第 VII 部門

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1. Introduction

The main purposes of the study are to try to find a method to evaluate the probability of the landslide, and make a identification of the risk assessment. There are two main parts in the study. A risk assessment model was built according to the studies on the one hand, and on the other, we discussed the susceptibility of the landslide according to the probability by the discriminant analysis and logistic regression.

2. The risk assessment framework

The definitions which describe the risk are different in various spheres, depending on the purpose. According to the original concept, risk is the probability and potential of the harmful event in the physical conditions. When concerning of the landslide risk, it is necessary that take account of the social and economic factors in the model of risk assessment, because it has been proved that the human development are significant factors to induce the landslide. Therefore, in the study, the risk for landslide is defined as the probability of the harmful event of the target that itself has a set of the social and economic conditions, which is threatened by the physical conditions.

The framework discussed of the risk assessment divided into three categories, generally risk is evaluated by the hazard and vulnerability, such as in the pressure and release (PAR) model. On the other way, the different is the part of the exposure and the capacity. It could be found that the exposure is considered as part of hazard, or vulnerability, or even it is independent as a factor of the risk. Because of the concept of the exposure is one of the conditions that the object would get loss from the hazard, or not. As the result, when considering of the framework of the risk, the hazard and vulnerability was set as the two main components. The hazard is thought as a qualitative description of a specific natural phenomenon, which is taken account of the magnitude and probability. Furthermore, the vulnerability is the conditions that the objective has itself to result in the disaster.

From the definitions that have been mentioned, the meaning of the exposure much more matched with the vulnerability, consequently, we concerned exposure as the part of the vulnerability. Furthermore, we thought of other factors that the objective might have, as well, the vulnerability was divided into exposure, economic and the social factors. The economic factor represents the economical conditions that an individual or community have, such as the percentage of the low income, infrastructure, etc, and the social factor represents the insufficient preparedness conditions.

We did not consider the coping capacity as the part of the vulnerability in this study. In ISDR, the coping capacity is the way which people or organizations use available resource to face the adverse effect from the hazard. In some studies, coping capacity is set as one factor of the vulnerability, which means that the changing of the risk depends on the total effects of the positive and negative conditions, the decreasing of the risk and the vulnerability is related with the coping capacity. However, it is not proved that when the loss did not happen, the reason is the risk or the vulnerability decreased, or not existed. Hence, we considered the



Fig.1 The susceptibility map made by logistic regression

coping capacity is independent out of the risk, and believed that the disaster happened or not, according to the growth and decline between risk, vulnerability, and coping capacity, as well.

3. The hazard analysis

In the first step, we try to evaluate the hazard, and show the result as a hazard map. The hazard map is an efficient tool to represent the dangerous grade of a specific area. The studying area is the Dousuixi basin which is located in the central of Taiwan. There are many severe sediment disasters happened in the basin in the past ten years and numerous loss happened on the property and human.

Discriminant analysis and logistic regression were used in the study to evaluate the susceptibility of the landslide. Five factors, which are aspect, the distance to the fault, geology, slope, and the distance from the river, were considered and used as the type of the odds. Odds is the ratio of each elements that landslide happened and not happened in a category of the factor. The odds of each factor are the independent variables, and the real case of the landslide event is the dependent variable. The susceptibility of landslide would be shown via the probability which was calculated from the statistic analysis.

Fig.1 and Fig.2 are the results from statistic



Fig.2 The susceptibility map made by discriminant analysis

method, the colors shows the susceptibility of the landslide. The deeper the color is, the higher the susceptibility is. We checked the result with the real case of the landslide happened in 2004. In the result from discriminant analysis, the high susceptibility much more matches the real cases of the landslide than the result of the logistic regression. As the result, we accepted the result made by discriminant analysis and to continue the further analysis.

4. Conclusion

The study described the initial concept of the risk assessment and simple result of the hazard analysis. The definition of the each part of risk assessment is referred and a rough framework is established. Accordingly, the next step of the study are to extend the framework and to discuss the relationship between each factor of the risk.

On the other hand, two statistic methods were used to evaluate the landslide susceptibility, even if the units of the factors were completely different, it is possible to do the evaluation by calculating the odds. From comparing with the result and real cases, we accepted the result which was made by discriminant analysis as the hazard map, finally. The hazard map not only shows the dangerous levels of the area, but also represents the environmental situation as the part of the risk.