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ICHARM Action Plan for 2008-2010

January 2009



United Nations
Educational, Scientific and
Cultural Organization



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

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

Action Plan 2008-2010

January 2009

This plan was prepared for the coming two years' ICHARM activities, taking valuable advice and comments from the ICHARM Advisory Board members at the second Advisory Board meeting on October 1, 2008. The contents of the plan may be reviewed and modified in accordance with the progress of the activities and/or change of surrounding social and economic conditions.

Acronyms and Abbreviations

ADB	Asian Development Bank
ADRC	Asia Disaster Reduction Center
AGCM	Atmospheric General Circulation Model
AGU	American Geophysical Union
AOGS	Asia Oceania Geosciences Society
APHW	Asia Pacific Association of Hydrology and Water Resources
APRSAF	Asia Pacific Regional Space Agency Forum
APFM	Associated Programme for Flood Management
APWF	Asia-Pacific Water Forum
APWS	Asia-Pacific Water Summit
ASCE	American Society of Civil Engineers
AWCI	Asia Water Cycle Initiative
CIWHR	China Institute of Water and Hydropower Research
COE	Centre of Excellence
EGU	European Geosciences Union
ERCE	European Regional Centre for Ecohydrology
ESCAP	UN Economic and Social Commission for Asia and the Pacific
FCSEC	Flood Control and Sabo Engineering Center under the Philippine Department of Public Works and Highways
GEF	Global Environment Facilities
GEOSS	Global Earth Observation System of Systems
GFAS	Global Flood Alert System
HEC	Hydrologic Engineering Center of US Corps of Engineers
HTC	Regional Humid Tropics Hydrology and Water Resources Centre for Southeast Asia and the Pacific (Kuala Lumpur, Malaysia)
IAHR	International Association for the History of Religions
IAHS	International Association of Hydrological Sciences
IAHS/PUB	IAHS Prediction in Ungauged Basin
ICIMOD	International Center for Integrated Mountain Development
ICSU	International Council on Sciences
ICWaRM	International Center for Integrated Water Resources Management
IDB	Islamic Development Bank
IDI	International Development Institute

IFI	International Flood Initiative
IFAS	Integrated Flood Analysis System
IFNet	International Flood Network
IRDR	Integrated Research on Disaster Risk
IRTCES	International Research and Training Centre on Erosion and Sedimentation
ISDR	International Strategy for Disaster Reduction
ISO/TC	International Organization for Standardization/Technical Committee
ITC	International Institute for Geo-Information Science and Earth Observation
IUGG	International Union of Geodesy and Geophysics
IWHR	China Institute of Water Resources and Hydropower Research -
IWR	Institute for Water Resources of US Army Corps of Engineers
JAXA	Japan Aerospace Exploration Agency
JCTC	Japan Construction Training Center
JICA	Japan International Cooperation Agency
JSCE	Japan Society of Civil Engineers
JWF	Japan Water Forum
KICT	Korea Institute of Construction Technology
K-water	Korea Water Resources Corporation
MEXT	Ministry of Education, Culture, Sports, Science and Technology (Japan)
MLIT	Ministry of Land, Infrastructure, Transport and Tourism (Japan)
MRC	Mekong River Commission
NARBO	Network of Asian River Basin Organizations
NDRI	Nepal Development Research Institute
NGO	Non Governmental Organization
NILIM	National Institute for Land and Infrastructure Management (MLIT)
PDA	Pilot and Demonstration Activity (ADB)
RCUWM	Regional Center on Urban Water Management, Tehran
RFMMC	Regional Flood Management and Mitigation Center
SFDH	Office of State Flood Control and Drought Relief Headquarter, China
TC	Typhoon Committee
UCD	University of California at Davis
UN	United Nations

UNESCO-IHE	UNESCO - Institute for Water Education
UNESCO-IHP	UNESCO - Int'l Hydrological Programme
UNSGAB	United Nations Secretary General Advisory Board
UNU	United Nations University
USACE	United States Army Corps of Engineers
USBR	US Bureau of Reclamation
USGS	US Geological Survey
WB	World Bank
WEP	Water and Energy Transfer Processes
WMO	World Meteorological Organization
WWAP	World Water Assessment Programme
WWDR2 /	Second / Third World Water Development Report
WWDR3	
WWF	World Water Forum

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FORWARD

The International Centre for Water Hazard and Risk Management (ICHARM) was established as an integral part of the Public Works Research Institute (PWRI) on 6 March 2006 under the auspices of UNESCO in cooperation with the Ministry of Land, Infrastructure, Transport and Tourism (MLITT), the Ministry of Foreign Affairs (MOFA), the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and other related organizations. For the past two and a half years after the official launch, ICHARM has actively involved in research, training and information networking activities in a combined manner, which include local studies to promote an appropriate flood-risk management cycle, the development of a satellite-based flood forecasting system, research on flood risk assessment and adaptation strategies to cope with possible global climate changes, and various training courses such as the one-year Master's course on water-related risk management. As a result, I understand that the name of ICHARM with its logo mark has gradually been recognized internationally.

PWRI, which was established in September 1922 and relocated from Tokyo to Tsukuba 30 years ago, has been engaged in multifaceted research activities to prevent and mitigate water-related disasters, such as floods, droughts and landslides. Based on this long-accumulated experience and knowledge, I hope that PWRI, through the activities of ICHARM, will make a substantial contribution to the international society in the prevention and mitigation of water-related disasters across the world.

As the Chief Executive of PWRI, I heartily expect the steady progress of ICHARM activities to achieve its mission and would like to ask experts and organizations worldwide to provide continuous support for the centre.



Tadahiko SAKAMOTO

Chief Executive

Public Works Research Institute

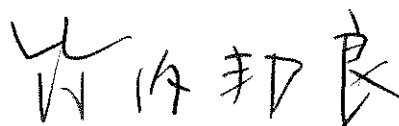
PREFACE

It is my great pleasure to present our second biennial action plan for 2008-2010.

Based upon the initial achievements accomplished in the first two and a half years since the foundation, ICHARM will take another step forward to strengthen the organizational structure and develop substantive activities. The first biennium was tough for us setting up organizational and personnel foundations and starting up key activities. Thanks to a great deal of worldwide support from organizations and individuals, we believe that the centre has so far achieved quite satisfactory results during this initial phase. The next biennium should still be considered part of the initial stage, and the foundation needs to be further strengthened. But at the same time, more visible achievements need to be demonstrated, and outcomes to be delivered to localities that are badly in need of them.

We think that some of the ICHARM programs are now ready for implementation and very promising; for example, an advanced early warning system and local flood risk management planning and training courses including a flood Master's course. We are so happy that ten students successfully completed this flood course and were awarded their Master's degrees in disaster management in September 2008. Also, we are so excited to start collaboration with ADB in the near future, especially on early warning systems and flood risk assessment in Asian nations.

The next biennium will focus on the three priority areas, i.e. advanced technology, local practices and capacity development. We will concentrate our efforts to develop and sophisticate our activities in line with those focuses. To this end, we need even stronger alliance with all related organizations and programs across the world. We need to create and reinforce synergy for effective and efficient implementation and operation of activities through such alliance. We sincerely request your continuous support.



Kuniyoshi TAKEUCHI

Director

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

1. Objective and guiding principles

1.1 Introduction

In the coming two years, climate change adaptation will be accepted by more nations as the principal strategy for national development. Both developing and developed countries will be forced to be geared towards the development and implementation of emergency strategies for water-related disasters. The international community should share the recognition that extreme meteorological events, especially cyclones and torrential rains, will be more intensified and that water-related disasters, including floods, sediment-related disasters and wind storms, will increase in frequency. This naturally increases the obligations of ICHARM in terms of technical assistance, joint research, capacity building, and leadership.

1.2 Guiding principles

To fulfill such international expectations, ICHARM will continue working to strengthen and implement the principal activities of research, training and information networking. The integration of the three pillars – the development and dissemination of “advanced technology”, the practice of “localism,” and the education and training for “capacity development” – should be enhanced to a greater extent. In this context, ICHARM will center its activities around the following four focus areas during the next two years.

1.3 Development and dissemination of a flood forecasting system with local ownership

ICHARM spent the last two years in developing the basic technology for a flood forecasting system. In the next two years, a part of the system will be implemented, and the system improvement spiral will start to work. The system will not be implemented by a top-down approach from developed to developing countries. Rather, ICHARM will aim at a system to enhance local ownership of flood forecasts, which will help localities become more self-supporting and self-leading in early warning operation.

In addition to technical assistance for specific regions, ICHARM is planning to provide worldwide real-time flood monitoring with the help of a Google Earth-type mapping system through the Internet.

1.4 Local practices in collaboration with ADB

Strategies for water-related disaster reduction should be designed based on natural and socio-economic conditions as well as future potential of localities. In this sense, such strategies should be developed in cooperation with local practitioners and policy makers. The ultimate goal of strategy development is to draw up a blue print of sustainable community development, and that should be done according to a specific guiding principle called “localism”. To practice localism in disaster reduction requires risk assessment indices as a guide, which should be developed as soon as possible.

1.5 Enhancement of the flood Master’s course

ICHARM Master’s course for water-related disaster management is the core of its “capacity building” program and should be further developed in terms of lecture, faculty, teaching material, scholarship, and participant-recruiting. Course participants should be recruited from the African and Latin American regions in addition to the Asian region, including Japan.

1.6 ICHARM contribution to IFI as secretariat

ICHARM has been given a chance to work with UNESCO, WMO, ISDR and UNU, IAHS and IAHR as the secretariat of IFI, a framework of collaboration for effective flood management. ICHARM will make a full commitment to this great opportunity and make the utmost effort to maximize the power of this collaboration to meet the urgent need of climate change adaptation. ICHARM is ready, if the IFI members agree, to put priority and work together on the development of flood preparedness indices and bring them up to a global standard.

2. Organization of ICHARM

2.1 Establishment of ICHARM

In September 2004, the IHP Intergovernmental Council (with the participation of 36 council countries and related organizations of the United Nations) adopted the resolution to support the proposal of the Japanese Government to establish ICHARM as a part of the Public Works Research Institute (PWRI). Through this resolution, the establishment of the centre gained a widespread international interest and recognition. In January 2005, the World Conference on Disaster Reduction sponsored by the United Nations was convened in Kobe. At the opening ceremony, then Prime Minister Junichiro Koizumi introduced the plan to establish the centre as Japan's contribution to the international community in the field of disaster prevention.

In October 2005, at the 33rd UNESCO General Conference in Paris, the resolution to approve the proposal was adopted by 191 member countries, which was followed by the agreements between the Japanese government and UNESCO and also between the Public Works Research Institute and UNESCO on 3 March 2006. Three days later, ICHARM was officially established on 6 March 2006.

2.2 Organization of ICHARM

ICHARM has one research group (Water Related Hazard Research Group) and three research teams (International Technical Exchange Team, Disaster Prevention Research Team, and Hydrologic Engineering Research Team). The International Technical Exchange Team is primarily responsible for planning and implementing training programs and follow-up seminars after such programs. The team is also responsible for the overall adjustment of plans for ICHARM's information networking activities. The Disaster Prevention Research Team is responsible for research activities related to risk assessment and management of water-related disasters. The Hydrologic Engineering Research Team is responsible for research activities in the field of hydrological observation, hydrological forecasting and hydrological analysis, which forms the base of the centre's research activities.

ICHARM staff is made up of full-time employees paid by personnel expenditure granted to PWRI by the Japanese government and temporary employees who are employed within a specific research budget in order to promote individual projects. Moreover, an external research employee system with the objective of obtaining advice and instructions from field specialists on specific research themes is also

in place.

2.3 ICHARM Advisory Board

Based on the agreement between the Japanese government and UNESCO (following the Japanese cabinet decision on 3 March 2006), an advisory board has been set up for giving advice to the activities of ICHARM. The advisory board is made up of up to 13 members commissioned by the PWRI Chief Executive, which should include six regional members elected by the Intergovernmental Council of UNESCO-IHP and a representative of the Director General of UNESCO.

The advisory board provides advice on the action plan submitted by the ICHARM Director and also reviews the reports of the centre's various activities. In principle, the board meets biennially. Based on the advice from the advisory board, the PWRI Chief Executive makes the final decision on the action plan and budget of ICHARM.

The second Advisory Board Meeting was held in Tsukuba, Japan, on 1 October 2008. The members of the ICHARM Advisory Board for the second term (2008-2010) are as follows;

- Director General of UNESCO (representative)
- Members elected by the IHP Intergovernmental Council:
 - Group 1 (Western Europe and North America): Mr. Eugene Z. Stakhiv (USA)
 - Group 2 (Eastern Europe and Russia): Mr. Maciej Zalewski (Poland)
 - Group 3 (Latin America and Caribbean): Mr. Carlos Eduardo Tucci (Brazil)
 - Group 4 (Asia and Oceania): Mr. Keizrul bin Abdullah (Malaysia)
 - Group 5a (Africa): Mr. Fransis Mushoka Mutua (Kenya)
 - Group 5b (Arab): Mr. Mohamed Bahaa Eldins Ahmaed Mohamed Saad (Egypt)
- Members appointed by the Chief Executive of PWRI:
 - Secretary General (representative), World Meteorological Organization (WMO)
 - Secretary General, International Strategy for Disaster Reduction (ISDR)
 - Rector, United Nations University (UNU)
 - Rector, UNESCO Institute for Water Education (IHE)
 - Vice President, Japan International Cooperation Agency (JICA)
 - Vice Minister for Technical Affairs, Minister of Land, Infrastructure and Transport

3. Research

ICHARM concentrated its effort on three principal research areas during the past two years – namely, “local studies”, “satellite-based flood forecasting and early warning” and “hazard mapping” (See the Biannual Report for 2006-2008 for the research results). Even though these three areas will continue to be important for ICHARM’s future work, there are many other issues that should be recognized as emerging research areas for water-related disaster management, such as adaptation to global climate change. Apart from climate change, there are still other issues which are globally observed and aggravate local, national, or regional vulnerabilities to disasters, such as increase in slum population and deforestation in river basins. A wise way to translate “advanced technologies” into “local application” needs to be actively sought and found to address those issues.

Against this backdrop, ICHARM will spend the next two years concentrating its effort on the key research areas as described below.

3.1 Local studies

ICHARM has conducted country/region-specific case studies. The centre will continue to make its best effort to obtain funds for this type of studies in the next two-year period. Local studies projects will include summary report publication of the past case studies to share research findings with the international community and to promote methodology development for climate change adaptation planning.

ICHARM has conducted local studies for Bangladesh, Sri Lanka, the Philippines, and Honduras on a country scale and for Hatiya Island of Bangladesh, Infanta City of the Philippines, and Banke District of Nepal (the Nepal study is under the *Kakushin* Project; see 3.5) on a regional scale. In these local studies, ICHARM tried to identify the root causes of past flood disasters through literature research, workshops and interviews with local people or specialists. The studies has found that post-disaster assessment under the Disaster Management Cycle framework can be a very effective tool to assess the root causes of past disasters and consequently the present capacity to cope with a disaster. This type of research is expected to contribute to more accurate assessment of vulnerability and coping capacity (preparedness), and also to identification and recommendation of necessary actions to be taken for future hazards of a similar scale to those in the past. Furthermore, because the methodology used in the local studies can also be applied to capacity development planning and monitoring, it should be compiled and published.

ICHARM has also conducted the Large Floods Report Project. Usually, major policy change in disaster management becomes clear only after a considerable time from the occurrence of the disaster. This project focuses on policy-related lessons from past floods in the world, and plans to cover flood events which occurred during the last two decades.

However, the project has a drawback because the assessment method developed in the project has limited application since it is based on past disaster events. The methodology is inapplicable to climate-change adaptation planning because it is hard to foresee what will happen when a region is hit by a larger-scale hazard than ever. Research effort will be made for assessment methodology development against catastrophic events in conjunction with flood preparedness indices or other tools.

3.2 Development of Flood Preparedness Indices

The Hyogo Framework for Action (HFA) clearly states in its five “Priorities for Actions” that the “formulation of strong institutional basis for implementation” and “strengthening disaster preparedness for effective response at all levels” are urgently necessary. For this purpose, it is essential that a package of internationally recognized indices should be proposed and applied to governments and communities of all scales. Such indices can help them strengthen preparedness for natural hazards and minimize their negative impacts, which will, in turn, quick recovery from a disaster even when they are hit by it. Such indices may need to address rational procedures to make governments and communities prepared for wide-ranged issues, such as warning, information dissemination, evacuation, refugee sheltering, refugee support, recovery, receiving official and volunteer helps, etc.

Indices to be proposed may not be a list of facilities nor equipment to be installed, but rather a list of institutional procedures. Similar activities have been conducted by several researchers and organizations, such as research projects coordinated by UNU-EHS in Indonesia and a questionnaire survey to prefectural governments by the Japan Fire Protection Agency. However ICHARM sees that there are still great challenges on how to organize an effective set of indices that can be commonly applied to local governments and communities in many countries, including the ones with scarce information. ICHARM’s plan is to develop and propose indices which are widely applicable to as many communities as possible, utilizing and coordinating with available cooperative networks, such as the ADB-ICHARM technical collaboration scheme and the International Flood Initiative (IFI). By the end of the next

biannual period, ICHARM hopes that the package of indices will be actually adopted and implemented by many communities in the world.

In order to design a standard disaster preparedness procedure to ensure a positive spiral installed into a community management system, the following principles may have to be taken:

- (1) The procedure should be designed based on the local reality and manageable within the local context and administrative framework. In particular, it should be operational within the socio-economic constraints of the community.
- (2) The procedure should be selected, implemented, checked and revised by the community authorities regularly and have a built-in mechanism for continuous improvement in a positive spiral based on the plan-do-check-action cycle.
- (3) The procedure should be linked to and consistent with the national and regional emergency management scheme. In order to ensure the wide, active linkage, the local procedure should be endorsed by the national and regional administration.
- (4) The procedure should be regularly reviewed and checked internally and externally, and the revising process should be built in.
- (5) The procedure should evolve itself with change in land use, development or installation of new control measures and any other societal conditions.

Budget:

Within ICHARM regular budget

Research Members: Katsuhito Miyake, Ali Chavosian

Activities:

- 1) Collection and study of other countries' disaster preparedness guidelines, if any.
- 2) Extraction/synthesis of knowledge based on which model indices are developed, while practically considering the reality of developing countries such as data availability.
- 3) Proposal of a model set of disaster preparedness indicators.
- 4) Application of the model indicators to selected localities. Collection of feedbacks from the model sites. Proposal of a revised set of indicators. This feedback process will be done several times.
- 5) Proposal of the final set of disaster preparedness indices and extension/training activities for utilization of the proposed guidelines.

Product:

A set of Flood Disaster Preparedness Indices and the Guideline for its application

3.3 Development and dissemination of IFAS

ICHARM spent the last two years developing basic tools for a flood forecasting system for ungauged or poorly-gauged basins. The tools include 1) a new global satellite-based rainfall map product (Real-time GSMaP) and its first-order correction method jointly with JAXA and 2) a software package as a fundamental tool to implement a flood forecasting/warning system called “IFAS”. In the next two years, a part of the system will be implemented, and the system improvement cycle will start. The system will not be implemented by a top-down approach from a developed to developing country. Rather, ICHARM will aim at the system implementation with local ownership to help localities become independent in flood forecasting based on the following five steps:

- i) ICHARM provides an advanced flood analysis model to local practitioners.
- ii) ICHARM provides technical training for the practitioners to learn how to use the model properly.
- iii) Flood forecasting will be possible anywhere in the world, including ungauged basins, using satellite-based globally-available data (rainfall, radiation, topography, land use, etc.).
- iv) The local practitioners will realize that flood forecasting will be improved further in accuracy when local ground data are also used.
- v) ICHARM will aim to complete a forecasting system with local ownership. The system is not designed so that a developed country provides forecasting or warning based on ground data sent by a developing country (a pump-up approach to data acquisition by a developed country).

In addition to technical assistance for specific regions, ICHARM is planning to provide a visual monitor of floods throughout the world in real time on Google Earth-type mapping system.

Budget:

Annual average of JPY 13 million (USD 140,000) for FY 2008-2010

Research Members:

Kazuhiko FUKAMI, Tomonobu Sugiura, Hironori Inomata, Pham Thanh HAI, Jun Magome and Yoshiki Shiraishi

Activities:

- 1) A method will be developed to further improve the accuracy of global satellite-based rainfall data without ground-based data, to validate near-real-time satellite-based rainfall products after the modification of the developed method using ground-based observational databases, and to make the products applicable to flood forecasting.

- 2) IFAS will be upgraded by adding more functions and libraries, such as the utilization of satellite-based rainfall correction methods, numerical weather forecasts, ensemble techniques to quantify the uncertainty of forecasts, combined output interfaces with Google Earth type global mapping system, etc. Such improvement will enable more consistent and more convenient setting-up and calibration of runoff forecast models in various river basins.
- 3) Pilot projects using IFAS should be promoted as a basis of implementing flood forecasting/warning systems in poorly-gauged basins in developing countries. The pilot projects will help ICHARM collect useful feedbacks from users, which will be used to improve the IFAS system.
- 4) The implementation of flood forecasting/warning systems should be promoted through technical training activities provided by ICHARM. The activities should also help developing countries develop the sense of ownership on the system.

Product:

IFAS Ver.2 and its pilot applications for developing countries

Outreach and Further Study:

IFAS will lead to the enhancement of the next-generation GFAS, called GFAS-streamflow. From a technical point of view, data assimilation among satellite-based rainfall, ground-based rainfall and numerical weather forecasts is one of the most challenging subjects. Besides, the research results should be linked with the realization of the GPM Project in near future. The expected outreach will be as follows:

- Contribution to the realization of Hyogo Framework of Action 2005-2015, GEOSS-AWCI and APRSAF-Sentinel Asia
- Contribution to the quick and efficient implementation of flood forecasting and warning systems in areas prone to flood hazards, especially in developing countries

3.4 Research on flood hazard maps for developing countries

ICHARM will continue research on how to prepare, disseminate and utilize flood hazard maps (FHM) in developing countries. Since FHM are produced based on anticipated inundation maps, the research will first study how to prepare inundation maps. There are two ways to acquire information on inundation areas. One is to use past inundation records, and the other is to use inundation analysis. The latter needs accurate topographical data, which are not often available in developing countries. Because of that, ICHARM is now studying the possibility of inundation analysis using satellite-based topographic data. Also, to promote public use of FHM, a guideline for

utilizing FHM has been discussed based on comments and opinions of ex-participants in the FHM training course or water-related disaster management course (Master's course). Further, materials for capacity building as well as awareness raising are scheduled to be prepared.

Budget:

Annual average of JPY 16 million (USD 170,000) for FY 2005-2008

Research members:

Shigenobu Tanaka, Daisuke Kuribayashi, Hideo Yamashita, Rabindra Osti

Product:

A report will be published in FY2008.

Outreach and further study:

- (a) Proposal on how to prepare FHM
- (b) Proposal on how to disseminate and use FHM
- (c) Preparation of educational and awareness-raising materials for disseminating FHM

3.5 Study on the effect of global climate change and adaptation measures

As part of the third phase (FY2006 - 2010) of Japan's Science and Technology Basic Plan, the Ministry of Education, Culture, Sports, Science, and Technology (MEXT) has launched a five-year (FY2007 - 2011) initiative called the Innovative Program of Climate Change Projection for the 21st Century (the *KAKUSHIN* Program), which uses the Earth Simulator (ES) to address emerging research challenges, which is expected to contribute to the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC).

ICHARM is participating in one of the *KAKUSHIN* Program's three major projects, "Extreme Event Projection," lead by the Meteorological Research Institute (MRI). ICHARM is in charge of the "assessment of the impact of climate change on flood disaster risk and its reduction measures over the globe and specific vulnerable areas", in which the following targets are set out for study:

- 1) Global assessment of flood risk changes in 30 years and 100 years.
- 2) Same assessment on a few special vulnerable areas.

In order to pursue these targets, the following sub-subjects are to be studied by the end of FY2011:

- 1) Identification of transformation formula relating MRI-simulated 20km-mesh precipitation/radiation prediction data with real ground observation data.
- 2) Development of a scale-free stream networking method to freely cover the globe

from 90m to 20km grids.

- 3) Application of distributed hydrological and hydraulic models to estimate the change of global-scale flood hazards based on the results from the above two research.
- 4) Development of a methodology to evaluate global-scale flood risk and its change caused by climate change
- 5) Assessment of change in global-scale flood risk based on the above research results.

Budget:

Annual average of JPY 18 million (USD 190,000) for FY2007-2011

Research members:

All researchers of ICHARM

3.6 Research on sustainable tsunami countermeasures for developing countries

ICHARM and the River Engineering Research Team of the Civil Engineering Research Institute for Cold Region have been conducting research on the development of sustainable tsunami countermeasures in developing countries. The River Engineering Research Team has conducted an analysis of tsunami propagation into rivers. The International Technical Exchange Team has conducted research on tsunami countermeasures with coastal forests. The Disaster Prevention Research Team has investigated several model cases of disaster risk assessment of coastal cities. The results of the first two research studies will be used in the assessment of the third study. Because river embankments in developing countries are not high enough in general, the amplification characteristics of tsunami running up in rivers should be taken into account. Also since structural countermeasures are very difficult to implement in developing countries, countermeasures using coastal forests will be very useful.

Budget:

Annual average of JPY 16 million (USD170,000) for FY2006-2010

Research members:

International Technical Exchange Team (Shigenobu Tanaka, Daisuke Kuribayashi, Toshikazu Tokioka, Rabindra Osti, Dinar Insiyanto), Disaster Prevention Research Team (Junichi Yosítani, Tomoyuki Noro), River Engineering Research Team (Yasuyuki Hirai, Hiroyasu Yasuda)

3.7 Development of an automatic flood/sediment discharge observation system

ICHARM and the National Institute for Land and Infrastructure Management (NILIM) have jointly started a research project since May 2008 for the enhancement of

water/sediment discharge observation technology under the direction of the Japanese Ministry of Land, Infrastructure, Transport and Tourism (MLIT). The final target of the project is to provide a practical technique for an automatic flood flow/sediment-discharge observation system. The system is planned to be composed of several observations and measurements using various devices, including 1) flood flow observation with a non-contact current meter, 2) river-bed observation with an echo sounder fixed obliquely downward to a pillar in the river, 3) water-level measurement with a water-level gauge, 4) river-bed and bed-load discharge observation with a Horizontal Acoustic Doppler Current Profiler (H-ADCP), 5) precise flood-flow observation with an Acoustic Doppler Current Profiler (ADCP) to calibrate the system, and 6) sediment-discharge measurement with a sediment sampler. Although this project started concerning domestic river issues in Japan, major technological results will be applicable to many rivers with a greater gradient and sediment load in humid and tectonic regions in the world, such as the Asian-monsoon region.

Budget:

Annual average of JPY 16 million (USD 170,000) for FY 2008-2010

Research Members:

Kazuhiko Fukami, Yuya Kannno, and Atsuhiko Yorozya

Time line:

FY2008: Observation at MLIT field sites and data analysis

FY2009: Observation at MLIT field sites and data analysis

Proposal on the methodology to utilize ADCP for flood-flow observation

FY2010: Observation at MLIT field sites and data analysis

Proposal on the flood-flow monitoring system using non-contact current meters and echo-sounders

Activities:

Flow/sediment discharge measurements will be conducted at several selected observation sites, where fixed-type instruments, such as non-contact current meters, have already been installed. At those observation sites, flood flow measurements will be conducted every flood season. For calibration purposes, special observation teams will conduct flow/sediment discharge observations using mobile-type instruments (ADCP etc.) during major flood events. On the basis of such field observational data, a flood flow/sediment monitoring system using non-contact current meters and echo-sounders will be proposed with its expected range of accuracy.

3.8 Research on water- and material- cycle modelling to support basin-wide integrated water resources management

With the increasing concerns over scarcity of freshwater resources and highly variable hydrologic conditions worldwide, integrated water resources management is needed to conserve and restore healthy hydrologic and material cycles, especially in rapidly changing urban environments. For such basin-wide management, it is indispensable for us to grasp and diagnose the entire system of water and material cycles in a river basin, including the effect of natural and human-induced impacts, such as urbanization, agriculture and other social and economic activities.

From the perspective above, ICHARM has started to improve the physically-based, distributed-parameter WEP (Water and Energy transfer Processes) hydrologic model, jointly developed by Professor Yangwen Jia (former PWRI staff and presently at IWHR) and the Japan Science and Technology Agency (JST), through incorporating different phases of nutrient dynamics and sediment erosion components while promoting model applications at the local level through its local study series and at the international level through various research collaborations with IWHR (China), KICT (Korea), etc., expanding the knowledge-base vital for the development of integrated river basin management perspectives and guidelines.

Budget:

Annual average of JPY 20 million (USD 210,000) for FY 2006-2010

Research Members:

Kazuhiko Fukami, Hironori Inomata, and Hemantha Rajapakse

Activities:

Target areas under local study series:

(a) Yata-gawa River Basin (Ibaraki Prefecture)

- Collection of river- and groundwater quality data and further improvements in the model to improve simulation results for basin-wide inorganic/particulate nitrogen and phosphorus dynamics

- Identification of the best management scenarios for integrated river basin management under ongoing development activities and future changes in land-use pattern

(b) Inba-numa Lake Catchment/Takasaki River Basin (Chiba Prefecture)

- Collection and compilation of GIS/DEM data, land-use, crop production and fertilizer application data

- Collection/compilation of river-, Inba-numa Lake- and subsurface water quality data and characteristics of urban runoff

- Basin-wide simulation to identify changes in hydrologic and material cycles due the impact of recent changes in land-use patterns and ongoing management and restoration approaches
- Evaluation, proposal, and production of guidelines for the best management scenarios for integrated river basin management approaches

Products:

New version of WEP (Water, Energy and Pollutant Processes) model

Future Directions:

- Developing of WEP model as a user-friendly and rigid platform tool for basin-wide water quality assessment and integrated river basin management approaches in rapidly urbanized basins in both industrial and developing countries.
- Tentative applications in other local and international river basins, to enhance knowledge base on diffuse pollution sources and pathways.

Outreach of the study results:

- Contribution to identification and early recognition of impending water quality issues in rapidly urbanized river basins in industrial as well as developing countries.
- Contribution to evaluation of the best management options for integrated river basin management approaches and support for decision making processes at the local and governmental levels.

4. Training

4.1 Introduction: Targets and follow-up activities after training programs

ICHARM has been conducting short- and long-term training courses. The short-term courses include the "Flood Hazard Mapping (FHM) Training Course" and the "River and Dam Engineering Course III". The latter is a 36-year-long training course although it was re-organized in 2008 as the "Comprehensive Management of River and Dam" training course mainly focusing problem-solving capacity.

The long-term course is the "Water-Related Risk Management" training course. It is one of the courses in the "Disaster Management Policy Program" provided by the National Graduate Institute for Policy Studies (GRIPS). This course is a joint program by ICHARM, GRIPS and JICA. All of these training courses are intended for practitioners involved in river management and water resource development (i.e. for those with a certain level of field experience in those areas after graduated from universities). They should also be able to disseminate the results of the training in their home countries. Further, in order to sustain the training and to ensure practical outcomes that extend beyond the span of the training period, the trainees are required to formulate specific local action plans for problems they face at home, such as flood-hazard-map implementation activities, after returning to their home countries. Concerning the Flood Hazard Mapping Training Course, ICHARM has conducted follow-up activities to monitor and supervise the implementation of each ex-trainee's action plan, and find and share solutions to problems they are facing. ICHARM will plan follow-up activities for other training courses.

The FHM Training Course is a five-year program from FY 2004 to 2008. ICHARM and JICA are planning to provide a more effective course from 2009 to develop the capacity of organizations which are responsible for flood disaster mitigation.

In order to facilitate wider knowledge and expertise on flood management and risk assessment of water-related disasters, a distance learning system will be introduced.

4.2 Training course on local disaster management plan with flood hazard map

Background and Outline of the Course:

After 5 years' successful implementation of the Flood Hazard Mapping Training Course, which received 16 trainees/year from 8 countries in East and South-east Asia from FY2004, ICHARM and JICA are planning to evolve it to a new

course entitled the “Local Disaster Management Plan with Flood Hazard Map” from 2009. This course aims to develop the flood disaster management capacity of the target organizations rather than individual capacity. The target organizations of this course will be selected before the first year program.

This prospective course will be a three-year program, aiming to build capacity for strengthening flood preparedness of localities. In each year, people at different levels in an organization of each country will be selected to participate in the program, i.e. those in upper management for the first year, engineers for the second year, and those in upper-middle management for the third year. Further, the course contents will be different in each year to meet the needs of participants at different organizational levels. More specifically, the first-year participants will be policy makers and expected to understand the importance of local disaster management plans, including emergency operation plans, through studying disaster management cases in Japan. They will be asked to nominate the second and third year participants. The second-year participants will acquire how to prepare FHM, and the third year participants will be expected to know how to build local disaster management plans using FHM and flood forecasting. The participants’ organizations will be requested to draw action plans to develop local disaster management plans using FHM and flood forecasting within the following several years. The target countries are Bhutan, Indonesia, Laos, Myanmar, Nepal, Pakistan, Sri Lanka, Tajikistan and Thailand. The number of participants from a target country will be one, two and two for the first, second and third years, respectively. The duration of the course will be three weeks for the first year, six weeks for the second and third years.



Fig.4-1 Target countries for “Local Disaster Management Plan with Flood Hazard Map” training course.

Course objective/outcome:

By the end of the training program, participants are expected to:

- (1) Identifying problems and issues on flood disaster countermeasures (First year)
- (2) Organizing a training plan for the second year on to set the direction for a local disaster management plan and to make a mid-term operation schedule (First year)
- (3) Identifying problems and issues for obtaining data to conduct hydrological and flood analysis (Second year)
- (4) Understanding of the relationship among flood hazard mapping, forecasting/warning systems and an evacuation plan in a local disaster management plan (Third year)
- (5) Developing an outline of the direction for a local disaster management plan and a mid-term operation schedule for a target area (Third year)

Participants are expected to share the knowledge, technology and experience acquired during the training with other governmental engineers and officials engaged in flood or river management after returning to their home countries.

4.3 River and dam Eng. III/comprehensive management of river and dam

Background:

Integrated water resources management, including water resources development, flood control, dam construction planning, and water environment conservation, is an effective approach for sustainable river management. Japan has been grappling with the issue of balancing various priorities of river water management for many years. Consequently, it has been successful in supplying water from river basins to urban and rural areas throughout the year, and, at the same time, reducing water-related disasters – problems that are still major challenges for many developing countries. The River and Dam Engineering Courses have been organized based on the philosophy that water management techniques Japan has developed over years should also be useful for other countries. The objective of this program is to train engineers in such areas as flood control planning, water resources development and river environment by providing them with knowledge and technology on river and dam engineering in Japan. The course has a history of 36 years and covers a wide spectrum of subjects ranging from the history of river and dam administration in Japan to advanced technical trends in river and dam engineering. Every year, around ten trainees from developing countries

across the world participate in the three-month training, which includes lectures, assignments and field trips related to rivers and dams. After completion of the coursework, each participant will work on a specific research theme at research laboratories of ICHARM, the Public Works Research Institute and the National Institute for Land and Infrastructure Management. In 2008, this course was re-organized and shifted its main focus from human-resources capacity building to problem solving. Accordingly, the title of the course was changed to the “Comprehensive Management of River and Dam” course. An improvement was also made on the time allocation of the course contents to give more time for assignments and individual study.

Course Objectives/Outcome:

- (1) Understanding Japan’s river works history and the present legal systems and organizations, including environmental assessment, and recognizing water problems in the participants’ countries.
- (2) Acquiring planning and design skills related to river improvement and water use.
- (3) Acquiring skills for design, construction and management of dams.
- (4) Producing a technical report including an action plan to tackle water problems in the participants’ countries, based on the knowledge and experience gained from the training.

Fig. 4-2 shows countries have participated in River and Dam Engineering Course and participating in Comprehensive Management of River and Dam.



Fig.4-2 Countries participating in RDE and CMRD

4.4 Master’s degree program on flood disaster mitigation

Background:

The number of flood disasters has been increasing during the past decade, and will keep on increasing at a significant rate in the future. Therefore, in order to respond to the global increase in flood vulnerability, the world is in need of a community of experts and professionals with a profound understanding of the emerging risks and a sound theoretical and practical background of water-related disaster risk management to take effective action. With this requirement in mind, ICHARM has launched a one-year Master's degree program in flood management in collaboration with the National Graduate Institute for Policy Studies of Japan. This program is designed to provide trainees from developing countries with the mastery of knowledge and technology on flood-related disasters. A Master's degree in flood disaster mitigation will be granted after the completion of the program.

Outline of the Course:

Since this course focuses on problem solving, the participants not only study the basic knowledge of hydrology and river engineering but also conduct research for their Master's thesis, which will eventually lead to the development of a flood disaster mitigation project. Also, they are expected to share knowledge acquired in this course with colleagues in their organizations.

The program consists of lectures and practical assignments in the first semester. The participants work on a Master's thesis in the individual study, which should include a proposal of flood disaster mitigation measures to cope with actual problems they are facing in their home countries. Field surveys are also included in each semester.

Course Objectives/ Outcome:

- 1) Fundamentals on meteorology, hydrological processes and how to get meteorological data for hydrological analyses.
- 2) Knowledge on hydrological observations, forecasting methods, and techniques for modeling flow, inundation, etc.
- 3) Knowledge on river engineering and river ecology.
- 4) Knowledge and technology related to flood risk evaluation and risk mitigation.
- 5) Research on themes closely related to the professional background of the participants, which should lead to their Master's theses.

After returning to their countries, they are expected to have workshops to share knowledge from the training course with their colleagues, and report the results of the workshops to ICHARM. ICHARM will keep contact with them and their organizations. Follow-up activities will be planned to monitor and supervise the

participants' activities based on their action plans as well as to get feedbacks on the training course. The feedbacks will be reflected in the course organization and contents in the following years.

Target countries are developing countries suffer from flood disasters. In the 2007-2008 course, ten participants from Bangladesh, China, India, Japan and Nepal finished the course successfully and got a master's degree. Nine participants from Bangladesh, China, Ethiopia, Indonesia, Nepal and Thailand were accepted for the 2008-2009 course. The demand for this course will be surveyed for the third year in wider areas, including Africa and Latin America. ICHARM will seek the possibility to increase the number of students by introducing additional financial sources, such as UNESCO Fellowships and ADB Fellowships.

4.5 Other training activities

In addition to the core training activities described above in detail, ICHARM will be involved in many other training activities as a contributing partner, such as:

- Master's course on tsunami disaster prevention conducted by the International Institute of Seismology and Earthquake Engineering of the Building Research Institute of Japan.
- "The JICA Group Training: Disaster Mitigation, Preparedness and Restoration of Infrastructure" implemented by the Japan Construction Training Centre. (ICHARM contributes to this course by providing a four-day course on flood hazard mapping.)

On an irregular basis, ICHARM also offers short-term trainings for JICA trainees of JICA, the World Bank and other programs and projects in such areas as flood management, river and water management, information systems, hydrological observation and water resources management.

4.6 Follow-up activities

In order to make training courses effective, it is important not only to give excellent lectures but also to enhance participants' ability to carry out projects relating to flood damage mitigation. In each training course, participants should make their own action plans for future activities in their organizations. It is also important to ensure that action plans will be implemented as planned. For the FHM training course, ICHARM has held follow-up seminars in Malaysia and China in collaboration with JICA. For new training courses, such as the Comprehensive Management of River and Dam training course and the Master's degree program in flood disaster mitigation, ICHARM plans to

organize the same kind of follow-up activities in cooperation with JICA.

5. Information networking

For the last two-year period, ICHARM has expanded information-networking activities with (1) international organizations and programs, (2) UNESCO Water Centres, (3) the ex-trainees of ICHARM training courses, (4) specific organizations under the MOUs, (5) MLIT affiliates through programs supported by MLIT, and (6) funding agencies through entrusted programs and activities as stated in the Biennial Activities Report 2006-2008.

ICHARM is going to place emphasis on IFI, WWAP, IFNet, the Asia Pacific Water Forum's Knowledge-hub network, and the ICSU Integrated Research on Disaster Risk for the next two years, based on the significance of mutual benefits and impacts.

5.1 IFI

The International Flood Initiative (IFI) is a joint initiative in collaboration with such international organizations as UNESCO (IHP), WMO, UN/ISDR, UNU, IAHS and IAHR. IFI made its official launch in January 2005 at the World Conference on Disaster Reduction (WCDR) in Kobe, Japan. IFI focuses on research, information networking, education and training, community empowerment, technical assistance and guidance.

The first meeting of IFI's Advisory Committee and Management Committee (AC/MC) was held on 26 January 2007 at WMO in Geneva. The IFI draft plan was officially adopted at the meeting, and ICHARM started working as the IFI secretariat.

The 2nd IFI AC/MC meeting was held in Toronto, Canada, taking the opportunity of the International Conference on Flood Defense.

ICHARM as the IFI secretariat will continue the active coordination of IFI-related issues in the next two years. The IFI website (www.ifi-home.info) designed and hosted by ICHARM was launched on 14 July 2008. The IFI website is expected to become an information source on flood-related events worldwide within the next two years with the contribution of the IFI members.

Biannual newsletters are also planned to be published by the IFI secretariat in order to cover the development of IFI-related activities and information of major flood-related events.

The 3rd IFI AC/MC meeting was held at ICHARM on 2 October 2008 immediately after the day of the 2nd Advisory Board Meeting to develop short- and mid-term IFI Action Plans. IFI mapping activities were prepared based on reports submitted by IFI partners. In total, 51 activities were submitted to the IFI secretariat at ICHARM by UNESCO, WMO, UN/ISDR, UNU, IAHS, IAHR, ICLR and ICHARM. This mapping activity exercise was used to identify the overlaps and gaps of the IFI's

current activities. This helped the IFI partners to propose more effective and efficient IFI Action Plans. The list of all the submitted activities with brief descriptions was also prepared in a separate Excel file. The original input files and analysis reports are available at: <http://www.ifi-home.info/Login.html>. ICHARM would like to follow a proposed idea of the development of flood preparedness indices and bring them up to a global standard. The centre is ready, if the IFI members agree, to put priority and work together on this indices development under the framework of IFI.

Moreover, the IFI secretariat will make active contribution to the organization of the 5th International Conference on Flood Management planned to be held in 2011 in Tsukuba, Japan.

5.2 IFNet GFAS/IFAS

ICHARM has been in cooperation with IFNet and participated in discussions at the IFNet general meetings held in Kobe (Japan), Mexico City and Beppu (Japan) to help the organization enhance its activities. For example, ICHARM has provided technical assistance to validate GFAS-rainfall data using worldwide in-situ ground-based rainfall data. ICHARM has also proposed a new core technology for IFNet, called GFAS-streamflow, which enables the implementation of flood forecasting systems even in ungauged/poorly-gauged river basins by using IFAS, which ICHARM developed in a joint research project during 2005-2007.

ICHARM will continuously cooperate with IFNet to help the organization enhance its activities, especially GFAS-rainfall and GFAS-streamflow, by providing state-of-the-art key technologies.

5.3 WWAP

The World Water Assessment Programme (WWAP), the collective UN system-wide continuing assessment process building on the achievements of many previous endeavors, focuses on assessing emerging situations as regards freshwater throughout the world. The primary output of WWAP is the periodic World Water Development Report (WWDR). Currently the third edition of WWDR entitled "Water in a Changing World" is under preparation for public release at the fifth World Water Forum in March 2009. The editing process for the forth edition is expected to start immediately after the fifth World Water Forum.

There have been some changes in the editorial policy for the third edition that affects ICHARM's activities:

- The report has been organized in an integrated, rather than thematic, manner under the chapter titles of Introduction, State, Use, Drivers, Response Options, and Recommendations.
- The overall focus of the report is “Climate Change and Water.”
- Some thematic topics will be published as side publications.
- Japan’s case studies are precluded from the third WWDR to give opportunities to countries which had no chance to present their case studies in the previous editions.

In response to the above mentioned changes of overall policy, the following actions are planned:

- ISDR, WMO, UNU, and ICHARM are going to publish a side publication report exclusively on disaster management. ICHARM will serve as the coordinator among these agencies. The planned publication date is September 2009.
- ICHARM will focus on policy and planning related to climate-change adaptation issues as input to the side publication and the fifth WWDR preparation. They include data collection and analysis on adaptation policymaking, planning, and implementation, and technical assistance to developing countries.

As constant contributor to WWAP, the following actions are continued:

- ICHARM will continue updating the “PWRI Risk Index,” which is referred to as “Risk and Policy Assessment Index” introduced in WWDR 2.
- ICHARM will strengthen alliance and data sharing to extend the PWRI Risk Index to build and develop a global flood risk map (outreach: to encourage countries to prioritize investment in water disaster management).
- ICHARM will try to join existing expert groups working on vulnerability and risk assessment such as the UNU-EHS vulnerability assessment panel.
- ICHARM will undertake joint scientific and technical programmes with WWAP partners aiming at defining an action plan to further strengthen the global risk management strategies. The aim of the action plan is to provide a high-level overview of priority areas and various actions related to agencies and institutes’ plans to undertake over the next few years in the field of risk management.
- ICHARM will support investment in data collection, analysis and modeling capacities related to water risk management in the aim of seeking a sturdy framework from which an implementation plan can be developed.

5.4 APWF *knowledge hub* on disaster risk reduction and flood management

As mentioned in the Biennial Activities Report 2006-2008, ICHARM has been appointed

as one of the APWF regional *Knowledge Hubs* (RKH) in charge of disaster risk reduction and flood management for the Asia-Pacific (AP) region. To fulfill its tasks as RKH, the centre has been working with ADB to develop a package of technical assistance under the framework of ADB's Regional Technical Assistance (RETA) scheme. The technical assistance will support the preparation and implementation of flood-management investment projects by providing knowledge and capacity-development services aiming to reduce vulnerability to water-related disasters through in-country and regional assistance.

The following is the outline of the assistance that is expected to be finalized:

- Title of technical assistance: Supporting Investments in Water-related Disaster Management
- Expected project period: 2009-2010 (two years)
- Target countries: Indonesia, India, Bangladesh and Lower Mekong Basin countries (Lao PDR, Cambodia and Vietnam)

The technical assistance is expected to result in (1) a regional index for in-country water-related disaster preparedness and a regional flood alert system; (2) improved flood management strategies and investment projects; (3) demonstration projects to improve flood forecasting and warning, including community-managed flood preparedness and disaster risk management practices; (4) improved capacity in flood management of project executing and implementing agencies in the participating countries; (5) enhanced policy and institutional modules of ICHARM's Master's course program on disaster management; and (6) an organized pool of regional experts for flood management emergency response.

The new technical assistance scheme is waiting for authorization by ADB for implementation, which is expected to be granted within 2009.

Technical assistance projects with ADB are expected to further enhance ICHARM in knowledge and experience in water-related disaster management. Such empowerment will surely help the centre extend its aid to other countries and regions, and thus contribute to water-related disaster risk reduction across the world as the centre of excellence in the field.

5.5 ICSU Integrated Research on Disaster Risk

ICHARM hopes to be actively involved in an expected research plan entitled "Integrated Research on Disaster Risk (IRDR)" led by the International Council on Sciences (ICSU). The plan was approved in October 2008 at the 29th ICSU General Assembly in Maputo,

Mozambique.

IRDR is a program developed by the ICSU Planning Group on Natural and Human-induced Environmental Hazards and Disasters established in 2005 (chaired by Dr. Gordon McBean), and the final report was issued in February 2008. The IUGG (International Union of Geodesy and Geophysics) Commission on Geophysical Hazard and Sustainability (GeoRisk Commission) has been involved in the planning of the program. ICHARM Director Takeuchi is the president of the GeoRisk Commission, and ICHARM Research and Training Advisor Jayawardena is also a member of the Commission. The International Flood Initiative, for which ICHARM acts as the secretariat is also listed in this program. Because of such deep involvement, ICHARM wishes to actively participate in the implementation of the IRDR science plan in cooperation with other universities and institutes.

5.6 Others

ICHARM wishes to work together with many related organizations, programs and individuals and improve visibility in related works, which includes:

- JICA, ADB, IDB, World Bank
- UNESCO water centers: IHE, IRTCES, HTC, RCUWM, ERCE, ICWaRM, etc.
- WMO, UNISDR, USGS, USBR, USACE IWR, IWHR, KICT, K-water, MRC, ICIMOD, ADRC
- NARBO, IFNet, JWF, APWF, TC
- Universities: UNU, UCD, University of Tokyo, Tokyo Institute of Technology, Kyoto University, University of Yamanashi and its Global COE on Evolution of Research and Education on Integrated River Basin Management in Asian Region, etc.

ICHARM will actively participate in various international research activities, workshops, symposia and conferences organized by IAHS, IAHR, IWRA, AOGS, AGU, EGU, APHW, etc. to improve ICHARM's expertise and make its research products widely available. ICHARM continues to contribute for the IAHS/PUB activities by actively participating in joint projects and presenting research results in workshops and other meetings. ICHARM will host the 5th International Conference on Flood Management in 2011 in Tsukuba. This conference is the successor of a symposium previously called the International Symposium on Flood Defense, which were convened in Germany, China, the Netherlands, and Canada before.

ICHARM will further improve its website and newsletters in content and readability. In particular, past and prospective research products of ICHARM will be

made accessible as much as possible for wider use through the website.

6. Closure

ICHARM is determined to strengthen its activities regarding the main principles of “advanced technology”, “local practices” and “capacity development”. We totally commit ourselves to this end. We know that we should not try to be involved in too many agenda. Rather, we have to be selective with clear and focused goals and make the best use of our expertise to achieve tangible results. Such prioritization of agenda is part of our commitment. Expectation to ICHARM is increasing as a result of increasing water-related disasters all over the world. However, we cannot do everything. We continue to focus on flood-related disasters and the three main principles in addition to activities that ICHARM should provide support based on the scope of those focuses.

In order to effectively carry out our plans listed in this Action Plan, we sincerely seek for an alliance with all related organizations, programs and individuals in localities, nations, regions and the world. Working together is our major strategy to combine limited and precious resources together and create synergy for real actions useful to solve real problems. We ask your kind support and cooperation.

Appendices

MOU and other Protocols

13. Memorandum of Understanding between the Special Cooperation Korea Disaster Prevention Association and PWRI (December 2006) ...1
14. Memorandum of Understanding between Regional Centre on Urban Water Management (RCUWM-TEHRAN) and ICHARM (June 2008) ...3
15. Memorandum of Understanding between UNESCO-IHE and ICHARM (June 2008) ...6
16. Memorandum of Understanding between the Flood Control and Sabo Engineering Center (FCSEC) and ICHARM (July 2008) ...10
17. 発展途上国の総合的な水災害管理に関する研究協力の覚書（山梨大学）
(March 2009) ...12

**IMPLEMENTING ARRANGEMENT
BETWEEN
THE INCORPORATED ADMINISTRATIVE AGENCY
PUBLIC WORKS RESEARCH INSTITUTE OF JAPAN
AND
THE SPECIAL CORPORATION
KOREA DISASTER PREVENTION ASSOCIATION
CONCERNING
INFORMATION EXCHANGE IN THE FIELD OF DISASTER**

The Incorporated Administrative Agency Public Works Research Institute of Japan and the Special Corporation Korea Disaster Prevention Association agree to conclude the Arrangement desiring to start information exchange in the field of disaster such as flood and sediment-related disasters.

Article 1

Purpose

The purpose of the Arrangement is to provide the terms of information exchange between the Public Works Research Institute and the Disaster Prevention Association in the field of disaster such as flood and sediment-related disasters.

Article 2

Scope of Information Exchange

The scope of information exchange is in the fields on the following:

1. Information about the field of disaster such as flood and sediment-related disasters.

Article 3

Forms of Information Exchange Activities

The forms of information exchange activities may be as follows:

- a. Exchange of publications
- b. Exchange of information in the field of disaster
- c. Visit to the site in each country

Article 4

Method of Implementation for Information Exchange

The specific methods for implementing information exchange shall be determined on the basis of consent between the two parties.

Article 5
Contact Point

The contact points to implement coordination of activities included in this arrangement are head of Planning and Management Division of Public Works Research Institute and deputy secretary general of Disaster Prevention Association.

Article 6
Miscellaneous

1. Activities under arrangement shall be subject to the applicable laws and regulations of each country and related regulations of each party.
2. This arrangement shall enter into force upon the signature by the representatives of the two parties.
3. The arrangement shall remain in force three years. The term of validity of the arrangement may be extended by mutual written agreement.
4. Any matters that are not mentioned in this arrangement and suggested by either party will be determined on deliberation by two parties.

The parties agree with the above articles. Each party shall keep one of original of arrangement which is signed by delegate of both organizations.

For the
Public Works Research Institute

For the
Disaster Prevention Association

坂本忠彦

朴慶夫

Sakamoto Tadahiko
Chief Executive
Public Works Research Institute
Japan

Park Kyung Boo
President
Disaster Prevention Association
Korea

Date: 2006年12月25日 Date: 2006.12.25



MEMORANDUM OF UNDERSTANDING
BETWEEN



THE INTERNATIONAL CENTRE FOR
WATER HAZARD AND RISK MANAGEMENT (ICHARM)

AND

REGIONAL CENTRE ON URBAN WATER MANAGEMENT (RCUWM-TEHRAN)

The International Centre for Water Hazard and Risk Management (ICHARM) and the Regional Centre on Urban Water Management (RCUWM-TEHRAN) have entered into a Memorandum of Understanding (MOU) to enhance cooperation and collaboration in the field of water hazard and risk management. The MOU was signed on 10/10/2007 by the representatives of the two organizations, who are committed to working together to address the challenges of water hazard and risk management in the region.

**MEMORANDUM OF UNDERSTANDING
BETWEEN**

**THE INTERNATIONAL CENTRE FOR
WATER HAZARD AND RISK MANAGEMENT (ICHARM)**

AND

**REGIONAL CENTRE ON URBAN WATER MANAGEMENT
(RCUWM-TEHRAN)**

Taking into account that the two organizations have a long history of cooperation and collaboration in the field of water hazard and risk management, and that the MOU is a key document for the implementation of the two organizations' joint projects and activities.

Considering that the two organizations have a long history of cooperation and collaboration in the field of water hazard and risk management, and that the MOU is a key document for the implementation of the two organizations' joint projects and activities.

Considering that the two organizations have a long history of cooperation and collaboration in the field of water hazard and risk management, and that the MOU is a key document for the implementation of the two organizations' joint projects and activities.

Therefore, the two organizations have entered into a Memorandum of Understanding (MOU) to enhance cooperation and collaboration in the field of water hazard and risk management.

Article 1

The purpose of this MOU is to enhance cooperation and collaboration between the two organizations in the field of water hazard and risk management, and to promote the implementation of their joint projects and activities.

Article 2

The two organizations have agreed to work together to address the challenges of water hazard and risk management in the region, and to promote the implementation of their joint projects and activities.

Article 3

The two organizations have agreed to work together to address the challenges of water hazard and risk management in the region, and to promote the implementation of their joint projects and activities.



**MEMORANDUM OF UNDERSTANDING
BETWEEN**



**THE INTERNATIONAL CENTRE FOR
WATER HAZARD AND RISK MANAGEMENT (ICHARM)**

AND

REGIONAL CENTRE ON URBAN WATER MANAGEMENT (RCUWM-TEHRAN)

The International Centre for Water Hazard and Risk Management (ICHARM) of the Public Works Research Institute (PWRI-Japan) and Regional Centre on Urban Water Management (RCUWM-Tehran), hereinafter jointly referred to as “the Parties”.

The undersigned, representative of the Parties, in the light of the outcomes of the United Nations Educational, Scientific and Cultural Organization (UNESCO) Category II Centres director’s meeting, held in Delft – The Netherlands, 11 – 12 June 2007:

Considering that both ICHARM and RCUWM-Tehran under the auspices of UNESCO are facing a new future for challenging water resources management issues,

Taking into account that this moment, at the brink of the new future, provides a unique opportunity to explore the possibilities of cooperation between the Parties,

Considering that RCUWM is functioning as a component of network organisation with a number of collaborative entities in the water community,

Considering that ICHARM is an international centre to provide and assist in the implementation of best practicable strategies to localities, nations, regions and the globe to manage the risk of water-related hazards,

Do hereby simultaneously declare the following framework of partnership:

Article I

ICHARM and RCUWM-Tehran will use their best effort to promote the formal co-operation by obtaining the necessary support for envisaged activities.

Article II

The Parties in a concerted effort will try to find moral, technical and financial support for this cooperation from both national governments, other interested states, UNESCO and the international community.

Article III

The partnership generally aims at developing new knowledge, sharing experiences and distributing knowledge and skills for the benefit of the region and other part of the world. The

activities under this co-operation framework will be based on mutual interests, and may include the following:

1. Holding technical workshops/seminars with the cooperation of the Parties about the urban water hazard and risk management and other important constraints and common challenges;
2. Holding training courses by involving the facilities of the Parties at different levels;
3. Defining and implementing studies and applied projects;
4. Dispatching experts and managers of the Parties in order to exchange experiences and to enhance and promote the Parties functions;
5. Establishing links between the Parties WebPages and developing electronic communications such as e-conference, teleconference;
6. Preparing technical and scientific reports in the field of the Parties interests.
7. Cooperating in the execution of seventh phase of International Hydrology Program (IHP-VII).

Article IV

A joint committee will be formed by the Parties' representatives. This Committee will hold its meetings in Iran and Japan or any other mutually agreed country, in order to prepare relevant cooperation programmes.

Article V

This Memorandum shall enter into force on the date of the receipt of the last signature for the period of execution seventh phase of International Hydrology Program (IHP-VII) and may be extended by mutual consent in writing at any time at the request of the Parties.

Article VI

Any cooperative activity undertaken between the Parties shall only be done under the authority of the laws, regulation, and policies governing each party individually.



Farhad YAZDANDOOST
Director, RCUWM-Tehran

9 June 08

DATE



Kuniyoshi TAKEUCHI
Director, ICHARM

9 June 2008

DATE



Memorandum of Understanding

between

the UNESCO-IHE Institute for Water Education (UNESCO-IHE)

Delft, The Netherlands

and

the International Centre for Water Hazard and Risk Management

under the auspices of UNESCO

(ICHARM)

Tsukuba, Japan

on

***Collaboration in research and capacity building
in the fields of water hazard and risk management
in the context of climate change***

Memorandum of Understanding

between

**the UNESCO-IHE Institute for Water Education (UNESCO-IHE)
Delft, The Netherlands**

and

**the International Centre for Water Hazard and Risk Management
under the auspices of UNESCO
(ICHARM)**

Tsukuba, Japan

on

***Collaboration in research and capacity building in the fields of
water hazard and risk management in the context of climate change***

The undersigned, representatives of the UNESCO-IHE Institute for Water Education (UNESCO-IHE) and the International Centre for Water Hazard and Risk Management (ICHARM)

considering that both UNESCO-IHE and ICHARM represent institutions that are dedicated to contribute to the improvement of the water and environmental sector,

considering their good relationship through their respective staff and joint activities,

considering that UNESCO-IHE and ICHARM have for several years cooperated in research and training related to issues of Water and Climate Change,

considering that ICHARM is a research centre with a mission to function as the Centre of Excellence to provide and assist implementation of best practicable strategies to localities, nations, regions, and the globe to manage the risk of water related disasters,

considering that UNESCO-IHE is an Institute for education, training and research with the mission to strengthen capacities of people and institutions in developing countries and countries in transition for the sustainable development of their water and environmental resources,

considering that ICHARM and UNESCO-IHE have complementary expertise in fields related to Floods, Risk Management and Climate Change, and have complementary experience and networks in different regions of the world,

considering that ICHARM and UNESCO-IHE have produced a document called "Proposal for an MoU between ICHARM and UNESCO-IHE", dated January 2008, in which the subjects for cooperation have been explored,

desirous to advance the scientific and human resources development activities in the field of Water and Climate by encouraging direct co-operation between both Partners in the following fields:

- training and capacity building in the field of water and climate,
- research on water hazard and (Flood) Risk Management, especially in the light of Climate Change.

agree to promote the formal co-operation between UNESCO-IHE and ICHARM by obtaining the necessary support for activities of the envisaged partnership,

agree that both Partners, in a concerted effort, will try to find moral and financial support for this co-operation from the national and international community, and

agree that the co-operation will involve education and research and that this education and research will satisfy internationally-accepted quality criteria visualized through the publication of research articles in peer-reviewed journals.

UNESCO-IHE and ICHARM further agree on the following operational elements:

Article 1: Post-Graduate Training and Capacity Building in the field of Water and Climate

- 1.1 On a yearly basis, ICHARM will deliver guest lecturing inputs in the UNESCO-IHE summer course on Water and Climate in the Netherlands.
- 1.2 On a yearly basis, UNESCO-IHE will deliver guest lecturing inputs in the regional course on Flood Hazard Mapping organised and implemented by ICHARM in Japan.
- 1.3 ICHARM and UNESCO-IHE will cooperate in the development of a new e-learning module of the summer course on Water and Climate. This module will be offered for the first time in summer of 2008;
- 1.4 ICHARM and UNESCO-IHE will identify and implement opportunities for conducting joint short courses, workshops and seminars as a means of teaching and training of participants and as capacity building of the training staff;
- 1.5 ICHARM and UNESCO-IHE will develop a proposal for the development of a joint international course on Water and Climate on the basis of a needs assessment carried-out by the Cooperative Programme on Water and Climate (CPWC). They will consider involving other international partners (e.g. WUR, CPWC) in this initiative.
- 1.6 ICHARM and UNESCO-IHE will investigate the feasibility of developing an international Masters' programme on Flood Management.

Article 2: Joint research in the context of Climate Change

- 2.1 UNESCO-IHE and ICHARM will work together on the development of a flood (risk) index or indicator, a flood preparedness indicator or a climate index, to express flood risks and to assess the progress in flood risk reduction from a global perspective. This will include PhD research at UNESCO-IHE on the Flood Vulnerability Index (FVI) in which ICHARM will cooperate.

- 2.2 ICHARM and UNESCO-IHE will identify opportunities for joint research and actively work on joint research proposal in the following fields:
- advanced flood early warning systems;
 - the effect of climate change and effective national adaptation plans for floods and droughts.

Article 3: Implementation of joint activities

- 3.1 Both Partners agree that they will make available the necessary resources to enable their own experts to implement the staff exchange activities mentioned in the Articles 1.1 and 1.2.
- 3.2 Both Partners agree to allocate sufficient time of their staff to implement this MoU. In case this conflicts with other time allocations, this will be discussed between the Partners.
- 3.2 Both Partners agree that for each specific joint activity, both institutions shall prepare and agree upon a document outlining the administrative aspects of the activity.
- 3.3 Both Partners will co-operate under the condition that staff services such as teaching, PhD supervision and research are paid for at fair market prices. For specific projects, financial agreements will be made beforehand.
- 3.4 Both Partners acknowledge that most activities will require external funding. Thereto, ICHARM and UNESCO-IHE agree to jointly develop project proposals and to find support for their joint activities with the relevant funding agencies.

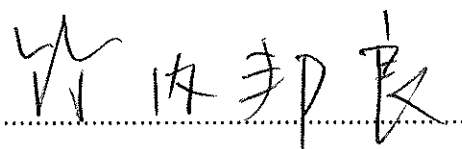
Article 4: Organisation

- 4.1 Both parties will nominate a representative responsible for the coordination of joint activities and the management of this Memorandum of Understanding. These representatives will consult at least once every year and will report the activities under this Agreement to the Management of both Parties. The representative at UNESCO-IHE will be Dr. Frank van der Meulen. The representative at ICHARM will be Mr. Akira Terakawa.
- 4.2 This Memorandum of Understanding will enter into force at the date of signing and has a duration of five years. It will be evaluated in the beginning of the fourth year on both effectiveness and efficiency and on the desirability of renewal.

This Memorandum of Understanding is drawn up in two (2) copies, each being equally valid.

Signed in Paris on June 9, 2008.


.....
for UNESCO-IHE, Delft, The Netherlands:
Prof. Richard A. Meganck, Ph.D.
Rector, UNESCO-IHE


.....
for ICHARM, Tsukuba, Japan:
Dr. Kuniyoshi Takeuchi
Director, ICHARM

MEMORANDUM OF UNDERSTANDING
BETWEEN
THE FLOOD CONTROL AND SABO ENGINEERING CENTER (FCSEC)
AND
THE INTERNATIONAL CENTER FOR WATER HAZARD RISK MANAGEMENT
(ICHARM)

The International Centre for Water Hazard and Risk Management (ICHARM) of the Public Works Research Institute (PWRI) of Japan, under the auspices of the United Nations Educational, Scientific and Cultural Organization (UNESCO), and the Flood Control and Sabo Engineering Center (FCSEC), of the Department Public Works and Highways (DPWH) in the Philippines, hereinafter jointly referred to as “the Parties”:

Having a common interest in water-related disaster mitigation;

Having independent missions with technical activities of multinational interests to promote research, capacity-building and enhance the use of effective water-related disaster management policies:

Recognizing ICHARM’s mission to establish a world-wide Partnership for Water Hazard and Risk Management Program and FCSEC’s parallel mission and interest in contributing to this Partnership;

Designing to promote and enhance social well being, environmental quality, sustainable economic development, public safety, development and the management of flood control, and to promote and encourage systems of safe, economical and environmentally sound flood and storm damage reduction through research and development, capacity building and cooperation; and

Recognizing the mutual cooperation and joint activities consistent with the policies, goals and laws governing each party would be beneficial to each party’s mission for contributing to global society in the field of water-related disaster mitigation management.

Do hereby simultaneously declare the following framework of partnership:

Article I

ICHARM and FCSEC will use their best efforts to establish a long-term cooperation and partnership in the field of water-related disaster management. The parties are especially interested in pursuing cooperative opportunities in the following areas of standards and procedures common interest;

1. Infrastructure development and related engineering design for water-related disasters such as floods, debris flows, landslides, storm surges and tsunamis;
2. Use of new technologies for research applications and;
3. Capacity building and training.

Article II

The Parties shall encourage their respective personnel to pursue mutually beneficial activities to enhance professional development through new knowledge, sharing experiences, and disseminating skills. The activities under this cooperation framework will focus on the:

1. joint research programs;
2. joint training seminars, workshops and symposia;
3. joint development of information networking;
4. exchange of personnel and information; and
5. joint contribution to development of water-related disaster management.

Article III

Each party shall designate a Principal Representative to serve as the primary point of contact between the parties on all matters arising under this Partnership Document.

Article IV

Any cooperative activity undertaken between the parties shall only be done under the authority of the laws, regulations, and policies governing each party individually.

Article V

Notwithstanding any other provision herein, nothing in this partnership document shall be construed as binding under International Law. Further, nothing in this document shall be construed as either authorizing or obligating either party to commit funds or resources to any project or work except as otherwise authorized by the laws, regulations, and policies governing each party individually.

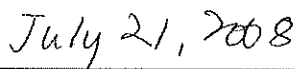
Article VI

This partnership document shall become effective on the date of the receipt of the last signature for a period of five (5) years and may be extended by mutual consent in writing at any time at the request of either Party.

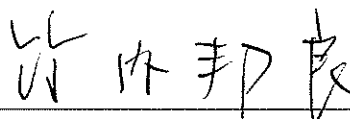


Resito V. David

Director, FCSEC

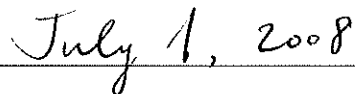


Date



Kuniyoshi Takeuchi

Director, ICHARM



Date

発展途上国流域の総合的な水災害管理 に関する研究協力の覚書



国立大学法人 山梨大学
国際流域環境研究センター
(ICRE)



独立行政法人 土木研究所
水災害・リスクマネジメント国際センター
(ICHARM)

発展途上国流域の総合的な水災害管理に関する研究協力の覚書

山梨大学国際流域環境研究センター（ICRE）（以下、甲という）と土木研究所水災害・リスクマネジメント国際センター（ICHARM）（以下、乙という）は、それぞれのミッションを達成する上で必要な連携・協力を推進するため、以下の通り覚書を締結する。

（目的）

第1条 甲は「国内外における水資源の枯渇、水災害、水環境の悪化、水に起因する病気などの解決に必要な研究、それらを統合して個々の流域の暮らしに密着した水問題解決の処方箋を提供すること」をミッションとし、また乙は「世界の水関連災害を防止、軽減するため、各地域の実態をふまえた的確な戦略を提供し、その実践を支援する国際的な拠点として機能すること」をミッションとしている。本覚書は、それぞれのミッション達成に向けた活動の相乗効果を発揮できるよう、相互の連携・協力を推進することを目的とする。

（連携・協力方法）

第2条 連携・協力の方法は以下の通りとする。

- （1）技術・研究情報の交流に関すること
 - （2）共同研究の企画・実施に関すること
 - （3）人材育成活動に関わる交流に関すること
2. 前項の連携・協力を実施するにあたって必要となる旅費等については、原則として各研究者等の所属する組織が負担するものとする。

（技術・研究情報の交流）

第3条 甲、乙は各々が有する活動成果およびその他有益な技術・研究情報を双方の合意のもとに交流するものとする。

2. 前項による技術・研究情報の交流は、研究会合の開催や研究者の相互訪問によって適宜行うものとする。

（共同研究の実施）

第4条 甲、乙は、特定のテーマについて共同研究を実施する場合は、研究内容、成果の取り扱い、研究機器等の使用、特許等の知的所有権及び研究経費の負担等について個別に協議した上で、別途契約を締結するものとする。

(人材育成活動に関わる交流)

第5条 甲、乙は、それぞれの人材育成プログラムの実施に必要な学生や研究者の相互交流を行うものとする。

(その他)

第6条 本覚書に定める事項について疑義が生じた場合、改定の必要がある場合または本覚書に定めるものの他必要な事項を定める場合は、甲、乙協議の上、処理するものとする。

(有効期限)

第7条 本覚書の有効期間は、両者署名の日から平成24年3月31日までとする。
ただし、期間満了の3ヶ月前までにいずれかより申し出がないときは、同一条件をもってさらに3年間継続するものとし、当該継続期間が満了したときも同様とする。

以上合意した証として、甲、乙の代表者が署名した覚書2通を作成し、甲、乙が各1通を保有する。

平成21年 3月27日

甲 国立大学法人 山梨大学
国際流域環境研究センター (ICRE)
センター長 砂田 憲吾

砂田 憲吾

乙 独立行政法人 土木研究所
水災害・リスクマネジメント国際センター (ICHARM)
センター長 竹内 邦良

竹内 邦良