

CONSUMER REVIEW WEBSITE-BASED APPLICATION TO DETERMINE POPULARITY INDEX AND SPATIAL DISTRIBUTION OF RESTAURANTS IN BANDUNG

*Dewi Susiloningtyas, Syarifah Salma A'idah, Febiana Nur Azizah, and Iqbal Putut Ash Shidqi

Faculty of Mathematics and Natural Sciences, University of Indonesia, Indonesia

*Corresponding Author, Received: 11 Jan. 2020, Revised: 05 July 2020, Accepted: 23 Sept. 2021

ABSTRACT: A consumer review website (CRW) is a web-based type of platform that provides information on one's perspective. In this case, the information provided is a review of a particular object. This information can be used as a spatial database because the object being assessed has spatial attributes in the form of geotagging. One form of CRW is the Zomato application, which provides information on ratings of various types of dining objects (cafes, fine dining, quick bites, stalls). This study utilizes attribute data available in the Zomato application to map the restaurant's popularity index's spatial distribution in the city of Bandung. The popularity index is built based on the rating of consumers of a restaurant. This study utilizes the application program interface (API) owned by Zomato to get restaurant location data and rating attributes. The popularity index value is divided into three group classifications: high, medium, and low popularity. This study concludes that high, average, low popularity restaurants are clustering in Bandung. The majority of the restaurants are closer to collector roads rather than arterial roads. The hotels are closer to most of the restaurants, especially the high-popularity restaurants, while only a few restaurants near the malls.

Keywords: *CRW, Popularity index, Restaurant, Spatial distribution, NNA*

1. INTRODUCTION

In this digital age, communication and information technology are increasingly advanced. With the growing popularity of the internet among the public, a review has become an essential source in determining a product's quality that will end in the consumer's decision before purchasing certain goods [1]. The reviews obtained are no longer discussed by word of mouth (WoM) but through diverse social media (e-WoM). Consumers can regularly obtain product reviews from online sellers, product websites, blogs, and third-party review platforms where consumers can participate and engage in discussions about their consumption experiences [2]. This consumer review platform or consumer review website (CRW) is now widely used by consumers as their reference in choosing products that follow the quality they desired. Nevertheless, many consumers rely on CRW to choose the restaurant or restaurant they want to visit to choose the place to eat.

Bandung is a city with many exciting tourist attractions, including food and beverage tourism, commonly referred to as culinary tourism [3]. With the number of places to eat (restaurants) in Bandung, many tourists follow the CRW platforms' reviews to choose their place to eat. One of the websites or applications providing consumer reviews for a restaurant is Zomato. Zomato provides information about consumer's reviews on restaurants in the form

of ratings and written reviews. Ranking (popularity index) is subjective and could be made based on the food, service, price, location, and environment of a particular restaurant [4]. This popularity index can be displayed or illustrated based on restaurants' ranking and distribution in a region.

Human perspectives, such as reviews or thoughts, could have been influenced by the so-called 'spatial cognition' of a particular individual. It is a cognitive process of gathering and manipulating information about the nature of the spatial environment and utilizing them in the adaptive process of decision making [5,6]. Therefore, this study aims to determine and map the spatial distribution patterns of restaurants in Bandung based on their popularity index and determine what factors influence the distribution patterns.

2. CONSUMER REVIEW AND POPULARITY INDEX

The consumer review, a particularly online review, is one of the new things in the modern technology era. It was the basis of the emerging electronic word of mouth (eWOM), which has become one of the crucial sources of information nowadays for someone's before their purchasing or selecting goods or services [7,8]. Those reviews are easy to find in a particular social media or web service and influence one's perspective toward a

specific product or service [9].

On the other hand, the popularity index or PI is a measurement index showing the popularity rate regarding some goods or services. PI describes how a certain eating place is popular based on the food (taste or price) and the scenery of the place in the culinary services. This rating system has been considered valuable input by some restaurants to assess their food and service qualities [10].

3. METHODS

Most of the secondary data are gathered from Zomato (www.zomato.com). The information collected from the secondary data is the attributes of a particular restaurant, such as location (latitude and longitude), popularity index, type of restaurant, and types of food served by the restaurant. The geographic information system (GIS) analysis is being utilized to map and describe the restaurant's spatial distribution based on its popularity index. A cross-tabulation and statistical analysis are employed to explain which factor is affecting the most.

3.1 Study Area

The study is located in the city of Bandung. Bandung City is the capital of West Java Province, Indonesia, which has an area of 167.31 km² and divided into 30 sub-districts, covering 151 sub-districts (Fig. 1). The city of Bandung has a population of 2,507,888 inhabitants in 2019. Bandung has many attractions that attract tourists to come to visits, such as nature and culinary tourism.

3.2 Materials

Some materials used in this study were gathered from secondary sources. Those materials were essential to answer the research questions and to build the hypothesis prior to the conclusions. Those materials are related to the popularity index, accessibility, and urban functional units.

Popularity index

The popularity index was obtained from the Zomato website (www.zomato.com). Zomato uses index values ranging from one to five based on consumer reviews. The thing that also takes into account is the credibility of these consumers. Further, the popularity index is being categorized into three classes (Table 1).

Accessibility

Accessibility is one of the factors that is suspected will affect the distribution of restaurants. Accessibility is representing the distance between

the restaurant and the road networks. Further, the road network data are being classified as arterial and collector roads (Fig. 2). This data was obtained from Open Street Map (www.openstreetmap.org).

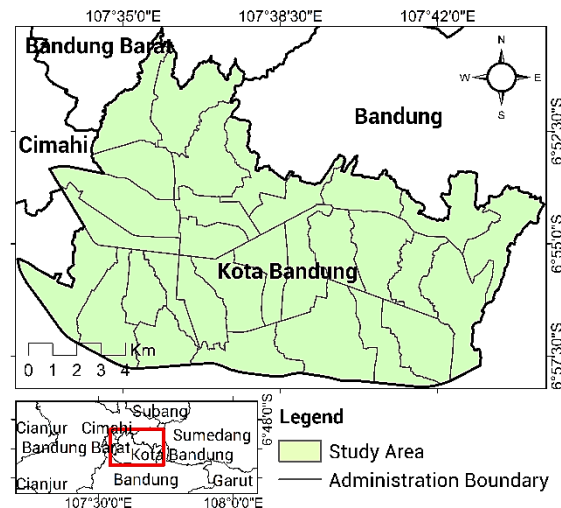


Fig.1 Study area located in the city of Bandung



Fig.2 The arterial and collector road networks in the city of Bandung

Urban functional unit

Urban functional units consist of various interrelated elements in a city intended to provide space for people's lives, production, recreation, and business activities, provide a pleasant living environment, and form an exchange platform [11]. Examples of this functional unit are malls, hotels, offices, hospitals, and banks. This study only limits the urban functional unit to malls and hotels (Fig. 3). Mall and hotel data are obtained from the Open Street Map. In addition, the central business district (CBD) can also influence the distribution of this restaurant. CBD data were obtained from Colliers

International Indonesia - Research.

Table 1 Categories of restaurant's popularity index

| Popularity index | Category |
|------------------|----------|
| < 2.9 | Low |
| 3 – 3.9 | Average |
| > 4 | High |

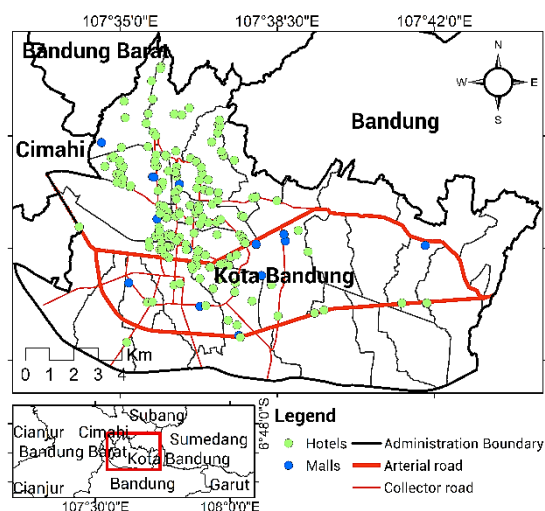


Fig.3 Distribution of hotels and malls in the city of Bandung

Land-use

Land use can affect the distribution of restaurant popularity. The type of land use used in this study is the type that has functions for settlement, business, social and culture, and tourism.

3.3 Data Processing and Analysis

Spatial distribution analysis

The analysis was performed using the Nearest Neighbor Analysis (NNA) and Kernel Density Analysis (KDA) methods. NNA is used to determine what distribution patterns are formed, for example, by grouping, spreading, or random. KDA is used to determine the density of existing restaurants per unit of a particular region. These NNA and KDA analyses are being performed using GIS software.

Distance analysis

The distance analysis that will be carried out in this study includes the employment of NEAR tools using GIS software. This analysis observes variations in the distance between restaurants and urban functional units (hotels, malls, and CBD). The distance between the restaurant and urban

functional unit was suspected to influence the restaurant's popularity index. The NEAR tool from GIS software is being utilized to measure the distance. The cross-tabular analysis is used to measure the relationship between restaurant locations, accessibility, and urban functional units.

4. RESULTS AND DISCUSSIONS

4.1 Distribution of Restaurants in Bandung City

In total, there are 4078 restaurants across Bandung City. This study has collected 980 locations of restaurants, with all of them have the popularity index in their attribute (Fig. 4). Most of the restaurants are located in the center of Bandung City, from which large groups of average-popularity restaurants have occurred.

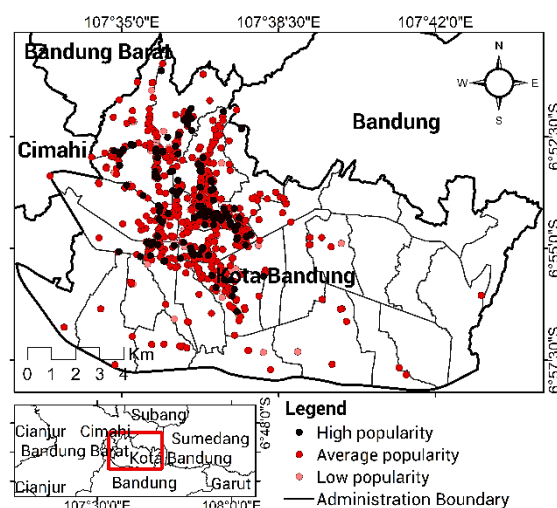


Fig.4 Location of restaurants based on the popularity index

Fig. 4, shows a clustered type of restaurant distribution, especially in the city center. The city center and CBD were located around four major road networks, like Braga, Asia-Afrika, Merdeka, and Dago. The area includes Regol, Sumur Bandung, Coblong, and Bandung Wetan sub-districts. Based on the data, Bandung Wetan is the sub-district with a significant number of indexed restaurants in Bandung City (Fig. 5). According to several studies, Bandung Wetan sub-district is one of the iconic places in Bandung with many clothing and crafting stores filled with creative workers and designers. The need to find a comfortable place for working and channeling their creative minds are becoming the factor behind the rapid growth of cafés and restaurants [12,13]. Based on the popularity level, it is known that most of the restaurants are in average-popularity, in which the rating score ranges from 3 to 3.9 (Fig. 6).

4.2 Restaurant's Popularity Distribution

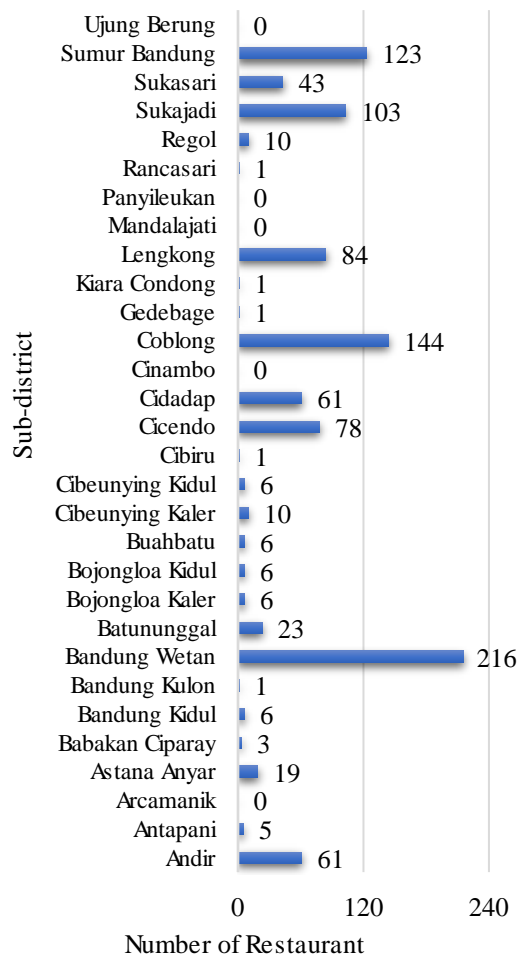


Fig.5 Number of restaurants on each sub-district

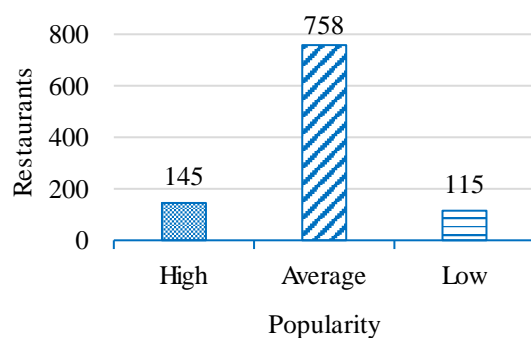
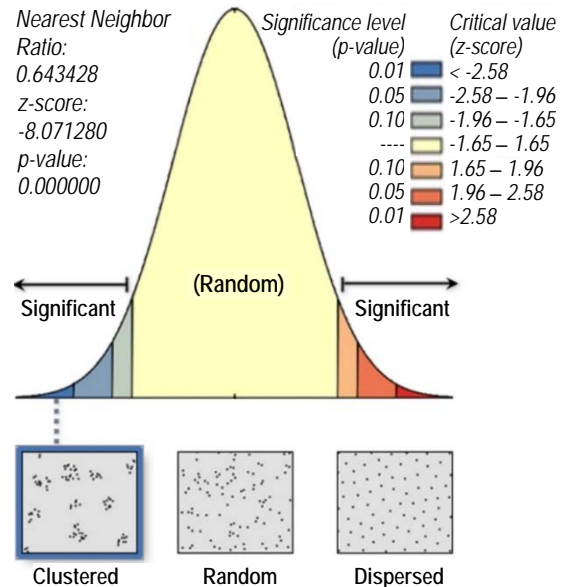


Fig.6 Number of restaurants based on popularity level

High popularity restaurants

Restaurants with a high-popularity index have a clustering pattern around the center of Bandung. The NNA analysis proves it, which shows the z-score value of -8.0713. Based on the z-score, the distribution type of the high-popularity restaurants is clustered (Fig. 7). The KDA analysis shows a

similar result where the highest density of the high-popularity restaurants found in Bandung Wetan. Based on the KDA, the highest density shows that there are probably more than 78 high-popularity restaurants per km² (Fig. 8).



Given the z-score of -8.07128012599, there is a less than 1% likelihood that this clustered pattern could be the result of random chance

Fig.7 NNA result for high-popularity restaurants in Bandung

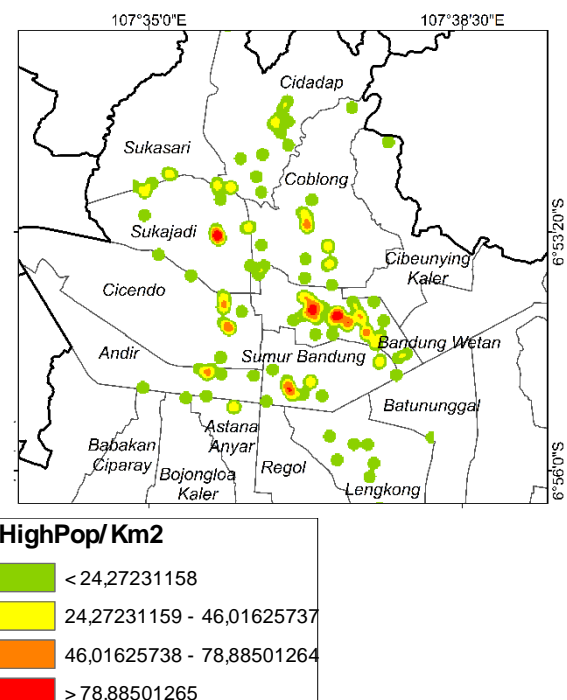
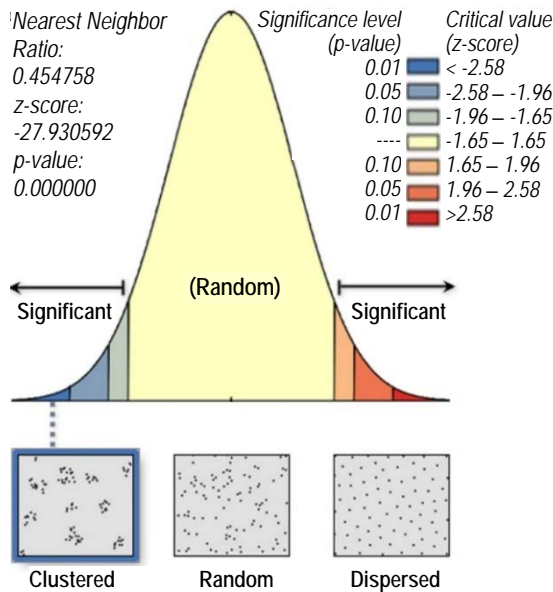


Fig.8 KDA result for high-popularity restaurants in Bandung



Given the z-score of -27.9305921725, there is a less than 1% likelihood that this clustered pattern could be the result of random chance

Fig.9 NNA result for average-popularity restaurants in Bandung

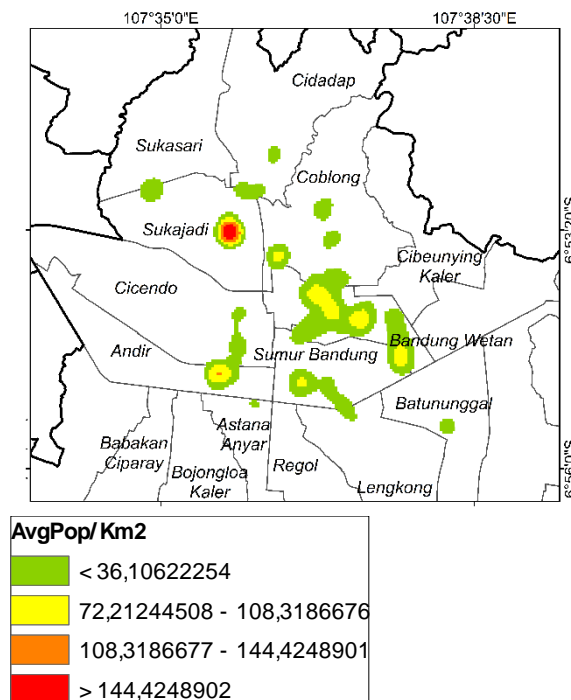
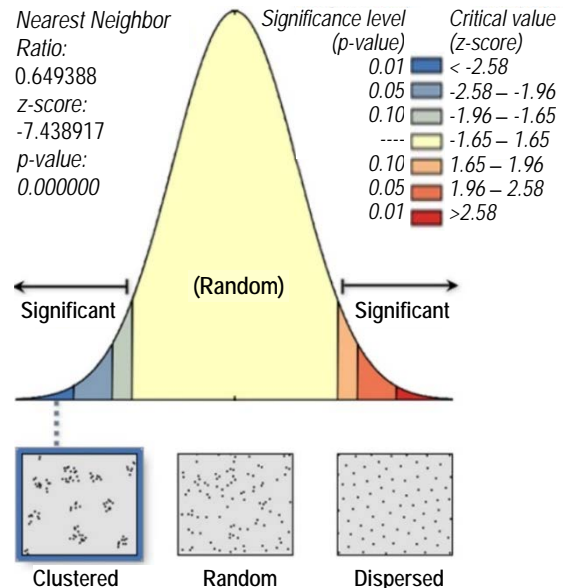


Fig.10 KDA result for average-popularity restaurants in Bandung

Average popularity restaurants

Restaurants with an average-popularity index are also having a clustering pattern located in Bandung City Center. Restaurants with this category are most dominant among restaurants with low- and high-popularity. The NNA analysis proves it, which

shows the z-score value of -27.9306. Based on the z-score, the type of distribution of the average-popularity restaurants is clustered (Fig. 9). The KDA for average-popularity restaurant shows a slightly different result, where the highest density occurred in Sukajadi. The highest density class shows that there are probably more than 144 average-popularity restaurants per km² (Fig. 10).



Given the z-score of -7.43891651252, there is a less than 1% likelihood that this clustered pattern could be the result of random chance

Fig.11 NNA result for low-popularity restaurants in Bandung

Low popularity restaurants

Restaurants with a low-popularity index also have a clustered pattern in the city of Bandung. This low index is dominant around the Bandung City Center. The z-score from NNA shows a value of -7.438917. Based on the z-score, the distribution type of low-popularity restaurants is clustered (Fig. 11). The KDA for low-popularity restaurants shows a slightly different result, where the number of highest density clusters found in Sukajadi, Coblong, and Batununggal (Fig. 12). Those areas are slightly far from the city center. The highest density class shows that there are probably more than 36 low-popularity restaurants per km² (Fig. 12).

4.3 Distance Analysis

Distance could play a significant role when it comes to someone's preferences. The relative locations or the distance between the restaurant to other specific entities might influence people's perspectives on how they will rate the restaurant. Zhai et al. [10] suggested that the restaurants with high popularity were closed to urban functional

units, whereas those with low popularity were at a faraway distance. It was supported by the study from Habib et al. [14], who suggested that a well-reputed restaurant will have less interest if far away. This study tries to examine whether the distance is related to the restaurant's popularity. A cross-tabulation is being employed to measure that condition. Table 2 shows the number of restaurants based on their distance to the road networks (arterial and collector roads).

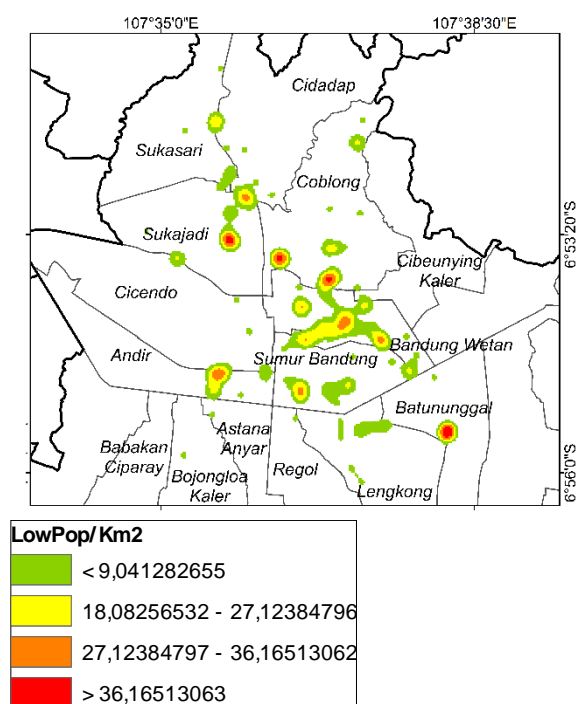


Fig.12 KDA result for low-popularity restaurants in Bandung

Table 2 Number of restaurants based on the distance to the road networks

| Popularity | Num. of nearest rest. to arterial road | Num. of nearest rest. to collector road | Mean distance rest. to arterial road | Mean distance rest. to collector road |
|------------|--|---|--------------------------------------|---------------------------------------|
| Low | 14 | 109 | 1979,15 | 331,19 |
| Avg. | 102 | 615 | 2033,22 | 418,25 |
| High | 7 | 133 | 2201,81 | 343,70 |

Based on the table, the majority of low-popularity restaurants are closer to the collector road, which is around 109 restaurants with an average distance of 331 meters. In comparison, there 14 low-popularity restaurants closed to arterial roads, with an average distance of about 1979 meters. Restaurants with average-popularity

are also closer to the collector roads (615 restaurants), with an average distance of 418 meters. The number of restaurants with average-popularity near arterial roads is 102, with an average distance of 2033 meters. Similarly, the majority of high-popularity restaurants are near the collector road (133 restaurants), with an average distance of 343 meters. The number of high-popularity restaurants near arterial roads is seven, with an average distance of 2201 meters. Conclusively, 87.4 percent of the total restaurants are closer to the collector roads.

Table 3 Number of restaurants based on the distance to the urban functional units

| Popularity | Num. of nearest rest. to hotel | Num. of nearest rest. to mall | Mean distance rest. to hotel | Mean distance rest. to mall |
|------------|--------------------------------|-------------------------------|------------------------------|-----------------------------|
| Low | 101 | 22 | 270,02 | 946,94 |
| Avg. | 619 | 98 | 278,91 | 1032,38 |
| High | 124 | 16 | 229,12 | 953,59 |

Table 3 shows the number of restaurants based on their distance to the urban functional units (malls and hotels). About 86 percent of the total restaurants are closer to the hotels than to the malls. The high-popularity restaurants are closer to the hotels, with a mean distance of 229 meters. In comparison, only 16 high-popularity restaurants near to the malls, with a mean distance of 953 meters. Restaurants with average-popularity are also closer to the hotels (619 restaurants), with an average distance of 278 meters. The number of restaurants with average-popularity near malls is 98, with an average distance of 1032 meters. Similarly, the majority of low-popularity restaurants are near the hotels (101 restaurants), with an average distance of 270 meters. The number of low-popularity restaurants near malls is 22, with an average distance of 946 meters.

5. CONCLUSION

This study concludes that high, average, low popularity restaurants are clustering in Bandung. The densest cluster in high-, average-, and low-popularity groups has up to 78 restaurants/km², 144 restaurants/km², and 36 restaurants/km², respectively. The majority of the restaurants are closer to collector roads rather than arterial roads. The hotels are closer to most of the restaurants, especially the high-popularity restaurants, while only a few restaurants near the malls.

6. ACKNOWLEDGMENTS

This study is supported and funded by the

Directorate Research and Development (DPRM), University of Indonesia under the *Publikasi Terindeks Internasional* (PUTI) 2020 research grant no. NKB-4513/UN2.RST/HKP.05.00/2020. The authors also express their greatest gratitude and the highest appreciation to Department of Geography, Faculty of Mathematics and Natural Science, University of Indonesia which has facilitated the research activities.

7. REFERENCES

- [1] Zhu, F., and Zhang, X., Impact of online consumer reviews on sales: The moderating role of product and consumer characteristics. *Journal of Marketing*, Vol. 74, Issue 2, 2010, pp. 133-148.
- [2] Kim, S. J., Maslowska, E., and Malthouse, E. C., Understanding the effects of different review features on purchase probability. *Int. J. Advert.*, Vol. 37, Issue 1, 2018, pp. 29-53.
- [3] Komaladewi, R., Mulyana, A., and Jatnika, D., The Representation of Culinary Experience as the Future of Indonesian Tourism Cases in Bandung City, West Java. *International Journal of Business and Economic Affairs*, Vol. 2, Issue 5, 2017, pp. 268-275.
- [4] Zhang, Z., Zhang, Z., and Law, R., Positive and negative word of mouth about restaurants: Exploring the asymmetric impact of the performance of attributes. *Asia Pacific Journal of Tourism Research*, Vol. 19, Issue 2, 2014, pp. 162-180.
- [5] Lloyd, R., Cognitive maps: Encoding and decoding information. *Annals of the Association of American Geographers*, Vol. 79, Issue 1, 1989, pp. 101-124.
- [6] Lloyd, R., *Spatial cognition: Geographic environments* (Vol. 39), Springer Science & Business Media, 1997, pp. 1-264.
- [7] Chen, Y., & Xie, J. Online consumer review: Word-of-mouth as a new element of marketing communication mix. *Management Science*, Vol. 54, Issue 3, 2008, pp. 477-491.
- [8] Kim, S. J., Maslowska, E., & Malthouse, E. C. Understanding the effects of different review features on purchase probability. *International Journal of Advertising*, Vol. 37, Issue 1, 2018, pp. 29-53.
- [9] Maslowska, E., Malthouse, E. C., & Bernritter, S. F. Too good to be true: the role of online reviews' features in probability to buy. *International Journal of Advertising*, Vol. 36, Issue 1, 2017, pp. 142-163.
- [10] Zhai, S., Xu, X., Yang, L., Zhou, M., Zhang, L., and Qiu, B., Mapping the Popularity of Urban Restaurants Using Social Media Data. *Applied Geography*, Vol. 63, 2015, pp. 113-120.
- [11] Hu, Y., and Han, Y., Identification of Urban Functional Areas Based on POI Data: A Case Study of the Guangzhou Economic and Technological Development Zone, *Sustainability*, Vol. 11, Issue 5, 2019, pp. 1-15.
- [12] Anugrah, I. W., and Suhaeni, T., Pengaruh Kepemimpinan Strategik Terhadap Strategi Bersaing UKM Café dan Restoran. *Jurnal Riset Bisnis dan Investasi*, Vol. 3, Issue 3, 2017, pp. 78-88.
- [13] Siswanto, M. R., and Choandi, M., Ruang Pertukaran Ide di Bandung Wetan. *Jurnal Sains, Teknologi, Urban, Perancangan, Arsitektur (Stupa)*, Vol. 2, Issue 1, 2020, pp. 707-718.
- [14] Habib, M. A., Rakib, M. A., and Hasan, M. A., Location, Time, and Preference Aware Restaurant Recommendation Method. In *2016 19th International Conference on Computer and Information Technology (ICCIT)*, 2016, pp. 315-320.

Copyright © Int. J. of GEOMATE. All rights reserved, including the making of copies unless permission is obtained from the copyright proprietors.
