

Evaluating the Underdeveloped Ratio (UR) Map Based on the Remaining FAR and PSL: A Case Study of Amakubo 3 Area, Tsukuba

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1. Motivation

Although there are some developed landscapes in the study area, such not fully developed buildings can be subjected to the development in future. To identify the potential development area of the study area, the underdeveloped ratio (UR) is used as a vital indicator. To evaluate the UR, land use type, number of floors, area of the buildings and plot, serviced life and structure of the buildings are investigated in this research by conducting the field-based study.

2. Study area

In order to achieve this purpose, Amakubo 3 area was selected as my study area. Based on last year's field survey results, as a low intensity of development area near the campus, the average floor area ratio (FAR) (Fig.1) of study area decreased from 31.65% to 36.95%. According to this number, there are still many spaces can be developed in the future. Furthermore, to improve the evaluation results of UR, only FAR is not sufficient. The remaining potential service life (PSL) of buildings is considered in this research.

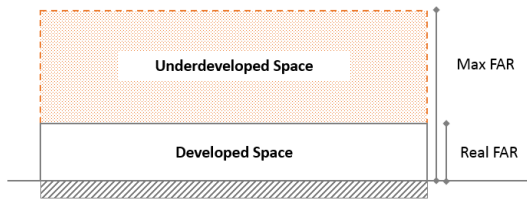


Fig.1 Conceptual illustration of FAR.

3. Methodology

The goal of this fieldwork is to evaluate the UR based on two factors: the remaining FAR of maximum zoning allowance and remaining PSL of buildings in law for study area.

$$FAR_{Real} = A_{building} * F / A_{plot} \quad (1)$$

FAR_{Real} is floor area ratio; $A_{building}$ is total covered area on all floors of buildings; F is the number of floors; A_{plot} is the area of the plot.

$$UR_{FAR} = 1 - (FAR_{Max} - FAR_{Real}) / FAR_{Max} \quad (2)$$

$$UR_{PSL} = 1 - (SL_{Max} - SL_{Real}) / SL_{Max} \quad (3)$$

SL_{Real} is the investigated real serviced life (SL) of buildings; UR_{FAR} and UR_{PSL} are the UR of FAR and PSL. The value of maximum serviced life (SL_{Max}) is defined by the law based on the service type and structure of buildings.

$$UR_{Final} = W_1 * UR_{FAR} + W_2 * UR_{PSL} \quad (4)$$

W_1 and W_2 are the weight of each indicator. In this research, both of these two weights are 0.5.

With the application of Survey 123 by ESRI, the location, land use type, field boundary, floors of the buildings, area of the buildings and plot, serviced life and structure of the buildings can be efficiently captured in the outdoor investigation.

4. Results

Fig.2 shows the final results of this study. The pie charts show the real developed ratio of buildings, and the blue classified color map is the final evaluated UR map. The deeper blue color is the higher the possibility to be developed in the future. Table.1 shows that the average SL of the wooden building is 28.71 years, and most of these buildings are already exceeded the max SL.

With the comparison of 2016 and 2017 maps, one new building is planned to build in this year as last year's prediction result.

Building Structure Type	SL_Real (yr)	SL_Max (yr)	PSL (yr)	URPSL (%)
Wooden and synthetic resin	28.71	22.00	-6.71	130.52
Steel reinforced concrete	16.43	47.00	30.57	34.95

Table.1 PSL in Amakubo 3 area.



Fig.2 UR_{Final} map of 2017