Sustainable Sand Mining Management in Merapi Area Using Groundsills

○Jazaul IKHSAN, Masaharu FUJITA, Hiroshi TAKEBAYASHI

Mt. Merapi is one of the most active volcanoes in the world, located at the vicinity of Yogyakarta city in central Java, Indonesia. Mt. Merapi has been giving various volcanic activities, such as eruptions, lava flows, pyroclastic flows, glowing clouds, volcanic ash falls and volcanic debris flows. The produced sediment has been causing many disasters, and threatening local residents. Particularly, pyroclastic flows due to collapse of lava dome or lava tip result in disasters and a tremendous amount of volcanic loose deposits on the its slope. Once there is intensive rainfall, the loose deposit flows downstream as the debris flow endangering the resident lives and assets. However, the sediment in Mt. Merapi has good quality and is popular as construction material. Its quality and increasing consumption of sand caused by the growth of economy attract sand miners. The sediment has become one of important income source for local people.

The sand mining is performed in the foothills of Mt. Merapi and river channel, especially in the downstream of Progo River. The activities have given some advantages for rural/local people and local governments, such as employment opportunities and incomes. Furthermore, the activities can be used as one of measures for sediment control to give empty capacities in the sediment reservoirs. However, uncontrolled sand mining has caused serious problems in the watershed such as instability of groundsills, bridges and so on due to bed degradation. Especially in the lower reach of the Progo River, bed degradations are observed at 10-30 cm/year. Fig.1. shows Mt. Merapi location.

In this study, considering the actual situation of sediment production, bed degradation and sand mining activities, sustainable sediment management assisted by sand mining and groundsills is proposed. One dimensional bed deformation analysis is performed for the lower reach of the Progo River. The results show that the allowable sand mining volume is depended on the design bed slope and the maximum volume is same as the sediment resource annually provided from Mt. Merapi. The simulation results also show that the construction order of groundsills must be from upstream area in order to keep the initial bed elevation. The suggested management concepts can be used to determine the politics on the sand mining management and the groundsill installation.

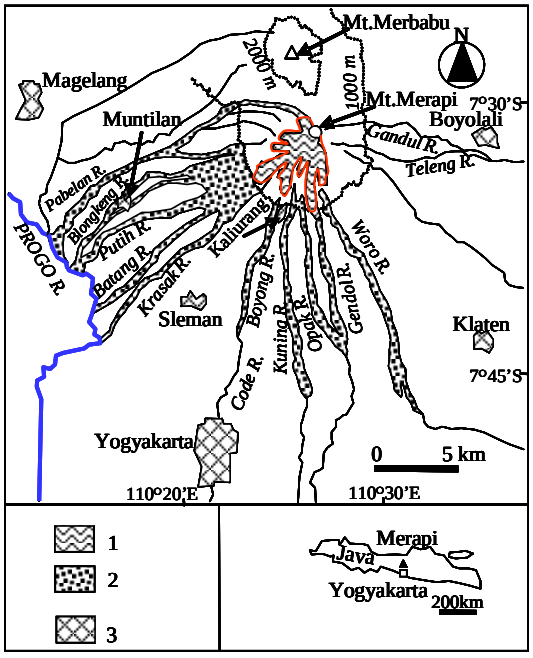

Fig.1 Location of Mt. Merapi and sediment deposits (1: Summit lava dome, 2: volcanislastic deposits from Merapi volcano, 3: main cities)