INTERPRAEVENT
2024 - Vienna, Austria

June 10th – 13th, 2024

PROPOSAL FOR EFFICIENT MANAGEMENT OF SEDIMENT-RELATED DISASTER WARNING AREAS USING DIGITAL TECHNOLOGY ACCORDING TO REGIONAL CHARACTERISTICS

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Introduction

In response to the frequent occurrence of sediment disasters in recent years, sediment-related disaster warning areas (Yellow Zones) have gained considerable recognition among residents. There are about 700,000 of Yellow Zones across Japan. This number is expected to increase with more precise topographic maps

Method

This study examined the digital technologies that could be utilised in managing warning areas.

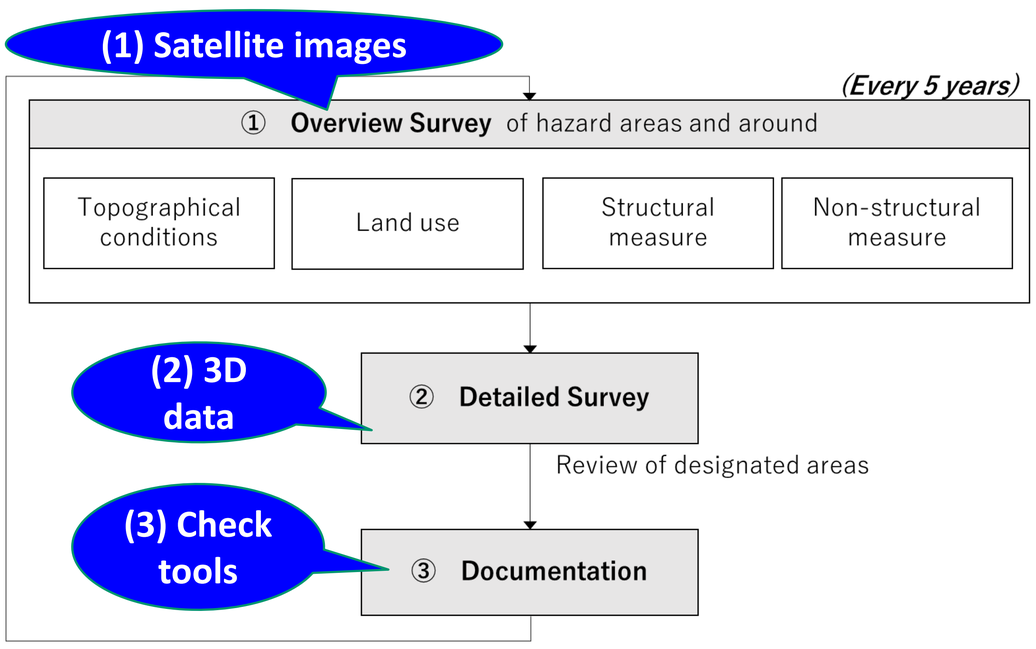


Figure 1: Basic process for updating disaster-warning areas

(1) Satellite images in the overview survey stage

Satellite images from Sentinel-2 are used in this study. Despite its limited 10-metre pixel resolution, the images are free and frequently captured. To analyse images, we used an analytical tool designed by Sabo Frontier Foundation [Terayama et al., 2024], .

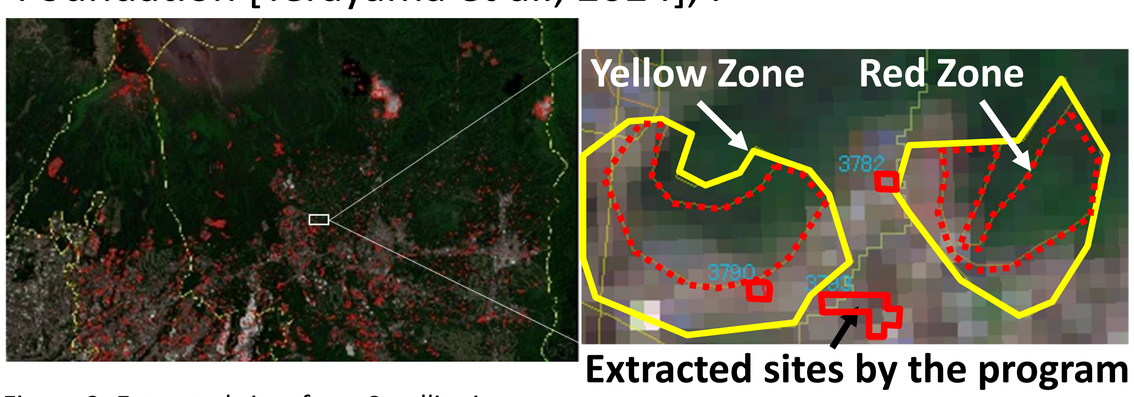


Figure 2: Extracted sites from Satellite images

(2) 3D data in detailed survey stage

The study compares 3D images acquired by a smartphone with the data obtained by the conventional photographic method, assuming that the data may serve as explanatory material.

(3) Check tools for Documentation

A company has previously developed the system [Seto et al., 2023], and we integrate it into our data verification flow.

Results and Discussion

(1) Satellite images in the overview survey stage

By using this program, 7.1 sites/km^2 were selected. Of these, 0.2 sites/km^2 were extracted within the special warning areas(Red Zone). Although, it is difficult to identify small changes of the slope behind a house frequently observed in urban areas. It is necessary to use additional way, cooperating with residents and others, to identify relatively minor alterations.

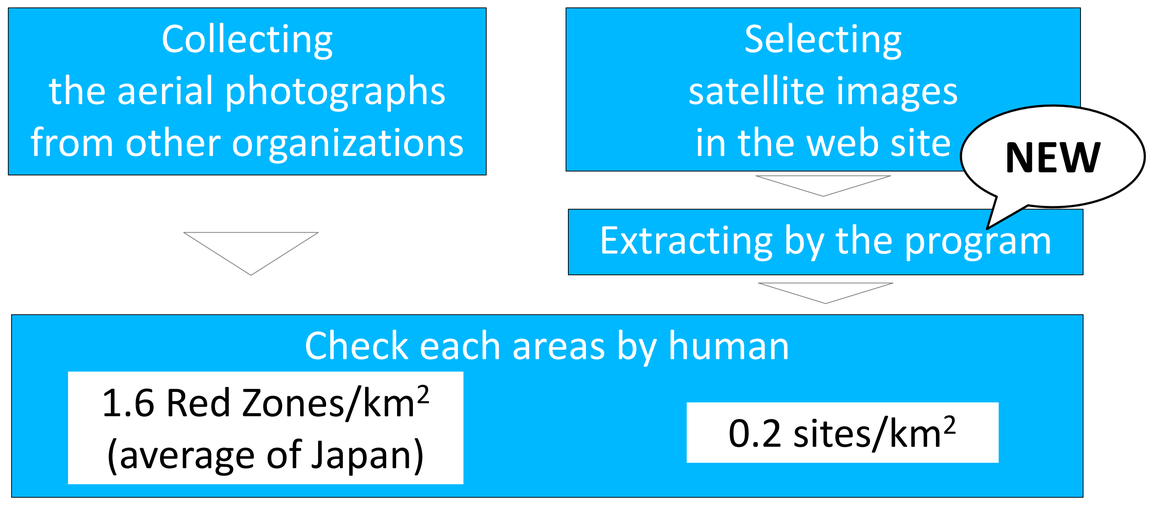


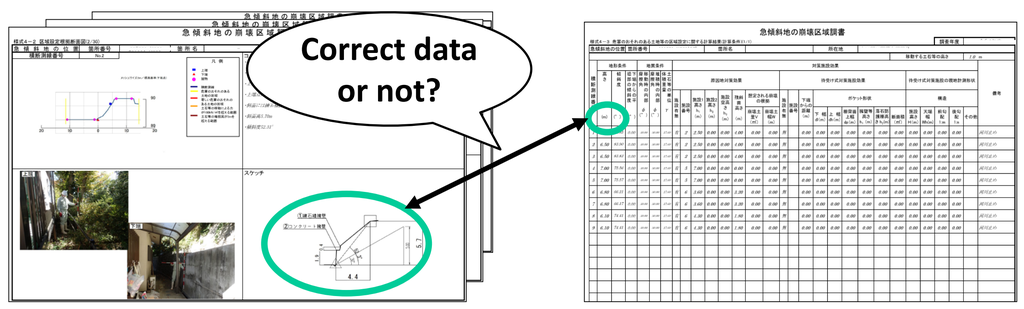
Figure 3: Common method and New method using satellite images

(2) 3D data in detailed survey stage

the 3D data is effective for understanding the state of relatively small retaining walls and small areas. Moreover, acquiring spatially continuous data allows providing information without many times field survey. However, storing 3D data can result in an enormous volume.

(3) Check tools for Documentation

Human costs can be reduced by mechanically. It helps engineers make advanced technical judgements. Yet data conforming to a specific format can only be mechanically checked, the amount of work may increase before the check stage, such as holding preliminary study sessions related to format creation.



Conclusion

This study outlines a new methodology for updating warning areas using digital technology, which is currently undergoing trials. Some methods is useful in urban areas, and others have merits in large mountainous regions. Further trials are needed before this method can be put into practical use.

References

Seto K., Yamaguchi K., Watanabe S., (2023) Ensuring the quality of basic surveys based on the Sediment-related disasters prevention Act (slope failures), summary report of the 72nd annual conference of sabo society: 491-492
Terayama Y., Sakatani Y., Uchiyama H., Chiba M., Yagi W., Kakuta S., Yoshimura G., Yamada A.,(2024) Extraction of land use modification areas using deep learning with satellite imagery, summary report of the 73nd annual conference of sabo society: 327-328

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