An Establishment on the Risk Assessment Model of Sediment Disasters Occurred at Taitung County in the Eastern Taiwan

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ABSTRACT

The topography of slope lands at Taitung County in the eastern Taiwan is quite steep combined with fragile geological structure. Chihpen and Taimali watersheds located at Taitung County were selected as study areas. In this research, mechanism, behavior, and scale of the sediment disasters are analyzed to rule out their interaction of the factors mentioned above and the extent of the debris flow. In this study, applications of global positioning systems (GPS) would be used to precisely locate site position. Geographic information systems (GIS) and remote sensing (RS) techniques are integrated and used to establish the sediment related disaster database system based on mathematic methods. 522 engineering related data were investigated from the field and analyzed by using the Multiple Linear Regression Analysis. Finally, GPS/GIS/RS integrated with the digital data was used to establish risk assessment model which can be utilized as an indication of sediment disaster occurrence. All results established by this study can help Taitung Country set up its own disaster prevention system and keep well development of rural and city in the eastern Taiwan.

KEYWORDS: Sediment Disaster, GPS, GIS, RS

INTRODUCTION

Taitung County with the total area of 3,515.24 km$^2$ lies in eastern Taiwan. The occurrence of earthquake at Taitung County is quite often. This county has also been attacked repeatedly by the multiple typhoons during the summer season, which causes landslide, soil erosion, and debris flow. These sediment disasters will affect the regional people’s life and its environment security.

Sediment disasters occurred at Taitung County have been recognized as a big issue which was serious concerned by the resident at Taitung County. However, Most of land areas are located at hill slope with 2,317.25 km$^2$ in total. Highly weathered geological formation, uneven distributions of rainfall intensity and steep geomorphology have been identified as the predominated factors contributing to the sediment disasters occurred at Taitung County.

In this research, the geological survey, soil property investigations meteorological hydrology, and sediment disaster of Chihpen and Taimali watersheds, applications of GIS integrated with GPS and RS technology should be necessary for this study. This project was also critical to establish a risk assessment model for Chihpen and Taimali watersheds. All results can give a fundamental guideline of disaster prevention program. Hopefully, this guideline can help Taitung County government set up a sediment disaster prevention system to keep their urban safe and well management of watershed in the future.

Chihpen and Taimali watersheds are one of the main regions for the watershed development at Taitung. Actually, large-scale landslide and debris flow after rainfall event does have a detrimental effect on the natural environment and public facilities in Taitung County. Factors governing this sediment related disasters are complicate. Various studies have shown that most landslide and debris flow in Taitung County is natural environment related. The great diversity of factors and complexity of interrelationships, as well as the practical relevance of large scale landslide and debris flow, can be recognized only by systematic field studies. Therefore, the possible approaches used to work out these hazards prevention should intensively perform the field investigations by using GPS/GIS integration to establish 522 engineering related data (Fig. 1).

522 engineering related data were investigated from the field and analyzed by using the Multiple Linear Regression Analysis in this study. The best results can be achieved by the combination of both these risk assessment model and GPS/GIS/RS integration. Since the field investigations can provide a clear picture of the origin, cause, and nature of disaster processes by checking their information against the result of static analysis. From what has been said above, a sound treatment for the soil mass movement on Taitung County is based on careful observations for possible site of landslide before, during and even after carrying out stabilization measures. Indispensable geological survey, hydrological analysis, slope failure investigations by means of GPS/GIS/RS integration shall serve this purpose during the period of this research. Besides purely theoretical considerations, the practical aspects also play an important part in this study. Hence, the reorganization of the cause, nature and development of landslide and debris flow occurred at Taitung County can make it possible to appreciate the extent of any danger and find an adequate solution to control these disasters. Hopefully, this study can give a reference on the