Visualization of Disseminated Disaster Information at Rural Mountainous Areas in Thailand

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Abstract. Non-structural measures including public warning take an important role for disaster risk reduction especially in rural mountainous areas where structural measures including dams and embankments are hard to be implemented due to lack of human and material resources. For example, a conventional medium used for warning local residents in those areas of Thailand is a loudspeaker. In addition to that, a mobile phone has gotten an attention to be used as such medium since its penetration rate has been increasing rapidly at rural areas in developing countries. Majority of mobile phones familiar in the areas are operated by second-generation (2G) cellular network which has Short Message Service (SMS) standardized by Global System for Mobile Communications (GSM). SMS is a mobile phone technology to send a text message to the other phone number. Therefore, there are variety of researches have been conducted in development of warning system using SMS as one of the important non-structural measures against disasters. However, little research using spatial analysis has been conducted which is able to show how disaster information disseminated by loudspeaker and SMS reach and spread among local communities in rural mountainous areas. We conducted demonstration experiment that dispatched warning message to local communities by both a loudspeaker and SMS. The results of the experiment obtained by a questionnaire were able to show advantages of SMS at rural mountainous areas in Thailand visually. Understandably, it could be seen that a loudspeaker was able to warn people simultaneously who are within a reach of sound. Although, a number of people that loudspeaker can transfer information is obviously greater than the one that SMS can do, the loudspeaker's advantage is relatively easy to be affected by the weather conditions: heavy rain decreases its reachable area significantly since typical houses in rural area of Thailand use corrugated metal roof and it generates noise when rain pelts it. On the other hand, we found

that warning message dispatched by SMS is able to reach people who are outside of the area where message from the loudspeaker cannot reach. This fact becomes obvious when the study areas have rain. As for people's actions after receive of warning message, they tend to transfer a content of the message orally to neighbors regardless the media used for the warning. Those results were visually presented in this research using geographic information system (GIS) program so that people can easily understand and figure out differences in effectiveness of SMS and loudspeaker for warning local communities. Non-structural measures fulfill their functions sufficiently only when users understand and utilize them, meanwhile structural measure works on right after its completion of installation. Therefore, to simply clarify where disaster information can or cannot be sent is very important for not only operators who are in charge of public warning but also for citizen who receive the warning messages. Our results demonstrate usefulness of spatial analysis which makes us easy to understand how disaster information reaches citizens and spreads at communities in rural mountainous areas. We anticipate our research to be a basis for further analysis on the SMS, text-based features of mobile phone, for public warning. Since warning with only sound-based disaster information from a loudspeaker gets affected by the weather conditions easily, SMS has a higher potential to strengthen the current warning system by multiplexing communication channels and way of information expression. For further challenges to that end, propagation of SMS message among a community should be visualized in chronological order. Furthermore, accuracy of disseminated information should be examined when the hearsay information is continued to be transferred person-to-person.

Keywords. Visualization, Disaster information, Warning, Short Message Service, Loudspeaker