Spatial Analysis of Disparities in Banyumas Regency Based on Socio-Economic and Infrastructure Indicators

Kikin Windhani[1]
Fajar Hardoyono[2]
Sudjarwanto[3]
Hary Pudjianto[4]

Abstract

Since 1968, socio-economic and infrastructure development focused on the accessible region such as urban and sub-urban area. Rural, rim-land, coastal area, highland, and isolated area were still ignored in national development priorities by the central and local government. This paper discusses the spatial analysis of disparities in Banyumas Regency, Central Java, based on indicators of socio-economic and infrastructure. We had collected data by doing a survey in 27 sub-districts in Banyumas Regency. Disparities in socio-economic development and infrastructure were measured using 14 variables, i.e. unemployment rate, consumer price index, wage index, poverty index, quality of life, quality of health, quality of education, criminal rate, quality of roadway, public transportation accessibility, quantity of traditional market, quantity of bridge, and the quantity of public school building. Multivariate statistical analyses based on the principal component analysis (PCA) and hierarchical cluster analyses (HCA) were used to analyze the disparities. The analysis on 14 socio-economic parameter displays that unemployment rate, poverty index, quality of health, and quality of education are the main contributor for socio-economic and infrastructure disparity. Ajibarang, Gumelar, Cilongok, and Rawalo had still a classic problem in economic development due to being the pockets of unemployment and poverty in Banyumas Regency. Based on social indicators, 6 sub-districts including Gumelar, Karanglewas, Lumbir, Pekuncen, Somagede, and Tambak should receive more attention by local government due to a high percentage of poor people to access medical and health facilities. In addition, the ratio of people who are able to access higher education in Jatilawang, Purwojati and Wangon was still less than 10%. There were no significance disparities in infrastructure indicator because the infrastructure had been developed equally in all sub-districts in Banyumas Regency.

Keywords : *patial disparities, socio-economic development, infrastructure, multivariate analyses*

JEL : R12, R53

---

[1]) Faculty of Economics and Business Jenderal Soedirman University
[2]) Faculty of Tarbiya and Teaching Science State Institute on Islamic Studies
[3]) Faculty of Economics and Business Jenderal Soedirman University
[4]) Faculty of Economics and Business Jenderal Soedirman University
   E-mail : kikin_025@yahoo.com, hardoyono@gmail.com

I. BACKGROUND

The first objective of national development is to achieve general welfare. General welfare, also known as social welfare, can be measured by several indicators. One of the easiest ways to measure social welfare is the ability of society to provide the basic needs to support human life. Food, clothing, housing, health, education and security are basic needs of people. The economic theory of David Ricardo explicitly states that prosperity can be achieved if there is a division of labour, capital accumulation, and the dominance of the agricultural sector (Kurz, 2010). An individual who has employment opportunities will earn the money to provide their basic needs. Furthermore, the extra income will be used for savings, investment, property, and so on.

Economic development experts used several parameters regarding the general welfare. Noll (2002) used social progress and economic parameters to measure the general welfare. The parameter of social progress included unemployment ratio, the ratio of educated people, the standard of living, and quality of health, quality of social protection, quality of social security, criminal rate, quality of public transportation, and quality of the environment. The Indonesian National Planning Board (Bappenas) used six indicators to measure the social welfare, i.e. unemployment index, wages index, poverty index, misery index, human development index and economic inequality index (Bappenas, 2010). On the other hand, the Indonesian statistics or BPS uses five indicators of social welfare i.e. human development index, poverty index, Gini index, quality of life index and social vulnerability index (Ananta *et al*., 2011)

After reaching the general welfare, the second objective of national development is to create social justice. Mubyarto (1995) defined social justice if there was a justice in the distribution of income among individuals with others, or between one region and others. Furthermore, social justice also occurred when there was equality (egalitarian) of individual rights for accessing economic resources.

One of the major issues in national development in Indonesia is a spatial inequity of development results in all regions of the country. Due to geographical factor, the level of economic and social development is unequal between the mountainous and the coastal region. Not all of all rural areas are able to gain the impact of economic growth as well as urban areas. Economic and social development in these regions tends to be slower when compared to other areas. Due to geographical or spatial factors, these regions are often categorized as disadvantaged areas which require more serious attention from the central and local government in order to improve the socio-economic and infrastructure development.

Analysis of disparities is important for designing, planning and evaluating development process. The analysis can be used as a parameter for policies development and budget allocations, especially, on disadvantaged regions e.g. mountainous, rimland, isolated and rural areas. Various policy making, budget allocation, and extra attention into disadvantaged regions are necessarily conducted to gain prosperity and social justice in all regions. As a case study, the spatial analysis of disparities in Banyumas Regency based on socio-economic development and infrastructure indicators had been conducted. Banyumas Regency is located on strategic location due to being a bridge between West Java Province and Southern Central Java Province. Banyumas Regency has also highly own-source revenue (OSR). Based on Indonesian statistics, the OSR of Banyumas Regency is the second highest after Semarang city.

Banyumas Regency consists of 27 districts. From the geographical factor, Banyumas Regency has a strategic point in the distribution of goods and services because it connects the cities in Eastern West Java and other cities in Southern Central Java eastern region. However, Banyumas Regency also disadvantaged of the topographical side because some districts

locate at the foot of Slamet Mount and South Serayu hill. Some district, furthermore, affected by these factors as the access of public transportation become secluded.

This paper aims to analyse the disparities of all districts in Banyumas Regency based on economic, social and infrastructure indicators. Through these analyses, all of the district in Banyumas Regency will be grouped in the under-developed, the semi-developed or the developed regions based on indicators of economic, social and infrastructure. Some districts, which are grouped in the under-developed regions, require more attention from the central government and the provincial government to improve the economy and welfare of the community.

II.   THEORETICAL BACKGROUND

National development in Indonesia aims to improve social welfare and social justice. The national development aims to improve physical infrastructure such as roads, bridges, electricity networks market, reservoirs and so on. In addition, national development was also directed at the development of non-physical such as reducing poverty, overcoming income inequality, employment, health, education, and so on (Todaro 2006). In accordance with the development objectives, the progress of socio-economic development can be measured using some parameters, e.g. the availability of physical infrastructures, low rate of poverty, low rate of income inequality, job availability, and the high quality of education and health.

In general, measurement of national development progress needs the combination of economic, social and infrastructure indicators. Noll (2002) used social progress and economic parameters to measure social welfare. Parameter social progress included unemployment ratio, educated people ratio, the standard of living, quality of health, social protection, social security, criminal rate, quality of transportation, and environmental conditions. Todaro (2006) used economic indicators and social benchmarks to measure the success of the national development. The economic indicators included economic growth, poverty index, and job availability. In addition, education, health, housing, and human development index were also used as the social benchmark.

Human development index (HDI) is an indicator that is used by the United Nations Development Program (UNDP) to measure the social welfare in a country. HDI is measured based on health quality, education quality, and standard of living (Ul Haq, 1995). Therefore, the Indonesian National Planning Board or Bappenas uses six indicators to measure the social welfare, including unemployment rate, wages index, poverty index, misery index, human development index and economic inequality. Indonesian statistics uses a quite similar indicator to measure social welfare in Indonesia i.e. human development index, poverty index, Gini index, and quality of life and social vulnerability index (Bappenas, 2010).

During this period of time, the development in Indonesia has been only focused on densely populated areas and urban areas. On the other hand, development in the buffer area of economic growth and rich area of agriculture, natural resources, and mine is still overlooked by central and local government. Economic development undistributed equally in all regions generates spatial disparities among regions.

Spatial disparities in development are measured using several models, such as model Bort, a model of Williamson (Ananta *et al*., 2011), a model of Theil entropy (Silber, 1999), and model TOPSIS analysis (Xiajing and Junjie, 2011). The model of Bort was based on neo-classical economic theory (Syafrizal, 2008). According to this model, there is a relationship between the levels of economic development of a country with the widening of disparities among regions. The higher of development in a country widens the disparities among regions.

Disparities are caused by the concentration of capital and labour in the centres of economic development, such as densely populated region and urban area. Model Bort also stated that economic growth, labour, and total capital / investment were used to measure the economic gaps among regions.

Williamson disparity index measured the economic disparities between regions by using GDP of the regions. (Ananta *et al.*, 2011). Theil entropy disparity index measured the disparity between regions by using the parameters of regional income, regional consumption, quality of education and the influence of economic policies between regions (Silber, 1999). Meanwhile, the TOPSIS model analysis used per capita income, GDP, total retail sales of goods, the composition of GDP, total investment, the total profit of the company, the annual per capita income of the household, the amount of savings held by households, the number of investment projects, and the value of exports and imports to measure disparities in all regions (Xiajing and Junjie, 2011).

III. RESEARCH DESIGN

3.1. Statistical Approach

Multivariate analyses methods based on the principal component analysis (PCA) and hierarchical cluster analysis (HCA) were used as a model to measure spatial disparities of development in Banyumas Regency based on socio-economic and infrastructure indicators. The PCA is a mathematical method used to reduce the dimension of a set of data while retaining as much as variance contained in the dataset (Jollife, 2005)**.** It transforms a number of correlated variables into uncorrelated variables and transforms the data into the new coordinates. In this study, the PCA was used to classify 27 sub-districts in Banyumas Regency based on a variation on the multivariate dataset. In addition, the PCA calculation was followed by the hierarchical cluster analysis (HCA) method. HCA in this study was used to analysis the similarity of matrix data set.

Statistically, a data set of socio-economic and infrastructure whose similar pattern with other data sets were grouped in a similar class. The advantage of this method is its user could directly classify the spatial disparities of all district as the research object based on multivariable indicator and classify the object into several classes based on the similarity of the multivariable dataset. The steps involved in PCA are as follows (Jollife, 2005):

1. Step 1. Inputs are expressed in the matrix form:

$$I = \begin{bmatrix} A_{11} & B_{21} & .... & X_{1n} \\ A_{21} & B_{22} & .... & X_2 n \\ .... & .... & .... & .... \\ A_{n1} & B_{n2} & .... & X_{nn} \end{bmatrix}$$

2. Step 2. The matrix input was subtracted to the mean from each of the data dimensions as follows:

$$I' = I - \bar{I} \begin{bmatrix} A_{11} - \bar{A} & B_{21} - \bar{B} & .... & X_{1n} - \bar{X} \\ A_{21} - \bar{A} & B_{22} - \bar{B} & .... & X_2 n - \underline{X} \\ .... & .... & .... & .... \\ A_{n1} - \bar{A} & B_{n2} - \bar{B} & .... & X_{nn} - \bar{X} \end{bmatrix}$$

3. Step 3. Find the covariance matrix input.

$$\Sigma = \begin{bmatrix} \text{cov}(A, A) & \text{cov}(A, B) & \text{cov}(A, C) & \text{cov}(A, D) \\ \text{cov}(B, A) & \text{cov}(B, B) & \text{cov}(B, C) & \text{cov}(B, D) \\ \text{cov}(C, A) & \text{cov}(C, B) & \text{cov}(C, C) & \text{cov}(C, D) \\ \text{cov}(D, A) & \text{cov}(D, B) & \text{cov}(D, C) & \text{cov}(D, D) \end{bmatrix}$$

4. Step 4. Count the eigenvector and eigenvalue of Σ by using $\Sigma Q = \lambda Q$, where λ is *eigen value* and Q is *eigen vector* of Σ. The eigen value and eigen vector follow the equation $\det(\lambda I - \Sigma)Q = 0$

5. Step 5. Find the Feature vector F which generated by descending of eigen vector :

$$[F] = [eigen_1 \quad eigen_2 \quad eigen_3 \quad .... \quad eigen_n]$$

6. Step 6. Find the principal components (PCs). The PCs is generated by multiplication of matrix feature vector F with matrix input I: $PCs = [F] \times [A]$

HCA is a method for dividing a group of objects into classes so that similar objects are in the same class. The distance, d, between two points in n-dimensional space with coordinates $(x_1, x_2, \ldots, x_n)$ and $(y_1, y_2, \ldots, y_n)$ is usually taken as the Euclidean distance defined by $d = \sqrt{(x_1 - y_2)^2 + (x_2 - y_2)^2 + \cdots .(x_n - y_n)^2}$. There are a number of methods for searching for clusters.

Single linkage method starts by considering each object as forming a 'cluster' of size one, and compares the distances between these clusters. The two points, which are closest together, are joined to form a new cluster. The distances between the clusters are again compared and the two nearest clusters combination. The successive stages of grouping can be shown on a dendrogram. In the dendrogram, the vertical axis can show either the distance, dij, between two points i and j when they are joined, or alternatively the similarity, sij, defined by $s_{ij} = 100 \left(1 - \frac{d_{ij}}{d_{max}}\right)$ where d_{max} is the maximum separation between any two points.

3.2. Spatial disparities indicator

The determination of the spatial disparities of development in Banyumas Regency based on 14 socio-economic and infrastructure indicators. The whole socio-economic and infrastructure indicators to measure the spatial disparities is expressed in Table 3.1.

Table 3.1 The socio-economic and infrastructure indicators used to measured the spatial disparities in Banyumas Regency

Indicator	Criteria	Code	Sub-criteria
Economic	Unemployment rate	E1	the percentage of unemployed individuals in 21-56 years old
	Consumer price index	E2	the average of prices of a consumer goods and services for accessing of basic need commodities
	Wage index	E3	The average of salary received by people for several livelihoods(farmer, labour, tradesman, civil servant, etc.) in a month.
	Poverty index	E4	The percentage of people which received salary less than US $ 2/day
Social	Life index	Q	The average of live expectancy
	Health quality	H	The percentage of poor people who are unable to access medical and health facilities

	Education quality	P	The percentage of people who are able to access higher education
	Criminal rate	K	The number of criminal occurrences in a year
Infrastructure	Roadway quality	J	The quality of roadway in a sub-district covered by asphalt and cement.
	Access to electricity	L	Percentage of total access to electricity in a sub-district area
	Access to transportation	T	Access to transportation in all region of sub-districts area
	Availability of traditional market	M	The number of traditional market in sub-district area, divided into 4 classes (A,B, C and D)
	Bridge quantity	B	The number of bridge in a sub-district area
	Availability of school for children and teenagers.	S	Availability of school building in sub-district areas; it includes pre-elementary school, elementary school, junior high school, senior high school and university

IV.   RESULT AND DISCUSSIONS

Table 4.1 shows the data of socio-economic and infrastructure condition in Banyumas Regency based on 14 indicators mentioned in Table 3.1. Due to multi-indicators, multivariate analyses based on PCA and HCA was useful to analyse the spatial disparities in all sub-districts. The performance of economic indicators in Banyumas Regency showed a positive trend. The average of the unemployment rate was approximately 8.10%. The highest level of unemployment rate located in 3 sub-districts region i.e. Ajibarang (0.30%), Baturaden (0.20%), and Gumelar (0.25%). The consumer price index of basic needs commodities in all sub-districts of Banyumas regency was almost similar at IDR 13.213. The consumer price index was measured by using the price of nine (9) basic needs per kg or per litre, i.e. rice, sugar, vegetables, beef, vegetable oil, milk, eggs, fuel, and salt.   The average wage index of people per month in Banyumas regency was in the range of IDR 1.77 million or USD 4.53 per day. Even the people's income was quite high; however, the poverty rate in Banyumas was still 13.21%. Six sub-districts had poverty rates above 20%, included Cilongok, Lumbir, Rawalo, Purwokerto Barat, Purwokerto Timur, Purwokerto Selatan and Purwokerto Utara. Four sub-districts, which are located in an urban area, would have a poverty rate above 20%. In another hand, Purwokerto was still being a region of poverty pockets in Banyumas regency.

Therefore, the research data in Table 4.1 were analysed using PCA and HCA to visualize the spatial disparities on 27 sub-district based on economic indicators using unemployment rate, consumer price index, wage index, and poverty index in the feature space of principal components. The first two principal components were kept because they accounted for 69.93% of the variance in the data set as a contribution from the variance of PC1 (captured 44.08%) and that of PC2 (captured 25.85%). Therefore, based on four (4) economic indicators mentioned in Table 3.1, PCA was able to classify the spatial disparities of 27 sub-districts in Banyumas Regency, based on economic indicators into four (4) groups shown through PCA score plot in Figure. 1.
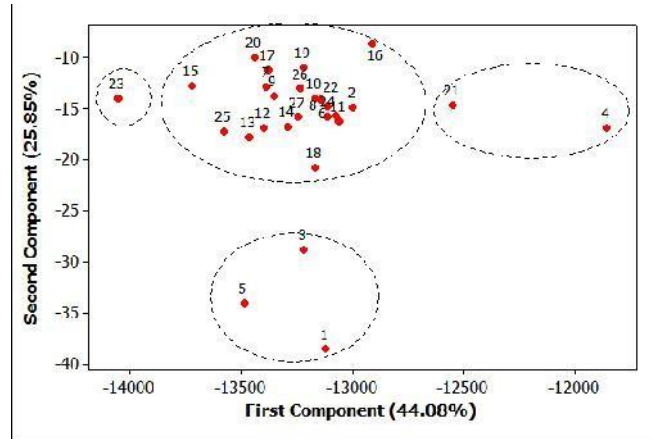
Figure. 1 The score plot of PCA regarding classification of spatial disparities based on economic indicators.

The clustering of sub-districts in Figure 1 shows that 21 sub-districts had an almost similar pattern of economic indicators, including unemployment rate, consumer price index, wage index, and poverty index. Six sub-districts had a different pattern than others. Cilongok (number 4) and Rawalo (number 21) was located in the similar cluster due to the high rate of poverty index. Ajibarang (number 1), Baturaden (number 3) and Gumelar (number 5) was located in the similar cluster due to the high rate of unemployment index. Meanwhile, Somagede located in the last class because the wage index in this sub-district was the highest in Banyumas regency.

Furthermore, HCA was used to analyze the similarity pattern of unemployment index, consumer price index, wage index, and poverty index simultaneously among 27 sub-district in Banyumas Regency. Figure 2 shows dendrogram of HCA that described the similarity pattern in all sub-districts. The main advantage of HCA over PCA is that HCA can provide numerical values of similarity among the subjects evaluated (Miller and Miller, 2005).
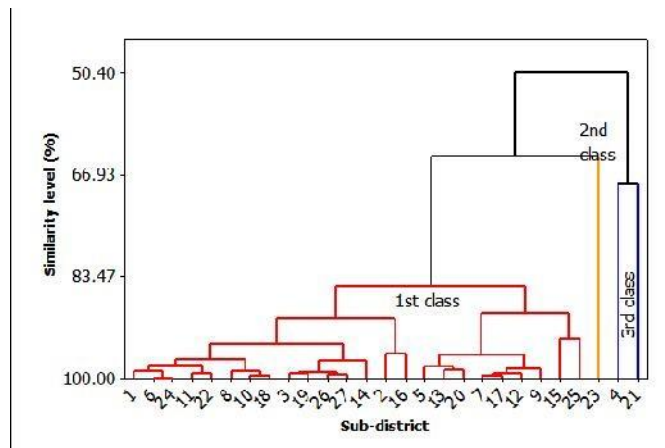

Figure. 2 The dendrogram of HCA descibes the the similarity pattern of unemployment index, consumer price index, wage index, and poverty index simultaneously among 27 sub-district in Banyumas Regency

The HCA analysis correlated with the PCA analysis. Based on the dendrogram in Figure. 2, 24 sub-districts had similarity pattern on four (4) economic indicators, so that these sub-districts was grouped in the first class. The data pattern of four (4) economic indicators in Cilongok (number 4) was almost similar with Rawalo (number 21), so that these was grouped in the third class. Somagede was grouped in the second class because the data pattern was almost different with other. Based on data in Table 4.1, the performance of economic indicators in Somagede, a rimland area, was very good because this sub-district had low of unemployment index (4.65%) and poverty index (5.76%).

The social condition was measured using 4 indicators, i.e. life index, health quality, education quality, and criminal rate. In general, the performance of social indicators in Banyumas regency was also showed a positive trend. The average of life expectancy in all sub-districts was 67.20 years old. Rawalo (number 21) had the highest life index in Banyumas regency. The average of people's life expectancy in this sub-district was nearly 74 years old. In another hand, the quality of health was not similar in all sub-districts. In this case, health quality was measured using the percentage of poor people who are not able to access medical and health facilities. The average percentage of health quality in all sub-districts was only 13.07%. However, 6 sub-districts which located in rural area, including Gumelar, Karanglewas, Lumbir, Pekuncen, Somagede, and Tambak had a high rate of an unavailable score for accessing medical and health facilities. Based on data in Table 4.1, the percentage of poor people in Gumelar and Pekuncen who were unavailable for accessing health and medical service was almost 40%.

In addition, the spatial disparities in education quality also appeared in Banyumas Regency. In this case, the education quality was measured using the percentage of people who are able to access higher education. The average percentage for this parameter was approximately 37.78%. However, the majority of sub-district had education quality score more than 30%. There were only seven (7) sub-districts in which the education quality percentage less than 30%. It was Cilongok (15%), Kebasen (20%), Jatilawang (10%), Purwojati (10%), Rawalo (20%), and Wangon (10%). The highest percentage of education quality occurred in several sub-districts in the urban area.

The last indicator of social condition was measured by criminal rate. The criminal rate was measured using criminal occurrence (robbery, murder, theft, etc.) in a year. The average occurrence of the criminal action in all sub-districts was almost 18 cases. Sub-districts in the urban area e.g. Patikraja, Purwokerto area, and Sumbang had a higher occurrence in criminal action than other sub-districts in the rural area.
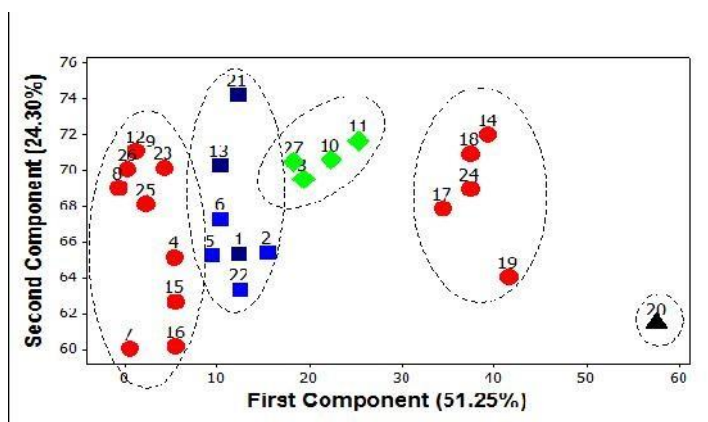

Figure. 3. The score plot of PCA regarding classification of spatial disparities based on social indicators.

Figure. 3 shows the PCA score plot that visualizes the spatial disparities on 27 sub-district based on social indicators using life index, health quality, education quality, and criminal rate. The first two principal components were kept because they accounted for 75.55% of the variance in the data set as a contribution from the variance of PC1 (captured 51.25%) and that of PC2 (captured 24.30%). The clustering of sub-districts in Figure 3 shows that 20 sub-districts had an almost similar pattern of social indicators, i.e. life index, health quality, education quality, and criminal rate. Seven sub-districts which locate in the urban area, including Patikraja (number 14), Purwokerto Barat (number 17), Purwokerto Selatan (number 18), Purwokerto Timur (number 19), Purwokerto Utara (number 21) and Sumbang had a different pattern than others. These sub-districts have the education and health qualities better than other sub-districts. Unfortunately, the occurrence of a criminal action in these sub-districts is higher than another area in Banyumas region.
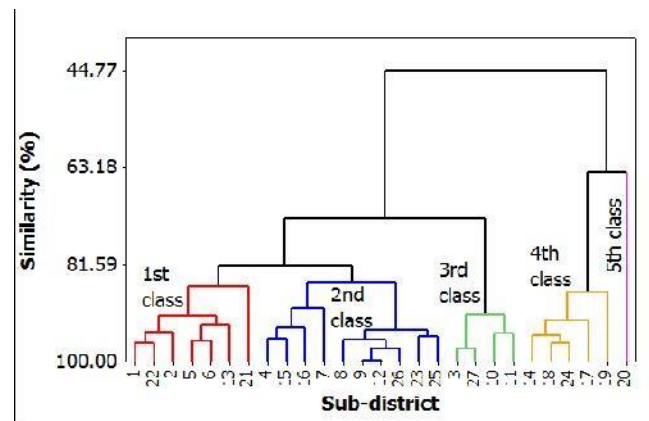

Figure. 4 The dendrogram of HCA described the similarity pattern of life index, health quality, education quality, and criminal rate simultaneously among 27 sub-districts in Banyumas regency

HCA was also used to analyze the similarity pattern of life index, health quality, education quality, and criminal rate simultaneously among 27 sub-districts in Banyumas regency. Figure. 4 shows dendrogram of HCA that described the similarity pattern in all sub-district. It can be shown in Figure. 5 that 27 districts are divided into 5 different classes. The first class consisted of 7 subdistricts including Ajibarang (number 1), Banyumas (number 2), Gumelar (number 5), Jatilawang (number 6), Rawalo (21) and Sokaraja (number 22). These sub-districts were placed in similar class due to the similarity data pattern on life expectancy and education quality. The second class consisted of 10 sub-districts including Cilongok (number 4), Kalibagor number (7), Karanglewas (number 8), Kedungbanteng (number 9), Kemranjen (number 12), Pekuncen (number 15), Purwojati (number 16), Somagede (number 23), Sumpiuh (number 25) and Wangon (number 26). The second class has also similar data pattern on life expectancy and education quality. The third class consists of 4 sub-districts, including Baturaden (number 3), Kedungbanteng (number 10), Kemranjen (number 11) and Wangon. The third class had similarity data pattern on life expectance. The 4th and the 5th class consisted of 6 sub-districts surrounding the urban area of Purwokerto city, i.e. Patikraja (number 14), Purwokerto Barat (number 17), Purwokerto Selatan (number 18), Purwokerto Timur (number 19), Purwokerto Utara (number 20) and Sumbang (number 24). These sub-districts have similarity data pattern especially on the low percentage of poor people who are unable to access health and medical service, a high rate of people who are able to access higher education, and also a high rate of occurrence of a criminal action.

The infrastructure was measured using 6 indicators, i.e. roadway quality, access to electricity, access to transportation, the number of traditional markets, the number of the bridge, and availability of school building. The roadway is a heart of an economy. All economic and social activity nearly depends on transportation. Good public transportation correlates with roadway quality. In this case, the quality of roadway was measured by the percentage of roadway in a sub-district that is covered by asphalt or cement. The mobility of people is also supported by access to public transportation for people. In addition, infrastructure development in a rural area can be measured by development of public access to electricity, development of the bridge, traditional market, and development of a school for children and teenagers. To be a developed region, these infrastructures must be available in a rural area.

Data in Table 4.1 shows that infrastructure in all sub-districts in Banyumas Regency has been grown equally. The average of the roadway, which is covered by asphalt or cement, has been reached 83%. Public access to electricity is also developed equally. All people who live in 24 sub-districts have been received public electricity service from the national electricity company. There were only 3 sub-districts, i.e. Lumbir, Purwojati, and Pekuncen, in which some villages are still unable to access electricity service due to the geographical problem.

Insignificant spatial disparities on infrastructure appear in the number of traditional markets, bridge, and availability of school for children and teenagers. Figure. 5 shows the PCA score plot that visualizes the spatial disparities on 27 sub-district based on infrastructure indicators using the number of traditional markets, the number of the bridge, and the number of public schools. The first two principal components were kept because they accounted for 75.61% of the variance in the data set as a contribution from the variance of PC1 (captured 41.85%) and that of PC2 (captured 33.76%).
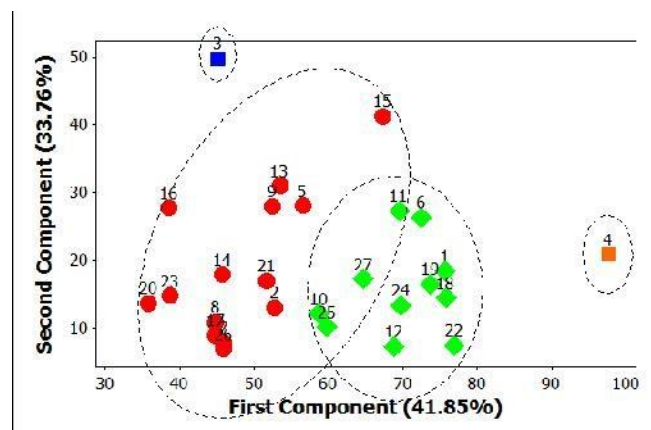

Figure. 5. The score plot of PCA regarding classification of   spatial disparities based on infrastructure quantity, i.e. traditional market, bridge, and public school.

Table 4.1 Data of socio-economic and infrastructure condition based on 14 indicators

Code	Sub-district name	Indicator													
		Economic				Social					Infrastructure				
		E1	E2	E3	E4	Q	H	P	K	J	L	T	M	B	S
1	Ajibarang	0.30	13,122	1.62	0.09	65.00	0.07	0.35	14.00	0.75	1.00	1.00	1.00	17.00	76.00
2	Banyumas	0.06	13,000	1.52	0.05	65.00	0.12	0.40	17.00	0.88	1.00	1.00	1.00	12.00	53.00
3	Baturraden	0.20	13,220	1.82	0.05	69.00	0.14	0.45	21.00	0.80	1.00	1.00	2.00	49.00	46.00
4	Cilongok	0.09	11,855	2.30	0.30	65.00	0.20	0.15	7.00	0.85	1.00	1.00	2.00	19.00	98.00
5	Gumelar	0.25	13,488	1.96	0.09	65.00	0.40	0.20	11.00	0.70	1.00	1.00	2.00	27.00	57.00
6	Jatilawang	0.06	13,111	1.45	0.06	67.00	0.02	0.10	12.00	0.90	1.00	1.00	2.00	25.00	73.00
7	kalibagor	0.04	13,388	1.72	0.09	60.00	0.05	0.35	2.00	0.80	1.00	1.00	1.00	7.00	46.00
8	Karanglewas	0.05	13,144	1.40	0.04	69.00	0.25	0.50	1.00	0.80	1.00	1.00	1.00	10.00	45.00
9	Kebasen	0.05	13,355	1.46	0.08	71.00	0.17	0.20	3.00	0.85	1.00	1.00	1.00	27.00	53.00
10	Kedungbanteng	0.06	13,170	1.76	0.06	70.00	0.08	0.45	24.00	0.80	1.00	1.00	1.00	11.00	59.00
11	Kembaran	0.08	13,060	1.76	0.13	71.00	0.07	0.60	27.00	0.90	1.00	1.00	1.00	26.00	70.00
12	Kemranjen	0.08	13,400	1.64	0.05	71.00	0.15	0.30	3.00	0.75	1.00	1.00	1.00	6.00	69.00
13	Lumbir	0.09	13,466	2.00	0.28	70.00	0.20	0.30	12.00	0.65	0.99	1.00	2.00	30.00	54.00
14	Patikraja	0.08	13,290	1.62	0.05	71.00	0.10	0.50	41.00	0.90	1.00	1.00	1.00	17.00	46.00
15	Pekuncen	0.04	13,720	2.30	0.10	62.50	0.38	0.30	7.00	0.62	0.95	0.97	3.00	40.00	68.00
16	Purwojati	0.05	12,911	2.03	0.10	60.00	0.06	0.10	7.00	0.50	0.90	1.00	2.00	27.00	39.00
17	Purwokerto Barat	0.02	13,380	1.96	0.28	67.00	0.03	0.65	36.00	0.95	1.00	1.00	4.00	8.00	45.00
18	Purwokerto Selatan	0.12	13,170	1.84	0.25	70.00	0.04	0.60	39.00	0.95	1.00	1.00	2.00	13.00	76.00
19	Purwokerto timur	0.02	13,220	1.96	0.20	63.00	0.03	0.70	43.00	0.95	1.00	1.00	4.00	15.00	74.00
20	Purwokerto utara	0.01	13,440	1.96	0.21	60.00	0.02	0.70	59.00	0.95	1.00	1.00	1.00	13.00	36.00
21	Rawalo	0.06	12,550	1.61	0.30	73.90	0.07	0.20	14.00	0.80	1.00	1.00	3.00	16.00	52.00
22	Sokaraja	0.07	13,078	1.84	0.10	63.00	0.03	0.60	14.00	0.94	1.00	1.00	2.00	6.00	77.00

23	Somagede	0.05	14,056	1.64	0.06	70.00	0.24	0.30	6.00	0.80	1.00	1.00	1.00	14.00	39.00
24	Sumbang	0.07	13,110	1.76	0.15	68.00	0.12	0.40	39.00	0.80	1.00	1.00	1.00	12.00	70.00
25	Sumpiuh	0.08	13,577	1.54	0.09	68.00	0.18	0.40	4.00	0.90	1.00	1.00	2.00	9.00	60.00
26	Tambak	0.04	13,233	1.64	0.09	70.00	0.29	0.30	2.00	0.90	1.00	1.00	1.00	6.00	46.00
27	Wangon	0.07	13,244	1.72	0.07	70.00	0.03	0.10	20.00	0.9	1.00	1.00	2.00	16.00	65.00

The clustering of sub-districts in Figure 5 shows that 27 sub-district can be clustered into 4 groups based on the variance of 3 infrastructure data, including the number of traditional markets, the number of the bridge, and the number of public schools.
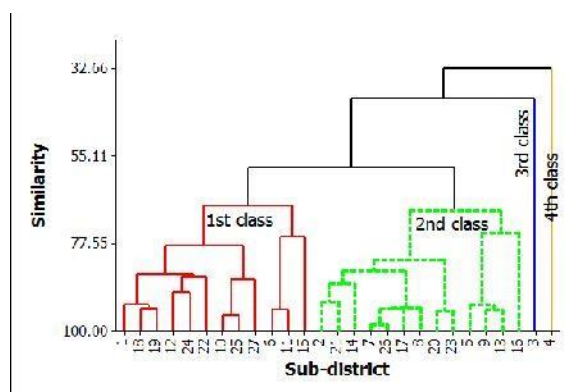

Figure. 6. The dendrogram of HCA descibes the similarity pattern of infrastructure quantity, i.e. the number of traditional market, bridge, and public school.

Figure. 6 shows dendrogram of HCA that describes the similarity pattern in all sub-districts. It can be observed in Figure. 5 that 27 districts are divided into 4 different classes. The first class consisted of 14 sub-districts, including Banyumas (number 2), Gumelar (number 5), Kalibagor (number 7), Karanglewas (number 8), Kebasen (number 9), Lumbir (number 13), Patikraja (number 14), Pekuncen (number 15), Purwojati (number 16), Purwokerto Barat (number 17), Purwokerto Utara (number 20), Rawalo (number 21) Somagede (number 23), and Tambak (number 26). The second class consisted of 11 sub-districts, including Ajibarang (number1), Jatilawang (number 6), Kedungbanteng (number 10), Kembaran (number 11), Kemranjen (number 12), Purwokerto Selatan (number 18), Purwokerto Timur (number 19), Sumbang (number 24), and Sumpiuh (number 25). The third and the fourth class consisted of Baturaden (number 3) and Cilongok (number 4). Based on data in Table 4.1, the first and the second group had similarity data pattern of the traditional market, bridge, and public school. The third and the fourth group were almost different data pattern than others. Baturaden (number 3) was grouped in the third class due to the highest number of bridges across Banyumas (49 bridges). Meanwhile, Cilongok was grouped in the different class because it has the highest number of school buildings in the district of Banyumas (98 schools building).

V. CONCLUSION

Multivariate analyses based on the principal component analysis (PCA) and hierarchical cluster analysis (HCA) has been used as a tool to measure the spatial disparities in 27 sub-districts in Banyumas regency. Based on 14 indicators of social, economic, infrastructure, unemployment rate, and poverty index is the main contributors of economic disparities. Four sub-districts, i.e. Ajibarang, Gumelar, Cilongok, and Rawalo are still a problem in economic development due to being the pockets of unemployment and poverty in Banyumas Regency. Meanwhile, 6 sub-districts including Gumelar, Karanglewas, Lumbir, Pekuncen, Somagede, and Tambak still have major problem issues regarding social development due to a high percentage of poor people to access medical and health facilities. Based on infrastructure indicators, there are no significance disparities in infrastructure indicator because the infrastructure has been developed equally in all sub-districts in Banyumas Regency.

REFERENCES

Ananta, A., Soekarni, M and Arifin, S. (2011). *The Indonesian Economy: Entering a New Era.* Singapore: Institue of Southeast Asia.

Bappenas, (2010). *Rencana pembangunan jangka panjang dan menengah tahun 2010-2014 bidang ekonomi* Bappenas. Jakarta

Jollife, I., (2002). *Principal Component Analysis, (2nd ed.)* New York : Springer-Verlag.

Kurz, H. D., (2010). Technical progress, capital accumulation and income distribution in classical economics: Adam Smith, David Ricardo and Karl Marx. *Euro. J. History of Economic Thought,* 17(5), p.1183–1222.

Miller, J.M. and Miller, J.C. (2005). *Statistics and chemometrics for analytical chemistry. (5th ed).* Essex, England: Pearson Education Limited

Mubyarto, (1995). *Ekonomi dan keadilan sosial.*: Yogyakarta: Aditya Media

Noll, H. N., (2002). Towards a European system of social indicators: Theoretical framework and system architecture. *Social Indicator Research,* 58, p.1-3.

Silber, J. (1999). *Handbook on income inequality measurement .* Massachusetts : Academic Publisher.

Syafrizal. (2008). *Ekonomi regional (2nd ed.).* Jakarta: Niaga Swadaya

Todaro, M. P., and Smith, S. (2006). *Economic development*. (9th.vol). London: Pearson Education Limited.

Ul Haq, M. (1995). *Reflections of human development.* New York: Oxford University Press

Xiajing, D., Z. Junjie, (2011). The TOPSIS Analysis on the regional disparity of economic development in Zhejiang Province. *Canadian Social Science,* 7 (5), p. 135