Report
The worst water-related disaster in Japan since 1982

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Severe torrential rain has continued over wide areas of western and central Japan, as well as Hokkaido, during the period of June 28 to July 8, triggered by Typhoon No.7 and the activated Bai-u front (seasonal rain front). Heavy rain has caused devastating flooding and mudslides, killing 220 people and missing 11 people, spreading over 14 prefectures as of August 5 (Figure 1). In all, two million people were evacuated. This is the Japan's worst water-related disaster since 1982 in Japan, when a great water-related disaster occurred in Nagasaki Prefecture, Kyushu, where nearly 300 people were killed or lost.

The most devastated regions are in western Japan: Chugoku and Shikoku regions. Accumulated amount of the precipitation over those 11 days has reached as high as 1,800 mm in the Shikoku region, and 1,200 mm in the Chugoku region, while many meteorological observation stations recorded the highest precipitation per 48 hours or per 72 hours ever in their observational histories. This unprecedented torrential rain caused damage to 48,250 houses, sediment-related disaster to 1518 locations, and river levee failures due to overflow in many places.

The Japanese Geotechnical Society (JGS), of which President is Professor Jun Otani, IPA Director and Chair of TC3, immediately responded by sending their members to the affected areas in order to investigate each situation and their possible causes, in particular, related to geotechnical disasters; landslide, debris flow and river bank failure. At the Annual Meeting of the JGS on July 25, the JGS called for an urgent meeting to report the information gathered by the various investigating teams. The conference room, with a capacity of more than 800, was almost full of the audience (Photo 1). During the meeting, participants were apprised of the serious damage and learned some technical information (i.e. case studies, countermeasures). At the end of the meeting, Professor Otani told those present that the JGS will conduct further investigations and determine a course of action to this disaster.

Note: The second JGS meeting is scheduled to be held in Tokyo on September 12, 2018.

Disaster mitigation is also one of the International Press-inn Association (IPA) missions, so we must cooperate with the JGS, and re-consider traditional concepts of suitable countermeasures for torrential rain.

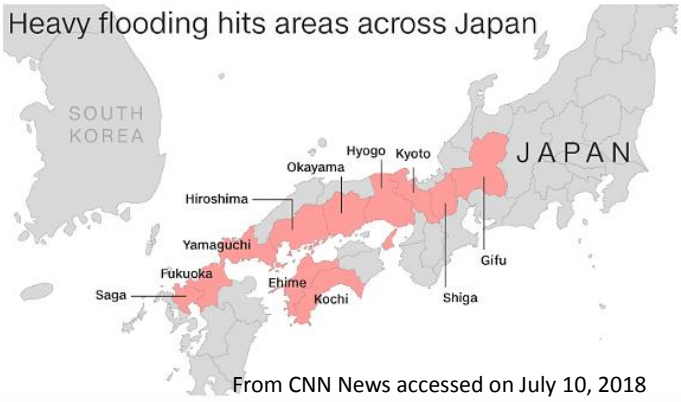

Figure 1 Fourteen prefectures suffered in Japan

Photo 1 The conference room was almost full of over 800participants.

The Investigation Report by the GIKEN Team

GIKEN LTD., which is an IPA corporate member, sent a team to examine the damage in Okayama and Hiroshima Prefectures, and to find out the possibility of utilizing Press-in Technology to be used in the restoration works related to the failure of river levees. They investigated fourteen damaged areas for three days from July 18 to 20 and reported on them in detail. Hereafter, some of them are introduced.

1. Saka-cho Nishi, Aki-gun, Hiroshima Prefecture (Ohshiro-ike Reservoir) … Figure 2

The reservoir dike, which is located upstream, collapsed. After the dike collapsed, debris, driftwood flowed into the lower basin. In the lower basin, driftwoods were caught on a bridge and at river curves, and the damage extended because the debris overflowed (Photo 2 & Photo 3).

Figure 2 Saka-cho Nishi, Aki-gun, Hiroshima prefectures

Photo 2 Driftwoods were caught on a bridge

Photo 3 The situation after the flood and mudslide

2. Mabi-cho, Kurashiki-shi, Okayama Pref. (Oda River, Suemasa River) … Figure 3

The water of the Oda River, which is a side stream, was dammed up when it joined up with the Takahashi River, which is the main stream, and a “backwater phenomenon” occurred. Because the water level suddenly rose, the Oda River embankment collapsed near the place where the both rivers join, which caused serious inundation damage to the whole area of Mabi-cho. In addition, there was a collapse of the embankment of Suemasa River, which is a sidestream of the Oda River. It was inferred that the embankments were scoured by the overflow due to the heavy rain. Removal and recovery work by the the Ministry of Land Infrastructure, Transport and Tourism (MLIT) and the Self Defense Forces of Japan (SDF) was carried out (Photo 4). At the collapsed embankments, tentative recovery work with the double steel sheet pile structure was done (Photo 5).

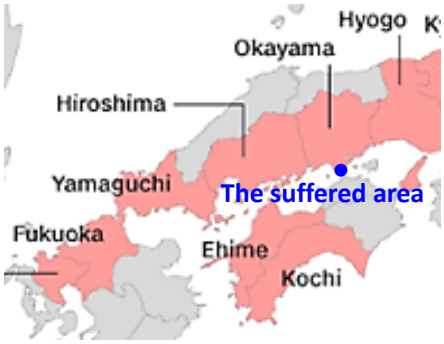

Figure 3 Mabi-cho, Kurashiki-shi, Okayama Pref.

Photo 4 Removal activity by SDF

Photo 5 Tentative recovery work with steel sheet piles structure

Report Summary

- A lot of bridges were washed away, which is assumed to have been caused by debris flow.
- It was confirmed that there were failures of back slopes which were not caused by overflows in reservoirs and river banks. Due to heavy rain over a short period, it is inferred that they were in a condition where the erosion of the bank body and seepage failures were likely.
- There were many places which presented problems of access as the road was either too narrow or there was only one way. Furthermore, main roads such as national roads or prefectural roads were also severely damaged by debris flow. It was made clear that, in the case of a large-scale disaster like this one, how to secure roads for carrying machinery and materials at the time is a major problem.
- We found that, at the places where river banks collapsed, not only the restoration work, but also improvement work with double steel sheet piles were carried out. It is assumed that the countermeasures were prepared in advance, from the fact that the period from failure to restoration was very short, approx.10 days. There is a possibility that a similar structure will be adopted in places where there are high risks of future flood disaster.
- In the case of proposing restoration work to the implant structure, a significant concern is the speed of supplying materials. The above-mentioned concern might be mitigated by concluding disaster agreements (including methodology, materials) with the national and local governments in advance.