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A Study on Changes in Regional Distribution of Asbestos Slate Buildings in Korea - Case Study of Gang-won Province -

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Abstract. Asbestos is classified as Group 1 carcinogen, and its use is fully banned in Korea. However, there are many slate buildings that contain asbestos, which has become a social issue. In this study, the building registers for the year 2010 and 2015 are examined to see changes in regional distribution of slate buildings in Gang-won Province. The share of slate buildings was 20.73% in 2010 and 20.77% in 2015 by the number of building, 7.46% in 2010 and 7.73% in 2015 by building area. These changes were visualized by using ArcGIS across cities and districts of Gang-won Province.

Keywords: Slate, Slate Building, Building register, Distribution Characteristics

1 Introduction

International Agency for Research on Cancer (IARC) has classified asbestos as Group 1 carcinogens for its health hazard. In Korea, the Occupational Safety and Health Act revised in 2009 fully banned the use of asbestos [1]. Slate produces asbestos fibers when it is old or when its surface is worn by climate changes or destroyed by other shocks [2]. In Korea, many buildings have slates and it has become a social issue. In this study, we examine building registers to identify buildings with asbestos-containing slate in the mountainous Gang-won Province where many antiquated buildings are located, and conduct a comparative analysis across different cities and districts based on ArcGIS. The objective is to examine the current state of asbestos management in Korea, and propose how to manage slate buildings more efficiently.

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2 Theoretical consideration

2.1 Overview of Slate

In Korea, approximately 80% of imported asbestos were used as building materials [3]. The level of asbestos content in asbestos-based materials ranges between 1% and 90%, and in most cases, between 5% and 15% [4]. In general, asbestos-based materials used for building interiors are not exposed to vibration, wind or rainfall, and subsequent dilapidation, and thus there is little concern for scattering of asbestos fibers [5]. However, slate is used for building exterior and has environmental impact, as it produces asbestos fibers as the surface is worn with time [6].

2.2 Overview of Building register

According to Article 38 of the Building Act, all the permitted buildings should be recorded on the building register [7]. The register contains information on the building and its owner, and thus provides useful information to identify buildings with slate roofs. However, the information could be incorrect due to errors that occur during the process of obtaining building permits and approvals.

3 Building register Analysis

An analysis was conducted based on the building register of Gang-won Province by cities and districts. In the 2010 register, a total of 350,274 buildings were on the record for the building area of 44,362,642 m^2. For the 2015 building register, a total of 370,762 buildings were on the record for the building area of 48,706,828 m^2. The share of buildings that used slate roofs was 20.73% and 20.77%, respectively, for the 2010 and the 2015 registers. By building area, they each represented 7.46% and 7.73% of all the registered buildings. Table 1 has shown the Target Area, and Table 2 illustrates the buildings in Gang-won Province by different types of roof materials.

Table 1. Target Area

Area	Classification	Local Situation
Gang-won Province	Urban(7)	Chuncheon, Wonju, Gangneung, Donghae, Taebaek, Sokcho, Samcheok
	Rural(11)	Hongcheon, Hoengseong, Yeongwol, Pyeongchang, Jeongseon, Cheorwon, Hwacheon, Yanggu, Inje, Goseong, Yangyang

Table 2. Buildings in Gang-won Province by Roof Materials.

Description		Asbestos Slate	Reinforced Concrete	Roofing tile	Other	Not reported
2010's Building Register	Number Standard	20.73%	32.74%	17.10%	27.34%	2.09%
	Area Standard	7.46%	47.30%	2.94%	40.78%	1.52%
2015's Building Register	Number Standard	20.77%	32.13%	16.62%	30.00%	0.48%
	Area Standard	7.73%	47.34%	4.08%	40.56%	0.29%

4 Changes in Regional Distribution of Asbestos Slate Buildings

In Gang-won Province, the number of slate roof buildings was 72,626 in 2010 and 76,978 in 2015. Their building area covered 3,307,687 m^2 in 2010 and 3,762,524 m^2 in 2015. The slate production has stopped for some time, but, the number of slate buildings and their building areas actually increased because a total number of buildings in Gang-won Province increased, and some of the previously unrecorded buildings were added to the building register later. Figure 1 illustrates the distribution of registered slate buildings by the number of building (for year 2010 and 2015), and Figure 2 shows their regional distribution by building areas.

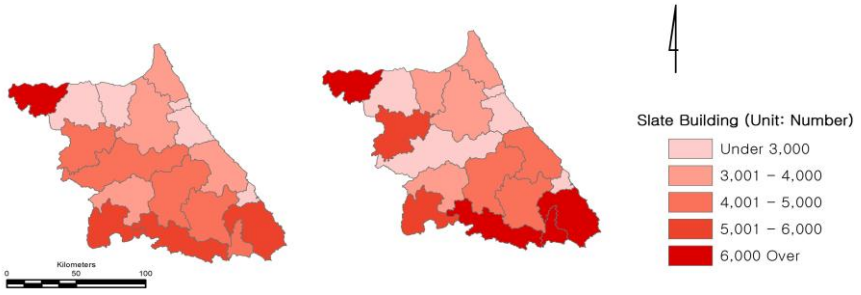

Fig. 1. Regional Distribution of Slate Buildings by Number of Building (2010 data on the left; 2015 on the right)

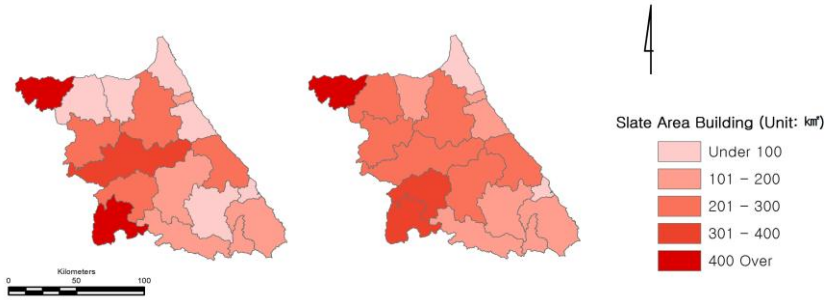

Fig. 2. Regional Distribution of Slate Buildings by building Area (2010 data on the left; 2015 on the right)

The change in the share of slate buildings in Gang-won Province was analyzed by comparing the building registers for 2010 and 2015. For the whole region, the share of slate buildings increased by 0.1% from 20.7% to 20.8% (by number of building), and increased by 0.2% from 7.5% to 7.7% (by building area). Figure 3 illustrates the changes in slate buildings in Gang-won Province between 2010 and 2015 by the number of buildings and their building area.

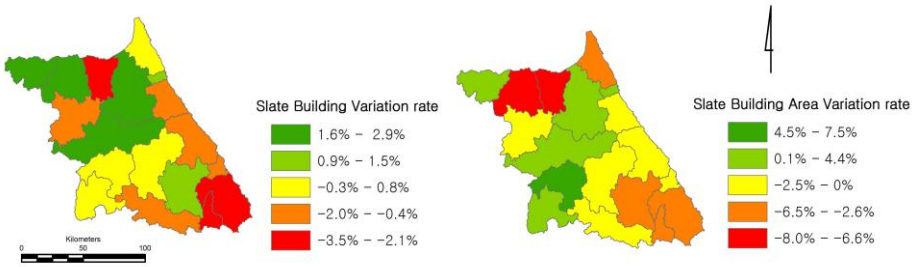

Fig. 3. Changes in Slate Buildings between 2010 and 2015 (the number on the left; the building area on the right)

5 Conclusions

In this study, the changes in distribution of slate buildings in Gang-won Province across cities and districts were examined based on the 2010 and 2015 building registers. The analysis produced the following results.

First, in Gang-won Province, slate buildings represented 20.73% in 2010 and 20.76% in 2015 by the number of building, 7.46% in 2010 and 7.73% in 2015 by the building area.

Second, between 2010 and 2015, the share of slate buildings in Gang-won Province increased by 0.1% from 20.7% to 20.8%, and increased by 0.2% from 7.5% to 7.7% by building area.

Third, the share of slate building varied widely by cities and districts within Gang-won Province. This needs to be taken into consideration when establishing a plan to demolish and tear down slate buildings in the future.

These findings are expected to provide useful data to identifying regions of priority when establishing future plans to demolish and tear down slate roof buildings in Gang-won Province.

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