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Policy Perspective **Open Access**

Spatial Distribution of Accommodation Supply in Osaka City - A Policy Perspective

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ABSTRACT: As one of Japan's most visited urban destinations, the city of Osaka has long faced overcrowding problems in certain areas. More importantly, the popularity is concentrated at only certain areas, leading to the unequitable distribution of socio-economic benefits to all stakeholders. To understand the city's condition from a viewpoint of the accommodation supply, this study investigates the distribution of accommodations and why the unequal distribution has developed in this city. It further examines the spillover effects observed in the spatial distribution of accommodations using exploratory spatial data analysis and local Moran statistics. Based on the empirical results, the spatial autocorrelation is identified and shown to be closely related to the main public transportation interchanges as well as iconic tourism spots. Areas around main interchanges present the most significant spillover effects on neighboring areas, followed by iconic tourism spots. With these preliminary findings, this study suggests tourist-flow-based destination planning as an alternative to government-centered destination planning.

KEYWORDS: accommodation supply distribution; exploratory spatial data analysis; Moran's *I* statistics; Osaka City; policy perspective

Introduction

In February 2002, at the 154th Diet, then-Prime Minister Junichiro Koizumi announced his policy for revitalizing local communities by increasing the number of international tourists in Japan. Following this political direction, "the revitalization of the tourism industry and longer consecutive vacations" was positioned as one of the national strategies for economic development, and the Ministry of Land, Infrastructure and Transport formulated the Global Tourism Strategy in December 2002. In January 2003, in his policy speech at the 156th Diet, Koizumi set a goal to draw 10 million international tourists to Japan annually by 2010. This speech was the beginning of Japan's national policy of transforming into a tourism-oriented nation. Koizumi also presided over the Tourism Nation Advisory Council, tasked with comprehensively considering Japan's fundamental role as a tourism-oriented nation, and the Ministerial Conference on Tourism Nation, held since May 2003. Therefore, promoting tourism in Japan has become a vital national policy issue (Japan Tourism Agency, 2003).

Against this background, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) has been officially implementing the Visit Japan Campaign—a series of strategic public and private promotions intended to attract more international tourists to Japan—since April 1, 2003. This campaign and related policies marked a new era for Japan's tourism industry, shifting its attention from the outbound market to the inbound market. In 2019, 31.88 million visitor arrivals were recorded, compared to 5.21 million in 2003 (Japan National Tourism Organization [JNTO], n.d.). Due to the tourist visa relaxation policy and the Japanese yen weakening against the US dollar, 2013–2019 was termed a "high-growth period" for the inbound tourism market. In 2015, for the first time since 1970, the number of visitor arrivals exceeded the number of Japanese overseas travelers, and this trend has continued (JNTO, n.d.).

Although the Visit Japan Campaign undoubtedly enhanced Japan's inbound tourism market, the rapid growth of the inbound market seems to have unevenly influenced tourism destinations in Japan. According to international visit rate data in all Japanese prefectures in 2019, Osaka Prefecture was the most visited destination for leisure and tourism, with a visit rate of 43.4% (compared with a visit rate of 0.19% for Kochi Prefecture, the least visited destination; Japan Tourism Statistics a, n.d.). Osaka City, the capital and most populous city in Osaka Prefecture, had the highest visit (88.0%) and stay (95.7%) rates in the prefecture in 2019 (Japan Tourism Statistics b, n.d.). Over 11 million international tourists reportedly stayed in Osaka City in 2019 (Osaka City, 2021). As a result, tourism has become a driving force of economic development. Although international tourists have almost disappeared since March 2020 due to the COVID-19 pandemic, the local government is working to revitalize the tourism industry in Osaka City; for example, the Expo 2025 Osaka, Kansai, is expected to attract 28 million visitors (Ministry of Economy, Trade and Industry, n.d.), significantly contributing to the local economy. Moreover, the Osaka City government is actively attracting an integrated resort (IR) project and positioning it as an engine of sustainable economic growth (Osaka Prefecture Government, n.d.). At the national level, Osaka City—with its blend of historic and modern locations—has become the most visited destination for international tourists in Japan. Due to its importance, Osaka City presents rich subjects as a typical urban destination for this tourism study.

Despite the high development of local tourism in Osaka City, tourist distribution remains unbalanced among the different administrative districts, resulting in unsustainable tourism. Based on the major tourist attractions promoted by the Osaka Tourism Bureau, Osaka City can be divided into six regions: Shin-Osaka, West Bay, Umeda, East Castle, Southern-Central Namba, and Southern (Sano, Nagata, Sano, & Cheer, 2021). The iconic tourism attractions and main public transportation modes in each region (Table 1) are always overcrowded, which may induce low tourist satisfaction as well as conflicts between local residents and tourists.

Table 1: Iconic tourist attractions and main modes of public transportation

Regions	Iconic tourism attractions	Main modes of public transportation
Shin-Osaka	Interchange point	Shinkansen (bullet train)
West Bay	Universal Studios Japan (USJ), Osaka Aquarium Kaiyūkan	Japan Railway (JR) Sakurajima Line, Osaka Metro Chūō Line
Umeda	Shopping center, Interchange point	Osaka Loop Line
East Castle	Osaka Castle	Osaka Loop Line, Osaka Metro Chūō Line
Southern-Central Namba	Shopping center, Interchange point	Osaka Metro Midōsuji Line
Southern	Tsūtenkaku Tower, Abeno Harukas	Osaka Loop Line, Osaka Metro Midōsuji Line

Sustainable tourism planning and development requires the input of all stakeholders, and the role of the government seems particularly important (Ruhanen, 2013; Shone, Simmons, & Dalziel, 2016). Even though neoliberalism has changed the local government's role in social and economic development (Bramwell, 2011), local governments are still widely acknowledged as pivotal and influential stakeholders in destination building (Bramwell & Lane, 2010) and generally believed to be the headquarters for destination regulation, co-ordination, and sectoral planning (Bramwell, 2011; Ruhanen, 2013). While a broad array of studies have investigated the role of local government in tourism destination planning from a sustainable perspective (e.g., Connell, Page, & Bentley, 2009; Page & Thorn, 2002; Richins, 2000; Ruhanen, 2013), most are government-centered studies that seldom pay attention to how tourists influence destination planning. This focus in the literature prompts us to rethink the role of local government in responsible tourism management. In many cases, the local government serves as the lead stakeholder in destination areas (Bramwell & Lane, 2010), which is typical of government-centered tourism destination planning. However, to ensure the effectiveness of government functions in destination planning, a better understanding of tourist behavior is needed rather than the ideal blueprint and one-sided view suggested by local governments.

Urban management is commonly expressed in problem-oriented terms or with regard to the pursued objectives (Pearce, 2015). The problem is that the local government appears not to be paying attention to ensuring that viable, long-term economic operations that provide socio-economic benefits to all stakeholders are fairly distributed, resulting in unbalanced benefits. From the perspective of responsible development in urban destinations, tourist revenues should be distributed equitably within a destination (Edwards & Griffin, 2013). Despite the tourism industry's important role in economic development, an understanding of how to design a local tourism policy through the lens of tourist spatial behavior is lacking. According to past studies' essential findings (e.g., Kang, Kim, & Nicholls, 2014; Gutiérrez, García-Palomares, Romanillos, & Salas-Olmedo, 2017; Yang & Wong, 2013), tourism resources can influence tourist flow, which in turn significantly influences the city or region's development. This study, therefore, discusses the trajectory of tourist-flow-based destination planning by local governments based on a preliminary analysis of the accommodation supply distributions, iconic tourism spots, and public transportation interchanges in Osaka City.

Problem Analysis

Spatial distribution of tourist flows

A better understanding of tourist flows can assist in tourism development and planning (Peng, Zhang, Liu, Lu, & Yang, 2016). Tourist flow is defined as the projection of tourists' trajectories and related activities in geographical space that includes three basic elements—direction, rate, and link mode (Bowden, 2003). Tourist flow has been used as important evidence to predict tourist spatial-temporal behavior (Xia, Zeephongsekul, & Packer, 2011; Zheng, Huang, & Li, 2017; Zheng et al., 2019), segment tourism market (Li, Xie, Gao, & Law, 2018; McKercher, Shoval, Ng, & Birenboim, 2012; Zhao, Lu, Liu, Lin, & An, 2018), and evaluate destination management (Edwards & Griffin, 2013). However, very few studies have discussed how tourist flows interact with the tourism development of neighboring areas.

As a pioneering study in this literature, Zhang, Xu, and Zhuang (2011) investigated the spatial dependence and mechanisms of international and domestic tourist arrivals in 299 Chinese cities based on GIS data. Using local indicators of spatial association (LISA), Zhang et al. (2011) divided areas into five categories using the following spatial typology: (1) "high & high" (city clusters with high tourist arrivals); (2) "low & high" (cities with low tourist arrivals that are adjacent to cities with high tourist arrivals); (3) "low & low" (city clusters with low tourist arrivals); (4) "high & low" (cities with high tourist arrivals that are adjacent to cities with low tourist arrivals); (5) "not significant" (cities with no spatial autocorrelation). The study found a significant degree of neighboring effect in both international and domestic tourist distributions, with tourism development in a given city influenced by neighboring cities; that is, there is a positive interrelationship between core cities and neighboring cities in terms of tourist spatial distribution. Echoing the findings of Zhang et al. (2011), Yang and Wong (2013) also showed that both international and domestic tourism flows reveal strong positive and significant spatial autocorrelation. Compared with Zhang et al. (2011), Yang and Wong (2013) focused on tourist clusters and suggested that those clusters are very stable over time. Both studies provide crucial implications for governments about hot spot spillover into neighboring areas.

Kang et al. (2014) employed spatial statistical techniques and LISA to examine the neighboring effects in 165 urban destinations in South Korea, finding that the number of tourists increased significantly from 1989 to 2011 due to many small tourism clusters rather than a single iconic cluster being developed to attract tourists. Similarly, Sarrión-Gavilán, Benítez-Márquez, and Mora-Rangel (2015) explored the tourism impacts on Andalusia, a Spanish autonomous community, using GIS and exploratory spatial data analysis and observed imbalanced development between littoral and inland areas. Sarrión-Gavilán et al. (2015) also introduced the concept of pressure caused by tourism activities; their data analysis showed that areas with high pressure tend to indicate imbalanced development, whereas low pressure areas represent sustainable development. Additionally, based on the number of international tourists in Wakayama Prefecture and Hokkaido Prefecture in Japan, Oi (2016) applied the five categories—"high & high," "high & low," "low & high," "low & low," and "not significant"—to examine different types of development. More recently, Gutiérrez et al. (2017) analyzed the spatial distributions of Airbnb lodgings, hotels, and photographs uploaded to a photo-sharing website to investigate how these distributions are interrelated in Barcelona. While the study does not highlight the neighboring effect among the destinations, it presents a useful insight for tourism planning as Gutiérrez et al. (2017) emphasized that Airbnb's expansion may result in increasing pressure from tourism.

Spillover effects of tourism spots and public transportation interchanges in Osaka City

Following the general idea of research designed by Gutiérrez et al. (2017), this study compares the distribution of accommodations with iconic tourism spots and main public transportation interchanges in Osaka City. International tourists' travel preferences and styles in Osaka City are very similar; regardless of their country of origin, they tend to visit popular spots and use the main public transportation systems (Sano et al., 2021). Based on the findings of Sano et al. (2021) and previous studies regarding the spillover effects of tourist flows, this study supposes that spillover effects resulting from iconic spots and main public transportation interchanges also occur in Osaka City, which influences accommodation distribution.

To investigate this proposition, we apply a spatial statistical analysis used in past studies to examine how neighboring areas interact with each other. To examine the effects of iconic tourism spots and main public transportation interchanges on accommodation distribution, we draw the LISA cluster map in terms of the number of accommodations in Osaka City. As the current study focuses on a single urban destination, instead of the administrative districts used in previous studies, we employ the mesh grid as the unit of analysis to provide more accurate information about accommodation distribution. The LISA cluster map classifies mesh grids into the following four categories:

- High & High (mesh grids with a high number of accommodations adjacent to mesh grids with a high number of accommodations)
- High & Low (mesh grids with a high number of accommodations adjacent to mesh grids with a low number of accommodations)
- Low & High (mesh grid with a low number of accommodations adjacent to mesh grids with a high number of accommodations)
- Low & Low (mesh grid with a low number of accommodations adjacent to mesh grids with a low number of accommodations)

Research Methods

Data

In this empirical study conducted from a policy perspective, we use the grid data of the number of accommodation facilities in Osaka City. The data are available from "Digital National Land Information," the public open geographical information service provided by the MLIT (https://nlftp.mlit.go.jp/ksj/index.html).

The area of each regular grid in the data is on kilometer squared, and the number of accommodations per grid is recorded. The data were compiled in 2010. Note that the data is the latest version provided by the MLIT as of June 2022. Accommodation facilities include hotels, *ryokan* (traditional Japanese inns), public facilities, and *minshuku* (Japanese-style bed and breakfast). See MLIT (n.d.) for a detailed definition of the accommodation types in the data.

In Figure 1, we illustrate a map of Osaka City with the above data to visualize the features of the grid data employed in our study. All figures and statistical analysis applied in this research are conducted using statistical software R and its additional packages "sf" and "leaflet," which are designed to handle geographic information. Numbers 1 through 7 on the white squares in Figure 1 indicate iconic tourist spots or transportation interchanges. We find that the accommodations are clustered around these significant spots for tourists.

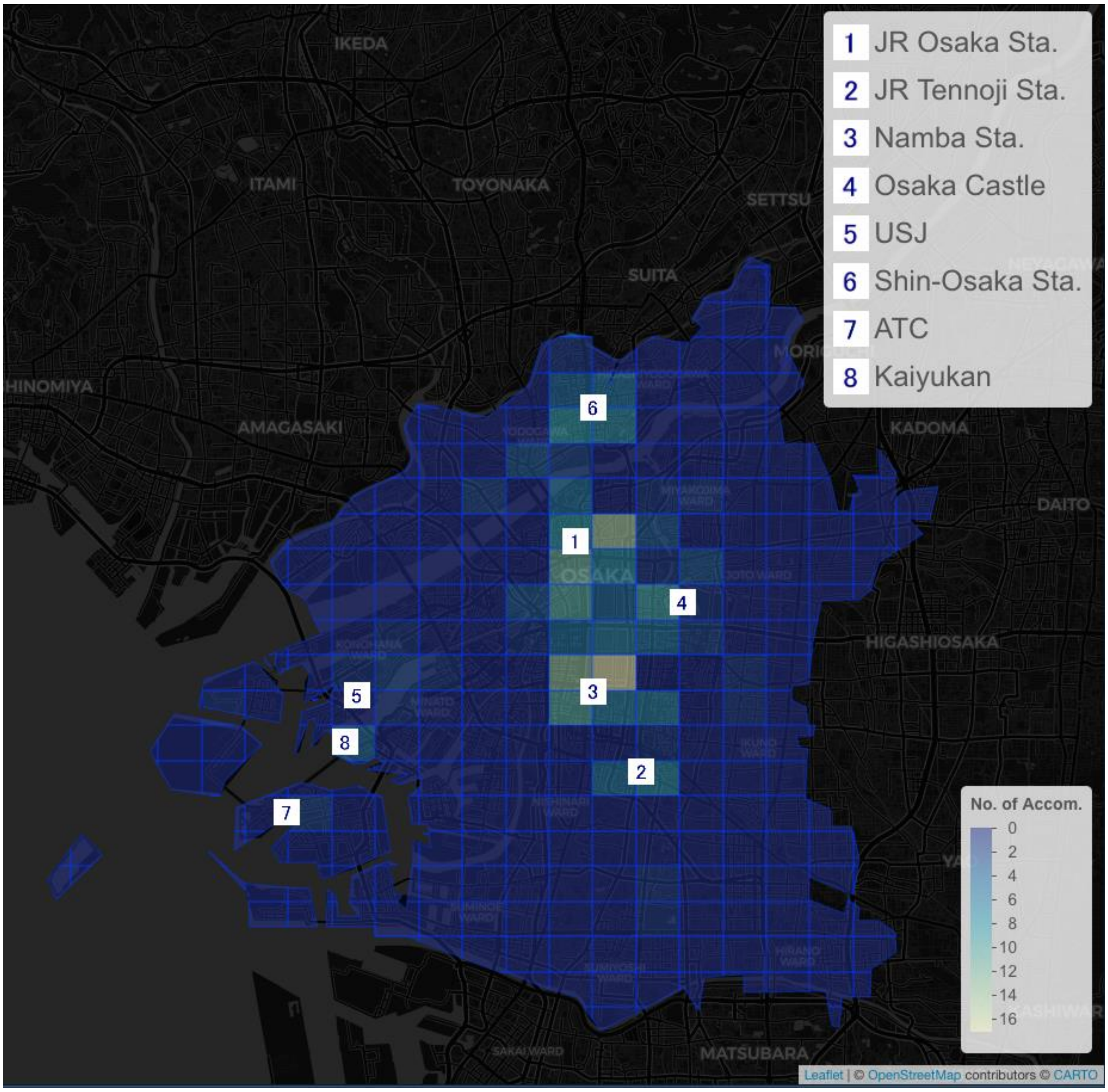

Figure 1: Accommodation supply distribution and major destinations in Osaka City

Method

To evaluate the spatial autocorrelation of accommodation distribution in Osaka City, we assume that "Everything is related to everything else, but near things are more related than distant things" (Tobler, 1970, p. 236), which is well known as Tobler's first law in geography and applies naturally to tourism geographical research. To evaluate the degree of spatial dependence of the location of accommodations in Osaka, we employ basic geostatistical methods.

Suppose that we can obtain an n dimensional vector $x = (x_1\ x_2\ , \dots , x_n)$, where x_i is the number of accommodation facilities in the i th grid and n is the number of all mesh grids.

Moran's I statistic, also called "Global Moran," is one of the most common tools used to check the spatial dependence of the data in spatial statistics and geographical analysis. It is a quantity expressing the spatial autocorrelation of the whole data and is defined as follows:

$$I := \frac{n}{S} = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}(x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^{n}(x_i - \bar{x})^2}$$

where w_{ij} is the (i, j) element of $n \times n$ spatial weighting matrix w and $S = \sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}$. This statistic is an extension of Pearson's correlation coefficient for spatial data, so the values usually range from −1 to 1. A larger value implies stronger spatial dependence.

To check the existence of a cluster of spatial dependence and heterogeneity, we calculate the LISA, proposed by Anselin (1995):

$$I_i := \frac{x_i - \bar{x}}{v}\sum_{j=1}^{n} w_{ij}(x_i - \bar{x})$$

where $v = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2$ is the sample variance of the sample vector x. I_i is local Moran index of the i th grid and indicates the correlation between i th grid and its neighborhood. Among the several definitions of the neighborhood in the literature, rook contiguity and queen contiguity are typical, with the names drawn from chess. In this research, we employ queen contiguity, so we set $w_{ij} = 1$ if ith and jth grids share an edge or a vertex and $w_{ij} = 0$ otherwise. The results of the local Moran calculations are graphically shown as a LISA cluster map in Figure 2 to illustrate the geographic pattern of the spatial autocorrelations.

Findings

Moran's I statistic of accommodation distribution in Osaka City is 0.281, with a p-value of 6.23e−14 (less than 0.01). This result reveals that the spatial autocorrelation of accommodation distribution is significant in Osaka City. According to Sano et al. (2021), iconic tourism spots in Osaka City include historical locations (e.g., Osaka Castle and Tsūtenkaku Tower), modern locations (e.g., Universal Studios Japan [USJ] and Osaka Aquarium Kaiyūkan), and shopping centers (e.g., Umeda and Namba). The main public transportation interchanges are Shin-Osaka station, JR Osaka Station, and Namba Station. The data analysis results indicate that the accommodation supply in Osaka City is concentrated around these tourism spots and transportation interchanges (Figure 2).

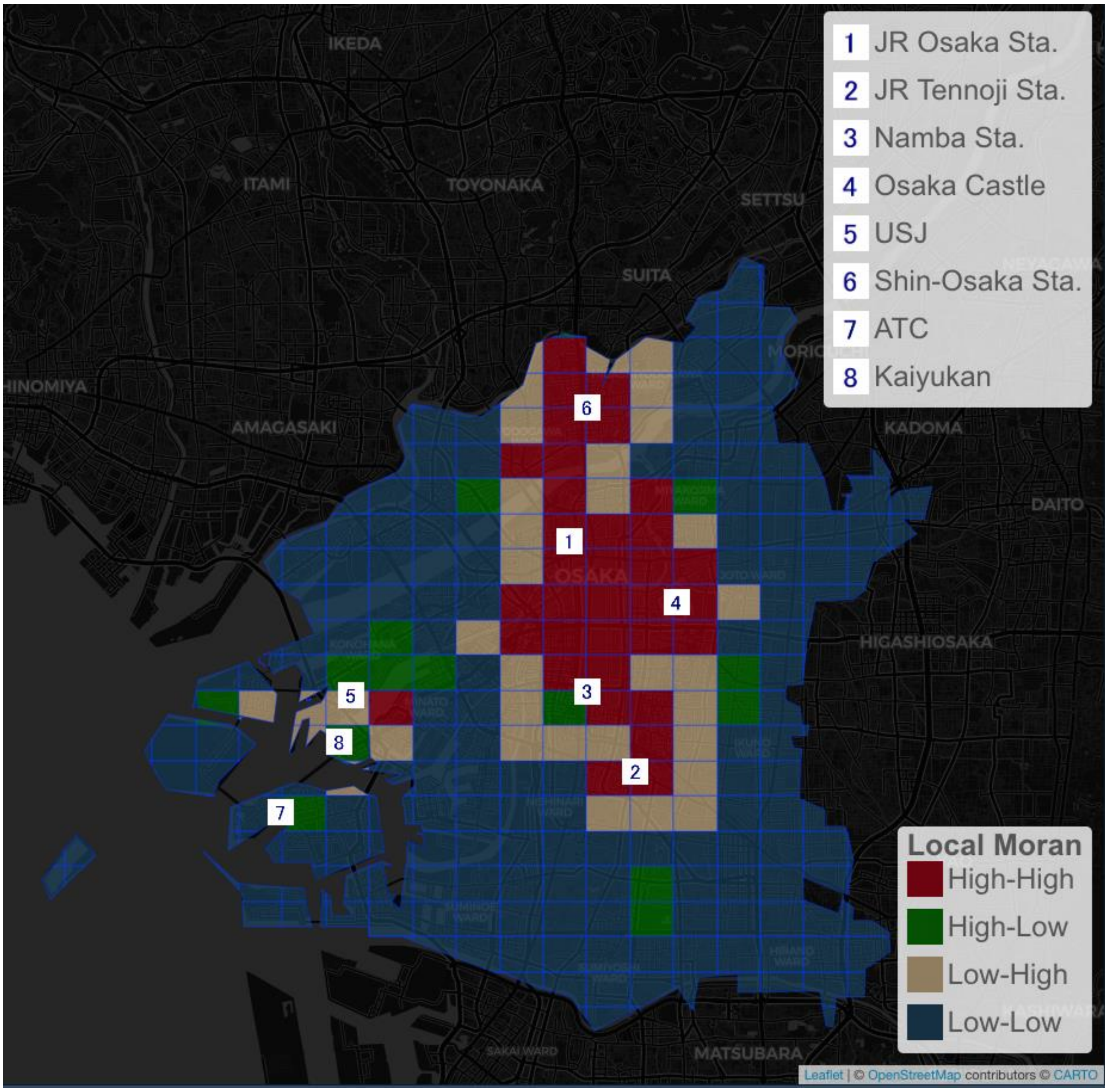

Figure 2: LISA cluster map of accommodation supply and major destinations in Osaka City

Effects of public transportation interchange spillover on accommodation supply distribution

From the empirical results, we identify that areas around main public transportation interchanges are hot areas in Osaka City. Figure 1 shows that those interchanges positively affect the accommodation supply distribution in the neighboring areas, particularly JR Osaka Station (High & High) and Namba Station (High & High and High & Low). The commonalities of these two spots are that both are not only main interchanges but also shopping centers, which results in a high cluster of accommodations. Compared with JR Osaka Station and Namba Station, the spillover effect of JR Tennōji Station is relatively weak, even though a shopping center (Abeno Harukas) and some tourism spots (Tsūtenkaku Tower and Tennōji Zoo) are located there. However, Shin-Osaka Station has a significant effect of spillover on accommodation supply distributions despite having no shopping centers or tourism spots nearby. This result may be explained by the fact that Shin-Osaka Station is the interchange of the Shinkansen (Japanese bullet train), which is highly used by both leisure and business tourists. Furthermore, the Shin-Osaka Station is a gateway for Osaka City, and its easy accessibility to tourists induces a large number of accommodations in neighboring areas.

Iconic tourism spots' spillover effects on accommodation supply distribution

In addition to the main public transportation interchanges, the iconic tourism spots (USJ, Osaka Aquarium Kaiyūkan, Asia & Pacific Trade Center [ATC], and Osaka Castle) also present spillover effects on accommodation supply distribution. Notably, Osaka Castle has the most significant effect on the spatial distributions of accommodation in neighboring areas (High & High), although there is no main public transportation interchange nearby. The results can be explained by Osaka Castle's location, which is conveniently placed in the center of Osaka City with multiple public transportation options accessible (e.g., Osaka Loop Line and Osaka Metro Chūō Line). Compared with Osaka Castle, even though USJ, Osaka Aquarium Kaiyūkan, and ATC positively influence spatial accommodation supply, the effects are limited to certain small areas very close to the tourism spots, resulting in several High & Low grids around them. Nevertheless, the accommodation cluster around USJ and Osaka Aquarium Kaiyūkan is sufficiently large to contain a High & High grid.

Potential areas' spillover effects on accommodation supply distribution

Convenient accessibilities and rich tourism resources can enhance the spillover effects of tourist arrivals (Gutiérrez et al., 2017; Sarrión-Gavilán et al., 2015; Zhang et al., 2011), indirectly influencing spatial accommodation distribution. Examining the empirical results, we found several areas with neither popular tourism spots nearby nor convenient public transportation that still had high accommodation distributions in certain limited areas. We call these areas "potential areas." For instance, the two High & Low grids in the south of Osaka City are located in the Sumiyoshi administrative district, which is less famous as a tourism spot compared with others. Moreover, the two High & Low grids in the east of Osaka City are near Tsuruhashi, where there is a "Korea town." Those areas have the potential to bring spillover effects to neighboring areas and develop the areas as new hot spots.

Areas not affected by spillover effects

Low & High and Low & Low grids can be regarded as areas not affected by spillover effects. Of such grids, those that are adjacent to High & High or High & Low grids are more likely to increase the number of accommodations in the future because spillover effects from tourism spots or transportation interchanges close to them may continue to expand. In contrast, Low & Low grids adjacent to neither High & High nor High & Low grids could increase the number of accommodations if positive shocks such as discovery or development of new tourism attractions, a launch of new subsidy program for the accommodation business, and implementation of a transportation policy that changes the flow of people.

Recommendations and Conclusion

Osaka City is the most visited tourism destination in Japan and a typical example of urban destination. The Osaka City government is responsible for the city's sustainable development. The empirical results of this study highlight the city's imbalanced accommodation supply distribution and the reasons behind this unequal distribution.

The uneven spatial distribution of accommodations leads directly to uneven tourist flow in the city, which causes overtourism problems and inequitably allocates the economic benefits from tourists toward each region in the city. Thus, although the findings are preliminary, this study suggests the importance of considering tourist flow in destination planning, on which local governments have insufficiently focused. We call this type of destination planning “tourist-flow-based destination planning” as an alternative to traditional “government-centered destination planning.”

To implement tourist-flow-based destination planning, policy makers should effectively analyze data that capture tourist flow to inform their decision-making. Aggregated tourist flow data may be publicly available from governmental agencies, but data collected by mobile phone operators or travel-related mobile application providers would be much more useful for understanding tourist flows at a granular level. These companies limit and control the availability of this data, which hinders tourist-flow-based destination planning. Therefore, efforts should be made to create more open and collaborative data-sharing agreements between local governments and data-owning companies by ensuring that all stakeholders understand the value of tourist-flow-based destination planning.

Similar to a core–periphery spatial structure (Yang & Wong, 2013; Zhang et al., 2011), regional agglomeration effects are expected to involve interactions between hot spots and other areas. The Osaka City government is advised to find a way to effectively narrow the gap between different clusters (crowded areas vs. uncrowded areas). Zhang et al. (2011) suggested linking hotspot tourism cities to their peripheral cities, constructing tourism cooperative alliances. However, this may be difficult to execute in a single urban destination. In the case of Osaka City, accommodation distribution is dense in the city center, which causes overcrowding in certain areas. To develop a sustainable tourism city, the Osaka City government should collaborate with governments in neighboring areas. As Osaka City is the capital of Osaka Prefecture, its development influences the entire prefecture’s development. Therefore, to alleviate overtourism problems in Osaka City, its government should treat the whole prefecture as an ecosystem, instead of dividing tourism promotions between the capital and other cities in the prefecture.

Additionally, this study demonstrates how a local Moran analysis helps clarify the spatial distribution of accommodations in urban cities, such as Osaka City. First, it characterizes mesh grids in terms of their own and the surrounding accommodations’ concentration. With other factors such as nearby tourism resources and ease of transportation, this information helps determine in which mesh grids the building of new accommodations should be encouraged for the city’s sustainable development. Second, it reveals the degree of positive spillover effects of major transportation interchanges and tourism spots on the number of surrounding accommodations. This information is helpful in evaluating a city’s tourism development planning combined with transportation development planning.

Finally, several limitations of this study should be acknowledged. First, due to data unavailability, this study relies on data compiled in 2010. If updated data were available, richer insights would be obtained in terms of accommodation supply distribution in Osaka City. Second, this study did not consider the distribution of vacation rentals due to data unavailability. Because vacation rentals are becoming increasingly popular and accepted in Osaka City, their influence should be taken into account if data are available. Third, this study does not explicitly examine how accommodation supply distribution and tourist flow are interrelated. In examining the interrelationship, further variables could be included, such as the concentration of local residences and the number of convenience stores, to enrich our understanding of destination development. All of these limitations provide opportunities for future research.

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