ICHARM Activity Report

Professor KOIKE Toshio, Executive Director, ICHARM, presented an overview of ICHARM's history since its establishment, its current activities in research, capacity development, and information networking, as well as its future vision, with particular emphasis on adaptation to climate change, an issue that has gained increasing recognition across society over the past two decades. This was followed by a presentation from Professor OHARA Miho, Visiting Researcher at ICHARM (Professor at the University of Tokyo and former Senior Researcher at ICHARM), who proposed directions for ICHARM's activities over the next decade. Her proposal was developed primarily by former ICHARM researchers and early-career researchers. In addition, Professor MIYAMOTO Mamoru, Senior Researcher at ICHARM (Professor (joint-appointment) of GRIPS), reported on the outcomes of discussions with alumni of ICHARM's training programs regarding capacity development activities and presented a future strategy based on those discussions. A summary of these presentations is provided below.

（Professor KOIKE Toshio）

ICHARM was established in 2006 following Japan's proposal at the Third World Water Forum in 2003. Its mission is to reduce water-related disaster risks worldwide by sharing Japan's experiences and integrating advanced research, capacity development, and information networking. Over the past two decades, ICHARM has evolved into a global center of excellence for water-related disaster risk reduction.

Shortly after ICHARM's establishment, the scientific understanding of climate change advanced significantly. In 2007, the IPCC confirmed that global warming was unequivocal and primarily caused by human activities. In 2008, a landmark paper in *Science* declared that "Stationarity is dead," challenging the long-standing assumption that historical hydrological conditions could reliably guide future water management. Since then, the frequency and intensity of floods and storms have increased worldwide, while successive IPCC reports have confirmed that climate change is contributing to more frequent and severe heavy precipitation events.

In response to growing global challenges, three major international frameworks were adopted in 2015: the Sendai Framework for Disaster Risk Reduction, the Sustainable Development Goals (SDGs), and the Paris Agreement. These frameworks recognized that global challenges such as climate change and disaster risk cannot be addressed by individual countries alone and require coordinated international action.

Japan itself has experienced severe flooding almost every year. In response, the government undertook a comprehensive review of flood management policies. Scientific advances played a crucial role in this process. Researchers developed large-scale climate projections and ensemble climate simulations, and the resulting data were made available through the Data Integration and Analysis System (DIAS). Using these data, the Council for Social Infrastructure Development reassessed design rainfall standards and revised infrastructure planning guidelines, incorporating climate change impacts into flood control measures. Additional measures addressing uncertainty, exposure management, and resilience enhancement were also introduced.

These efforts led to the promotion of a new flood management philosophy known as River Basin Disaster Resilience and Sustainability by All**,** which emphasizes collaboration among all stakeholders within a river basin. Legislative reforms and new financial mechanisms were introduced to support implementation. ICHARM considers it an important responsibility not only to contribute to these domestic reforms but also to share Japan's evolving experiences with the international community.

To support disaster risk reduction globally, ICHARM developed atmospheric modeling systems that combine ensemble weather prediction, downscaling techniques, and globally available datasets. These systems can be applied anywhere in the world and are linked with hydrological models to provide real-time flood forecasts. As a result, forecast accuracy for one- to three-day lead times has improved substantially. A notable example was the 2018 Kerala flood in India, where ICHARM's ensemble simulations successfully predicted a rainfall pattern later confirmed by radar observations and associated with severe flooding.

In hydrological modeling, ICHARM developed the Integrated Flood Analysis System (IFAS), a user-friendly tool that has been adopted worldwide. It later introduced the Rainfall-Runoff-Inundation (RRI) model, which incorporates more sophisticated hydrological processes while remaining practical for operational use. The RRI model was successfully applied to the 2011 Chao Phraya River flood in Thailand and contributed to decisions regarding Japan’s support for flood drainage infrastructure.

Building on the RRI framework, ICHARM developed the Water and Energy Budget-based Rainfall-Runoff-Inundation (WEB-RRI) model. This advanced system integrates surface water, soil moisture, groundwater, and energy balance processes, enabling seamless simulation of hydrological conditions ranging from droughts to extreme floods over several decades. The model has become a valuable tool for climate change impact assessment and long-term water resources planning.

ICHARM has also expanded its work to sediment and debris-flow hazards. The Rainfall-Sediment-Runoff (RSR) model simulates sediment transport and debris movement across entire river basins and provides detailed information through two-dimensional and three-dimensional analyses. These tools have been applied to disaster events in Japan and abroad through collaborative research and graduate education programs.

Recognizing that technology alone is insufficient, ICHARM has invested heavily in risk communication and capacity development. It published a collection of 28 flood emergency case studies from across Japan, highlighting critical situations, lessons learned, and practical guidance. During the COVID-19 pandemic, supplementary guidance was developed to support flood emergency management under pandemic conditions. Additional tools, including online disaster management support systems and the Virtual Flood Experience System (VFES), have strengthened public awareness and professional training. VFES enables users to simulate flooding in realistic environments, including digital recreations of their own communities.

Another major achievement has been the development of an integrated information platform that connects climate models, weather forecasts, hydrological systems, satellite observations, agricultural models, and water management infrastructure. Through this framework, ICHARM has effectively established a Water-Food-Energy Nexus monitoring and prediction system, allowing climate and hydrological information to support decision-making in agriculture, energy production, flood management, and drought mitigation.

Capacity development remains a cornerstone of ICHARM’s mission. Supported by JICA, GRIPS, and PWRI, its master’s and doctoral programs have produced 226 graduates from around the world. New courses on Water and Sanitation, Water and Poverty, and Water and Peace have expanded the program's scope, reflecting the need for leaders capable of coordinating across sectors. Alumni engagement is maintained through regular seminars and webinars covering meteorology, hydrology, sediment management, and disaster risk reduction.

At the international level, ICHARM serves as the Secretariat of the UNESCO-supported International Flood Initiative (IFI). It has established the Platform on Water Resilience and Disasters, bringing together experts from multiple sectors to address water-related challenges collaboratively. Activities have expanded across Asia, Africa, and Latin America, including drought monitoring systems in North Africa and flood and drought early warning systems in Kenya, Ghana, and other African countries.

Looking ahead, ICHARM recognizes the need to move beyond a narrow focus on floods and droughts. Under Japan's emerging concept of Integrated River Basin Management for All, attention is being broadened to include water supply, sanitation, food production, energy generation, environmental sustainability, health, education, and economic development. Water-related disasters are closely linked to these sectors through their impacts on vulnerability, exposure, and resilience.

As climate change accelerates and the era of "stationarity" comes to an end, integrated and cross-sectoral approaches are becoming increasingly important. ICHARM believes that future decision-making must incorporate quantified uncertainty, economic impacts, and the interactions between natural, infrastructural, and institutional systems.

For the next 20 years, ICHARM proposes three strategic priorities: (1) building integrated systems that combine scientific knowledge and practical experience across sectors; (2) advancing science capable of quantifying not only direct impacts but also economic spillover effects and hidden societal costs; and (3) strengthening capacity development and the science-policy interface to enable countries and communities to build sustainable resilience independently.

Through these efforts, ICHARM aims to support a more resilient, sustainable, and water-secure world in the face of climate change.

(Professor OHARA Miho)

To develop the future vision for ICHARM toward its 30th anniversary and beyond., ICHARM established a task force composed of current and former researchers who met repeatedly to discuss the organization's future direction. Their recommendations focus on strengthening ICHARM's three core pillars: innovative research, effective capacity development, and efficient information networking.

Regarding innovative research, the task force emphasized the importance of continuing to accumulate and preserve technical knowledge and practical experience, ensuring that these assets are passed on to future generations. As a global knowledge hub, ICHARM should further enhance collaboration among domestic and international institutions to maximize the use of accumulated knowledge and data. The group also highlighted the need to develop and apply emerging technologies, such as artificial intelligence (AI) and extended reality (XR), while improving existing tools to support future disaster risk reduction.

For capacity development, the task force proposed moving beyond the traditional one-way educational model toward a two-way learning community. In this approach, participants would learn not only from Japanese experiences but also from successful practices around the world. Given the increasing challenges posed by climate change, mutual learning across countries and regions is becoming increasingly important. The group also stressed the need to diversify learning opportunities by expanding online and e-learning programs alongside existing master's, doctoral, and internship programs, thereby reaching a broader global audience.

Concerning information networking, the task force emphasized the importance of addressing emerging water-related challenges and sharing knowledge about future risks with the international community. It also highlighted the potential of a "Tsukuba Model," which leverages collaboration among ICHARM, national research institutes, private organizations, and the University of Tsukuba to develop integrated solutions for water-related issues. Finally, the task force recommended that ICHARM strengthen its role as a facilitator, connecting governments, academia, the private sector, and other stakeholders to enhance collaboration and generate greater impact in addressing global water challenges.

(Professor MIYAMOTO Mamoru)
The results of a review of ICHARM's educational programs and alumni engagement activities, focusing on how ICHARM can continue supporting graduates and strengthening its global alumni network was presented.

To date, ICHARM has produced 226 alumni from 41 countries, while 22 students are currently enrolled in its programs. As part of ICHARM's 20th anniversary review, a three-step process was undertaken to identify future directions. First, a SWOT analysis was conducted based on feedback from alumni to clarify the program's strengths, weaknesses, opportunities, and threats. One of the key strengths identified was ICHARM's ability to integrate advanced science and technology with practical knowledge and field experience. In contrast, limited collaboration with industry and practitioners was recognized as a weakness. Alumni highlighted the global alumni network as a major opportunity for international partnerships and collaboration, while a potential threat was the difficulty some graduates face in fully applying their acquired knowledge and skills after returning to their home countries.

The second step involved collecting and analyzing alumni experiences after graduation. Alumni shared a wide range of examples related to project implementation, policy development, research, capacity building, and technical applications. These experiences demonstrated that graduates are making significant efforts to apply what they learned at ICHARM to real-world decision-making and problem-solving. However, they also face challenges, including gaps between scientific knowledge, engineering practice, and governmental decision-making, as well as shortages of human and technical resources.

Based on these findings, several strategic priorities were identified. First, ICHARM should continue strengthening its unique approach of combining advanced technologies with practical experience while adapting solutions to local contexts. Second, more opportunities for continuous learning after graduation should be established, including recurrent training and professional development programs. Third, ICHARM should further expand and strengthen its alumni network to promote collaboration, knowledge exchange, and mutual support. Alumni also emphasized the importance of advanced digital technologies, stronger international cooperation, and supportive policies to enhance the impact of water-related disaster risk reduction and sustainable development efforts worldwide.

ICHARM 活動報告

小池俊雄 ICHARM センター長から、ICHARM 設立経緯から現在の研究、研修、情報ネットワーク活動、ならびに今後のビジョンについて、特にこの 20 年で社会全体の認識が高まっている気候変動への適応という視点から報告があった。続いて大原美保 ICHARM 招へい研究員（東京大学教授・元 ICHARM 主任研究員）から、ICHARM 出身研究員および若手研究員を中心として取りまとめられた今後 10 年の ICHARM の活動の方向性について提案があった。加えて宮本守 ICHARM 主任研究員（GRIPS 連携教授）から、研修プログラム卒業生との研修に関する意見交換結果とそれを踏まえた将来戦略について報告された。以下にその要旨を示す。

（小池センター長）

・ICHARM は、2003 年の第 3 回世界水フォーラムを契機に日本が設立を提案し、2006 年に開所した。その使命は、日本が蓄積してきた水災害対策の経験を世界と共有し、水関連災害の軽減に貢献することである。研究、能力開発、情報ネットワークを統合した世界的な中核拠点として活動してきた。
・設立直後の 2007 年、IPCC 第４次報告書は気候システムの温暖化が疑う余地のない事実であり、その主因が人間活動であると結論づけた。さらに 2008 年には『Science』において「Stationarity is Dead（定常性は死んだ）」という論文が発表され、水管理の前提となっていた過去データ依存型の考え方が通用しなくなったことが示された。実際、この 20 年間で洪水や暴風災害は大幅に増加しており、最新の IPCC 報告でも極端降雨の頻度・強度の増大が確認されている。
・2015 年には仙台防災枠組、SDGs、パリ協定という 3 つの国際枠組みが採択され、気候変動や災害リスクへの対応には国際協力が不可欠であるという認識が共有された。一方、日本でも毎年のように深刻な洪水被害が発生し、従来の治水政策の限界が明らかになった。
・そこで日本は、大規模気候シミュレーションや DIAS のデータを活用し、将来の降雨

増加を考慮した新たな設計基準を導入した。さらに、施設整備だけでなく曝露の制御やレジリエンス向上も重視し、「流域治水」という新たな政策へと転換した。関連法改正や財政制度の整備も進められている。

- ICHARM はこうした国内の施策に貢献するだけでなく日本の経験を世界と共有することが責務であり、先進的な科学技術を開発してきた。気象分野では、アンサンブル気候予測を活用した大気モデリングシステムを構築し、世界各地で適用可能な洪水予測技術を実現した。2018 年のインド・ケララ州豪雨では、実際の降雨帯を高精度で再現し、予測能力の有効性を示した。
- 水文学分野では、統合洪水解析システム（IFAS）や降雨流出氾濫モデル（RRI）を開発し、国際的に広く利用されている。2011 年のタイ大洪水では、モデル解析結果が日本政府による排水ポンプ支援の判断材料となった。さらに WEB-RRI を開発し、地下水や土壌水分まで含めて長期間の水循環をシームレスに再現できるようになった。また、土砂や流木移動を扱う RSR モデルも開発し、流域全体の総合的な災害リスク評価を可能にした。これら研究成果は日本国内外の災害事例に適用されるなど社会実装にも結びついている
- ICHARM はリスクコミュニケーションにも取り組んできた。水害対応ヒヤリハット事例集やその別冊としての COVID-19 下での災害対応編を作成し、自治体向けのオンライン支援システムも開発した。さらに、仮想洪水体験システム（VFES）によって住民や学生が自地域の洪水リスクを体験的に学べる環境を整備し、防災意識向上に役立てている。
- また、気候予測、水文モデル、農業モデル、衛星観測データを統合した情報プラットフォームを構築し、水・食料・エネルギー連関を包括的に監視・予測できる仕組みを実現している。
- 能力開発も重要な柱である。ICHARM は JICA、PWRI の支援を受け、GRIPS と共同して修士・博士課程を運営している。これらのプログラムには大学の学部学生や研究者ではなく、各国の水災害管理を所管する機関の専門家が参加しており、これまで 226 名の修了生を輩出した。教育の目標は、科学と政策をつなぐファシリテータの育成である。2025 年度からは「水と衛生」「水と貧困」「水と平和」という新科目を導入し、さらに幅広い視点を持ち、各国、地域の様々セクターと連携できるリーダーの育成を進めている。加えて、卒業生向けの気象学、水文学、土砂管理、災害リスク軽減をテーマとした定期的なセミナーやウェビナーや国際ネットワークを通じて継続的な人材育成を行っている。
- 国際的には、国際洪水イニシアティブ（IFI）の事務局として活動し、国際的にハイレベルの支持を受けて「水レジリエンスと災害のためのプラットフォーム」を推進している。アジア、アフリカ、ラテンアメリカへ拡大しており、洪水・干ばつ早期警報システムや農業干ばつ監視システムを展開し、多くの専門家育成と地域協力を

支援してきた。

・今後は、日本が進める「流域総合水管理」の考え方を踏まえ、洪水や干ばつだけでなく、水供給、衛生、食料、エネルギー、環境を含む総合的な水問題への対応を目指す。脆弱性や曝露は日常の水管理と深く結びついており、気候変動下では分野横断的な連携が不可欠である。

・「定常性は死んだ」という現実を前提に、社会共通資本の持続的発展を支える新たなガバナンスが必要性であり、ICHARM は今後、①科学知識と現場経験を統合・共有する仕組みの強化、②経済波及効果や潜在的負債まで可視化する科学の推進、③科学と政策をつなぐ人材育成と能力開発支援の強化、という 3 つの柱を中心に、世界の水レジリエンス向上に貢献していく方針である。

（大原教授）

・ICHARM20 周年を機にタスクフォースを設置し、30 周年およびその先を見据えた将来ビジョンを検討した。議論には現役・OB 研究員らが参加し、ICHARM の今後 10 年間の方向性について提言をまとめた。

・提言は、ICHARM の三つの柱である「革新的研究」「効果的な能力開発」「効率的な情報ネットワーク」を基盤としている。まず研究面では、水災害分野の専門知識や経験を継承・蓄積するナレッジハブとしての役割を強化し、国内外の機関、そして将来世代とをつなぐ中核拠点となることが重要とされた。また、AI や XR などの先端技術の開発と実装を進め、将来の災害リスク低減に貢献すべきである。

・能力開発では、従来の「日本から学ぶ」一方向型教育から発展し、世界各国の参加者が相互に学び合う双方向型の学習コミュニティの形成を目指すべきだと提言した。さらに、修士・博士課程、インターンシップだけでなく、オンライン教育や e ラーニングを拡充し、多様な学習機会を提供する必要があるとしている。

・情報ネットワーキングについては、変化する世界の水課題に対応し、その知見を国際社会と共有することが求められる。特につくば市に集積する研究機関や大学との連携を強化し、統合的な技術・知見を「つくばモデル」として世界へ発信することを提案したい。

・また、政府、民間企業、学術界など多様な関係者を結び付けるファシリテータとしての役割をさらに強化し、水問題解決に向けた協働を促進していくことを期待。

（宮本主任研究員）

・これまでに 41 カ国の計 226 名の卒業生を送り出しており、現在も 22 名が在籍している。この 20 周年を機に、教育プログラムの将来像を検討するため、①客観的評価、②卒業生の経験収集、③将来戦略の策定、という 3 段階の分析を行った。

・まず、卒業生へのアンケートをもとに SWOT 分析を実施した。その結果、先端技術と

Reflecting on the Past 20

The signing ceremony for ICHARM on March 3, 2006

The IHP Intergovernmental Council adopted the resolution to support the proposal of the Japanese government to establish ICHARM as a part of PWRI in September 2004.

The resolution to approve the proposal was adopted by the 33rd UNESCO General Conference in Paris in October 2005.

Mission:

Contributing to
the mitigation of water-related disasters worldwide
by sharing Japan's experiences
with water-related disasters
and their countermeasures.

The official opening of ICHARM on March 6, 2006

What era is this 20-year period?

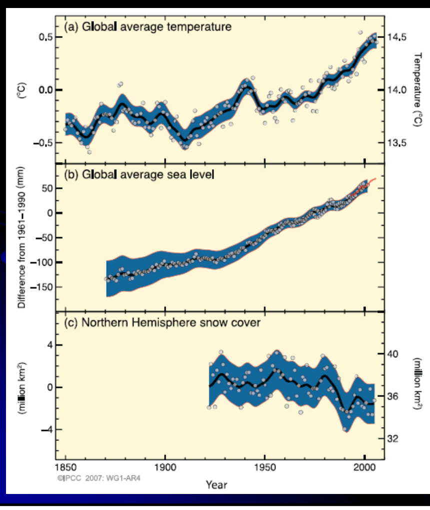
ICHARM focuses on
research, capacity development, and information networking as three principal areas of its activity,
and has served the world as the Global Center of Excellence
in water hazard and risk management through numerous projects.

3

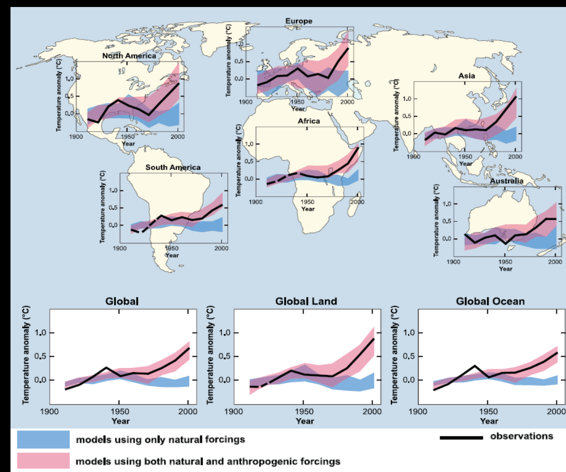
Is the climate changing?

Warming of the climate system is unequivocal.

IPCC/AR4 (2007)



What does change the climate?



Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations. (IPCC/AR4, 2007)

POLICYFORUM

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CLIMATE CHANGE

Stationarity Is Dead: Whither Water Management?

Climate change undermines a basic assumption that historically has facilitated management of water supplies, demands, and risks.

P. C. D. Milly,[1]* Julio Betancourt,[2] Malin Falkenmark,[3] Robert M. Hirsch,[4] Zbigniew W. Kundzewicz,[5] Dennis P. Lettenmaier,[6] Ronald J. Stouffer[7]

Systems for management of water throughout the developed world have been designed and operated under the assumption of stationarity. Stationarity—the idea that natural systems fluctuate within an unchanging envelope of variability—is a foundational concept that permeates training and practice in water-resource engineering. It implies that any variable (e.g., annual streamflow or annual flood peak) has a time-invariant (or 1-year–periodic) probability density function (pdf), whose properties can be esti-

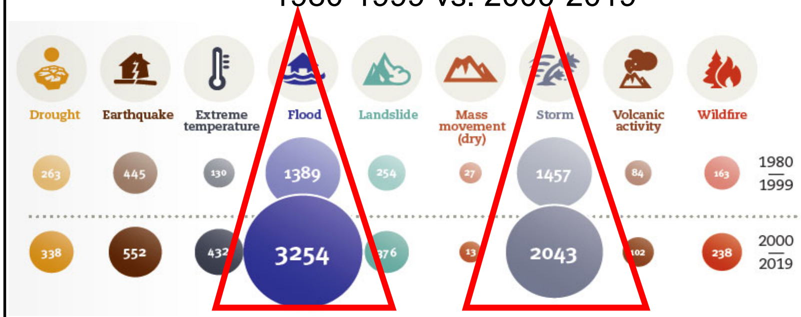
that has emerged from climate models (see figure, p. 574).

Why now? That anthropogenic climate change affects the water cycle (9) and water supply (10) is not a new finding. Nevertheless, sensible objections to discarding stationarity have been raised. For a time, hydroclimate had not demonstrably exited the envelope of natural variability and/or the effective range of optimally operated infrastructure (11, 12). Accounting for the substantial uncertainties of climatic parameters estimated from short

Stationarity is Dead: Whither Water Management

Total disaster events by type by CRED and UNDRR 2020

1980-1999 vs. 2000-2019



IPCC/AR6/WG1, 2021

It is unequivocal that human influence has warmed the atmosphere, ocean and land.

The frequency and intensity of heavy precipitation events have increased since the 1950s over most land area for which observational data are sufficient for trend analysis..

5

Three Key Global Agendas in 2015

- The world knows that countries cannot act in isolation to address global issues.
- Concerted Action is Required.

March 2015	September 2015	December 2015
Sendai Framework on Disaster Risk Reduction	Sustainable Development Goals	Paris Agreement (COP 21)

Recurrent Water-related Disasters in Japan

7

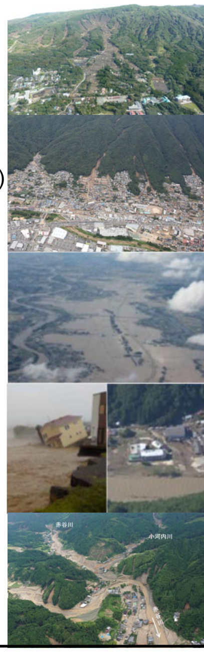
Oct., 2013
Izu Oshima Island（Sediment）
- 824mm/24hrs (Typhoon)
- Human Loss: 39
- *evacuation warning*

Aug., 2014
Hiroshima City (Sediment)
- 121mm/hr (Typhoon, Frontal Line)
- Human Loss: 77
- *evacuation warning, land use*

Sep., 2015
Kanto & Tohoku (Bank Breach)
- 551mm/24hrs (Typhoons)
- Human Loss：20
- *evacuated by helicopter: 1343 and by boat: 2919*

Aug., 2016
Hokkaido & Tohoku (Bank Breach and Sediment)
- 251mm/72hrs (Typhoons)
- Human Loss: 31
- *evacuation of physical handicaps*
- *local socio-economic impact*

June, 2017
Northern Kyushu (Sediment)
- 299mm/6hrs (Frontal Line)
- Human Loss: 44
- *sediment and flood complex*



Nov., 2014
Amendment: Sediment Disasters Prevention Act

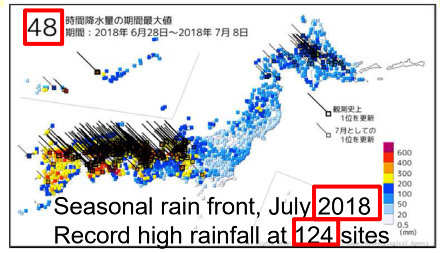
Jan., 2015：
Policy Vision: Disaster Prevention and Mitigation against a New Stage

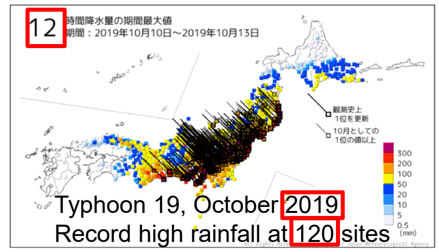
May, 2015
Amendment: Flood Risk Management Act
PMP for Flood Hazard Map

Dec., 2015
Policy Vision: Rebuilding Flood-Conscious Societies: Class A Rivers

Jan., 2017
Policy Vision: Rebuilding Flood-Conscious Societies: Class B Rivers

May, 2017
Amendment: Flood Risk Management Act





Houses Inundated above the First Floor Level	7,173	8,129
Human Loss	245	107

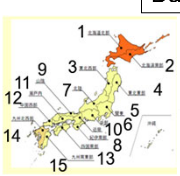
New River Planning: Observed Data and Climate Change Projections

8

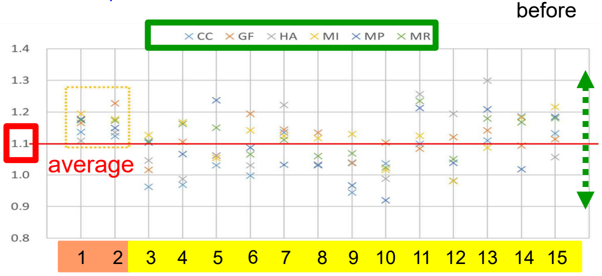
Climate change projection by MEXT and JMA

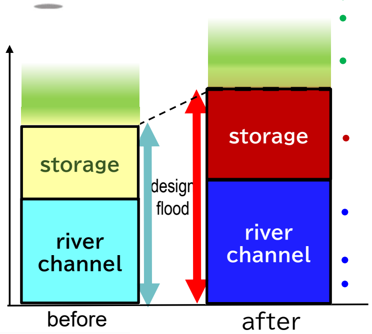
"Database for Policy Decision-Making for Future Climate Change" (**d4PDF**)
- global：60km, 6000yr in past, 3240yr under 2d increase, 5400yr under 4d increase.
- Around Japan: 20km and 5km, 6000yr in past, 3240yr under 2d increase, 5400yr under 4d increase.

Data is available from DIAS

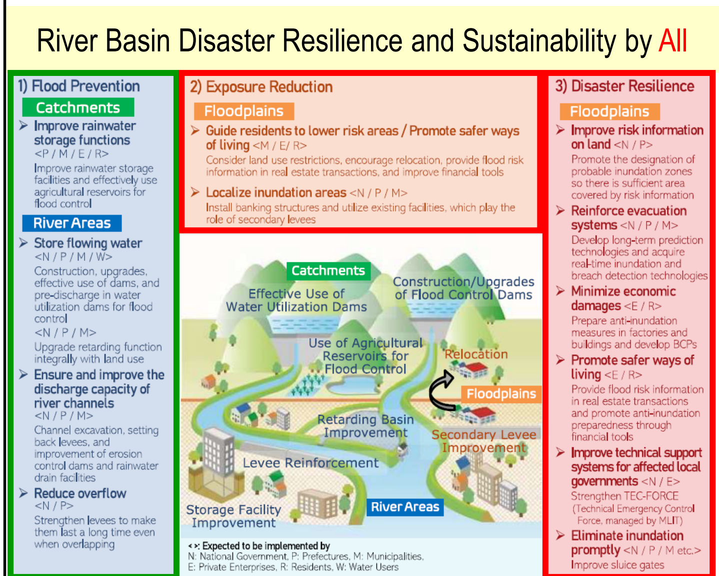


Changing Factor of Design Rainfall





- land use
- retention, storage, recreational functions
- evacuation, business continuity, restoration
- flood control plan
- river channel planning
- embankment
- channel excavation



Governance
Amendment of the associated nine acts → Unanimous adoption

Finance
Accelerating National Resilience
about 110B$ from 2021 to 2025

Reflecting on the Past 20

The signing ceremony for ICHARM on March 3, 2006

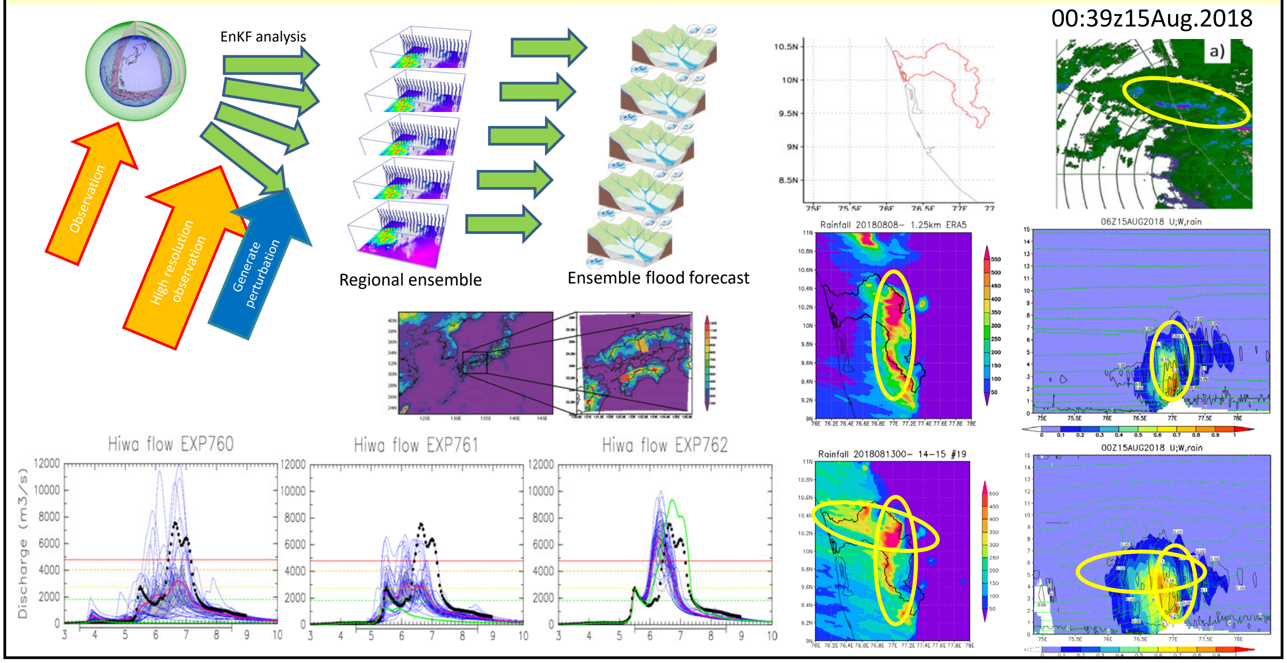
The IHP Intergovernmental Council adopted the resolution to support the proposal of the Japanese government to establish ICHARM as a part of PWRI in September 2004.

The resolution to approve the proposal was adopted by the 33rd UNESCO General Conference in Paris in October 2005.

Mission:
Contributing to
the mitigation of water-related disasters worldwide
by sharing Japan's experiences
with water-related disasters
and their countermeasures.
Contributing to the simultaneous advancements
in Japanese policy reform and sharing these with the world.

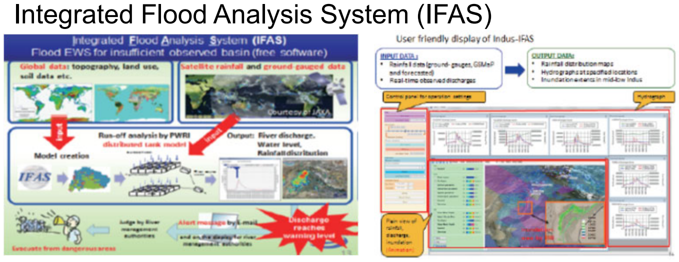
The official opening of ICHARM on March 6, 2006

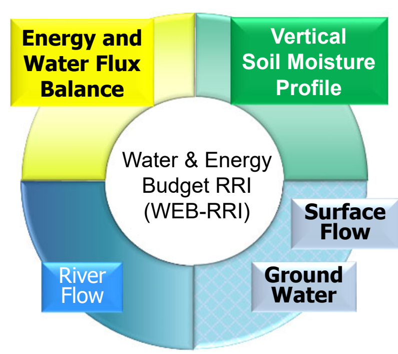
Innovative Research: Atmospheric Modeling



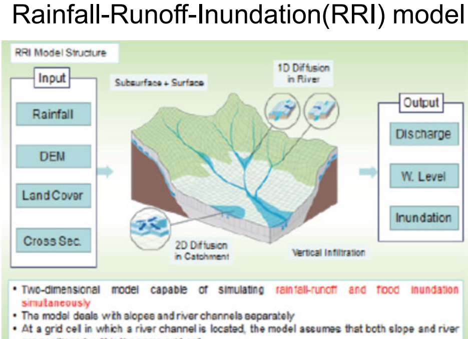
Innovative Research: Hydrological Modeling

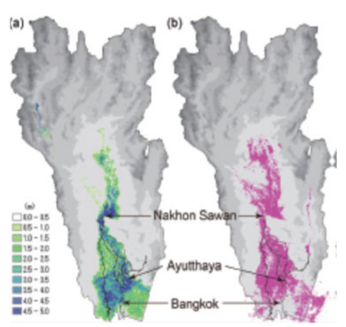
Integrated Flood Analysis System (IFAS)



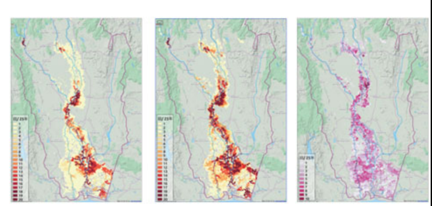


Rainfall-Runoff-Inundation(RRI) model



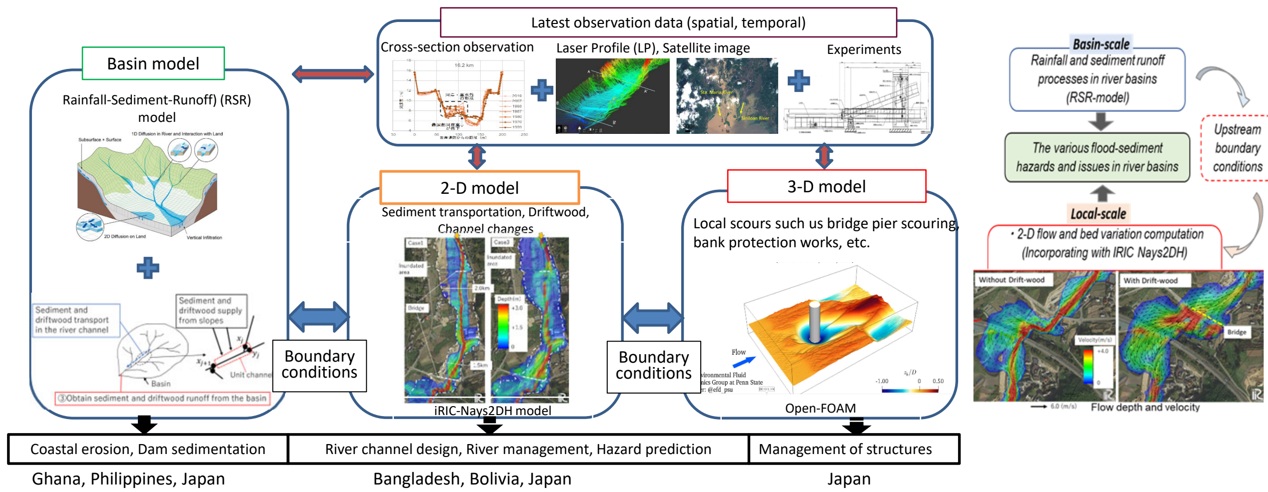


Emergency Simulation in the Chao Phraya River
Left: RRI, Right: Satellite observation



Climate change impacts on the inundation frequency (Left: Present(1979-2003), Center: Future(2075-2099), Right: Change (F-P))

Innovative Research: Sediment & Drift Wood Modeling



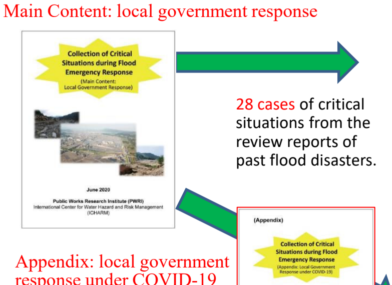
13

Innovative Research: Risk Communication

14

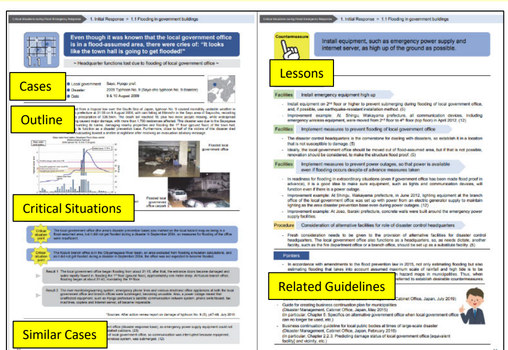
ICHARM has published a booklet entitled "Collection of Critical Situations during Flood Emergency Response" in June, 2020.

Main Content: local government response

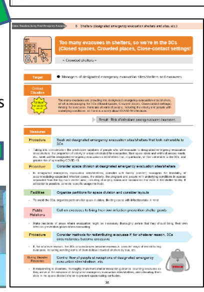


28 cases of critical situations from the review reports of past flood disasters.

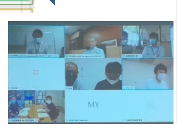
Appendix: local government response under COVID-19



28 possible cases of critical situations considering several guidelines and manuals.



Support System for responsible sectors of municipalities in checking measures

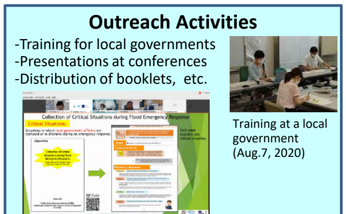


Capacity Building

URL: https://www.pwri.go.jp/icharm/special_topic/20200625_flood_response_collection_e.html

Outreach Activities

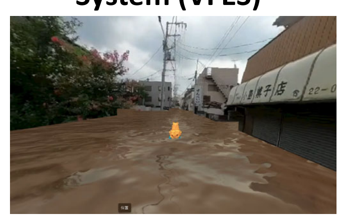
-Training for local governments
-Presentations at conferences
-Distribution of booklets, etc.



Training at a local government (Aug.7, 2020)

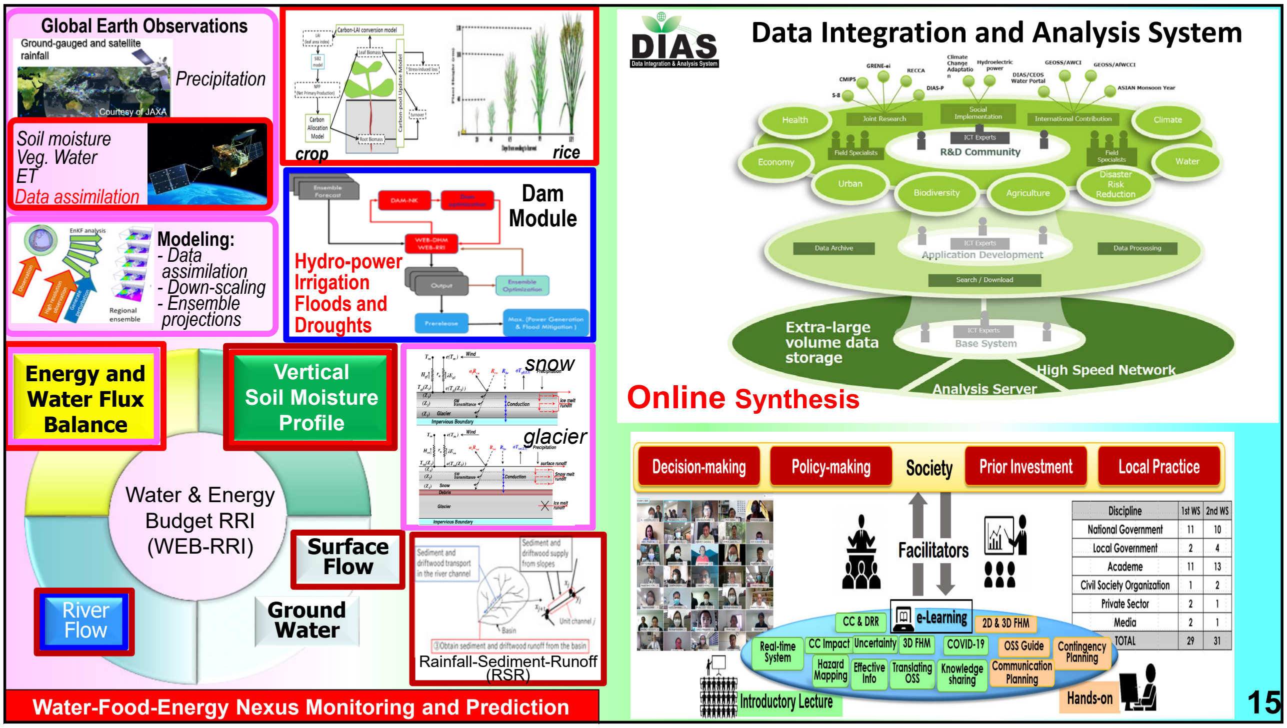
Online conference by High Level Experts and Leaders Panel on Water and Disasters (HELP) (Aug. 20, 2020), attended by their Majesties the Emperor and Empress of Japan together with 300 participants from 40 countries.

Virtual Flood Experience System (VFES)



VFES lets users experience flooding of various conditions as many times as possible.

Students experienced flooding virtually using VFES



Discipline	1st WS	2nd WS
National Government	11	10
Local Government	2	4
Academe	11	13
Civil Society Organization	1	2
Private Sector	2	1
Media	2	1
TOTAL	29	31

Effective Capacity Development

16

Fostering Facilitators

not just as "a master of ceremony"
but as "catalytic beings"

1. Master's degree program (1 year)

- In partnership with the National Graduate Institute for Policy Studies (GRIPS), the Japan International Cooperation Agency (JICA) and the Public Works Research Institute (PWRI).
- 202 graduates since 2007

2. Doctor's degree program (3 years)

- In partnership with GRIPS, JICA and PWRI
- 24 graduates since 2010
- Three additional courses since 2025
  - Water and Sanitation
  - Water and Poverty
  - Water and Peace

Follow-up Seminar for ICHARM Alumni
In-person and on-line since 2013

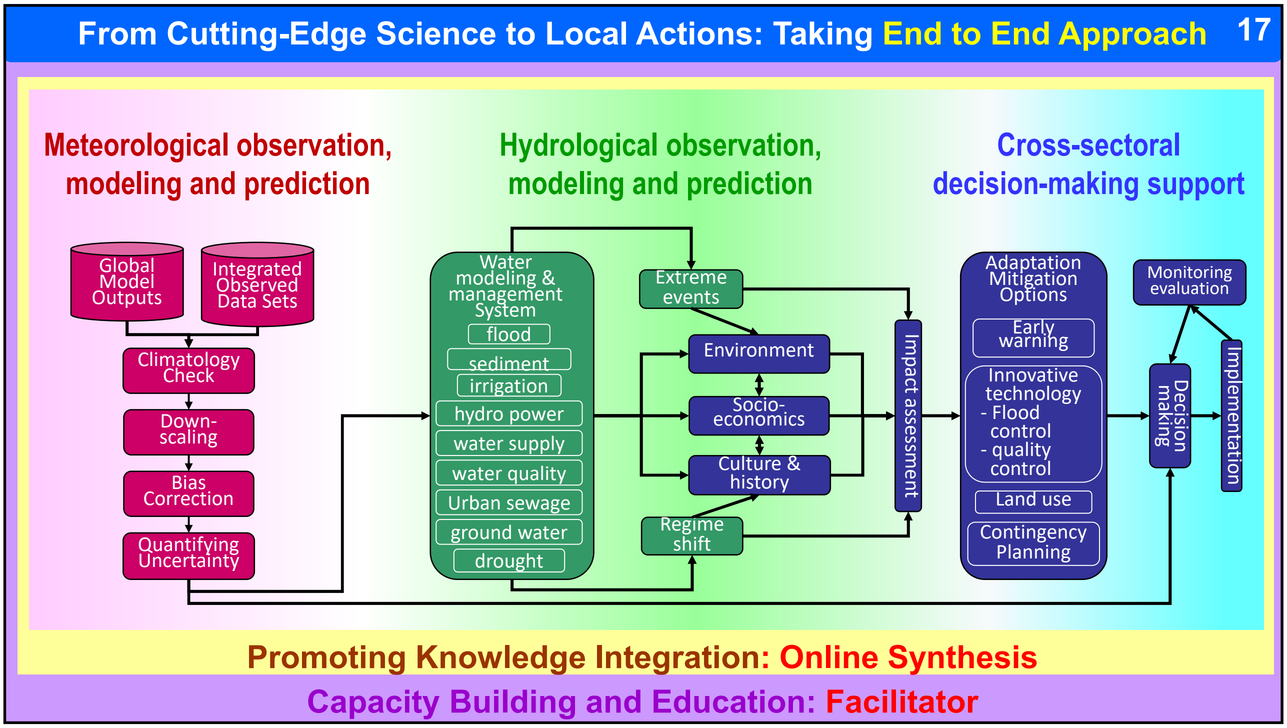
ICHARM Alumni Webinar

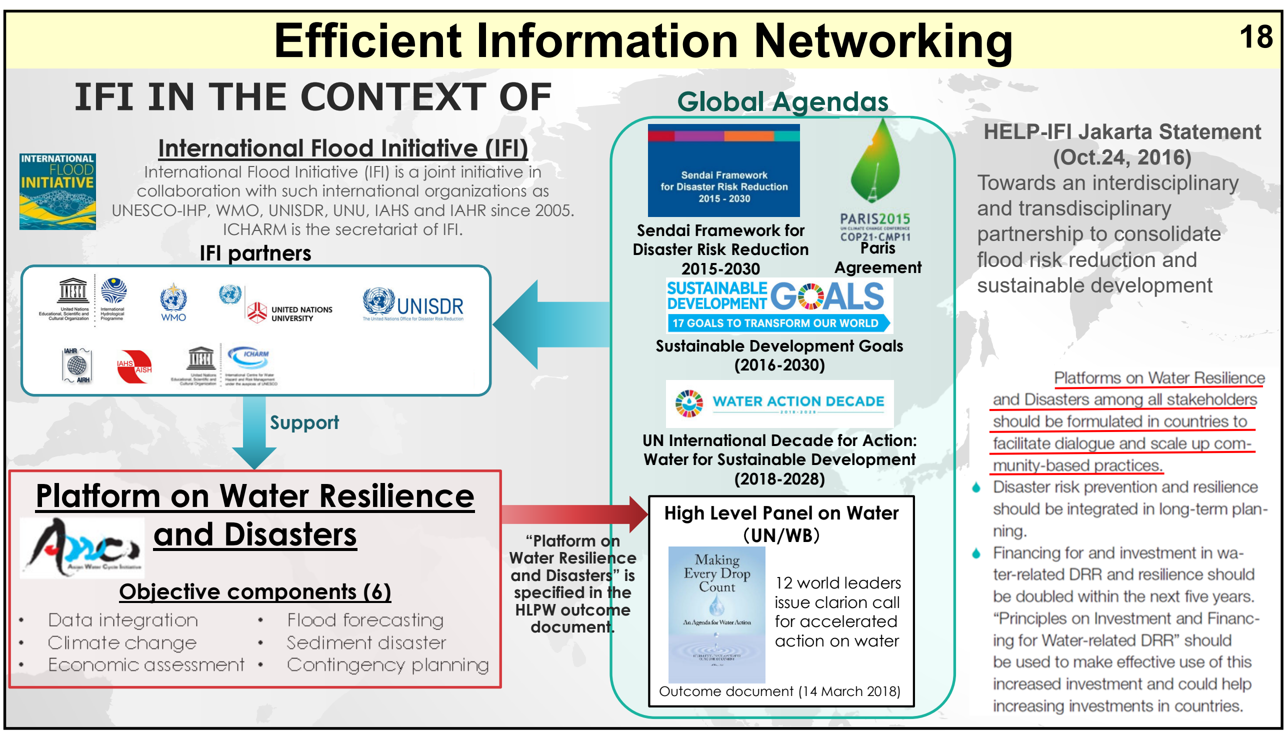
Disaster Management Policies A
Disaster Management Policies B
Hydraulics
Hydrology
Sediment transport mechanics

(1) Lecture courses
Sediment Management
River Engineering
Geography on Flood Disaster Management
Socio-economic and Environmental Aspects of Sustainability-oriented Flood Management
Disaster Risk Reduction for Hydroclimatic Extremes

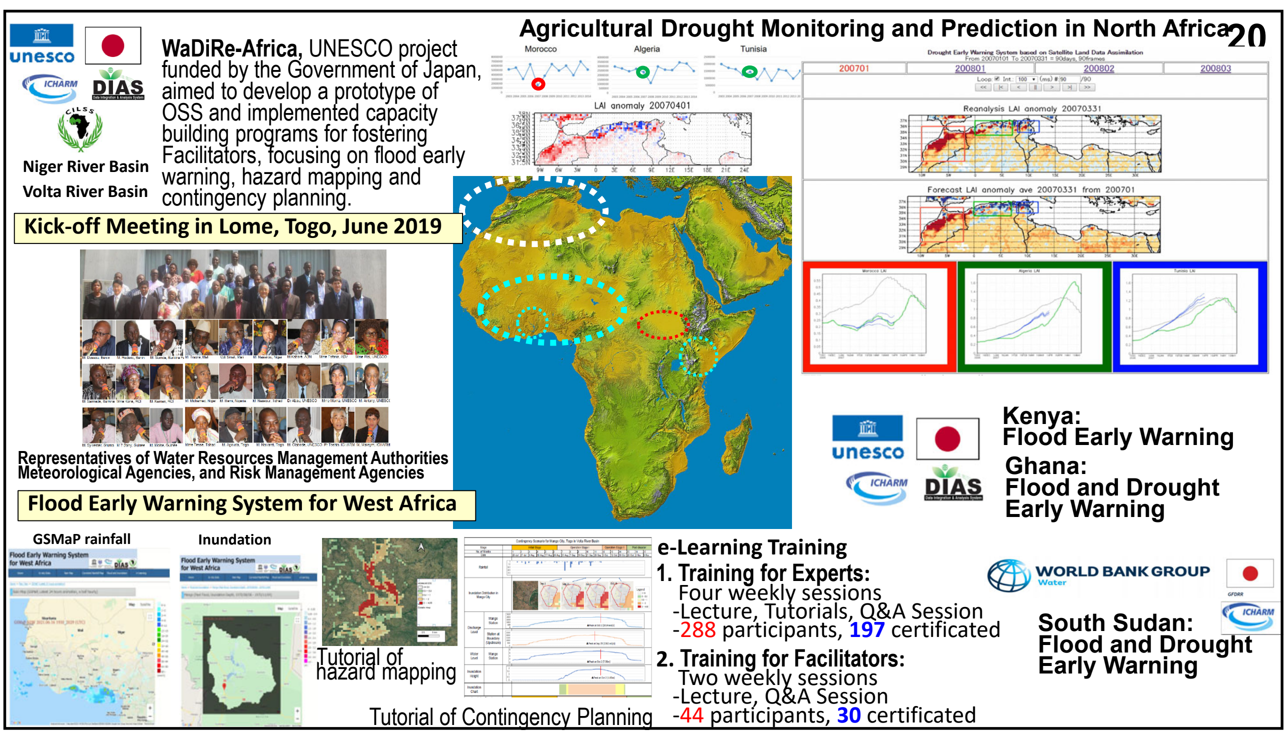
(2) Practical courses
Open Channel Hydraulics and Practice
Numerical Analysis Method and Practice
Hydrologic Modeling and Practice
GIS and Remote Sensing
Field Inspection Study
Project Cycle Management Practice
Water-related disaster comprehensive seminar
Water-related disaster specific seminar

(3) (4) : Individuals and implementations
Advanced Hydrodynamics
Advanced Hydrometeorology

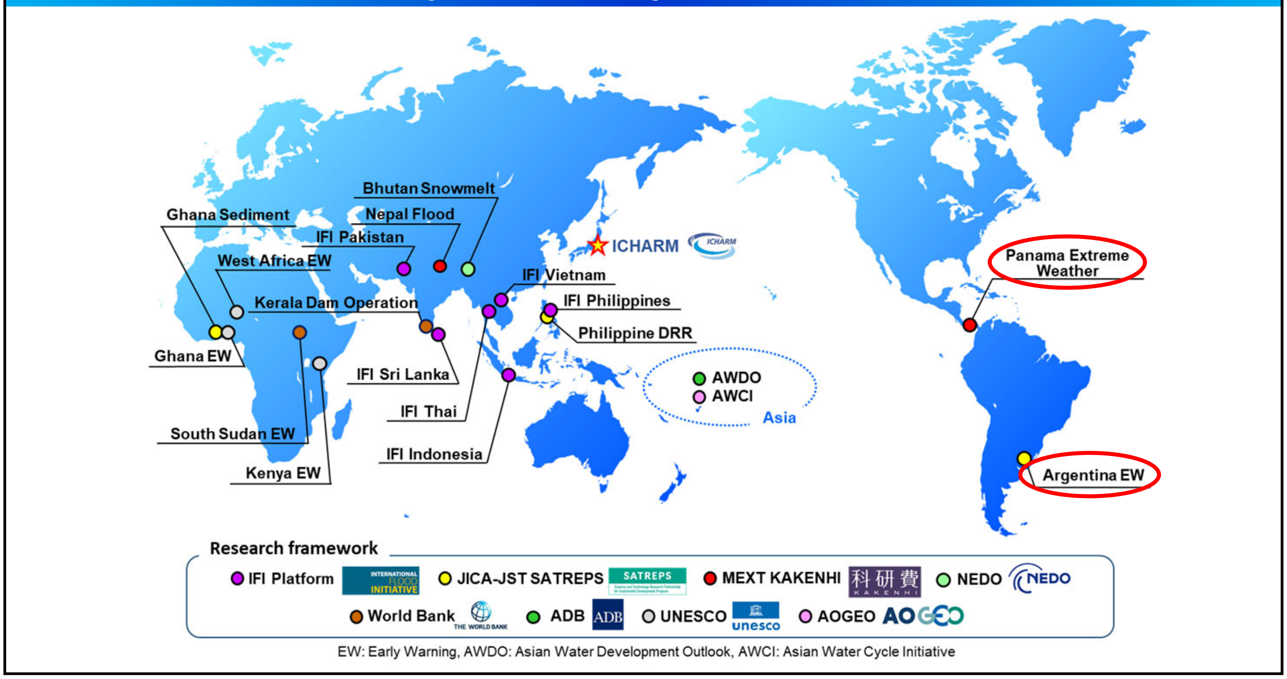

From Cutting-Edge Science to Local Actions: Taking End to End Approach
17
Meteorological observation, modeling and prediction
Hydrological observation, modeling and prediction
Cross-sectoral decision-making support
Global Model Outputs
Integrated Observed Data Sets
Climatology Check
Down-scaling
Bias Correction
Quantifying Uncertainty
Water modeling & management System
flood
sediment
irrigation
hydro power
water supply
water quality
Urban sewage
ground water
drought
Extreme events
Environment
Socio-economics
Culture & history
Regime shift
Impact assessment
Adaptation Mitigation Options
Early warning
Innovative technology
- Flood control
- quality control
Land use
Contingency Planning
Monitoring evaluation
Decision making
Implementation
Promoting Knowledge Integration: Online Synthesis
Capacity Building and Education: Facilitator


Efficient Information Networking
18
IFI IN THE CONTEXT OF
Global Agendas
International Flood Initiative (IFI)
International Flood Initiative (IFI) is a joint initiative in collaboration with such international organizations as UNESCO-IHP, WMO, UNISDR, UNU, IAHS and IAHR since 2005. ICHARM is the secretariat of IFI.
IFI partners
WMO
UNITED NATIONS UNIVERSITY
UNISDR
Support
Platform on Water Resilience and Disasters
Objective components (6)
Data integration
Climate change
Economic assessment
Flood forecasting
Sediment disaster
Contingency planning
"Platform on Water Resilience and Disasters" is specified in the HLPW outcome document.
Sendai Framework for Disaster Risk Reduction 2015-2030
Paris Agreement
SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD
Sustainable Development Goals (2016-2030)
WATER ACTION DECADE
UN International Decade for Action: Water for Sustainable Development (2018-2028)
High Level Panel on Water (UN/WB)
Making Every Drop Count
12 world leaders issue clarion call for accelerated action on water
Outcome document (14 March 2018)
HELP-IFI Jakarta Statement (Oct.24, 2016)
Towards an interdisciplinary and transdisciplinary partnership to consolidate flood risk reduction and sustainable development
Platforms on Water Resilience and Disasters among all stakeholders should be formulated in countries to facilitate dialogue and scale up community-based practices.
Disaster risk prevention and resilience should be integrated in long-term planning.
Financing for and investment in water-related DRR and resilience should be doubled within the next five years. "Principles on Investment and Financing for Water-related DRR" should be used to make effective use of this increased investment and could help increasing investments in countries.


Platform on Water Resilience and Disasters 19
Pakistan
- Indus River Basin
Vietnam
Myanmar
- Bago River Basin
- Sittaung River Basin
Thailand
Philippine
- Pampanga River Basin
- Davao River Basin
Sri Lanka
- Kalu River Basin
- Kelani River Basin
- Malvathu River Basin
Indonesia
- Bengawan Solo River Basin
26
19


unesco
ICHARM
DIAS
CILSS
Niger River Basin
Volta River Basin
WaDiRe-Africa, UNESCO project funded by the Government of Japan, aimed to develop a prototype of OSS and implemented capacity building programs for fostering Facilitators, focusing on flood early warning, hazard mapping and contingency planning.
Kick-off Meeting in Lome, Togo, June 2019
Representatives of Water Resources Management Authorities Meteorological Agencies, and Risk Management Agencies
Flood Early Warning System for West Africa
GSMaP rainfall
Inundation
Tutorial of hazard mapping
Tutorial of Contingency Planning
Agricultural Drought Monitoring and Prediction in North Africa
20
Morocco
Algeria
Tunisia
LAI anomaly 20070401
200701
200801
200802
200803
Reanalysis LAI anomaly 20070331
Forecast LAI anomaly ave 20070331 from 200701
Kenya:
Flood Early Warning
Ghana:
Flood and Drought
Early Warning
e-Learning Training
1. Training for Experts:
Four weekly sessions
-Lecture, Tutorials, Q&A Session
-288 participants, 197 certificated
2. Training for Facilitators:
Two weekly sessions
-Lecture, Q&A Session
-44 participants, 30 certificated
WORLD BANK GROUP
Water
GFDRR
South Sudan:
Flood and Drought
Early Warning

ICHARM Projects Currently Conducted in the world



Reorganizing the Conceptual Framework

Three Key Global Agendas in 2015

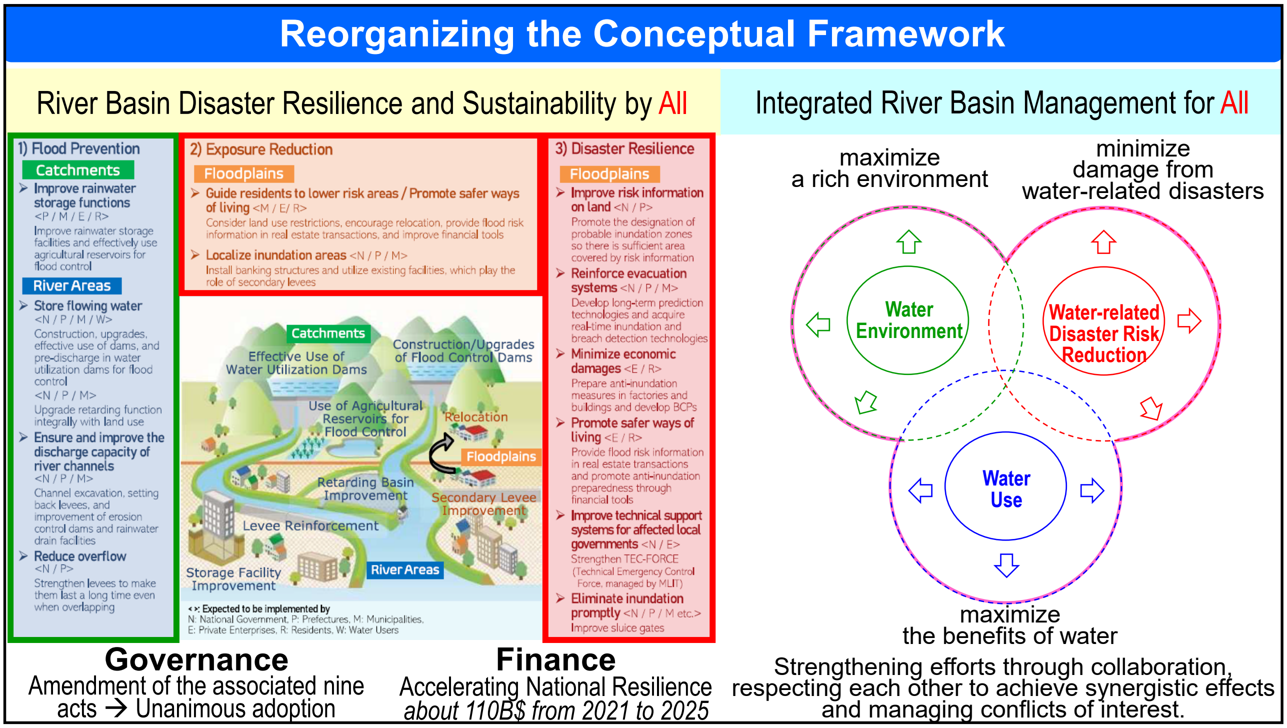
- The world knows that countries cannot act in isolation to address these risks.
- Concerted Action is Required.

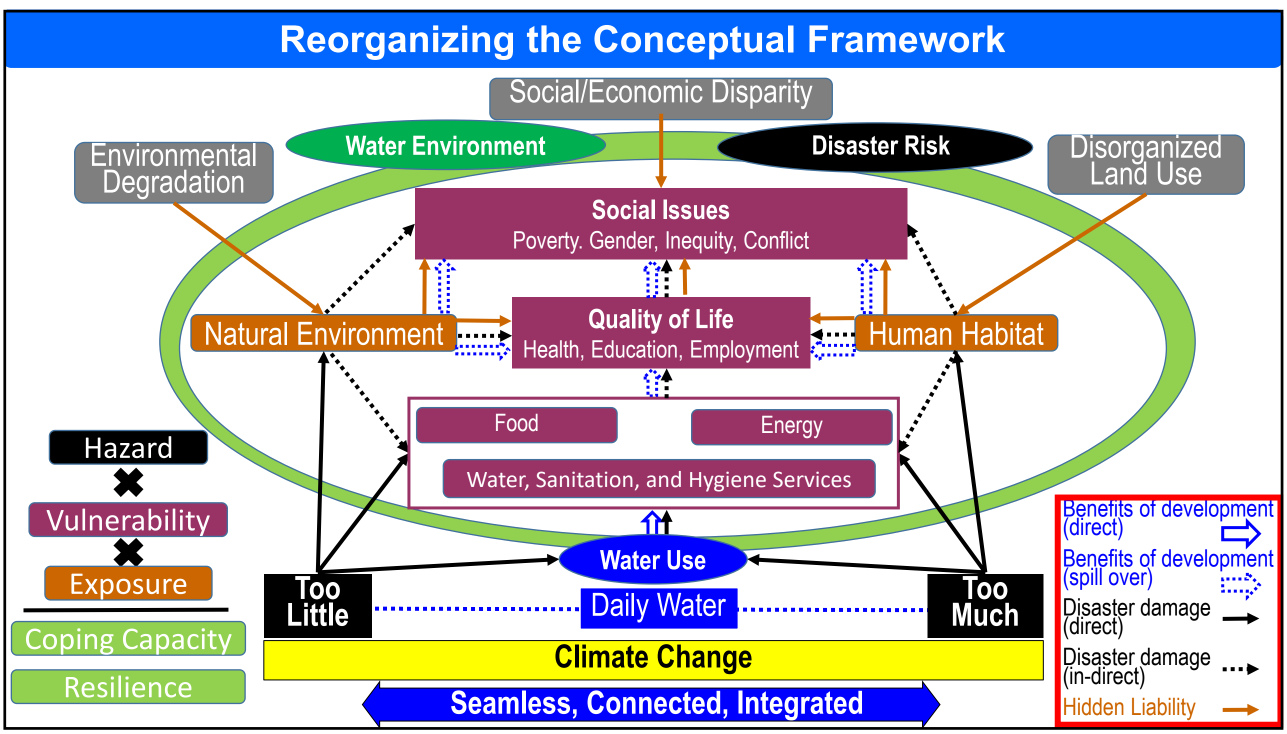
March 2015 — Sendai Framework on Disaster Risk Reduction

September 2015 — Sustainable Development Goals

December 2015 — Paris Agreement (COP 21)

Post 2030


Reorganizing the Conceptual Framework
River Basin Disaster Resilience and Sustainability by All
Integrated River Basin Management for All
1) Flood Prevention
Catchments
Improve rainwater storage functions <P / M / E / R>
Improve rainwater storage facilities and effectively use agricultural reservoirs for flood control
River Areas
Store flowing water <N / P / M / W>
Construction, upgrades, effective use of dams, and pre-discharge in water utilization dams for flood control <N / P / M>
Upgrade retarding function integrally with land use
Ensure and improve the discharge capacity of river channels <N / P / M>
Channel excavation, setting back levees, and improvement of erosion control dams and rainwater drain facilities
Reduce overflow <N / P>
Strengthen levees to make them last a long time even when overlapping
2) Exposure Reduction
Floodplains
Guide residents to lower risk areas / Promote safer ways of living <M / E/ R>
Consider land use restrictions, encourage relocation, provide flood risk information in real estate transactions, and improve financial tools
Localize inundation areas <N / P / M>
Install banking structures and utilize existing facilities, which play the role of secondary levees
Catchments
Effective Use of Water Utilization Dams
Construction/Upgrades of Flood Control Dams
Use of Agricultural Reservoirs for Flood Control
Relocation
Floodplains
Retarding Basin Improvement
Secondary Levee Improvement
Levee Reinforcement
Storage Facility Improvement
River Areas
<>: Expected to be implemented by
N: National Government, P: Prefectures, M: Municipalities, E: Private Enterprises, R: Residents, W: Water Users
3) Disaster Resilience
Floodplains
Improve risk information on land <N / P>
Promote the designation of probable inundation zones so there is sufficient area covered by risk information
Reinforce evacuation systems <N / P / M>
Develop long-term prediction technologies and acquire real-time inundation and breach detection technologies
Minimize economic damages <E / R>
Prepare anti-inundation measures in factories and buildings and develop BCPs
Promote safer ways of living <E / R>
Provide flood risk information in real estate transactions and promote anti-inundation preparedness through financial tools
Improve technical support systems for affected local governments <N / E>
Strengthen TEC-FORCE (Technical Emergency Control Force, managed by MLIT)
Eliminate inundation promptly <N / P / M etc.>
Improve sluice gates
maximize a rich environment
minimize damage from water-related disasters
Water Environment
Water-related Disaster Risk Reduction
Water Use
maximize the benefits of water
Governance
Amendment of the associated nine acts → Unanimous adoption
Finance
Accelerating National Resilience about 110B$ from 2021 to 2025
Strengthening efforts through collaboration, respecting each other to achieve synergistic effects and managing conflicts of interest.


Reorganizing the Conceptual Framework
Social/Economic Disparity
Water Environment
Disaster Risk
Environmental Degradation
Disorganized Land Use
Social Issues
Poverty. Gender, Inequity, Conflict
Natural Environment
Quality of Life
Health, Education, Employment
Human Habitat
Food
Energy
Water, Sanitation, and Hygiene Services
Hazard
Vulnerability
Exposure
Coping Capacity
Resilience
Too Little
Water Use
Daily Water
Too Much
Climate Change
Seamless, Connected, Integrated
Benefits of development (direct)
Benefits of development (spill over)
Disaster damage (direct)
Disaster damage (in-direct)
Hidden Liability

Envisioning the Next 20

- We need to establish practical governance structures that support the balanced development of social common capital - namely, the natural environment, social infrastructure, and institutional capital - in the context of climate change.
- We need to encourage increasing strategic investment based on this interconnectivity.

To promote these activities, ICHARM will strengthen the following:

1. Development of a system for integrating and sharing scientific and experiential knowledge across various fields, connecting everyday life with extreme times and enabling all stakeholders to reflect this knowledge in their actions.
2. Promotion of science that quantifies and visualizes not only direct benefits and harms but also economic spillover effects and hidden liabilities.
3. Support for capacity development to enhance the science-policy interface, as well as the creation of systems that enable communities, countries, and regions to implement capacity building independently.

ICHARM Future Vision ~ICHARM 20→30~

OHARA Miho,

Center for Integrated Disaster Information Research, University of Tokyo

/ICHARM Visiting Researcher (Previous Senior Researcher)

Background

- At twenty years' anniversary, it is important to consider how **<u>ICHARM should move forward over the next decade as ICHARM take the next step toward our 30th anniversary</u>**.
- For the purpose, ICHARM has developed a **task force team including current and former ICHARM researchers to discuss "ICHARM Future Vision."**

Task force team

Member:
- Prof. OHARA Miho (University of Tokyo),
- Prof. SAYAMA Takahiro (Kyoto University),
- Dr. KAKINUMA Daiki (ICHARM Senior Researcher)
- Dr. MOROOKA Yoshimasa (ICHARM Senior Researcher)
- Mr. YAMASHITA Daiki (ICHARM Researcher)

Advisor:
- Prof. SHIMIZU Yoshihiko (ICHARM Research & Training Advisor)

Coordinator:
- Dr. KURIBAYASHI Daisuke (ICHARM Chief Researcher)

<Innovative research>

Accumulation of technical experience

- As a research institute, ICHARM has a distinctive mission to **accumulate technical expertise** over time and ensure its **reliable transmission across generations** by leveraging approaches different from those of universities.

Knowledge Hub

- The data that ICHARM has created enhances its value as a **knowledge hub that connects domestic and international institutions** and will be effectively utilized over the next decade.

Developing new technologies

- ICHARM should continue **developing new technologies**, including XR and AI, while enhancing existing technologies for their effective implementation for future disaster risk reduction.

<Effective Capacity Development>

Two-way learning

- ICHARM should move beyond the conventional one-way teaching model and **build a two-way learning community** where participants, including us, actively learn from successful practices in the world.

Diverse modes of learning

- ICHARM needs further strengthen online and e-learning approaches, establish **more diverse modes of learning**, and respond to learning needs around the world.

<Efficient information networking>

Addressing emerging trend of global water-related issues

- Global water issues continue to evolve. At this milestone of the 20th anniversary, ICHARM needs deepen understanding of the **emerging trends of global water issues among international community** and make strategic efforts to address them.

”TSUKUBA Model”

- ICHARM will collaborate with research institutes in Tsukuba such as NILIM etc. and disseminate integrated technologies as the “Tsukuba Model” so that these can be contributed to solve region-specific water issues in the world.

Intermediary Facilitator

- ICHARM should enhance its role as a **facilitator** and strengthen its value by serving as an **intermediary** that bridges governmental organizations and private sectors.

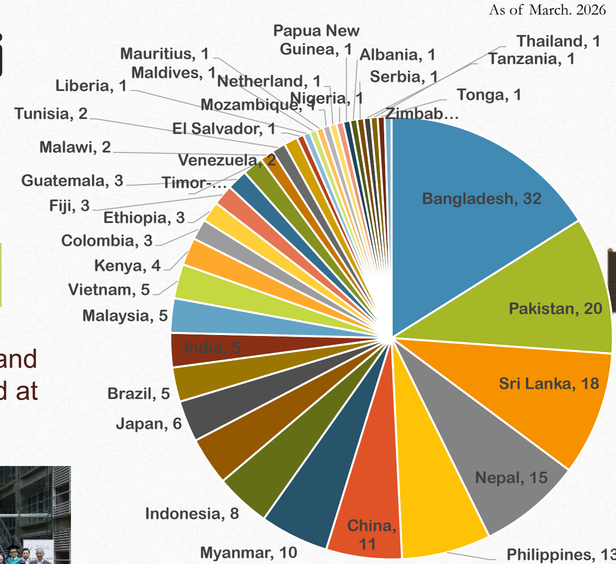
As of March. 2026

ICHARM Alumni

226 graduates consist of **202** master course and **24** doctoral course

The number of countries our graduates come from is **41**

22 students, **14** master students and **8** doctoral students, study hard at ICHARM and GRIPS in 2026



STEPS FOR SHAPING FUTURE ICHARM'S EDUCATION

- Scenario planning based on **future visions**
- Adapting programs to **long-term changes**
- Recurrent education opportunities
- Supporting the strengthening of alumni networks

- **Alumni Tracking**
- **Collecting cases** of project formulation, institutionalization, and implementation
- Also, cases where a need for further learning or experience was identified

- Look at the **current status** of ICHARM educational programs from afar in terms of internationality, practicality, and research potential
- What we need to do is more than just a satisfaction survey
- Also, investigate similar and competing programs
- Clarify the **identity** of ICHARM and its graduates
- **SWOT analysis**

1. OBJECTIVE EVALUATION

SWOT analysis of ICHARM educational program

	Positive	Negative
Internal	**Strength** • **Integration of advanced technologies with practical knowledge** • High specialization in water-related DRM and climate issues • Highly experienced faculty staffs • Extensive networking opportunities	**Weakness** • Very short and intensive program duration • Limited coverage of new or related topics (AI/ML, law environment…) • Language barriers • **Limited collaboration with industry or practice** • Student's different background
External	**Opportunity** • **Strong alumni network enabling global partnerships** • Increasing demand for DRR and integration of AI, big data, and satellite technologies • Opportunities for online education and short courses to expand reach	**Threat** • Lack of independency and increasing competition from other programs • **Risk of underutilization of graduates' skills in home countries** • Risk of falling behind rapid technological advancements (AI, big data…)

1. OBJECTIVE EVALUATION

TOWS result (action tool)

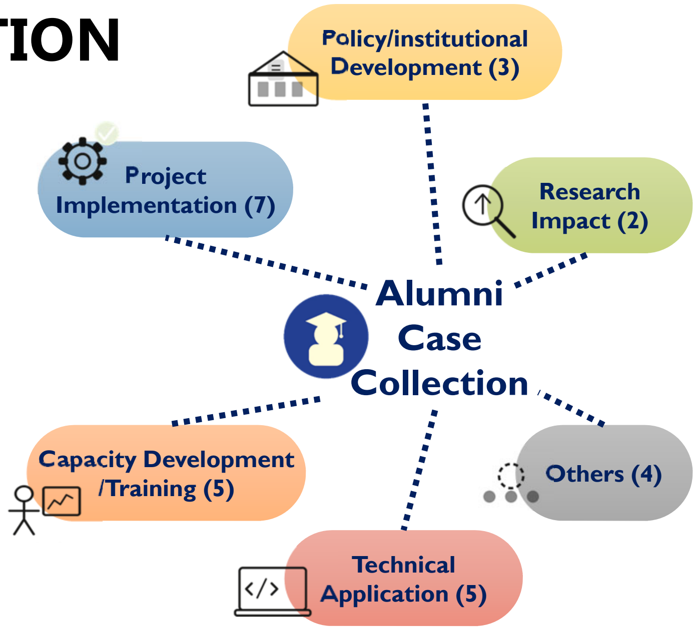
Program Evolution
Follow-up System
Alumni Networking

		Strength	Weakness
		• Extensive **networking** • Highly **expertized** faculty • International and multicultural	• Limited **topics**, collaboration, **recognition** • Small-scale program • Different types/level of students
Opportunity	• Increasing global demand • **Integration** (AI and satellite technology) • Online platform education	• **Advanced but localized technology**	• **Introduce rapid advanced technology**
Threat	• **Increasing competition** • **Underutilization** of skills • Risk of falling **behind rapid technological advancements**	• **Enhance follow-up** • **Consolidate alumni networking**	• **Improve global awareness**

2. CASE COLLECTION

Alumni tracking

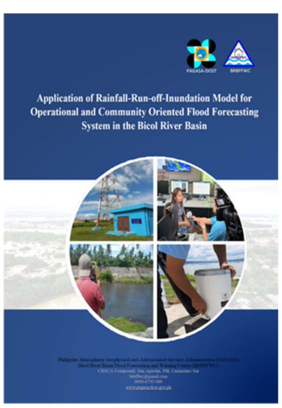
- Flaviana Pinto Fernandes, Timor-Leste, 2025
- Markandu Mauran, Sri Lankan, 2024
- Nalin Kumar Ranasinghe, Sri Lankan, 2013
- Sheila Joy L. Go-oc Abdon, Filipino, 2018
- Allen B. Orogo, Filipino, 2023
- Zaw Myo Khaing, Myanmar, 2014
- Akshay Kowlesser, Mauritian, 2021
- RAFAEL SILVA ARAÚJO, BRAZILIAN, 2020
- Jhon Alex Bautista Mejía, Peruvian, 2025
- Sanjeewa Illangasingha, Sri Lankan, 2024
- Rahman MD Shahinur, Bangladesh, 2025
- Caballero Figueroa Eduardo Jose, Honduras, 2024
- Roshan Indika Jayasinghe, Sri Lankan, 2018
- Mihretab Gebretsadik Tedla, Ethiopian, 2023
- Salah Ud Din, Pakistan, 2024



2. CASE COLLECTION

Example of Cases

Allen B. Orogo, Filipino, graduated in **2023**



Activity report of her application

Leveraging her experience at ICHARM, she developed the RRI Model for the Bicol River Basin as the **operational flood forecasting system**. This achievement has won 2nd place in the PAGASA innovation awards 2025.
To expand the implementation, she is also leading the organization of a **training seminar** on developing operational flood warning systems, together with other ICHARM graduates.

Jhon Alex Bautista Mejía, Peruvian, graduated **2025**

To bridge the gap between academic training and real-world engineering challenges, he has conducted some **seminars** on RRI, RSR, and IWRM collaborating with Water Resources Management Council or Republic Peruvian Congress

Integrated Water Resources Management seminar, in collaboration with the Republic Peruvian Congress

Basin-scale sediment transport modelling methodology, using RSR and Nays2DH models

2. CASE COLLECTION

Suggestion from Alumni

Experience and knowledge gained through ICHARM's programs have enhanced leadership and institutional development, as well as structured organizational practices, accountability systems, and decision-making processes.

However, some alumni also identified challenges:

- **Gaps between scientific research, engineering practice and the administrative decision-making hierarchy**
- **Limited technical staffs**

Then, some suggestions from alumni are …

- **Inclusion of new technology and advance digital technology in practice**
- **Strengthening collaboration, networking and exchange program**
- **Enhancement in Policy**

3. FUTURE STRATEGY

Key Directions

- **Evolving into an educational program integrating advanced science and technology with practical sense**
- **Create more opportunities for promoting to further learning after graduation**
- **Develop consolidated and mutual networking among all alumni**

実践的知識を統合した教育が大きな強みとして評価された。一方、産業界や実務者との連携不足が弱みとして指摘された。また、世界41か国に広がる同窓生ネットワークは国際協力を促進する大きな機会と捉えられたが、帰国後に学んだ知識や能力を十分に活用できない可能性が潜在的脅威として挙げられた。これらを踏まえ、先進技術と地域特性を両立させる「地域に根ざした先端技術」の推進や、新技術の導入、教育体制の強化、国際交流の拡充が重要な方向性として示された。

・次に、卒業生の活動事例を分析した結果、多くの卒業生が取得した知識や技術を自国の政策立案、研究、プロジェクト実施、人材育成などに活用していることが確認された。一方で、科学・技術と行政の意思決定の間に存在するギャップ、人材や技術者不足といった課題も明らかになった。

・これらの分析を踏まえ、、いくつかの戦略的優先事項が示された。

① 先端技術と実践経験を組み合わせる独自のアプローチを引き続き強化しながら、各地域の状況に適応した解決策の提供

② 卒業後も学び続けられるリカレント教育の充実

③ 相互に支え合う強固な同窓生ネットワークの構築

・また、水関連災害リスク軽減および持続可能な開発の取り組みの効果を高めるためには、先端的デジタル技術の活用、より強力な国際協力、そしてそれらを支える政策の重要性がますます高まっていることも強調した。