Estimation of Radiological Terrorism Risk by Administrative Districts

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1. Introduction

Since the 9/11 attack in USA, the threat of terrorism across the world has dramatically increased. Accordingly, estimating terrorism risk has become an essential part of catastrophe risk strategies throughout the world. There are many forms of terrorism. Recently, the prospect of the radiological terrorist attack using the radioactive material is considered as one of the most serious threats.

The aim of this paper is to assess the radiological terrorism risk by administrative districts based on the parameters that imply threat, vulnerability, and consequences of terrorist attacks.

2. Methods and Results

According to Willis et al., terrorism risk is defined as a function of threat, vulnerability, and consequences.[1] There are two approaches used for estimating risk: simple risk indicators and event-based models.

There are practical benefits for applying simple risk indicators. In general, these indicators are easily measurable and related data is widely available.

Hence, in this work, even if there were some limitations to apply simple indicators to estimating terrorism risk, three indicators were introduced in order to assess the radiological terrorism risk by administrative districts.

2.1 Population

Population is closely linked with terrorism risk and it is well known that consequences are correlated with population. However, even if population of some districts is the same, terrorism risks differ from area to area due to population density. Namely, the denser population is, the higher risk is.

Density-weighted population, which is the product of a region's population and its population density that is correlated with threat, is one of many simple indicators that can account for this difference.

Figure 1 shows terrorism risk shares by administrative districts based on density-weighted population. The results of population and housing census taken in 2005 were used in this calculation.[2]

2.2 The Number of Organizations

For a terrorist to execute a radiological terrorism, it is necessary to procure any of the radioactive material or to attack the facilities that utilize the radioactive sources.

From the standpoint of this, it can be considered that threat and/or vulnerability to radiological terrorism increase with the number of organizations in each district.

The term of 'organization density' was newly introduced in order to reflect this effect. Figure 2 provides the estimates of risk shares weighted with population and organization density. Information on regional distribution of organizations was taken from a reference published annually.[3]

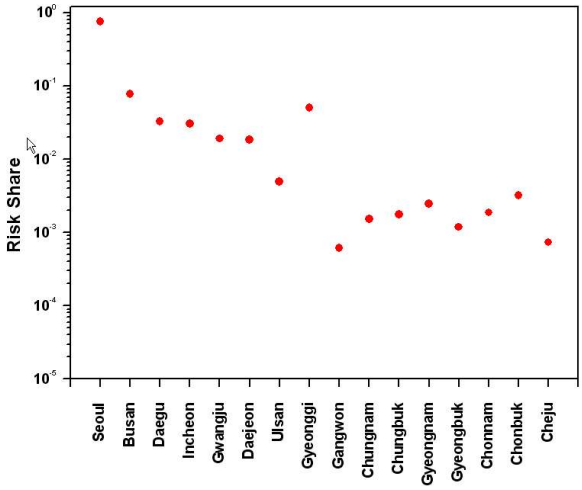

Fig. 1. Risk shares by administrative districts based on density-weighted population

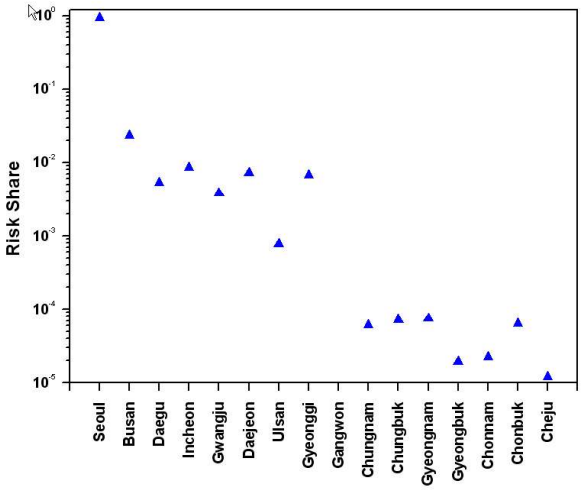

Fig. 2. Risk shares by administrative districts based on density-weighted population and organization density

2.3 Gross Regional Product

Similar to population density, gross regional product is correlated with consequences. Given that a radiological terrorism happens, it is obvious that economic impacts in the process of emergency responses increase with the gross regional product.

In addition to the above two indicators, the term of 'gross regional product density' was introduced as an additional weight in order to consider this effect.

The risk estimates employed three simple indicators are illustrated in Figure 3. Information on gross regional product was taken from a website of KOSIS (Korean Statistical Information Service).[2]

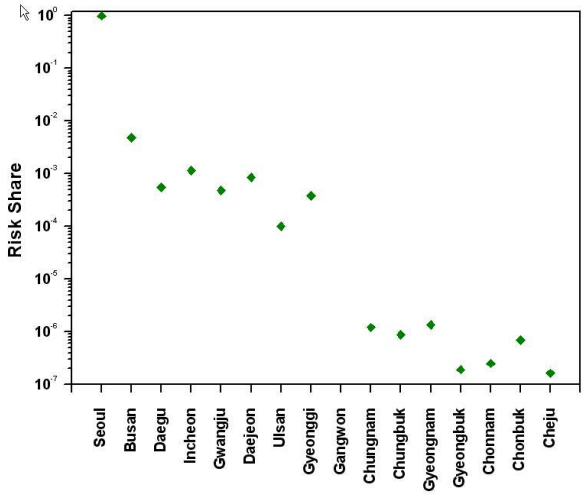

Fig. 3. Risk shares by administrative districts based on three simple indicators

3. Conclusions

In this paper, the radiological terrorism risk by the administrative districts was assessed using three simple indicators. The final results are presented in Figure 3.

From the figure, it is found that most of the radiological terrorism risk is concentrated in the National Capital region and 6 big cities. This concentration is outstanding in the case of employing three indicators (Fig. 3) than that of considering population density and/or organization density as the weight (Fig. 1 and 2).

Based on the results, therefore, resource allocations for decreasing the radiological terrorism risk should be focused on the National Capital region and 6 big cities that are likely to expose relatively.

REFERENCES

[1] Willis, H.H., Morral, A. R., Kelly, T. K., and Medby, J., Estimating Terrorism Risk, MG-388-RC. Santa Monica, CA: RAND Corporation, 2005.
[2] http://www.kosis.kr/
[3] Statistics on Radiation Practices in Korea, Korea Radioisotope Association, 2007