Field Surveys on Flood Damage abroad

ICHARM has conducted a wide range of field surveys overseas, including a riverbed-material survey in 2017 and a flood-damage survey in 2024 in Nepal; riverbank-erosion surveys from 2017 to 2020 in Myanmar; participation as part of the Japanese delegation in a flood-damage survey in 2017 in Sri Lanka; and a survey of cultural heritage sites affected by the 2022 flood in 2023 in Pakistan. The experience and insights gained from these surveys have contributed directly to ICHARM's research and implementation activities.

The following sections introduce several of the major surveys.

a) Nepal

① Riverbed-material survey

A team of researchers from ICHARM and PWRI conducted a field survey on the West Rapti River in Western Nepal from October 31 to November 5, 2017, to characterize the river's longitudinal grading based on the grain size of riverbed materials. At that time, sediment production was high in the upper reach and no dams had been built along the river, so the sediment produced was transported downstream to the middle and lower reaches. For this reason, the target river was a valuable site for observing longitudinal sediment grading.



Photo 1 Field survey on a rubber boat

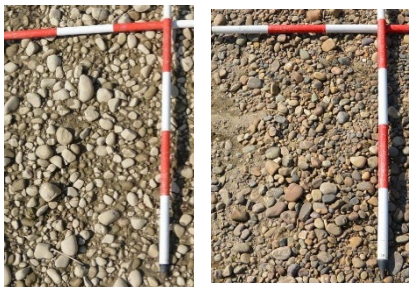


Photo 2 River materials collected from the upper (left) and lower (right) reaches

This survey was conducted by Research Specialists YAMAZAKI Yusuke, NAGUMO Naoko, and HARADA Daisuke from ICHARM, together with Senior Researcher YOROZUYA Atsuhiro and Researcher KOSEKI Hiroshi from the Hydrologic Engineering Research Team of Hydraulic Engineering Research Group, PWRI. The team also received invaluable support from Mr. Gopal Sharma, a senior divisional engineer with the Water Induced Disaster Management Department of the Ministry of Irrigation in Nepal, who completed ICHARM's master's program in 2016.

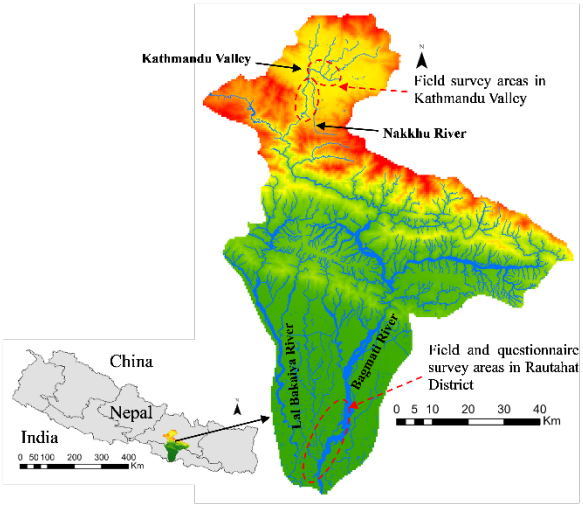


Figure 1 Locations of field and questionnaire survey areas in the Bagmati River basin

② 2024 flood damage survey

In late September 2024, Nepal experienced its highest rainfall in at least 50 years. Continuous extreme precipitation on September 27-28 caused severe flooding and sediment disasters in 44 districts across the country, claiming at least 249 lives, with 18 people missing and 178 injured,

according to the Ministry of Home Affairs. More than 2.5 million people were affected, and the estimated economic loss reached approximately 46.6 billion Nepalese Rupees. The bowl-shaped Kathmandu Valley, where the capital city is located, received 240-350 mm of rainfall in 24 hours.

To understand the characteristics of the 2024 flood and collect damage data, Research Specialist Badri Shrestha conducted field and questionnaire surveys in the flood-affected areas of the Bagmati River basin in November 2024 (Figure 1), as part of the JSPS KAKENHI Research (Grant number: 24K07692), in collaboration with local governments of Rautahat District (Madhav Narayan Municipality, Gadhimai Municipality, Rajdevi Municipality, and Durga Bhagawati Rural Municipality) and other related organizations. The collected data and information have been used to develop appropriate flood risk assessment methodologies and to provide science-based solutions for flood disaster mitigation.



Photo 3,4,5 Discussion and group photos with Mr. Baijnath Prasad Yadav, the mayor of Madhav Narayan Municipality (left and middle photos) and with Mr. Bhikhari Prasad Yadav, the mayor of Rajdevi Municipality (right photo)



Photo 6,7,8,9,10 Damaged infrastructure and houses in the Kathmandu Valley

b) Myanmar

The estuary of the Sittang River in Myanmar is highly dynamic, characterized by features such as sandbars and braided channels. The rapid changes occur because both river flow and tidal motion drive active erosion and deposition. In particular, since 2014, the western bank of the Sittang River had experienced significant farmland loss due to

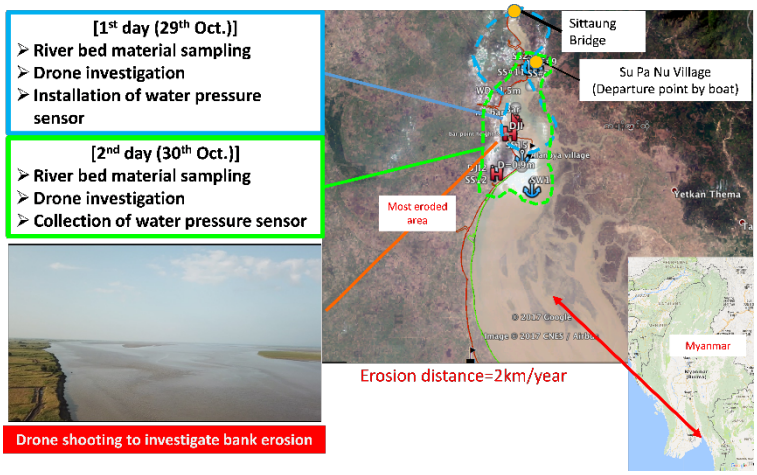


Figure 2 Area of the first survey

riverbank erosion, making countermeasures an urgent priority by the time of our survey.



Photo 11 Observed tidal bore

In May 2017, the Myanmar government requested ICHARM's support in formulating erosion control measures. After discussions, ICHARM decided to conduct joint field surveys with the University of Tokyo, which had prior research experience in Myanmar, to assess coastal areas affected by tidal bores and tidal currents and to examine riverbed and riverbank materials and flow conditions in the Sittang River. Four field surveys were carried out: October 29–30, 2017; February 16–18, 2018; February 21–24, 2019; and February 25–26, 2020.

During the first survey, sediment samples were collected from the riverbed and riverbanks to analyze grain size and other sediment properties. To document the current state of riverbed and riverbank erosion, aerial photographs and videos of representative erosion sites (marked 'H' in Figure 2) were also taken using a drone.

During the second survey, an ADCP was used to measure flow velocity, discharge, and river cross-sectional profiles.

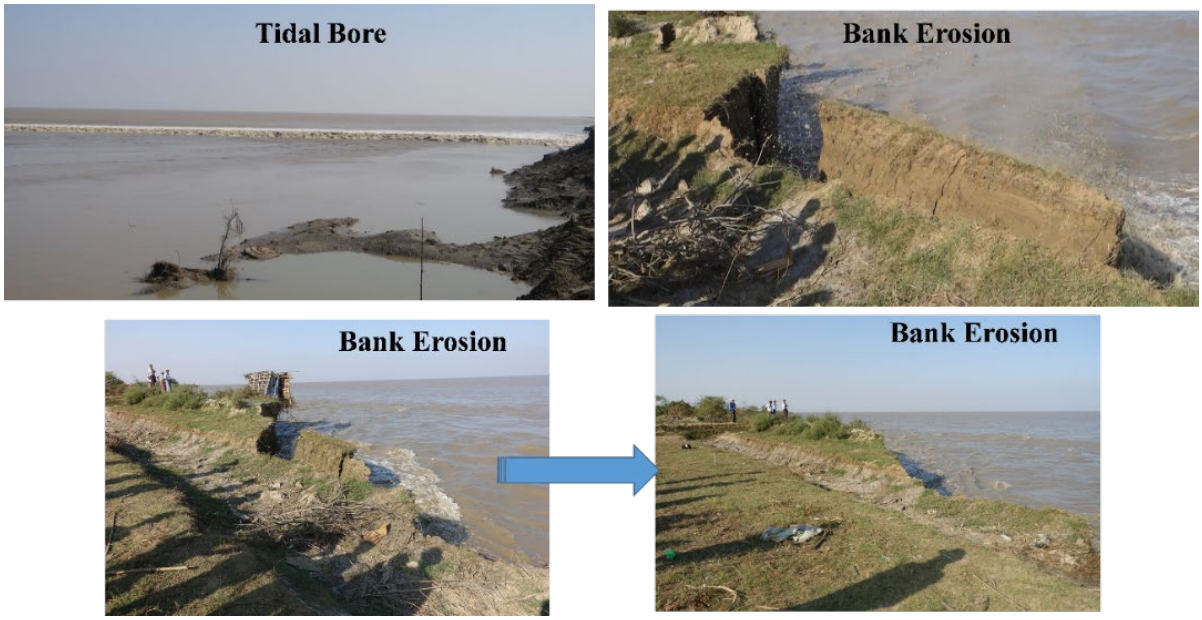


Photo 12,13,14,15 Riverbank erosion caused by tidal bores



Photo 16,17,18 Sample collection and measurement using a ADCP boat

c) Sri Lanka

On May 24, 2017, a rainfall event began in the southern and western regions of Sri Lanka. The event intensified by 9:00 p.m. on May 25 and maintained its intensity until 9 a.m. the following day. During these 12 hours, total rainfall exceeded 500 mm. This unprecedented heavy rainfall caused severe floods and landslides across the affected regions, resulting in devastating damage to lives and property. According to the Sri Lankan government, as of June 3, 2017, 211 people had lost their lives, 96 people had gone missing, and about 704,000 people had been affected.

In response to a request from Sri Lanka, the Japanese government dispatched the Japan Disaster Relief Expert Team (the JDR Team) on June 3. The team consisted of 10 technical experts in flood control, erosion and sediment control, water resources, flood forecasting, and remote sensing, and was tasked with providing technical advice on effective short-, mid-, and long-term measures for flood and landslide control. PWRI also assisted the mission by sending Senior Researcher Mohamed Rasmy. The JDR Team surveyed affected areas, held meetings with relevant ministries, organizations, and stakeholders, and finally submitted a report on the findings and future collaborations between the two countries to the relevant ministries and government officials of Sri Lanka. Senior Researcher Rasmy received an award from Ministry of Foreign Affairs and JICA for his outstanding contribution as a member of the JDR Team dispatched to Sri Lanka.



Photo 19,20　Scenes of field survey

d) Pakistan

This survey was conducted as part of the Japan Consortium for International Cooperation in Cultural Heritage program, commissioned by the Agency for Cultural Affairs of Japan. As one of its annual activities, the consortium carries out one field survey each fiscal year, and for FY2023, it selected a survey on the damage to cultural heritage in Pakistan caused by the torrential rains and subsequent flooding of 2022. The floods, which occurred between June and October 2022, were said to be the worst the country had experienced in several decades, submerging one-third of its land area. Although the country's treasured cultural heritage sites also suffered extensive damage, detailed information on the impacts had not been widely shared in Japan.

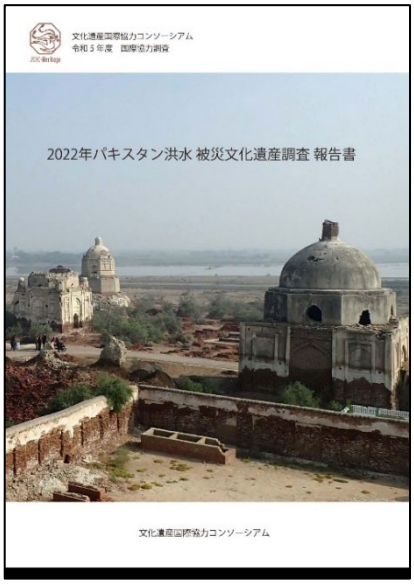


Photo 21 Investigation report

To address this, a multidisciplinary survey team comprising experts in archaeology, structural engineering, conservation science, and disaster-risk management was organized and dispatched to Sindh Province. The province, home to numerous cultural-heritage sites including World Heritage properties, sustained particularly severe damage. Senior Researcher Mohamed Rasmy of ICHARM participated as a specialist in flood risk management.

The survey was carried out from December 20 to 31, 2023. The investigation team inspected World Heritage sites, such as the Mohenjo-Daro ruins and the Kot Diji Fort, and provided support for documenting and assessing damaged cultural heritage and developing disaster risk management plans. The team of experts produced a technical report entitled "2022 Pakistan Flood: Report on the Damage Assessment of Cultural Heritage in Sindh Province", which is available on the consortium's website:

https://www.jcic-heritage.jp/wp-content/uploads/2024/04/ReportOnDamageToCulturalPropertiesInSindhProvince_JCIC-Heritage.pdf





Photo 22,23 The ruins (walls, stupa domes, etc.) are being capped with slurry or mud to protect them from extreme climatic and weather conditions.