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Effectiveness of warning and evacuation measures for preventing sediment-related disasters

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Introduction

Because many residents live in mountainous areas in Japan, both non-structural and structural measures are important for preventing sediment-related disasters. Non-structural measures were first implemented in the 1960s, when disasters occurred that were so serious that many people had to relocate to other areas. In 2000, non-structural landslide disaster prevention measures were introduced, including new hazard areas, improved warning and evacuation systems, designated locations for new housing, building structure regulations, etc. In 2005, a sediment-related disaster warning system was launched.

However, dozens of people died in disasters every year; e.g. in 2018, 161 people were killed by sediment-related disasters. It has also been reported that the numbers of deaths and missing persons associated with sediment-related disasters caused by rainfall, which are considered to be amenable to warning evacuation, did not change significantly from 1983 to 2013 (Shinohara et al., 2016).

This study focuses on warning and evacuation measures, and considered possible future countermeasures based on data regarding the number of evacuations and evacuation triggers.

Methods

We extracted information on 24 disasters that occurred during the period 2007–2013 from published records on sediment-related disasters (MLTI, 2019), including the number of evacuees (involuntary and voluntary evacuations), and analysed trends in the number of evacuations. In addition, we collected data on evacuation rates, etc., from papers published in the *Journal of the Japan Society of Erosion Control Engineering* of and survey reports pertaining to recent disasters, and considered possible future warning and evacuation measures.

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Results and discussion

Based on the data collected, changes in the number of evacuees and evacuation rates could not be determined. In Japan, about 1,000 sediment-related disasters occur every year, and the annual average number of evacuees is about 2,600. About 90% of all evacuees are subject to an evacuation advisory; the remaining 10% are voluntary evacuations. Although there have been several reports on the effectiveness of evacuation measures during 2007–2013, we could not confirm their effectiveness herein.

The evacuation rate, the proportion of those who evacuated in hazard area, for disasters occurring in July 2018 was 22.1% by Hiroshima city. Evacuation advisories generally proceed as planned, but perhaps there were some problems. For example, evacuation of individuals who previously experienced a disaster, or have an interest in disaster prevention information, may be delayed (Kondo et al., 2006); moreover, areas where the risk of landslide disaster is high show low evacuation rates (Suganuma et al., 1996). We continue to explore how disaster prevention education and training programs, etc. can be implemented more effectively to clear these problems.

The trigger of each ones for evacuation have not changed significantly since 1987. Additionally, many evacuations are more closely associated with rainfall than with evacuation advisories. For more effective evacuations, more detailed data pertaining to previous evacuations are needed.

Conclusions

The results of this study indicated that most evacuees are subject to evacuation advisories, but there are many other triggers for evacuation. It is necessary to implement measures tailored to local and individual circumstances, which in turn is expected to require additional expenses, time, and expertise. To improve the effectiveness of evacuation measures, additional data pertaining to previous evacuations is needed, not only to inform warning and evacuation measures, but also for relocation and structural measures.

References

Shinohara Y., and Komatsu H. (2016) The Recent trend in annual death toll by landslide disasters in Japan. Journal of the Japan Society of Erosion Control Engineering Vol.68, No.5: 3-9

Ministry of Land, Infrastructure, Transport and Tourism (MLIT). (2019) Disaster and Disaster Prevention Information (in Japanese). http://www.mlit.go.jp/saigai/. (accessed 2019-9-26)

Kondo K., Kanada A., Hayashi S. (2006) Evacuation of residents in the mountainous area on water induced disaster – Water induced disaster in Miyagawa Village, Mie Pref. caused

by Typhoon Meari (No.0421) in Sep., 2004 - . Journal of the Japan Society of Erosion Control Engineering Vol.59, No.4: 32-42

Suganuma A., Ohta F., Ishikawa Y., Osanai N., Ishizuka T. (1996) Actual State of Debrisflow Warning and Evacuation at Hime-kawa Drainage Area, During the Heavy Rainfall Caused by a Baiu Front11, in Jul., 1995. Journal of the Japan Society of Erosion Control Engineering Vol.49, No.2: 35-44