

論文の要旨

題目 The study of the built-up area expansion in the small provincial cities on the floodplains for proposing the method to design land-use policy in the spatial data-scarce environment: case study of Nong Khai City along Mekong River in Thailand

(地理データ整備が不十分な環境下における土地利用政策立案を目的とした氾濫原小都市の市街地拡大に関する研究: メコン川沿いのタイ・ノンカーイを対象として)

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Floodplain is a fundamental topography in which humankind usually settles and develops the urban area. Despite the beneficial functions of floodplains to support economic growth and human daily life, the settlement in the floodplain is likely to be affected by flood which is a natural phenomenon in this area. Over the past years, the urbanisation across the world caused the built-up lands to sprawl into the peri-urban areas and increased the exposure to floods. Although the expansion of the built-up lands is getting attention from worldwide scholars ranging from the macro-scale to micro-scale, there are limited understandings of the built-up land expansion in Thailand which almost all of the urban centres, like the provincial cities, settle on the floodplains, especially in the small provincial cities, because most studies have focused on land-use changes in the Bangkok Metropolitan Region and regional cities without the consideration of flood. To support the city development that tends to increase and bring with it the exposure to flood, the understanding of the built-up land expansion is required to manage the expansion in the problematic areas. Although there are studies of urban management to cope with the urban sprawl in the flood-prone areas, it is still challenging to implement them in a specific case in the developing countries and small cities due to the limitation of data.

To fulfil the understanding of the built-up land expansion in the data-scarce environment, Nong Khai City was selected as a case study. The various methods with the qualitative and quantitative approaches were integrated in this study to respond to two main objectives of this study: (1) to clarify the patterns of the built-up land expansion in Nong Khai City, which is a small provincial city on a floodplain, from past to future and (2) to apply the GIS technique to the study of land-use change and the urban planning to manage the expansion of the built-up lands in the data-scarce environment in two dimensions: the flood-prone area analysis and the analysis of the suitable areas for urban development.

This study reveals that before the numerous expansions of the built-up areas in Nong Khai City from 1997, in the premodern time, most built-up areas were dense on the natural levee, which was higher than unused lands and agricultural lands in the surrounding areas and free from floodings. However, from 1997 to 2007, the study reveals that most built-up lands expanded in the surrounding areas and towards the south along with Highway No. 2 and 233. The distance from the malls was indicated as the main factor. Then, the built-up lands continued to expand on the southern side in the next period

from 2007 to 2017. Besides, the expansion of the built-up lands was also dense on the eastern side around the original settlement and along with the transportation. The agricultural lands were indicated as a crucial factor in the transformation into the built-up lands in this period. The expansion of the built-up lands in the peri-urban area is in accord with the stagnant population change trend in the core area and the increasing population in the peri-urban areas. According to the prediction about the built-up lands, the expansion of the built-up lands on the southern side, which was the main area in the prior time, will slow down. At the same time, the built-up lands will expand more on the eastern side in 2037. However, the findings of the flood-prone areas and suitable areas for urban development based on the integration of GIS with Weight of Evidence (WoE) and Analytical Hierarchy Process (AHP) indicate that most of the areas on the eastern side of Nong Khai City are flood-prone areas and least suitable area for urban development. The expansion of the built-up lands in Nong Khai City in the future thus is on the risk path to the increase in the exposure to floods. All the findings imply that Nong Khai is in the suburbanisation stage and needs the policies to manage the sprawl of the built-up lands in the peri-urban areas and maintain the economic role in the centre area to retain the population. According to the analysis of the built-up land expansion with different scenarios of policy implementation, the integrated policies (the policy to protect the expansion of the built-up lands in the flood-prone areas and the policy to support the settlement in a suitable area which provides a good environment in term of safety, accessibility, and policy to conserve the assets) are the most efficient way to reduce the expansion of the built-up lands in the flood-prone areas and least suitable area for urban development. The performance of the integration shows that the land-use management of a city in the floodplain cannot only concentrate on either the flood-prone area or the economic development, but it needs to consider everything to support the sustainable growth. As a result, Nong Khai City should be divided into three zones: a zone for urban development, a zone for non-urban development, and a restricted zone. About thirty percent of the total areas should be a restricted zone and avoid the transformation due to flood and waterbodies conservation. Almost fifty percent of the total areas were recommended for urban development with different policies.

Based on the findings, this study provides the scientific evidence to support the understanding of the expansion of the built-up lands in the small cities which required more attention. In addition, the application of GIS to support the urban management in the floodplain areas in the data-scarce environment also proved its performance and are presented through two crucial applications: the analysis of the flood-prone areas to create a flood susceptibility map and the analysis of suitable areas for urban development.