Available online www.jsaer.com

***Journal of Scientific and Engineering Research*, 2018, 5(3):45-51**

Review Article

ISSN: 2394-2630
CODEN(USA): JSERBR

Optimization of SME Based on Clustering and Geographic Information System

Rakhmat Himawan*, EndraYuafanedi Arifianto, Yeni Sumantri

Industrial Engineering Department, Brawijaya University, Indonesia

Abstract Small and Medium Enterprise (SME) has been significantly contributing to Indonesia's East Java province economic development since 1997. To further develop cooperation between the scattered SMEs across East Java, a map of potential SME and their location is needed. For this purpose, clustering method is used in accordance with the Geographic Information System. The potential SME cluster to be developed is determined based on eligibility criteria. Some alternatives are made and used to determine priority clusters for development. Finally, an institutional role model is developed to coordinate those clusters.

Keywords Geographic Information System, Clustering, Small Medium Enterprise

Introduction

In this era of ASEAN Economic Community (AEC), East Java as part of Indonesia's provinces needs to develop economic growth. Small and Medium Enterprise (SME) is one type of Industry that hold important role in the development. Besides opening access to employment, SME was the only industry that was not significantly affected by the Indonesia's monetary crisis in 1997. Based on the BPS (central for statistic) data, SME has given input to Nation's Gross Domestic Product as much as 2,609 trillion Rupiah or around 55.56% from all of the income. Despite SME's advantages, there are certain drawback of low productivity that impede its development and very limited access to productive resources such as capital, raw material, information and technology access, and human resources. Those limitations can be overcome by collaboration and cooperation between SME's industries across East Java. Therefore, an East Java's map of potential SME is needed to be the basis of information to encourage mutual cooperation between industries. Furthermore, the map can also indicate which SME's cluster development to be prioritized.

Industrial cluster is a geographical sector concentrations of companies. It is a system that consist of enterprises and institutions that synergistically connected and depend each other in order to enhance competitiveness, especially geographically. Rabellotti define some key factors to promote the industrial clusters or districts: consist of geographically sectoral enterprises; good connection exists between companies, and share similar social background that exhibit work culture. Four key elements have been described in an Industrial cluster: related industries, supplier industries, core industry, buyers, and supporting institutions. When the buyers, related, and supplier industries interconnected to the core industry, the supporting institutions act as regulator and they give boundaries for the business processes across supply chain. Porter (2001) further develops a model of industrial cluster that determine a nation's competitiveness. The model consists of four key elements: factor condition; demand factor; firm, strategy and rivality; and related supporting Industries. Those four elements form a diamond shape, and it determines country competitiveness toward other countries in term of industries. Condition factor include capital availability, human resources ability, infrastructure resource and information access.

The research is aimed to implement Geographic Information System to map SME potentials and cluster them for each East Java's cities and regencies. Moreover, a role model institution is developed to coordinate the clusters in order to cooperate and expand the market.

Methods

The research is started through literature review and extensive field data collection. Literature review is done to extract background theories connected to Clustering method and Geographical Information System. The researcher then goes to the location of major SME across East Java as well as the authorities, including East Java's SME Union and Trade Union. The data collection method is divided into three main categories:

a. Interview. Some questions are asked to the companies and authorities with close connection to the research objectives
b. Observation. The SME's activities and production processes are observed in real time.
c. Documentation. SMEs location and quantity data are received, including the pictures of activities and maps.

Results and Discussions

After thorough observation through Google Maps and GIS, and additional data from the East Java's SME Union and Trade Union, the number of Small and Medium Industries particularly in the Processing industries for each East Java's cities and districts are identified. Table 1 shows the detailed SMEs distribution for 38 cities and regencies. Banyuwangi regency has the highest number of SMEs, followed by Malang, Blitar, Jember, and Magetan regencies for the number above 15,000 industries. The five biggest regencies containing most of the processing industries are located in the southern side of East Java which have the soil type such as Andosol, Glei, Grumosol, NCB soil. Those soil types are known to be unsuitable for agriculture. This condition may lead the southern regencies to develop processing industries more than the agriculture. Therefore, the northern regencies with soil type preferable for agriculture such as Aluvial, Latosol, Litosol, Mediteran and Regosol, have more agriculture industries development than the southern regencies. The detailed map of soil types is presented in Figure 1.

Table 1: Processing SMEs number in each Cities and Regencies

No.	Cities/Regencies	Number of SMEs	No.	Cities/Regencies	Number of SMEs
1	Banyuwangi Regency	29,774	20	Lumajang Regency	8,929
2	Malang Regency	20,894	21	Pamekasan Regency	8,195
3	Blitar Regency	19,778	22	Ponorogo Regency	7,788
4	Jember Regency	17,546	23	Kediri Regency	6,657
5	Magetan Regency	16,926	24	Probolinggo Regency	6,179
6	Sumenep Regency	14,754	25	Tuban Regency	6,024
7	Pacitan Regency	14,634	26	Nganjuk Regency	6,008
8	Bondowoso Regency	13,784	27	Sampang Regency	5,747
9	Trenggalek Regency	13,237	28	Bangkalan Regency	5,712
10	Tulungagung Regency	13,062	29	Ngawi Regency	5,595
11	Mojokerto Regency	12,716	30	Madiun Regency	4,638
12	Gresik Regency	12,539	31	Malang City	4,094
13	Surabaya City	11,394	32	Pasuruan City	2,762
14	Jombang Regency	10,955	33	Blitar City	1,896
15	Lamongan Regency	10,317	34	Mojokerto City	1,282
16	Bojonegoro Regency	9,852	35	Kediri City	1,198
17	Pasuruan Regency	9,781	36	Batu City	1,047

18	Situbondo Regency	9,288	37	Probolinggo City	1,016
19	Sidoarjo Regency	9,008	38	Madiun City	1,014

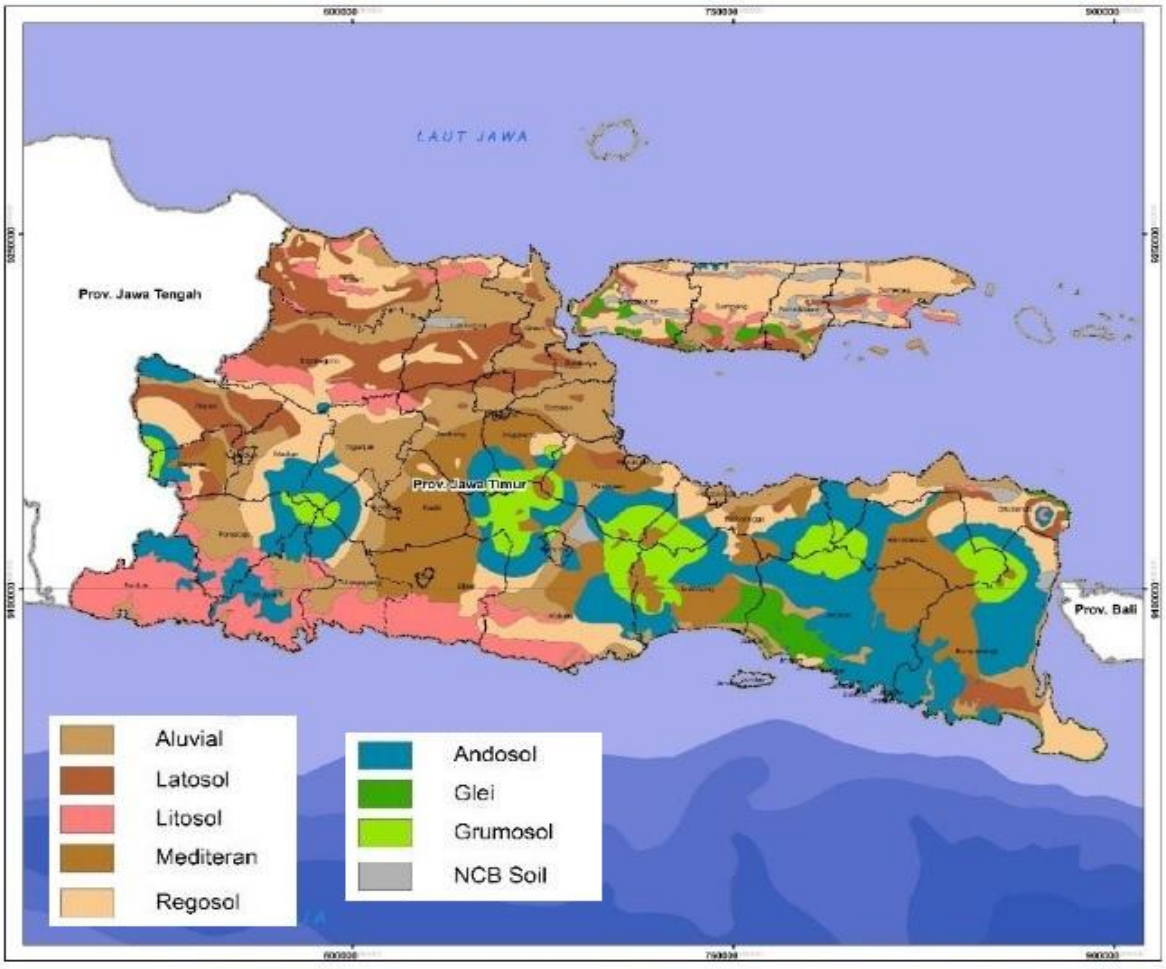

Figure 1: Soil types in East Java (JawaTimur) province

The difference of processing SME development between regencies and cities can also be determined. Almost all of the cities hold much less SMEs number than the regencies. The processing industries need more space and human resources in order to perform effectively and efficiently. Thus, regencies with their spacious terrain and cheaper workers provide better condition for processing industries. Cities, however, have much less space and more expensive workers that make them unsuitable for processing industries. Only Surabaya city as East Java Capital city has substantial number of processing industries despite its narrow terrain and high wages workers. The conducive business environment and good facilities availability may be the reason for Surabaya's suitability for processing industries.

Some major processing industries location, particularly in fertilizer, herbal medicine, shoes and slippers, as well as dairy product are depicted in Figure 2, 3, 4, and 5. Fertilizer processing SMEs are distributed mainly in Surabaya city and Sidoarjo regency. The other are scattered in the regency of Lamongan, NganjukTuban, Ponorogo, Blitar, Malang and Jember, depicted in Figure 2. The herbal medicine processing SMEs, however, are less scattered than Fertilizers and more concentrated in Malang city and regency. Figure 3 shows that medicine processing concentration and few other scattered locations in Surabaya city, Sidoarjo and Bojonegoro regency.

Figure 2: Location of major fertilizer processing SMEs

Figure 3: Location of major herbal medicine SMEs

Dairy processing SMEs are concentrated in two main areas: Malang and Surabaya. Few minor dairy industries perform in Kediri and Sidoarjo regencies as shown in Figure 4. Figure 5 shows the distribution of shoes and slippers processing SMEs location. They are manufactured in Surabaya city and regency of Malang, Tulungagung, Ponorogo, Magetan, Ngawi, Sidoarjo and Pasuruan.

Figure 4: Location of major SMEs' dairy product

The four major processing SMEs locations are located mainly in Surabaya city and Malang regency, and other are scattered throughout East Java's regencies those industries development suffer from less capital availability, less information technology, and less suitable human resources. Therefore, a role model institution is proposed. It functions as a coordinator for each SME cluster and placed in strategic areas with high potential of SME's development.

The role model institution designed for four main roles: collective efficiency, policy inducement, social capital, and training. First, collective efficiency is used to analyse East Java's SMEs cluster development within external economy and joint action between industries. Then, policy inducement involves government authorities to support SMEs. There are four steps in this regard:

1. Regencies and provincial authorities involve SMEs in their annual program to develop industrial cluster
2. Authorities act as SMEs' dynamist to maintain cluster sustainability and facilitatethe transfer of bigger enterprises' knowledge and technology into SMEs cluster.
3. The government establish policies specifically to SMEs development such as, official loan, technical training, facilities support, and SME's product exhibition.

The third role model institution role concern social capital that influence East Java's industrialization. Social capital can be seen through the existence of community group, informal social capital and family impact. An area with less industries usually has less social capital than the one with more industries. The role model institution can promote social capital in the area with less industries. Finally, the fourth role is to conduct training for SMEs to enhance their marketing strategy, information technology, as well as their manufacturing tools to efficiently produce goods.

Figure 5: Location of major SMEs' shoes and slippers product

Conclusion

The research found six main locations with high processing SMEs potential development in East Java: regency of Banyuwangi, Malang, Blitar, Jember, and Magetan. Their soil types that are unsuitable for agriculture is the reason for their increase of potential processing industries. In addition, Surabaya city also has potential due to the city's conducive business environment and good facilities availability. While those potential regencies and city for processing SMEs development, the lack of coordination between industries obstruct business development. Therefore, role model institution is proposed to be formed in strategic and potential locations. Four main roles of the institution to enhance and promote SMEs are collective efficiency, policy inducement, social capital, and training.

Reference

[1]. Porter, M. E., (2001). "Cluster of Innovation Initiative: Regional Foundation of U.S. Competitiveness". Washington, DC: Council on Competitiveness.

[2]. Bappeprop (2003). "*Laporan Penyusunan Model Pengembangan Industri Regional Berbasis Cluster Industri*", Provinsi Jawa Timur. Bappeprop.

[3]. BPS (2007). "*Angka Produk Domestik Bruto (PDB), Indeks Tendensi Bisnisdan Indeks Tendensi Konsumen Triwulan IV Tahun 2007*". Badan Pusat Stastistik. Jakarta.

[4]. BPS (2007). "*Pertumbuhan Sektor Industri Manufaktur*". Badan Pusat Stastistik. Jakarta.

[5]. Disperindag (2008). "*Persebaran Industri Manufaktur Indonesia*". Dinas Perindustriandan Perdagangan. Jakarta.