Field Surveys on Flood Damage in Japan

Heavy rainfall disasters have been occurring almost every year across Japan in recent times. In particular, damage tends to be more severe in events that involve not only flood flows but also slope failures, debris flows, and flooding accompanied by large volumes of sediment and driftwood. To help reduce the impacts of such disasters, ICHARM conducts field surveys and research at disaster sites with the aim of clarifying these complex flooding phenomena and examining effective methods of information dissemination during emergencies. The following section provides an overview of major field surveys.

a) Heavy rainfall disaster in western Japan in July 2018

From July 5 to 7, 2018, continuous rainfall in western Japan triggered numerous slope failures, debris flows, and floods accompanied by massive sediment transport across several prefectures in the Chugoku and Shikoku regions, including Hiroshima, Okayama, and Ehime. These events caused extensive damage, leaving about 230 people dead or missing nationwide. From July 14 to 16, Senior Researcher OHARA Miho and Research Specialists Young Joo Kwak and NAGUMO Naoko conducted a joint field survey with researchers from Utsunomiya University, Shibaura Institute of Technology, and University of Hyogo in affected areas, such as Okayama City and Mabi Town in Kurashiki City, Okayama Prefecture, and Mihara and Onomichi cities, Hiroshima Prefecture. In Mabi Town, they used a drone to observe the inundation caused by a levee breach along the Oda River and examined levee damage along its tributaries. They also interviewed local residents about the situation during the disaster and their living conditions after evacuation. The investigation team confirmed that the maximum inundation depth exceeded the second-floor level of houses in the area.



Photo 1 Levee breach along the Oda River (a drone photo taken over Mabi Town, Kurashiki City)



Photo 2 Levee breach along the Suemasa River (Mabi Town, Kurashiki City)

b) Typhoon No.19 (Hagibis) in October 2019

On October 12, 2019, Typhoon No.19 (Hagibis) struck the Izu Peninsula and brought record-breaking heavy rainfall over a wide area of Japan. At one location, accumulated precipitation exceeded 1,000 mm. At many locations, mainly in eastern Japan, the 3-, 6-, 12-, and 24-hour precipitation totals reached record highs, causing floods with massive sediment transport, as well as slope failures and debris flows. The disaster caused considerable damage, leaving 102 people dead or missing nationwide. ICHARM conducted field surveys immediately after the onset of the disaster through December in Sano City, Tochigi Prefecture; Aga Town, Niigata Prefecture; and Marumori Town of Miyagi Prefecture.



Photo 3 Driftwood accumulated at Tokiwa Bridge



Photo 4 Flooding with massive sediment transport in Marumori Town

c) Heavy rainfall over the Kyusyu Region in July 2020

From July 3 to 8, 2020, an active seasonal rain front that stretched from the Kyushu Region to eastern Japan remained stationary, bringing heavy rainfall to western and eastern Japan. In particular, Kyushu experienced record-breaking rainfall from July 4 to 7.

Linear rain bands formed and remained over the Kuma River basin in Kumamoto Prefecture, producing rainfall of over 30 mm per hour for about eight hours. As a result, the four rain-gauge stations along the Kuma River and its largest tributary, the Kawabe River, recorded 6-, 12- and 24-hour rainfall totals exceeding those that triggered the major floods of July 1965 and 1982, both of which caused the worst flood damage in the postwar period. This torrential rain caused record flooding, with water levels at the Hitoyoshi station rising 2.2 m above the previous maximum, resulting in widespread inundation throughout the basin, including downtown Hitoyoshi City.

ICHARM conducted field surveys in and around Hitoyoshi City, focusing on the characteristics of the inundation, the processes of sediment supply from the Kuma River and its tributaries, the particle size of transported sediment, and the damage at the confluence of the main river and the tributaries.



Photo 5 Inundation marks at the Aoi Aso Shrine



Photo 6 Investigation of the transported sediment in downtown Hitoyoshi City