

Appropriate Land Use Regulation for Mitigation in Sediment Hazard-Prone Area

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The main purpose of this study intends to determine the better mitigation strategies and appropriate land use regulations for decreasing regional vulnerability in a small catchment which is exposed to sediment hazards. Mitigation and development are always the two conflict concepts in the disaster risk reduction plan. When mitigation strategies increase, development activities might be decreased, and vice versa. The insufficiency of Taiwanese disaster risk reduction plan represents a proper land use regulation is a significant problem in recent situation. Therefore, according to the current situation, the appropriate land use regulation is estimated from the solutions composed of three main alternatives, which are “tourist area and tourist agriculture”, “maintenance agriculture”, and “design as soil and water conservation area”.

The assessment for the appropriate land use regulation was made in terms of multi-criteria decision analysis (MCDA). For MCDA, we determined a framework that includes a) two main goals, which are development and mitigation, b) five criteria, including two for development and three for mitigation, and c) nine sub-criteria, including variables for calculating scores of each solution. The necessary variables are calculated by the current data and by the simulation results, such as the efficiency of engineering control facilities, landslide susceptibility, and vulnerability scores.

Landslide susceptibility was estimated by statistical analysis. It is an important step for clarifying the dangerous levels as hazard mapping and the principle fragile environmental conditions. The efficiency of engineering facilities value was estimated in terms of three cases, including natural, levee and debris detention basin in four torrents with the highest proportion of dangerous levels. We calculated the efficiency by the sum of probable losses from local residents and from governments' paying. On the other hand, to describe the regional vulnerability of the catchment, nine sub-areas were separated and regional vulnerability of each sub-area was evaluated in terms of biophysical, social, and environmental vulnerability, and exposure. Regional vulnerability scores is the important basis for judging how much vulnerability value changes after land use regulations. According to the results, the number of people affected, development net benefit value and regional vulnerability after the solutions are clarified. We proved that it is possible to decrease regional vulnerability in terms of appropriate land use regulation, and regional vulnerability is probably increased, as well. The probable total paying for mitigation and preparedness are listed. It proved that the modification on the current disaster risk reduction plan is necessary, especially the parts of insurance and the cooperation on development and mitigation between government and residents.