

Identification and Strategy of Leading Sector Development in The Migrant Workers Area in the Framework of Expanding Employment Opportunities

Yeni Nuraeni

Puslitbang Kementerian Ketenagakerjaan
Correspondence Email: yeninur@hotmail.com

ABSTRACT

The unemployment rate in Indonesia is still high, dominated by a low-educated workforce. One solution to reduce the unemployment rate is to send workers abroad. Problems often occur with migrant workers in the informal sector, due to the minimal level of protection from the user country so as from the Indonesian government. The Indonesian government issued a policy to limit the sending of migrant workers in the informal sector, especially to middle eastern countries. This policy brings the consequences for the Indonesian government to provide alternative employment opportunities in the country. This study aims to identify leading sectors and analyze their development strategies. The development of leading sectors is expected to expand employment opportunities for local communities thereby reducing interest in working abroad, especially in the informal sector. Research uses quantitative and qualitative approaches. Data analysis using the Analysis Hierarchy Process (AHP) method. Data collection was carried out in Cilacap Regency, Central Java Province, as the largest regency for sending migrant workers in Central Java. The results showed the leading sectors in Cilacap Regency were the Agriculture and Processing Industry Sector. As for the development strategy, the most important factor is the development of human resources and the development / management of natural resources. Short-term Development Plans and Long-Term Development The Cilacap Regency Government must focus on leading sectors

Keywords: Analysis Hierarchy Process (AHP), Identification of Leading Sectors, Indonesian Migrant Workers

INTRODUCTION

Low economic growth in Indonesia has an unfavorable impact on labor, namely low wages and income levels. Difficult to find work in the country because of higher population growth compared to available employment, making labor migration abroad chosen as one solution to reduce unemployment in Indonesia (Yosep, Rito, et al 2013).

Employment in Indonesia is dominated by the informal sector which is characterized by low productivity and income (Tavi, Vita, et al, 2010). On the other hand, labor migration abroad is dominated by workers in the informal sector with a proportion ranging from 75% (BNP2TKI, 2015). They aim to increase income to improve the economic condition of the family (Ardina, Leon, et al. 2013). The low proportion of Indonesian Migrant Workers (PMI) in the formal sector is due to the still low level of education and skills making it difficult to enter employment in the formal sector.

Problems often occur when labor migration abroad is dominated by workers in the informal sector, this is because of the low level of protection of workers by recipient countries. Supervision of informal workers (individual use) abroad is relatively more difficult than supervision of formal workers (users of legal entities). The Government of Indonesia and the government of the user country are difficult to be able to enter the territory of individual user services. Various government policies have been implemented to reduce PMI shipments in the informal sector including a moratorium on stopping PMI shipments to Middle Eastern countries (Nissa, 2014). The government continues to encourage the sending of PMI informal sector. By increasing PMI education and skills, it will enable PMI to enter the formal sector with higher positions and income (Dewi, Luh, 2013).

Previous studies have focused on solving PMI problems before departure, at work and after returning home. Research that focuses on preventing problems by providing alternative employment opportunities in the country is still small. This research is expected to provide an overview of the potential of the Indonesian Migrant Worker Area that can be developed and its development strategy, thereby reducing the interest of the community to work abroad. Data collection and analysis relating to the economic base and problems of developing local potential

is the first stage in planning local economic development. With the lack and accuracy of data, it will be difficult to maximize the use of resources and increase local economic growth (Blakerly, Brdshaw, 2002).

RESEARCH METHODS

The research location took one of the Migrant Worker Areas, Cilacap Regency, Central Java Province. Cilacap Regency is one of the regions that send the most labor abroad in Central Java Province. The data used in the study are secondary data from various relevant agencies and primary data obtained through the process of field observation, interviews and questionnaires with key informants from the government, PMI sending companies and the local community.

This study uses mixed methods which are a combination of quantitative and qualitative research approaches (Brannen, 1992). The research design uses concurrent embedded design in which the researcher uses quantitative and qualitative methods simultaneously in one time (Creswell, 2003). To determine the base sector and its development policy strategy using the Analytical Hierarchy Process (AHP) method. A qualitative approach is used to get deeper information relating to internal and external factors that will influence the process of developing the base sector and its development strategy (Niskha, Abdul, et al, 2015).

By using the AHP method, the Cilacap Regency Government can establish a development program focused on the base sector, so that it is expected to create jobs and improve the living standards of the local community. Development in the base sector is ultimately expected to reduce poverty by increasing economic growth (Dikdik, 2014). AHP can provide alternative solutions to problems that contain multi-criteria decision making (Drake, 1998). AHP method includes a methodology that is subjective because information and priority weight elements are obtained from decision-makers through an interview process or using a questionnaire (Cheng, Li, 2001). AHP has the principle of giving weight to each factor, variable and indicator by making comparisons with one another. Larger values indicate these factors, variables, and indicators are more important than others (Dikdik, 2014).

There are three levels in the AHP method, namely; (i) the level of objectives to be the target of assessment, (ii) the level of criteria is components of aspects that affect the objectives, and (iii) the level of alternatives that indicates an action or plan (Lingyue, Maria, et al, 2019). AHP makes it possible to integrate quantitative and qualitative aspects in the decision-making process, this makes the AHP method very efficient and effective in solving complex problems (Ludovic, Franck, et al, 2011). AHP is possible to be applied to various problems, which all underline the user-friendliness and intuition of the methodology (Chiu & Chen, 2007; Gersdri & Kocaoglu, 2007; Lin, Wang, & Yu, 2008; Vidal, Sahin, Martelli, Berhounne, & Bonan, 2010). This makes it both a very generic and project context-friendly method.

AHP focuses on the question of how to choose the best among the available alternatives. AHP can be used to design alternatives effectively in problems solving related to decision making for public policy (Yoshinori, Seigo, et al, 2010). AHP is used to rank various attributes related to the problems faced, the process of selecting attributes to be analyzed is the key to getting effective and reliable decisions to solve problems (Vandana, Anjana, 2011).

RESULT AND DISCUSSION

Identification of the base sector is very important to be able to focus on economic development in the context of expanding employment opportunities. The base sector is defined as the sector that will be able to win the competition with other regions in the same sector, which can be seen from the market share and contribution to the Gross Regional Domestic Product (GRDP). According to Kartika (2009) the sector which is a specialization of regional economic activity needs to be encouraged to grow to become a sector that has competitive or comparative competitiveness.

To determine the base sector in Cilacap Regency to expand employment opportunities, the AHP method is used. The determination of the base sector in the context of expanding employment opportunities consists of 5 (five) criteria as shown in Figure 1.

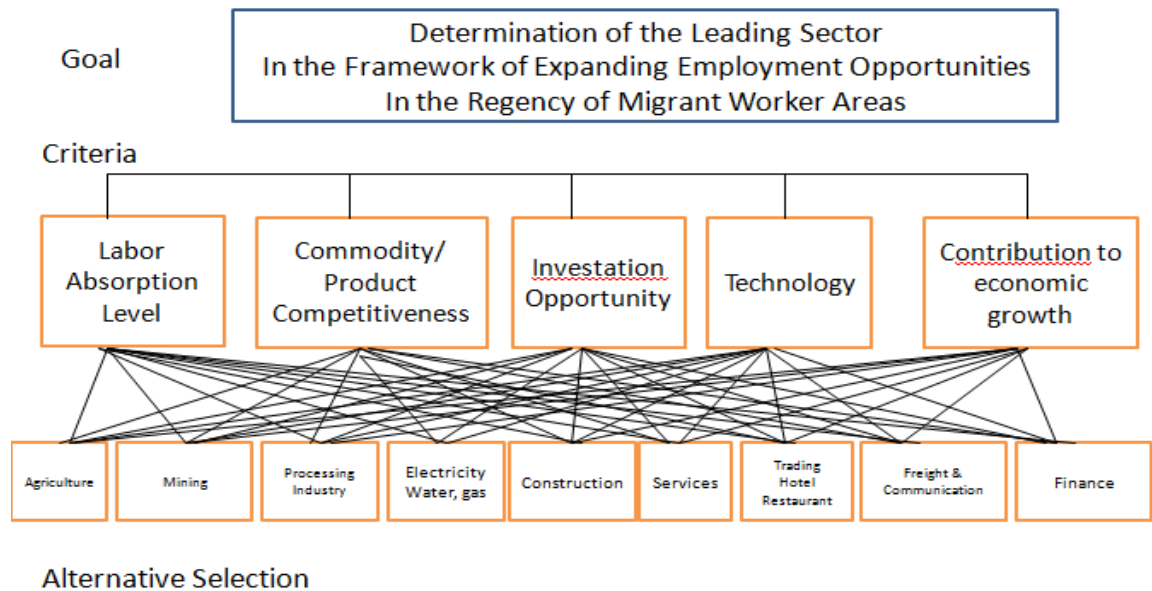


Figure 1: Hierarchy of Determination Leading Sector in the Framework of Expanding Employment Opportunities in Cilacap Regency

The AHP method is also used to determine the leading sector development policy strategy to expand employment opportunities. There are 6 (six) aspects of the strategy that are reviewed in a hierarchical arrangement as shown in Figure 2.

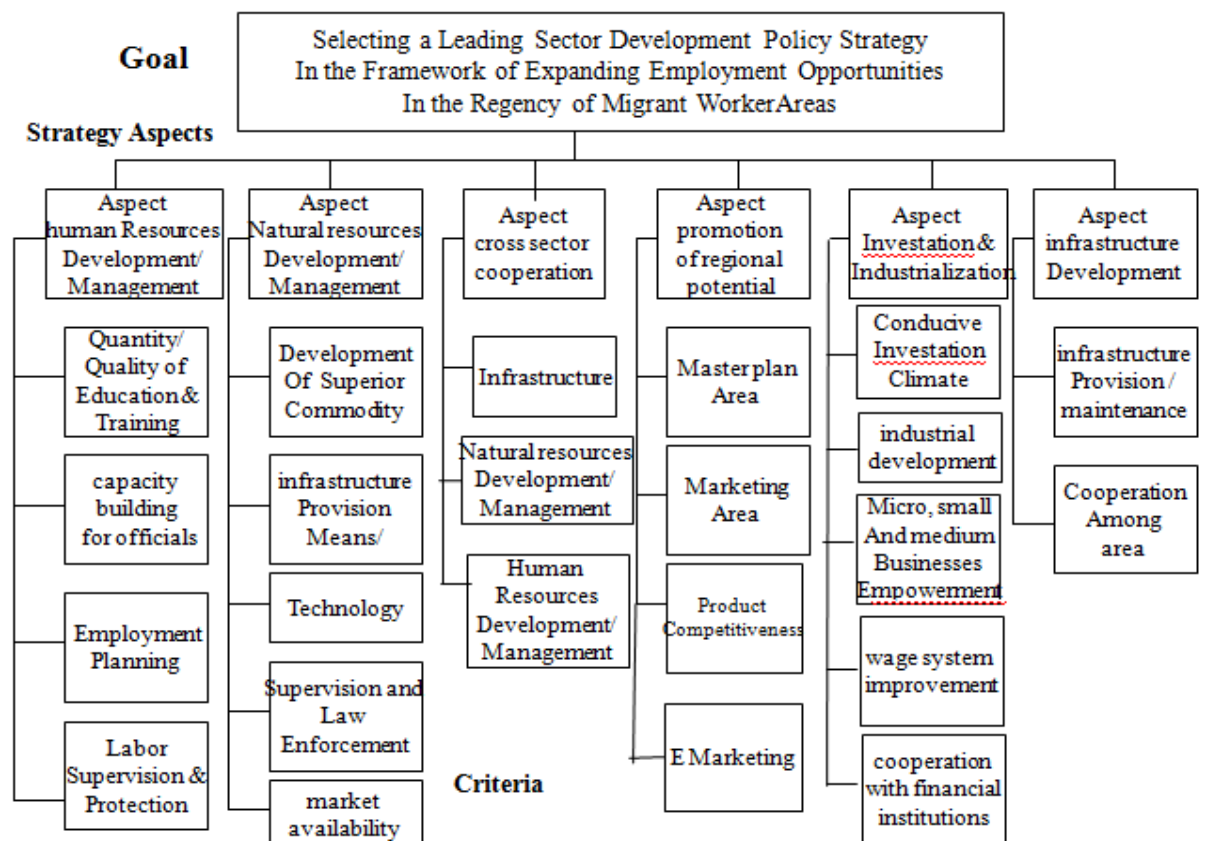


Figure 2: Selecting a Leading Sector Development Policy Strategy in the Framework of Expanding Employment Opportunities

To facilitate the computing process and AHP visualization, including doing sensitivity

analysis for the decision-making process and evaluating inconsistencies, in this study using the Expert Choice software version 11.

Base Sector Determination

Based on the results of processing with Expert Choice version 11, the priority weight output for determining the basis of each criterion can be seen in Table 1.

Table 1: Priority Weight Criteria for Determining Leading Sectors for Expanding Employment Opportunities

Source: Processed Data for Mapping of Leading Sector of Migrant Worker Area

Goal	In the Framework of Expanding Employment Opportunities In the Regency of Migrant Worker Areas									The highest score
Strategy Aspects	Labor Absorption Level	Commodity/ product Competitiveness	Investation Opportunity	Technology	Contribution to economic growth					Labor Absorption Level
AHP Weight	0,534	0,088	0,156	0,131	0,091					0,534
Strategy Aspect	Labor Absorption Level									The highest
Criteria	Agriculture	Mining	Processing Industry	Electricity Water, gas	Construction	Services	Trading Hotel Restaurant	Freight & Communication	Finance	Agriculture
AHP Weight	0,351	0,058	0,171	0,045	0,096	0,117	0,062	0,069	0,030	0,351
Strategy	Commodity / product Competitiveness									The highest
Criteria	Agriculture	Mining	Processing Industry	Electricity Water, gas	Construction	Services	Trading Hotel Restaurant	Freight & Communication	Finance	Processing Industry
AHP Weight	0,215	0,195	0,244	0,064	0,083	0,077	0,053	0,045	0,023	0,244
Strategy Aspects	Investation Opportunity									The highest score
Criteria	Agriculture	Mining	Processing Industry	Electricity Water, gas	Construction	Services	Trading Hotel Restaurant	Freight & Communication	Finance	Electricity Water, gas
AHP Weight	0,153	0,156	0,175	0,187	0,109	0,048	0,103	0,047	0,023	0,187
Strategy	Technology									The highest
Criteria	Agriculture	Mining	Processing Industry	Electricity Water, gas	Construction	Services	Trading Hotel Restaurant	Freight & Communication	Finance	Processing Industry
AHP Weight	0,106	0,114	0,199	0,186	0,121	0,071	0,042	0,114	0,047	0,199
Strategy Aspects	Contribution to economic growth									The highest score
Criteria	Agriculture	Mining	Processing Industry	Electricity Water, gas	Construction	Services	Trading Hotel Restaurant	Freight & Communication	Finance	Processing Industry
AHP Weight	0,203	0,110	0,209	0,151	0,101	0,075	0,062	0,049	0,040	0,209

Criteria for determining leading sectors to expand employment opportunities, respondents chose the main priority criterion is to increase employment. The level of employment is a condition that reflects how much the total workforce can be absorbed or can actively participate in a sector of economic activity. The results showed that the two leading sectors considered to need to be increased in the context of employment were the agriculture and manufacturing industries.

The output from the economic sector is expected to be able to produce quality commodities/products that are as good as the output of other economic sectors in the region but provide lower prices or be able to produce output with better quality so the results are more valuable. In Cilacap District, two leading sectors considered to have competitiveness are the agricultural processing industry sector.

An opportunity or attraction that can create investment or goods that can generate added value overtime to accelerate macroeconomic growth. In this case, the investment opportunity in question is more directed towards investment both Foreign Investment and Domestic Investment. Two leading sectors assessed as having opportunities to increase investment opportunities are the gas water electricity sector and the processing industry.

Leading sectors require the use of technology to produce better output. The better and more sophisticated the technology used will make the production process more efficient so that the better the output produced. The two leading sectors considered to be the most widely used technology are the gas processing industry and gas electricity.

In determining leading sectors one of the criteria used is the amount of contribution to economic growth so that it is expected to focus on developing leading sectors. The economic growth of the Cilacap district will increase rapidly while at the same time creating greater employment opportunities. The two leading sectors considered to provide the biggest

contribution to economic growth are the manufacturing and agriculture sectors.

From 5 aspects of the strategy used to determine the leading sector in Cilacap Regency, it can be concluded that there are 3 main sectors which occupy the 2 biggest values of each criterion used namely; agriculture, manufacturing and electricity, water, gas. Local governments need to develop strategies for the development of the three leading sectors.

Determination The aspects of the leading sector development policy strategy in the Framework of Expanding Employment opportunities

The aspects of the leading sector development policy strategy in the context of expanding employment opportunities consist of 6 aspects which are broken down into several criteria. Based on the results of processing with Expert Choice version 11, the priority weight output of each aspect and criteria can be seen in table 2.

Table 2: Leading Sector Development Policy Strategies in the Framework of Expanding Employment Opportunities

Goal	Selecting a Leading Sector Development Policy Strategy In the Framework of Expanding Employment Opportunities In the Regency of Migrant Worker Areas						The highest score
Strategy Aspects	Aspect human Resources Development /	Aspect Natural resources Development/ Management	Aspect cross sector cooperation	Aspect promotion of regional potential	Aspect Investation & Industrialization	Aspect infrastructure Development	Aspect human Resources Development/ Management
AHP Weight	0,46	0,153	0,125	0,056	0,122	0,084	0,46
Strategy Aspect	Aspect human Resources Development / Management						The highest score
Criteria	Quantity/ Quality of Education & Training	capacity building for officials	Employment Planning	Labor Supervision & Protection			Quantity/ Quality of Education & Training
AHP Weight	0,47	0,166	0,203	0,161			0,47
Strategy Aspects	Aspect Natural resources Development / Management						The highest score
Criteria	Development Of Superior Commodity	infrastructure Provision Means/	Technology	Supervision and Law	market availability		infrastructure Provision Means/
AHP Weight	0,255	0,286	0,23	0,108	0,121		0,286
Strategy Aspects	Aspect cross sector cooperation						The highest score
Criteria	Infrastructure	Natural resources Development/ Management	Human Resources Development/ Management				Human Resources Development/ Management
AHP Weight	0,252	0,277	0,471				0,471
Strategy Aspects	Aspect promotion of regional potential						The highest score
Criteria	Master plan Area	Marketing Area	Product Competitiveness	E- Marketing			Master plan Area
AHP Weight	0,349	0,294	0,266	0,091			0,349
Strategy Aspects	Aspect Investation & Industrialization						The highest score
Criteria	Conducive Investation Climate	industrial development	Micro, small And medium Businesses Empowerment	wage system improvement	cooperation with financial institutions		Conducive Investation Climate
AHP Weight	0,464	0,223	0,143	0,103	0,067		0,464
Strategy Aspects	Aspect infrastructure Development						The highest score
Criteria	infrastructure Provision / maintenance	Cooperation Among area					infrastructure Provision / maintenance
AHP Weight	0,602	0,398					0,602

Source: Processed Data of Mapping of Leading Sector in The Indonesian Migrant Worker Area

The results showed 2 leading sector development policy strategies to expand employment opportunities that have the highest value are the development/management of human resources and the development/management of natural resources. The discussion of the criteria for aspects of leading sector development policy strategies in the context of expanding employment opportunities is as follows.

Development/management of human resources aims to deal with various problems in the scope of employees, laborers, managers and other workers so that they can support the activities of the organization or company to achieve predetermined goals. The highest criteria

weights are increasing the quantity/quality of education and training and employment planning.

The determination of aspects of development/ management of natural resources is based on the fact that in each region of the Migrant Worker Areas have natural resources that have competitive advantages, comparability and specialization, the problem is in efforts to develop and manage natural resources. The two main policy strategies chosen were the provision of facilities/infrastructure and the development of leading commodities.

Aspects of cross-sector cooperation are very much needed in the context of absorbing regional, national and international workforce, cross-sectoral coordination and cooperation need to be improved to expand employment opportunities by optimizing the potential of the region in Cilacap district. The strategies considered most important are the development/management of human resources and the development/management of natural resources.

An opportunity or attraction that can create investment or goods that can generate added value overtime to accelerate macroeconomic growth. In this case, the investment opportunity in question is more directed towards investment both Foreign Investment and Domestic Investment. Based on the results of the research the two main efforts that can be done are to create a conducive investment climate and the development/development of industries / industrial estates.

Infrastructure refers to the physical system that provides transportation, water, buildings, and other public facilities needed to meet basic human needs economically and socially. Infrastructure is a basic element of a city, the main building of an activity and building support activities. The aspect of infrastructure development is considered important things related to various installations and facilities which are indispensable in carrying out economic activities. The two main strategies that are considered the most important to be pursued are the provision/maintenance of infrastructure and the second is cooperation between regions.

The aspect of promoting regional potential provides an illustration related to the government's efforts in developing regional potential through all business sectors. This is done by promoting this potential at the local, national and international levels so that it is expected to provide added value in efforts to develop leading sectors to expand employment opportunities. The main strategy that needs to be done is to create a regional master plan with and improve marketing.

Policies / strategies that have been launched by the Cilacap Regency government to develop leading sectors include:

- The Government of Cilacap Regency attempted to develop leading industries into larger industries such as the Sebutret industry (which stands for rubber coir fiber, or rubberized coir), ant sugar, banana sale and batik. At present the industry is still of MSME scale and it is expected that in the future especially ant sugar and Sebutret can become a bigger industry because the export opportunity is still very large and is a special feature of Cilacap.
- The Government's current strategic effort is to propose or provide proposals to the Central Government in this case the Ministry of Trade and Industry to develop these characteristics into a larger industry so that it can absorb more workers.

The strategies that have not been announced by the government in short, medium- and long-term planning documents, and need to be realized immediately for the development of industry-leading sectors in order to expand employment opportunities are:

- Strengthening the roles of related institutions for developing the potential of the Cilacap region, such as strengthening the Department of Industry, Trade and Cooperatives, and Labor
- Capturing developing issues related to human resources and the management and utilization of natural resources, especially in dealing with the global economy.
- Preparing workers who have added value. To create a workforce that has added value, it is necessary to develop a productive work training center
- Need to increase training to be able to create goods for the people of Cilacap Regency.
- For the development of small businesses, the local government, especially the Regent, must be able to make political policies to force large companies to develop small companies to make the components needed by large companies. Don't just import components from abroad.
- Develop superior products which are a specialty in Cilacap in order to meet a larger scale of production and better standardization in order to meet export opportunities that are still wide open as in the ant and sugar industry.

The strategies that have not been announced by the government in short, medium- and

long-term planning documents, and need to be realized immediately for the development of industry-leading sectors in order to expand employment opportunities are:

- Strengthening the roles of related institutions for developing the potential of the Cilacap region, such as strengthening the Department of Industry, Trade and Cooperatives, and Labor
- Capturing developing issues related to human resources and management / utilization of natural resources, especially in dealing with the global economy.
- Preparing workers who have added value. To create a workforce that has added value, it is necessary to develop a productive work training center
- Need to increase training to be able to create goods for the people of Cilacap Regency.
- For the development of small businesses, local governments must be able to make political policies to encourage large companies to foster small companies, so that they can make the components needed by large companies and do not need to import components from abroad.
- Develop superior products that are unique in Cilacap so that they can reach a larger production scale and have better standardization. In the end, superior products in Cilacap Regency will have export opportunities such as the ant and sugar industry.

Supporting factors to be able to develop leading sectors in Cilacap Regency include; Abundant labor, regional regulations relating to the Implementation of One Door Services to facilitate the licensing for domestic and foreign investors, the policy to expand industrial region.

In terms of the quantity of labor available in Cilacap Regency is abundant, but in terms of quality human resources are still low. The following problems are related to the quality of human resources in Cilacap Regency:

- The workforce is mostly high school educated.
- Most of the workforce with secondary education level and below cannot fill the job qualifications of large companies in Cilacap such as Pertamina, Semen Holcim and Pakan Mas, so that the workforce of large companies in Cilacap actually comes from outside Cilacap.
- If it is related to the superior sector that is being developed, the workforce in Cilacap, which is mostly of secondary education level and below, is expected to be able to fill the workforce needs in leading sectors such as ant sugar, banana sale, batik and minapolitan.

The obstacles faced by the Government of Cilacap Regency in the context of developing the quality of human resources include;

- Education and training facilities and infrastructure in Cilacap Regency are very limited. In Cilacap Regency there is only one tertiary institution that has been ratified as a state tertiary institution, the Cilacap State Polytechnic.
- There is an overseas work training center owned by the Cilacap district government but it cannot be maximally efficient. Problems related to regional budget funds. Many occur now Cilacap is only able to sell the potential of natural resources in the form of untreated raw materials so there is no added value. Example: selling iron sand. Need to increase training to be able to create goods for the people of Cilacap Regency.

CONCLUSION

The determination of leading sectors is important as a basis for regional development planning, where regions have the opportunity and authority to make policies that are in line with regional potentials to expand employment opportunities to accelerate regional economic development. In Cilacap Regency based on AHP 2 analysis, the basic sector that needs to be developed to expand employment opportunities in the Agriculture and Processing Industry Sector.

To be able to develop the base sector requires a strategy from the central and regional governments as outlined in the Short-term Development Plan and Long-Term Development Plan. Based on AHP analysis, to be able to develop a sector basis human resource development strategy and development/ management of natural resources selected as a key success factor in developing a sector base. The most important criteria chosen for the development of human resources is through education/training, while for the development of natural resources through the provision of facilities/infrastructure.

To create a workforce that has added value, it is necessary to develop a productive work training center such as training that is in accordance with the skills needed to make superior products. Need to increase training to be able to create goods for the people of Cilacap

Regency and create tertiary graduates who are in accordance with the skill requirements of superior products.

REFERENCES

- Ardina Ariani, Leon Andretti Abdillah, Firamom Syakti. 2013. "Sistem Pendukung Keputusan Kelayakan Tki Ke Luar Negeri Menggunakan FMADM". *Jurnal Sistem Informasi*. 4(5) : 336-343.
- Blakely, Edward J. and Ted K. Bradshaw. 2002. *Planning Local Economic Development: Theory and Practice*, Sage publications, London second edition
- Brannen, Julia. 1992. *Mixing Methods: Qualitative and Quantitative Research*. Aldershot, Avebury.
- Cheng, E. W. L. & Li, H. 2001. "Information Priority Setting for Better Resource Allocation Using Analytic Hierarchy Process (AHP)". *International Journal of Information Management and Computer Security*. 9(2): 61-70
- Chiu, Y. J., & Chen, Y. W. (2007). "Using AHP in Patent Valuation". *Journal Mathematical and Computer Modelling*. 46(7) :1054–1062.
- Cresswell, John W. 2003. *Qualitative, Quantitative. and Mixed Methods Approaches*. Sage Publications, London.
- Dewi Aprilliana, Luh Gede Meydianawathi. 2013. "Faktor-Faktor Yang Mempengaruhi Pengiriman Remitansi TKI Asal Bali Di Amerika Serikat". *E-Jurnal Ekonomi Pembangunan Universitas Udayana*. 2(8) : 373 – 383.
- Dikdik Kusdiana. 2014. "Pengembangan Produk Unggulan UMKM Kabupaten Sukabumi". *Jurnal Trikonomika*. 13(2):153–171
- Drake, P. R. 1998. "Using the Analytical Hierarchy Process in Engineering Education". *International Journal of Engineering Education*. 14(3): 191-196.
- Gerdri, N., & Kocaoglu, D. F. (2007). "Applying the analytic hierarchy process (AHP) to build a strategic framework for technology roadmapping". *Journal Mathematical and Computer Modelling*. 46(8): 1071–1080
- Lin, C. C., Wang, W. C., & Yu, W. D. (2008). "Improving AHP for construction with an adaptive AHP approach". *Journal Automation in Construction*. 17(2):180–187.
- Lingyue Zhanga,b, Maria Cristina Lavagnoloc, Hao Baid, Alberto Pivatoc, Roberto Ragac, Dongbei Yuea,b. 2019. "Environmental And Economic Assessment Of Leachate Concentrate Treatment Technologies Using Analytic Hierarchy Process". *Journal Resources, Conservation & Recycling*. 141: 474–480
- Ludovic-Alexandre Vidal, Franck Marle, Jean-Claude Bocquet. 2011. "Using a Delphi process and the Analytic Hierarchy Process (AHP) to Evaluate The Complexity of Projects". *Journal Expert Systems with Applications*. 38 (5) : 5388–5405
- Nissa Juandea. 2014. "Dampak Penerapan Kebijakan Moratorium Bagi Tki Ke Arab Saudi Oleh Pemerintah Indonesia". *eJournal Ilmu Hubungan Internasional*. 2(3) : 589-600
- Niskha Sandriana, Abdul Hakim, Choirul Saleh. 2015. "Strategi Pengembangan Produk Unggulan Daerah Berbasis Klaster Di Kota Malang". *Jurnal REFORMASI*. 5(1): 89-100.
- Tavi Supriana, Vita Lestari Nasution. 2010. "Peran Usaha Tki Purna Terhadap Pengembangan Ekonomi Lokal Dan Faktor Yang Mempengaruhi Pendapatan Usaha Tki Purna Di Provinsi Sumatera Utara". *Jurnal Makara, Sosial Humaniora*. 14(1) : 42-50
- Yosep Yonhy, Rito Goejantoro, dan Sri Wahyuningsih. 2013. "Non Linear Trend Method For Forecasting The Departure Number Of Indonesian Labors At The Class II Immigration Office On Nunukan District". *Jurnal EKSPONENSIAL*. 4(1) : 47-54 .
- Yoshinori Nakagawa, Seigo Nasu, Taiki Saito, Nobuyoshi Yamaguchi. 2010. "Analytic hierarchy based policy design method (AHPo) for solving societal problems that require a multifaceted approach". *European Journal of Operational Research*. 207(3) : 1545–1553
- Vandana Bagla And Anjana Gupta. 2011. "Analytical Hierarchy Process Based Assignment Model for Allotting Parking Slots to Different Localities". *Journal Of Multi-Criteria Decision Analysis*. 18 (4) : 173–185
- Vidal, L. A., Sahin, E., Martelli, N., Berhoune, M., & Bonan, B. (2010). "Applying AHP to select drugs to be produced by anticipation in a chemotherapy compounding unit". *Expert Systems with Applications*. 37(2) : 1528–1534