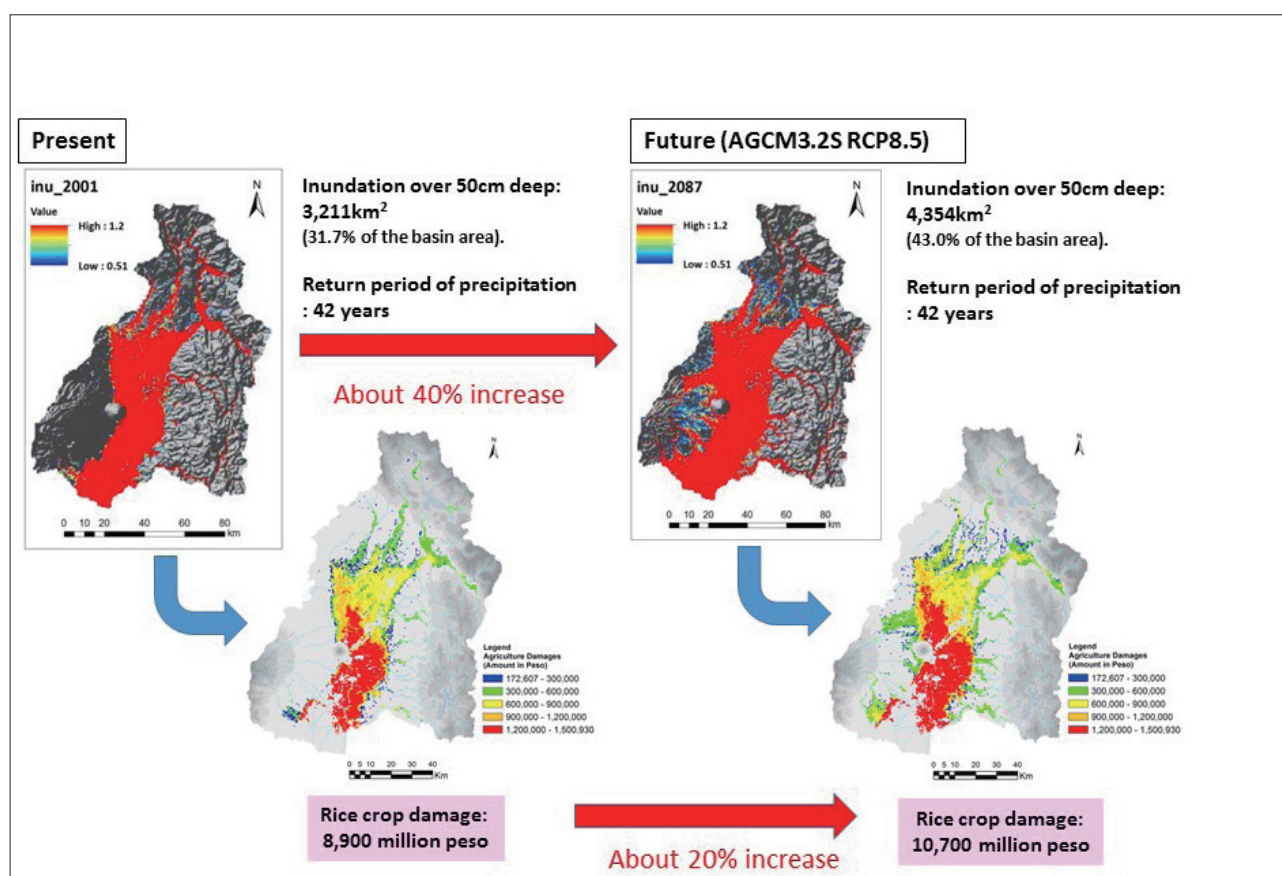


Figure 5-4-3 Comparison of rice crop damage under the current and future climates (Simulation example in the Pampanga River basin in the Philippines)

(Written by Katsuhito Miyake)





Asia Water Cycle Symposium: AWCS2016  
1<sup>st</sup> March, 2016, Tokyo, Japan

# 6 Future Vision







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Asian Water Cycle Symposium 2016 at University of Tokyo, Japan  
March 1, 2016



## 6 Future Vision

### Water-related disaster risk reduction under the changing hydrological environment

#### (1) Changing hydrological environment and increased risks of water-related disasters

At the beginning of the International Hydrological Decade (IHD), UNESCO defined hydrology as follows:

“Hydrology is the science which deals with the waters of the earth, their occurrence, circulation and distribution on the planet, their physical and chemical properties and their interactions with the physical and biological environment, including their responses to human activity. Hydrology is a field which covers the entire history of the cycle of water on the earth.” (UNESCO, 1964)

A half century ago, before the emergence of global environmental issues including climate change, UNESCO already had a great deal of foresight incorporating a global perspective, the geophysical and biological environment, in addition to the interactions with human activities, which we highly appreciated.

Under the earth environment, water changes its phases of gas, liquid, and solid, accompanied by the absorption and release of large amounts of latent heat, circulates between land, ocean surface, and atmosphere, and plays a main role in global climate formation by transferring solar-radiation energy absorbed by the earth's surface. The fourth (2007) and fifth (2014) assessment reports issued by the Intergovernmental Panel on Climate Change (IPCC) stated in just the same manner that warming of the climate system is unequivocal and the cause is very likely (2007) or extremely likely (2014) to lie in the increased concentration of greenhouse gases emitted by human activities. As a result, there are concerns about changes in atmospheric pressure patterns and resulting seasonal or regional changes (regime shift) of rainfall zones, more intense or frequent rainfall or droughts, and more extreme events due to increased activities of tropical depressions (typhoons,

hurricanes, and cyclones).

Rapidly increasing population has forced humans to develop land that was previously considered unsuitable for building structures and form more settlements in low-lying areas and on steep slopes, which has resulted in massive damage once a flood or landslide occurs. It is also becoming obvious that the water supply cannot catch up with the rapid increase in demand and there are areas with absolute water scarcity despite accelerated development of the infrastructure. In the meantime, there are threats from increased flood risk due to land subsidence caused by excessive use of groundwater. Moreover, large-scale flood events in recent years have caused the interruption of global supply chains in some cases, and the devastation of settlements in other cases, which has consequently produced a huge number of refugees.

Conventional infrastructure development for rivers and water resources has been designed based on the scales of the largest natural hazards in the past or using a stationary stochastic process. However, this theoretical framework has been found in need of serious review as climate change progresses, and decision making in the midst of this uncertainty has become ever more challenging. Furthermore, water-related disasters are closely associated not only with land use and industrial structure but also with governance, economy and culture. Nevertheless, coordination between natural sciences and social sciences is still inadequate, and thus collaboration between science and society is still difficult, making little contribution to progress in understanding the very nature of the issues we face today.

## (2) Prescription for the reduction of the changing risks of water-related disasters

To reduce increasing risks of water-related disasters under the changing hydrological environment in association with climate, water cycle, and human activities, it is required to understand the entire picture of the problems comprehensively and quantitatively and develop science and technology to help reflect such understanding in the decision-making process of society and individuals. To this end, strategic efforts should also be made to develop human resources and strengthen cooperative networks at local, national, regional and global levels.

### 1) Promotion of research through interdisciplinary and transdisciplinary cooperation

To reduce the risks of water-related disasters, it is necessary to understand the changing nature of water disasters and identify factors that affect the changes, and then enhance the capacity of monitoring and forecasting changes of water disasters. This requires comprehensive collection of data and information regarding flood hazards, socio-economic activities, and human behavior. In addition, it is essential to establish an integrated assessment system by combining water cycle models, which cover the time scale from now-casting to climate change prediction, with agricultural and economic models. In this case, it is necessary to clarify both the uniqueness of human cognition and behavior under the influence of the natural conditions, history, culture, and religion of the target area, and the universality of human cognition and behavior in a wider area, on a global scale as well as on a regional scale, including the target area.

It is important to assist governments in making critical decisions, such as selecting effective measures from options ranging from investment in disaster risk reduction to disaster management, by presenting methods and technologies for integrated assessment and monitoring and forecasting changes of water disasters. In addition, support should be provided for local communities to develop a disaster management plan to reduce disaster risks and increase resilience for quick recovery from disasters. With this plan, local communities should enhance the capacity of business continuity to continue regular livelihood and socio-economic activity as much as possible even after a disaster.

### 2) Development of expert leaders and policy leaders

When I attended a workshop on flood hazard mapping held in Myanmar's capital Naypyidaw in May 2016, I was so happy to see excellent presentations by two young professionals who had just completed a master course, Disaster Management Program (DMP), which is offered by ICHARM in cooperation with the National Graduate Institute of Policy Studies (GRIPS) and the Japan International Cooperation Agency (JICA). They led the hazard map training conducted as a joint effort with multiple government agencies, introducing the analysis results of the impact from recent typhoon disasters

and appropriately responding to various questions and proposals from other government agencies.

In the meantime, when we visit government agencies responsible for water and meteorology in foreign countries, we sometimes have chances to meet bureau-chief level leaders who thoroughly understand the features and background of water-related disasters in their countries, and formulate policies based on a comprehensive review of risk reduction measures. They have a deep knowledge of not only natural science and engineering but also society, economy, culture, and traditions, and we learn a great deal from such leaders.

To develop such human resources, graduate-level education is effective. The two young experts in Myanmar studied in the master course at ICHARM and learned basic knowledge of hydrology, fluid mechanics, numerical calculation methods, in addition to integrated knowledge of planning and disaster prevention. They also learned the qualities required of them for project implementation. The excellent bureau-chief level leaders who we have encountered, almost without exception, had a Ph.D. and a broad international network of experts and acquaintances. Short-term capacity development programs are certainly effective to widely spread specific science and technology, and should continue being offered as an option to develop human resources. However, it is also important to further promote graduate-level education in order to develop "expert leaders," who can practice their expertise to lead local and national projects, and "policy leaders," who can lead the formulation and implementation of government policies.

### 3) Promotion of multi-layered international cooperation

To reduce the risks of water-related disasters, each country is expected to establish a platform for water-related disasters as a part of its national platform for disaster risk reduction, which consists of various stakeholders in a country. Adequate support should be provided for the water disaster platform to promote its activity nationwide and steadily increase disaster prevention investment based on scientific evidence. Water-related disaster risk reduction measures should be developed and organized in consideration of local needs and conditions. Continuous efforts should be made to raise awareness towards water-related disaster management on community, municipal and basin scales. Necessary assistance should be provided to build disaster resilient communities that can respond properly and quickly at the time of disaster, start restoration incessantly, and shift to rehabilitation without interruption. Moreover, in each country, local communities and the national platform for disaster risk reduction should work together in a cooperative framework built on an interactive relationship between the two parties which allows both top-down and bottom-up communication.



The international community should cooperate in widely accumulating and sharing good practices. International organizations in disaster management should work closely with their local counterparts and support the activities of each country's platform for water-related disasters. International efforts should also be made to coordinate the national platforms for water-related disasters within the same region beyond national borders and encourage them to address common

issues among them and provide mutual support to one another. Further, nations should cooperate to develop a global-scale system that can compare water-related disasters between countries and between regions, integrate the results, analyze the global trends of water-related disasters, forecast future trends, and provide information on a regular basis for the United Nations and international donors to make informed decisions.

### (3) ICHARM's strategies for the expansion of its activities

The mission of ICHARM is to serve the world as the Global Centre of Excellence for water hazard and risk management by observing and analyzing natural and social phenomena, developing methodologies and tools (e.g., water-related hazard analysis and risk assessment such as vulnerability assessment), building capacities, creating knowledge networks, and disseminating lessons and information in order to help governments and all stakeholders reduce water-related disaster risks at community, national, and global levels. To fulfill this

mission, ICHARM focuses on innovative research, effective capacity development, and efficient information networking as the priority areas of its activity, and has steadily produced important achievements in the effort to reduce water-related disaster risks in many project areas.

Building on the past achievements, ICHARM will set out for the next stage. We will start with the comprehensive and quantitative understanding of the changing



**Shoji Fukuoka**

● Professor, Research and Development Initiative, Chuo University

## Ten Years of ICHARM and Expectations for the Future

I would like to offer my congratulations to ICHARM on its 10th anniversary.

Positive evaluations that ICHARM has earned for its international contributions as a global center in water disaster risk management over the past ten years are surely the fruits of the enormous effort exerted by those involved in its activities, and are also indicative of the high level of water-related disaster research conducted in Japan, which of course makes us very proud.

There are, however, issues that must be resolved in order to ensure further progress. The first issue has to do with disaster prevention infrastructures in developing nations, which are undergoing improvements. Taking this into consideration, those nations need to study investigative research that involves extensive examinations regarding the main issues of water-related disaster risk management. The main issues include how disaster prevention infrastructures should be established and improved, how their effectiveness should be assessed in terms of hardware, and the like, in addition to analysis and forecasting of floods and inundations that were conducted in the past. In Japan, the probability of river embankments being destroyed by floods has been taken into consideration in inundation analysis as well as flood and inundation risk management at a practical level. Additional consideration has also been taken on appropriate water balance and distribution that encompasses the amount of water stored at river channels and dams located in river basin areas, as well as flood inundation amounts during heavy rainstorms, from the perspective of flood control over river basins. These viewpoints represent inundation risk management technologies that must be understood at a fundamental level in order to proceed with the establishment and improvement of disaster prevention infrastructures and constitute key points for consideration that cannot be avoided. ICHARM should be active in providing assistance for developing nations to put such knowledge into practice.

The second issue involves the establishment of a framework for sustaining activities at ICHARM and the development of ways in which they should be executed. The reduction of water-related disaster risk is a crucial issue for every country to protect its social and economic systems from serious interruptions due to water-related disasters. ICHARM has expertise to support countries in this area and should be able to provide it in a sustainable way. To this end, I would also like to stress that it is very important for ICHARM to continue strengthening its network with other public and private organizations, both at home and abroad, for closer cooperation to reduce water-related disaster risk.

I am looking forward to seeing further advancement that ICHARM will make in the future.

hydrological environment, promote well designed activities on the basis of the prescription to reduce water-related disaster risks, and continue its effort towards the realization of the world free from the threats of water-related disasters.

ICHARM will enhance its capacity in two areas, research and development in advanced science and technology and social implementation, by maximizing its advantages as an organization consisting of researchers and government policy experts. By integrating both areas, we will develop the overall capacity to implement science and technology in society by strengthening the ability to select the best options suitable for the conditions of the target areas and apply them to assist governments and communities in making decisions and taking actions.

In addition, ICHARM will address both good and bad practices concerning the implementation of results from research and development in society. We will share information on not only outcomes but also processes with experts in each community and country through capacity development programs to nurture expert leaders and policy leaders.

With the increased capacity in research and development, social implementation, and capacity development, ICHARM will continue its commitment to the reduction of water-related disaster risks worldwide by closely working with various organizations at home and abroad and promoting initiatives on water-related disasters at local, national, regional and global levels.

*(Written by Toshio Koike)*





# Annex



## A-1 Organizational change of ICHARM

### March 6, 2006

- ICHARM was established officially, setting up the Water-related Hazard Research Group consisting of three teams of International Technical Exchange, Disaster Prevention, and Hydrology.
- Kuniyoshi Takeuchi, professor emeritus of Yamanashi University, became the inaugural director of ICHARM.

### April 1, 2011

- A new position, "Research Coordinator for International Water Disaster Risk Management," was created to supervise worldwide research on flood disaster prevention.
- ICHARM reorganized the three teams into the new sections of Training and Public Relations, Hydraulic and Hydrologic Research, and Risk Management, assigning a chief researcher to head each section.

### October 1, 2014

- Toshio Koike, professor of the University of Tokyo, became the second director of ICHARM.
- Former Director Kuniyoshi Takeuchi became the advisor of ICHARM.

### April 1, 2016

- PWRI partially restructured its organization and assigned hydrologic research to the Hydrology Team, which is a new section created under the Hydraulic Engineering Research Group of PWRI.
- The Water-related Hazard Research Group of ICHARM conducts investigations, tests, research, and training, develops technologies, and provides guidance, including administrative work involved in those activities, in order to address the issues regarding:
  - (1) International dissemination of technologies for the prevention and mitigation of water-related disasters
  - (2) Water-related disaster hazard
  - (3) Water-related disaster risk management

## A-2 ICHARM building, logo, etc.

### September 2005

The first phase of the ICHARM building construction (August 2004-September 2005) completed, remodeling the Soil Mechanics Laboratory of PWRI into the main building of ICHARM.

### January 2006

The logo of ICHARM selected through an open design competition.

The winner, Ms. Naomi Sekiguchi, staff of PWRI, explained the concept of the logo:

*"The logo shows a calm water surface consisting of three individual crescents. The upper crescent is from the PWRI logo; the lower one stands for the letter "U" from UNESCO; the third one refers to ICHARM. The three crescents together are expected to hold the image of gently embracing and supporting people and water all over the world by cooperating with one another."*

### March 6, 2006

The flag of the United Nations (purchased in January 2006) hoisted for the first time in front of the main entrance of PWRI.

### September 15, 2006

The name board of ICHARM posted at the main entrance of its building.

(Calligraphy on the board by Mr. Kazuo Kitagawa, the then Minister of Land, Infrastructure and Transport)

### November 2007

The auditorium completed.

### March 2010

Students' room put in service (the room later became a meeting room.)

### July 2011

Researchers' room on the first floor put in service.

### October 2011

Current students' room put in service, which finally completed the remodeling project.

## A-3 List of ICHARM staff and tenure

### Director

1. Kuniyoshi Takeuchi (2006.3 - 2014.9)
2. Toshio Koike (2014.10 - )

### Deputy Director

1. Akira Terakawa (2006.3 - 2009.7)
2. Shigenobu Tanaka (2009.7 - 2013.6)
3. Nario Yasuda (2013.7 - 2014.3)
4. Atsushi Suzuki (2014.4 -2015.6)
5. Junichi Yoshitani (2015.7 -2016.3)
6. Katsuhito Miyake (2016.4 - )

### Advisor

1. Kuniyoshi Takeuchi (2014.10 - 2017.3)

### Special Coordinator

1. Minoru Kuriki (2006.4 - 2007.3)

### Research Coordinator for Water Disaster Risk Management

1. Kenzo Hiroki (2011.4 - 2014.6)

### Director for Special Research

1. Nario Yasuda (2013.4 -2013.6)
2. Junichi Yoshitani (2015.5 -2015.6)

### Research & Training Advisor

1. Amithirigala Widhanelage Jayawardena (2007.7 - 2012.9)
2. Shinji Egashira (2013.7 - )

### Chief Researcher

1. Shigenobu Tanaka (2006.3 -2009.7)
2. Junichi Yoshitani (2006.3 -2009.7)
3. Kazuhiko Fukami (2006.3 - 2013.3)
4. Katsuhito Miyake (2007.7 -2011.8, 2015.10 -2016.3)
5. Kei Kudo (2009.4 - 2011.1)
6. Yoshiyuki Imamura (2009.8 - 2010.8, 2014.5 - 2015.3)
7. Minoru Kamoto (2010.6 - 2015.10)
8. Toshio Okazumi (2011.9 - 2014.3)
9. Shinya Mitsuishi (2011.10 - 2012.3)
10. Pat Yeh (2012.4 - 2013.6)
11. Akihiro Shiratori (2012.4 - 2012.12)
12. Yoichi Iwami (2013.5 - )
13. Masahiko Murase (2013.8 - 2016.6)
14. Hisaya Sawano (2014.4 - )
15. Yoshio Tokunaga (2014.5 - )

### Deputy Chief Researcher

1. Yoshio Suwa (2006.3 - 2006.6)
2. Norimichi Takemoto (2006.7 - 2008.3)
3. Tomoyuki Noro (2008.4 - 2010.3)
4. Yoshikazu Shimizu (2010.4 - 2014.3)
5. Yoji Chida (2014.4 - )

### Senior Researcher

1. Merabtene Tarek (2006.4 - 2007.8)
2. Daisuke Kuribayashi (2008.4 - )
3. Tomonobu Sugiura (2008.4 - 2010.3)
4. Osti Rabindra (2009.4 - 2011.9)
5. Guangwei Huang (2011.1 - 2011.9)
6. Toshiya Uenoyama (2011.4 - 2014.3)
7. Seishi Nabesaka (2013.4 -2014.3)
8. Takahiro Sayama (2013.7 -2015.3)
9. Morimasa Tsuda (2014.4 - )
10. Miho Ohara (2014.4 - )
11. Badri Bhakta Shrestha (2015.4 - )
12. Hitoshi Umino (2015.4 - )
13. Mohamed Rasmy Abdul Wahid (2015.4 - )
14. Atsuhiko Yorozyuya (2015.7 - )
15. Yoshito Kikumori (2016.4 - )

### Researcher

1. Hironori Inomata (2006.3 -2011.3)
2. Hitoki Imamura (2006.3 -2008.3)
3. Assela Pathirana (2006.3 -2006.12)
4. Toshikazu Tokioka (2006.4 -2008.3)
5. Daisuke Kuribayashi (2007.4 - 2008.3)
6. Tomonobu Sugiura (2007.4 - 2008.3)
7. Hideo Yamashita (2008.4 -2011.3)
8. Yuya Kanno (2008.4 -2011.3)
9. Takahiro Sayama (2009.10 -2013.6)
10. Seishi Nabesaka (2010.4 -2013.3)
11. Atsuhiko Yorozyuya (2011.4 - 2015.6)
12. Akiko Hiroe (2011.4 -2013.3)
13. Badri Bhakta Shrestha (2011.9 -2015.3)
14. Shun Kudo (2013.4 -2016.3)
15. Mamoru Miyamoto (2013.11 - )
16. Hiroshi Koseki (2016.4 - )

### Exchange Researcher

1. Mutsumi Hagino (2006.3 )
2. Yoshiki Shiraishi (2008.4 -2009.3)
3. Go Ozawa (2009.4 -2011.3)
4. Takahiro Kawakami (2009.4 -2011.3)
5. Yuya Tatebe (2011.4 -2013.3)
6. Susumu Fujioka (2011.4 -2013.3)

### Research Specialist

1. Merabtene Tarek (2006.3)
2. Osti Rabindra (2006.6 - 2009.3)
3. Hapuarachchi Prasantha (2006.7 -2007.12)
4. Adikari Yoganath (2007.7 -2012.6)
5. Ali Seyed Chavoshian (2007.8 -2012.7)
6. Dinar Istiyanto (2007.8 -2012.8)
7. Rajapakse Hemantha (2007.12 -2009.12)
8. Atsuhiko Yorozyuya (2008.1 - 2011.3)
9. Pham Thanh Hai (2008.2 -2010.3)
10. Jun Magome (2008.2 -2010.3)
11. Mamoru Miyamoto (2010.5 -2013.10)
12. Tadashi Nakasu (2010.6 -2013.9)
13. Tomoki Ushiyama (2010.7 - )
14. Akira Hasegawa (2010.7 - )
15. Youngjoo Kwak (2010.7 - )
16. Shigenobu Hibino (2011.3 -2013.8)
17. Edangodage Duminda Pradeep Perera (2011.5 - )
18. Ai Sugiura (2011.5 -2014.9)
19. Megumi Sugimoto (2012.4 -2014.3)
20. Yoshiki Motonaga (2012.4 -2014.9)
21. Sangeun Lee (2012.11 -2014.10)
22. Hideyuki Kamimera (2012.11 -2015.3)
23. Maksym Gusyev (2012.12 - )
24. Kibler Kelly Maren (2013.1 -2014.12)
25. Yusuke Yamazaki (2013.8 - )
26. Yoko Hagiwara (2013.12 -2016.10)
27. Naoko Nagumo (2014.1 - )
28. Tong Liu (2014.6 - )
29. Hiroshi Koseki (2014.11 -2016.3)
30. Karina Vink (2015.3 -2017.1)
31. Yoshihiro Shibuo (2015.4 - )
32. Sanchez Patricia Ann Jaranilla (2015.7 -2016.4)
33. Daisuke Harada (2016.9 - )

### ICHARM Research Assistant

1. Tesfaye Haimanot Tarekegn (2011.11 -2012.10)
2. Narayan Prasad Gautam (2011.11 -2013.9)
3. Karina Vink (2011.12 -2014.9)
4. Fernandez Reynosa Rodrigo (2012.11 -2015.9)



5. Masood Muhammad (2012.12 -2015.9)
6. Biswas Robin Kumar (2013.10 -2016.9)
7. Ahsan Md Nasif (2013.10 -2016.9)
8. Juarez Lucas Andrea Mariel (2013.11 -2016.9)
9. Escalona Martinez Rosiret (2014.10 - 2017.3)
10. Ghimire Prem Raj (2014.10 - 2015.2)
11. Naseer Asif (2015.10 - )
12. Mahtab Mohammad Hossain (2015.10 - )
13. Islam Md Khairul (2016.10 - )
14. Gul Ahmad Ali (2016.11 - )

#### **Administrative Staff**

1. Takashi Yamashita (2006.3 )
2. Junko Miyamoto (2006.4 -2009.3)
3. Akemi Saito (2009.4 -2012.3, 2016.4 - )
4. Yukio Kobayashi (2011.4 -2014.3)
5. Katsuhiko Kikuchi (2012.4 -2016.3)
6. Katsuichi Tadokoro (2014.4 -2016.3)
7. Noriko Yamaguchi (2014.4 - )
8. Takashi Shirai (2014.4 - )

#### **Administrative Assistant**

1. Natsuko Kurihara (2006.3 -2007.1)
2. Junko Katayama (2006.3 -2006.9)
3. Mariko Suzuki (2006.3 -2007.3, 2008.5 - 2009.6)
4. Kumi Sakurai (2006.10 -2007.6)
5. Naoko Tobaru (2006.10 -2006.12)
6. Yoko Ishiwata (2007.3 -2012.3)
7. Nobuko Shiga (2007.4 -2007.10)
8. Akiko Hirata (2007.4 -2008.1)
9. Kyoko Takahashi (2007.7 -2012.3)
10. Kensuke Yamazaki (2007.10 -2008.3)
11. Mikiko Nakamura (2008.1 -2013.1, 2016.5 - )
12. Sachiko Ebashi (2008.4 -2011.3)
13. Mariko Daito (2008.8 -2008.10)

14. Eri Uchida (2009.6 -2011.12)
15. Rie Kurihara (2009.11 -2011.3)
16. Yuriko Sakamoto (2010.2 -2015.1)
17. Atsushi Yuhara (2010.7 -2010.8)
18. Chieko Nochi (2010.12 -2014.2)
19. Yuri Suzuki (2010.12 -2012.8)
20. Midori Morinaga (2011.4 -2012.1)
21. Aiko Arving (2011.4 -2012.10)
22. Momoe Nakamura (2011.4 -2011.9, 2011.11 -2014.10)
23. Katsura Miyazaki (2011.10 -2014.3)
24. Shiori Ozawa (2011.10 -2013.12)
25. Akiko Hojo (2012.3 -2012.10)
26. Mayumi Tomimura (2012.4 -2017.3)
27. Taeko Akimoto (2012.7 -2014.6)
28. Seiko Tanaka (2013.1 - )
29. Kazumi Ikeda (2013.4 -2014.3)
30. Mie Uedaira (2013.12 - )
31. Tomomi Wakasugi (2013.12 - )
32. Shigeyuki Senda (2014.4 - )
33. Yukie Okawa (2014.4 - )
34. Manami Yamamoto (2014.6 - )
35. Izumi Nishi (2014.12 - )
36. Rika Kumada (2015.1 - )
37. Shuhei Maruo (2015.11 -2016.3 )
38. Masako Kuwayama (2016.3 - )

#### **Temporary personnel**

1. Masahiko Okubo (2006.3 -2014.3, 2014.9 - )
2. Masumi Kuramochi
3. Mariko Hoshi
4. Masahito Naito
5. Yoshifumi Okabe
6. Teruo Sekiguchi
7. Shinji Hamada
8. Yuko Yanagisawa

## **Staff of the Secretariat for Preparatory Activities of UNESCO-PWRI Centre**

#### **Director of the Secretariat**

1. Akira Terakawa (2004.4 -2006.3)

#### **Chief Researcher**

1. Nario Yasuda (2004.4-2004.6)
2. Junichi Yoshitani (2004.4-2006.3)
3. Kenzo Hiroki (2004.12-2005.4)
4. Shigenobu Tanaka (2005.4-2006.3)
5. Kazuhiko Fukami (2005.4-2006.3)

#### **Senior Researcher**

1. Tetsuya Ikeda (2004.4-2005.3)
2. Yoshio Suwa (2005.4-2006.3)

#### **Researcher**

1. Daisuke Kuribayashi (2004.5-2006.3)
2. Hitoki Imamura (2005.4-2006.3)
3. Hironori Inomata (2005.4-2006.3)
4. Assela Pathirana (2005.12-2006.3)

#### **Exchange Researcher**

1. Mutsumi Hagino (2005.5-2006.3)

#### **Research Specialist**

1. Merabtene Tarek (2004.4-2006.3)
2. Yoshiko Iizumi (2005.4-2006.3)

#### **JST CREST Researcher**

1. Takeo Onishi
2. Taichi Tebakari

#### **Administrative Staff**

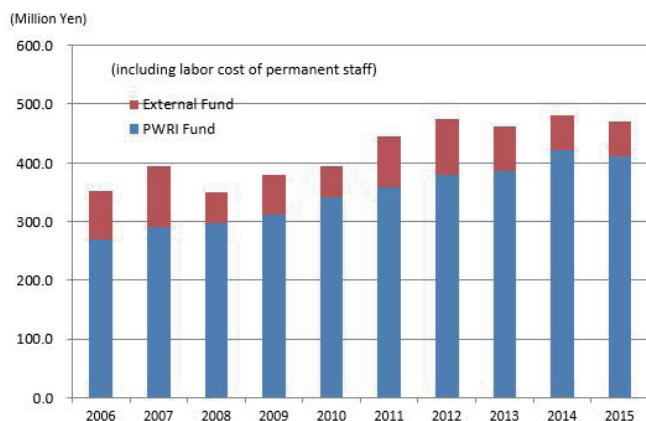
1. Takashi Yamashita (2004.4-2006.3)

#### **Administrative Assistant**

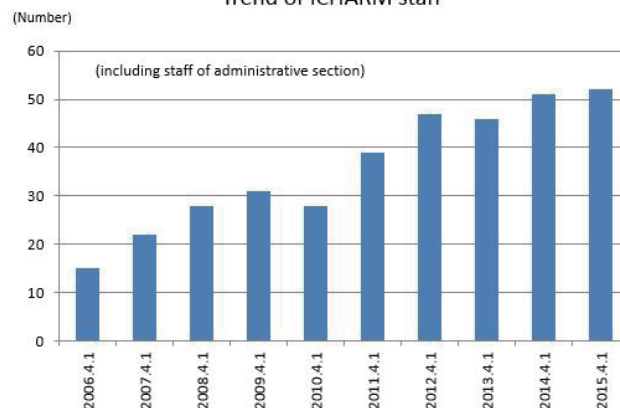
1. Natsuko Kurihara (2005.4-2006.3)
2. Junko Katayama (2005.4-2006.3)
3. Mariko Suzuki (2005.4-2006.3)

## A-4 Trend of ICHARM budget and staff

Trend of ICHARM Budget



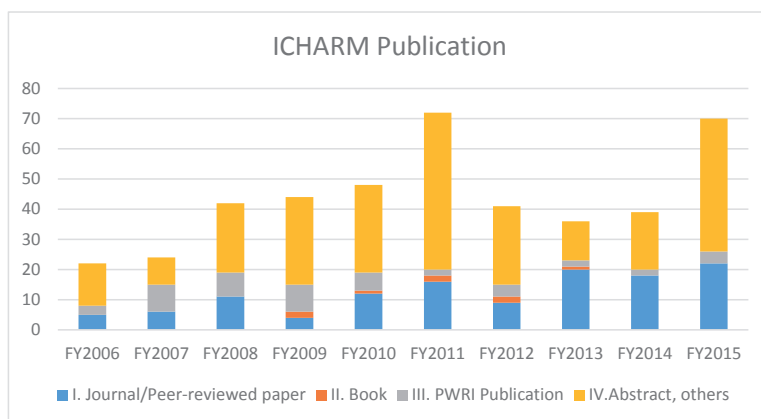
Trend of ICHARM staff



## A-5 List of publications

Number of publications by ICHARM researchers

	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	Total
I. Journal/Peer-reviewed paper	5	6	11	4	12	16	9	20	18	22	123
II. Book	0	0	0	2	1	2	2	1	0	0	8
III. PWRI Publication	3	9	8	9	6	2	4	2	2	4	49
IV. Abstract, others	14	9	23	29	29	52	26	13	19	44	258
Total	22	24	42	44	48	72	41	36	39	70	438





# Major Publication

## 2006

- Tarek Merabtene, Junichi Yoshitani and Assela Pathirana (2006) Status of Disaster Database and Limitations for Planning. "Proceedings of the 3rd APHW Conference" "Wise Water Resources Management Towards Sustainable Growth and Poverty Reduction", National Research Council of Thailand (NRCT); the Association of Researchers (AR); the Asia Pacific Association of Hydrology and Water Resources (APHW).
- Kazuhiko Fukami (2006) Development of an integrated flood runoff analysis system for poorly-gauged basins IAHR. Proceeding of the 7th International Conference on Hydroinformatics (HIC2006), IAHS, IWA, ASTEE, SHF, Hydroinformatics Society, and Tropical Marine Science Institute, 4, 2845-2852.
- 飯泉佳子・木内豪・深見和彦 (2006) 分布型モデルを用いた河川・地下水の水質解析. 河川技術論文集, 土木学会水工学委員会河川部会, 12, 335-339.
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## A-6 List of Ph.D. and MDMP thesis titles

### List of MDMP thesis titles

Year	No.	Country	Name	Male Female	Title	Award
2007- 2008	1	China	DAI, Ming-Long	M	Dam-break flood analysis in mid-down stream of Han river	
	2	India	Khanindra BARMAN	M	Development of flood forecasting model in Brahmaputra valley of India	
	3	Bangladesh	Md. Aminul ISLAM	M	Flood hazard mapping of Dhaka-Narayanganj-Demra (DND) project using geo-informatics tools	
	4	Nepal	Mitra BARAL	M	Rainfall runoff modelling and inundation analysis of Bagmati river at Terai region of Nepal	Outstanding Award
	5	Bangladesh	Muhammad MASOOD	M	Flood hazard and risk assessment in mid-eastern part of Dhaka, Bangladesh	
	6	China	YE, Li-Li	F	Flood risk analysis and risk management in Mengwa detention basin	
	7	Japan	Yasuo Kannami	M	Establishment of country-based flood risk index	
	8	Japan	Hirohisa Miura	M	The analysis of flood risk awareness at resident level in Mekong river basin focusing on the evacuation behavior	
	9	Japan	Ryota Ojima	M	Impact assessment of road construction on the flood inundation in Dhaka, Bangladesh	
	10	China	Ji, Zhou	M	A numerical study on the open channel network in Wuxi city	
2008- 2009	11	Bangladesh	Biswas Robin Kumar	M	Water level prediction by artificial neural network in the Surma-Kushiyara river system of Bangladesh	Outstanding Award
	12	Bangladesh	BANDA Mohd. Sarfaraz	M	Migration characteristics of meandering channels based on river morphodynamics	
	13	China	JIN Ke	M	A methodological study to improve flood management of the Taihu lake basin	
	14	China	XIAO Fei	M	Hydraulic modelling of Nenjiang river floodplain in Northeast China	
	15	Ethiopia	ALEMU Yonas Tadesse	M	Socio-economic impacts of flooding in Dire Dawa, Ethiopia	
	16	Indonesia	Simatupang Maruli Tua Gregorius	M	Identification potential effect of illegal residence in floodplain and socio-economic efforts for solution	
	17	Nepal	SAH MANOHAR KUMAR	M	Inundation analysis and development of rainfall runoff model for Tinau river basin in Nepal	
2009- 2010	18	Bangladesh	Partha Pratim Saha	M	Flood characteristics analysis for seven hydrological regions of Bangladesh	Dean's Award
	19	Bangladesh	A.K.M. Saifuddin	M	Homogeneity and trend analysis of temperature for urban and rural areas	
	20	China	Gong Zhen Bin	M	Application of artificial neural networks for rainfall forecasting in Fuzhou city	
	21	Ethiopia	Zinash Mekonnen Zewde	F	Development of flood forecasting model in middle Awash river basin of Ethiopia	
	22	Myanmar	Nay Myo Lin	M	Storm surge inundation analysis of Cyclone Nargis event	
	23	Philippines	Jerry Austria Fano	M	Establishment of Philippine flood risk index by province based on natural and social factors	
	24	Sri Lanka	Seenipellage Chaminda Sugeeswara	M	Development of a flood forecasting model for Kalu river and Kelani river basins in Sri Lanka using radial basis function neural networks	
	25	Thailand	Somchit Amnatsan	M	Water level prediction in Nan river, Thailand using wavelet neural network	Sontoku Award, Best Research Award
	26	Indonesia	Vidi Bhuwana	M	Rainfall runoff modeling by Using Adaptive-Network-Based Fuzzy Inference System (ANFIS)	
	27	Indonesia	R. Panji Satrio	M	Flood characteristics of upper Solo river sub-basin case study: Surakarta city	
	28	Indonesia	Gunawan Suntoro	M	Development of rainfall runoff model for Bogowonto river basin by using tank model	
29	Japan	Shiro Hishinuma	M	Interregional comparison of climate change impact on drought		
2010- 2011	30	Bangladesh	Pijush Krishna Kundu	M	Effects of coastal vegetation and embankment on storm surge inundations in Bangladesh	
	31	Bangladesh	Md. Sabibur Rahman	M	Morphological changes in Ganges river and its impacts on the branches	
	32	China	Xu Guanglei	F	Dam safety preparedness exercises in China	
	33	China	ZHOU Huaqiang	M	Change of water resources in Jiangsu province with economic development and climate change	Sontoku Award
	34	Colombia	Julian Javier Corrales Cobos	M	Application of a spatially distributed model for predictions of flood discharge and inundation in the Magdalena-Cauca basin of Colombia	
	35	Guatemala	Rodrigo Fernandez Reynosa	M	Assessment and adaptation to climate change using precipitation and discharge projections on Montagua river basin	Best Research Award
	36	Indonesia	Ambar Puspitosari	F	Study on the improvement of flood warning system using IFAS in Solo river basin	
	37	Myanmar	Kyaw Zayer Tint	M	Storm surge inundation analysis of river and floodplain during Cyclone Nargis	
	38	Nepal	Prem Raj Ghimire	M	Application of support vector machine for rainfall-runoff modeling in West Rapti river basin, Nepal	

Year	No.	Country	Name	Male Female	Title	Award
2010-2011	39	Nepal	Manish Maharjan	M	Application of recurrent neural network for runoff prediction in Bagmati river basin	Best Research Award
	40	Nepal	Rajendra Sharma	M	Development of a flood forecasting model for Lothar river basin in Nepal using radial basis function neural networks	
	41	Pakistan	ABDUL AZIZ	M	Regional parameterization and applicability of Integrated Flood Analysis System (IFAS) for flood forecasting of upper-middle Indus river	
2011-2012	42	Bangladesh	MD. MAJADUR RAHMAN	M	Assessment of precipitation and river runoff change on the Ganges, Brahmaputra and Meghna river basins due to climate change and adaptation measures by structural means	Dean's Award
	43	Bangladesh	Md. SIRAJUL ISLAM	M	Influence of Jamuna bridge on river morphological changes	
	44	China	ZHANG HANG-HUI	F	Study on potential contributions of the proposed Huangpu gate to flood control in Taihu lake basin	
	45	China	ZHU BING	F	Hydrological forecasting based on T-S-K fuzzy logic system in Fu river basin	Best Research Award
	46	Fiji	VEREIVALU VILIAME	M	Application of fuzzy logic for the early warning system on the Rewa river downstream	
	47	Indonesia	LINA FITRIANI	F	A case study of urban flood risk assessment for Ciliwung river basin, Jakarta, Indonesia	
	48	Indonesia	ANDI WILDANIAH	F	Development of flood warning system in small scale urbanized basin - study case: upper Citarum river basin	
	49	Nepal	KUMAR BARUN KARNA	M	The effect of rainfall input to distributed hydrological model on flood runoff simulations in poorly rain gauged river basin	
	50	Nepal	RAJBANSHI KRISHNA PRASAD	M	Prediction of inundation processes of Narayani river with bed deformation	
	51	Pakistan	ATIF IRSHAD	M	Flood risk mapping and damage assessment of Mianwali district, Indus river basin, Pakistan	
	52	Pakistan	ARSLAN USMAN	M	Verification of satellite based rainfall estimates GSMaP and development of a correction method for Indus river basin	Best Research Award
	53	Pakistan	RASHID KARIM	M	On the root causes of Indus 2010 Flood through examination of the cases sent to the supreme court	
	54	Pakistan	AHMAD ALI GUL	M	Rainfall-Runoff-Inundation modeling for the lower Indus river basin	
	55	Pakistan	RANA MUHAMMAD ATIF	M	Analysis of Quantitative Precipitation Forecast (QPF) for floods in Pakistan using WRF model	
	56	Pakistan	RAMAY MUHAMMAD ALEEM-UL-HASSAN	M	Rainfall-Runoff-Inundation modeling for the Indus river basin in Pakistan considering the evapotranspiration effect	Sontoku Award
	57	Philippines	DAMO GRECILE CHRISTOPHER RIGODON	M	Flood hazard and risk assessment of lower Dipolog river, Mindanao island, Philippines	
58	Sri Lanka	AMARASEKARA JAGATH DEHSAPRIYA	M	Development of flood forecasting model for Gin river and Kelani river basins in Sri Lanka using fuzzy logic approach		
59	Tunisia	LAZRAC AYMEN	M	Application of support vector machines for real time flood stage forecasting in a semi-arid watershed		
60	Viet Nam	PHAM DOAN KHANH	M	A study on necessary actions for better integration of disaster risk management into socio-economic development in Vietnam		
2012-2013	61	Republic of Albania	ZAIMAJ Eglantina	F	Effectiveness of flood countermeasures in Drini-Buna river basin in Albania based on flood risk assessment	
	62	Bangladesh	BHUYAN Mohammad Arifuzzaman	M	Nation-wide riverine flood risk assessment in Bangladesh by an integrated GIS-based model and remote sensing techniques	Best Research Award
	63	Bangladesh	HYDER Noman	M	Flood risk assessment of the Surma river basin of Bangladesh using RRI	
	64	Colombia	BERNAL QUIROGA Fabio Andres	M	Development of hydrological forecasting system in Magdalena basin, Colombia	
	65	Malaysia	FAUZIANA Ahmad	F	Weather radar based quantitative precipitation estimation for flood forecasting model	
	66	Malaysia	LIVIA Lahat	F	Development of a fuzzy logic based flood early warning model for Kelantan river basin in Malaysia	
	67	Myanmar	TIN Myint Aung	M	Flood inundation analysis for effective countermeasures in the Bago river basin	Best Research Award
	68	Nepal	SIDDIKI Akhlaque Ahmad	M	Flood inundation analysis and risk assessment of Bagmati river basin of Nepal	
	69	Nigeria	UBA SHAZALI AJINGI	M	Development of flood warning system using IFAS in Hadejia river basin Nigeria	
	70	Serbia	ZLATANOVIC Nikola	M	An integrated design discharge calculation system for small to mid-sized ungauged catchments in Serbia	Sontoku Award
	71	Sri Lanka	KONARA MUDIYANSELAGE Nalin Kumar Ranasinghe	M	Flood hazard and damage assessment study for Kelani river basin - Sri Lanka	



Year	No.	Country	Name	Male Female	Title	Award
2012-2013	72	Venezuela	Rosiret ESCALONA MARTINEZ	F	Debris flow prediction method for developing hazard map	
2013-2014	73	Bangladesh	ALAM Muhammad Jahangir	M	Morphological changes of Jamuna river and its countermeasure in Sirajganj hard point area	
	74	Bangladesh	ISLAM Md. Khairul	M	Importance of distributed hydrological model for present and future flood risk management in Bangladesh	Dean's Award
	75	China	HAO Ying	F	Improvement of quantitative precipitation forecast in Huaihe basin based on downscaling by WRF model	
	76	El Salvador	ALFARO LOPEZ Ingrid Altagracia	F	Debris flow characteristic along the main channel with structures in the Arenal de Mejicanos, San Salvador, El Salvador	
	77	Kenya	ONJIRA Pauline Ingado	F	Application of remote sensing and Rainfall-Runoff-Inundation Model to near realtime flood inundation mapping in Kenya	Best Research Award
	78	Myanmar	ZAW Myo Khaing	M	Flood inundation analysis and risk assessment of Sittoung river basin	Sontoku Award
	79	Sri Lanka	GUNASENA Muthubanda Appuhamige Sanath Susila	M	Effective dam operation method based on inflow forecasting for Senanayaka Samudra reservoir, Sri Lanka	
	80	Sri Lanka	MOUFAR Mohamed Mashood Mohamed	M	Flood inundation analysis for Metro Colombo area - Sri Lanka	
	81	Pakistan	Muhammad Afzal	M	Estimation of snowmelt contribution to discharge in upper Indus basin in Pakistan using degree day method	
	82	Philippines	BASILAN, Emar Guevara	M	Evaluation of flood-prone areas in Bicol river basin, Philippines: comparison of flood hazard mapping using hydro-geomorphic and hydrologic modelling methods	
83	Philippines	FERRER Santy Bumali	F	Flood risk assessment under the climate change in the case of Pampanga basin, Philippines	Best Research Award	
84	Venezuela	CABRITA Alfonso Raul Figuera	M	Numerical analysis of the bed morphology in the reach between Cabruta and Caicara in Orinoco river		
2014-2015	85	Bangladesh	BHUAYAN Md Abu Baker Siddique	M	Prediction of morphological changes in Jamuna river near Bahadurabad area	
	86	Colombia	GONZALEZ Rojas Jorge Andres	M	Flood forecasting in Colombia using numerical weather prediction from WRF (ARW)	
	87	Fiji	NAWAI Josefa	M	Flood and drought risk assessment with investigation on effectiveness of proposed infrastructures for Ba river basin, Fiji.	
	88	India	SHARMA Sanjay Kumar	M	Sensitivity for hydrological simulation from topographic data in Kushi river basin, India.	
	89	India	SYED Mohd Faiz	M	Comparative analysis of flood forecasting techniques using RRI, HEC-RAS & Gauge-to-Gauge correlation method for Delhi, India	Best Research Award
	90	Kenya	OTIENO George Chilli	M	Prediction of sediment transport processes in Nzoia river using rainfall runoff model	Best Research Award
	91	Kenya	BARASA Betty Namulunda	F	Impacts of land use changes on flood occurrence in Sosiani river basin in Kenya	
	92	Kenya	ODHIAMBO Collins Otieno	M	Flood and drought management by dams and retardation basin: a case study of upper Ewaso Ngiro North river basin	
	93	Myanmar	NAING Aye Aye	F	Flood inundation analysis for Chindwin river basin by using RRI model, Myanmar	
	94	Pakistan	MUHAMMAD Irfan Virk	M	Applicability of satellite rainfall observation for flood forecasting in a trans boundary basin, Pakistan	
95	Pakistan	SOHAIL Babar Cheema	M	Mountainous snow cover monitoring by WEB-DHM-S for Gilgit basin		
96	Sri Lanka	NAVARATHINAM Kirushnarupan	M	Assesment of the proposed dam for flood and drought mitigation in the Lower Malwathoya basin, Sri Lanka	Sontoku Award	
97	Sri Lanka	VALLIPURAM Thavakkumar	M	Development of comprehensive flood control operation with incorporated inflow by cascaded small tanks to Pavatkulam reservoir, Sri Lanka		
2015-2016	98	Bangladesh	AHMED Tanjir Saif	M	Sedimentation and its countermeasure at the off-take area of New Dhaleswari river	Best Research Award
	99	Bangladesh	HOWLADER Md Mamun	M	Study on proactive breach of submersible embankment for its sustainable maintenance in Haor area	
	100	Brazil	SAIA ALMEIDA LEITE Francisco	M	Evaluation of flood control countermeasures considering climate change - case of study: Itajaí river basin, Brazil -	
	101	Maldives	MOOSA Fathimath Shaushan	F	Water scarcity management and adaptation to climate change in Maldives	
	102	Myanmar	Myo Myat Thu	F	Analysis of floods and droughts in the Bago river basin, Myanmar under climate change	
	103	Nepal	SHARMA Gopal	M	Method for predicting sediment runoff processes and channel changes during floods in West Rapti river, Nepal	Dean's Award

Year	No.	Country	Name	Male Female	Title	Award
2015- 2016	104	Pakistan	BILAL Rashid	M	Transboundary flood forecasting through downscaling of global weather forecasting and RRI model simulation	
	105	Pakistan	KHAN Irfan Ullah	M	Incorporation of snow & glacier melt processes in RRI model for estimating peak river discharges & inundation analysis in Neelum river basin	
	106	Philippines	JACELDONE Catherine Guevarra	F	Sediment transport processes in mountain area of Kinugawa river	
	107	Sri Lanka	BABARANDE GURUGE Thanura Lasantha	M	Integrated water resources management for eastern dry zone of Sri Lanka Study of Mundani river basin	Best Research Award
	108	Sri Lanka	SINNAPPOO Kokularamanan	M	Development of flood forecasting and data dissemination system for Kalu river basin, Sri Lanka	Sontoku Award
	109	Timor Leste	DE ARAUJO Antonio	M	Flood risk index analysis for Cuha river basin, Timor-Leste	
	110	Zimbabwe	RUKARWA Lorraine	F	Flood and drought risk assessment in the Manyame river basin of Zimbabwe under climate change	

## List of Ph.D. thesis titles

Year	No.	Country	Name	Male Female	Title	Award
2010- 2013	1	Japan	Shiro Hishinuma	M	Challenges of hydrological analysis for water resources development in semi-arid mountainous regions: A case study in Iran	
2011- 2014	2	Netherlands	Karina Vink	F	Vulnerable people and flood risk management policies	
2012- 2015	3	Bangladesh	Muhammad Masood	M	Assessment of climate change impact on hydrology of the Ganges-Brahmaputra-Meghna basin and implications for future water resource management	
2012- 2015	4	Guatemala	Rodrigo Fernandez Reynosa	M	Comparative assessment of hydrologic functions at large river basins and their responses to climate change	
2013- 2016	5	Guatemala	Andrea Mariel Juárez Lucas	F	Risk-benefit analyses to balance flood risk, livelihoods and ecosystem services	
2013- 2016	6	Bangladesh	Nasif Md. Ahsan	M	Disaster preparedness at household and community levels: The case of cyclone prone coastal Bangladesh	
2013- 2016	7	Bangladesh	Robin Kumar Biswas	M	Numerical prediction of channel in large, braided rivers dominated by suspended sediment	



## A-7 List of hosted events

No	Year	Date	Venue	Country	Title
1	2006	May 10	Tokyo	Japan	ICHARM Inauguration Commemorative Symposium
2		Sep 14	Tokyo	Japan	ICHARM Inaugural Ceremony and Commemorative Symposium
3		Oct 17	Bangkok	Thailand	Session "Comprehensive Approaches for Flood Disaster Mitigation in Asia" at UNESCO-IHP International Symposium on Managing Water Supply for Growing Demand
4	2007	Jan 19	Bangkok	Thailand	International Symposium on 2006 Flood of Chao Phraya River: "Emerging issues and contribution of hydrological studies"
5		Feb 7 - 9	Kuala Lumpur	Malaysia	1st Follow-up Seminar for ICHARM ex-trainees
6		Sep 6	Tokyo	Japan	International Symposium on 2007 Basin Water Management Policy for Chao Phray River (Thailand) and Changjiang River (China)
7		Nov 6	Tsukuba	Japan	ICHARM Quick Report on Floods 2007
8		Dec 3-4	Beppu	Japan	1st Asia Pacific Water Forum
9	2008	Jan 30- Feb 1	Guangzhou	China	2nd Follow-up Seminar for ICHARM ex-trainees
10		Sep 30	Tokyo	Japan	International Symposium "Local Practices of Integrated Flood Risk Management under Changing Natural and Social Conditions"
11		Oct 3-8	Tsukuba	Japan	Training workshop for the validation of the Global Flood Alert System (GFAS)
12	2009	Nov 3-5	Beijin	China	Session "Catchment-scale water and material cycle studies with WEP and its future potential" at 4th Conference of the Asia Pacific Association of Hydrology and Water Resources (APHW)
13		Feb 17-19	Manila	Philippines	3rd Follow-up Seminar for ICHARM ex-trainees
14		Mar 21	Istanbul	Turkey	IFI side event "Charting Global Agenda for Meeting Today's Flood Management Challenges" at 5th World Water Forum"
15		Mar 25	Baguio	Philippines	Turn-over ceremony and Seminar on Debris-flow Countermeasures
16		Aug 3-7	Tsukuba	Japan	International Workshop on Application and Validation of GFAS/IFAS
17		Aug 26-27	Kathmandu	Nepal	IFAS Training Seminar
18	2010	Dec 10	Tsukuba	Japan	ICHARM Quick Report 2009
19		Mar 2-4	Solo	Indonesia	IFAS Training Seminar
20		May 12-15	Orissa State	India	IFAS Training Workshop
21		Jun 22-24		Manmar	IFAS Training Seminar
22		Sep 28	Tokyo	Japan	International Symposium "Floods-A global problem that needs local solutions"
23		Nov 6-7	Hanoi	Viet Nam	4th Follow-up Seminar for ICHARM ex-trainees
24		Nov 8-10	Hanoi	Viet Nam	Session "Flood Disasters and Predictions in Asian Pacific Countries" at 5th Conference of the Asian Pacific Association of Hydrology and Water Resources (APHW)"
25	2011	Dec 7-9	Bangkok	Thailand	Workshop on satellite application to reduce water-related disaster risk in Asia
26		Sep 27-29	Tokyo	Japan	5th International Conference on Flood Management
27		Nov 7-11	Manila	Philippines	One-day session at ABD Water Learning Week
28	2012	Nov 23-25	Solo	Indonesia	IFAS Training Seminar
29		Feb 20-23	Bangkok	Thailand	The Southeast Asia Flood Risk Reduction Forum
30		Mar 5	Kathmandu	Nepal	Workshop "The effect of climate change in lower West Rapti river basin"
31		Mar 12-17	Marseilles	France	6th World Water Forum
32		May 15-24	Tokyo, Tsukuba	Japan	Workshop "2012 Capacity Development for Integrated Flood Risk Management in Pakistan,"
33	2013	Jun 20-22	Hanoi	Viet Nam	IFAS Training Seminar
34		Feb 13-14	Dhaka	Bangladesh	5th Follow-up Seminar for ICHARM ex-trainees on Sediment Hydraulics and River Management in Bangladesh
35		Mar 5-6	New York	U.S.A.	IFI side event at UN special high-level session on water and disasters
36		May 28- Jun 6	Tokyo, Tsukuba	Japan	Workshop "2013 Capacity Development for Integrated Flood Risk Management in Pakistan"
37		Sep 9-12	Jakarta	Indonesia	IFAS Training Seminar
38		Sep 11-13	Nairobi	Kenya	Special Sesion" at UNESCO strategic and high-level meeting on water security and cooperation"
39		Oct 8-11	Manila	Philippines	IFAS Training Seminar
40		2014	Mar 11	New York	U.S.A.
41	Jun 23		Bangkok	Thailand	Side Event "Water-Related Disaster Risk Information for Risk Reduction: Flood Forecasting, Disaster Information & Risk Assessment for Preventative Investment" at 6th Asian Ministerial Conference on Disaster Risk Reduction"
42	Jun 30- Jul 4		Kuala Lumpur	Malaysia	IFAS Training Seminar

No	Year	Date	Venue	Country	Title
43	2014	Jul 11	Tokyo	Japan	IFAS Training Seminar
44		Sep 16-18	Sao Paulo	Brazil	IFI session at 6th International Conference on Flood Management
45		Sep 30	Tokyo	Japan	International Symposium, "Together with the people coping with increasing water-related disasters in the world"
46	2015	Mar 3-4	Jakarta	Indonesia	6th Follow-up Seminar for ICHARM ex-trainees
47		Mar 14-18	Sendai	Japan	3rd UN World Conference on Disaster Risk Reduction
48		Apr 12-17	Daegu and Gyeongbuk	Korea	7th World Water Forum
49		Apr 19	Nghệ An Province	Viet Nam	IFAS Training Seminar
50		Oct 5-9	Jakarta	Indonesia	IFAS Training Seminar at "Training Programme on Capacity Development for Immediate Access and Effective Utilization of Satellite Information for Disaster Management"
51		Oct 19-22	Medan	Indonesia	IFI session at "Integrated Actions for Global Water and Environmental Sustainability"
52		Nov 18	New York	U.S.A.	Technical session at 2nd United Nations Special Thematic Session on Water and Disasters took place
53		Dec 15-16	Cairo	Egypt	IFAS training session at "Training Workshop on Warning Systems and Geographical Information Systems (GIS) Courses"
54	2016	Mar 1-2	Tokyo	Japan	2016 Asian Water Cycle Symposium (ICHARM 10-year anniversary session)



## A-8 List of awards

Year	No.	Award recipient		Award	Achievement, manuscript, etc.	Awarding organization	Date
		Position	Name				
2006	1	Chief Researcher	Junichi Yoshitani	Hydrologic Engineering Journal Best Paper Award	Watershed environmental hydrology (WEHY) model based on upscaled conservation equations	American Society of Civil Engineers	5/24/2006
		Chief Researcher	Kazuhiro Fukami				
2007	2	Director	Kuniyoshi Takeuchi	Yamanashi Science Academy Award	Contribution to promoting hydrology and water resources in the world	Yamanashi Science Academy	5/28/2007
2008		None					
2009	3	Director	Kuniyoshi Takeuchi	JSCE International Contribution Award	Contribution to global water issues	Japan Society of Civil Engineers (JSCE)	5/29/2009
	4	Exchange Researcher	Takahiro Kawakami	2009 Excellent Performance Award from MLIT Land and Infrastructure Management Study Group	Development of Integrated Flood Analysis System (a flood forecasting system using satellite rainfall information)	Ministry of Land, Infrastructure, Transport and Tourism	10/30/2009
2010	5	Chief Researcher	Katsuhito Miyake	JSCE Continuing International Contribution Award	Long-term commitment to international activities	Japan Society of Civil Engineers (JSCE)	5/28/2010
2011		None					
2012	6	Exchange Researcher	Yuya Tatebe and others	SAT Technology Showcase Best Research Exchange Award	Development of technology for monitoring and forecasting large-scale floods worldwide	Science and Technology Promotion Foundation of Ibaraki	1/22/2013
2013	7	Researcher	Takahiro Sayama	MEXT Minister's Award for Young Scientists and Engineers	Research on Rainfall-Runoff-Inundation Prediction for Major Floods Worldwide	Ministry of Education, Culture, Sports, Science and Technology (MEXT)	4/16/2013
	8	—	—	2013 Infrastructure Technology Development Award	Development of the Rainfall-Runoff-Inundation Model	Selection Committee for Infrastructure Technology Development Award	7/5/2013
	9	Research Specialist	Hideyuki Kamimera	MONRE Minister's Award	Contribution to the development of hydrometeorology in Vietnam through joint research on ground, radar and satellite rainfall observation with the Hydrometeorological Agency of MONRE	Ministry of Natural Resources and Environment (MONRE) of Vietnam	8/16/2013
2014	10	Senior Researcher	Takahiro Sayama	JSCE Best Paper Award	An Emergency Response-type Rainfall-Runoff-Inundation Prediction for 2011 Thailand Flood	Japan Society of Civil Engineers (JSCE)	6/13/2014
		Former Exchange Researcher	Yuya Tatebe				
		Former Exchange Researcher	Susumu Fujioka				
		Research Specialist	Tomoki Ushiyama				
		Researcher	Atsuhiko Yorozuya				
		Former Deputy Director	Shigenobu Tanaka				
11	—	—	2013 Infrastructure Technology Development Award	Development of a system for observing river and sediment discharges by using an acoustic Doppler current profiler (aDcp)	Selection Committee for Infrastructure Technology Development Award	7/30/2014	
2015	12	Director	Toshio Koike	2015 Science Award from the Japan Society of Hydrology and Water Resources	Development of the Data Integration and Analysis System (DIAS), research on integration of satellite hydrological observation and water-cycle analysis models, and international contribution through such activities	Japan Society of Hydrology and Water Resources	9/10/2015
	13	Advisor	Kuniyoshi Takeuchi	Certificate of appreciation	Long-term support and contribution to UNESCO natural science programs in Asia and the Pacific region especially in the area of water management	Jakarta Office of the UNESCO IHP	10/21/2015
	14	Advisor	Kuniyoshi Takeuchi	UNESCO-IHP RSC-SEAP Award	Outstanding contribution and dedication to the committee, in commemoration of the 50th anniversary of the UNESCO International Hydrological Decade (IHD) and international Hydrological Programme (IHP)	UNESCO-IHP Regional Steering Committee for Southeast Asia and the Pacific	10/20/2015
	15	Senior Researcher	Miho Ohara	2015 Best Paper Award by the Institute of Social Safety Science	Study on Basic Flood Risk Assessment Method in Asian Flood Prone Area with Limited Regional Data -Case Study in Pampanga River Basin, Philippines-	Institute of Social Safety Science	1/26/2016
		Research Specialist	Naoko Nagumo				
Senior Researcher		Badri Bhakta SHRESTHA					
Chief Researcher		Hisaya Sawano					
16	Research Specialist	Naoko Nagumo	2015 Best Presentation Award by the Institute of Social Safety Science	Geographical Characteristics of Flood Occurred in Joso City Ibaraki Prefecture in September, 2015	Institute of Social Safety Science	1/28/2016	

## A-9 List of ICHARM R&D Seminars

FY	No	Date	Lecturer	Position	Lecture Title
2006	1	5-Apr-06	Dr. Toshikatsu Omachi	Yachiyo Engineering, Co., Ltd	The situation of international cooperation on water resources and disaster prevention, and expectation to ICHARM
	2	20-Jul-06	Prof. Katsuaki Suzuki	Kumamoto University	How to make an effective materials for the training
	3	26-Dec-06	Dr. Shunta Dozono	Department of Public Works and Highways, Philippines	The situation on flood control in Philippines -Action for the flood risk evaluation -
	4	13-Feb-07	Prof. Zhang Changkuan	Hohai University, China	Current situation of the South-to-North Water Diversion
2007	5	18-Jul-07	Prof. Hideo Matsutomi	Akita University	Countermeasures on tsunami/storm surge by shore vegetation
	6	19-Sep-07	Mr. Osamu Arai	Konoike Construction, Co., Ltd	Comprehensive flood control policy in USA and Hurricane Katrina disaster in 2005
	7	13-Nov-07	Mr. Tetsuya Ikeda	Japan Construction Information Center	Current water issues in China
	8	30-May-07	Mr. Masayuki Watanabe	Invited Researcher, ICHARM	A viewpoint to look at disasters and a case study of disaster prevention
	9	22-Jan-08	Prof. Yutaka Takahashi	Professors emeritus, University of Tokyo	Men who worked for Mankind
	10	23-Jan-08	Dr. Mandira Singh Shrestha	International Centre for Integrated Mountain Development	Flood disaster countermeasures in the Himalaya region
	11	30-Jan-08	Dr. Alan Werritty	Dundee Univ., U.K.	Living with floods:societal responses to changing flood risk in 21st century
2008	12	8-Jul-08	Prof. So Kazama	Tohoku University	Evaluation of large scale water-related disasters considering climate change
			Mr. Koji Ikeuchi	Cabinet Office	Projection of human and property losses by large scale flooding in Tone-Ara Rivers and Technical Issues
	13	10-Jul-08	Mr. Yuichi Ono	United Nations International Strategy for Disaster Reduction	Activities of the ISDR system and the ISDR secretariat - for implementing the Hyogo Framework for Action
	14	5-Sep-08	Pro. Nigel Wright	Professor, UNESCO-IHE	oundation modeling and flood risk management
	15	23-Jan-09	Dr. Shinji Egashira	Technical advisor, Newjec	Importance of introducing sediment transport process in river planning
	16	27-Jan-09	Mr. Masayuki Watanabe	Invited Researcher, ICHARM	Debris-flow dewatering brakes -a promising tool for disaster management in developing countries-
	17	9-Feb-09	Dr. Mandira Shrestha	ICIMOD (International Centre for Integrated Mountain Development)	Koshi Flood Disaster 2008
2009	18	2-Apr-09	Prof. Reiko Kuroda	Professor, Department of Life Science, Graduate School of Arts and Sciences, The University of Tokyo	Future activities of ICSU (International Council for Science)
	19	7-Apr-09	Prof. Yukio Tamura	Tokyo Polytechnic University, Director of Global Centre of Excellence (GCOE)	TPU Global COE Program NEW FRONTIER OF EDUCATION AND RESEARCH IN WIND ENGINEERING and IAWQ Activities on Wind-related disaster reduction
	20	11-Jun-09	Mr. Wouter Lincklaen Arriens	Senior water resources specialist, ADB (Asian Development Bank)	CHALLENGES AND OPPORTUNITIES IN WATER-RELATED DISASTER MANAGEMENT
			Mr. Neil Britton	Senior disaster management specialist,	
			Mr. Terry Day	Specilist on Disaster Management Policy in New Zealand,	
			Mr. Satoru Nishikawa	Director, Water Resources Policy Division, Water Resources Bureau, MLIT, Japan	
	21	22-Jun-09	Dr. Rabindra Osti	Researcher, ICHARM	Special lecture for ICHARM BEST PAPER AWARD
	22	16-Jul-09	Prof. Syunsuke Ikeda	Department Chair, Civil and Environmental Engineering of Tokyo Institute of Technology	Sediment and nutrient transport in watershed and their impact on environment
	23	24-Jul-09	Dr. Roland K. Price	Emeritus Professor of Hydroinformatics, UNESCO-IHE Delft, The Netherlands	Development and practice of hydroinformatics
	24	1-Mar-10	Prof. Kengo Sunada	Professsor, Yamanashi University	Hydraulic Aspects of the Historical Flood Control Works in the Fuji River
25	12-Mar-10	Prof. Ganesh P. SHIVAKOTI	Professsor, University of Tokyo	Theoretical and Practical Issues of Water Resources and Associated Risk Management in Asia	
2010	26	2-Apr-10	Prof. Tadashi Yamada	Professsor, Chuo University	Hot topics in Japanese water affairs
	27	25-May-10	Mr. Narcio Rodrigues	Brazilian Congressman	The problems of the floods in Brazil
	28	3-Sep-10	Prof. Daisuke Higaki	Professor, Hirosaki University	GLOF risk reduction in the Bhutan and Nepal Himalayas with reference to erosion and sedimentation problems



FY	No	Date	Lecturer	Position	Lecture Title
2010	29	10-Sep-10	Dr. Kim Sung	Director, Sustainable Water Resources Research Center, Korea Institute of Construction Technology	Sustainable Water Resources Research Project (2001-2010) in Korea
	30	12-Nov-10	Prof. Shoji Fukuoka	Professor, Chuo University	Adaptation of River technology for climate change
	31	25-Nov-10	Asso. Prof. Hiroshi Takebayashi	Associate Professor, Disaster Prevention Research Institute, Kyoto University	Application of bed deformation analysis on natural rivers
	32	7-Feb-11	Asso. Prof. Frank van der Meulen	Associate Professor, UNESCO-IHE	Climate change and adaptation in Europe
2011	33	13-Apr-11	Prof. Toshio Koike	Professor, University of Tokyo	Integrated Earth Observations and Predictions toward Flood and Water Use under the Climate Change
	34	21-Jun-11	Dr. Rabindra Osti	Senior Researcher, ICHARM	Special lecture for ICHARM BEST PAPER AWARD
	35	21-Sep-11	Prof. Djoko Legono	Gajah Mada University , Yogyakarta, Indonesia	THE TRUE COLLABORATIVE-BASED LAHAR FLOW MONITORING SYSTEM IN A CHAOTIC CONDITION
	36	17-Oct-11	Asso. Prof. Pat Yeh	Special-appointed Associate, Institute of Industrial Science, The University of Tokyo	Estimation of Evaporation and Terrestrial Water Storage Change over Global Large River Basins
	37	13-Dec-11	Prof. Toshio Koike	Professor, University of Tokyo	GEOSS Water Cycle Integrator An Innovative Tool Contributing to Integrated Human Security and Green Growth"
	38	13-Dec-11	Prof. Takashi Asaeda	Professor, Department of Environmental Science, Saitama University	Ecological knowledge for natural disasters
2012	39	28-May-12	Mr.Kenzo Hiroki	Principal, ICHARM	Water, Disasters, and Green Economy
	40	11-Jun-12	Mr. Eisa Bozorgzadeh	Deputy of technical and research affairs	Analytical Study of Drought Management: Remarks and Points
			Dr. Saied Yousefi	Sr. Technical Expert, IWPCO	Forensic Management of Water Resources for Generating Hydropower in IWPCO
	41	11-Sep-12	Mr. Imbe Masahiro	Executive, Association for Rainwater Storage and Infiltration Technology	Implementation of Well-balanced Hydrological System for the Development along the Tsukuba Express Line
42	26-Feb-13	Prof. András Szöllösi-Nagy	Rector, UNESCO-IHE	How should a (flood) early warning system be developed in data poor nations?	
2013	43	27-May-13	Dr.Takahiro Sayama	Researcher, ICHARM	Rainfall-Runoff-Inundation of Large Scale Flooding : From Prediction to Process Understanding
	44	12-Jun-13	Mr. Takezumi Ban	President, Association for World Peace Japan	Earthquake Disaster and Poverty Prevention – Work of Toyohiko Kagawa
	45	18-Oct-13	Mr. Wouter T. Lincklaen Arriens	Leadership Coach and Advisor, UNESCO-IHE	Expectation for Japan for improvement in the water security in Asia
	46	13-Dec-13	Mr. Hayato Nakamura	Project Formulation Advisor (DRM), JICA Philippine Office	Typhoon Yolanda: Gap between Philippine DRRM and Mega Disaster
	47	16-Jan-14	Dr. Anthony Kiem	Hydroclimatologist/Senior Lecturer, Faculty of Science and IT, University of Newcastle	Understanding and Adapting to Hydroclimatic Variability and Change in the Asia-Pacific Region
2014	48	10-Jun-14	Dr. Ursula Schaefer-Preuss	Chair, Global Water Partnership (GWP)	GWP strategy
			Dr.Ania Grobicki	GWP Executive Secretary	GWP : Building water security, climate resilience and integrated management of water-related disasters
			Dr.Mohamed Ait-Kad	Chair,GWP Technical Committee	THE GLOBAL WATER PARTNERSHIP: A KNOWLEDGE NETWORK
	49	27-Aug-14	Dr. Takahiro Sayama	Senior Researcher, ICHARM	Representation of Groundwater in Rainfall-Runoff-Inundation Model
			Dr. Yoshiki Motonaga	Research Specialist, ICHARM	Method of simultaneous measurement for water discharge and sediment transport using Acoustic Doppler Current Profiler ~ Technology to understand the phenomenon under water-surface during flood ~
	50	1-Sep-14	Dr. Ali Chavoshian	Director of Regional Center on Urban Water Management (RCUWM) under the auspices of UNESCO	Water resources issues in Iran and RCUWM-Tehran
51	1-Oct-14	Dr. Kate White	Senior Lead for Global and Climate Change, Institute of Water Resources, US Army Corps of Engineers	Sharing Lessons Learned About Future Water Resources Infrastructure Challenges	
		Dr. Shahbaz Khan	Deputy Director and Senior Program Specialist, UNESCO Jakarta	Water Innovations and Cooperation -For Shaping the Future We Want for All-	
2015	52	3-Aug-15	Prof. Kun Yang	Institute of Tibetan Plateau Research,Chinese Academy of Sciences	Climate changes and their impacts on water cycle in the Tibetan Plateau
	53	7-Sep-15	M. Levent Kavvas	Distinguished Professor, University of California, Davis	Maximum Precipitation Estimation over a River Basin by Numerical Atmospheric Modeling

<b>FY</b>	<b>No</b>	<b>Date</b>	<b>Lecturer</b>	<b>Position</b>	<b>Lecture Title</b>
2015	54	15-Feb-16	Dr. Katsumi Mushiake	professor emeritus of both the University of Tokyo and Fukushima University	Basic Act on Water Cycle: Hopes and Challenges
	55	3-Mar-16	Prof. Johannes Cullmann	Director, Climate and Water Department, World Meteorological Organization (WMO)	WMO's activities in flood forecasting and warning
			Prof. Christophe Cudennec	Secretary General, International Association of Hydrological Sciences (IAHS)	IAHS - A community effort to consolidate and disseminate hydrological knowledge in an increasingly uncertain world
2016	56	21-Jul-16	Dr. 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
	57	1-Dec-16	Dr. Yasutaka Wakazuki	Associate Professor of College of Science, Ibaraki University	Incremental dynamical downscaling for probabilistic climate change projection and a dynamical approach for precipitation nowcast
	58	1-Dec-16	Dr. Srikantha Herath	Senior Advisor, Ministry of Megapolis and Western Development, Gov. of Sri Lanka	Integrated Flood Control and Water Management in Colombo, Sri Lanka



## A-10 ICHARM Advisory and Governing Board members

### ICHARM Advisory Board members

Name	Position	Affiliation	IHP Category	
<b>1st ICHARM Advisory Board Members</b>				
Mr. Eugene Z. Stakhiv	International Water Advisor	Institute for Water Resources, U.S. Army Corps of Engineers	Group I	W.Europe, N.America
Mr. Maciej Zalewski	Director	International Centre for Ecology Polish Academy of Sciences	Group II	E.Europe, Russia
Mr. Carlos E. Tucci	Professor	Federal University of Rio Grande do Sul	Group III	Central America, Caribbean
Mr. Muhammad A. Kahlowan	Chairman	Pakistan Council of Research in Water Resources	Group IV	Asia, Oceania
Mr. Abou Amani	Senior Researcher	Scientific coordinator of Agrhyment Regional Centre	Group V	Africa
Mr. Anwar G. H. Jiries	Professor of Hydrogeology and Environmental Sciences, Director of The Water and Environment Research Center (WERC), Mu'tah University		Group VI	Arab
Mr. András Szöllösi-Nagy	Director	Water Sciences Division, UNESCO		
Mr. Avinash C. Tyagi	Director	Department of Hydrology and Water Resources, WMO		
Mr. Salvano Briceno	Director	UN/ISDR		
Mr. Hans van Ginkel	Rector	United Nations University (UNU)		
Mr. Richard A. Meganck	Director	UNESCO-IHE Institute for Water Education		
Mr. Atsushi Hatanaka	Deputy Director	JICA		
Mr. Hiroaki Taniguchi	Vice-Minister for Engineering Affairs	MLIT		
<b>2nd ICHARM Advisory Board Members</b>				
Mr. Eugene Z. Stakhiv	Executive Director	Institute for Water Resources (IWR), U.S. Army Corps of Engineers	Group I	USA
Mr. Maciej Zalewski	Director	The European Regional Centre for Ecohydrology u/a UNESCO	Group II	Poland
Mr. Carlos EDUARDO Tucci	Professor	Federal University of Rio Grande do Sul	Group III	Brazil
Mr. Keizrul bin Abdullah	Former Director General	The Department of Irrigation and Drainage	Group IV	Malaysia
Mr. Mohamed-Bahaa Eldin Ahmed Mohamed Saad	Emeritus Professor	Hydraulics Research Institute, National Water Research Center	Group V	Egypt
Mr. Francis Musyoka Mutua	Associate Professor	University of Nairobi	Group VI	Kenya
Mr. András Szöllösi-Nagy	Representative of the Director General	UNESCO		
Mr. Avinash C. Tyagi	Director	Climate and Water Department, WMO		
Mr. Konrad Ostervalder	Rector	United Nations University		
Mr. Salvano Briceno	Director	UN/ISDR		
Mr. Richard A. Meganck	Rector	UNESCO-IHE Institute for Water Education		
Mr. Kenzo Ohshima	Senior Vice- President	JICA		
Mr. Hiroaki Taniguchi	Vice-Minister for Engineering Affairs	MLIT		
<b>3rd ICHARM Advisory Board Members</b>				
Mr. Eugene Z. Stakhiv	US Co-Director, IJC Upper Lakes Study, and Technical Director, UNESCO-ICIWaRM Institute for Water Resources		Group I	USA
Mr. Zurab D. Kopaliani	Head	Laboratory for Computation and Forecasting River Channel Changes, State Hydrological Institute (SHI)	Group II	Russia
Mr. Basil Fernandez	Managing Director	Water Resources Authority	Group III	Jamaica
Mr. Keizul bin Abdullah	Former Director General	Department of Irrigation and Drainage, Malaysia	Group IV	Malaysia
Mr. N'Guessan Bi Tozan Michel * Representative of Biémi Jean	Director	Water Resources, Ministry of Environment, Water and Forest	Group V (a)	Cote d'Ivoire
Mr. Mohamed-Bahaa Eldin Ahmed Mohamed Saad	Emeritus Professor	Hydraulics Research Institute, National Water Research Center	Group V (b)	Egypt
Mr. Avinash C. Tyagi	Director	Climate and Water Department, WMO		
Mr. Kenyu Koumura	Vice Minister for Engineering Affairs	MLIT		
Mr. Konrad Osterwalder	Rector	United Nations University (UNU)		
Mr. Noriaki Nagatomo * Representative of the Vice President, JICA	Senior Advisor to Director General	Global Environmental Department, JICA		
Mr. Salvano Briceno	Director	UN/ISDR		

Name	Position	Affiliation	IHP Category	
Mr. Siegfried Demuth * Representative of the Director General, UNESCO	Chief	Hydrological Processes and Climate Section, Division of Water Sciences, Natural Sciences Sector, UNESCO		
Mr. Stefan Uhlenbrook * Representative of the Rector, UNESCO-IHE	Professor, Hydrology and Water Resources, UNESCO-IHE Professor, Hydrology, Delft University of Technology			



1st ICHARM Advisory Board Meeting  
(September 15, 2006)



2nd ICHARM Advisory Board Meeting  
(October 1, 2008)



3rd ICHARM Advisory Board Meeting  
(September 29, 2010)



## ICHARM Governing Board members

Name	Position	Affiliation	In place of:
<b>1st ICHARM Governing Board Members</b>			
Takashi Shiraishi	President	GRIPS	
Johannes Cullmann	Chairperson	International Hydrological Programme (IHP) Intergovernmental Council	
Margareta Wahlström	Special Representative	The Secretary-General for Disaster Risk Reduction (ISDR)	
Masami Fuwa	Director General	Global Environment Department, JICA	Mr. Akihiko Tanaka, President, JICA
Toshiyuki Adachi	Vice Minister for Engineering Affairs	MLIT	
Taketo Uomoto	Chief Executive	PWRI	
Blanca Jimenez- Cisneros	Director	Division of Water Science, UNESCO	Ms. Irina Bokova, Director-General, UNESCO
<b>2nd ICHARM Governing Board Members</b>			
Shoichi Ando	Professor	Disaster Management Policy Program, GRIPS	Dr. Takashi Shiraishi, President, GRIPS
Korenfeld Federman	Chairperson	International Hydrological Programme (IHP) Intergovernmental Council	
Yuki Matsuoka	Head	The UNISDR Japan Liaison Office	Mr. Robert Glasser, Special Representative of the Secretary-General for Disaster Risk Reduction (ISDR)
Kunihiro Yamauchi	Director General	Global Environment Department, JICA	Mr. Shinichi Kitaoka, President, JICA
Koji Ikeuchi	Vice Minister for Engineering Affairs	MLIT	
Taketo Uomoto	President	PWRI	
Shahbaz Khan	Director	UNESCO Regional Science Bureau for Asia and the Pacific	Ms. Irina Bokova, Director-General, UNESCO



1st ICHARM Governing Board Meeting  
(February 25, 2014)



2nd ICHARM Governing Board Meeting  
(March 3, 2016)

## A-11 List of MoUs with organizations

.....	MoU currently in effect
.....	MoU already expired

NO.	Title	Country	Organization	Date	Termination date	Extention
1	MEMORANDUM OF UNDERSTANDING BETWEEN THE INSTITUTE FOR WATER RESOURCES(IWR) AND THE INTERNATIONAL CENTRE FOR WATER HAZARD AND RISK MANAGEMENT(ICHARM)	U.S.A.	THE INSTITUTE FOR WATER RESOURCES(IWR)	2006/7/3	Not stated	
2	MEMORANDUM OF UNDERSTANDING BETWEEN THE PUBLIC WORKS RESEARCH INSTITUTE OF JAPAN AND THE UNITED NATIONS UNIVERSITY	INTERNATIONAL ORGANIZATOIN	UNITED NATIONS UNIVERSITY	2006/8/22	2011/8/21	
3	Amendment 1 to the Implementing arrangement concerning research cooperation in the field of watershed and river system management(Extension)	U.S.A.	Bureau of Reclamation of the Department of the Interior of the United States of America	2007/6/20	2012/6/19	
4	Memorandum of Understanding	Netherlands	UNESCO-IHE Institute for Water Education(UNESCO-IHE)	2008/6/9	2013/6/8	Renewed on 2014/5/23
5	MOU: Comprehensive cooperation	Iran	Regional Centre on Urban Water Management(RCUWM-TEHRAN)	2008/6/9	Effective for the period of IHP-VII. Renewable by the mutual agreement in writing of both parties	Renewed on 2014/9/1
6	MOU: Cooperation in the field of water-related disaster mitigation	Philippines	Flood Control and Sabo Engineering Center(FCSEC)	2008/7/21	2013/7/20	
7	MOU: Yamanashi University	Japan	2009 Comprehensive Water-related Disaster Management in Developing Countries	2009/3/27	2014/3/31 Automatically renewed every 3 years unless one of the parites gives a notice of the intention to terminate the agreement	
8	Memorandum of Understanding	CHINA	International Research and Training Center on Erosion and Sedimentaentation(IRTCES)	2009/9/18	Effective for the period of IHP-VII. Renewable by the mutual agreement in writing of both parties	
9	Preliminary Memorandum of Understanding	Brazil	HydroEx (Institute for Applied Water Science)	2010/5/25	Not stated	
10	Memorandum of Understanding	Indonesia	Tsunami and Disaster Mitigation Research Center (TDMRC)- SYIAH KUALA UNIVERSITY	2010/6/21	2015/6/20	
11	General Memorandum for Academic Cooperation and Exchange	Japan	Kyoto University	2010/1/25	2015/1/24	Renewed on 2015/6/24
12	Support to the Mekong River Commission to develop flood vulnerability indices (FVIs) in the Lower Mekong Basin under the ADB RETA-7276 by the ICHARM	INTERNATIONAL ORGANIZATOIN	Mekong River Commission (MRC)	2010/9/3	Not stated (only effective for the period of ADB RETA-7276?)	
13	Agreement of research on analysis and practical use of Earth observation satellite data for water-related disaster forecasting	Japan	Japan Aerospace Exploration Agency Infrastrucure Development Institute	2011/9/1	2015/3/31 Automatically renewed every year unless one of the parites gives a notice of the intention to terminate the agreement	
14	General Memorandum for Academic Cooperation and Exchange	Indonesia	Faculty of Engineering, Universitas Gadjah Mada (UGM)	2011/9/21	2016/9/20	
15	Memorandum of Understanding on Research Exchange and Technical Cooperation	Iran	The Iran water and power resources development company(IWPC), Ministry of Energy, Tehran, I.R.IRAN	2013/4/12	2018/4/11	
16	Memorandum of Understanding (MoU) between ICHARM, CERI and SHI	Russia	State Hydrological Institute (SHI)	2013/8/5	2018/8/4	
17	Agreement on the implementation of the collaborative doctoral program on disaster management	Japan	National Graduate Institute for Policy Studies	2014/2/25	2018/2/24	
18	MOU: Collaboration in research and capacity building in the fields of water hazard and risk management in the context of climate change	Netherlands	UNESCO-IHE Institute for Water Education(UNESCO-IHE)	2014/5/23	2019/5/22	
19	Memorandum of Understanding on Research Exchange and Technical Cooperation	Iran	Regional Centre on Urban Water Management(RCUWM-TEHRAN)	2014/9/1	2019/8/31	
20	General Memorandum for Academic Cooperation and Exchange	Japan	Disaster Prevention Research Institute (DPRI), Kyoto University	2015/6/24	2020/6/23	
21	Memorandum of Understandings	Philippines	National mapping and Resource Information Authority (NAMRIA)	2015/10/28	2017/3/31	
22	Agreement on the promotion of collaboration and cooperation	Japan	Research Center for Reinforcement of Resilient Function, National Research Institute for Earth Science and Disaster Resilience	2015/12/16	2018/3/31	



## A-12 Mission of ICHARM and long-term programs

### 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.

### Long-term programs (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 2 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.

# A-13 Brochures and newsletters

## Brochures






<p>2004</p>	<p>2005</p>	<p>2006</p>	<p>2007</p>
<p>2009</p>	<p>2012</p>	<p>2014</p>	<p>2017</p>

## Newsletters

<p>Newsletter from the Secretariat for Preparatory Activities of UNESCO-PWRI Centre</p>	<p>ICHARM Newsletter</p>			
<p>No.1 (September 2004)</p>	<p>No.1 (March 2006)</p>	<p>No.12 (April 2009)</p>	<p>No.23 (January 2012)</p>	<p>No.34 (October 2014)</p>
No.2 (November 2004)	No.2 (August 2006)	No.13 (July 2009)	No.24 (April 2012)	No.35 (January 2015)
No.3 (January 2005)	No.3 (December 2006)	No.14 (October 2009)	No.25 (July 2012)	No.36 (April 2015)
No.4 (March 2005)	No.4 (March 2007)	No.15 (January 2010)	No.26 (October 2012)	No.37 (July 2015)
No.5 (May 2005)	No.5 (July 2007)	No.16 (April 2010)	No.27 (January 2013)	No.38 (October 2015)
No.6 (July 2005)	No.6 (October 2007)	No.17 (July 2010)	No.28 (April 2013)	No.39 (January 2016)
No.7 (October 2005)	No.7 (January 2008)	No.18 (October 2010)	No.29 (July 2013)	No.40 (April 2016)
No.8 (January 2006)	No.8 (April 2008)	No.19 (January 2011)	No.30 (October 2013)	No.41 (July 2016)
	No.9 (August 2008)	No.20 (April 2011)	No.31 (January 2014)	No.42 (October 2016)
	No.10 (November 2008)	No.21 (July 2011)	No.32 (April 2014)	No.43 (January 2017)
	No.11 (January 2009)	No.22 (November 2011)	No.33 (July 2014)	



# A-14 Chronological summary of main events

		Year number since 2006	1	2	3	4
		Fiscal Year	2006	2007	2008	2009
Staff size at the start of every April			15	22	28	31
Budget (Million Yen)			352.3	394.4	349.1	380.0
Major events of ICHARM			2006,3.6 Establishment (1st Director: Dr. Kuniyoshi Takeuchi)		Assigned as Asia-Pacific Water Forum Knowledge Hubs	
Major international events				1st Asia Pacific Water Forum	5th World Water Forum	
Advisory Board (AB) / Governing Board (GB)			1st Advisory Board Meeting		2nd Advisory Board Meeting	
Events hosted by ICHARM			ICHARM Inauguration Commemorative Symposium	ICHARM Quick Report	ICHARM International Symposium	ICHARM Quick Report
Research	MEXT funded KAKUSHIN Program					
	MEXT funded SOSEI Program					
	Major research output				- IFAS ver.1 release - Turn-over ceremony and Seminar on Debris-flow Countermeasures by ADB fund	Contribution to WWAP3
	Others	SATREPS, ISO/TC113				
Training	Ph.D. Course (Num. of Graduate/Enrollee)					
	M.Sc. Course (Num. of enrollee)			11	9	13
	Short training course (Num. of participants)	Flood Hazard Mapping	16	20	10	
		Local Emergency Operation Plan With Flood Hazard Map				10
		Capacity development for Adaptation to Climate Change				
		Capacity Development for Flood Risk Management with IFAS				
	Follow-up activity for ex-trainees		Kula Lumpur, Malaysia	Guangzhou, China	Manila, Philippines	
	IFAS local seminar/training			31	83	89
	Others				- ISDR Tsunami training course (11 participants) - Training workshop for the validation of the Global Flood Alert System (GFAS) (7 participants)	
Information networking	Typhoon Committee					
	International Flood Initiative (IFI)					
	Sentinel Asia					
Local practices	ADB TA7276: Supporting Investment in Water-Related Disaster Management					
	ADB TA8456: Transformation of Urban Management					
	UNESCO "Strategic strengthening of Flood Warning and anagement Capacity"	1st phase				
	UNESCO "Strategic strengthening of Flood Warning and anagement Capacity"	2nd phase				
	IFAS application to local places			(IFAS ver.1 release)	Application to Solo River basin in Indoensia	
	RRI application to local places					
Awards						- Director Takeuchi awarded the 2008 International Contribution Award by the Japan Society of Civil Engineers (JSCE)

5	6	7	8	9	10	11
2010	2011	2012	2013	2014	2015	2016
28	39	47	46	51	52	50
393.5	445.9	474.4	462.5	481.3	470.4	
			2013.7.23 Renewal of Agreement between GoJ and UNESCO	2nd Director: Dr. Toshio Koike		
5th Conference of the Asian Pacific Association of Hydrology and Water Resources (APHW)	6th World Water Forum	UN special high-level session on water and disasters (2013.3.6)	2nd Asia Pacific Water Forum	3rd UN World Conference on Disaster Risk Reduction	- 7th World Water Forum - UN special high-level session on water and disasters ) - 2016 AWCS	
3rd Advisory Board Meeting			1st Governing Board Meeting		2nd Governing Board Meeting	
ICHARM International Symposium	ICFM5			ICHARM International Symposium		
	Workshop "The effect of climate change in lower West Rapti river basin"					
Controbution to AWDO2010	- Quick response-type simulations in Chao Phraya River basin by RRI model - Development of FDP1		Controbution to AWDO2013		Community-level Evidence-Based Flood Contingency Planning in the Philippines	RRI with GUI release
( /1)	( /3)	( /2)	(1/3)	(1/2)	(2/2)	
12	19	12	12	13	13	
12	11					
	7					
		20	16	20	20	
Hanoi, Viet Nam	Bangkok, Thailand	Dhaka, Bangladesh	Kuala Lumpur, Malaysia	Jakarta, Indonesia	Tokyo, Japan	
147	173	156	82	133	105	
		Workshop for "2012 Capacity Development for Integrated Flood Risk Management in Pakistan"	Workshop "2013 Capacity Development for Integrated Flood Risk Management in Pakistan"		International summer program with Tokyo University	
		(IFAS ver.2 release)	Introduction of Auto IFAS / in Cagayan River in the Philippines / in Pakistan (by PMD)	Introduction of Auto IFAS in Kelantan and Dungun River in Malaysia		
	(RRI developed) Application to Chao Phraya River basin		Introduction of RRI in JICA Project	Introduction in the Lower area of Indus River (by PMD)	Application to Myammar (by ADB fund)	(RRI with GUI release)
		- ICHARM Director Takeuchi awarded the International Hydrology Prize - ICHARM Research Team awarded the Best Research Exchange Award in the 2013 SAT Technology Showcase	- ICHARM Researcher Sayama awarded the 2013 Young Scientists' Prize by MEXT Minister - RRI Model awarded the 15th Infrastructure Technology Development Award 2013 - Research Specialist Kamimera awarded by a Vietnamese Ministry	- ICHARM Researchers Sayama awarded the Best Paper Award by JSCE - ICHARM Researcher Yorozuya awarded 16th Infrastructure Technology Development Award and PWRI Chief Executive Award	- ICHARM awarded outstanding award at Water showcas, 7th World Water Forum - ICHARM Director Toshio Koike awarded the Science Award - ICHARM Researcher Ohara awarded the best paper award by ISSS - ICHARM's risk management team awarded with a certificate of appreciation from Philippines Calumpit Mayor	- Advisor Kuniyoshi Takeuchi awarded the certificate of appreciation by the Jakarta Office of the UNESCO IHP - Advisor Kuniyoshi Takeuchi awarded the UNESCO-IHP RSC-SEAP Award



**Editors' note:**

We are pleased to have this 10th anniversary publication completed just before the 11th anniversary. We thank all the contributors for your valuable inputs.

The publication of this anniversary volume aims to keep precious records of ICHARM activities we have had so far as much and accurately as possible and express our sincere thanks to all the supporters for the past decade. At the same time, we wish to present the current activities and enthusiasm of ICHARM to all who share the common objectives with us and to ask for continuous support for the next decade. We hope our wishes reach the readers.

The editorial process was not easy. The substantive editorial work started late July 2016 and took much time to make sure that all the important records were included. Still, many missing parts were found only after the final shape of the publication emerged in January 2017 and had to bother quite many people with late requests. We thank you for your cooperation.

Many staff contributed to the editorial process. To mention just a few, Yoko Hagiwara served as the main engine and information clearance during the most difficult stage of the first three months till unfortunately she had to leave ICHARM as her contract came to an end. Daisuke Kuribayashi, as the longest witness of ICHARM, was the key person throughout the editorial process, collecting and checking all records and controlling the quality of all materials. Shigeyuki Senda assembled all collected materials into a single volume and rearranged them over and over to the final form. Masahiko Okubo checked and edited English translation and did the final polishing of all texts. Hitoshi Umino took care of column arrangements and internal organizational logistics. Yoshio Tokunaga made all the administrative arrangements. Needless to say, the publication was never possible without enormous support of all ICHARM members, for which we express our deepest gratitude.

Recalling decadal activities of ICHARM, the editorial staff were indeed overwhelmed by the great change and development that ICHARM has made since its start and a countless number of people who worked together. It is the human network and fusion of wills that make any difficult challenges successful. We all hope that the next decade will be even more productive in the cooperation that can make our wishes come true.

(kt)

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