Report on Investigation of Sediment Disasters in the Republic of Korea

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1. Introduction

In early July of 2006, the Republic of Korea was struck by a large-scale sediment disaster resulting from continual rain at the end of the rainy season and localized heavy rain associated with a typhoon (which was referred to as Typhoon No. 3 in Japan). The country suffered a catastrophic disaster which was caused by Typhoon No. 15 (Rusa) and left nearly 250 people dead and missing during the period from the end of August to early September of 2002. According to the material by National Emergency Management Agency, with regard to human damage, the nationwide number of dead and missing is 62 as of the end of August. The local government explained that the most of the death were caused by sediment disasters.

The authors and other researchers were given an opportunity to investigate the disaster affected areas in Sokcho-si, Pyongchang-gun, and Inje-gun in Kangwon-do at the invitation of Korea Disaster Prevention Association. Through the investigation, we found that they were struck by catastrophic disasters including large-scale debris flow, the raised riverbed at the downstream, and inundation with driftwoods.

Fig. 1 Local Sites for Investigation

2. Scale of Precipitation

The total and hourly amounts of rainfall in the north east region of the Republic of Korea reached a record high due to continual rain and typhoon from early to mid July.

In Pyongchang-gun, which is one of the disaster affected areas, the precipitation was 793mm and the maximum hourly precipitation reached 82mm during 5 days from July 11 to July 15 when the county suffered heavy rain, whereas its annual average precipitation is 1,200 to 1,500mm.

3. Overview of Damage

(1) Pyongchang-gun

In the Republic of Korea, the granite soil accounts for more than 50% of its land. Discharge of a great amount of fine granite sediment was the feature of the sediment disaster which struck Pyongchang-gun. Although the scale of the collapse is relatively small, various places were collapsed, a great deal of sediment was discharged to the downstream, and the riverbed was raised. In comparison with recent disasters that Japan suffered, it would appear that the occurrence ratio of collapse is quite higher in the Republic of Korea. Moreover, the problem of damage by driftwoods is same as Japan. There was a case where driftwoods blocked bridges, increasing flood damage.

Many people in the Republic of Korea said that abandoned cut-down trees from tree thinning

must have increased the damage. As in Japan, it seems that management of mountains is one of the issues they need to address in the Republic of Korea, and we learned that working out a measure for driftwoods is a common issue between the two countries.

Photo-1 shows a large amount of sediment (sand) is heaped and buries houses. Photo-2 is a distant view of the same area. From these photos, you can learn that the amount of sediment was overwhelming.

Photo-1 Damage to Soksa 1-ri

Photo-2 Sediment piles Soksa 1-ri

(2) Disaster along national road No. 44 and highway

The highway which connects Seoul to Kangnung, which is a city along the Sea of Japan, suffered the first extensive closure since its opening. After this closure, the Republic of Korea public highway corporation declared that they would implement a full-scale measure for sediment disasters.

In Oseakch'on, which flows along national road No. 44, and Buk-Hangye, sediment disasters different from those of Pyongchang-gun occurred. While these areas also have the granite soil, they are cliff terrain. Various places were collapsed by heavy rain, and tons of rocks fell down, resulting in avalanche of rocks. Therefore, most of discharged sediment is boulders, causing damage to roads in many locations. Furthermore, the sediment was conveyed to the downstream, and the downstream suffered serious damage due to meandering and raised riverbed. While the bank protection work has been done for the rivers in the investigated areas, there is almost no transverse work piece to control the flow direction. As the result, water flowed into behind the embankment, and some areas were left as a sandbar, and boulders were piled in residential areas.

Photo-3 shows the closure of a bridge in Buk-Hangye. It was completely closed, and the bridge beams were displaced by approx. 30cm at the joint part. Photo-4 and 5 are an air view of a flood caused by meandering and an enlarged view of the disaster affected area. It reminded us of disasters related to river Sabo in Japan several decades ago.

Photo-3 Bridge closed with rocks and driftwoods; Bridge beams displaced by 30cm (Buk-Hangye)

Photo-4 Meandering and flood at Buk-Hangye

Photo-5 Damage to houses at Buk-Hangye

(3) Skull Session with Related Institutes

Through the instrumentality of Korea Disaster Prevention Association., we were privileged to exchange views with parties concerned from local disaster prevention institutes. During this 2-hour session, we were able to discuss the causes of the disasters and future measures. As the causes, they cited that measures using structure were insufficient as the disaster prevention work focusing on tree planting had been carried forward, as well as unusual heavy rain and instability of the rock bed due to melt of frozen areas. In the meantime, with regard to future measures, some said that not only hard measures but also soft measures using lands would be required, but there was almost nobody who proposed promotion of preemptive evacuation as in Japan.

Han-Kyoreh Newspaper, which is a national paper in the Republic of Korea, accompanied us to the investigation and skull session and carried a story as shown in Photo-6.

Photo-6 Han-Kyoreh newspaper

Lastly, I would like to take this opportunity to express our gratitude to t Korea Disaster Prevention Association.