

The determination of regional development priorities

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Abstract. Development plans in a region cannot use generic models if the potentials and challenges of each area are different. Therefore, the development plan should be adjusted to their respective characteristics. This study aims to define the priority of regional development scenarios by using K-means clustering algorithm and Analytical Hierarchy Process (AHP). The research was done in Garut Regency, data source used is statistic data of Garut, the result of spreading of the questioner and Focus Group Discussion. The result of research has divided Garut Regency into four clusters/development areas. Furthermore, Cluster I main priority is the scenario of development programs in the infrastructure and facilities sectors. Cluster II's main priority is the scenario of development programs in the sectors of commodity optimization, commodity diversification, and trading system. Cluster III's top priority is the scenario of development programs in the manufacture and service industry sectors. Cluster IV's main priority is the scenario of development programs in the infrastructure and facilities sectors. Overall, the conclusion of the study indicate that the scenario of development programs in the infrastructure and facilities sectors is the most essential scenario among other scenarios.

1. Introduction

Garut Regency is an area with potential regions that are prospective to be developed, its existence is supported by various diverse economic activities, including; industrial sectors, services, agriculture, tourism and others, of course, all the potential possessed must be able to be processed and developed into a real economic power which ultimately can encourage the development of community welfare [1].

For such potentials to be managed properly, it must be supported by a structured development plan. The policy direction is to utilize all of its potential resources to have a positive impact on improving the socioeconomic and environmental quality for all stakeholders in the region [2, 3].

Several studies have been conducted in the context of regional development strategies [4], focuses on the formulation of rural development strategies based on human resource development [5], analyzes the application of renewable energy sources (RES) for agricultural areas [6], designs innovation strategy of traditional village tourism development.

In this research, because the characteristics of the region in Garut Regency is different, then the development plan should be tailored to the potential and challenges of each. Therefore, it is necessary to analyze the regional grouping based on uniformity of its characteristics. Furthermore, the implementation of the development plan cannot be done simultaneously considering the limited resources, so it is necessary to set the priority scale of the development scenario for each region.



2. Methodology

This research uses K-means clustering algorithm and Analytical Hierarchy Process. K-means algorithm is one of the most widely used clustering techniques in various fields [7, 8, 9]. In this research, K-means algorithm is used to construct regional classification typology in Garut Regency, by grouping the area based on uniformity on a particular characteristic, thus forming relatively homogeneous groups [10, 11]. The group profile is identified using test of mean differences of attributes that make up a group of territories to the entire population under study so that the characteristics of each group of regions can be identified.

Source of data used is statistic data Garut Regency, the number of a region to be grouped about 42 districts, while the number of attributes analyzed about 20 which consists of: the proportion of labor in agriculture, plantation, trade, services, and industry. Furthermore, the level of education, employment rate, Gross Domestic Regional Income (GDRI) / capita, economic growth rate, the presence of conservation area, transportation access and the proportion of GDRI in agriculture, plantation, animal husbandry, forestry, fishery, trade, tourism, and services.

The AHP method is used to define the priority of regional development scenarios. The method is applied to each group of regions formed based on the result of K-means clustering algorithm. AHP has a functional hierarchy tool that can be used as multi-criteria decision making (MCDM) tools [12, 13]. Also, AHP can accommodate multiple decision makers [14, 15]. Hence the AHP method is considered relevant in this study since the establishment of the development plan should involve all stakeholders [16]. Participants involved were about ten people consisting of elements of government, society, business, and academics.

3. Result and discussion

3.1. K-means algorithm

Based on region attribute data, grouping is done using K-means Algorithm with the following steps [17]: (1) Set the N number of cluster for K ($K = 0, 1, 2 \dots N$), (2) Center of the cluster is initialized ($\mu_i = \text{value}, i=1, \dots, k$), (3) Each data point marks the closed cluster ($c_i = \{j: d(x_j, \mu_i) \leq d(x_j, \mu_l), l \neq i, j=1, \dots, n\}$) (4) Set the locus of each cluster to the mean of all data points insertion to that cluster ($\mu_i = 1/c_i | \sum_j \in c_i x_j, \forall i$), (5) Repeat steps 2-3 till line up, (6) Notation $|c|$ = number of elements in c.

By following that stages then from 42 districts in Garut Regency can be classified into four groups of regions. Furthermore, by analyzing each attribute, then obtained the following picture:

- **Cluster I** covers nine districts, characteristic of having the potential for development in agriculture, plantation and forestry sectors, but the potential has not been well managed. When viewed from the rate of economic growth and human resources, this group is relatively left behind compared to other groups, and the type of field of business is still fixed on the sectors of agriculture and plantation. This can be caused by the lack of transportation support, which can support the activities of the community so that accessibility becomes the keyword for the development of this region, but besides the existence of the function of a conservation area that has been set by the government, gives limitation in the development of this region.
- **Cluster II** covers 11 districts; the characteristic is that it has developed a business field of trade, service, and industry, but it has not been run optimally yet. The support of adequate transportation access has become a valuable capital so that the development of economic sectors becomes an essential icon in the development of this region. Besides, this area has a potential for land use in the field of a plantation.
- **Cluster III** covers two districts; the characteristic is the rapid and fast-growing economic activity supported by the availability of potential that has the advantage both competitively and comparative when compared with other clusters. In general, this cluster has several strategic sectors with prominent indications, namely; the development of agricultural sector that has high productivity, the growth of industry, services and extensive marketing network supported by adequate transportation access facilities, and the potential of tourism that has

grown well, but on the other hand high unemployment rate in this region becomes a problem to note.

- **Cluster IV** covers 20 districts; the characteristic is that it has developed well trade and service activities, so its economic growth rate runs fast. This region has its superior commodities in agriculture, livestock, and fishery. The problem in this area group is that transportation access support is inadequate. On the other hand, the existence of the conservation area becomes a limitation in land use in this region, but this provides the potential for the development of the tourism sector.

3.2. Analytical hierarchy process

The initial phase in the AHP is to formulate a hierarchy of decisions, including the determination of the main objectives, identification of criteria, sub-criteria, and alternatives [18]. Based on the results of a literature study on the pattern of regional development, the process of adjustment to the data object research and development direction in Garut Regency, and the process of dialogue with participants agreed on hierarchical decision model as presented in Figure 1.

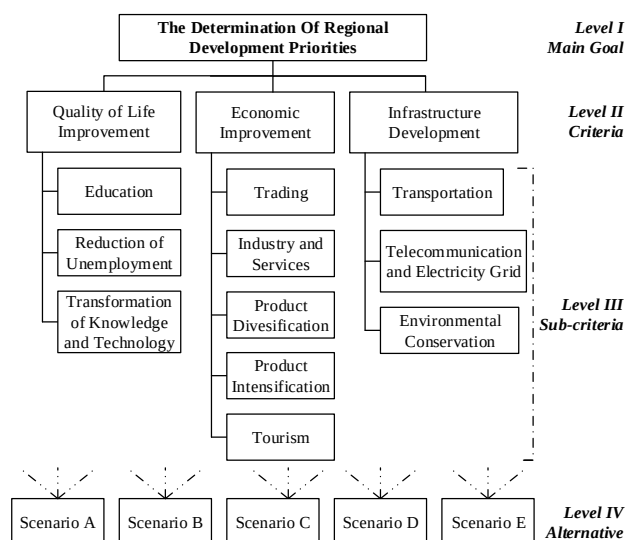


Figure 1. Model hierarchy of priority determination of regional development scenario.

The scenario descriptions in Figure 1 are as follows:

- Scenario A, which includes development programs in the community empowerment sector, human resource development, and technology transfer.
- Scenario B, which includes development programs in the sector of commodity optimization, commodity diversification, and trading system.
- Scenario C, which includes development programs in the manufacture and service industry sectors.
- Scenario D, which includes development programs in the infrastructure and facilities sectors.
- Scenario E, which includes development programs in the environmental conservation sector, ecological sanitation, and tourism.

Furthermore, based on the results of the pairwise comparison, the following presented the priority scenario for each formed cluster:

- Cluster I

The main priority is the scenario D, which includes development programs in the infrastructure and facilities sectors, with a very dominant interest weight of 0.527. Subsequent priorities are A, B, E and C scenarios, where the weight of importance of the four scenarios is relatively close to 0.140, 0.124, 0.105 and 0.104.

- Cluster II

The main priority is scenario B, which includes development programs in the sector of commodity optimization, commodity diversification, and trading system, with the importance weight of 0.344. The next priorities in a sequence are C, A, E and B scenarios with the importance weight of 0.278, 0.203, 0.09 and 0.084.

- Cluster III

The main priority is scenario C, which includes development programs in the manufacture and service industry sectors, with the importance weight of 0.315. The next priority in a sequence is the scenario E, B, D and A with the weight of importance of 0.256, 0.173, 0.135 and 0.121.

- Cluster IV

The main priority is the scenario D, which includes development programs in the infrastructure and facilities sectors, with a very dominant interest weight of 0.512. The next priority in a sequence are scenario E, B, A and C, where the weight difference of importance of the four scenarios is relatively close, that is equal to 0,141, 0,1139,0,118 and 0,141.

Overall, the results of the study indicate that the scenario of development programs in the infrastructure and facilities sectors is the most essential scenario among other scenarios. This suggests that the general problem of development in developing countries is the infrastructure sector [19].

4. Conclusion

The results show that K-means clustering algorithm and AHP can be used as a decision support tool in determining the priority of development scenario based on the characteristics of the region in Garut Regency.

For further research is recommended to conduct a study by considering the synergy between groups of regions, so it can give a positive impact in accelerating the development process in Garut Regency.

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