DOI: https://doi.org/10.18778/0867-5856.33.2.09 e-ISSN 2080-6922, ISSN 0867-5856

COPE Member since 2019 JM14487

Turyzm/Tourism
2023, 33/2

Tourism village clusters: Potential for development at Jepara, Indonesia

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How to cite (APA style): Fafurida, F., Oktavilia, S., Putri P.I., & Lutfiana, N.A. (2023). Tourism village clusters: Potential for development at Jepara, Indonesia. *Turyzm/Tourism, 33*(2), 111–120. https://doi.org/10.18778/0867-5856.33.2.09

ABSTRACT

The tourism sector is one of the leading national economic sectors in Indonesia and it has developed very rapidly. Efforts to improve the rural economy are also directed at tourism development. Central Java is a province with a number of tourist villages and development in some regions like Jepara Regency has locations that are close to each other. This research aims at identifying the cluster pattern of tourist village development in Jepara Regency, Central Java Province. It applies a quantitative approach using secondary data with a k-means cluster analysis. The results found that there are three clusters of tourist villages in Jepara Regency: (a) cluster 1 has six tourist villages which have high numbers of visitors, easy access, appropriate public and tourist facilities, but have few attractions and their locations are quite far from each other; (b) cluster 2 has eight tourist villages with many attractions, appropriate public facilities, close distances between locations and easy access, but have low numbers of visitors and limited tourist facilities; (c) cluster 3 has ten tourist villages, easy access, but a low rate of tourist visits, limited attractions, long distances between locations, and also limited public and tourist facilities.

KEYWORDS

rural tourism, cluster, regional, economic development

ARTICLE INFORMATION DETAILS

Received:
3 January 2023
Accepted:
26 October 2023
Published:
12 December 2023

1. Introduction

The tourism sector is one of the leading national economic sector in Indonesia and has developed very rapidly. It has multiplier effects that may affect other sectors as well in encouraging regional and national economic development. The tourism sector plays an important role by being a source of foreign exchange earnings, creating jobs, increasing community and regional income, developing business and infrastructure, and also introducing the nation's culture. The significant role of the tourism sector is increasing.

The contribution of the tourism sector to national economic growth can be identified through the national gross domestic product (GDP), foreign exchange earnings, foreign tourist visits and domestic tourist trips.

In the period 2016–2020, the national tourism sector increased consistently, despite 2020 when it decreased due to the COVID-19 pandemic. The achievement of the tourism sector has made it the leader in contributing the foreign exchange to national economic growth. The following table shows data related to targets and their achievements in this contribution to national economic growth via several indicators during the period 2016–2020.

Table 1 shows that during the period of 2016–2020 the national tourism sector relative to national GDP reached its target. In 2018, the contribution was 5.25%, in 2019 – 4.80%, and in 2020 – 4.1%, but targeted at just 4% due to the COVID-19 pandemic. During 2016–2020, the achievement of the sector as a contributor to foreign exchange earnings also reached its target: in 2018, the sector earned foreign exchange of IDR 224 trillion, in 2019 – IDR 197 trillion, and in 2020 – IDR 41.3 trillion. The achievements exceed their targets and consistently make national tourism the leading sector contributing to foreign exchange earnings in the national economy. This was supported by the numbers of foreign tourist visits and domestic tourist trips also exceeding their targets. During 2016–2020, foreign tourist visits increased: in 2018 there were 15.81 million visits, in 2019 – 16.1 million, while in 2020 – 4.02 million. For domestic tourist trips: in 2018 there were 303.5 million, in 2019 – 290 million, and in 2020 – 129 million. In addition, the competitiveness of the national tourism sector has increased but has not yet reached its target, so it is necessary to improve infrastructure and other supporting factors so that competitiveness may increase and achieve those targets.

The national tourism sector involves both rural and urban tourism. Rural tourism has two components: rural tourism itself and tourist villages. A tourist village is an area with potential and uniqueness as a tourist attraction including the unique experience of life and the traditions of rural communities with all their potential (Wirdayanti et al., 2021). Tourist villages have a significant role in reducing the burden of urbanization, providing job opportunities and improving welfare, and is used as an alternative strategy for village development. In Indonesia, there are many villages that have been called tourist villages. Based on the 2020 village potential statistics, Indonesia has 1,734 tourist villages on various islands. Java and Bali have the most, namely 857, the island of Sumatra – 355, followed by Nusa Tenggara with 189, Sulawesi – 119, Kalimantan – 117, Papua – 74, and Maluku – 23.

The province in Java-Bali that has the highest number of tourist villages is Central Java Province. According to data obtained from the Youth, Sports and Tourism Office of Central Java Province, in 2020 it had 551 tourist villages. The number had increased significantly from 2019, when it was only 353 (Fafurida et al., 2023).

Figure 1 shows that the number of tourist villages in Central Java is increasing, despite the significant increase of 198 from 2019 to 2020. In Central Java, Jepara Regency located at the northern end of Java Island has drawn the public's attention due to its high tourist attractiveness with many potential and extraordinary tourist attractions. Based on data from the Central Bureau of Statistics of Jepara Regency (Kabupaten Jepara Dalam Angka, 2021), there are about 40 tourist attractions in Jepara Regency. The decree of the Regent of Jepara (Bupati Jepara Provinsi Jawa Tengah, 2020), states that Jepara Regency has 24 tourist villages and each has potential and characteristics that can be developed, such as Tempur with its original hillside charm, Mulyoharjo with sculptures and carvings, Troso with its weaving crafts, and Karimunjawa with its culture and the natural beauty of the underwater world.

Table 1. Tourism sector targets and their achievement in Indonesia: 2016–2020

Indicator	2016			2017			2018			2019			2020		
	T	R	A (%)	T	R	A (%)	T	R	A (%)	T	R	A (%)	T	R	A (%)
Contribution to national GDP (in %)	4.50	4.13	92	5	5	100	5.25	5.25	100	5.5	4.8[a]	87	4	4[a]	102
Foreign exchange (trillion Rp)	172	176	102	200	202	101	223	224	100	280	197[a]	70	48	41[a]	86
Number of workers (million)	12	12	104	12	13	105	13	13	100	13	15	115	10	14	140
Competitive index (World Economic Forum)	n.a.	n.a.	n.a.	40	42	95	n.a.	n.a.	n.a.	30	40	75	n.a.	n.a.	n.a.
Foreign tourists (million)	12	12	100	15	14	94	17	16	93	20	16	80	4	4	101
Domestic tourists (million)	260	264	101	265	271	102	270	303	112	275	290[a]	105	120	129[a]	108

Note: T – target, R – realization, A – achievement; n.a. – competitive index only (conducted twice a year); [a] temporary projection figure.
Source: Presiden Republik Indonesia (2020); authors' analysis.

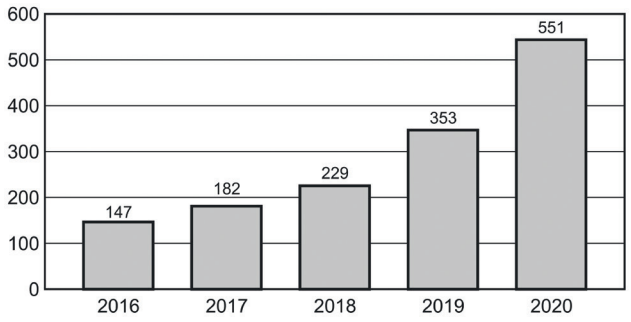

Figure 1. The number of tourist villages in Central Java: 2016–2020
Source: Dinas Kepemudaan, Olahraga, dan Pariwisata Provinsi Jawa Tengah (2020)

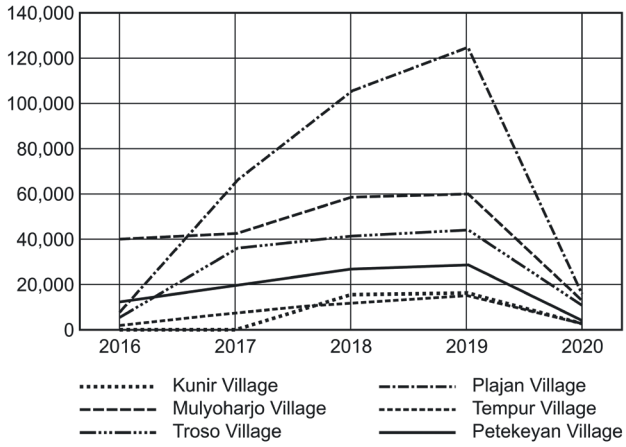

Figure 2. Number of academic articles from 2002 to 2022
Source: Scopus data

The development of tourist villages in Jepara Regency is considered to have had a high success rate, supported by their geographical location in that they tend to be close to each other and also by their variety. In some districts there is more than one tourist village, such as Tahunan that has several: Petekeyan with a carving craft center, Tegalsambi with its 'torch war' culture, and Telukawur and Semat with natural tourist attractions. Based on location several are quite close to each other and have various and interesting tourism potential and it is possible to develop them into a tourist village cluster.

According to data from the Tourism and Culture Office (Dinas Kepemudaan, Olahraga, dan Pariwisata Provinsi Jawa Tengah, 2020), during the last five years there has been an increase in the number of foreign and domestic visits despite a significant decline in 2020 caused by the COVID-19 pandemic and the government's policy to close some tourist attractions to prevent its spread.

Figure 2 shows that several tourist villages are located quite close to each other and have relatively stable increasing trends. This can be seen in Troso, Mulyoharjo and Petekeyan which have the characteristics of the attractiveness of handicrafts and the processing of different handicraft products, so it is possible to develop them into a tourist village cluster. At first, the artisan profession was only used to fulfill daily needs. However, market demand for Troso weaving, carving and sculpture keeps increasing so that craft businesses in the village are growing rapidly, making the village a center for the craft industry and the artisan profession supplies not only a daily need but also longer term to meet market demand.

After handicraft industry growth, collaboration can be carried out among village officials, tourism managers and the community to develop an industrial village into a tourist village. In the process of managing and developing a tourist village, a community group is formed called a tourism awareness group (*pokdarwis*) with legal status and local members. The majority of handicrafts in the tourist village are in the form of home-scale industry, so when tourists enter the residential area they will be presented with the process of making handicrafts in almost every house and can see and learn the manufacturing process of the craft. There are many handicraft shops. Every home artisan in the tourist village will be coordinated and integrated by the *pokdarwis*, other community groups and village government officials.

Promotion and marketing of tourist village products is carried out through print and social media by several organisations, including village governments, local government, *pokdarwis*, and others having an interest in it. Therefore, the number of tourist visits has increased every year. During the COVID-19 pandemic, the number decreased from the previous year but was still high enough for the tourist villages to survive. Based on this, the villages in Jepara Regency have a variety of attractions, they tend to be close to each other because each district has one tourist village or more, and the number of visits of foreign and domestic tourists is increasing every year. This shows success in the management and development of such villages with a close geographical location. Therefore, it is considered important to conduct research on the development of a tourist village cluster pattern and this study aims at identifying such a pattern in Jepara Regency, Central Java Province.

2. Materials and methods

This research uses a quantitative approach using secondary data obtained from the Central Bureau of Statistics and the Department of Tourism and Culture of Jepara Regency (Badan Pusat Statistik Kabupaten Jepara, 2021; Dinas Kepemudaan, Olahraga, dan Pariwisata Provinsi Jawa Tengah, 2020). The secondary

data used includes information on tourist villages, their geographical location, the number of tourist attractions, transportation routes, amenities owned by tourist villages, supporting facilities and the number of tourist visits.

The data analysis technique uses cluster analysis according to the k-means method. Cluster analysis is a statistical tool that aims at classifying research subjects based on similar characteristics. Assumptions that must be fulfilled in cluster analysis are representative sampling and multicollinearity. A representative sample is one used to represent the population and here the Kaiser-Mayer-Olkin (KMO) test is used. If the KMO value is 0.5–1, it can be said that the sample used may represent the population (representative). Multicollinearity is the existence of a perfect or definite linear relationship among some or all variables (Gujarati, 1978). Multicollinearity occurs when the variance inflation factor (VIF) value >10 and the tolerance value <0.1.

This research uses the k-means cluster analysis method to classify tourist villages into clusters. The k-means cluster method is selected because this algorithm has a high accuracy and in processing the research subjects it tends to be more scalable and efficient, and not affected by sequence. This research uses several variables: the number of tourist attractions, the average number of tourist visits, the distance from the tourist village to the city center, accessibility, and available public and tourism facilities.

3. Findings

In the context of tourism, the cluster approach is used to increase competitiveness as a tourism development strategy. Research conducted by Rodríguez-Victoria et al. (2017) finds that grouping has a positive impact on competitiveness. Majewska and Truskolaski (2019) prove that cluster mapping may improve the identification of tourism clusters. Moric (2013) conducts a cluster approach to rural tourism in Montenegro showing that it may overcome its main problems in rural tourism by seeking and increasing competitiveness through the integration of different attractions so as to produce more complex and attractive tourism products.

In the context of tourism, Porter (2000) states that tourism clusters are based on the quality of the visitors' experience depending on the main tourist attractions and tourism complementary businesses, such as hotels, restaurants, shops and transportation facilities. The development of tourism clusters must be supported by the main tourist attractions and supporting factors in the form of public facilities, tourism facilities, institutions and other factors that may increase tourism competitiveness (Fafurida et al., 2020). The determination of tourist village clusters in Jepara Regency is based on the cluster theory of Porter (2000) and the factors that affect a tourist village cluster using the Porter diamond model are:

1. Factor conditions – the main factors that affect a tourist village cluster: tourist attractions, labor and infrastructure.
2. Demand conditions – factors that allow higher consumer demand to increase competitiveness from the number of tourist visits.
3. Structure, strategy and competition which are seen in the market share of tourist villages, tourism governance structures and tourism village promotion strategies.
4. Related and supporting industries that may encourage tourism development including accommodation, catering and retail.
5. The government which plays a role in providing policies and improving the quality of natural resources and tourism infrastructure.
6. Opportunities and circumstances that are beyond control such as politics, changes in market demand and tourist trends.

The determination of tourist village clusters in Jepara Regency based on the Porter diamond model is in line with research conducted by Saraswati et al. (2019) for building a competitive advantage in the Ngringingrejo Bojonegoro starfruit agrotourism area. This showed that the important determinant of competitive advantage there is in line with the model. In addition, it has been used in the industrial sector by Erika (2016) who shows that in the development and strengthening of industrial clusters it is used to formulate an implementation plan for industrial policy.

This research includes the variables of tourist attractions, the average number of tourist visits, the distance from tourist village locations to the center of the capital city of Jepara Regency, public facilities (electricity, water, telecommunications networks, banking, health facilities, places of worship and security) and tourism facilities (shops/kiosks, accommodation and restaurants). The determination of variables used is in line with research conducted by Nurkukuh and Kurniawati (2018) in the use of amenity variables, tourist attractions, institutions, accessibility and supporting facilities as components of a tourist village cluster. The steps in determining the cluster of tourist villages in Jepara Regency are:

1. Determining the data on variables used in the research.
2. Conducting a data standardization process in case of discrepancies in research data.
3. Testing cluster analysis assumptions in the form of a representative sample and multicollinearity tests.
4. Grouping data into clusters using the k-means cluster method, with the following steps:

Table 2. Descriptive statistics (n = 24)

Variable	Min	Max	Mean	Standard deviation
Tourist attractions	1.0	12	4.08	2.962
Average number of tourist visits	0.0	234,811.00	31,853.975	54,564.221
Distance between tourist villages	3.6	90	24.725	23.687
Public facilities in tourist villages	13.0	74	38.71	17.706
Tourism facilities in tourist villages	0.0	150	44.79	40.916
Security in tourist villages	7.0	80	36.79	16.272

Source: authors' analysis.

– determining the desired number of clusters,
– determining the initial cluster center (centroid),
– calculating the distance of each to the centroid,
– allocating locations to the nearest centroid,
– iterating to get a fixed centroid.

5. Interpretating the cluster – an explanation of the results of analysis and labelling to explain it.

Before conducting the process of grouping data using the k-means cluster method, standardization of research data is required because there are a high discrepancies among the variables. The following is a descriptive statistical table from the results of data standardization.

Table 3. Representative sample assumption test

Kaiser-Meyer-Olkin (KMO) and Bartlett' test		
KMO measure of sampling adequacy		0.512
Bartlett's test of sphericity	approximately chi-square	35.594
	df	21
	Sig.	0.024

Note: *df* – degrees of freedom, Sig. – significance.
Source: authors' analysis.

Table 2 shows the statistical results: the highest mean value is the tourist visit average of 31,853.975 and the lowest mean value is tourist attractions at 4.08. The results of these calculations are used to overcome data discrepancy by producing z-score values used in the data clustering process. Before clustering the data, it is necessary to test the assumption of cluster analysis using representative sample and multicollinearity tests. The representative sample test is for the sample used to represent the research population and carried out through Kaiser-Mayer-Olkin (KMO) and Bartlett's test.

Table 4. Multicollinearity assumption test

Collinearity statistics		Z-score: Tourist attraction object	Z-score: Average visits	Z-score: Distance	Accessibility	Z-score: Public facilities	Z-score: Tourism facilities	Z-score: Security
Z-score: Tourist attraction object	Tolerance	Constant	0.804	0.809	0.612	0.671	0.762	0.542
	VIF		1.243	1.236	1.635	1.491	1.312	1.846
Z-score: Average visits	Tolerance	0.557	Constant	0.534	0.608	0.595	0.792	0.542
	VIF	1.794		1.872	1.644	1.680	1.263	1.846
Z-score: Distance	Tolerance	0.858	0.817	Constant	0.677	0.632	0.825	0.559
	VIF	1.166	1.224		1.477	1.582	1.213	1.709
Accessibility	Tolerance	0.554	0.795	0.579	Constant	0.593	0.736	0.629
	VIF	1.804	1.257	1.728		1.686	1.359	1.590
Z-score: Public facilities	Tolerance	0.609	0.780	0.541	0.594	Constant	0.704	0.683
	VIF	1.642	1.282	1.847	1.682		1.420	1.465
Z-score: Tourism facilities	Tolerance	0.582	0.873	0.594	0.620	0.593	Constant	0.550
	VIF	1.717	1.146	1.682	1.612	1.687		1.819
Z-score: Security	Tolerance	0.538	0.777	0.524	0.689	0.747	0.715	Constant
	VIF	1.858	1.288	1.910	1.451	1.339	1.399	

Note: VIF – variance inflation factor.
Source: authors' analysis.

Based on Table 3, the KMO value is 0.512 with a significant value of 0.024. This means that the KMO value is in the range of 0.5–1, which means that the sample used in the research may represent the population or a representative sample. Then, the multicollinearity assumption is tested to determine the existence of a linear relationship among the variables by looking at the VIF value and the tolerance value for each research variable.

Table 4 shows that all variables in the research have a tolerance value greater than 0.1 and a VIF value less than 10 which means that all research variables are free from multicollinearity problems. Based on the results this shows that the variables in this research have passed the representative sample test and are free from multicollinearity problems and therefore can proceed to the clustering process. The initial cluster center is determined randomly from the research data shown below.

Table 5 shows a temporary grouping process with a centroid position that could still change so that it is necessary to repeat the process several times to obtain valid data in which the centroid position does not change its position in the determination of the three clusters.

Table 5. Initial cluster centers

Value	Cluster		
	1	2	3
Z-score: Tourist attractions	–0.36570	2.67245	–1.04085
Z-score: Average number of tourist visits	0.73026	–0.43970	1.08811
Z-score: Distance between tourist villages	–0.49498	1.15144	–0.79894
Access to tourist villages	1	2	2
Z-score: Public facilities in tourist villages	0.69419	–0.20943	–1.22601
Z-score: Tourism facilities in tourist villages	1.76481	–0.33708	0.90939
Z-score: Security in tourist villages	2.65537	–0.17156	–1.46212

Source: authors' analysis.

Table 6 shows that data repetition stops at iteration 3 and convergence has been reached because there is no change in the cluster center with a maximum absolute coordinate change of 0.000 and a minimum distance between the initial centers of 4.801. After the clustering process has been determined, the final step to form the three clusters is carried out. This process is used to identify the characteristics of each.

Table 6. Iteration history

Iteration	Change in cluster centers		
	1	2	3
1	1.900	1.887	1.891
2	0.639	0.000	0.401
3	0.000	0.000	0.000

Source: authors' analysis.

Based on Table 7, the characteristics of each cluster are as follows:

1. Cluster 1: tourist attractions and the distance between tourist villages are below the population average, while the average number of tourist visits, accessibility, public facilities, tourism facilities, and security in tourist villages are above the population average.
2. Cluster 2: the average number of tourist visits and tourism facilities are below the population average, while tourist attractions, location distance, accessibility, public facilities and security in tourist villages are above the population average.
3. Cluster 3: access to tourist villages is above the average population, while tourist attractions, the average number of tourist visits, location distance, public facilities, tourism facilities and security in tourist villages are below the population average.

In the final result of the clustering process, the distances between the cluster centers indicates that the greater the value for the clustering, the greater the distance between the clusters will be.

Table 7. Final cluster history

Value	Cluster		
	1	2	3
Z-score: Tourist attractions	–0.25318	1.11118	–0.73703
Z-score: Average number of tourist visits	0.76766	–0.17804	–0.31816
Z-score: Distance between tourist villages	–0.54494	0.84854	–0.35187
Access to tourist villages	1	2	2
Z-score: Public facilities in tourist villages	0.59065	0.60242	–0.83632
Z-score: Tourism facilities in tourist villages	0.55908	–0.15377	–0.21243
Z-score: Security in tourist villages	1.03705	0.18949	–0.77382

Source: authors' analysis.

Based on Table 8, the distance between cluster 1 and cluster 2 is 2.477, and for cluster 3 is 2.765. The distance

between cluster 2 and cluster 3 is 2.808. After knowing the distances between clusters, an ANOVA test is carried out to identify the significance and differences between each cluster.

Table 8. Distances between final cluster centers (kilometer) based on k-means analysis

Cluster	1	2	3
1	x	2.477	2.765
2	2.477	x	2.808
3	2.765	2.808	x

Source: authors' analysis.

Based on Table 9, the results show that the three clusters have in the variables of tourist attractions, distance to tourist villages, public facilities and security significant differences at the <0.05 level, while in the variables of numbers of tourist visits, accessibility and tourism facilities there is no significant difference among the three clusters. After knowing the distance between clusters and the characteristics of each, the final step is to identify the members of each cluster.

Based on Table 10, the members of each cluster are as follows:

1. Cluster 1: Bondo, Mulyoharjo, Troso, Bandengan, Welahan and East Suwawal.
2. Cluster 2: Tanjung, Damarwulan, Plajan, Tempur, Karimunjawa, Kemujan, Batelait and Watu Aji.

Table 9. Result of analysis variance (ANOVA)

Value	Cluster		Error		*F*-test	Sig.
	Mean square	*df*	Mean square	*df*		
Z-score: Tourist attractions	7.847	2	0.348	21	22.557	0.000
Z-score: Average number of tourist visits	2.401	2	0.867	21	2.770	0.086
Z-score: Distance to tourist villages	4.390	2	0.677	21	6.483	0.006
Access to tourist villages	0.575	2	0.229	21	2.511	0.105
Z-score: Public facilities in tourist villages	5.995	2	0.524	21	11.436	0.000
Z-score: Tourism facilities in tourist villages	1.258	2	0.975	21	1.290	0.296
Z-score: Security in tourist villages	6.364	2	0.489	21	13.011	0.000

Note: *df* – degrees of freedom, Sig. – significance.
Source: authors' analysis.

Table 10. Cluster members

Tourist village	Cluster	Average distance between tourist villages (kilometer)	Tourist village	Cluster	Distance
Bondo	1	1.180	Batealit	2	1.800
Mulyoharjo	1	1.085	Watu Aji	2	0.841
Troso	1	2.032	Gemulung	3	1.041
Bandengan	1	3.197	Tegalsambi	3	1.351
Welahan	1	2.454	Kunir	3	1.377
Suwawal Timur	1	2.269	Petekeyan	3	1.610
Tanjung	2	1.696	Telukawur	3	2.060
Damarwulan	2	1.996	Panggung	3	0.970
Plajan	2	1.957	Semat	3	1.270
Tempur	2	1.887	Banjaragung	3	0.872
Karimunjawa	2	3.861	Kendengsidialit	3	1.157
Kemujan	2	2.540	Pule	3	1.535

Source: authors' analysis.

3. Cluster 3: Gemulung, Tegalasambi, Kunir, Petekeyan, Telukawur, Panggung, Semat, Banjaragung, Kendengsidialit and Pule.

Based on the clustering process, there are three tourist village clusters in Jepara Regency. The distribution of locations and members of each cluster can be seen on the map below (Figure 3).

Based on the results of clustering using the k-means cluster method, after iteration 3 there is a minimum distance between cluster centers of 4.801 and a significant centroid of 0.000. The clusters of tourist villages in Jepara Regency are:

1. Cluster 1 has six tourist villages: Bondo, Mulyoharjo, Troso, Bandengan, Welahan and East Suwawal. The advantages of cluster 1 tourist villages are that they have a high average number of tourist visits, easy access, with complete public and tourism facilities. While their weakness is that the attractions are limited and the distances between tourist villages is quite far.
2. Cluster 2 has eight tourist villages: Tanjung, Damarwulan, Plajan, Tempur, Karimunjawa, Kemujan, Batealit and Watu Aji. The advantages of cluster 2 are that they have many tourist attractions,

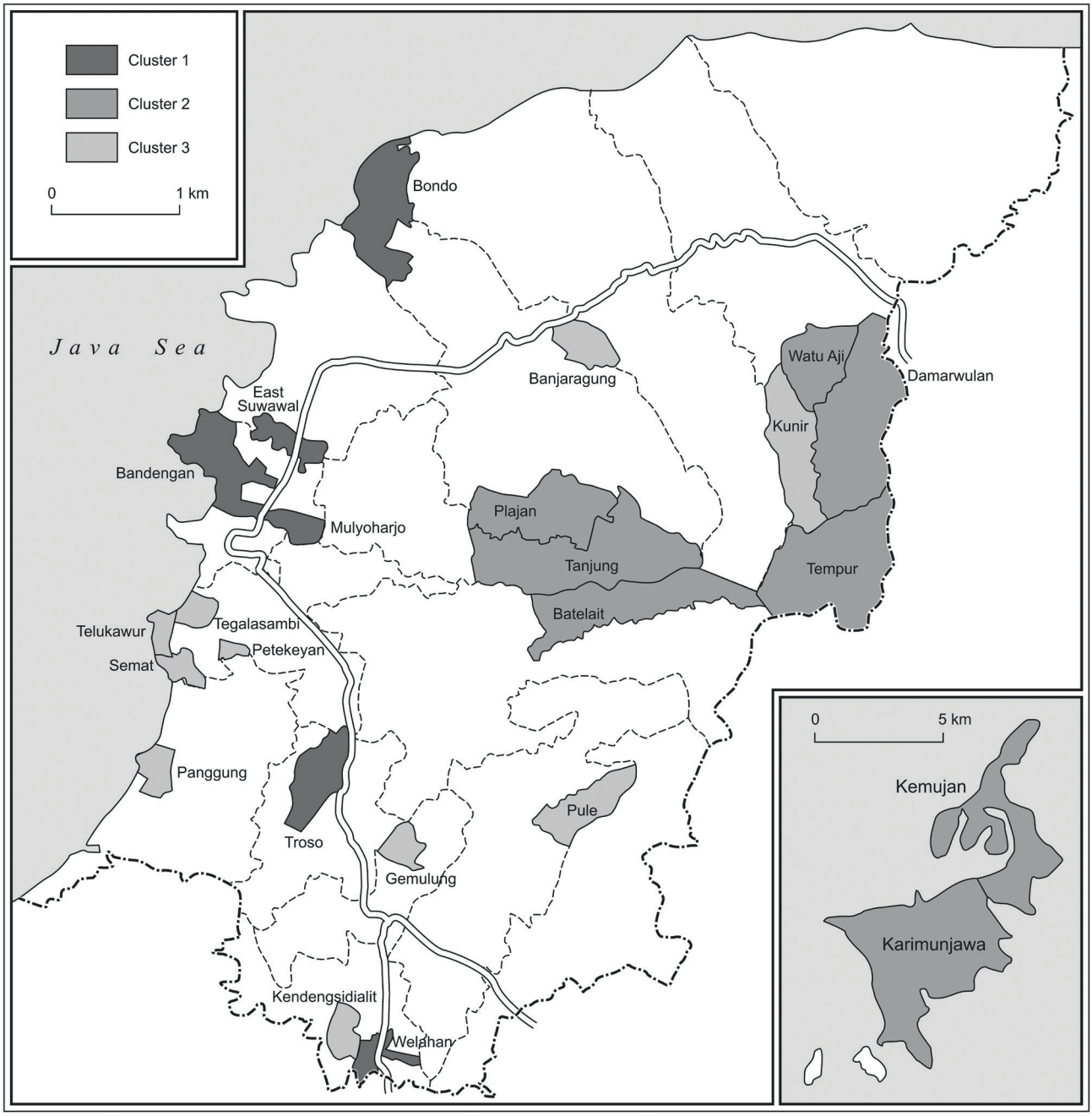

Figure 3. Map of tourist village clusters in Jepara
Source: results of k-means cluster analysis

complete public facilities, distances between tourist villages tend to be close and access is easy. While the weakness is that it has a low average number of visits and there are only limited tourism facilities.

3. Cluster 3 has ten tourist villages: Gemulung, Tegalsambi, Kunir, Petekeyan, Telukawur, Panggung, Semat, Banjaragung, Kendengsidialit and Pule. The members of cluster 3 are mostly still pilot tourist villages, so the advantages of this cluster are limited to easy access. While the weaknesses are that tourist attractions are still limited, the average number of tourist visits is low, distances between tourist villages tend to be long while public and tourism facilities are still limited.

The results of this study show that accessibility and facilities are very influential on tourist visits. This is shown in cluster 1 where even though the number of tourist attractions is limited and the distance between tourist villages is quite far, due to good accessibility and facilities, tourist visits are high. However, things are different in cluster 2, where even though there are many tourist attractions, complete public facilities, close distances between villages and easy access, there are a low number of tourist visits. This is due to several factors including that although there are many tourist attractions, they do not necessarily attract tourists. This shows the need to improve quality to encourage tourists to come and enjoy them. In cluster 3, despite conditions for easy access, tourist attractions are still limited, distances between villages are far, and public and tourist facilities are limited. This also leads to the number of tourist visits being low.

The results obtained from the analysis of tourist village clusters in Jepara Regency are in line with previous research using the k-means cluster method in data grouping. That conducted by Mustaniroh et al. (2016) is on the strategy of developing apple processing clusters with k-means clustering and hierarchy analysis, and this produces three clusters of apple processing small medium enterprise in Batu City in iteration 2 with the differentiating variables being the number of workers and the value of investment. The research of Maulida (2018) on the application of data mining in classifying tourist visits to top tourist attractions in Daerah Khusus Ibu Kota (DKI) Jakarta province with k-means, produces three clusters of superior tourist attractions in DKI Jakarta province in iteration 2 in which cluster 3 is a record for DKI Jakarta province. In addition, the research of Perera et al. (2020) using k-means cluster analysis on the grouping of visitors who travel to Rocha results in four cluster groups.

The cluster approach is also carried out in the industrial sector. Research conducted by Raharjo (2012) in classifying industries based on type and location results in four clusters including the furniture industry in Genuk, Mijen and West Semarang districts, and food processing in Central Semarang. The grouping was carried out using a geographical information system (GIS) method that is different from the k-means method used in this research.

4. Conclusion

From the analysis, this research has found that there are three clusters of tourist village development in Jepara Regency:

1. Cluster 1 has characteristics of a high average number of tourist visits, easy access to tourist village locations, complete public and tourism facilities, but limited attractions and quite long distances between tourist villages. There are six tourist villages in this cluster: Bondo, Mulyoharjo, Troso, Bandengan, Welahan and East Suwawal.
2. Cluster 2 has characteristics of many tourist attractions, complete public facilities, close distances between tourist villages, and easy access to locations, but a low average number of visits and limited tourism facilities. There are eight tourist villages in this cluster: Tanjung, Damarwulan, Plajan, Tempur, Karimunjawa, Kemujan, Batelait and Watu Aji.
3. Cluster 3 has characteristics of easy access to locations, but still has limited tourist attractions, low numbers of tourist arrivals, long distances between tourist villages, limited public and tourism facilities. There are ten tourist villages in this cluster: Gemulung, Tegalasambi, Kunir, Petekeyan, Telukawur, Panggung, Semat, Banjaragung, Kendengsidialit and Pule.

The results of this study show that accessibility and facilities are very influential on tourist visits. This is shown in cluster 1 where even though the number of tourist attractions is limited and distances between tourist villages is quite long, due to good accessibility and facilities, tourist visits are high. However, things are different in cluster 2, even though there are many tourist attractions, complete public facilities, close distances between tourist villages and easy access, tourist numbers are low. This is due to several factors; although there are many tourist attractions, they do not necessarily attract tourists. This shows the need to improve the quality of tourist attractions to encourage tourists to come and enjoy them. In cluster 3, there is easy access to the locations, but tourist attractions are still limited, distances between tourist villages are long, and public and tourist facilities are limited which leads to low numbers of tourist visits. In the future it will be necessary to have different strategies for developing each cluster.

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