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ICHARM

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

Message from Executive Director

Think over "The last-mile challenge" again

Bringing about the catastrophic impact on every aspect of society, COVID-19 has put us in an inescapable situation to take a second look at our behaviors under a crisis from a different perspective.

We sometimes make inaccurate judgments and illogical interpretations of the situation we face due to various cognitive biases. Daniel Kahneman, who established behavioral economics, clarified a mechanism of the thought process that goes into every decision

we make. According to Kahneman, there are two systems in this process: System 1 and System 2. System 1 is fast, instinctive and emotional, while System 2 is slower, more deliberative and more logical. System 1 is easily affected by cognitive biases and much more dominant in daily life than System 2.

There is also a gap between "I know it" and "I do it". A theory identifies several psychological steps between knowledge and behavior: for example, "I am interested in it (interest)," "I want to commit to it (motive)," and "If I have a chance, I will do it at any time (intention)." Still more psychological determinants are reported to be involved for us to move from a step to the next: a sense of crisis, responsibility, effectiveness, feasibility, costs and benefits, and moral standard. These determinants can be fostered by feedback from experiences.

Meanwhile, our memories are likely to fade away as time goes along. "Vijnaptimatra" in the Sanskrit language, or consciousness-only theory in English, is a Buddhist doctrine established in the fourth century. Under our consciousness stimulated by our five senses through eyes, ears, nose, tongue and body, there are two deep psychological levels: "Manas-vijnana" and "Aalaya-vijnana." "Manas" means human, and "Aalaya" means storehouse. Vijnaptimatra explains that our consciousness grows out of the interaction between Manas-vijnana and Aalaya-vijnana, which accumulates through daily actions and influence our mind just like incense permeates into and remains in priests' robes.

Learning lessons from the experiences with black plague, cholera, Spanish flu, SARS, Ebola hemorrhagic fever, and other infectious disease pandemics, we should try harder to fill a gap between knowledge and behavior by checking our actions one by one and accumulating achievements. "The last-mile challenge," a common target among all disasters, is the key to reducing the possibility that cognitive biases cloud our decisions and actions under this crisis.



Speech at the International Symposium on Water and Culture, GRIPS, on February 3, 2020
「水と文化」国際シンポジウム、政策研究大学院大学（2020年2月3日）

今一度考える「ラストマイルチャレンジ」

新型コロナウイルス感染症（COVID-19）は危機的状況下における私たちの行動の在り方を改めて考える機会となっています。

私たちは認知バイアスと呼ばれる心理作用によって、間違った判断や合理的でない解釈をしがちです。「行動経済学」を創始したD.カーネマンは、私たちが意思を決定する際の思考過程を明らかにしています。彼によれば、システム1とシステム2という2つの過程があり、前者は素早く、直感的で、情緒的であり、一方後者は時間がかかり、より深く考え、より論理的であるとしています。しかも、日々の意思決定のほとんどは、様々な認知バイアスに影響されやすいシステム1によってなされているということです。

私たちの行動が、私たち自身が持っている知識と乖離していることも問題です。「知っている」という段階から「行動する」という段階の間には、興味、動機、行動意図といういくつかの心理段階があり、ある段階から次の段階に移るには、危機感、責任感、有効性、実行可能性、報われ感、社会的規範が作用しているといわれています。また実際の経験がそれぞれの段階をより確実にするというフィードバック作用も報告されています。

一方で、私たちの記憶は時間と共に薄れていくことも確かです。4世紀にまともられた仏教経典の「唯識」では、眼・耳・鼻・舌・身を通じた五感の刺激に基づく意識の奥に、「マナ識」と「アーヤ識」という深層心理過程があるとしています。サンスクリット語で「マナ」とは人間を、「アーヤ」は蔵を意味しています。「唯識」では、まるでお香の薫りが衣に染み付いて残存する（これを薫習とよぶ）ように、日々の行動の積み重ねから、この「マナ識」と「アーヤ識」が相互作用して私たちの意識を生み出しているとしています。

ペスト、コレラ、スペイン風邪、SARS、エボラ出血熱など、人類が経験してきた過去の感染災害に学び、私たち自身の行動を一つ一つ見直し、実行を重ねることで、知識と行動の乖離を埋めることが必要です。全ての災害に共通である、この「ラストマイルチャレンジ」により、危機的状況下における私たちの判断に認知バイアスが入り込む余地をなくすことが重要です。

April 30, 2020
KOIKE Toshio
Executive Director of ICHARM



Special Topics

3. Revised agreement on ICHARM between the government of Japan and UNESCO has been signed / ICHARM に関する日本国政府とユネスコとの改定協定書が署名されました

International Flood Initiative (IFI)

4. "Orientation seminar on climate change adaptation" held in Surakarta City, Indonesia / ソロ川気候変動適応オリエンテーション
5. Fourth Plenary Session of the Platform on Water Resilience and Disasters under IFI in Sri Lanka / スリランカで第4回 IFI 水のレジリエンスと災害に関するプラットフォーム会議を開催しました

Research

6. Introduction of ICHARM research projects / 研究紹介
KAKINUMA Daiki, Research Specialist [A study on improvement of RRI-model reproducibility and efficiency for flood forecasting in small mountainous river basins] / 柿沼太貴 専門研究員「中小河川における洪水予測に向けた RRI モデルの再現精度向上と効率化に関する研究」

Training & Education

8. Educational Program Updates / 修士課程研修 活動報告
10. The 13th ICHARM Follow-up Seminar was held in Colombo, Sri Lanka, on February 12 and 14, 2020. / 2020 年 2 月 12 日と 14 日の 2 日間、第 13 回 ICHARM フォローアップセミナーをスリランカのコロomboで開催しました。

Information Networking

12. ADBI-ICHARM Policy Dialogue Water-related Disaster Resilience under Climate Change / ADBI-ICHARM 共催による「気候変動下における水関連災害へのレジリエンスに関する政策対話」
13. 100th AMS Annual Meeting 2020 in Boston, USA

Field Survey

13. Fourth Field Survey in the Sittaung River of Myanmar to Investigate Riverbanks and Coastal Erosion / 第 4 回ミャンマー国シッタウン川現地調査

Others

15. Comments from internship students / インターン生からのコメント
16. Video clip posted: people experiencing a virtual flood using VR goggles / VR 動画の ICHARM ホームページ掲載のお知らせ
17. Personnel change announcement / 人事異動のお知らせ
18. Business trips / 海外出張リスト
18. Visitors / 訪問者リスト
18. Publications / 発表論文リスト

Special Topics

Revised agreement on ICHARM between the government of Japan and UNESCO has been signed

ICHARMに関する日本国政府とユネスコとの改定協定書が署名されました

ICHARM, a category II center of UNESCO, was established in March 2006 based on the agreement between the government of Japan and UNESCO. The agreement was first renewed in July 2013 and to be expired in February 2020 after an extension of 6 months.

On February 13, 2020, the revised agreement on ICHARM was signed by Ambassador YAMADA Takio, the Permanent Delegate of Japan to UNESCO, and Director-General Audrey Azoulay of UNESCO just before the expiration.

Under the revised agreement, ICHARM will continue to conduct various activities covering research, capacity building, and information networking in the field of water-related hazards and risk management at the local, national, regional, and global levels in close cooperation with UNESCO.

The revised agreement will be in effect for 6 years until February 2026.



Courtesy of the Permanent Delegation of Japan to UNESCO
写真提供：日本政府ユネスコ代表部

(Written by IKEDA Tetsuya)

ユネスコのカテゴリー2センターであるICHARMは、日本政府とユネスコとの間で締結された協定書に基づき、2006年3月に設立されました。その後、2013年7月に協定書の更新がなされましたが、半年間の延長を経て、2020年2月が期限となっていました。

このたび、2020年2月13日、ICHARMに関する協定書の改定について、日本国政府ユネスコ代表部・山田滝雄大使とユネスコ Audrey Azoulay 事務局長との間で署名が交わされました。

改定された協定書においても、ICHARMは引き続き、ユネスコと緊密に連携しつつ、地方・国・地域・地球規模のレベルで水関連災害及びリスクマネジメントの分野における研究・研修・情報ネットワーク活動を進めることとしています。

なお、改定された協定書については、6年間、2026年2月まで有効とされています。

International Flood Initiative (IFI)

The International Flood Initiative (IFI) is a worldwide framework to promote collaboration in flood management among international organizations such as UNESCO, the World Meteorological Organization (WMO), the United Nations University (UNU) and the United Nations Office for Disaster Risk Reduction (UNDRR). ICHARM has been its secretariat since the establishment of IFI.

In October 2016, the Jakarta Statement towards an interdisciplinary and transdisciplinary partnership to consolidate flood risk reduction and sustainable development, was adopted by the member organizations of IFI. As part of this effort, the Philippines, Sri Lanka, Pakistan, Myanmar and Indonesia have already decided to establish a Platform on Water Resilience and Disasters involving various government agencies, and ICHARM has been supporting their decision as facilitator.

This article reports "Orientation seminar on climate change adaptation" held in Surakarta City, Indonesia and Fourth Plenary Session of the Platform on Water Resilience and Disasters under IFI in Sri Lanka.

国際洪水イニシアティブ (International Flood Initiative: IFI) はユネスコ (UNESCO)、世界気象機関 (WMO)、国連大学 (UNU)、国連防災機関 (UNDRR) などの国際機関が世界の洪水管理推進のために協力する枠組みで、ICHARMは、IFIの事務局を担当しています。

2016年10月に承認された「洪水リスク軽減と持続可能な開発を強固にするための学際的な協力に向けた宣言文 (ジャカルタ宣言)」を受け、各国および関係機関と協働しながら、統合洪水マネジメントに貢献する活動を進めています。特に、フィリピン・スリランカ・パキスタン・ミャンマー・インドネシアにおいては、各国の関係機関による「水のレジリエンスと災害に関するプラットフォーム」の構築に向けた取り組みが始まり、ICHARMはファシリテーターとしてその活動の促進を図ってきました。

本号では、ソロ川気候変動適応オリエンテーション、スリランカで第4回IFI水のレジリエンスと災害に関するプラットフォーム会議について報告します。

“Orientation seminar on climate change adaptation” held in Surakarta City, Indonesia

ソロ川気候変動適応オリエンテーション

2020年2月26日にインドネシア国スラカルタ市においてソロ川流域をパイロットケースとした気候変動適応オリエンテーションセミナーが開催されました。このセミナーは、気候変動に対する適応策を策定することを目的とした「水のレジリエンスと災害に関するプラットフォーム」の能力開発プログラムであり、ソロ川の水災害と気候変動に係る機関から約40名が参加しました。ICHARMからは、小池俊雄センター長、岡田智幸 上席研究員、Mohamed Rasmy Abdul Wahid 主任研究員、富澤洋介主任研究員、牛山朋来専門研究員が参加し、気候変動に関する講義やソロ川流域における気候変動影響評価の紹介、災害レジリエンス向上のための活動提案がなされました。

公共事業住宅省 (PUPR)、気象気候地球物理庁 (BMKG)、国家開発計画庁 (BAPPENAS) 等の現地機関からは、気候変動に対して現在取り組んでいる活動の紹介があり、ソロ川流域における水に関する問題やプラットフォーム参加機関間でのデータの共有に関する議論が行われました。

2月27日にはジャカルタで PUPR のバスキ大臣や水資源総局長などの幹部にオリエンテーションセミナーの成果を報告しました。

今回の会議での議論を踏まえ、データ収集の枠組みの構築や、水防災・減災の施策決定・展開の根拠となる高度なデータ分析事例の紹介等を通じて、ICHARM では今後もインドネシア国におけるプラットフォーム活動を支援していきます。

The Orientation Seminar on Climate Change Adaptation in the Pilot Case of the Solo River Basin was hosted by ICHARM on February 26, 2020, in Surakarta City, Indonesia. The event was a capacity building program of the Platform on Water Resilience and Disasters, aiming at initiating activities to formulate adaptation measures for climate change. It gathered around 40 participants from relevant agencies and stakeholders. Director KOIKE Toshio, Chief Researcher OKADA Tomoyuki, Senior Researcher Mohamed Rasmy Abdul Wahid, Senior Researcher TOMIZAWA Yosuke, and Research Specialist USHIYAMA Tomoki participated from ICHARM, providing lectures on climate change, introducing climate change impact assessment, and giving suggestions to improve disaster resilience. Local agencies, such as the Ministry of Public Works and Housing (PUPR), the Agency for Meteorology, Climatology and Geophysics (BMKG), and the Ministry of National Development Planning (BAPPENAS) of the Republic of Indonesia, also presented their ongoing activities to address climate change. Participants earnestly discussed local issues on the Solo River basin and a data sharing policy among the platform member organizations.

On February 27, the ICHARM researchers visited PUPR in Jakarta and reported the results of the orientation seminar to Minister Basuki and other PUPR executives, including the director general of water resources.

Based on the discussion of the orientation seminar and the meeting, ICHARM will continue to support Indonesia in carrying out activities related to the Platform on Water Resilience and Disasters, such as constructing a framework for collecting data and information and introducing cases of advanced data analysis for determining and developing measures for water-related disaster prevention and mitigation.



A scene of the Orientation Seminar on Climate Change Adaptation
気候変動適応に関するオリエンテーションセミナーの様子



Meeting with PUPR Minister Basuki
公共事業住宅省バスキ大臣への報告

(Written by TOMIZAWA Yosuke)

Fourth Plenary Session of the Platform on Water Resilience and Disasters under IFI in Sri Lanka

スリランカで第4回 IFI 水のレジリエンスと災害に関するプラットフォーム会議を開催しました

The 4th Plenary Session for the Platform on Water Resilience and Disasters under the International Flood Initiative (IFI) in Sri Lanka was held on February 13, 2020. More than 50 experts participated from the water-related government organizations of Sri Lanka, including the Irrigation Department, the National Building Research Organization (NBRO), the Disaster Management Center (DMC), the Department of Meteorological (DOM), the Ministry of Megapolis and Western Development, the Mahaweli Authority of the Ministry of Mahaweli, the Sri Lankan Land Reclamation and Development Corporation (SLLRDC), and the University of Moratuwa. The session started with a welcome speech by Eng. S. Mohanarajah, the director general of the Irrigation Department. Prof. KOIKE Toshio, the director of ICHARM, delivered a presentation on "Strengthening Water-related Disasters Resilience and Enabling Sustainable Development," and Prof. Srikantha Herath, the team leader of the Center for Urban Water (CUrW), delivered a presentation on "International Flood Initiative: A Roadmap for Collaboration in Sri Lanka." ICHARM researchers and Sri Lankan experts presented the recent and prospective progress in the platform activities. Notably, the engineers from the Irrigation Department, who graduated from the master's course program managed by ICHARM and the National Graduate Institute for Policy Studies (GRIPS), presented their research achievements made during their stay at ICHARM. A Sri Lankan irrigation engineer, who is presently enrolled in the Ph.D. program, spoke about his ongoing research on the Mahaweli River basin. The participants had very detail discussions about the current and future directions of activities under the framework of the Platform for the selected river basins (i.e., Kalu, Kelani, Malwathu, and Mahaweli). All the participants agreed to develop a progress report on the activities conducted in the past two and half years and to draft an implementation plan on the future activities of the Platform by identifying tasks, defining the responsibilities of each organization, and creating timelines.

During the visit to Sri Lanka, Prof. KOIKE and Senior Researcher Rasmy paid a special visit to meet honorable Minister Chamal Rajapaksa, who serves as Minister of Mahaweli, Agriculture, Irrigation and Rural Development, Minister of Internal Trade, Food Security and Consumer Welfare, and State Minister of Defense. They explained the platform activities and collaboration between ICHARM and Sri Lankan organizations, as well as briefed him on the upcoming Fourth Asia-Pacific Water Summit (4th APWS), scheduled on October 19 and 20, 2020, in Kumamoto City, Japan. In addition, they also paid a special visit to the presidential office and met Admiral Professor Jayanath Colombage, who serves as Additional Secretary to the President for Foreign Relations. After explaining the 4th APWS to the professor, they discussed possible participation by the Sri Lankan government and collaboration between ICHARM and the Institute of National Security Studies of Sri Lanka, where the admiral professor serves as Director General.

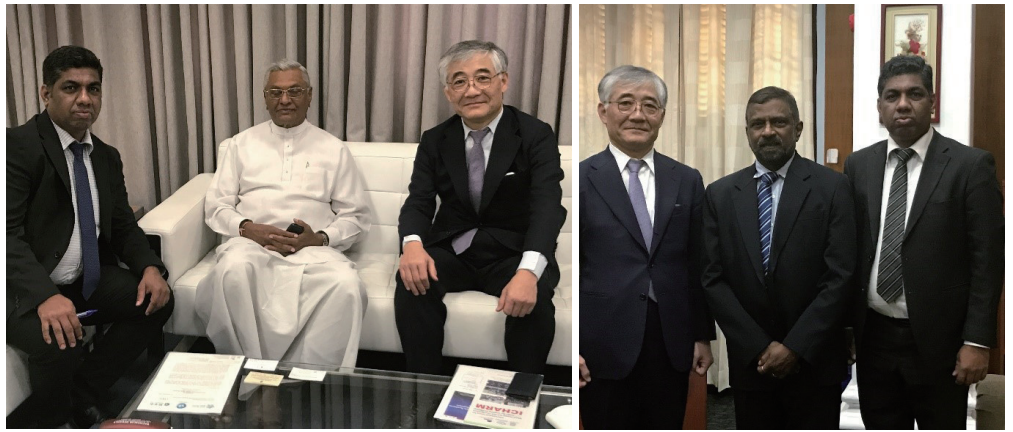
スリランカで第4回 IFI 水のレジリエンスと災害に関するプラットフォーム会議が2020年2月13日にスリランカで開催されました。会議には、かんがい局、国家建築研究機関(NBRO)、災害管理センター(DMC)、気象局(DOM)、メガポリス西部開発省、マハウエリ省マハウエリ開発庁、土地開拓開発公社(SLLRDC)、モラトゥワ大学を含むスリランカの水に関する政府機関等から50名以上の専門家が参加しました。会議ではかんがい局の局長 Eng. S. Mohanarajah による歓迎の挨拶がなされ、ICHARM 小池俊雄センター長から「Strengthening Water-related Disasters Resilience and Enabling Sustainable Development」、Center for Urban Water (CUrW) のチームリーダーである Herath 教授から「International Flood Initiative: A Roadmap for Collaboration in Sri Lanka」の発表が行われました。その後、ICHARM 研究者やスリランカの専門家らによりプラットフォームにおける最近の活動状況や今後の進め方について発表が行われました。特に ICHARM と政策研究大学院大学(GRIPS)による修士課程を修了したかんがい局のエンジニアたちから、ICHARM での滞在中に行った研究成果が発表されました。また現在博士課程に在籍しているスリランカかんがい局のエンジニアからは、マハウエリ川流域について進めている研究内容について発表がなされました。参加者たちはプラットフォームの枠組みにおけるモデル河川流域(カル、ケラニ、マルバツ、マハウエリ)での活動に関する現状と今後の方向性について、詳細な議論を行いました。また、これまでの2年半にわたる活動を取りまとめた Progress Report の作成と、タスクの特定、各組織の役割分担、またタイムラインを作成することにより、プラットフォームの将来の活動予定に関する Implementation Plan を作り上げていくことが全ての参加者によって合意されました。

滞在期間中、小池センター長と Mohamed Rasmy Abdul Wahid 主任研究員は、マハウエリ・農業・かんがい・地域開発大臣、国内通商・食料安全・



Participants in the 4th Plenary Session of Platform on Water Resilience and Disasters under IFI
第4回水のレジリエンスと災害に関するプラットフォーム会議 集合写真

消費者大臣、国防担当大臣を務める Chamal Rajapaksa 大臣を表敬訪問しました。小池センター長らはプラットフォーム活動や ICHARM とスリランカ関係機関との協働について説明を行い、2020年10月19日及び20日に熊本市で開催予定の第4回アジア太平洋水サミットについて説明を行いました。また大統領府にも特別訪問を行い、大統領の外交担当秘書を務める Jayanath Colombage (Admiral) 教授に第4回アジア太平洋水サミットの説明を行うとともに、スリランカ政府による参加の可能性、ICHARM と Colombage 教授が所長を務めるスリランカ国家安全保障研究所との協力について議論を行いました。



Special visit to meet honorable Minister Chamal Rajapaksa (center, left photo) and Admiral Professor Jayanath Colombage (center, right photo)
Chamal Rajapaksa 大臣との表敬訪問（写真左、中央）と Jayanath Colombage (Admiral) 教授（写真右、中央）

(Written by Mohamed Rasmy Abdul Wahid)

Research

Introduction of ICHARM research projects / 研究紹介

ICHARM は、その使命を果たすため、世界及び地域での災害の傾向及び経験と災害対応に関する地域のニーズ、重要課題、開発段階等を踏まえつつ、自然、社会及び文化といった地域の多様性を考慮する原則というローカリズムを念頭に、研究、能力育成及び情報ネットワーク構築の3本柱を有機的に連携させて、現地実践活動を実施しています。

そのうち、研究としては

- (1) 水災害データの収集、保存、共有、統計化
 - (2) 水災害リスクのアセスメント
 - (3) 水災害リスクの変化のモニタリングと予測
 - (4) 水災害リスク軽減の政策事例の提示、評価と適用支援
 - (5) 防災・減災の実践力の向上支援
- の5つの柱のもと、革新的な研究活動を行っています。

本号では、柿沼太貴専門研究員の行っている「中小河川における洪水予測に向けた RRI モデルの再現精度向上と効率化に関する研究」を紹介します。

ICHARM sets three principal areas of activity: research, capacity building, and information network. It plans and implements projects in these areas in order to fulfill its mission, always keeping in mind "localism", a principle with which we respect local diversity of natural, social and cultural conditions, being sensitive to local needs, priorities, development stage, etc., within the context of global and regional experiences and trends of disasters.

At present, ICHARM conducts innovative research in the following five major areas:

- (1) Water-related disaster data archiving, sharing and statistics**
- (2) Risk assessment on water-related disasters**
- (3) Monitoring and forecasting water-related disaster risk changes**
- (4) Support through proposal, evaluation and application of policies for water disaster risk reduction**
- (5) Support for improving the capacity to practice disaster prevention and mitigation**

This issue introduces a researcher as listed below:

KAKINUMA Daiki, Research Specialist

A study on improvement of RRI-model reproducibility and efficiency for flood forecasting in small mountainous river basins



A study on improvement of RRI-model reproducibility and efficiency for flood forecasting in small mountainous river basins

中小河川における洪水予測に向けた RRI モデルの再現精度向上と効率化に関する研究

KAKINUMA Daiki, Research Specialist

近年、豪雨災害が頻発・激甚化しており、毎年のように水害による多くの人的被害が発生しています。また、地球温暖化の影響により、豪雨は今後さらに増加・激甚化するとみられています。特に中小河川ではその流域特性上、急激な水位上昇が起りやすいことに加え、急激な豪雨

In recent years, water-related disasters due to torrential rainfall have become more frequent and severe, consequently causing more human damage every year.

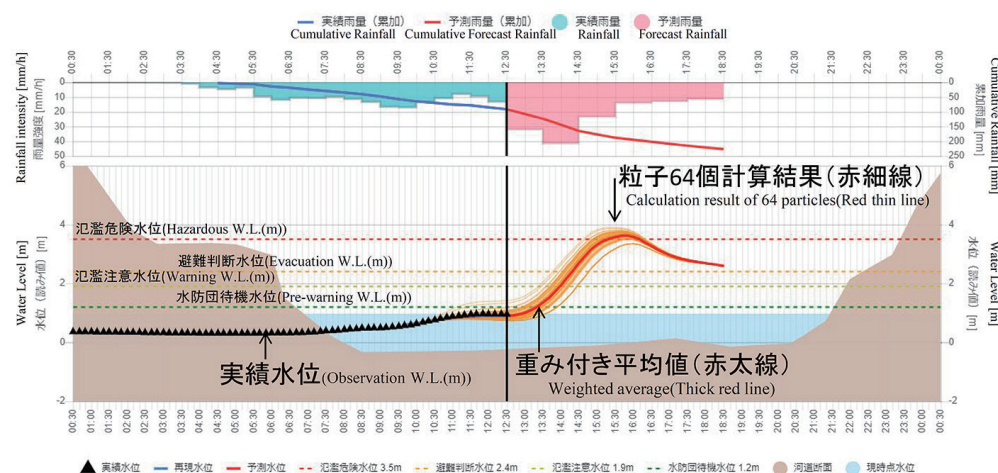
Torrential rainfall is expected to be even more frequent and intense due to global warming. The impact of such changes is likely to be greater in small mountainous river basins across Japan. Residents living in such basins often fail to evacuate in time because the water level rises rapidly during the flood due to the topographical

characteristics of the basins. As the frequency of sudden torrential rainfall continues to rise, the flood arrival time will become shorter, which leads to an even higher possibility of residents' failing to evacuate in time.

To address this challenge, ICHARM has been working on the development of a flood forecasting model to provide trigger information to support timely flood control activities and evacuation for disaster damage prevention and reduction. More specifically, ICHARM aims to develop a water-level forecasting model specializing in predicting when the water level may start to rise and when it may exceed the hazardous level likely to result in flooding, with a lead time of more than two hours. In addition, the model is designed to be inexpensive and easy-to-operate, so that it can be easily introduced to small mountainous river basins.

The water-level forecasting model employs the Rainfall-Runoff-Inundation model (RRI model), developed by ICHARM, as the rainfall-runoff model.

We also employ a particle filter and applies it to the RRI model (Fig. 1). A particle filter was introduced to avoid decreases in water-level forecasting accuracy due to the divergence between calculated and observed values, which tends to become greater as the real-time calculation of river water levels continues for a long period. To prevent this divergence, observed water-level data need to be sequentially assimilated to the water-level forecasting model, and this can be done by estimating state variables and parameters in a non-Gaussian manner using non-linear water-level forecasting models. A particle filter is a powerful tool with high applicability to carry out sequential data assimilation.



Real-time water-level forecasting calculation results using a particle filter applied to the RRI model. It predicted the water level 6 hours ahead using the observed water level three hours before the current time. This result predicted that the river water level will exceed the hazardous level in about 3 hours.

図-1 RRIモデルに粒子フィルタを適用したリアルタイム水位予測計算結果。現時刻から3時間前の実績水位を用いて6時間先の水位を予測している。この結果では約3時間後に氾濫危険水位を越えると予測している。

The RRI model is equipped with an easy-to-use interface and allows the user to build a model with little effort. On the other hand, it has been known to require considerable time and effort to estimate parameters that can significantly affect the reproducibility of the RRI model. Additional uncertainties also exist, originating in the user's hydrological background and level of understanding of hydrological phenomena handled by the RRI model. These issues need to be addressed to disseminate the water-level forecasting model widely.

To find solutions to those issues, I have been studying a method for parameter optimization that can increase the accuracy and efficiency of the water-level forecasting model.

More specifically, we have been studying parameter identification methods to obtain optimal solutions by applying the Shuffled Complex Evolution method developed at University of Arizona (SCE-UA) to the RRI model. The SCE-UA method is a global optimization method with good search efficiency, developed by combining the concepts of competitive evolution and group mixing mainly for the optimization of many parameters in non-linear hydrological models.

の頻発化により洪水到達が早まっており、住民の避難が遅れる可能性がさらに高まっています。

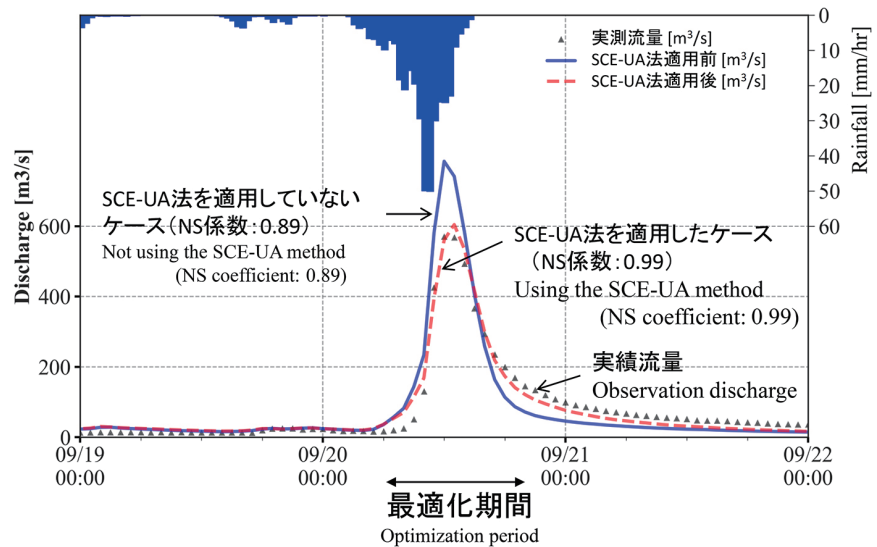
このため、ICHARMでは中小河川において、被害を防止・軽減するための水防活動や避難活動のトリガー情報となるよう、水位上昇と氾濫の恐れがある水位の超過を2時間以上前に予測する(リードタイム)ことに特化するとともに、速やかに普及が可能な安価で汎用型の水位予測モデルを開発することを目指しています。上述した水位予測モデルのベースとなる降雨流出モデルにはICHARMが開発した降雨流出氾濫モデル(RRIモデル)を用いています。さらに、河川水位をリアルタイムで連続計算を行う際に、計算を長期間続けていると計算値と観測値の乖離が大きくなり、水位予測精度の低下が懸念されるため、水位観測データを水位予測モデルに逐次同化させる方法として、非線形の水位予測モデルを取扱え、状態量やパラメータを非ガウスで推定することが可能であり、応用性の高い逐次データ同化手法の一つである粒子フィルタを選定し、RRIモデルに適用しました(図1)。

RRIモデルは充実したインターフェースにより誰でも簡単にモデル構築ができますが、モデルの再現性を大きく左右するパラメータの推定には、従来から時間と労力を要してきました。また、RRIモデルが扱う水文現象の理解や技術者の水文学的バックグラウンドによる不確実性も生じます。これらの点は、モデルを広く普及するという観点からは課題といえます。

私は上記の課題を改善するためにモデルの精度向上と効率化の両面を考慮したパラメータ最適化の方法について研究しています。その一つとして、探索効率に優れた大域的探索手法であるSCE-UA法をRRIモデルに適用し、最適解を得るためのパラメータの同定手法について研究しています。SCE-UA法は非線形水文モデルにおける数多くのパラメータの最適化を主目的として開発された手法であり、競争進化・集団混合の概念を組み合わせた手法です。その探索手法によって局所最適値から広域最適値へより早く収束することから効率化が期待されます。具体的な研究内容として、洪水予測の観点から、水位上昇部やピークの再現性を重視するために、評価関数を例えばピーク流量誤差に重みを置く等の種々の評価関数を使用することや、複数イベントを組み合わせた評価期間を変えた最適化等を試行・検証しています(図-2)。より長いリードタイムを精度よく得られ、汎用性の高いモデルを構築し普及できるよう研究していく予定です。

This search method is expected to improve the efficiency of the model because it speeds up the conversion from local optimum to global optimum.

I have tested various optimization methods, focusing on the reproducibility of the rising and peaking parts of the water level from the perspective of flood forecasting. I tried out different evaluation functions, including ones created by weighting peak flow errors. I also conducted experimental reproductions by combining multiple events or changing the evaluation period, for example (Fig. 2).



Calculation results by applying the SCE-UA method to the RRI model. Overall, the calculation accuracy improves.
 図-2 RRIモデルにSCE-UA法を適用した計算結果。全体的に計算精度の向上がみられる。

We will continue to work on the development of a water-level forecasting model that produces more accurate information with a longer lead time, hoping that it will be widely disseminated for various purposes in disaster risk reduction.

(Written by KAKINUMA Daiki)

■ Training & Education

Educational Program Updates

修士課程研修 活動報告

ICHARMでは2007年以降、JICA、GRIPSと共同して、主に外国人行政職員を対象として、約1年間で学位取得できる修士コースを設けています。例年、10月から翌年3月の6ヶ月は主に講義が行われ、4月から8月にかけては論文執筆に取り組みます。12月からは実習科目「Practice on Open Channel Hydraulics」の講義を行い、また、12月26日にはつくば市郊外の屋外実験施設を借りて水理学実習を行いました。

1月に入ると、実習科目「Computer Programming」と「Control Measures for Landslide & Debris Flow」の講義を開始しました。1月7日から9日にかけては、「Project

Since 2007, ICHARM has provided a one-year master's program in collaboration with JICA and GRIPS, which is designed mainly for officers of overseas government organizations. Students mainly attend lectures in the first six months from October to March and work on their individual theses in the second six months from April to August.

Among the exercise classes, "Practice on Open Channel Hydraulics" started in December. On December 26, the students practiced hydraulic techniques at an outdoor experimental facility located in the suburb of Tsukuba, a local city where ICHARM is located. In January, "Computer Programming" and "Control Measures for Landslide & Debris Flow" started. They also attended a "Project Cycle Management" workshop from January 7 to 9. The first of the five master's thesis presentation meetings was held on January 30, and each student explained a plan for their individual study and received advice from their supervisors and other

ICHARM researchers.

In February, “Socio-economic and Environmental Aspects of Sustainability-Oriented Flood Management” started. From February 25 to 28, the students visited Kochi, Kagawa and Tokushima prefectures. On the first day, they received a lecture entitled “New Kochi Port Construction Plan” at New Kochi Port. Then, they moved to Mt. Godai’s observation deck, where an officer of Kochi Prefecture explained “Anti-Earthquake and Tsunami Triple Safety Measures at Kochi Port (Urado Bay).”

On the second day, they visited Hidaka Village to see the Nagoya chinka-bashi (“sink-bridge”) crossing the Niyodo River near the village. This bridge is a unique compromise to achieve a balance between benefit and cost. While it provides a short cut for the small, riverside community to get to a national road on the opposite side of the Niyodo River, the bridge goes underwater during a flood, though such a case happens rarely, because it is built to cross the river at a lower height than usual for saving cost. After that, the students visited the Kusaka River New Floodway Construction Site in Hidaka Village, where they entered the floodway tunnel and took a close look at its facilities. They also visited the Kochi University of Technology and attended a lecture on “Development of Decision Making System for Water Resource Policy under Climate Change in Shikoku Area” by Prof. NASU Seigo.

On the third day, after visiting the Sameura and Ikeda dams, the students visited Lake Manno in Manno Town, Japan’s largest reservoir for irrigation purposes.

On the last day, they visited the Ishii Disaster Prevention Station in Ishii Town. They first received a brief lecture on the Yoshino River, one of the nation’s most famous rivers, and then learned about several measures that have been used in flood fighting efforts in Japan. They also had a chance to see how such measures as the sand-bag ringing method and the sheet-covering approach can be applied. After that, they learned rope techniques useful in flood fighting.

All the classes ended in March, and the students now focus on their individual studies, including writing a master’s thesis from April.

ICHARM would like to express sincere thanks to the Kochi River and Highway Office of MLIT, Mr. YAMAMOTO Kuniichi, the Tokushima River and Highway Office of MLIT, the Manno Lake Land Improvement District, the Japan Water Agency, and the Department of Civil Engineering of Kochi Prefecture.



The central area of Kochi city
from Mt. Godai observation deck
五台山展望台から眺める高知市中心部



Exercise on rope work at Ishii Disaster Prevention Station
石井防災ステーションでのロープワーク実習

「Cycle Management」の講習を行いました。1月30日には、年間5回予定されている研修員のプレゼンテーションのうちの第1回目が実施され、ICHARM 指導教員及び研究員がアドバイスを行いました。2月に入ると、「Socio-economic and Environmental Aspects of Sustainability-oriented Flood Management」の講義を開始しました。2月25日から2月28日にかけては、高知県、香川県、徳島県を訪問しました。まず、初日は、高知新港にて高知新港の整備計画の説明を受けた後、高知市内を一望できる五台山に移動し、高知県庁職員から「高知港（浦戸湾）の三重防護による地震・津波対策」について説明を受けました。

2日目は、高知県日高村で仁淀川に架かる名越屋沈下橋を見学しました。小規模集落が対岸の国道を利用するために架けられた橋梁で、建設費用を抑えるために低い位置に架橋されているため、増水すると橋梁自体が水面下に沈みます。平常時のみ橋梁を利用出来れば良いと割り切られて設置された橋梁で、利便性と建設費用の調和のユニークな例を学びました。次に、同じく日高村にて日下川新規放水路の工事現場を見学しました。ここでは、トンネルに入り、設備を間近で見学しました。その後、高知工科大学を訪問して「Development of Decision Making System for Water Resource Policy under Climate Change in Shikoku Area」というテーマで那須清吾教授の講義を受けました。

3日目には、早明浦ダムと池田ダムを見学した後、香川県まんのう町を訪問し、日本最大級のかんがい用ため池である満濃池を見学しました。

最終日には、徳島県石井町の石井防災ステーションで水防工法の実習を受けました。まず、吉野川の概要説明を受け、月輪工法、シート張等の水防工法を見学した後、水防活動に不可欠なロープ・ワークの実習を受けました。

3月には、講義科目の終了に伴う試験が多く実施され、4月からは本格的に研究・論文執筆に取り組むこととなります。

現地訪問のご対応を頂いた高知河川国道事務所、山本邦一先生、徳島河川国道事務所、満濃池土地改良区、水資源機構及び高知県土木部の皆様には大変お世話になりました。ここにお礼申し上げます。

(Written by NAKAMURA Tomoki)

The 13th ICHARM Follow-up Seminar was held in Colombo, Sri Lanka, on February 12 and 14, 2020.

2020年2月12日と14日の2日間、第13回 ICHARM フォローアップセミナーをスリランカのコロンボで開催しました。

本セミナーは、主に ICHARM での研修を終え帰国した修士課程の修了者を対象とし、帰国後抱える課題の解決、最新の研究成果の紹介を通じた能力向上、修了生間のネットワーク強化、相手国政府関係機関への研修の広報、将来の博士課程候補者の人材発掘、研修へのニーズ把握等を目的とし、毎年1回開催しています。今年も、昨年のネパールに引き続きスリランカで開催しました。12日のセミナーには10名の帰国研修員（修士課程10名）と、関係政府機関、日本大使館と JICA 事務所の方々にもご出席いただき、総勢32名が参加しました。

セミナーでは、小池俊雄センター長による歓迎挨拶の後、星合千春在スリランカ日本国大使館一等書記官、高嶋清史 JICA スリランカ事務所次長、シリワルダナかんがい局副局長 (Eng. Siriwardana Additional Director General of Irrigation Department)、東部県かんがい局ラジャコパラシガム副所長 (Mr. V. Rajagopulasingham, Deputy Director of Department of Irrigation-Eastern Province)、セナデーラ統括マネージャー (Ms. Srimathe Senadeera General Manager of SLLRDC) からご挨拶を頂きました。

その後、ICHARM から小池センター長、江頭進治研究・研修指導監、Mohamed Rasmy Abdul Wahid 主任研究員が特別講演を、香港大学の Prof. A. W. Jayawardena、Moratuwa 大学の Prof. R. L. Lalith Rajapakse から招待講演を行いました。

講演に引き続き、帰国研修員による発表を行い、それぞれが現場で取り組んでいる業務や、各自が経験している同国の水害リスクマネジメントの現状や課題について報告頂きました。

日本で学んだ技術を使用した業務の取り組みとして、ダム運用による下流洪水被害の軽減、ダム間の連結水路建設、ダムの堆砂問題対策、ラグーンでの水利用などの説明があり、各々が現場で奮闘、活躍している様子がうかがえました。

今回、ICHARM で勤務していた時に ICHARM 研修員だったセミナー参加者を知る Prof. A. W. Jayawardena、Prof. R. L. Lalith Rajapakse 両氏に参加頂いたことは、ICHARM での研修を通じて築かれたネットワークを強固にするための大きな貢献となりました。

セミナーの途中からは、モハナラジャかんがい局副局長 (Eng. S. Mohanarajah Director General of Irrigation) にもご参加頂きました。

モハナラジャ局長をはじめ、かんがい局関係者からは ICHARM の研究成果に対して非常に高い評価を頂きました。また、研究成果の社会実

The seminar is organized once a year overseas, inviting graduates of ICHARM's training courses, mainly those from the master's program. Following the seminar in Nepal last year, this year's seminar was held in Sri Lanka with a total of 32 participants, including ten graduates from the master's course and a dozen of representatives from the governmental organizations of Sri Lanka, the Embassy of Japan, and JICA office.

The seminar opened with welcome remarks by Prof. KOIKE Toshio, the director of ICHARM. Then, opening remarks were made by Ms. HOSHIAI Chiharu, the first secretary of the Embassy of Japan, Mr. TAKASHIMA Kiyofumi, the senior representative of JICA Sri Lanka Office, Eng. Siriwardana, the additional director general of the Irrigation Department, Mr. V. Rajagopulasingham, the deputy director of the Department of Irrigation-Eastern Province, Ms. Srimathe Senadeera, the general manager of the Sri Lanka Land Reclamation and Development Corporation.

After the opening ceremony, a series of presentations were delivered by ICHARM researchers, starting from Prof. KOIKE, and then Prof. EGASHIRA Shinji, the research and training advisor, and Senior Researcher Mohamed Rasmy Abdul Wahid. The invited experts, Prof. A.W. Jayawardena of Hong Kong University and Prof. R. L. Lalith Rajapakse of Moratuwa University, also delivered special talks on water-related issues.

After those experts, the graduates of ICHARM's training courses made presentations on their ongoing or past activities, including the current conditions and challenges regarding flood risk management in Sri Lanka.

The presentations showed that they are making great efforts in solving problems arising one after another and leading projects to which they are assigned. Some reported on the use of knowledge and technology learned in Japan for the mitigation of downstream flood damage by improving dam operation, the construction of a diversion canal between dams, the development of measures against dam sedimentation, and the promotion of water use in lagoons.

The participation of Prof. A. W. Jayawardena and Prof. RL Lalith Rajapakse contributed a great deal to strengthening the network created through the training at ICHARM, for especially they knew some of the graduates attending the seminar since they had worked at ICHARM as the research and training advisor and a researcher, respectively.

Eng. S. Mohanarajah, the director general of irrigation, also joined the seminar during the presentations by managing his busy schedule.

The director general, as well as other executives of the Irrigation Department, exhibited a great appreciation for the achievements of ICHARM's research projects and expressed high expectations for the further application of research findings to society and the more contributions of ICHARM graduates to the country's future development.

On February 14, the ICHARM staff took a field trip with some graduates of ICHARM's training courses to look into bank erosion along the Maha River, which runs near Negombo, about one-hour drive to the north from Colombo, and the Deduru River, which runs near Chirawa, about one-hour drive to the north from Negombo. They also visited some irrigation facilities.

At a site along the Maha River, the field-trip participants observed the situation of channel changes due to a flood (a new channel and a sandbar formed by it), as well as erosion and erosion control measures in a water-contact section. Prof. EGASHIRA gave some advice to control the river flow around the water-contact

section in consideration of the new channel conditions.

Along the Dedura River, erosion was confirmed over a long section of the river bank, and the participants discussed possible control measures in areas of fine sediment deposits.

The follow-up seminar was an excellent opportunity to learn that the graduates of ICHARM's educational programs are working hard for their country by making the most of the skills they acquired in Japan and the knowledge they have about their country.

Finally, the ICHARM staff extended many thanks to those who attended the seminar and those who helped make it happen, including the field trip.



Advisor EGASHIRA gave technical advice during the field trip
現地視察で技術指導を行う江頭研究・研修指導監

装や ICHARM 修了生の今後の活躍についても大きな期待が寄せられました。

14日にはコロンボ市内から1時間からほど離れたネゴンボ近郊のマハ川、更に1時間ほど北上したチラウ近郊のデドゥル川の河岸浸食の現場を視察しました。また、かんがい施設の見学も行いました。

マハ川の現場では、出水による流路変更状況(新たに形成された流路と流路変更で形成された中洲)、水衝部の浸食・対策状況を視察しました。江頭研究・研修指導監からは新たに流路が形成されたことで水衝部となる区域への対策についてアドバイスを行いました。

デドゥル川の現場では、長い区間で連続して発生している河岸浸食の状況を確認するとともに、細粒分が多い地域での対策を議論しました。

今回の視察を通じ、日本で学び、かつスリランカの現状を知る彼らが、活躍する様子を垣間見ることができました。

最後にフォローアップセミナー及び現地視察に参加、案内していただいた方々のご協力に対して感謝いたします。



Participants in the 13th Follow-Up Seminar
第13回フォローアップセミナー 集合写真

(Written by WASHIO Yoichi)

Information Networking

ADBI-ICHARM Policy Dialogue Water-related Disaster Resilience under Climate Change

ADBI-ICHARM 共催による「気候変動下における水関連災害へのレジリエンスに関する政策対話」

アジア開発銀行研究所 (ADBI) の資金協力により、ICHARM は、2020年1月27～28日、東京・ADBIにおいて「気候変動下における水関連災害へのレジリエンスに関する政策対話」を共催しました。水関連災害レジリエンスに関する政策面に重点を置きつつ、本政策対話は、科学技術コミュニティ、政府高官、開発に関わる国際機関の専門家が、セクターを超えた対話及び協働を通じて、アジア地域を対象に、気候変動下における水関連災害レジリエンス向上に必要なガバナンスや投資を強化するための取り組みについて議論することを目的に開催されました。

開会式では、ADBI・吉野直行所長とICHARM・小池俊雄センター長による歓迎挨拶の後、国土交通省・山田邦博技監により「近年の水関連災害に対するレジリエンス—科学・投資・ガバナンス」と題した基調発表が行われ、昨年10月の台風19号 (Hagibis) による被害の状況と水関連災害リスク軽減に係る日本での政策展開について紹介されました。また、本政策対話では、「経験の共有」、「ガバナンスの強化」、「投資の促進」、「施策の設計」といった4つのダイアログ・セッションが開催され、各セッションでは、フィリピン、スリランカ、ミャンマー、インドネシアといったIFIプロジェクト実施国のプラットフォーム参加機関代表と、日本の関係政府機関又は学術組織の専門家によって、それぞれ基調講演・発表が行われました。また、関係国際機関からも代表が参加しました。

2日目の1月28日には、横浜市の鶴見川多目的遊水地の現地視察を行い、昨年の台風19号による洪水の調節効果について説明を受けました。

本政策対話では、政策調整の向上、資金調達と投資、科学技術の適用を通じて、気候変動下における水関連災害リスクの軽減を図るためには、政策決定者と専門家が知識を共有する必要があることが強調されました。この成果はポリシー・ブリーフとして取りまとめられ、2020年10月19～20日に熊本で開催される予定の第4回アジア太平洋水サミットなど、水関連災害リスク軽減に関する主要な国際・地域会合への重要なインプットとなるものと期待されます。

ADBI ウェブサイト:

<https://www.adb.org/adb/main>

Funded by the Asian Development Bank Institute (ADBI), ICHARM co-organized “ADBI-ICHARM Policy Dialogue Water-related Disaster Resilience under Climate Change” on January 27-28, 2020, at ADBI, Tokyo, Japan. Placing a high priority on the policy-relevant aspects of water-related disaster resilience, this policy dialogue focused on exploring and discussing initiatives and efforts for strengthening governance and investment for water-related disaster resilience under climate change in Asia through transdisciplinary dialogue and collaborative work between the science and technology community and other stakeholders, including senior government officials and experts from international development organizations.

In the opening plenary, Prof. YOSHINO Naoyuki, the dean of ADBI, and Prof. KOIKE Toshio, the director of ICHARM, gave a welcome address, followed by the keynote presentation by Mr. YAMADA Kunihiro, the vice-minister for Engineering Affairs, Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Japan. In his presentation titled “Recent Initiatives on Water-Related Disaster Resilience - Science, Investment, Governance”, he spoke about damage by Typhoon Hagibis last October and policy development on water-related disaster risk reduction in Japan. The policy dialogue was composed of four sessions: “Sharing Experiences,” “Strengthening Governance,” “Encouraging Investment” and “Implementation Design.” The session keynotes and presentations were made by the representatives from the Platform participating organizations of the IFI project implementing countries (the Philippines, Sri Lanka, Myanmar and Indonesia) and the experts from the government or academic organizations of Japan. It was also attended by the representatives of relevant international organizations.

On the second day, January 28, the participants took a field trip to the Tsurumi multi-purpose retarding basin in Yokohama City, where they were given an explanation about the effect of the basin on controlling the flood caused by Typhoon Hagibis.

The conference emphasized that policy makers and experts need to share knowledge for reducing water-related disaster risks under climate change via improved policy coordination, financing and investment, and the application of science and technology. The conclusion will be summarized into a “Policy Brief,” which is expected to be a key input for major international and regional conferences on water-related disaster risk reduction, such as the 4th Asia-Pacific Water Summit to be held in Kumamoto, Japan, on October 19-20, 2020.

ADBI Website: <https://www.adb.org/adb/main>



Group photo at the Opening plenary
開会式での集合写真

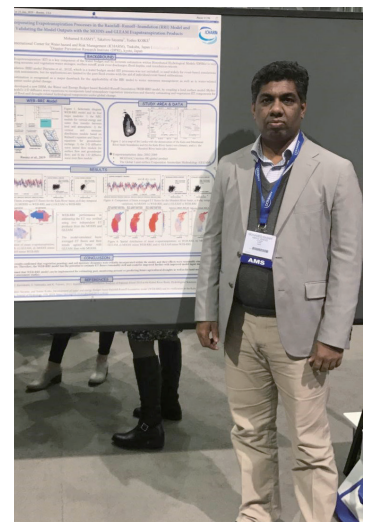
(Written by IKEDA Tetsuya)

100th AMS Annual Meeting 2020 in Boston, USA

The American Meteorological Society (AMS) Annual Meeting is the world's largest yearly gathering for the weather, water, and climate communities with approximately 4,000 scientists, educators, students, and other professionals in attendance. The AMS Annual Meeting 2020 was held as the organization's 100th event on January 12–16, 2020, at the Boston Convention and Exhibition Center. The theme for the meeting was "The AMS Past, Present and Future: Linking Information to Knowledge to Society," emphasizing the links created by research, applications, and technology for weather and government services, industry uses, risk management, education, policy development, communications, watch/warning responses, and more.

Dr. Mohamed Rasmy, a senior researcher of ICHARM, participated in this milestone event and presented his research work on "Incorporating Evapotranspiration Processes in the Rainfall-Runoff-Inundation (RRI) Model and Validating the Model Outputs with the MODIS and GLEAM Evapotranspiration Products." This research was carried out to introduce the basin-scale evapotranspiration processes to the Water and Energy Budget-based Rainfall-Runoff-Inundation (WEB-RRI) Model, a newly-developed distributed hydrological model ICHARM. The WEB-RRI model has several advantages over the RRI model. It is based on the seamless modelling approach and capable of addressing Integrated Water Resource Management (IWRM) as well as Water-related Disaster Risk Reduction (WDRR) issues, including flood- and drought-related risk assessment, operational applications (e.g., flood forecasting and seasonal flow prediction), and long-term applications (e.g., catchment responses to past and future climatology, water cycle variability, hydrological extremes, and land-use changes).

Dr. Rasmy also introduced ICHARM's latest and cutting-edge research work on advanced hydrological modeling, such as the development of WEB-RRI models, to share with the audience the information and ideas about their model structures and applicability to various parts of the world. He also learned useful ideas from the experts' opinions on the models and other related studies in the same field around the world. The meeting was an excellent opportunity to promote ICHARM's networking activity through discussions on future research collaborations with international scientists from leading research centers and universities.



Dr. Mohamed Rasmy presents his research activities to international researchers and scientists at the 100th AMS annual meeting 2020 in Boston, USA.

(Written by Mohamed Rasmy Abdul Wahid)

Field Survey

Fourth Field Survey in the Sittoung River of Myanmar to Investigate Riverbanks and Coastal Erosion

第4回ミャンマー国シッタウン川現地調査

A large estuary about 220 km long and 270 km wide develops in the mouth of the Sittoung River, one of the major rivers in Myanmar. On the land along the estuary are many settlements, using it primarily for agriculture. Despite the land being important for their livelihoods, active bank erosion continues owing to the river flow and tidal motion, and bank retreats have been causing serious problems such as loss of settlements and farmland. ICHARM has conducted research activities, including material analyses, field observations, hydraulic experiments and numerical simulations, in the lower Sittoung River since 2017 to understand the processes of sediment transport and bank erosion with assistance from the Directorate of Water Resources and Improvement of River Systems (DWIR) of Myanmar. As part of this research, ICHARM conducted a field survey on February 25-26, 2020, and sent a team of four researchers: Research and Training Advisor EGASHIRA Shinji, Senior Researcher YOROZUYA Atsuhiko, Research Specialists Ralph Allen ACIERTO and NAGUMO Naoko.

Fig. 1 explains the field survey. Since one of the main causes of the bank erosion around this area is tidal currents, especially tidal bores in spring and autumn, the team conducted the field survey at the time of tidal bores (tidal bore: a series of

ミャンマーの主要河川の一つであるシッタウン川の河口には長さ 220 km、幅 270 km 程の大規模なエスチュアリーが発達し、その河岸部は農地として活用され多くの集落が形成されています。ところが、この地域では河岸流と潮汐流の作用により激しい河岸侵食が生じ、河岸線の後退によって集落や農地が消失するなど、深刻な問題が起っています。ICCHARM では、この地域におけるシッタウン川の土砂輸送や河岸侵食プロセスの理解を目的に、2017 年より同国水資源・河川系開発局 (DWIR) と協力しながら、資料解析、現地観測、水理実験および数値解析を進めてきました。この研究の一環として、江頭進治研究・研修指導監、萬矢敦啓主任研究員、Ralph Allen Acierto 専門研究員、南雲直子専門研究員が参加し、2020 年 2 月 25 ~ 26 日に現地調査を行いました。

図1に現地調査の様子を示します。シッタウン川エスチュアリー河岸侵食は潮汐流の影響が大きく、特に春と秋に発生する海嘯（タイダルボア：潮位が上がる際に波が河川を遡る現象）の影響を大きく受けています。今回の現地調査は、この海嘯発生タイミングに合わせて実施し、ドローンによる海嘯遡上や侵食発生状況の観察、ボートを利用したエスチュアリー内の河川水と、河床・河岸材料の採取、河岸断面形状の観察を行いました。その結果、エスチュアリー右岸でも海嘯は観察されるものの、これまでと比べてかなり小規模であり、潮汐流や侵食の中心はエスチュアリー中央部に移りつつあることが分かりました。このような観察だけでなく採取した試料、データの分析も進めており、エスチュアリーにおける土砂輸送や侵食現象の実態解明、近い将来起こり得る地形変化予測、また、河川流と潮汐流を考慮した土砂輸送シミュレーションの精度向上に役立つものと期待されます。

この現地調査に先立つ2月24日には、DWIRのヤンゴン事務所を訪問しました。図2はその様子を示したもので、同局リージョン1ダイレクターのAung Myo Khaing氏らに2019年2月の現地調査から得られた成果について報告するとともに、土砂輸送のシミュレーション結果、今後の研究計画について意見交換を行いました。また、図3に示すように、現地調査後の2月28日に同事務所を再度訪問し、局長代理のWin Hlaing氏らにこれまでの調査研究、及び今回の現地調査の概要について説明するとともに意見交換を行い、今後も協力を継続しながらICHARMとDWIRでシッタウン川に関する調査・研究を進めていくことで合意しました。

waves propagating upstream at the time of rising tide). During the survey, the team used a drone and observed tidal waves going upstream and eroding the riverbanks. They also used boats and collected river water and sediment from the river bed and riverbanks, and observed cross-sectional bank topography. The observations revealed that the magnitude of tidal bore propagation along the right bank was smaller than those of the previous years, and that the main body of the tidal currents and associated erosion shifted to the central part of the estuary. The collected samples and measured data are also under analysis, which will help characterize the sediment transport and bank erosion processes in the Sittaung estuary and identify topographic changes in the near future, as well as improve the accuracy of sediment transport simulation.

Prior to the field survey, the team visited the DWIR Yangon Office on February 24 for a research meeting. As Fig. 2 shows, they reported the investigation results based on the previous field survey in February 2019 to Mr. Aung Myo Khaing, the Region 1 director of DWIR, and other officers, and discussed the results of sediment transport simulation and future research plans. After the field survey, the team visited the DWIR office again on February 28 and explained the research activities conducted in the past three years to Mr. Win Hlaing, the acting director general of DWIR, and other officers (Fig. 3). They also reported the outline of the latest field survey carried out this time and exchanged opinions with the DWIR officers about the research activities. The DWIR officers and the team members agreed that surveys and research activities in the Sittaung River should be continued in close collaboration between DWIR and ICHARM.



Fig. 1 Sediment sample collection and propagation of a tidal bore
図1 試料採取および海嘯の様子



Fig. 2 Meeting at DWIR (February 24)
図2 DWIRにおける打ち合わせの様子 (2月24日)



Fig. 3 Group photo at DWIR (February 28)
図3 DWIRにおける集合写真 (2月28日)

(Written by NAGUMO Naoko)

Others

Comments from internship students

インターン生からのコメント

ICHARM accepted internship students Mr. Hendra Ramdhani from the University of Tokyo from November 2019 to January 2020 and Mr. Chung Sarit from October 2019 to March 2020.

They contributed short messages as below while looking back at their studying at ICHARM.

ICHARMでは、インターン生として、Hendra Ramdhani氏（東京大学博士課程）とChung Sarit氏を受け入れました。

ICHARMでの研究活動を振り返って、両氏からコメントをいただきました。

Mr. Hendra Ramdhani (from Indonesia), the University of Tokyo

Stay period: November 7 - January 31, 2020

My name is Hendra Ramdhani, doctoral course student at River and Environmental Engineering Laboratory, University of Tokyo. During my 3 months internship at ICHARM, I studied about Nays2DH solver as a part of iRIC software which is now being using for river numerical simulation. My research interest related to meandering river forming mechanism and I got a lot of input during discussion especially from Prof. EGASHIRA, Dr. HARADA and Dr. Robin. We discussed every important part of Nays2DH source code that has been developing at ICHARM. Several challenging parts of simulating morphological process of meandering river are also explained. After that I have better understanding about mechanism, equations and calculation process in the solver. I believe this understanding will help me further for developing my research progress. Many interesting opinions also discussed to have wider viewpoint of meandering river studies. It is really encouraging me to gather many information about how these studies have been developing in recent decades.



Mr. Hendra Ramdhani

This is a really great opportunity for me to extend my knowledges and I would like to convey my gratitude to all ICHARM members for supporting me during the internship period. In near future, I really hope that I can collaborate my research about meandering river with ICHARM.

Mr. Chung Sarit (from Cambodia)

Stay period: October 2 - March 27, 2020

After graduating from Kyoto University, I came to ICHARM for a 6-months internship program supported by JICA-Innovative Asia program. At ICHARM, I conducted a study on investigation of local characteristics of sediment transport taking place at the surrounding area of Tonle Sap Lake in Cambodia under the supervision of Prof. Dr. EGASHIRA Shinji, Dr. HARADA Daisuke, and Dr. NAGUMO Naoko. The influx of sediment from the lake's tributaries is essential, providing nutrients and other materials to sustain the lake's ecosystem. Thus, this study aimed to investigate the influence of backwater effect of the lake on the behaviors of sediment transport in the lower reach of Stung Sen River, the largest tributary among the lake's 11 major tributaries. To understand this phenomenon, numerical simulation of sediment transport was conducted by using Nay2DH model. During my stay at ICHARM, I attended a lecture on the mechanics of sediment transportation provided by Prof. EGASHIRA. This lecture provided me a basic understanding of sediment transport process bridging me to numerical simulation. On the other hand, I would like to express my gratitude to Dr. HARADA Daisuke for his guidance and never-ending help and support from the numerical model setup to digging inside the source-code. Moreover, I would like to extend my sincere appreciation to all ICHARM staff who either directly or indirectly helped during my stay, especially Ms. HIDA Makiko and Ms. NAKAMURA Mikiko. Finally, I strongly believe that this meaningful internship experience will be particularly valuable for my future career and further study.



Dr. NAGUMO Naoko, Mr. FUKAMI Kazuhiko, Prof. KOIKE Toshio, Prof. EGASHIRA Shinji, Mr. Chung Sarit and Dr. HARADA Daisuke (from left)

Video clip posted: people experiencing a virtual flood using VR goggles

VR動画のICHARMホームページ掲載のお知らせ

近年の洪水災害時において、事前に提供された洪水に関する各種の防災情報が活かされず、適切な避難行動が行われなかったために多くの人的被害が発生している現状があります。このような社会的状況を鑑み、ICHARMでは洪水を『我がこと』（自分にも起こりうること）と捉えて住民一人一人の行動意図を醸成するための研究の一環として仮想現実（Virtual Reality: VR）による洪水疑似体験ツールの開発を進めています。本ツールは、洪水を経験したことのない一般の方々に対して、洪水を疑似的に体験してもらうことで洪水に対する関心や意識を喚起することを目的とし、以下のようなシナリオ構成となっています。日常に近い状況から体験が始まるように、①体験者が軒家の1階リビングにいる状況から、②家の近くを流れる川から溢れた水が、家の目の前の道路上を流れ、③さらに増水して家の中まで水が入り込み、④2階の天井まで浸水し、⑤屋上に避難する。という構成です。本ツールは、VRゴーグルを使うと前後・左右・上下を自由にすることができ、実際の家の中にあるような体験ができます。この度、本ツールで体験できる内容を動画として、ICHARMホームページの動画コレクションにアップロードしました。

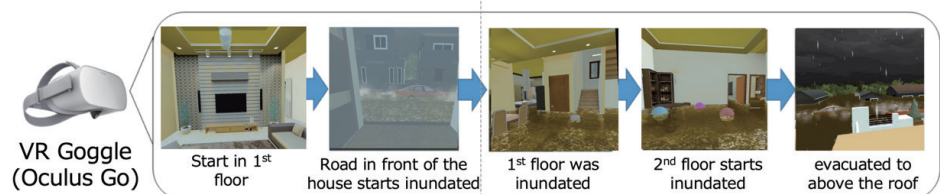
(http://www.icharm.pwri.go.jp/activities/movie_collection/index_j.html)

ICHARMでは引き続き、VRを活用した災害「我がこと感」を醸成するリスクコミュニケーションツールの検討を行っており、開発したコンテンツを随時ホームページに掲載していくことを予定しています。

In recent flood disasters, people often failed to take appropriate evacuation actions, which resulted in significant human damage, even though various types of flood-related information had been provided for them in advance.

ICHARM is hoping to help this situation by developing a VR-driven tool with which people can experience a flood virtually. This tool is useful to have people with no flood experience realize that floods can be life-threatening and is something they need to prepare for in normal times. This tool is designed to provide people with a flood experience starting from an everyday situation: The simulation starts with the user in the 1st-floor living room; Floodwaters from a nearby river starts covering the road in front of the house; The floodwater level heightens and starts flooding the 1st floor; The floodwaters reach the ceiling of the 2nd floor; The user have to evacuate to the rooftop.

(http://www.icharm.pwri.go.jp/activities/movie_collection/index.html)



Outline of flood experience in VR space
洪水疑似体験ツールの概要

With a VR goggle on, people can feel as if they were really in a house, for the goggle let them look around the house in all directions.

For many people to have an idea of what this VR tool can do, a video clip of people experiencing a virtual flood has been added to ICHARM's movie collection.

ICHARM is studying risk communication tools using VR to help people have a real sense of flood risk and planning to upload more digital content like the video clip just posted.



Children experience a VR-created flood at Tsukuba Kid Scientists Festival 2019
つくばちびっ子博士 2019にて洪水疑似体験をしている様子

(Written by MOROOKA Yoshimasa)

Personnel change announcement 人事異動のお知らせ

New ICHARM Members

Four new members joined ICHARM.
They would like to say brief hello to the readers around the world.



OONUMA Katsuhiko / 大沼 克弘

Chief Researcher / 上席研究員

Japan

I came to ICHARM this April for the first time. Although many things are new to me here, like international work and the research fields of the Water-related Hazard Team, I would like to get used to them as soon as possible and start contributing to various research activities of ICHARM, using my extensive knowledge and experience in both research and administration.



MIYAZAKI Ryosuke / 宮崎 了輔

Chief Staff / 主査

Japan

I am greatly honored to become a member of ICHARM, which I have been wanting to work at. While I am at ICHARM, I will continue making efforts to tackle various administrative duties, making sure that students study in cozy atmosphere and everything goes well among all members. By the way, my favorite activities are playing the acoustic guitar and kendama, the Japanese version of the classic cup-and-ball game. Please feel free to talk to me anytime!



Naseer Asif / ナシール アシフ

Research Specialist / 専門研究員

Pakistan

It is overwhelming to become a team member of ICHARM. I have always been interested in bridging the gap between scientific and socio-economic outcomes. Here at ICHARM, both the water-related hazard and disaster risk management teams are working in collaboration focusing on water-related disasters and their risk management. Therefore, I am really excited to work at ICHARM and will try with the best of my efforts in order to maximize this opportunity to contribute towards the development and establishment of updated solutions to existing challenges pertaining to water issues worldwide.



NUMATA Shingo / 沼田 慎吾

Exchange Researcher / 交流研究員

Japan

I have been sent from Muromachi gijyutsu. I worked at its Osaka office for six years until last March. My specialty is river planning, and I have been involved in inundation flow analysis, river channel planning, cost-benefit analysis, flood forecasting, and so forth. I would like to research flood forecasting using the RRI model at ICHARM. Thank you.

Leaving ICHARM

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| <p>- FUKAMI Kazuhiko: Deputy Director
Director of Research Planning
Planning and Research Administration Department,
Public Works Research Institute</p> | <p>○深見 和彦 グループ長
土木研究所 企画部 研究企画監</p> |
| <p>- KIKUMORI Yoshito: Senior Researcher
Senior Deputy Director, River Planning Division, Water and Disaster
Management Bureau, Ministry of Land, Infrastructure, Transport and
Tourism (MLIT)</p> | <p>○菊森 佳幹 主任研究員
国土交通省 水管理・国土保全局
河川計画課 企画専門官</p> |
| <p>- NAKAMURA Tomoki: Administer</p> | <p>○中村 友紀 主事</p> |
| <p>- NAKAMURA Yosuke: Exchange Researcher
Muromachi gijyutsu Co., Ltd.</p> | <p>○中村 要介 交流研究員
室町技術株式会社</p> |

Position Change

- | | |
|------------------------------------------------------------------------------------------------|-------------------------------------------------|
| <p>- ITO Hiroyuki: Chief Researcher (Water-related Hazard Team)
Deputy Director</p> | <p>○伊藤 弘之 上席研究員 (水災害研究チーム)
グループ長</p> |
|------------------------------------------------------------------------------------------------|-------------------------------------------------|

- **IKEDA Tetsuya** : Chief Researcher (Special Assignment)
Director for Special Research
- **USHIYAMA Tomoyuki** : Research Specialist
Senior Researcher

- **池田 鉄哉** 上席研究員 (特命事項担当)
特別研究監
- **牛山 朋来** 専門研究員
主任研究員

Business trips / 海外出張リスト

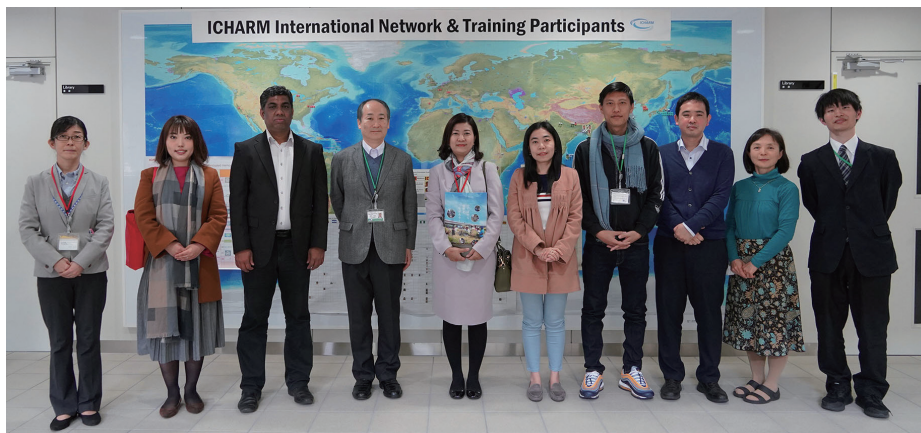
* January - March 2020

- January 4 - 14, Ho Chi Minh City, Viet Nam, EGASHIRA Shinji, to give lectures to K2018 students of the English Program at the Ho Chi Minh City University of Technology.
- January 10 - 11, Manila, Philippines, KOIKE Toshio, to have meeting with DPWH Secretary Mr. Emil Kiram Sadain
- January 12 - 18, Boston, US, Mohamed Rasmy, to attend the 100th AMS Annual Meeting
- January 20 - 25, Jakarta and Surakarta, Indonesia, OKADA Tomoyuki, TOMIZAWA Yosuke, surveyance on IFI and Togo program for Adaptation to the Impacts of Climate Change
- February, Colombo, Sri Lanka, KOIKE Toshio (10 - 14), FUKAMI Kazuhiko (11 - 15), EGASHIRA Shinji (11 - 15), IKEDA Tetsuya (9 - 15), Mohamed Rasmy Abdul Wahid (9 - 16), WASHIO Yoichi (9 - 21), USHIYAMA Tomoki (9 - 15), NAKAMURA Mikiko (11 - 16), Selvarajah Hemakanth (9 - 25), (1)the 13th follow-up training in Colombo (2)IFI, the 4th Plenary Session for the Platform on Water Resilience and Disaster
- February 15 - 18, Mascut, Oman, KOIKE Toshio, To attend the Regional Training Workshop on "Advances in Remote Sensing Application in Water Resources Management in Asia"
- February 23 - 29, Indonesia, KOIKE Toshio (- 28), OKADA Tomoyuki, Mohamed Rasmy Abdul Wahid (25 - 27), TOMIZAWA Yosuke, USHIYAMA Tomoki (25 - 27), (1)Orientation seminar on climate change adaptation in the pilot case of Solo river basin (Feb.26) (2)Field survey on Solo river basin from Surabaya to Solo
- February 23 - 29, Yangon and Bago, Myanmar, EGASHIRA Shinji, YOROZUYA Atsuhiko, NAGUMO Naoko, Ralph Allen Acierto, (1)Field survey at Sittaung River and meeting with DWIR (2)Meeting on the follow up training with IWUMD in Nay Pyi Taw (EGASHIRA and YOROZUYA)
- February 24 - 26, Singapore, IKEDA Tetsuya, MIYAMOTO Mamoru, to participate in the 25th Governing Council Meeting of the Asia-Pacific Water Forum

Visitors / 訪問者リスト

* January - March 2020

- Visited by JICA Myanmar, March 5, 2020
Purpose: To visit a class(self study) for observation and have a small meeting with Myanmar students and their supervisors.



Publications / 発表論文リスト

* January - March 2020

1. Journal, etc / 学術雑誌 (論文誌、ジャーナル)

- Md. Nasif Ahsan, Amina Khatun, Md. Sariful Islam, Karina Vink, OHARA Miho, Preferences for improved early warning services among coastal communities at risk in cyclone prone south-west regions of Bangladesh, *Progress in Disaster Science*, Vol.5, January 2020,
- 栗林大輔、大原美保、小藪剛史、澤野久弥、イメージ映像での洪水疑似体験による洪水意識及び減災行動意欲向上に関する考察、日本災害情報学会誌「災害情報」、No.18-1, pp.35-45、2020年3月

2. Oral Presentation (Including invited lecture) / 口頭発表 (招待講演含む)

- 南雲直子、原田大輔、江頭進治、丸森町の土砂・洪水氾濫に関する現地調査と地形解析、日本地理学会2020年春季学術大会、日本地理学会、駒澤大学、2020年3月26日~29日

3. Poster Presentation / ポスター発表

- Abdul Wahid Mohamed Rasmy, KOIKE Toshio, Incorporating Evapotranspiration Processes in the Rainfall-Runoff-Inundation (RRI) Model and validating the model outputs with the MODIS and GLEAM Evapotranspiration Products, AMS Annual meeting, AMS, Boston, USA, January 12-16, 2020

4. Magazine, Article / 雑誌、記事 (土技資含む)

- 深見和彦、水災害リスクの低減に何が必要か?、土木技術資料、第62巻、pp.6-7、令和2年2月号
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5. PWRI Publication / 土研刊行物（土研資料等）

None / 該当者無し

6. Others/ その他

None / 該当者無し

Dear readers,

Thank you very much for subscribing to the ICHARM newsletter.

We would also like to thank you for your kind understanding and cooperation regarding our activities.

Under the recent worldwide outbreak of the coronavirus disease 2019, or COVID-19, we suppose that many people are inconvenienced and anxious about the situation.

However, we sincerely believe that if each individual acts responsibly and does whatever they can to help the situation, the world will overcome this unprecedented crisis soon.

Even amid this confusion, people around the world should also remember that other disasters may occur just like they did in past years. Floods occur every year in many countries, causing tremendous damage. Because of that, it is critically important to plan preventive measures now in order to protect patients' lives and secure medical resources in case of a disaster. In fact, some groups have already started proposing guidelines and preparing measures for water-related disaster risk reduction by quickly reviewing evacuation and rescue plans under the COVID-19 crisis.

ICHARM has also joined such efforts. These topics will be covered in our future newsletters.

Last but not least, we heartily hope that the readers and their family members and colleagues will stay safe and well and take good care of one another while getting through this hardship together.

ICHARM Newsletter Editorial Committee

ICHARM ニュースレターをご覧くださいまして、誠にありがとうございます。

また、ICHARMの活動にご理解・ご協力を賜りまして、感謝申し上げます。

このたびの新型コロナウイルス（COVID-19）の世界的な感染拡大により、多くの方々がご不便・不安な日々を過ごされているかと思えます。

一人一人ができる限りの努力を最大限行うことで、速やかにこうした事態に打ち勝てることを心から願っております。

一方で、甚大な水災害は毎年発生しています。患者の皆さまや医療資源を水災害から守ることはもとより、COVID-19 災禍の下での避難や救援のあり方を早急に見直して、適切に水災害対策が講じられるよう、指針等を提案する動きも出てきています。

ICHARM も取り組みを開始しました。こうした動きについても今後のニュースレターで取り上げていきたいと思っております。

時節柄、皆様方やご家族・ご親戚、ご同僚の方々のご健康、ご健勝を心からお祈り申し上げます。

ICHARM ニュースレター
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We welcome your comments and suggestions.

