Mapping of culinary tourism distribution based on web data mining information. Case Study: Bandar Lampung City

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Abstract. In the previous decades, tourism was expanding rapidly, as every country both developed and developing one has gained its impact of increasing revenue through tourism sector. Sympathetically in Indonesia, the tourism sector is growing in every area that has potential tourism sites whether in urban or rural areas. For urban areas that generally do not have a natural tourism destination, they develop the artificial products and services, such as culinary tours that turned out to show significant development. Bandar Lampung, as a capital city of Lampung Province, potentially become a metropolitan city, also has mushroomed culinary tours that become the main attraction for the tourists. Furthermore, this research aim to mapping and spatially revealing the spread pattern of culinary tourism in Bandar Lampung. This research uses a descriptive method, while in mapping the distribution of culinary tourism, web mining applications with crawling method is mobilized to collect and extract information about culinary or restaurants in Bandar Lampung obtained from the Trip Advisor website. The result of this study shows the deployment points of the culinary tourism follow the consumer's agglomeration which grows in the scattered land use pattern. This research could be a reference for local governments in determining tourism development policies without violating the land use regulation.

Keywords: Culinary tourism, tourism distribution, land use, Bandar Lampung

1. Introduction

More than the last few decades the governments in both developed and developing countries pay attention to tourism development which is considered to have a significant role in improving economic regeneration and revitalization [1]. Tourism has been able to bring economic benefits, from being initially limited to developed countries as tourist destinations and then growing and spreading to developing countries as tourist destinations of interest. This issue is evidenced by 45% of foreign tourist visits to developing countries in 2015 compared to 1950 which was less than 5% [2]. Then in 2017, the growth of tourist visits to Southeast Asia (including Indonesia) reached 7.8% above the average growth of world tourist visits by 4% [3].

Various types of tourism are of interest to domestic and international tourists, from natural tourism (beaches, mountains, waterfalls, etc.) to artificial tourism such as cultural tourism, religious tourism or culinary tourism; and what will be discussed more in this study is culinary tourism. Culinary tourism
has become prominent in 2001 that The World Food Travel Association estimates food and beverage expenses 15% to 35% of all tourism spending, depending on the affordability of the destination [4, 5]. In 2013 in Indonesia, the culinary tourism contributed gross value added of Rp.208.6 trillion while having an average growth of 4.5 percent from 2012-2013. The culinary sector also absorbs 3.7 million people with an average growth of 0.26 percent. The business unit created from the culinary destination was at 3.0 million with an average growth of 0.9 percent. Therefore culinary tourism is believed to be able to become the central element that serves as an adhesive to a series of tours, given that tourism is a multi-attribute and prospective sector as a gateway as well as the image of Indonesian tourism.

Indonesia has also entered an increasing phase in tourism development which is shown by including it as one of development priority in the current government work program (Nawacita) in addition to infrastructure, energy, food and maritime. So that regions in Indonesia that have potential tourism are competing to increase income in their area through the tourism sector, one of which is culinary tourism. The central government through the Ministry of Tourism has helped accelerate tourism growth by making strategies and breakthroughs by imitating other countries whose gastronomic tourism has advanced, to be implemented in Indonesia [6]. Based on data from the Ministry of Tourism, cultural tourism contributes 60% to the country's tourism industry around 45% of which are culinary and shopping. Based on the creative economy gross domestic product (GDP), 32.5% from Rp641 trillion or around Rp.208.32 trillion of which are culinary donations and 28% (Rp179.5 trillion) of fashion [6].

Bandar Lampung which is well-known as the capital city of Lampung Province is developing culinary tourism. Unlike some regencies in Sumatra Province which do have a lot of natural tourism potential while Bandar Lampung as the capital city does not have much that kind of potential tourism, but has the opportunity to develop culinary tourism. Unfortunately, the mapping of the existence of culinary tourism in Bandar Lampung itself does not yet exist. Whereas to determine the right and optimal development policy in the future, it is necessary to map the existing tourism distribution. Careful planning has to be considered to make culinary tourism as a strong sector in improving regional economy. Planning definition is the requirement for activities and practices to be arranged orderly to decrease the uncertainty aspect that may arise in the long run future. Regulation of Land-use planning policy plays a prominent role in creating a distinctive atmosphere (especially Bandar Lampung) and environmentally sustainable tourism. Moreover, tourism as an activity is based on interactions of particular destinations and requires cooperation in both the public and private sectors. The importance of tourism has brought about the realization in Bandar Lampung that this industry deserves special attention.

2. Methodology
This study uses quantitative methods. The procedure carried out to achieve the research aim is to identify the spread of culinary tourism by referring to the information provided by consumers towards the favorite culinary destinations in Bandar Lampung through international level tourism sites. In identifying culinary tourism, web mining applications with crawling methods are collected to collect and extract information about culinary or restaurants in Bandar Lampung, obtained from the TripAdvisor website. TripAdvisor was chosen as a data source because TripAdvisor is the largest tourist site in the world [7], which has more than 661 million reviews and opinions about 7.7 million accommodations, airlines, attractions and restaurants [8]. These reviews and point of views help tourists in making decisions related to travel, such as places to eat, places to stay, airlines, and list of things to do. With an average of 456 million visitors per month [8], it appears that the TripAdvisor site is one of the reference choices in traveling globally. The process of extracting data (data mining) from the Web is also called Web Mining. Information about culinary destinations is obtained and collected using the crawling method, which is downloading web pages automatically and extracting the data needed from the web page. The data extracted consists of the name of the restaurant, address, website, telephone number, rating, and some reviewers. The amount of information obtained is 129 culinary information...
contained in the city of Bandar Lampung, with the success rate of information obtained as much as 71.1%.

Then in this study, data on the spread of culinary destinations were analyzed spatially using the Geographic Information System application, ArcGIS version 10.5. The map of the culinary tourism distribution patterns was then analyzed by referring to the spatial planning documents of Bandar Lampung region and city in 2011-2030 using descriptive analysis methods.

3. Literature Review

3.1 Web Mining

The term Web Mining (WM) was first used by Oren Etzioni who define it as the application of Data Mining techniques to Web data to extract relevant information from available resources on the Web; resources could be documents or web services [7]. Researchers classify Web Mining into three types, namely: Web Structure Mining, Web Content Mining, and Web Usage Mining. Web Structure Mining is a method for finding useful information or knowledge from hyperlinks (links).

Web Content Mining is a method for extracting or extracting useful information or knowledge from webpage content. Web Usage Mining is a method for finding user access patterns from a web usage log [8]. The Web Mining process is similar to the Data Mining process, which usually distinguishes in the data collection process. In the Data Mining process, the database or data warehouse is the place to collect the data. Whereas in Web Mining, data collection becomes an important task especially for Web Structure Mining and Web Content Mining, which requires crawlers to download some web pages. Crawlers are programs that can download web pages automatically. Crawlers can explore many sites to collect information automatically [8].

The website used is TripAdvisor which is the largest tourist site in the world [7] which has more than 570 million reviews and opinions about 7.3 million accommodations, airlines, tourist attractions, and restaurants. TripAdvisor sites are available for 49 countries, and overshadow the largest tourist community in the world, with an average of 455 million visitors each month [10]. TripAdvisor provides reviews from many people regarding travel, such as places to stay, airlines, things to do, and places to eat. The general procedure to get information from web data mining is as follows.

![Figure 1. The procedure of Web Data Mining](image)

3.2 Culinary Tourism Distribution

The dominant goals in developing a tourism product are both pursuits’ economical and social benefits. Hence, the tourism development needs careful planning to extend or harness its life cycle [1]. A tourism destination is described by Medlike, (1993:148), as:
Countries, regions, towns or other areas visited by tourists. Throughout the year, their amenities serve their resident and working populations, but at some or all times of the year, they also have temporary users – tourists. How important any geographical unit is as a tourist destination, is determined by three prime factors: attraction, amenities, and accessibility, which are sometimes called tourism qualities of the destination” [2].

Moreover, in recent years, tourism has started to recognize the surge power of attraction and communication of food products, to the point of turning them into tourist attractions [3, 4]. According to previous research, consumers interested in food, are ordinarily interested in multidisciplinary aspects related to cuisine and gastronomy, stressing the cultural curiosity of the culinary tourist; that is why gastronomy/culinary tourism is having a prominent role as an instrument for the development of a new market segmentation and specialized destinations [4].

In dealing with the upward number of culinary destinations, spatial planners have to be considered to put them in the appropriate zone to make maximum profit for both the private and the regional sake. In this matter, land-use planning plays a crucial role in applying sustainable principles at all government levels. These principles relate to sustainable development in its broadest sense including economic, social and environmental aspects. Also, the decentralization of land-use planning and decision-making raises the question of suitable local institutions and organizations for managing these tasks.

3.3 Bandar Lampung City Spatial Plan Policy

The policy of Bandar Lampung RTRW in 2011-2030 was prepared to direct the development in Bandar Lampung City in an efficient, effective, harmonious, balanced and sustainable manner to improve community welfare and defense security. The RTRW policy regulates one of the space pattern plans that will be used as a reference for 20 years in the development of the area so that all development/programs/activities that use cultivation land must be by their designation in the RTRW.

In related to the culinary destinations take place, it has also been regulated in the RTRW so that the existence of culinary locations is actually by the designation of the land. That way, spatial planning in Bandar Lampung can run optimally and sustainably. Until now the government has mapped the spread of nature tourism and cultural tourism in Bandar Lampung, but no research maps and analyzes the distribution and suitability of culinary locations solely as one of the leading sectors for land use set by the government. Therefore this research will answer the gap.

4. Findings

Based on the results of the acquisition of culinary tourism location data in Bandar Lampung through collecting data from TripAdvisor, 121 culinary destinations are recommended by Bandar Lampung culinary destinations with each having a variety of culinary types. This study aims to spatially reveal the spread pattern of culinary tourism in Bandar Lampung. Spatially, the distribution of culinary destinations locates in almost all sub-districts in Bandar Lampung. Fifteen of the 20 sub-districts in Bandar Lampung have culinary destinations that are in demand by local and outside consumers.
Table 1. Distribution of Culinary Destinations in Bandar Lampung City in 2018 Based on Sub-Districts

| No | Sub-District  | Culinary Tourism |
|----|--------------|------------------|
|    |              | Restaurant | Café & Bistro | Bakery | Total |
| 1  | Bumi Waras  | 7          | 2             | 9      |
| 2  | Enggal      | 20         | 14            | 1      | 35    |
| 3  | Kedamaian   | 4          | 3             | 0      | 7     |
| 4  | Kedaton     | 8          | 1             | 0      | 9     |
| 5  | Kemiling    | 0          | 0             | 0      | 0     |
| 6  | Labuhan Ratu| 2          | 1             | 0      | 3     |
| 7  | Langkapura  | 0          | 0             | 0      | 0     |
| 8  | Panjang     | 1          | 0             | 0      | 1     |
| 9  | Rajabasa    | 3          | 0             | 0      | 3     |
| 10 | Sukabumi    | 0          | 0             | 0      | 0     |
| 11 | Sukarame    | 1          | 1             | 0      | 2     |
| 12 | Tanjung Karang Barat | 3 | 8 | 0 | 11 |
| 13 | Tanjung Karang Pusat | 4 | 0 | 0 | 4 |
| 14 | Tanjung Karang Timur | 0 | 0 | 0 | 0 |
| 15 | Teluk Betung Barat | 0 | 0 | 0 | 0 |
| 16 | Teluk Betung Selatan | 8 | 1 | 0 | 9 |
| 17 | Teluk Betung Utara | 14 | 3 | 1 | 18 |
| 18 | Teluk Betung Timur | 0 | 0 | 0 | 0 |
| 19 | Way Halim   | 5          | 2             | 0      | 7     |

Based on the table above, we can see that the most culinary locations are in Enggal sub-district with 35 culinary destinations, then the second and third most sequential are in Teluk Betung Utara sub-district with 18 culinary sites and Tanjung Karang Pusat with 11 culinary destinations. Bumi Waras, Kedaton, and Teluk Betung Selatan have culinary places that are pretty much in demand as well as nine culinary locations; then some are scattered in Kedamaian and Way Halim districts. Whereas in other sub-districts only a few culinary destinations were identified, some sub-districts did not have recommendations for culinary destinations to visit or exist but were not attended much or received testimonials from consumers that were not detected by TripAdvisor.

Enggal sub-district, which is an extent of Tanjung Karang Pusat sub-district, has many culinary destinations because it is a mix use zone. Most of them are in business areas, besides that several of them are located in the education facilities of elementary, junior high and high schools both private and public and also high-density settlements. Enggal Sub-district consists of Enggal, Pahoman, Tanjung Karang Pusat, Pelita, Rawa Laut, and Gunung Sari villages which are passed by primary and secondary roads so that it is a strategic area for trade and services. With the dense activity in this area, culinary tourism surges rapidly in this zone and then develop linearly to the surrounding area along the primary and secondary roads. Also, we can identify clearly that the distribution of culinary destinations grows in a ribbon development pattern, along with the primary and secondary arterial roads.

Moreover, Teluk Betung Utara sub-district which occupies the second highest place for culinary destinations have a mixed land use patterns, which are mostly water catchment areas (Batu putu Village),
then there are government offices zone, business, and high-density settlements. When looking at the
trends in the spread of culinary destinations in the district, the pattern formed is nucleated patterns in
trade and service areas which are indeed one of the centers of population activity, then only a small part
is spread in high-density residential areas adjacent to trade and service areas.

Then in Tanjung Karang Pusat Subdistrict which is a trading and service area also has a lot of culinary
destinations. Adjacent to Enggal Subdistrict, Tanjung Karang Pusat sub-district which is a business zone
has culinary destinations sprawl with a nucleated pattern. Culinary locations are known to favor on these
strategic areas of business. Unlike the case in Kemiling sub-district, Langkapura, Tanjung Seneng, Teluk
Betung Barat and Teluk Betung Timur which according to data extraction, they do not have a well-
known culinary destination out of the area. Another interesting finding is that apart from being
distributed linearly in the business zone, culinary destinations in Bandar Lampung began to sprawl in
high and medium density residential areas. We can see the sprawl in Way Halim sub-district and several
sub-districts which are crossed by primary arterial and collector roads. The following is the result of
culinary destinations mapping in Bandar Lampung City based on zoning pattern.

![Distribution of Culinary Destinations in Bandar Lampung City in 2018 Based on Zoning](Image)

**Figure 2.** Distribution of Culinary Destinations in Bandar Lampung City in 2018 Based on Zoning

Figure 2 illustrates the distribution pattern of culinary locations is not distributed evenly, but most of
them creating a ribbon development along the business zone. Furthermore, based on GIS information
obtained, business zone become the most favorable zone for culinary destinations, namely 90 culinary
locations are there or around 76% of the total. Meanwhile, 16% of the total sprawl in a high-density
residential zone or as many as 19 sites and the remaining 1 -2 culinary locations are also in medium and
low-density settlements, then in government offices, worship complexes, warehousing, and higher
education areas.
Distribution map of culinary destinations in several sub-districts:

A: Rajabasa, Kedaton, Way Halim, Bahagia, Kedaton Pusat, Tj. Karang Pusat, Tj. Karang Barat, Tj. Karang Timur, Enggal, Kedamaian
B: Tj. Karang Utara, Tj. Betung, Bumi Waras, Panjang
C: Tl. Betung Utara, Tl. Betung Selatan, Bumi Waras, Panjang

Figure 3. Distribution Mapping of Culinary Tourism in Bandar Lampung
Figure 4. Distribution Map of Culinary Tourism Each Zone in Bandar Lampung City Boundary
Sub-district Boundary
Village Boundary
River
Coastline
Primary Arterial Road
Secondary Arterial Road
Primary Collector Road
Secondary Collector Road
Environmental Road
Rail Road
Rail Border
Rivers Border
Springs Border Line
Beach Border Line
Water Infiltration Area
Protected Forest
Green Open Space
Scenic Trails, Mangroves,
Cultural Heritage
Railroad Border Area
River Border
Springs Border Area
Beach Border Line
Water Infiltration Area
Government Offices
Trade and Services
Low Density Residential
High Density Residential
Med. Density Residential
Non-Green Open Space
Mining Area
Fisherman Housing
Fisheries
Marina Area
Maritime Complex
Terminal Area
Bakung Landfill
Defense and Security
Potential Development area
Port/Terminal Own Interests
Education Area
High Education Area
Bakery
Restaurant
Café & Resto
5. Discussions

The purpose of this research is mapping the distribution and spatially revealing the spread pattern of culinary tourism in Bandar Lampung. A discussion about the distribution of tourism at the country, province, and district/city scale has been carried out a lot [7, 11, 12, 13, 14, 15, 16, 17, 18, 19], but no one has included culinary tourism related analysis inside it. In addition, research on the distribution of tourism, namely culinary tourism in particular at the city scale, no one has done it. In fact, culinary tourism is one form of tourism which now invites tourists from both locally even internationally [20]. Therefore, this research was made to answer the gap.

Based on the findings above, we can mention that the distribution of identified culinary destinations is uneven. The trend of the spread of culinary destinations is very dependent on the land use function in each existing zone. Based on this research, trade and service areas have the highest distribution of culinary destinations; even the ratio is very far compared to the number of culinary destinations in other regions. In detail, zonation with the most tourist locations to the smallest are business areas, high-density, medium, until low-density residential areas, and educational areas as well. Meanwhile, the zonation with the least culinary destinations is in the government office zone, religious zone, warehousing zone, and river border area. The business zone has a great potential in attracting many people to come because they are strategic areas, one of which is close to the primary and secondary roads, the center of the population activity, good accessibility, which encourages the culinary destinations within the zone. According to Bandar Lampung City Spatial Planning Policy, the government directs the business zone to be in a linear pattern. And on an existing basis, the sprawl of culinary destinations in the business zone is vast, reaching 76% compared to other regions with ribbon development patterns. Furthermore, the distribution pattern of culinary tourism in Bandar Lampung City in addition to forming ribbon development also forms nucleated patterns in the prime strategic business zone, around Tanjung Karang District (precisely in Enggal District), and around Teluk Betung District South (in North Teluk Betung Business Zone to be exact).

Furthermore, an interesting finding from the mapping results is the sprawl pattern of culinary sites in high, medium and low-density residential zones and in the higher education zones which formed a dispersed pattern. In detail, the culinary destinations sprawl following the potential number of consumers. As illustrated in the map above, high-density settlements in Bandar Lampung have expanded next to the business zone, following the pathway along the zone. Hence, the potential for the growth of culinary destinations in this area is enormous. Likewise, the housing area where being traversed by primary and secondary arterial roads is likely to become the next most population activity after the business zone are fully used. Because these locations are considered strategic in terms of accessibility and facilities.

An interesting finding is that culinary destinations in Bandar Lampung spread in the area of higher education. Although not widely known yet, the existence of educational facilities is a separate trigger that attracts investors or culinary managers to build culinary destinations around the area. Moreover, we believe that young consumers are most active social media users [21, 22, 23], so indirectly they help introduce the culinary destinations in Bandar Lampung that they visit. Therefore, culinary destinations begin to look at higher education zone as the location of their businesses. The area located in Zainal Abidin Pagar Alam, Gedong Meneng, and Rajabasa are educational zone (elementary, junior high, high school, and universities) both public and private gathered there so that many culinary destinations are sprawl in the region. Likewise in the area around Gotong Royong and Pahoman villages, there are also educational facilities (see figure 4). The sprawl of culinary tourism in the educational area is still in line with the government's plan in the RTRW policy related to the provision of common education support.
facilities specifically for students. It also mentioned the same regulation for development in the business zone by taking into account the characteristics of the region.

Things that need to be concerned are the presence of culinary destination in the protected zone, namely the coastal borderline. The location was chosen perhaps because it was close to the beach tourism location so that it made it strategic to attract consumers to come. However, if the development is not well controlled, it will endanger and damage the function of the protected area itself.

Unfortunately, this study cannot analyze the suitability of land-use functions more accurately because this study uses consumer preference data and compares the culinary existence locations with city-scale planning documents. While to get more detailed justification to assess the spatial suitability of land-use is to compare it with more detail scale of document plans, such as per zoning (RDTR) or even per building and environment (RTBL). In addition, further research related to the spread of culinary tourism seen from the scale of the land use area will be interesting to conduct.

Even so, for the initial analysis related to the spread of culinary destinations in general, this study has been able to spatially describe the spread of culinary tourism that tourists are interested in in the capital city of Lampung Province.

6. Summary
This study succeeded in mapping the distribution of culinary tourism in Bandar Lampung City, in which the distribution is uneven, some sub-districts have many famous culinary destinations that many tourists familiar with and vice versa there were sub-districts that might have culinary destinations but are not well-known outside the region. This study reveals that Enggal sub-district has the first most culinary destinations, then followed by the second and third consecutive sub-districts are in Teluk Betung Utara and Tanjung Karang Pusat sub-districts. Substantial number differences with the three sub-districts, there are also culinary destinations in the sub-districts of Bumi Waras, Kedaton, and Teluk Betung Selatan which are known and in high demand, and the rest are scattered in Kedamaian and Way Halim sub-districts.

Besides, this research successful in spatially reveals the spread pattern of culinary tourism in Bandar Lampung City. The distribution pattern of culinary sites dominate to form a ribbon development along the business zone, nucleated in a specific colossal business zone and dispersed development in several residential areas passed by the primary and secondary main roads. If we refer to the Bandar Lampung City plan policy, the distribution pattern of the culinary is accordance with the built function area which is intended for building usage. In addition, the development and distribution of culinary tourism are still accordances with the government planning policy that wants to intensify international and regional trade and service areas in Teluk Betung Selatan, Tanjung Karang Pusat, and Kedaton sub-district. However, the local government must control the development of the culinary destinations sprawl because if it is not the strategic location used for the business can penetrate into protected zone widely such as in the coastal borderline which incidentally is also adjacent to the natural tourist beaches there.

Further research is strongly advised to gain a more detailed understanding of the culinary tourism distribution considering the classification of zones, the advantages or disadvantages of each zone and using a more comprehensive existing data.

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