ASSESSMENT FOR DEEP CATASTROPHIC LANDSLIDE SUSCEPTIBILITY IN JAPAN

Taro UCHIDA[1], Osamu YOKOYAMA[2], Nagazumi TAKEZAWA[3] and Tadanori ISHIDUKA[4]

INTRODUCTION

In steep mountainous regions, not only soils but also weathered bedrocks were sometimes sliding simultaneously. Velocities and volumes of these landslides were often very large. In this study, these landslides are referred to "deep catastrophic landslide" (Fig. 1). This study excludes slow failures of a more chronic nature, such as deep-seated chronic landslide, deep-seated gravitational creep or rock flow, from the deep catastrophic landslide. Deep catastrophic landslide occurred and triggered serious damages. However, there is currently no widely used method for estimating spatial patterns of deep catastrophic landslide susceptibility of catchment or hillslope scale (Montgomery, 2001).

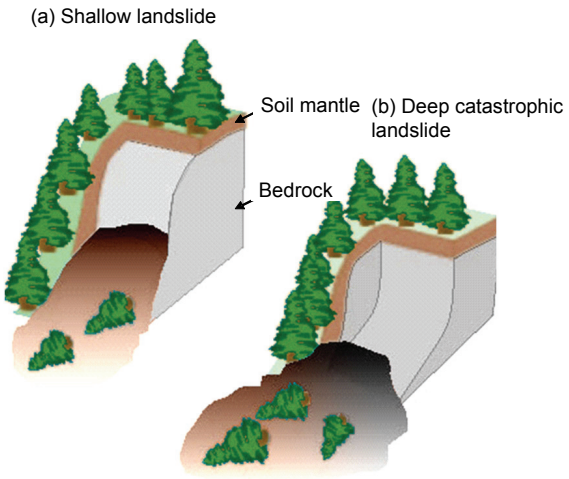

Fig. 1 Conceptual diagram of deep catastrophic landslide and shallow landslide

Since 1960s, many researchers investigated landforms and geological structures on the slope where deep catastrophic landslide occurred (e.g., Machida, 1967). Based on these detailed field investigations, much information has been stored. However, this information has not been successfully used for assessing spatial patterns of deep catastrophic landslide susceptibility. So, at first, we review previous studies about landforms and geological structures on the slope where deep catastrophic landslide occurred. According to the review, we proposed a new method for estimating spatial patterns of deep catastrophic landslide susceptibility for large area. Then, we test applicability of our new method using a data in Wanizuka Mountains, Miyazaki, Japan.

BRIEF REVIEW FOR DEEP CATASTROPHIC LANDSLIDE SUSCEPTIBILITY

Based on the review of previous studies, we showed that

1. Deep catastrophic landslide susceptibly might be high in the area where many deep catastrophic landslides occurred in the past.
2. Spatial distribution of landforms due to long-lasting mass movements, such as rock creep slopes, ancient deep-seated chronic landslide, linear depression and downhill facing scarps, might be an index for deep catastrophic landslide susceptibly.
3. Spatial distribution of geological structures which controls long-lasting mass movement, likes active fault, might be an index for deep catastrophic landslide susceptibly.
4. Deep catastrophic landslide susceptibly might be large at the steep slope with large upslope contributing area.
5. Deep catastrophic landslide susceptibly might be large at the edge of gentle ridge top.

[1] Taro UCHIDA. National Institute for Land and Infrastructure Management, Japan (e-mail: uchida-t92rv@nilim.go.jp)
[2] Osamu YOKOYAMA, Public Works Research Institute, Japan
[3] Nagazumi TAKEZAWA, Public Works Research Institute, Japan
[4] Tadanori ISHIZUKA, Public Works Research Institute, Japan

METHODS FOR ASSESSING POTENTIAL DEEP CATASTROPHIC LANDSLIDE SOURCES

In this study, we propose a method for assessing the susceptibility of deep catastrophic landslide for each small catchment (ca. around 1 km^2) in relatively large area (ca. several hundreds km^2). According to the reviews, to assess the susceptibility of deep catastrophic landslide, here we proposed three following criteria (Fig. 2);

1. Catchment with ancient deep catastrophic landslide scars
2. Catchment with faults and/or landforms due to long-lasting mass movements
3. Catchment with many steep slopes with large upslope contributing area.

Moreover, we hypothesized that the susceptibility of given catchment increased with the increase of criteria which satisfied.

Further, since processes and mechanism of deep catastrophic landslide were strongly affected by bedrock geology and climate, the relationships between landforms, geological structures, topography and deep catastrophic landslide occurrence should be varied due to difference of bedrock geology and climate, although we did not use climatic condition as an index of susceptibility. So, in our proposed method, the detailed criteria were determined by preliminary analyses for study area where underlain by homogenous bedrock geology and located under homogenous climatic condition (Fig. 3). Based on the detailed criteria determined by the preliminary analyses, the susceptibility of deep catastrophic landslide of each small catchment was assessed (Fig. 3).

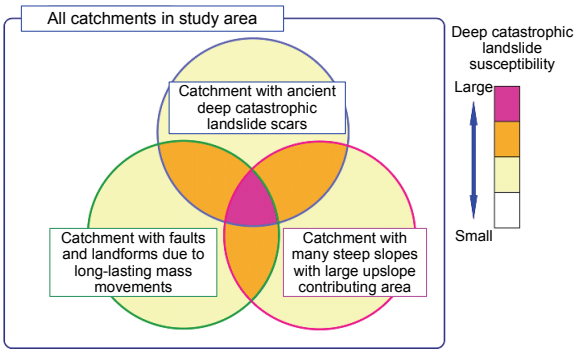

Fig. 2 Conceptual diagram of proposed method for assessing deep catastrophic landslide susceptibility

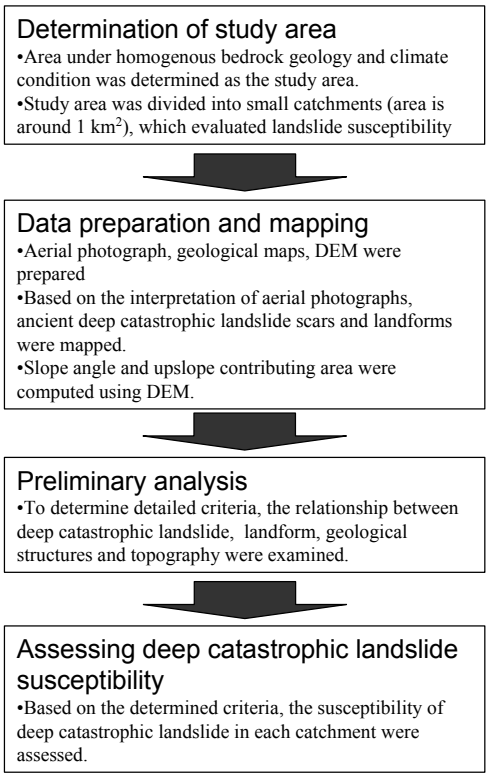

Fig. 3 Flowchart of proposed method for assessing

TEST OF APLLICABILITY

We examined the applicability of this method using data of Wanizuka Mountains, Miyazaki, Japan. Here we confirmed high applicability of our proposed method based on the result of the test for deep catastrophic landslide patterns in Wanizuka Mountains.

REFERENCES

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