INDONESIAN JOURNAL OF GEOGRAPHY

RESEARCH ARTICLE

Model of Agents-Based Branchless Banking Services Development in Urban and Rural Area

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Abstract The banking sector has experienced a far leap related to Information Communication and Technology (ICT)-based services. Among them is e-banking that has been used by the community, especially in urban areas. Likewise, the use of ATMs can be used to provide banking services to the wider community, so that it can replace most of the functions of services in banks. However, in communities outside of urban areas such as rural communities there are still limitations in accessing e-banking and ATM services. Limited use of e-banking because this service must use internet media or smart phones to access. Meanwhile, the limited use of ATMs due to the availability of ATMs in rural areas is not as much as in urban areas, considering that rural areas are areas with low settlement densities. Today, banks in Indonesia have provided branchless banking by enabling agents. Branchless banking is found in urban, suburban and rural areas. In previous research, the existence of branchless banking in the form of agents and their utilization by customers has been identified. From previous studies, maps of agent and customer density and analysis related to the condition of regional accessibility have been produced. This research is a further study focusing on sub districts area with high agent density in both rural, suburban and urban areas. The purpose of this research is to analyze the development model of agent-based branchless banking services. Data was collected through primary data through observation, structured interviews and measurement of coordinates of the location of agents and banking services in the form of ATMs and Banks. The final result is expected to be used as a model for the development of branchless banking services in Indonesia.

1. Introduction

Advances in information technology affect the way of life, including the banking sector, which has an impact on the way people access banking (Ferdous et al.; Rachmawati and Rijanta, 2012). At present branchless banking services have been developed. Kenya has been the center of branchless banking financial innovation in the past decade, which has attracted global research interest (Chipeta and Muthinja, 2018).

The technological revolution changes the basic dimensions of human life in terms of time and place (Castells, 1989 in Stilwell, 1995), especially for computer applications and telecommunications such as e-banking (Stilwell, 1995). E-banking as one of the branchless banking services. E-banking services provide convenience in conducting transactions, consisting of SMS banking, phone banking, and internet banking, this service allows people to get e-banking services without moving (Rachmawati and Rijanta, 2012). Mobile banking is the newest way of banking, as it makes it easier for consumers to access their finances, even from rural and remote areas. However, for conditions in Indonesia, the use of mobile banking in rural areas is likely still not much. Recently branchless banking service exists in the form of agents. This service does not emphasize physical services such as banks. Banking agents have become an important practice of financial institutions in bringing their services closer to service users (Ferdous et al., 2015). Trust factors play an important role in whether a person is willing or not to adopt the e-banking model (Yousafzai et al., 2003). Trust is built on a sense of security, guarantees of privacy, benefits gained, honesty, and competence (Yousafzai et al., 2003). High trust is supported by low risk factors encouraging to be willing to use e-banking services (Yousafzai et al., 2003). Lack of customer confidence is an inhibiting factor for adopting branchless banking (Hegde and Kotian, 2016).Three important things related to efforts to increase utilization of branchless banking are:

First, build customer confidence and increase use. Second, invest in the agent network to ensure a consistent, reliable, and uniform customer experience at all agents. Third, prevent fraud and abuse. Evidence

of abuse of branchless banking services could undermine the confidence of customers. (Bold, 2011).

In connection with the use of ATM (Automatic Teller Machine), e-banking, mobile banking, not everyone is ready and able to utilize this technology, especially in rural areas. Some of them still like to use banking services through direct contact with officer. Likewise, certain community groups in urban areas, base on previous research 2 of 40 case unit (informant) perceive that face to face communication is more favored than receiving service from a machine (Rachmawati, 2011). The existence of an ATM is usually located in a central area of trade and services, industry, and regular residents (Rachmawati, et al., 2009). Related to this, the existence of ATMs is more often found in urban areas compared to rural areas. The starting point of building branchless banking system is to take banking transactions out of bank branches into retail stores in every neighborhood and in every village (Mas, 2009).

In the British building society sector, despite some evidence of branch closure as the use of the Internet and telephone call centres in the delivery of financial services has grown, the picture that emerges is of a dynamic branch network that is responding to changing customer demands and new technological possibilities. Face-to-face advice and discussions between customers and trained 'experts' remain an important part of the mortgage transaction. (Willis et al., 2001).

In relation with branchless banking, several banks in Indonesia have introduced branchless banking, especially to make it easier to provide services to people who cannot easily access ICT-based banking services such as ATM, e banking and mobile banking, through the role of agents. The use of agent is also as to get bank services and need assist from someone being agent but not in informal place like at bank. This phenomena is very important to be explored. Interesting research questions to study are; how is the branchless banking development model suitable for rural and urban areas in the future? Furthermore, this research is intended to develop a model for developing agents-based branchless banking services. This research is a continuation of the first research that has resulted in the identification and mapping of the distribution of the existence of branchless banking and its utilization by customers and analysis related to the condition of the region (Rachmawati et al., 2019/b).

2. The Methods

This research was conducted in three regions, namely Kulon Progo Regency as a representation of rural areas, the City of Yogyakarta, and the suburbs covered by sub districts located in Sleman Regency which is a suburb of Yogyakarta City. Based on the research that carried out in 2017, the result showed that there are ten districts in the three regions

mentioned above that have the highest number of agents. In the research in 2018 data collected in the field was focused on these sub-districts. This research was conducted to identify branchless banking services through agents and customers, particularly in areas where previously identified research was high density areas for agents.

The data taken includes checking the existence of agent that has been identified before and adding the location of the new agent. Besides that, there are also identified the location of banks and ATMs. The data of the existence of agents is done through field surveys. Furthermore, the coordinates of the location of the agent are measured.

Data is also collected through structured interviews of both agents and customers. Data of customer is collected using accidental sampling. In accidental sampling, sample was carried out by selecting the cases until the desired number of sample was reached (Wilson 2014). In this study accidental sampling is used to retrieve data about agents user. Interviews were conducted with customers who were visiting the observed agent.

3. Results and Discussion

Bank have an authority to cooperate with agents serving as the extension of the bank in providing services to customers (Otoritas Jasa Keuangan 2014 in Rachmawati et.al., 2019/b). Branchless banking service is a saving product and credit/payment to customers, and other bank services (Rachmawati et al., 2019/b). There are some types of branchless banking model in Indonesia i.e. using ATM, agent and branchless banking by bank officer who comes to customer place (Shabirah and Aldianto 2014 in Rachmawati et al., 2019/b). Branchless banking included also e-banking such as phone banking, sms banking and internet banking, but now people prefer use mobile banking form their smart phone. Several forces shaping the future of branchless banking i.e. (Pickens et al., 2009): 1) a greater number of younger consumers and mobility will be favorable for the adoption of branchless banking; 2) a great role from governments as regulators of the financial sector, providers or encouragers of the rollout of low-cost bank accounts and financial infrastructure; 3) security concerns about cash crime will continue to drive the adoption of electronic transaction channels; 4) internet browsing via mobile phones will reduce costs of financial transactions. Pickens et al. (2009) adopted the CGAP and DFID definitions of branchless banking. In this regard, branchless banking is defined as the delivery of financial services outside conventional bank branches using information and communication technology and non-bank retail agents, for example, through card-based networks or by cellphones. However, in this research branchless banking includes agents. The discussion will focus on branchless banking-agents.

The definition of branchless banking services in an other research is a program of providing banking services through collaboration with other parties (bank agents) and supported by ICT (Kustina, 2019). By using Branchless Banking, the transactions were not dependent on the bank offices presence, since the financial services can be done through bank agents using Electronic Data Capture (Kustina, 2019).

In relation to branchless banking in Indonesia, the survey results in the study area found 5 banks that provide branchless banking-agent services, namely: BTPN, BPD, BRI, Mandiri and BNI. The chosen research location is the location with the highest agent density (Figure 1) in each Regency/City, namely in Kotagede, Umbulharjo, and Danurejan Sub Districts located in Yogyakarta City; Suburban areas consist of Depok, Gamping and Godean Sub Districts, as well as in rural areas consisting of Kalibawang, Lendah, Panjatan and Pengasih Sub Districts.

The customer density map in Figure 2 shows a linear relationship with the agent density map in each district/city. This shows that the increasing number of agents in an area is proportional to the number of customers in the region. When viewed from the level of existence, agent and customer relations have a relationship that is inversely proportional to the number of banks and ATMs in each region. Based on Table 1, in the rural area (Kulon Progo Regency) has the least number of banks and ATMs, but the number of agents in the region is the most. The development of information and communication technology has enabled the transition of urban services to take place in villages in the implementation of branchless banking services through agents (Rachmawati, et al., 2019/c). Unlike the City of Yogyakarta and Sleman Regency which have fewer agents but many ATMs and banks are found in the region. This is in accordance with the agent's function in branchless banking services that can be used as a substitute for bank offices or ATMs in conducting various types of transactions, especially for areas that have not been reached by banks so as to facilitate the public in accessing banking services.

Based on the density map in Figures 3 and 4, shows that the number of ATMs and Banks is dominated in urban areas. It can be seen that the number of ATMs in Kulon Progo

Regency is only in 1 Sub District, namely Lendah Sub District, in contrast to ATMs and banks located in Yogyakarta City which can be found in all study districts. ATM and Bank density maps can describe the distribution patterns of ATMs and Banks in all three regions. Increasingly heading to urban areas, ATM and bank density levels are also getting higher.

The location of several sub-districts in Kulon Progo Regency is far from the city center. This causes banks and ATMs to be rarely available in this region. This condition is in line with the concept of branchless banking services which are basically intended to expand banking services, especially in rural areas far from the location of bank offices.

Based on Table 2, the number of agents in 2018, there were 27 agents, namely, 21 agents were old agents, and 6 agents were new agents in Kulon Progo Regency. As for customers who can be found as many as 19 customers. The most number of agents is in Kalibawang District, namely 12 agents and the fewest in Pengasih District, namely 3 agents.

The difference between the number of agents and customers in 2017 and 2018 has changed differently in each region. Significant changes are in Panjatan District. Panjatan District bank agents are no longer active since some agents have begun to have difficulties in depositing balances as well as the absence of periodic checks from the bank. In addition, the existence of agents in the Panjatan region has been replaced by start-ups like Bukalapak that offer the same services as bank agents, namely to pay credit, electricity, and others. The type of transaction that is most commonly used according to the agent's perception is an electricity payment of 29%, whereas according to customer perception, the most commonly used transaction is 37% credit payment.

Of the total agents, 48% reasoned to be agents because of their own desire to get some benefits such as attracting visitors, business needs according to the times, and because banks had not yet reached the local area. The existence of an agent serves to facilitate customers from the location of the house so that it can save time and costs. The location factor influences the time and costs incurred by customers in accessing services, so that the perception of the location of the agent by the customer is important to be studied to deter-

Table 1. Comparison of the Number of Agents, Customers, ATMs and Banks

Regency/City	Total		ATM	Bank
	Agents	Customers		
Kulon Progo Regency	27	19	1	7
Sleman Regency (Peri Urban)	20	12	60	38
Yogyakarta City	14	0	85	26

Table 2. Comparison of the Number of Agents and Customers of Kulon Progo Regency

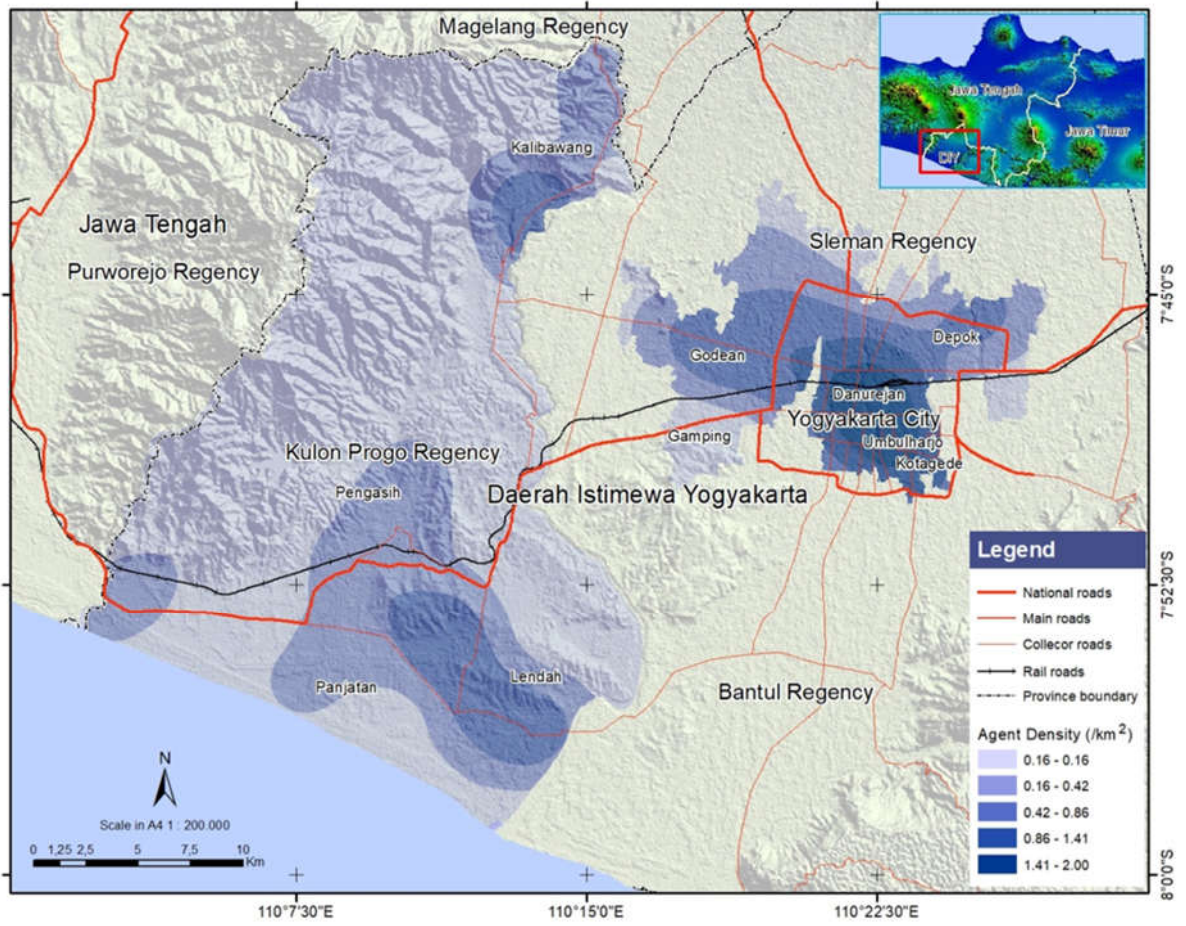| Sub District	Number of Agents		Number of Customers		ATM	Bank
	2017	2018	2017	2018		
Kalibawang	10	12	4	4	0	4
Lendah	8	6	0	6	1	5
Panjatan	10	6	12	6	0	3
Pengasih	3	3	6	3	0	5
Total	31	27	22	19	1	17

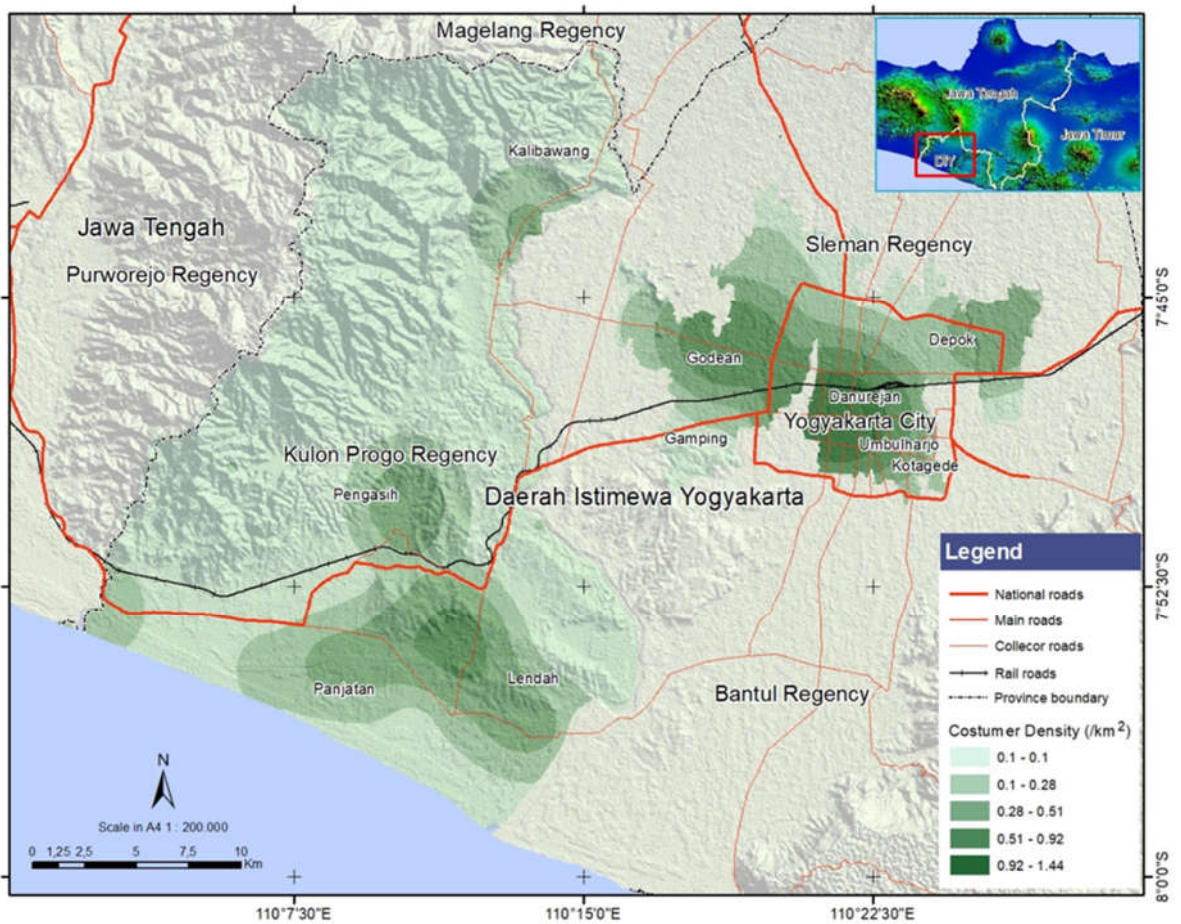Figure 1. Map of Agent Density in Research Area

Figure 2. Customer Density Map in the Research Area

mine the feasibility of the distribution of existing agents in Kulon Progo Regency. The location of agents in Kulon Progo Regency apart from being on the side of the highway also spread to the village streets and settlements.

Most of the areas in Kulon Progo Regency are rural areas. The results in Kulon Progo district are in line with the results of other studies which state that agents-based branchless banking can provide services to rural communities (Hegde and Kotian, 2016). For example, a large proportion of the rural population in South Kanara District and Udupi District do not have bank accounts due to insufficient money and fears of insecurity of funds being deposited to banks that they choose to use agent services (Hegde and Kotian, 2016). Customer existence and its relation to accessibility in Kulon Progo Regency can be seen in Figure 5.

There are 20 agents in 2018, consisting of 8 old agents, and 12 new agents are new agents in peri urban area in Sleman Regency. Customers can be found as many as 12 customers (Table 3). The decline in the largest number of agents was found in Gamping Sub District, a decline in the number of agents due to the emergence of various types of start-ups that offered the same services as bank agents. However, in Godean Sub District, there was a fairly high increase. This is due to the regional regulation that requires that non-cash assistance must be through bank agents, thus giving rise to many bank agents who work directly with the regional government.

The type of transaction, according to the agent, is at most a deposit of (22%), while the version is dominated by electricity payment transactions (38%). The majority of business operators come from being offered directly from the bank. As many as 65% of agents got benefit in the form of increase

income. Meanwhile, 42% of customers state that the biggest benefit is the location of the agent adjacent to the customer's residence. So that customer can save time compared to having to do transactions in the bank that need more time to queue.

The existence of a large number of banks and ATMs is caused by the fact that the suburbs of Yogyakarta are included in the high population density, there are many services, education and office activities, which gives rise to high mobility of money and the need for financial service providers. Customer identity and its relation to accessibility in Urban Fringe of Yogyakarta that located in Sleman Regency can be seen in Figure 6.

There are 14 agents in Yogyakarta City in 2018, namely 5 agents are old agents and 9 agents are new agents. The most number of agents is in two sub-districts, namely Danurejan and Umbulharjo Sub Districts. While the least agents are in Kotagede Sub District. Significant changes are in Kotagede Sub District. In 2017 there were 9 active agents, while in 2018, only 1 agent was active, and 1 other agent was a new agent. The type of transaction that is often carried out is the distribution of poor rice (36%). Fifty percent of active agents reason to be agents because there are direct offers from banks. In addition, 41% of agents stated that one of the advantages of being an agent is increasing income. The results of the previous research show that the making use of branchless banking through an agent in urban areas is more based on the factors of location close to the customers' home and easy accessibility (Rachmawati et al., 2019/b). In addition, there are also convenience factors, such as unlimited time for service and familiarity in accessing (Rachmawati et al., 2019/a).

Table 3. Comparison of the Number of Agents and Customers in Sleman Regency (Peri Urban Area)

District	Sub Districts	Number of Agents		Number of Customers		ATM	Bank
		2017	2018	2017	2018		
Sleman	Depok	7	7	8	3	14	7
	Godean	8	16	7	7	17	17
	Gamping	7	5	5	2	29	14
	Total	22	20	20	12	60	38

Table 4. Comparison of the Number of Yogyakarta City Agents and Customers

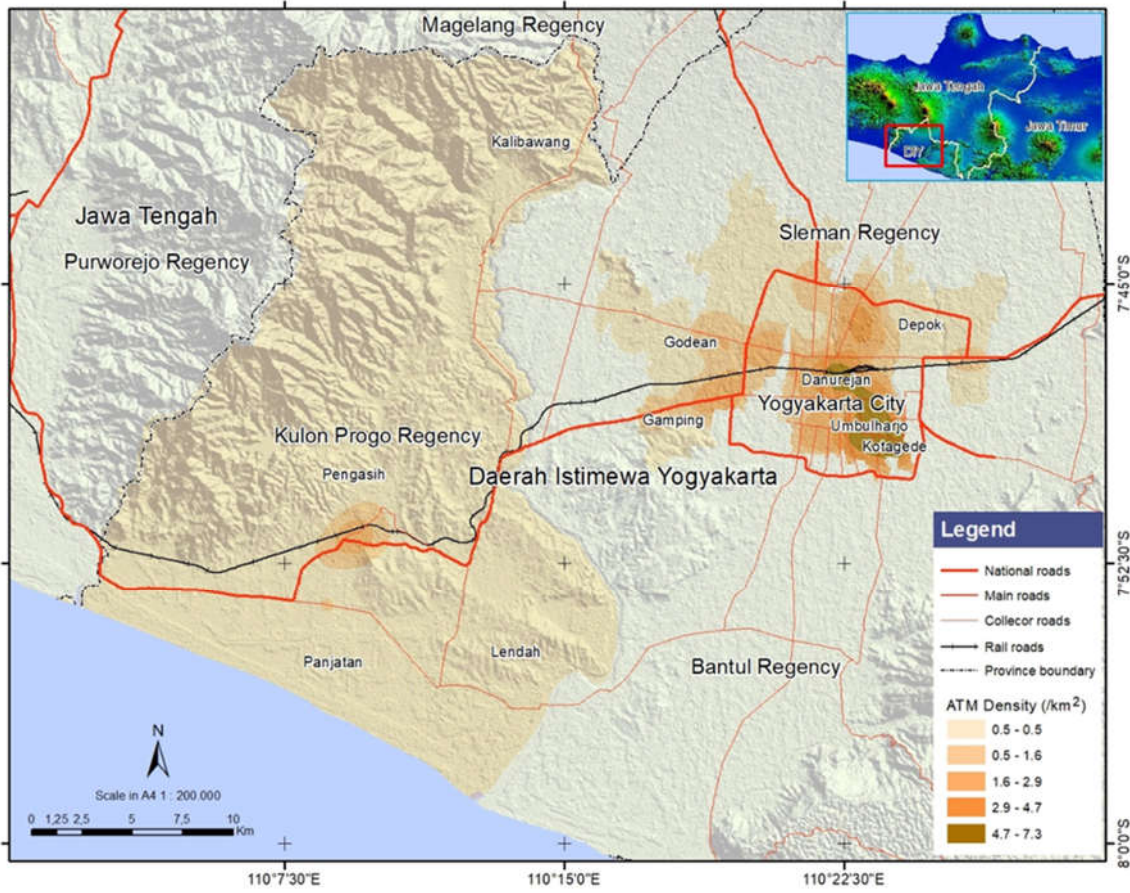| Sub Districts		Number of Agents		Number of Costumers		ATM	Bank
		2017	2018	2017	2018		
Danurejan		5	6	2	0	14	4
Kotagede		9	2	2	0	25	7
Umbulharjo		8	6	3	0	46	15
	Total	22	14	7	0	85	26

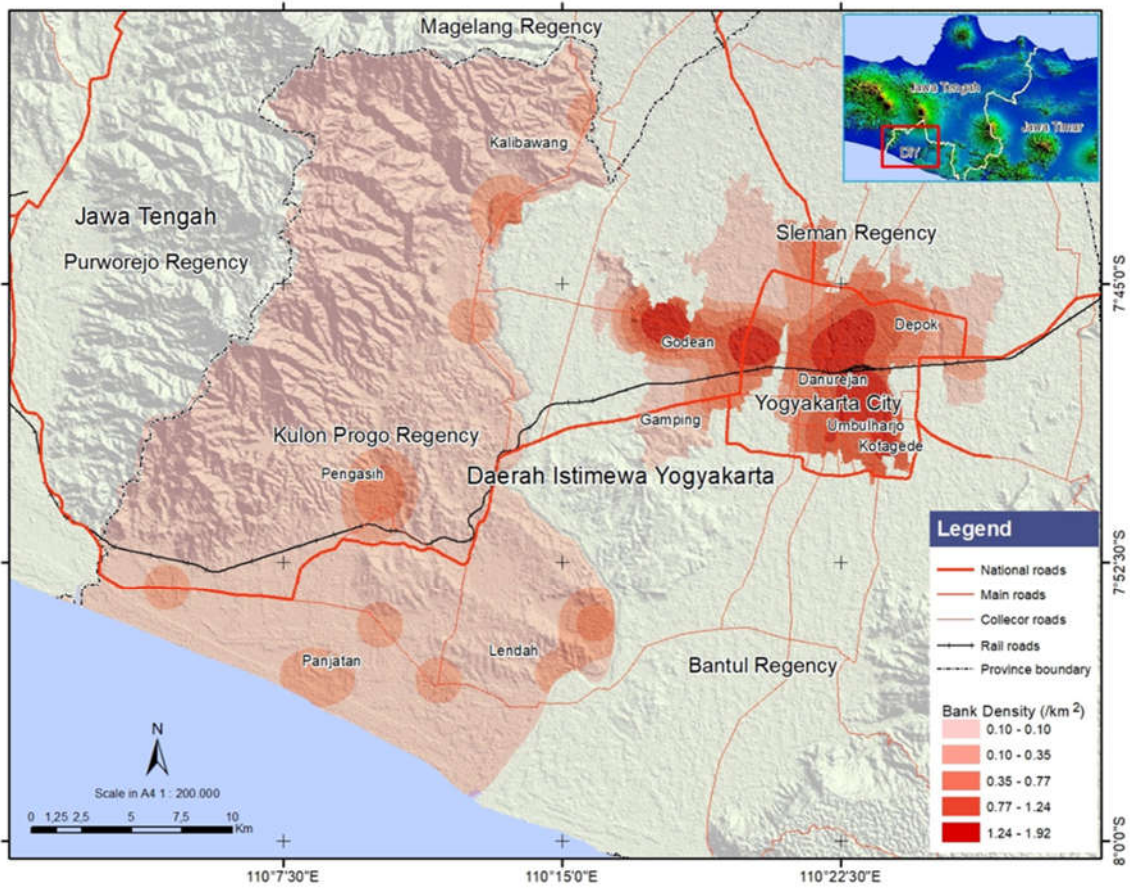Figure 3. ATM Density Map in the Research Area

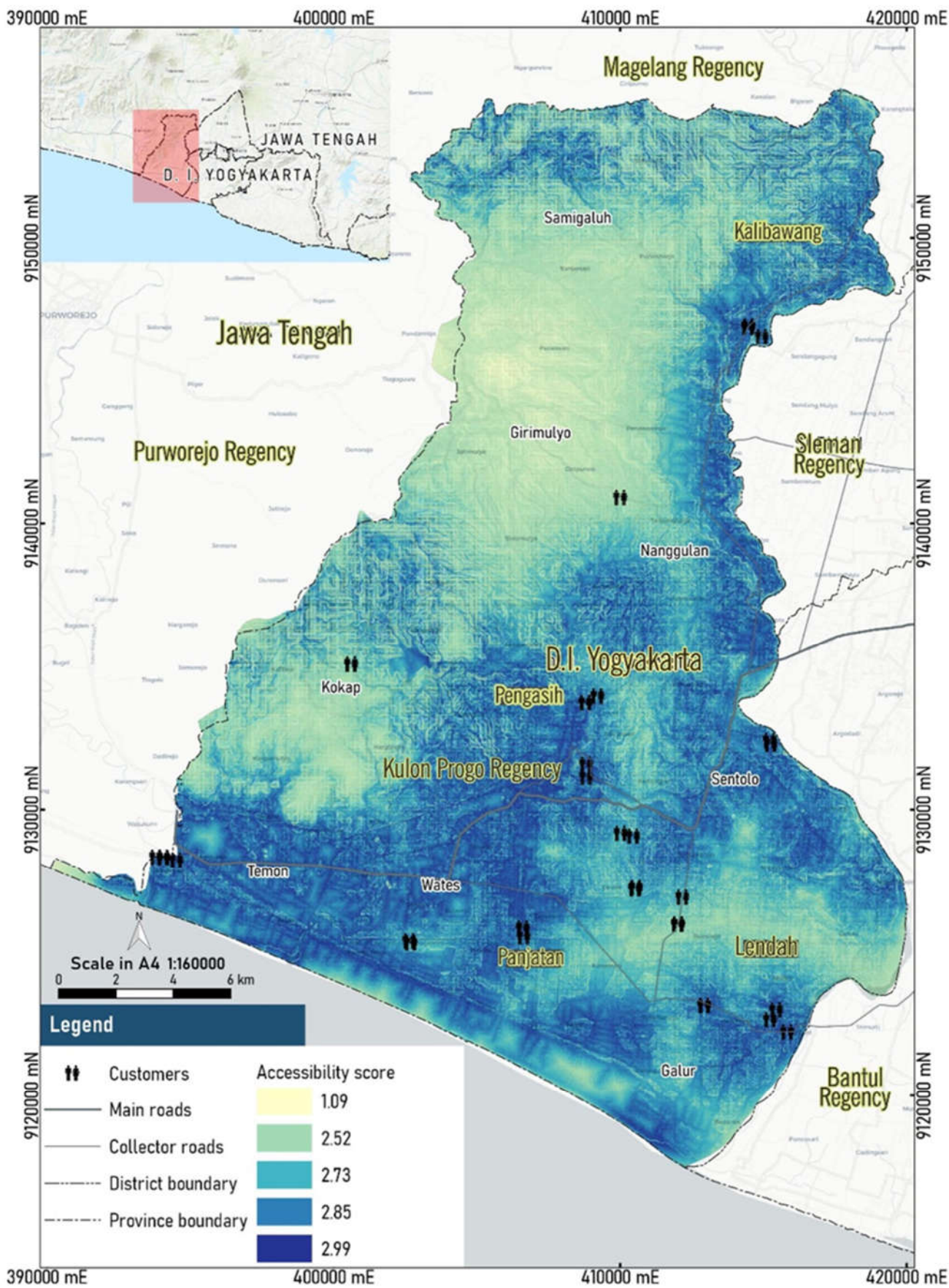Figure 4. Bank Density Map in the Research Area

Figure 5. Map of Customer Existence and its Relation to Accessibility in Kulon Progo Regency
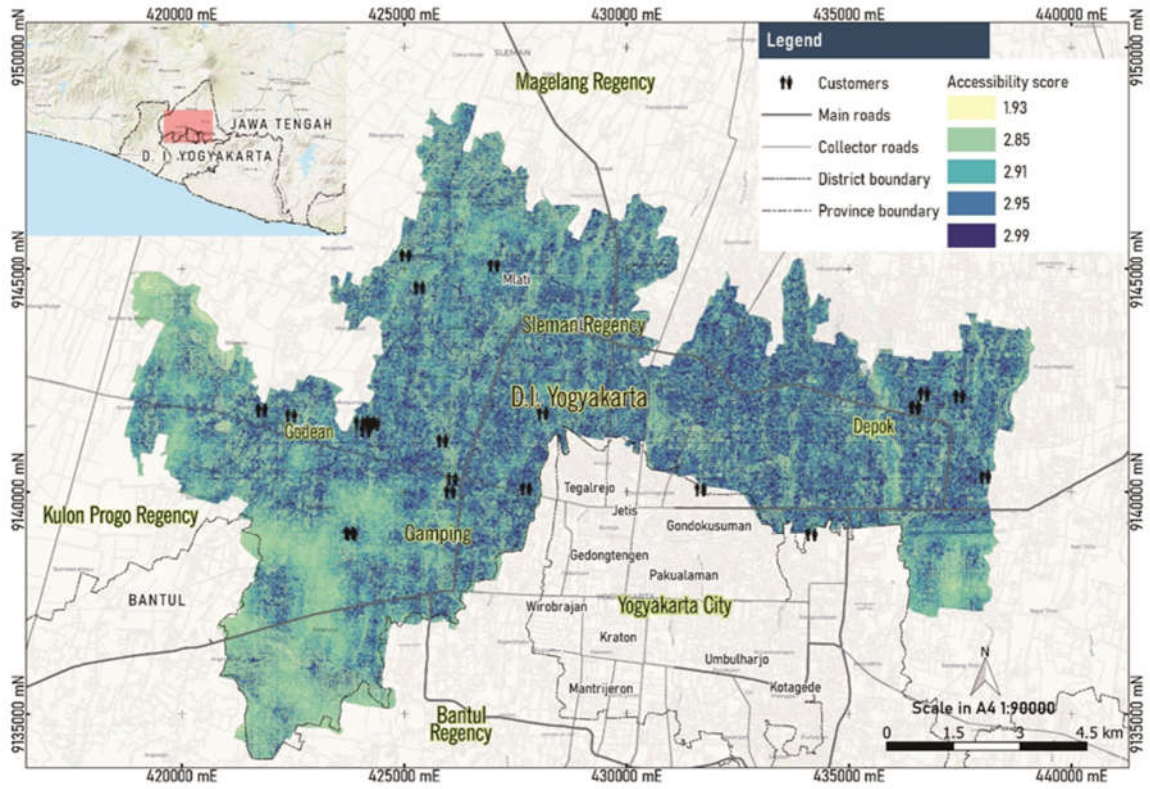
Figure 6. Map of Customer Identity and its Relation to Accessibility in Urban Fringe of Yogyakarta City that
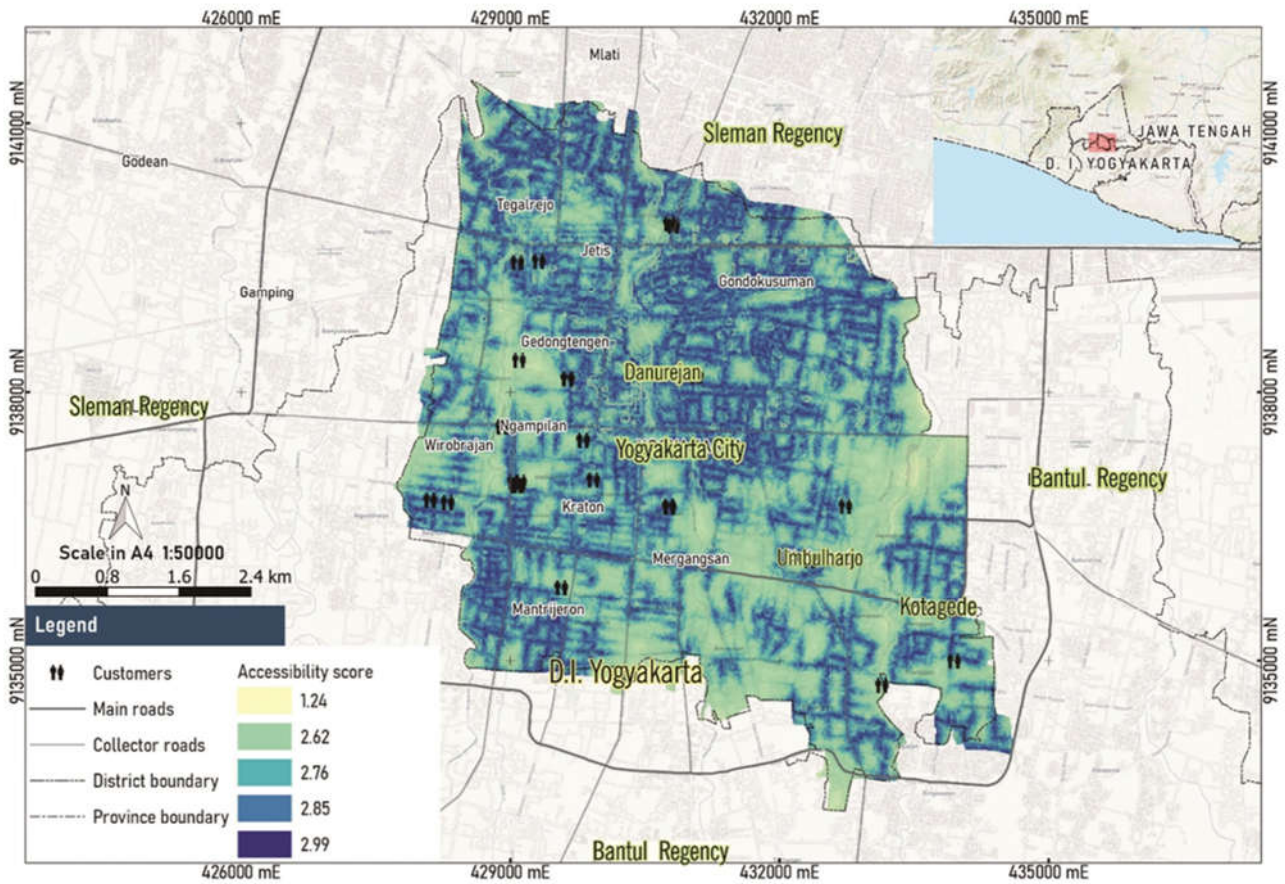

Figure 7. Map of Customer Existence and Its Relation to Accessibility in Yogyakarta City

The results show that better accessibility in the city of Yogyakarta makes it easy for customers to utilize agents. However, because in the city there are many ATMs, most people tend to use ATMs rather than agents. In Bangladesh, banking agents can be incorporated into the banking system and can help increase bank profitability (Ferdous et al., 2015). Likewise, that should be done in Indonesia. Agents in rural areas need to be trained to improve their performance so that people are interested in utilizing banking services through agents. What has already happened in rural areas is a sense of trust and comfort towards the agent because there are still elements of neighbor relations, besides because the place of residence is close to the agent.

In connection with the modeling of the location of recommendations for new branchless banking agents, several steps in spatial modeling are needed (Figure 8). The first step is making a map of the density of agents and customers. Kernel density estimation (KDE) from Silverman (1986) used to create density map in km². The second step is making accessibility maps. The map of ATM, bank, road network, and settlement convert to Euclidean distance map. The Euclidean distance is generating the output in raster format contains
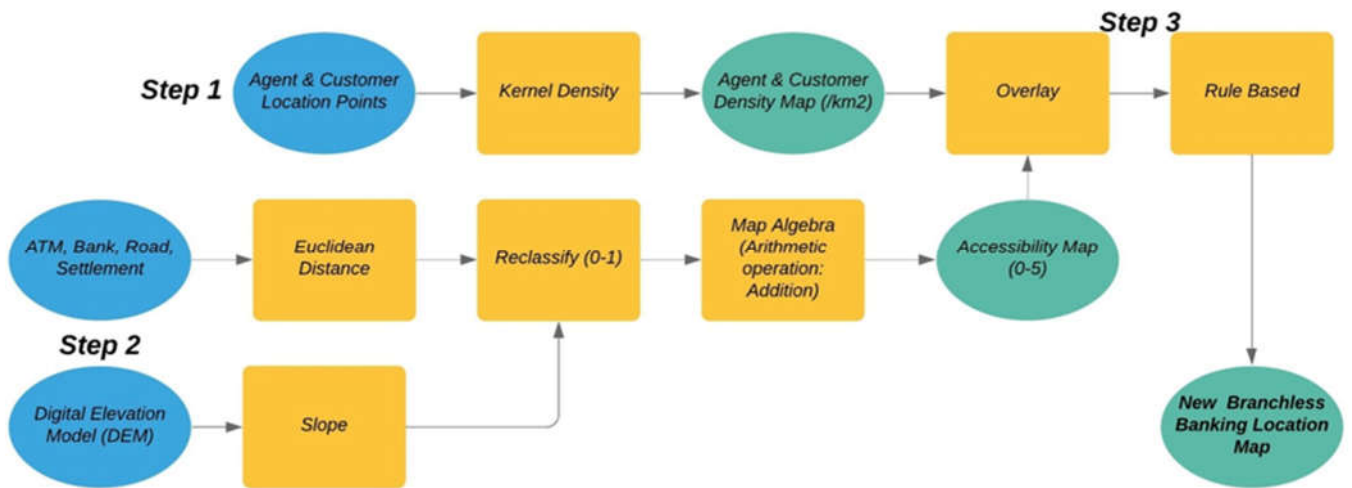

Figure 8. The model of agents-based branchless banking service development in urban and rural area.
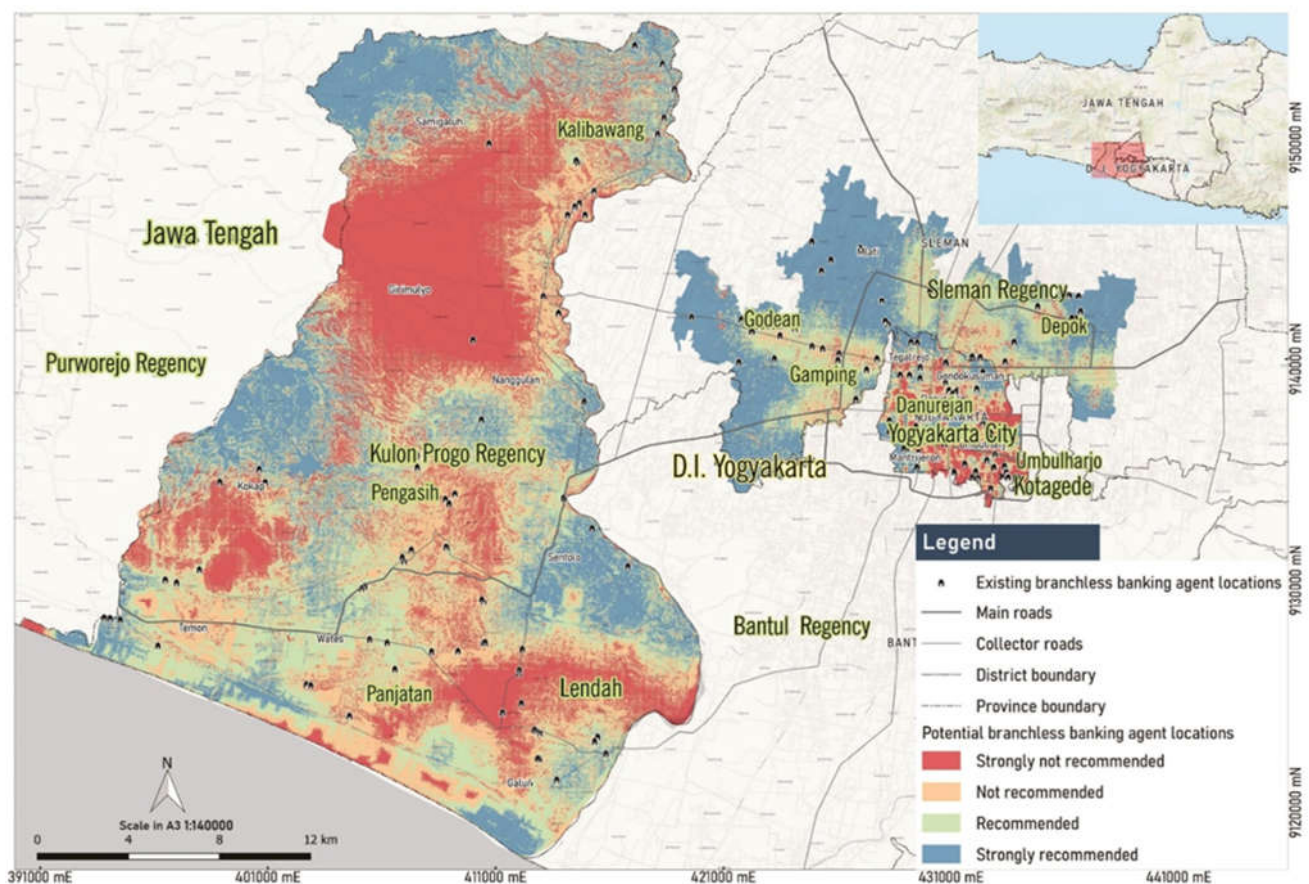

Figure 9. Map of Potential Branchless Banking Agent Locations

the measured distance from every cell to the nearest source in the projection units of the raster and computed from cell center to cell center (Anton and Rorres, 2013). The digital elevation model (DEM) process to generate slope map. Euclidean distance map and slope map are reclassifying to value 0 – 1, then process to arithmetic operation (overlay) using addition to make accessibility map. The third step is to create a combined map of agent and customer density with accessibility map as an analysis map. Overlay and rule based analysis are applied to make the final map of new branchless banking location.

The recommendation for the location of the new priority agent is to be around the customer density that is not yet in the existing agent density. The second priority location is in locations other than the first priority which has high accessibility. Locations that are not prioritized are those that are in low accessibility. Potential branchless banking agent locations can be seen in Figure 9.

4. Conclusion

The results showed that the level of utilization of branchless banking in urban, suburban, and rural areas was inversely proportional to the presence of ATMs and banks in each region. The less the number of banks and ATMs, the more agents and customers in a region. The number of agents in rural area is higher than in urban area. It can be seen for the case of the research in Kulon Progo Regency, which is a rural area and the City of Yogyakarta. Judging from the cross-check results, the field shows that the number of agents and customers in urban, peripheral and rural areas experienced a decrease which was indicated by the presence of customers and agents who were no longer operating because they had been replaced with start-ups such as Bukalapak which offered the same services as bank agents namely to pay credit, electricity, and others. The development of branchless banking services is more directed at locations in rural areas taking into account accessible locations.

The development of branchless banking services is more directed at locations in rural areas taking into account accessible locations. But in general, the recommendation for the location of the new agent is to be around the customer density that is not yet in the existing agent density and in locations other than the first priority which has high accessibility.

Acknowledgments

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