

Problems and Concerning Issues of Hazard Map for Residential Land made of large amount of Piled Earth

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1. Background

It has been verified that the whole piled earth in the residential land block, which was developed by filling the valley and swamp, slipped during the earthquakes in Southern Hyogo and Niigata Chuetsu. Thus, to survey and understand the piled earth in the artificial land block, [The Guideline of Survey to Forecast the Change of Large amount of Piled Land] has been put forth.

It is determined to make hazard map for two types of large scale artificial land. The map will be used to employ some necessary regulations with the aim to prevent the hazard and make the citizens to deeply understand the damage caused by the earthquake on the artificial land block.

A simple method to create the hazard map is to pick up the filled area with the difference between the DEM data of two periods in GIS.

We have studied the method to analyze the geographical deformation with the materials such as topographical map or aero-photograph, which record the historical land changes and are necessary for hazard map.

This paper analyze the quality of the DEM data, which are created with different materials in several regions and show the past topography, and summarize the problems in creating the DEM data that are necessary for the hazard map. We further inspect the illustrating method of the publication or usage of the map, which is based on the analysis of the DEM data before and after the land construction.

2. Problems in creation of past DEM data

1) Common Problems

Selection of GCP:

Although the unchanged items should be used as the GCP, the scale of the topographical change and the number of the distinguished buildings may affect error level in location matching for the whole region.

Algorithm of DEM Calculation:

Due to algorithm, the height values of a grid may change even the same contour line are used to make the grid. The only method to reduce the error is to supplement the changing sites with break line.

Problems of Each Kind of Material:

Paper Map:

When we can get the contour line from paper map, the quality of the obtained data may be not good because some contour lines may be cut by the artificial slopes or collapsed sites. Moreover, the position slippage to base map in different survey may not be always checked.

Aero photograph (with camera elements):

Generally, the accuracy of aero-photo survey is determined by the scale of the photograph. However, the accuracy is also affected by the function of the digital photo survey machine and the reading technique of the operator. An evaluating method of the quality of method to create DEM with aero-photo survey and the grid resolution has been put forth.

American Military Photograph (without camera elements):

Because only the hard copy or copied images are available in Japan instead of the original negative films, the quality of American military aero-photographs is bad and the camera elements are unknown. Consequently it is difficult to execute high quality survey with American military aero-photographs. This fact has been verified by many DEM made of American military aero-photographs. We have cleared the requirements for high quality DEM creation showing former topography with American military aero-photographs (1/10,000).

3. Recorded Items and the Illustrating Methods

We introduce the analyzed results of the piled earth based on the difference between two periods of DEMs.

Grid Resolution:

Basically there is no doubt that the grid resolution should be correspond to the quality of DEM. However, the accuracy and method to calculate the being used contour lines, height points and the BL will also affect the quality of the DEM.

Height and Boundary of the Piled Earth:

The dangerous region of the collapse caused by land slip and the easiness of the slip may not coincide with the height of the piled earth. Moreover, because the grid division is difficult for citizens to understand, the boundary of the piled earth should be shown.