

## Methodology for flood risk assessment in Tokyo metropolitan area

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Flood is one of the most significant natural hazards in Japan. The Tokyo metropolitan area has been affected by several large flood disasters. Therefore, investigating potential flood risk in Tokyo metropolitan area is important for development of new adaptation strategy for future climate change, and socio-economic changes. We aim to develop a new method for evaluating flood risk in Tokyo Metropolitan area by considering effect of historical land use and land cover change, socio-economic change, and climatic change. Ministry of land, infrastructure, transport and tourism in Japan published Statistics of flood, which contains data for flood causes, number of damaged houses, area of wetted surface, and total amount of damage for each flood at small municipal level. Based on these flood data, we constructed a flood database system for Tokyo metropolitan area for the period from 1961 to 2008 by using ArcGIS software. By using these past flood data, we estimated damage by inundation inside a levee for each prefecture based on a statistical method. On the basis of estimated damage, we developed flood risk curves in the Tokyo metropolitan area, representing relationship between damage and exceedance probability of flood for the period 1976-2008 for each prefecture. Based on the flood risk curve, we attempted evaluate potential flood risk in the Tokyo metropolitan area and clarify the cause for regional difference of flood risk. By analyzing flood risk curves, we found out regional differences of flood risk. We identified high flood risk in Tokyo and Saitama prefecture. On the other hand, flood risk was relatively low in Ibaraki and Chiba prefecture. Prefecture with high (low) flood risk roughly corresponds to high (low) property. However, there are several exceptions. Although, property is relatively low in Saitama prefecture, flood risk is high. On the other hand, flood risk in Kanagawa prefecture is relatively low in spite of high property. In order to investigate possible factors that can explain these regional differences of flood risk in detail, we investigated spatial distribution pattern of property and ratio of damaged housing units in each prefecture. As a result, we found out that both property and ratio of damaged housing units are high in southeastern part of Saitama prefecture. We indicated that this spatial consistency between property and ratio of damaged housing units in Saitama prefecture seems to be a reason for high flood risk. On the contrary, high property area of Kanagawa prefecture is different from area with high ratio of damaged housing units. This spatial inconsistency between property and ratio of damaged housing units seems to cause relatively low flood risk. Consequently, we can point out that spatial consistency (inconsistency) between distribution patterns property and flood risk in each prefecture is also an important factor for explaining regional difference of flood risk between prefectures.

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