THE SIGNIFICANCE OF MODERN JAPANESE CITY PLANNING:
a morphological examination of the land readjustment projects in Korea, Taiwan and Japan

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Keywords:

Seoul
Taipei
Kyoto
Land readjustment project
Modernization
Urban morphology

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Abstract

In city formation, not only functional requirements but also the planner's ideology plays important roles. Land readjustment can be interpreted as an indicative methodology in "modern" Japanese city planning. The method provided a homogeneous and "economical" layout for unstructured lands and transformed them into the typical modern standard. This resulted in an increase in land prices and in improved public hygiene; however, cities were monotonously and repetitively produced in the manner of cars on assembly lines. Our first question is whether the "deliberate" modern cities were able to execute the function they were designed to perform. In addition, we examine whether such artificial planning was successful in eliminating conventional environments, such as places where the indigenous inhabitants were able to spend their lives. With this aim, we analyzed three typical districts that underwent transformation during the modern era—Nishiohji Street (Kyoto, Japan), Ximending (Taipei, Taiwan), and Shinchon Street (Seoul, Korea)—and investigated the impacts of modern Japanese city planning.

Introduction

The modernization of cities in Far East Asia coincided with inflow of immigrants. The premodern-era rules on the inflexibility of the social classes and the prohibition on movement to other cities were relaxed, and rural dwellers were able to migrate to urban areas. These dramatic changes gave rise to housing and social problems in cities. Takada et al. wrote the following: "In Japanese cities and East Asian cities under Japanese rule during the modern era, urban planning focused on how to control the expansion of cities; in order to tackle this issue, 'land use rules,' 'building lines,' and 'land readjustment' were authorized (Takada et al. 2005:218)." Due to the increase in their populations, the cities in Far East Asia expanded, and modern urban planning was introduced in an attempt to control the transformation in an administrable way.

With regard to the demand for expansion, if a city has insufficient capacity, it should undergo urban renovation to satisfy the increased

demand; however, a simple expansion, like developing the area surrounding the conventional urban area, gives rise to another demand for renovation because the old quarter was not designed to cope with the new shape, and it is necessary to adjust for the estrangement. This demand can be referred to as the "demand for quality." The demand for quality pursues a good balance in the layout of shopping areas and residences in the city, i.e., "intelligibility." Hence, there are two kinds of urban renovation: urban renovation for quantity and urban renovation for quality.

Space Syntax is an effective methodology for tracing the demand for quality in cities over periods of time. It involves analyzing how city shapes were transformed, interpreting the changes in the numerical values of global and local, and analyzing the balance between them. Regarding the balance between global and local, Hillier wrote the following: "Poor correlation between the local and the global integration...suggesting an area which 'freezes' the natural movement (Hillier 1996:135)." According to Stegen, synergy is one of the concepts that show the capacity of an urban system: "The overall external image of the virtual community, mainly composed by both the majorities of the local and the global communities, is then confused. This must be confusing for all the social groups and urban functions (especially shops), which synchronize on the overall virtual majority" (Stegen 1999:6).

Focusing on the unique state of an urban system, which can be expressed by "freeze" in Hillier's text and "confusing" in Stegen's, we have developed a concept, Urban Entropy Coefficient (Kigawa and Furuyama 2004). Its definition will be provided in the next section.

Urban Entropy Coefficient

In terms of Space Syntax, global has only one center; in contrast, local has plural centers. We define a center as a vertex with a higher integration value than any other vertex directly connected to it. The concept of our entropy has been defined as the degree of estrangement that can be seen between the distributions of global and local (Kigawa and Furuyama 2004). The estrangement between global and local has conventionally been obtained by using R^2 in Space Syntax methodology. However, R^2 has a limitation: it shows a negative correlation, even though such a correlation hardly appears. Therefore, we adopt another way of obtaining the correlation coefficient. We define Urban Entropy Coefficient (UEC) as in equation 2 (see Kigawa and Furuyama 2004). Since each axial line (AL) has its own Global and Local values, we can describe a spatial system as AL_1 (x_1,y_1), AL2 (x_2,y_2),...AL_n (x_n,y_n), where x_n represents the Global value and y_n the Local value of AL_n. The numerical value of the UEC ranges from 0 to 2. If the UEC has a high value, the estrangement between the global and local systems is relatively high, and it is likely that the urban structure would experience the state of "freeze" or "confusion" in the terms of Hillier and Stegen, respectively. A city experiencing such a state is regarded as having approached a point where transformation could occur in response to the need for adaptation. We call this condition "dynamic."

Conventional Space Syntax methodology shows the traffic efficiency of a city, and the UEC shows whether or not the city is in a dynamic condition. In such a case, when a new spatial system intrudes into an existing one, the condition changes from static to dynamic; this creates the need for a new urban framework to reconcile these two systems. Thus, a city with pluralistic spatial systems requires renovation.

$$r_{xy} = \frac{\sum_{i=1}^{n} (x_i - \overline{x})(y_i - \overline{y})}{\sqrt{[\sum_{i=1}^{n} (x_i - \overline{x})^2][\sum_{i=1}^{n} (y_i - \overline{y})^2]}} \quad \text{--- Equation (1)}$$

$$UEC = 1 - r_{xy} \quad \text{--- Equation (2)}$$

where $AL_1 = (x_1, y_1), AL_2 = (x_2, y_2) \ldots AL_n = (x_n, y_n)$

$$x = (x_1, x_2, x_3 \ldots x_n) \qquad y = (y_1, y_2, y_3 \ldots y_n)$$

$$x = \text{Global} \quad y = \text{Local}$$

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In our previous paper (Kigawa, Seo, and Furuyama 2006), we applied the UEC to analyze two Baroque cities: Rome and Paris. In the case of Rome, straight lines and trivium were incorporated as the symbolic elements of Baroque. These elements changed the distribution of Local; however, they did not have a strong influence on Global. As a result, the UEC increased. Similar to the case in Rome, in Paris, Baroque raised the value of the local integration only, prior to the renovation by Haussmann. In contrast, the urban renovation undertaken by Haussmann considered the whole network system and changed the entire structure of Paris. As a result, the renovation could change the distribution of Global in addition to that of Local, and the UEC decreased. In this paper, we have concluded that Baroque made the city dynamic (high UEC), and the intention of Haussmann was to make the city static (low UEC).

Modern Japanese City Planning

During the Meiji period (1868–1912), almost all Japanese systems—political, economic, and social systems—as well as Japanese city planning underwent rapid modernization. Modern urban planning was first practiced in Tokyo. The Japanese government invited well-known German architects Hermann Ende and Wolhelm Bockmann and asked them to design a layout for governmental offices in central Tokyo. In 1884, the government formulated the first urban improvement plan for Tokyo, which was aimed at building a capital befitting a modern nation, like London or Paris. Although the plan had been revised several times, its implementation gave Tokyo an appearance similar to that of any European city. (See fig.1.)

Figure 1:

Little London in Tokyo, 1910?
(Ishiguro 2001: Cover)

An urban improvement plan normally contains a map showing the important streets. Fig.2. is the second revision map of the urban improvement plan for Tokyo, drawn up in October 1885. This plan attempted to penetrate the enclosure of premodern Tokyo and to make the city permeable (Fujimori 1982). In the plan, streets had a hierarchy, which was as follows: first-, second-, third-, and fourth-class streets. From this hierarchy, we were able to comprehend the objective and ideology underlying the planning of the city.

The urban improvement plan for Tokyo became a "model" for modern Japan and was applied to other big cities, notably, Osaka, Nagoya, and Kyoto. Subsequently, Japanese cities underwent a dramatic face lift corresponding with the change in Tokyo. In 1919, the law on urban improvement was repealed, and the urban improvement plan came into force and could be applied to land readjustment. The plan accelerated the transformation of the urban scene in Japan. In particular, a land readjustment project was undertaken for the recovery of Tokyo after the 1923 Great Kanto Earthquake destroyed 44% of the city's urban area. Subsequently, land readjustment projects became more popular.

031-04

Figure 2:

Urban improvement plan for Tokyo
(Fujimori 1982: Appendix, trans. by Kigawa, T.)

Land readjustment projects were originally intended for the development of agricultural land. Hence, they were undertaken for the expansion of cities after the revision of the law in 1919. The expansion of most Japanese cities and the development of most of the Japanese colonial cities were carried out by means of these projects; therefore, they can be interpreted as an indicative methodology in "modern" Japanese city planning. The project provided a homogeneous and

"economical" layout to unstructured lands and transformed them into the typical modern standard.

Nishiohji Street in Kyoto

Kyoto was constructed in an orthogonal grid shape. It was the Japanese symbolic capital, the emperor's abode, from 794 to 1868. Since actual political power lay in the hands of soldiers from the twelfth century onward, the power struggles among the soldiers led to wars and decay, resulting in the deformation of the grid. During the Edo period (1603–1867), the nonoccurrence of major war devastation, the superiority of Kyoto's geographical location, and the efforts of the then emperor boosted Kyoto's economy, although the political institutions still continued to be located in Edo (presently, Tokyo). The urban area of present-day central Kyoto was formed during this period.

At the end of the Edo period, the political system underwent a dramatic change due to the Meiji restoration, and the capital moved to Tokyo in 1868. An internal war before the restoration damaged Kyoto, and aristocrats moved to the new capital to follow the emperor. These events led to the decline of Kyoto. In the Meiji period (1868–1912), the new Japanese government attempted to restore Kyoto, and several urban planning measures were carried out. The plans included the widening of several streets based on the conventional structure and the setting up of a tram system on these streets.

Concurrent with the end of the Meiji period, Kyoto entered the next stage of modernization. By the Taisho period (1912–1026), Kyoto had recovered its economic status, and the city had accepted the inevitability of migration from rural areas. The population increase was rapid not in the conventional urban area but on the outskirts of Kyoto (City of Kyoto 1944). In order to solve the problem of chaotic development, an urban improvement plan was announced in 1922. Since central Kyoto had a number of traditional and important temples, the plan proposed a beltway encircling the conventional Kyoto area for residential development (City of Kyoto 1944).

The plan's announcement rendered its practice more difficult. Ishida wrote the following: "The announcement of the plan accelerated an urban sprawl on the outskirts. Houses were irregularly constructed along narrow and winding passes. As a solution to the urban sprawl, the city of Kyoto decided to commission a land readjustment project in 1925 (Ishida 2000)." The western part of the proposed beltway was particularly difficult to construct; therefore, the land readjustment project for the formation of the beltway was mainly carried out in this part. This portion of the beltway was called Nishiohji Street.

Analysis of Kyoto

In order to investigate the impact of the urban improvement plan on Kyoto, we analyzed three maps: Kyoto (1701), the one in the plan, and Kyoto (1940). Fig.3. shows the result of axial analyses on the three maps and a scattergram obtained from the Global and Local values.

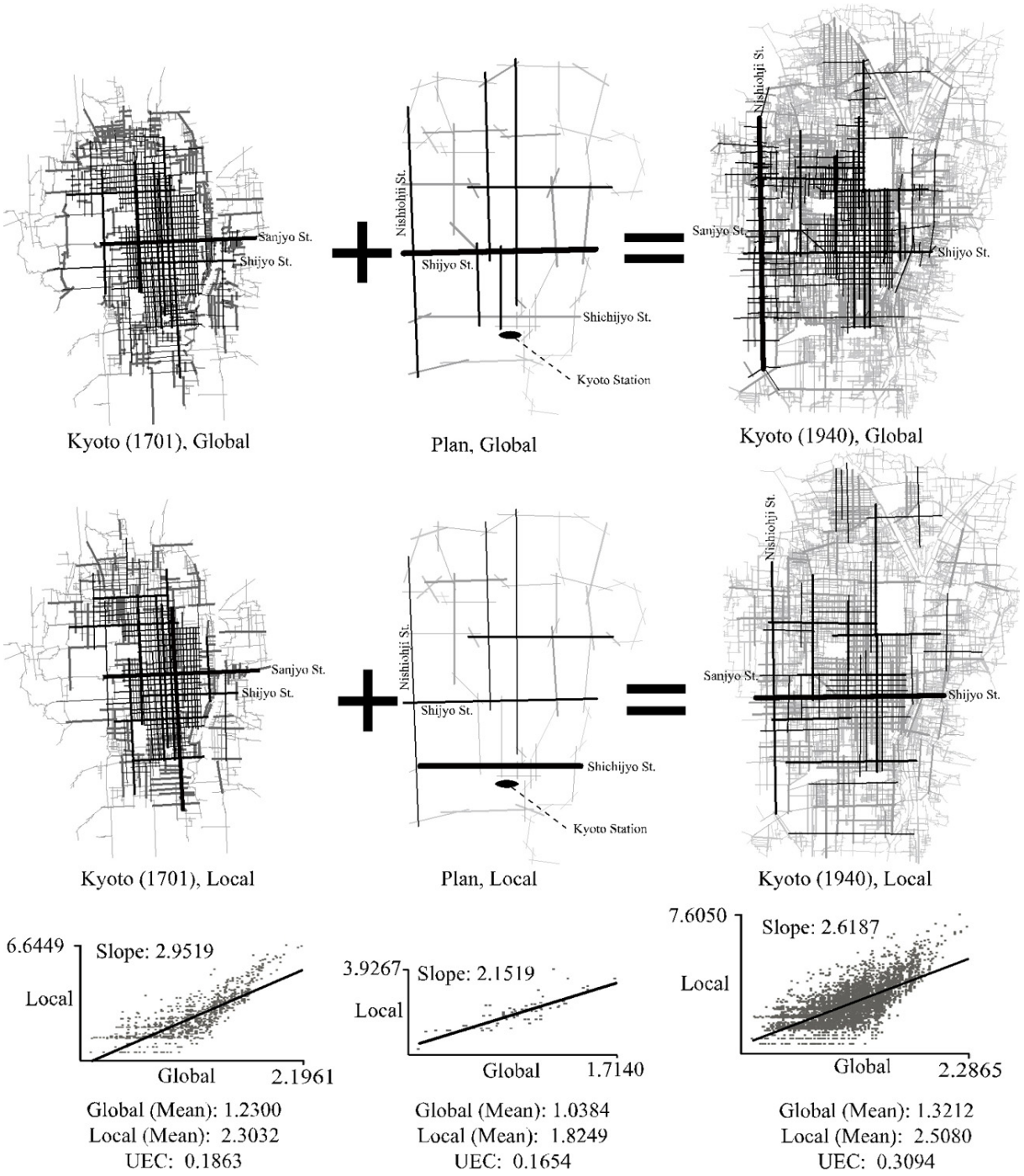
By studying the distributions of Global and Local in Kyoto (1701), we can acquire some understanding of the similarity in the distributions. The UEC of Kyoto (1701) is very low (0.1863) as compared with those of the other two maps. In both the maps, Sanjyo Street is the most integrated street. This street was known as the main commercial street and was connected to a highroad from Kyoto to Edo; thus, the result reflects the condition in those days.

The axial analysis on the urban improvement plan provides a clue to the planner's intention in those days. First, we can see the beltway,

although it cannot be considered as a permeable street from the viewpoint of Space Syntax. In the case of a grid pattern, it is difficult to construct a permeable beltway, as we had concluded in a previous paper (Kigawa and Furuyama 2005). Second, Sanjyo Street, which was the most integrated street in 1701, was excluded from the plan due to the presence of important buildings on the street, for example, the post office and banks. Finally, we were able to unearth the intention underlying the integration of Shichjyo Street, the street nearest to Kyoto Station in the plan: the construction of a new entrance into Kyoto. Global indicates that several north-south streets from Kyoto Station are integrated; Shichjyo Street itself is integrated in Local.

Figure 3:

031-06 *Axial analysis on Kyoto*



A glance at the results for Kyoto (1940) reveals that Nishiohji Street turned out to be phenomenally integrated in Global through the application of the plan to the shape in 1701. Further, we were able to

understand that Shichjyo Street is also dramatically integrated in Local, despite the fact that the original intention of the plan was to bring the center to this street.

An Interpretation of the Result of Kyoto's Evolution Process

Kyoto in 1701 may have had one of the typical premodern city shapes, which had been constructed by meeting the balance between demand for quality and quantity in the long period of peace and the static condition of the society. Owing to the difficulty in developing the central area, the plan included the construction of a beltway. As a result, in 1940, Nishiohji Street became the main axis of Kyoto. Subsequently, the balance that had matured during the premodern era was disrupted. As we see from the changes in the UEC (Kyoto 1701, UEC 0.1863; Kyoto 1940, UEC 0.3094), the condition of Kyoto changed from static to dynamic. The dynamic condition could be one of reasons driving Kyoto to expand further after WWII. The analysis of Kyoto (1996) was shown in the proceedings of 5th Space Syntax Symposium (Kigawa and Furuyama 2005).

Shinchon Street in Daehyeon District, Seoul

Daehyeon district is located outside Donuemun (Sodaemon (east main gate)). A fortress wall had surrounded Seoul at the time of the Chosun dynasty, and Donuemun was one of the gates in the wall. The gates closed at night; therefore, this district had inns for merchants who came from all over the country to attend to their commercial interests within the city walls. With this advance in location, settlements were formed spontaneously. This area had hills and rivers, and the settlements formed were organic so as to adjust to these geographical features.

During the periods of Japanese governance, modern urbanization was implemented by means of land readjustment projects in these districts, which were planned as residential areas for Koreans in order to solve the serious housing problems in Seoul (Sohn 2003: 228). Regarding the purpose of the project in Daehyeon, Mitsugu Okada, the planner of the project, wrote the following: "(Daehyeon district) is an important place because a main route (to Seoul) passes through it. Although the district has a hilly topography and the earth is damp, the population of this area has recently increased. A number of houses have been built on irregular plots. If this condition is not solved, it will lead to inconvenience in traffic and severe problems in public health and security. Therefore, we planned to reorganize the streets based on an urban improvement plan. The plan involved tidying up irregular lands and standardizing the shapes and undulations of plots, and attempted to contribute to future development by producing an ideal residential area (Okada 1938)." The urban improvement plan was announced in 1936. Further, the widest and longest street was named "Shinchon Street."

Before the plan was implemented, several spontaneous settlements—Ahyon-dong, Chanchon-dong, and Daehyeon-dong—had sprung up, and they were already fairly developed. Yongi School was built in 1917, Ewha Woman's University was moved there in 1929, and the Shinchon Station of Kyongi railway was set up in 1929. Further, several morning markets used to be held around Ahyon-dong. Prior to the project, the northern area of Ahyon-dong had been developed as a residential area for the middle class.

In 1936, the then local government of Seoul announced an urban improvement plan for Seoul and selected 30 districts for development under land readjustment projects. Daehyeon district was nominated for the first three projects, and the government asked landowners to

apply for permission for the enforcement of the project. However, since there were no applicants, the government decided to carry out compulsory enforcement. The project began in 1938; however, World War II interrupted the construction work. The project was taken over by the South Korean government and was completed after the Korean War from 1950 to 1953 (Sohn, 2003: 478). A number of refugees had settled down in the district during the interruption caused by the wars; due to this, the plan could not be completed as initially designed.

Analysis of Daehyeon

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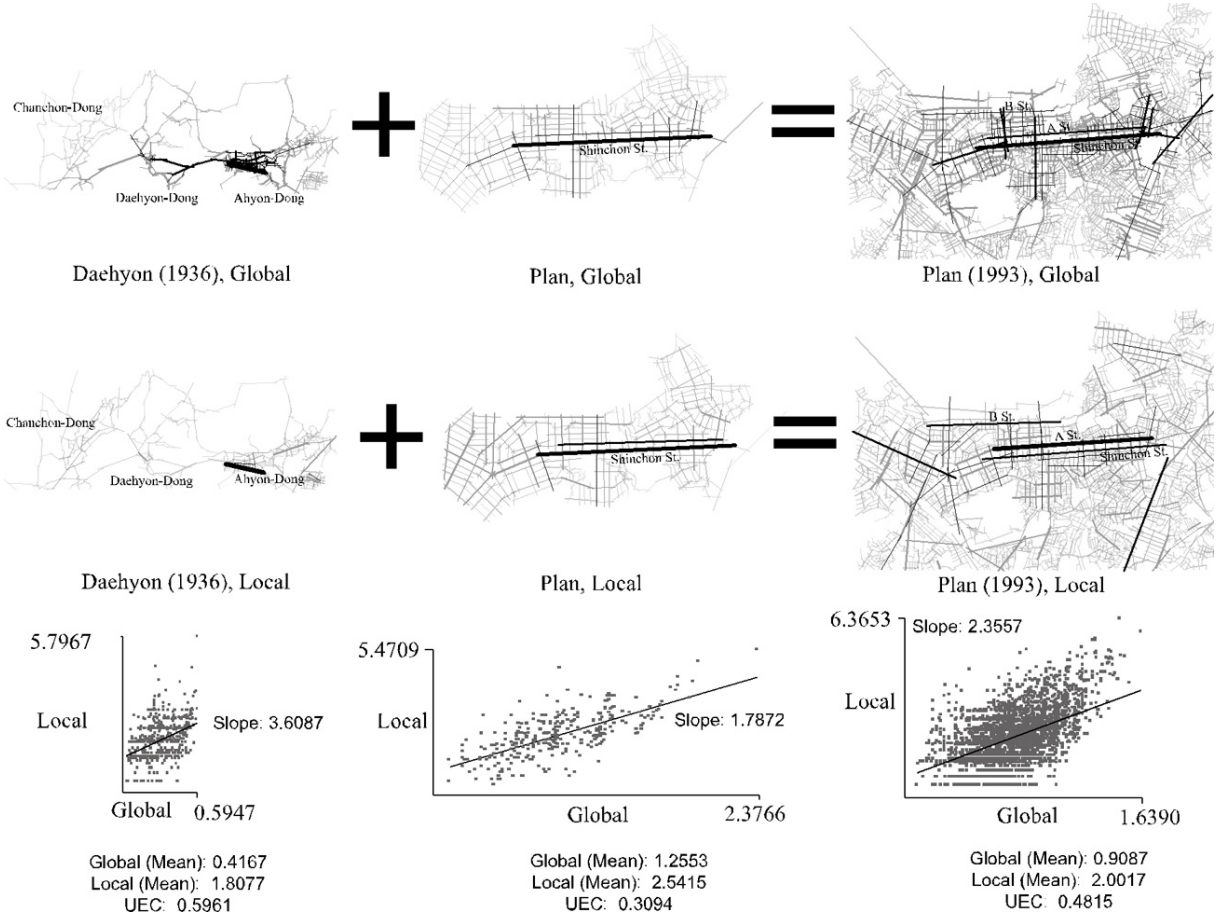
Regarding an analysis of Daehyeon, Ishida, J. and his colleague studied the district from historical and morphological viewpoints (Ishida and Kim 2006, Kigawa, Kitao, and Ishida 2006). Kigawa, one of the authors of this paper, was involved in Ishida's series of the study and carried out the Space Syntax analysis for it. In this paper, we cite the Space Syntax analysis data on Daehyeon in previous paper and interpret it from different angle. In Fig.5, three different maps were analyzed by means of the Space Syntax. The scattergrams reveal a correlation between the Global and Local integration of the data.

The result of the analysis on Daehyeon district in 1936 indicates the spatial layout of this district to be that of a rural area—spontaneous and in harmony with the geographical features. Rural areas normally have several settlements; the rest of the land is used as farmland or rice fields. We found such a pattern in this area as well. Among these settlements, Ahyon-dong is the most integrated one. This result suggests that there may have been some markets or commercial activities in Ahyon-dong. This fact corresponds with the historical evidence (Ishida and Kim, 2006).

Figure 4:

Axial analysis on Daehyeon district



We see from the results of the axial analysis that the values of Global and Local on the urban improvement plan show the highest values among the three cases. This means that this layout has rationality in traffic. This implies that there were a limited number of cul-de-sacs; therefore, this plan was able to achieve a high level of permeability. However, it appears that the plan did not take the geographical features into consideration. For example, Shinchon Street, which passes through the center of the district from east to west, was planned on a hill; this was avoided in the layout revision in 1936.

The result of the analysis on Daehyeon in 1993 represents the present condition. In this result of Global, Shinchon Street is highlighted as the most integrated line, and as for Local, Streets A and B show higher integration. Street B is known among students as a place where food and drinks are available. Street A has a morning market. Interviews with shop owners in the market revealed that the market was in existence from before the land readjustment projects. This implies that a market had existed and that it was divided into two parts by the construction of Shinchon Street.

Interpretation of the Result

By comparing the data of Daehyeon with those of other cities, we can say that the colonial government attempted to install a rational network that would include this area; however, due to the condition of the district, its real layout is not as rational as shown in the plan. This implies that the original plan during the colonial period appears not to have considered the actual condition. Although at a glance the shape appeared to have been considerably transformed, we found that today's urban form is derived from the original spatial configuration before the project. The results of the transaction between the spatial layouts and human activities in the city were evident.

Ximending in Taipei

The urbanization of Taipei began at the start of the eighteenth century; thus, it has a shorter history than the other two cities analyzed in this paper. However, its history was enriched by its continuous acceptance of Chinese immigrants from different regions and governance by three different regimes since its urbanization: the Qing dynasty, Japan, and the Republic of China. Thus, the social structure of Taipei is complex and interesting. The immigrants from China first urbanized one shore of the Danshuhe River and named it "Mengjia." Then, they built the Longshan temple (the oldest temple in Taipei) in 1738 in order to worship their gods. Subsequently, Dadaocheng (see fig.6.) was developed in the mid-nineteenth century owing to a territorial conflict with Chinese immigrants from another region; therefore, by the end of the nineteenth century, this new area had flourished more than Mengjia (Huang et al. 1995).

Apart from the private development carried out by the immigrants, the Qing dynasty had constructed a fortress with a jurisdiction comprising the northern half of Taiwan from 1879–1882. However, only 25% of the land inside the fortress was developed; the rest was used as fields or agricultural land (Allen 2005). Actual development began after the Japanese began to govern Taiwan in 1895 and built the office of the Japanese Governor-General of Taiwan inside the fortress.

After the Japanese began to govern Taiwan, the fortress wall, built by the Qing dynasty, was removed, and a boulevard was constructed in its place in 1904. Guidebooks in those days presented the boulevard and its surrounding as the "little Paris in the Orient" (Guo 1986). Due to a major flood in 1912, a swale between Dadaocheng and Mengjia was reclaimed and named "Ximending" (east gate town). Ximending attracted Japanese investment because the conventional areas,

Dadaocheng, Mengjia, and the fortress, were significantly influenced by Chinese merchants, and Ximending was a new world for the Japanese. After this, Ximending became the most flourishing entertainment and commercial downtown in Taipei, and this situation continued until Japan's defeat in World War II.

According to Guo, the earliest commercial downtown was Mengjia, where the Longshan temple is located. Dadaocheng was formed after that. However, Dadaocheng was unable to take over Mengjia's position as the principal commercial center until the Qing dynasty built the fortress (Guo 1986). These transitions should be studied from various viewpoints: trends in international markets, political situations, and so on. However, it is beyond the scope of this paper to analyze these viewpoints; therefore, we will present our interpretations of the transition using Space Syntax.

Analysis of Taipei

Based on the historical details, we analyzed three maps: Taipei in 1895, the urban improvement project plan drawn up by the Governor-General of Taiwan, and Taipei in 1927.

Fig.5. presents the axial map of Taipei in 1895. It illustrates the estrangement in the distributions of Global and Local. The most integrated point in Global is located at an intersection between Dadaocheng and the fortress; however, the points of Local exist in every district. Hence, the permeability (mean of Global) in this map is lower than that in the other two maps. The estrangement raises the UEC (0.6247).

A glance at the result of the axial analysis on the urban improvement project reveals that the boulevards on the former site of the fortress wall are integrated in Global and Local. In the plan, we can see a regular grid outside the fortress; however, the railway between Dadaocheng and the fortress creates a gap, and the grid stops there. Thus, Global has a low integration in Dadaocheng. The structure as a whole has no severe estrangement in the distributions of Global and Local; therefore, the UEC is low.

From the structure of Taipei in 1927, we can understand the subdivided plots if it is compared with the plan. Similar to the case in the plan, the result for Taipei in 1927 shows high integration values for the former site of the fortress wall. Except for this site, the street connecting Dadaocheng and Ximending is the most integrated. As a result, Ximending can also be understood as integrated. As for the distribution of Local, we can see that the three conventional districts had streets with high integration. As a result, Ximending may have been the center of gravity and may have been integrated. This corresponds to Ximending's description as the most flourishing commercial area in Taipei in 1927.

Interpretation of the Result of Taipei

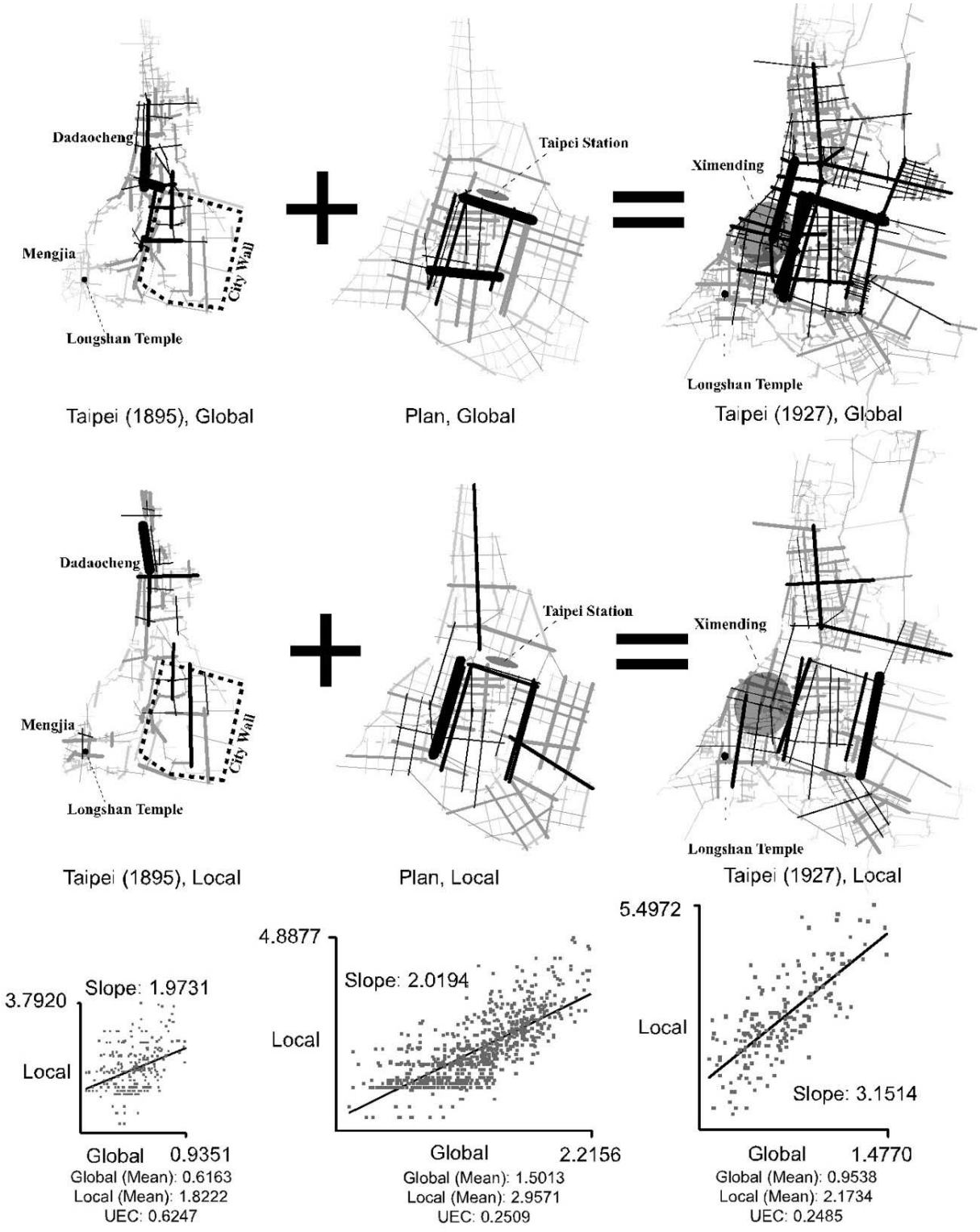
Thus far, we have carried out Space Syntax analyses on Taipei over a period of years and mentioned our interpretation of the results. In this section, we will explain our interpretations. The data indicate that Dadaocheng was the most integrated and prevalent district in 1895. This corresponds with the description by Guo. At the same time, as we could read from the UEC, Taipei in 1895 showed an estrangement in the distributions of Global and Local; this indicates that the villages could work independently. In this paper, we regard the plan as a map showing the purpose and ideology of the planner. The hypothesis suggests that the plan could have had the purpose of linking the independent villages and raising their permeability by demolishing the

fortress wall, providing a traffic function, and bringing the prevalent to the fortress, where the Japanese offices were located.

The consequence of the deliberate plan could be understood by comparing the plan with the actual condition of Taipei in 1927. Two major differences were evident to us. First, the integration values for Dadaocheng and Mengjia in Taipei (1927) are considerably higher than those in the plan. Second, the integration value for Ximending is also higher than that in the plan. Thus, we can say that the plots in the conventional district influenced the condition, inadvertently resulting in the birth of Ximending as a commercial area.

Figure 5:

Axial analysis on Taipei



Conclusion

The land readjustment project was used for urban expansion, and the expansion, triggered by the migration from rural to urban areas, was indicative of modernization. The projects involved the formation of a residential area outside the conventional city in Kyoto, the building of new residences in the farm district of Daehyeon, and the construction of an entertainment zone in the spaces lying between the conventional towns in Taipei. These plans had a common rationale; however, the rationale of the final development did not match that of the plan. In Kyoto, the plan incorporated a center outer the central area. In Daehyeon, the plan was unable to include the conventional shopping area. In Taipei, an entertainment area was inadvertently formed.

Based on the result of the Space Syntax analysis, we discovered that the land readjustment projects in Kyoto had aimed to control the expansion of Kyoto's size; however, in reality, the development only accelerated the expansion. On the other hand, with regard to Seoul and Taipei, the original intention of constructing economical and homogeneous layouts and developing unresolved conditions that were a legacy of the premodern layouts was only partly realized. We conclude that owing to a combination of the existing conditions and modern concepts, the Japanese modernization resulted in the cities becoming more complex and dynamic despite the goal of creating monotonously repetitive and homogeneous cities.

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