

A Study on the Insurance Premium Rate Map Considering the Natural Disaster Risks in Korea

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Abstract—Recently, the number of natural disasters has increased due to abnormal changes in the weather in Korea. A storm and flood insurance system is available to prevent fallout from these natural disasters. The national storm and flood insurance premium rates are very low and the risk of adverse selection exists because the system is based exclusively on those who live in high-risk areas. To solve these problems, a storm and flood insurance premium rate map is required. In this paper, we investigate domestic and foreign storm and flood insurance maps and extract the common elements of these storm and flood insurance maps. We also created a prototype storm and flood insurance premium rate map of Ulsan in Korea.

Keywords-natural disaster; hazard risk; insurance map; GIS; insurance premium rate.

I. INTRODUCTION

Recent widespread flooding and other extreme weather events have caused devastating losses across Korea. These losses have been borne by individuals and businesses, local governments, community organizations, the by Korean government. For this reason, the Korean government has developed a storm and flood insurance system which pays benefits in the event of this type of damage [1]. This system was introduced in 2006 to protect businesses and residences from the effects of natural disasters such as typhoons, floods, torrential rain, gales, heavy seas, tidal waves, heavy snowfalls and earthquakes, as well as tsunamis, as shown in Fig. 1 [2]. The storm and flood insurance system is managed by the National Emergency Management Agency in Korea and is administered by private insurance companies. The central (59.5%) and local (25.5%) governments offer partial subsidies for the insurance premiums of customers (15%) to make them more capable of coping with unexpected storms and floods [3].

Generally, standard insurance premium rates are rationally graded or applied according to the magnitude of the risk (the degree of risk). However, present storm and flood insurance in Korea applies the same insurance premium rate regardless of the risk or district, using only one risk grade all 230 cities covered [4]. Therefore, the current insurance premium rate is unfairly discriminatory, as it is supposed to be graded and applied in the standard manner of insurance premium rates based on the level of risk [5]. For example, as shown in Fig. 2(a), the same insurance premium rate is applied despite the fact that zone A has a lower degree of risk

than zone B. This study provides a framework for applying different insurance rates depending on the risk of the subject-matter insured, as shown in Fig. 2(b) [4].

This paper aims to present spatial data and analysis methods to assist the creation process of a storm and flood insurance premium rate map. A concurrent aim is to produce a pilot map. The rest of this paper is organized as follows: Section II gives a definition of an insurance premium rate map and demonstrates how to produce such a map for Ulsan in Korea. Section III concludes the paper and summarizes the benefits stemming from its results.

II. INSURANCE PREMIUM RATE MAP

The storm and flood insurance map is the digital map constructed by a computer system as the thematic map that represents the risk of damage from storm, flood and snow.

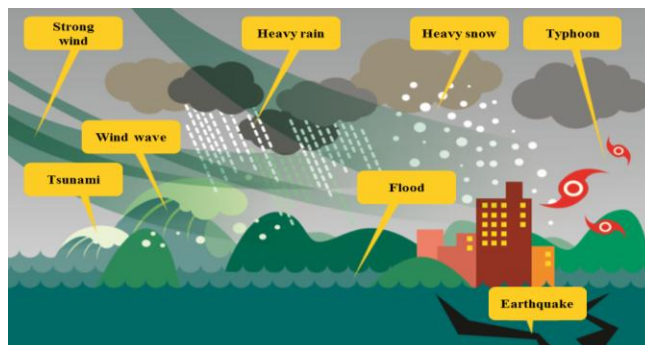


Figure 1. Targets of storm and flood insurance.

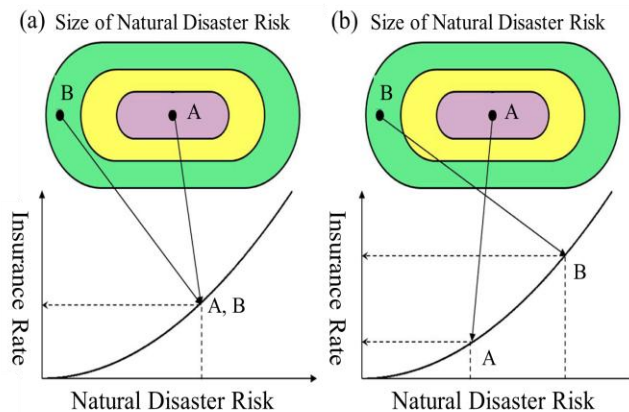


Figure 2. Insurance premium rate system: (a) current (b) revised.

Fig. 3 shows the calculation procedures to determine the storm and flood insurance premium rates. Also shown are the components of the insurance map. The risk levels of three disasters (wind, snow, and water) can be calculated through a grid operation. In this study, we used a grid resolution of 10m, in accordance with the resolution of the DEM (digital elevation model). This work was performed with ArcGIS 10.1 [6].

The completed insurance premium rate map is shown in Fig. 4(a), which shows the final map classified into four grades – safe, alert, dangerous, and very dangerous – in contrast to the existing single premium rate for each of the five districts of Ulsan City.

This map was converted into a KMZ file for the sharing of the data. Then, as shown in Fig. 5, insurance premium rates on Google Earth could be obtained. The data analysis results from the insurance premium rate are also shown above the image of the map.

III. CONCLUSION

We proposed the storm and flood insurance premium rate map. Also we made the prototype storm and flood insurance rate map of the Ulsan Korea. In this paper, we were focused that GIS-based spatial database was constructed for risk zone information about storm and flood damage. It is possible to analyze various disasters and to support disaster prediction for the future.

ACKNOWLEDGMENT

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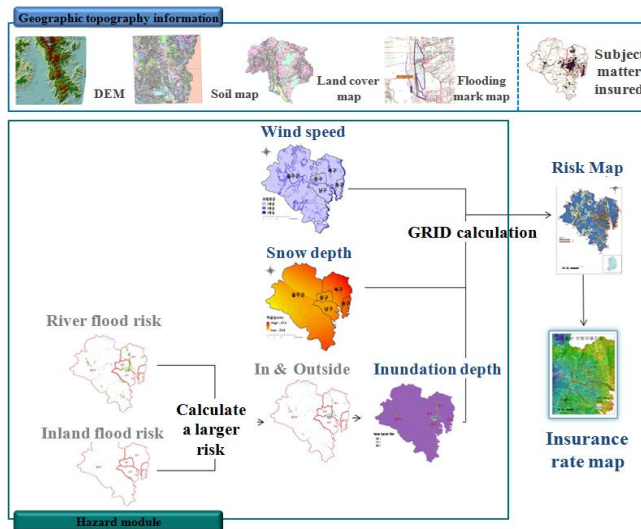


Figure 3. Procedure of producing the storm and flood insurance map.

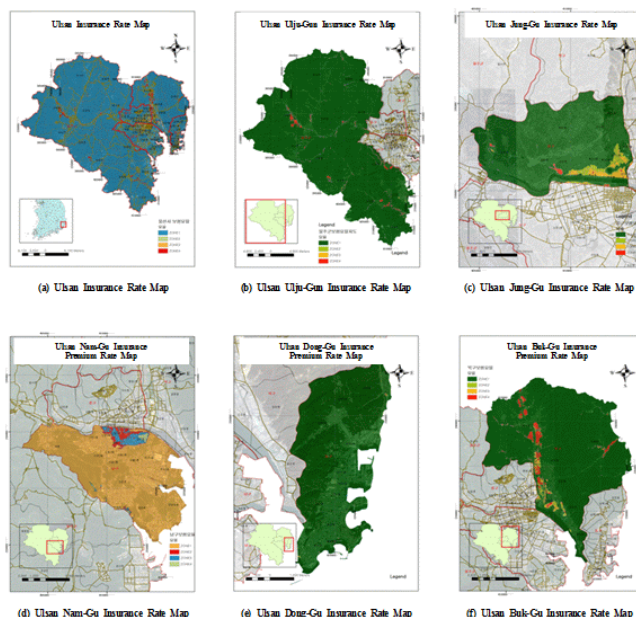


Figure 4. Storm and flood insurance premium map of Ulsan: (a) whole map, (b) Ulju Gun, (c) Jung Gu, (d) Nam Gu, (e) Dong Gu, (f) Buk Gu

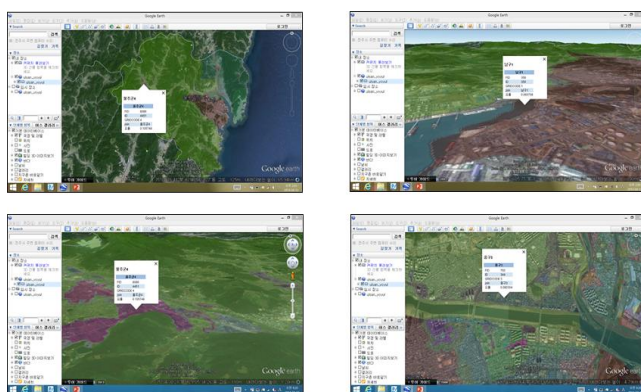


Figure 5. The insurance map in Google earth.