



## **Volcanic risk: mitigation of lava flow invasion hazard through optimized barrier configuration**

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In order to mitigate the destructive effects of lava flows along volcanic slopes, the building of artificial barriers is a fundamental action for controlling and slowing down the lava flow advance, as experienced during a few recent eruptions of Etna. The simulated lava path can be used to define an optimize project to locate the work but for a timely action it is also necessary to quickly construct a barrier. Therefore this work investigates different type of engineering work that can be adopted to build up a lava containing barrier for improving the efficiency of the structure. From the analysis of historical cases it is clear that barriers were generally constructed by building up earth, lava blocks and incoherent, low density material. This solution implies complex operational constraints and logistical problems that justify the effort of looking for alternative design. Moreover for optimizing the barrier construction an alternative project of gabion-made barrier was here proposed. In this way the volume of mobilized material is lower than that for a earth barrier, thus reducing the time needed for build up the structure. A second crucial aspect to be considered is the geometry of the barrier which, is one of the few parameters that can be modulated, the others being linked to the morphological and topographical characteristics of the ground. Once the walls have been realized, it may be necessary to be able to expand the structure vertically. The use of gabion has many advantages over loose riprap (earthen walls) owing to their modularity and capability to be stacked in various shapes. Furthermore, the elements which are not inundated by lava can be removed and rapidly used for other barriers.

The combination between numerical simulations and gabions will allow a quicker mitigation of risk on lava flows and this is an important aspect for a civil protection intervention in emergency cases.