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Prospects for a Debris-flow Disaster Free Society in Japan and Switzerland

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Abstract

The key to success in dealing with disasters due to debris-flow is to reside, based on the lessons learned from past lamentable events, at the location selected taking strictly into account land-formation processes ranging from sediment yield at the headwaters to deposition on an alluvial cone. Hazard maps which demonstrate risks of damage and loss of life have been applied for administrative practices for land-use regulation in Switzerland and, on the other hand in Japan, for simple hazard delineation and incremental services. The paper outlines the root causes of recurrent nature of disasters due to sediment discharge and coping measures so far taken in Switzerland and Japan focusing on hazard maps.

1. Meaning of disaster sciences

The roles and responsibilities of the people specialized in disaster sciences are, firstly to recognize the facts, secondly to learn lessons from the facts, thirdly to put what had learned into practices employing all the means of both so-called soft and hard. The objectives of an initiative for disaster coping are therefore to avoid recurrence of similar disasters and to prepare for unprecedented but potential disasters mobilizing fully coping capacities to disasters.

The ultimate objective of the initiatives for disaster coping is therefore referred to as a building work for lifeboats like the Noah's Ark which are not for specific persons like Noah's family members but all the people at risk.

2. Lessons learned from the facts

The disasters due to sediment yield and discharge are featured by strong recurrent nature of similar events to previous cases because of quantity of mobile materials on torrent bed in headwaters, piping through sediments and associated massive debris flow mixed with bulky drifting woods. It is quite contradictory that destructive debris flows run the particular points at which either monuments or shrines had been hoisted. The monuments and shrines demonstrate that the hamlets once situated at the location had been perished and had provided new settlers with warning signals on subsequent debris-flows. The disasters are therefore nothing but the consequence of negligence of the people concerned.

3. The 2014 disaster of Hiroshima is nothing but a copy of the 1967 disaster of Kobe

All the papers and discussions, except the one authored by Professor Masahiro KAIBORI[1)], appeared in the Journal of the Japan Society of Erosion Control Engineering, on the disasters due to debris-flow have dealt with triggering events and poor awareness to them and associated delayed responses made by the people concerned especially at risk and in charge of disaster prevention administration as the major cause of destructive events and associated damage and losses.

Since the ultimate goal of our projects is to achieve a society in which casualty due to sediment disasters is absolutely zero no matter how large, in terms of intensity and probability, a hazard is and, furthermore, based on the axiom that a disaster is a consequence of the polymerism of a hazard and vulnerabilities[2)]as illustrated in the equation 1.

$$\text{Exposure} \cap \text{Vulnerabilities} \cap \text{Hazards} = \text{Risks of disasters} \quad (1)$$

4. Lessons learned from the 1967 disasters in Kobe and Hiroshima

The causes of the 1967 disasters in Kobe and Hiroshima, in addition to the localized downpour, are, firstly , overexploitation of the area on alluvial cones for housing lots, secondly, inadequate building type, thirdly, neglect of morphological feature of the longitudinal profile of a torrent[3)] and, fourthly, earthworks without drainage ditch on mountain slopes.

5. Reduction in vulnerabilities as the key to disaster prevention

The triggering event such as localized downpour is an unavoidable hazard but well forecastable, but the disasters due to the second, the third and the fourth causes could be avoidable if vulnerabilities had been properly identified, assessed and reduced. In another word, a society in which no toll is taken even in case of localized downpour is not a dream if the policy based on the hazard mapping would be exercised properly as Swiss people do[4)].

6. Hazard map developed and used as a tool for the Spatial Planning in Switzerland

Swiss people had been aware of impending tremendous large risks of disasters[5)] due to sediment yield and transportation as global warming becomes more serious. The mean they had taken is not to trivialize the issues as the problem of public awareness and emergency evacuation but to remove the root causes of vulnerabilities to unavoidable natural hazards following the geomorphological axiom. The Swiss Federal Government exercised strong political will to cover settlements with hazard zoning maps dividing the territory into five (5) colored areas; red, blue, yellow, yellow and white stripes, and white. The area colored in red is designated as the prohibited area in which no new building work is allowed; in the blue area new buildings are allowed under certain conditions (local proofing). Swiss people, including estate businesses, respect and follow the policy because the policy is administered in combination with the compulsory building insurance system and grass-rooted democracy.

1) Masahiro KAIBORI (2017): No disaster-free society can be achieved without awareness and cooperation of local people – Old but still new issue we need to tackle (in Japanese), Journal of the Japan society of Erosion Control Engineering, Vol.69, No.6, p.1-2

2) Masayuki WATANABE et al. (2010): At Risk (Japanese edition of the At Risk, 2004, by Ben Wisner et al., Routledge), Tsukiji-shokan Publishing, p.55

3) Shigekiyo TABATA (1967): The processes of sedimentation and associated flooding in the channel of the river Ishiyagawa in Kobe, Journal of the Japan society of Erosion Control Engineering, Vol.3, p.23-35

4) Roberto LOAT (2003/2010): Risk management of natural hazards in Switzerland, FOEN

5) Markus ZIMMERMANN et al.(1992): Climatic change and debris flow activity in high-mountain areas. A case study in the Swiss Alps. Catena Suppl. Vol. 22, p.59-72.