

# Coal Supplier Selection of PT. XYZ Trading Indonesia with Green Supplier Selection Approach

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**Abstract:** Green suppliers have become one of the important issues for environmental protection because pollution issues by coal mining industry are currently increasing. To reduce negative impact of environmental pollution issues by mining industry, a selection of suppliers, that takes attention to environmental aspects, can be seen as an important part of the concept of Green Supplier Selection or GSS. To meet the specifications of coal from customers (company group and retail), PT. XYZ Trading Indonesia must select suppliers that meet the required criteria. Many methods can be used for supplier selection, as recommendation from many studies, this thesis used Analytic Hierarchy Process Method. AHP is a method which helps decision makers to select the best options by considering multi-attribute criteria. The developed model is applied in selecting the supplier considering the relevant Safety, Corporate Social Responsibility (CSR) and Green criteria.

**Keywords:** AHP, Analytical Hierarchy Process, Coal, green supplier, green supplier selection

## 1. Introduction

Indonesia is one of the largest coal producers and exporters in the world. Since 2005, when it surpassed Australia's production, Indonesia has become a leading exporter of thermal coal (Paul 2012). The majority of the exported thermal coal comprises of intermediate quality types between 5100 and 6100 cal / gram and low quality types under 5100 cal / gram that most of the demands come from India and China (Gandolphe 2017). The share of Indonesian coal exports ranges from 70 to 80 percent of total production, while the rest is sold in domestic market where the use of coal is still relatively low. Here is the production, export, domestic consumption and coal price in the period of 2009-2015:

**Table 1:** Production, export, domestic consumption and coal price

	2009	2010	2011	2012	2013	2014	2015
Production (million tons)	254	275	353	412	474	458	453
Export (million tons)	198	210	287	345	402	382	366
Domestic consumption (million tons)	56	65	66	67	72	76	87
Price (CBP, USD/ton)	70.7	91.7	118.4	95.5	82.9	72.6	60.1

Source: Indonesian Coal Mining Association and Ministry of Energy and Mineral Resources

Based on data from the Directorate General of Mineral Coal (Directorate General of Minerba) of the Ministry of Energy and Mineral Resources, there are 10 export destination countries for Indonesian coal that mostly are still from Asian countries.

From Table 2, Thailand, Malaysia and the Philippines are the three main countries in ASEAN region that use coal from Indonesia for power generation and main fuel for cement and paper industries. Most of the coal imported by Thailand is from PT. XYZ Trading Indonesia, purchased from various suppliers located in East Kalimantan, South Kalimantan, and Bengkulu. Besides selling to Thailand, PT. XYZ Trading

Indonesia also sells to Vietnam, Cambodia, Myanmar and the Philippines. PT. XYZ Trading Indonesia supplies coal from Indonesia to its own Company Group in ASEAN region, only about 10% of which are retailed outside the company group.

**Table 2:** Data of Indonesian coal export destination

Country	Year (million tons)					
	2010	2011	2012	2013	2014	2015
India	51.3	74.7	96.1	118.3	136.4	124.5
China	74.8	104.1	115.7	130.4	99.3	72.7
South Korea	43.3	39.6	37.9	36.3	35.6	34.0
Japan	35.3	35.4	35.5	37.7	35.6	32.5
Taiwan	25.0	27.1	29.1	28.3	27.3	24.4
Thailand	13.1	13.3	14.7	14.4	16.2	17.9
Malaysia	15.5	17.3	16.1	17.1	14.5	16.6
Philippines	11.1	11.0	11.6	14.5	15.0	15.8
Hong Kong	9.7	11.9	12.0	13.0	12.6	9.8
Spain	1.6	3.6	5.7	4.1	4.1	4.8

Source: Central Bureau of Statistics

To meet the specifications of coal from customers (Company group and retail), PT. XYZ Trading Indonesia must select suppliers that meet the required criteria. In the process of selection of conventional suppliers, decision makers or management usually consider factors that are; cost, level of service, and product quality (Thiruchelvam and Tookey 2011).

With regard to global trends that consider sustainability issues in recent years, the company has begun to incorporate the criteria of environmental management (green) and corporate social responsibility (CSR) or ethical criteria in supplier selection and evaluation activities (Agarwal and Vijayvargy 2012). Green supplier has become an important issue for environmental protection due to increasing pollution issue by the current coal mining industry (Shen et al., 2013). To overcome the negative impacts of environmental pollution issues by the mining industry, the selection of suppliers, who consider the environmental aspects, can be seen as an important part of the concept of Green Supplier Selection or GSS.

When compared to the concept of conventional supplier selection, the concept of selecting the green supplier (GSS) has a fundamental difference, that the conventional one often concentrates on price, quality, capacity and delivery, while GSS besides economic and value purposes, it also gives significant consideration to ecological impacts (Chen et al., 2016). On the other hand, many companies give privilege to their suppliers that have sustainability concepts to gain positive perceptions from customers or consumers (Gurel et al., 2015).

In the decision-making process to determine the green supplier, the company's management receives much information about the suppliers to be selected and can be audited later on the green supplier selection process (Nielsen et al 2014). As a result, company's management needs to have a tool that can be used in the selection of coal green supplier that plays an important role in the company's business (Chamid 2007). This makes the reason of this research; to determine the method of supplier selection in accordance with the criteria of green suppliers expected by the company, especially PT. XYZ trading Indonesia. The determination of the appropriate method for selection of suppliers is done by using Analytical Hierarchy Process (AHP) which is one of the Multi Criteria Decision Making (MCDM) which is often used in the process of selecting the best alternative, and AHP is also expected to provide an organized, rational and comprehensive mindset in structuring a problem that leads to effective decision-making.

Based on the above problems, the purposes of this study are:

- 1) To analyze the selection of coal suppliers done by PT. XYZ Trading Indonesia.
- 2) To identify and analyze the criteria of selection of coal green supplier.
- 3) To determine the prioritized companies that met the criteria of coal green supplier.

## 2. Data

This study used primary data obtained from experts in the form of scores based on priority scale based on expert opinion in the field of coal. The secondary data were obtained from the internal company that is PT. XYZ Trading Indonesia. The secondary data obtained include several coal companies belonging to the "green supplier" with several criteria. Sampling from internal experts aimed to describe several criteria of the object investigated. The selected respondents were experts from the internal management of PT. XYZ Trading Indonesia and some experts from the management of external companies engaged in trading coal and considered competent to know the policies and concepts and can provide opinions related to decision making for supplier selection.

## 3. Methodology

The method used in determining the company that has met the criteria of coal green supplier is the Analytical Hierarchy Process (AHP) method. The data processing and data analysis can be seen in Figure 1.

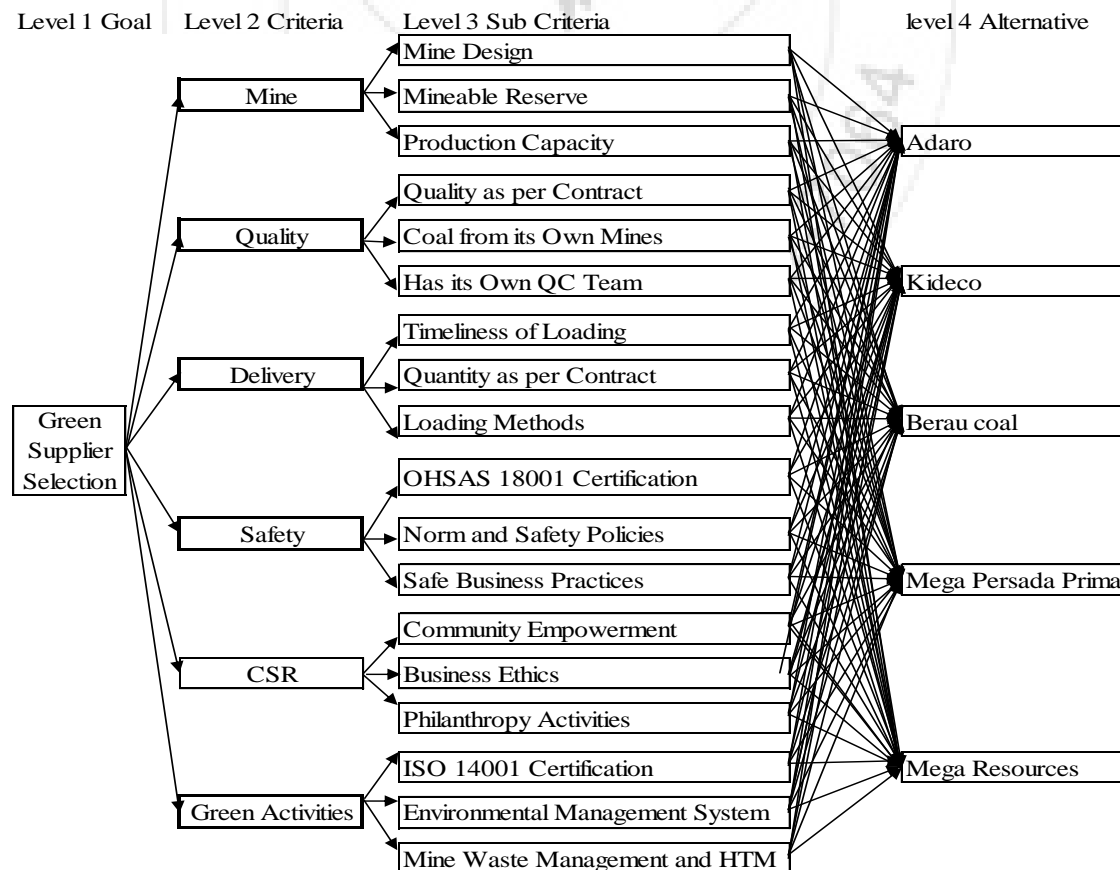


Figure 1: Framework of the study

## 4. Results

### Vision of PT. XYZ Trading Indonesia

"XYZ Trading dedicates itself to deliver world-class quality products and services to meet customer needs consistently. All customer opinions should be taken promptly to ensure sustainable customer satisfaction".

### Mission of PT. XYZ Trading Indonesia

- 1) In 2018, XYZ Trading's goal is to become the most trusted business partner and to be a part of sustainable customer success.
- 2) As a spearhead, we will develop new businesses and new markets while strengthening distribution channels through our global network.
- 3) We are going to be an innovative organization, which strictly adheres to ethical, environmental and social responsibility.

### Results of The Descriptive Analysis

The selection of coal suppliers in PT. XYZ Trading Indonesia still uses the traditional criteria such as mine, quality and logistics (delivery), that its assessment is only done by rating / valuation method with a total score of 100 points. In the sub criteria of mine design, that is how the mine is designed or made by considering the drainage system, pit benches and the use of tools in the mining process (total score 20 points). Production capacity assesses mine production capability that is capable of producing less than 10,000 Mt / month (1 point) to more than 150,000 Mt / month (10 points), by giving a total score of 10 points. The mineable reserve / estimated reserve criteria, quantity and quality distribution, which at feasibility assessment are eligible to be mined, which in the future can guarantee sustainable supply to customers. This criterion is awarded the highest score of 10 points for mineable reserve of more than 15 million tons, while 1 point of the total score of 10 points for reserves of less than 1 million tons.

The quality of coal is the second criterion of the company to assess a mine before purchasing, whether the process of its quality control, the size distribution of its final product, and the possible contamination of its final product. On this criterion, the company provides an assessment with a total score of 30 points out of a total of 100 points. The quality control gets 15 points, the size distribution of final product gets 5 points, and contamination gets 10 points.

The last criterion of the company is logistic / delivery, where company gives a total score of 30 points from total 100 points. With the distribution of assessment: distance from mine to port gets 4 points, truck hauling rate 4 gets points, loading method gets 5 points, loading rate at jetty gets 5 points, jetty ownership gets 3 points and stockpile capacity at jetty gets 4 points, and several other supporting categories (equipment, bedding coal, can berth 330ft barge) get 5 points. This criterion was chosen by the company to support the smooth traffic of coal from the mine to shipping process in jetty and port.

### Identification of Selection Criteria for Green Supplier

The following is the result of identification of green supplier selection criteria based on the results of literature study and expert depth interview:

- 1) Mine, this criterion consists of 3 sub criteria, namely: Mine Design, Coal Reserves and Production Capacity.
- 2) Quality, this criterion consists of 3 sub criteria, namely: Quality as Contracted, Coal from owned mine and Availability of owned QC team.
- 3) Delivery, this criterion consists of 3 sub criteria, namely: Load Time Accuracy, Quantity as requested and Loading Method.
- 4) Safety, this criterion consists of 3 sub criteria, namely: Certification of OHSAS 18001, Safety Norms and Policies and Safe Business Practice.
- 5) Corporate Social Responsibility (CSR), this criterion consists of 3 sub criteria, namely: Community Empowerment, Business Ethics and Philanthropy Activities.
- 6) Green activity, this criterion consists of 3 sub criteria, namely: certification of ISO 14001, Environmental Management System and Mine and B3 Waste Management.

### Analysis of Selection Criteria of Green Supplier

After the criteria of green supplier were identified, then the Consistency Test was conducted on all criteria and sub criteria. If the consistency test on the main criteria showed consistent results, then the weighting process could be processed for the main criteria which the results can be seen in Figure 2 below:



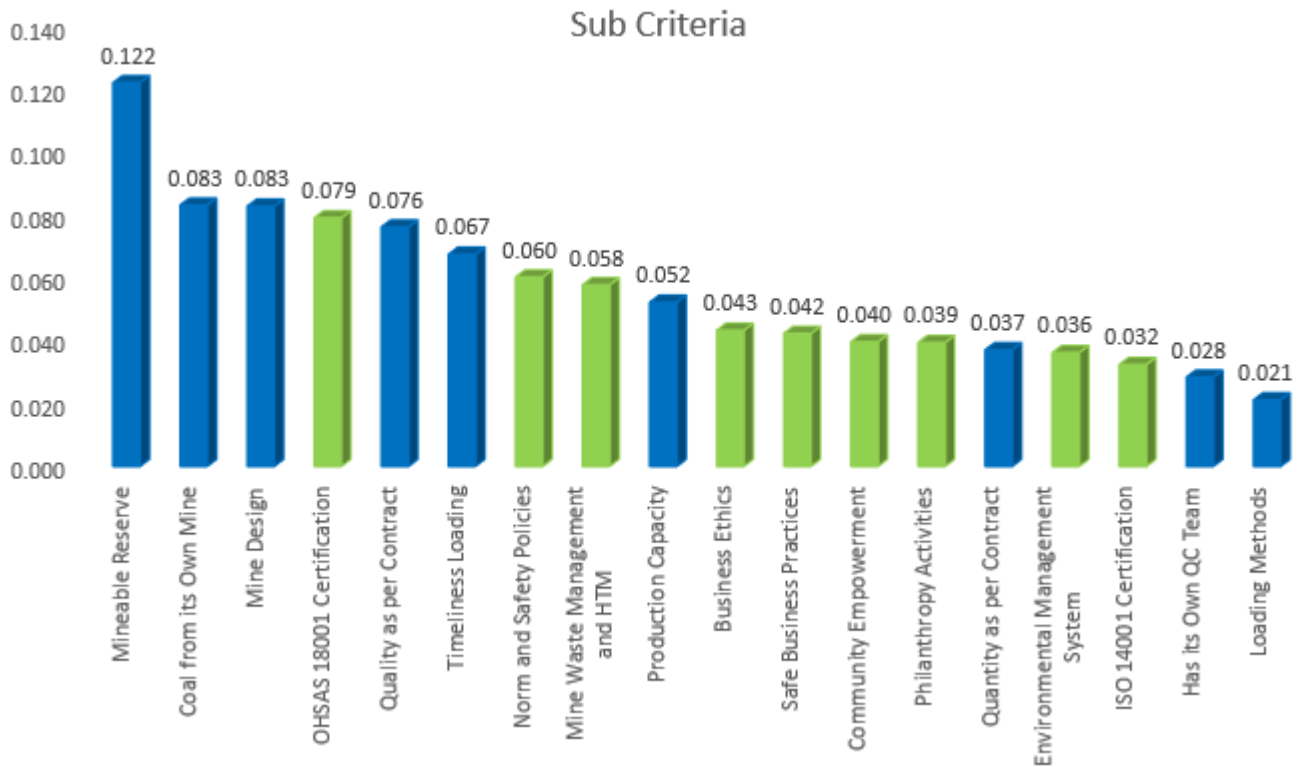
**Figure 2:** The main criteria weighting result

Figure 2 shows that Mine criterion (0.257) and Quality criterion (0.188) remained a top priority in the selection of supplier criteria. It is interesting to note that Safety criterion (0.181) and Green Activity criterion (0.126) ranked the third and the fourth. This shows that green criterion can influence decision making by expert respondents in determining the main criteria for supplier selection.

The next step was to do assessment on the importance weight of each sub criteria selected as can be seen in Figure 3. The respondents considered that the certification of OHSAS 18001 criterion, safety norms and policies, and mine and B3 waste management have an important role in the coal mining process. This is evidenced by the weight of

sub criteria that had a fairly high value of 0.079, 0.050 and 0.058. From the weighting result, it shows that the sub green criteria could still influence the experts in making decisions in selecting a coal supplier. This is in line with the

respondents' knowledge of the mining company's policy to run good mining practices.

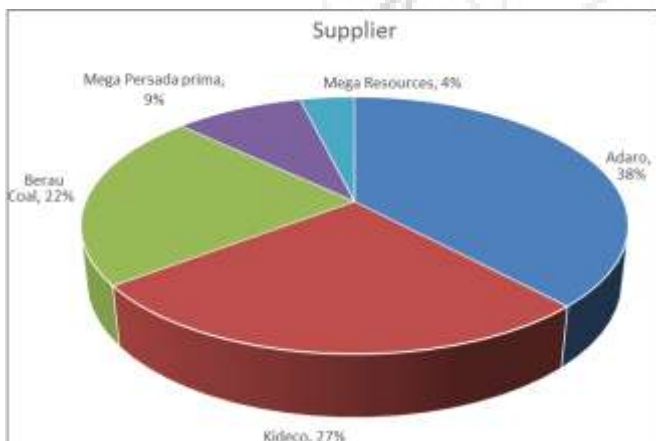


**Figure 3:** Result of weighting sub criteria

**Determination of Prioritized Companies**

This section is a step to know the value of the prioritized green supplier companies. The suppliers that were assessed are five suppliers of coal companies that had been supplying coal to PT. XYZ Trading Indonesia.

product known as Enviro coal (environmentally friendly coal), and has been certified by ISO 9001, ISO 14001 and OHSAS 18001 (Adaro annual report 2016).



**Figure 4:** Prioritized companies

Kideco Supplier was chosen as the second prioritized supplier, with the five sub-criteria obtained were the norm and safety policy of 0.300, environmental management system of 0.294, the loading accuracy of 0.293, the coal from owned mine of 0.292, and the certification of ISO 14001 of 0.289. While Berau Coal supplier was chosen as the third prioritized supplier. While the top five sub criteria were loading method of 0.288, availability of owned QC team of 0.276, coal from owned mine of 0.252, safety norms and policies of 0.252, and certification of OHSAS 18001 of 0.242.

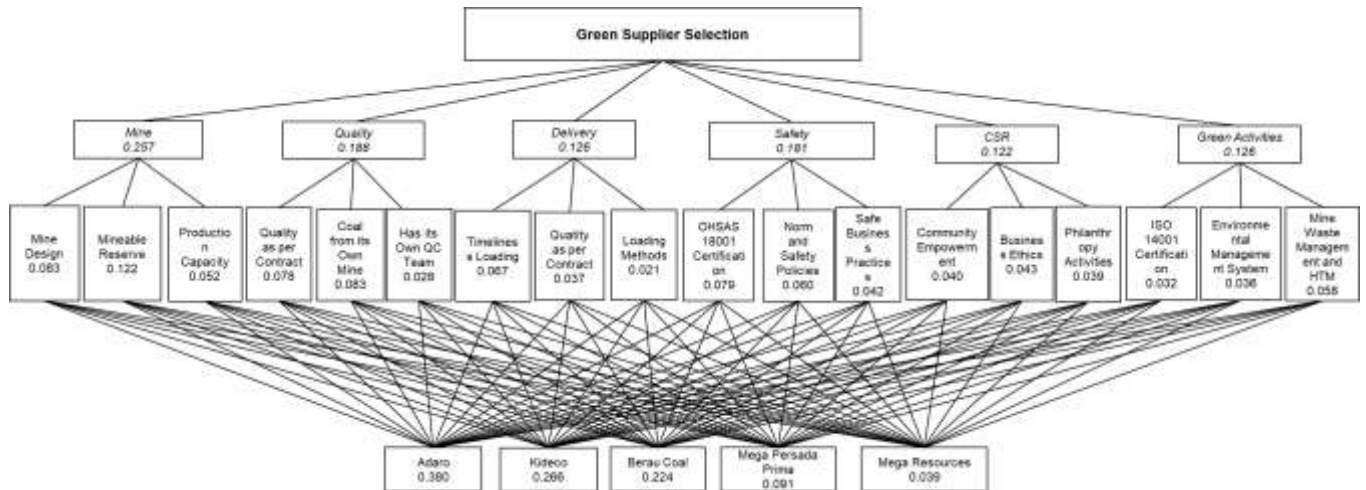
Based on the AHP weighting results of eighteen sub criteria, it shows Adaro supplier achieved the highest point with 38% compared to Kideco 27% and Berau Coal 22%. The five sub-criteria obtained by Adaro were production capacity of 0.499, mine design of 0.461, coal reserve of 0.434, safe business practices of 0.417, and philanthropy activities of 0.386. This is supported by Adaro's reputation as one of the largest coal mining companies in Indonesia, and its coal

**Managerial Implications**

Implementation of green supplier selection methods in the company's activities will provide benefits and obstacles. The benefits are getting better quality and fulfilling buyers' specifications and requirements, getting positive social image that can reduce the image of the mining industry –that is destructive to the environment, reducing costs, getting better time management of product delivery, getting better business relationships, getting improvement and development opportunities and having a list suppliers that fulfill the criteria. While the challenges to face by the company are the process of selecting green suppliers that require more time, lack of knowledge and experience in the



implementation of new systems and the need for new technologies for the implementation process.



**Figure 5:** Final result of hierarchy structure of coal supplier selection of PT. XYZ Trading Indonesia by green supplier selection approach

## 5. Conclusion

Based on the results, the conclusions of this study are:

- 1) The selection of suppliers that have been done by PT. XYZ Trading Indonesia still uses traditional criteria, namely Mine, Quality, and Logistics. While, for the assessment only uses scoring / simple rating.
- 2) Green criteria and sub criteria can influence the respondents in deciding coal suppliers. This is supported by respondents' knowledge of the coal mining company's policies to implement good mining practices and safety policies as well as the trend of coal mining companies that are environmentally friendly and concern for the empowerment of the surrounding communities where the company operates.
- 3) The selected supplier using green criteria and sub criteria is Adaro supplier. The second is Kideco, followed by Berau Coal at the third. Respondents agreed that the three supplier companies have met the requirements to currently become the best green suppliers for the company.

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