Risk and Economic Feasibility of Countermeasures for Rainfall-Induced Disasters in El Salvador
- Development of simplified tool for disaster risk management -

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INTRODUCTION

The simplified sequence spreadsheet assessment tools for hazard vulnerability, disaster risk, and economic feasibility of disaster mitigation project for rainfall-induced disasters for bridge, slope, and rivers/storm water drainage basins have been developed by the Technical Assistance Project of the Japan International Cooperation Agency (JICA) for the Department of Climate Change Adaptation and Strategic Risk Management (DACGER, abbreviation in Spanish) for the Ministry of Public Works, Transportation, Housing and Urban Development (MOPTVDU, abbreviation in Spanish) in El Salvador. The technical cooperation project was named as project GENSAI, which is the Japanese word written in the Latin alphabet meaning disaster mitigation.

RISK CURVE THEORY, HAZARD VULNERABILITY RATING PROCEDURES AND THEIR SUITABILITY FOR SIMPLIFIED RISK ESTIMATES

The risk curve theory was proposed by [*Public Works Research Institute Japan*, 2003] (hereafter referred to as "[*PWRI_JP* 2003]"), with the purpose of estimating slope-disaster risk. Disasters may occur repeatedly at the same site or area, with every specific event having its own particular magnitude. Disaster magnitude is assumed to be different depending on the magnitude of induced cause (heavy rains, etc.). The risk curve is derived from the plots of exceedance probability per year of disaster occurrence on the vertical axis and potential economic loss of disaster event on the horizontal axis.

The reason the authors adapted the risk curve theory to develop a risk estimate spreadsheet tool is that the theory can enable the estimate of a single value of potential annual loss of site/area to help prioritize the site/area for disaster mitigation. Furthermore, the annual benefit by the countermeasures can be estimated by determining the area between the risk curves with and without countermeasures and the coordinate axes. The annual benefit can then be directly

entered into the computation of economic feasibility indexes, such as the cost/benefit ratio of disaster mitigation project.

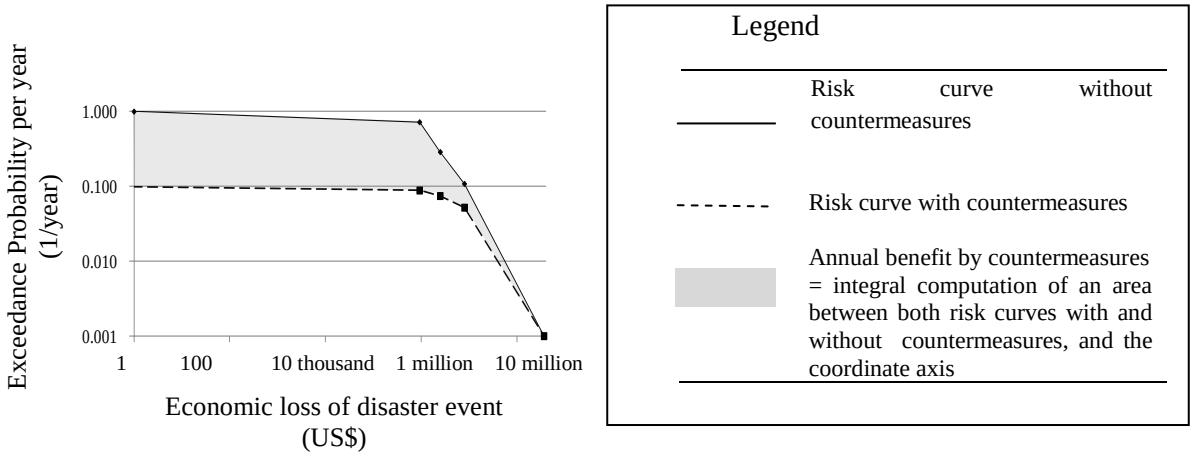

Fig. 1 Example of risk curve for rainfall-induced disaster

IMPROVEMENT POINTS OF THE RISK ASSESSMENT PROCEDURE

As [*PWRI_JP*, 2003] provides only the theory for risk estimates and risk management for road slope disasters, the authors developed simplified spreadsheet tools for hazard vulnerability, disaster risk estimates and economic feasibility of disaster countermeasures for bridge, slope and river/storm water drainage basins.

In the hazard vulnerability assessment, the authors selected inductive statistical approaches, because deductive methods such as hydrological simulation etc., were too laborious for the preliminary assessment. The advantage of the authors' procedure derived from [*PWRI_JP*, 2003], is the adaptation of the return period rating, (which is the reverse value of the exceedance probability per year), for the vulnerability index, which can be easily applied into the risk estimate tool. Whereas the customary practice, included in [*PWRI_JP*, 2003], of dimensionless rating, requires a complicated process in order to determine the exceedance probability per year.

DISCUSSIONS AND CONCLUSIONS

The developed assessment procedure has been presented to over 200 engineers in El Salvador and other Central American countries since July 2014.

However, the authors are aware of the limitations of this procedure and requirement of further efforts as follows:

- The accuracy of assessment results depends on the quality of data entered for disasters and rainfall, which needs further improvement.
- The precise disaster records (occurrence time, magnitude, damage assessment including economical loss estimate), dense distribution of rainfall stations, and automatic recording of precise time period of rainfall amount are essential to improving the accuracy of the assessment results.

Keywords: Risk Assessment, risk estimation, potential annual loss, rainfall-induced disasters, risk curve