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### **STRATEGIES OF ELECTRIC BUS IMPLEMENTATION IN SOEKARNO-HATTA AIRPORT USING STRENGTH-WEAKNESS-OPPORTUNITY-THREAT (SWOT) ANALYSIS AND QUANTITATIVE STRATEGIC PROGRAMMING MATRIX**

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#### **Abstract**

Most of the transportation in Indonesia still uses oil as their fuel, thus Indonesia is currently facing one of the Energy Security issues which are oil availability. Nowadays, Indonesia doesn't have sufficient oil production, consequently, Indonesia must import oil to meet its daily demand. Furthermore, Indonesia also dealing with an environmental issue from the transportation sector, which is air pollution. Air pollution is one of the non-military threats that threaten the lives of many people in Indonesia. The non-military defense is an effort made to ward off non-military threats. One of the ways to fight air pollution is to reduce the use of oil in the transportation sector. Currently, the development of innovative technology in the field of transportation is increasingly oriented to electric vehicles (EV). This is due to EVs that do not produce gas emissions, increase energy efficiency, and reduce oil consumption. In August 2018, a one-week trial runs on an electric bus at Soekarno-Hatta Airport conducted to looking for responses from passengers when boarding an electric bus as an airport shuttle bus. Therefore, this study will be further determining the strategies of electric bus implementation at Soekarno-Hatta Airport. The method used is a qualitative method using a case study approach and Strength-Weakness-Opportunity-Threat Analysis with Quantitative Strategic Programming Matrix. This study concludes that the strategy that has to be implemented first for electric bus implementation in Soekarno-Hatta Airport is Strength-Opportunity 3 (SO3) strategy, which is collaborating with Bus Companies to become a pioneer in electric bus implementation in Indonesia's Airport and improve the Eco Airports Status.

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## INTRODUCTION

Government Regulation of the Republic of Indonesia Number 79 Year (2014) concerning the National Energy Policy states that energy security is a condition of guaranteed energy availability and public access to energy at an affordable price in the long term while still taking into account environmental protection. Meanwhile, according to the APERC (Asia Pacific Energy Research Centre, 2007), energy security is a condition where energy sources are available continuously at an affordable price.

According to the WEC (World Energy Council, 2018) in the Energy Trilemma Index, Indonesia's energy security rating in the world is quite low. Indonesia is ranked 75th out of 125 countries in the world. The first rank is occupied by Denmark, the second rank is occupied by Sweden and the third rank is occupied by Switzerland, those countries that have the best energy security ratings in the World have implemented the concept of energy security very well. Starting from the availability of energy, public access to energy, affordable energy prices, pay attention to the environment, and have energy sustainability.

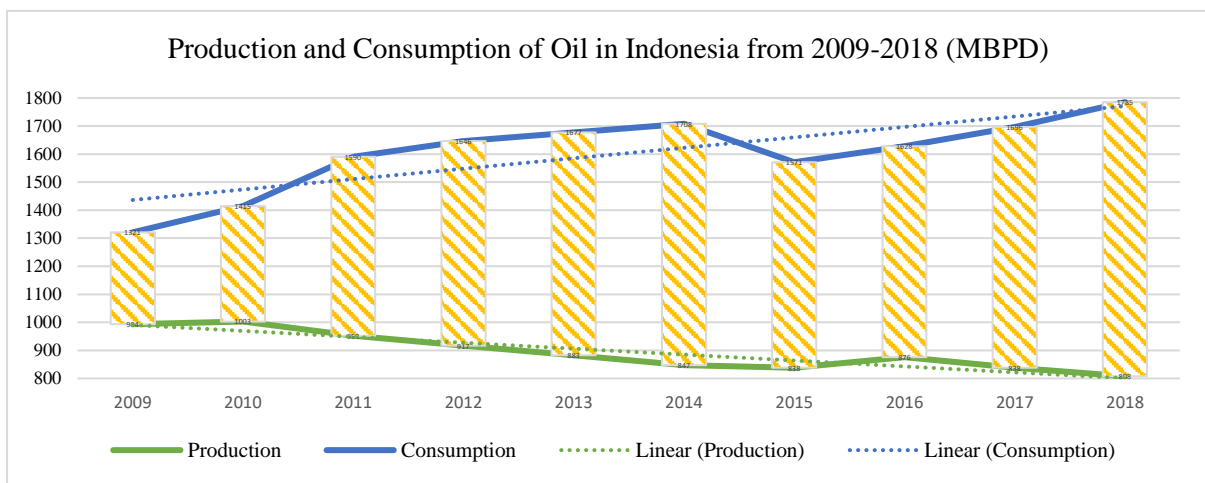
Energy Security is one aspect of national resilience that can assist a nation to achieve its national goals. To create national resilience, strong energy resilience is required. Energy is closely related to every aspect that supports national resilience. Concerning ideology, Indonesia aspires to achieve energy sovereignty, that is, a condition where we no longer depend on other countries to meet national energy needs. In relation to politics, energy can be used as an instrument for political gain between Indonesia and other countries. In relation to the economy, energy can be an exportable commodity to increase Indonesia's income. In relation to the energy culture, it can also regulate people's lives by implementing an energy-saving culture and reduce pollution. In the field of defense and security, energy is used to fuel our defense equipment. Therefore, energy

security is one of the most important factors for a country to achieve national resilience.

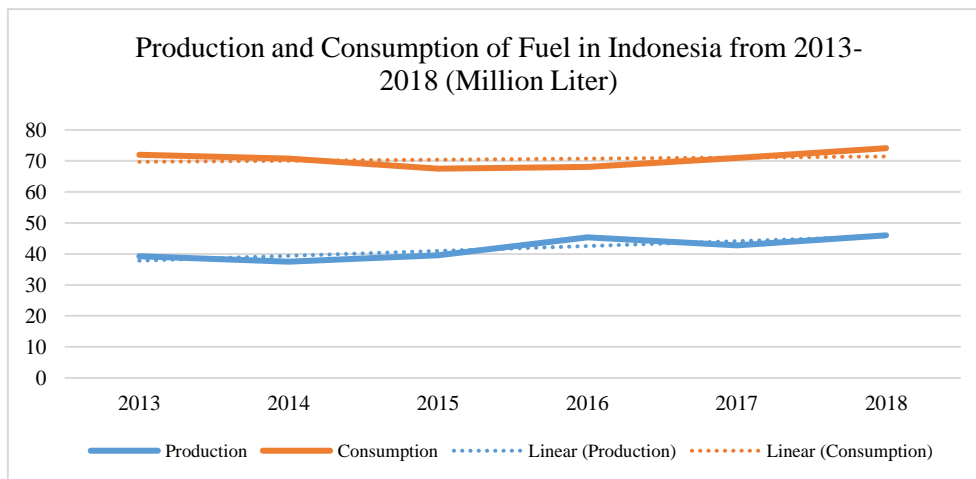
Whereas in Indonesia, the condition of our energy security is still relatively low. Indonesian people's dependence on fossil energy sources, especially petroleum is immensely large. The public still relies on oil to meet their daily energy needs, from the household scale to the industrial scale. As a result, oil consumption in Indonesia keeps increasing. While oil production in Indonesia keeps declining. This is proven by the data provided by BP (2019) in the Statistical Review of World Energy.

As seen in Figure 1, the trend of the amount of oil consumption in Indonesia has increased over the past 10 years. In 2009, our total oil consumption was 1,321 MBPD, then increased by 464 MBPD to 1,785 MBPD in 2018. This was not balanced with the amount of oil production in Indonesia, which was far less than the amount of consumption of the people. Moreover, the trend of the amount of oil production in Indonesia decreases every year. In 2009, our total oil production amounted to only 994 MBPD, a deficit of 327 MBPD to meet public consumption demand. In 2018, the difference between production and consumption grew even bigger, with the production only 808 MBPD while the consumption is 1,785 MBPD, the difference reached 977 MBPD. This is why Indonesia must import petroleum to meet domestic needs and become a net importer of petroleum since 2004. Indonesia's fuel consumption from 2013 to 2018 tends to increase and has an upward trend, as well as Indonesia's fuel production which increases and has an upward trend as shown in Figure 2.

The problem that occurs in Indonesia today is that the production of petroleum fuels cannot compensate for the large consumption of fuel so that Indonesia needs to import oil to meet the energy needs of fuel every day. This is because there is no development in oil refineries and no new oil wells are found. As a solution to the problem is the need for diversification of



**Figure 1.** Production and Consumption of Oil in Indonesia from 2009-2018  
 Source: BP Statistical Review of World Energy, 2019



**Figure 2.** Production and Consumption of Fuel in Indonesia 2013-2018  
 Source: BP Statistical Review of World Energy, 2019

energy other than fuel. One of the alternatives is to use electricity as energy that environmentally friendly and does not cause air pollution (Hikmat, 2019).

Air pollution is one of the non-military threats that threaten the lives of many people in Indonesia. The non-military defense is an effort made to ward off non-military threats. One of the ways to fight air pollution is to reduce the use of fuel oil in the transportation sector which produces air pollution. International Energy Agency (2019) shows that the global transportation sector must contribute about one-fifth of the overall reduction in greenhouse gas emissions from energy use by 2050. Electric vehicles are expected to be the right solution to reducing greenhouse gas

emissions in the transportation sector. Electric vehicles are seen as a major contributor to the goal of reducing greenhouse gas emissions because it increases energy efficiency and reduces CO<sub>2</sub> emissions. Thereby, the Government of Indonesia issuing President Regulation Number 55 of 2019 about Accelerating the Development of Electric Vehicles in Indonesia as a legal foundation of electric vehicles implementation in Indonesia. At present, electric buses have been developed by BPPT (Agency for Assessment and Application of Technology) and MAB (*Mobil Anak Bangsa*) ltd.

One of the types of electric vehicles is the electric bus. The electric bus can be one of the solutions to overcome these problems

because it is better than the conventional bus from costs and environment (Rismana, Budiarto, & Widi Harto, 2019; Sheth & Sarkar, 2019). Other countries in the world have implemented the use of electric buses at their eco airports, as a step to reduce fuel consumption and to reduce air pollution. Meanwhile in Indonesia, all of the shuttle buses in Indonesia's Airport still use conventional buses. Even though According to Government Regulation Number 40 of 2012 about Development and Preservation of the Environment in Airport and ICAO Doc 1984 (2018) about Land Use and Environmental Control state that every airport must apply an environmentally friendly Airport (Eco Airport) including reducing air pollution by minimalizing pollutant volume from Airport daily operational, reduce energy consumption that can produce CO<sub>2</sub>, reduce the noise level from Airport daily operational that can be achieved by implementing electric vehicle. Thus, Indonesia should be immediately following their step by replacing conventional airport shuttle buses with electric buses as a stepping stone to increase its Eco Airport status.

This study chooses Soekarno-Hatta International Airport as the research location because, in August 2018, a one-week trial of an electric bus operation at Soekarno-Hatta Airport have positive feedback from the passengers as a substitute to conventional shuttle buses that have been operating at Soekarno-Hatta Airport, but it has been discontinued even though it has many benefits for increasing Soekarno-Hatta Eco Airport status. Therefore, this study aims to determine the strategies of electric bus implementation at Soekarno-Hatta International Airport using SWOT analysis and Quantitative Strategic Programming Matrix (QSPM).

## **METHODS**

### **SWOT Analysis**

SWOT is an acronym of strength, weakness, opportunities and threats. The

first two factors (strengths and weaknesses) are related to internal organizational factors, while opportunities and threats cover a wider context or environment in which the entity operates (Oreski, 2012). SWOT analysis is a commonly used tool for analyzing external and internal environments simultaneously in order to acquire a systematic approach and support for a decision situation (Görener, Toker, & Uluçay, 2012). SWOT analysis is a qualitative analysis tool for formulating strategies with consideration of external and internal factors of the organization. QSPM is used to determine the strategies order generated in the SWOT matrix (David, David, & David, 2009)

The step of SWOT analysis are (Ommani, 2011; Taslimi & Omeyr, 2014; Mahfud & Mulyani, 2017):

1. Determining the Weight of each SWOT Factors.
2. Determining the Score of each SWOT Factors.
3. Determining the SWOT Matrix.
4. Determining the SWOT Quadrant.
5. Determining the strategy's priority from the SWOT Matrix using QSPM.

### **Qualitative Methods**

Creswell (2010) said that qualitative research methods are methods used to explore and understand the meaning and can be done with approaches such as participatory research, discourse analysis, ethnography, grounded theory, narrative, and case studies. In this study, the method used is qualitative. In researching electric bus implementation at Soekarno-Hatta Airport, the approach used is the case study approach.

At the stage of data collection, the authors use interview techniques with informants, field observations, and documents related to the case to be examined. So that research with qualitative methods with a case study approach supports the authors in obtaining the right research results and recommendations in the case. Creswell (2010) said that a case

study is a research strategy in which the researcher investigates a program, event, activity, process, or group of individuals. This research uses a case study approach, so this research focuses on following up the one-week trial of an electric bus operation at the Soekarno-Hatta Airport event in August 2018.

This study has 8 (eight) research subject consisting of the Ministry of Transportation, the Ministry of Energy and Mineral Resources (ESDM), the Ministry of Environment and Forestry, the Agency for Assessment and Application of Technology (BPPT), the Indonesian Institute of Educational Sciences (LIPI), PT. Angkasa Pura II, PT. PLN, PT. Mobil Anak Bangsa (MAB). This research was conducted in these places because of the need for interviews and data collection following research interests. These institutions are located in Banten and Jakarta Province. These institutions are institutions that have links to renewable energy, electric vehicles, and energy security.

Moleong (2005) said that a researcher in the process of collecting data depends more on himself as a collecting tool. This study uses interview guidelines which are a set of direct questions and written questions about the variables studied to the informants to be answered. In addition to interviews as the main data collection tool. This study also uses other data collection techniques used in this study including direct field studies and documentation studies. In testing the credibility of the data or trust in the results of qualitative research, triangulation, discussion with colleagues, negative case analysis, and member check (Sugiyono, 2011). This study conducts triangulation and member checks to test the credibility of the research conducted.

The data analysis technique used in this study is an interactive model of qualitative data techniques from Miles and Huberman (2014). Analysis activities consist of a flow of activities that occur simultaneously, namely data collection, data condensation,

data presentation, and concluding something that is a cyclical and interactive process before, during, and after data collection.

## RESULT AND DISCUSSION

### Research Interview

Research interviews were conducted directly using interview guidelines and voice recorder to maintain the study purpose and facilitate author limitation with 8 expert informants from each research subject consisting of Table 1.

- a. 3 (three) Related Ministries (Ministry of Transportation, Ministry of Energy and Mineral Resources, Ministry of Environment, and Forestry)
- b. 2 (two) Research Institutions (Indonesian Institute of Science and Research, Agency for Assessment and Application of Technology)
- c. 3 (three) Related Companies (PT. Angkasa Pura II, PT. Mobil Anak Bangsa, PT. PLN).

Interview conducted to each expert informant in Table 1 (see Appendix Page) using the interview guideline in Table 2 (see Appendix Page) Author then summarize the interview results in Table 2. From Table 2 number 1-7 by an average of more than 2, we can conclude that all the stakeholders are a bit involved until involved in Policy, Research, and Development, Production and Licensing Electric Vehicle, Production and Licensing of Charging Station, also from number 8 we can conclude that all of the stakeholders are strongly supported the implementation of electric vehicle in Soekarno-Hatta Airport.

After a thorough interview, each of the expert informants filled the Rating (R) column of the SWOT Questionnaire according to their role and opinion but with Angkasa Pura II Ltd. point of view showed in Table 3 (see Appendix Page). For I1, I2, and I3 they also filled the Weight (Wi) column according to their role and opinion with Angkasa Pura II Ltd. point of view shown in Table 4 (see Appendix Page).

The step of the SWOT analysis are

(Ommani, 2011; Taslimi & Omeyr, 2014; Mahfud & Mulyani, 2017):

1. Determining the Weight (W) of each SWOT Factors.

Weight is needed to determine which factor has a greater impact among other factors. The factor with the highest Weight means it is a dominant factor. To determine the weight of each factor using the formula (Ommani, 2011):

$$W = \frac{\sum W(n)}{\sum(\sum W)}$$

Where W is Weight for each factor,  $\sum W(n)$  is the sum of weight from 3 Informant in the same factor, and  $\sum(\sum W)$  is the sum of  $\sum W(n)$ .

Example for Factor S1:

$$\begin{aligned} W &= \sum W(1) / \sum(\sum W) \\ &= 5 / 30 \\ &= 0.17 \end{aligned}$$

2. Determining Score (S) of each SWOT Factors.

The score is needed to determine which factors have a significant role in the SWOT Matrix. The factor with the highest Score means it is a significant factor. To determine the SWOT analysis score using the formula (Ommani, 2011):

$$S = W \times \sum R(n); S(N) = \frac{S}{\sum S}$$

Where S is Score for each factor, S(N) is Normalized Score for each factor, W is Weight for each factor,  $\sum R(n)$  is the sum of rating from 8 Informant in the same factor and  $\sum S$  is the sum of S.

Example for Factor S1:

$$\begin{aligned} S &= W(1) \times \sum R(1) \\ &= 0.17 \times 28 \\ &= 4.76 \end{aligned}$$

$$\begin{aligned} S(N) &= S / \sum S \\ &= 4.76 / 28.28 \\ &= 0.17 \end{aligned}$$

From Table 7 (see Appendix Page) we have significant factors from each SWOT Factors. In Strength, there is factor S4 which is Increase Eco Airport Index, in Weakness, there is factor W5

which is The source of electricity is still dependent on PLN (renewable energy is insufficient), in Opportunity, there is factor O3 which is Government policy that supports electric vehicles, in Threat, there is factor T1 which is Limited electric bus manufacturers. These significant factors will be used to make strategies in SWOT Matrix.

3. Determining the SWOT Matrix.

According to Humphrey (2005) from the SWOT Matrix, we can obtain 4 (four) main strategies, namely:

a. Strength-Opportunity (SO)

- 1) SO1 - Requesting support from the government for Electric Bus implementation at Soekarno-Hatta Airport to increase energy security.
- 2) SO2 - Conduct an MoU with PLN for electricity supply, infrastructure, and discount electricity prices for charging electric buses, thereby reducing operational costs
- 3) SO3 - Collaborating with Bus Companies to become a pioneer in electric bus implementation in Indonesia's airports and improve the Eco Airports Status.
- 4) SO4 - Promote electric bus implementation in the near future to get positive media coverage, increase the status of eco airports, and get recognition from the international community.

b. Weakness-Opportunity (SO)

- 1) WO1 - Minimizing budget provision by requesting government support, in collaboration with bus companies and PLN.
- 2) WO2 - Creating a charging station with the support of the government, PLN, and cooperation with bus companies.
- 3) WO2 - Making a policy on electric bus implementation at Soekarno-Hatta Airport based on government policy and utilizing

fiscal incentives.

- 4) WO3 - Creating a more reliable renewable energy infrastructure for electric energy to get positive media coverage, international accreditation for Eco Airport, and carbon trading opportunities.

c. Strength-Threat (ST)

- 1) ST1 – Conduct an MoU with domestic bus producers to reach a good price agreement and guaranteed after-sales service.
- 2) ST2 - Pioneering the implementation of the electric bus at airports so that it can be followed by other airports in Indonesia and encourages the growth of the electric vehicles market in Indonesia.
- 3) ST3 - Use an electric bus to be able to create public interest that increases resale prices.

d. Weakness - Threat (WT)

- 1) WT1 - Minimizing the provision of a budget for the procurement of electric buses from domestic electric bus producers by requesting generator facilities and after-sales service.
- 2) WT2 - Policy training for technicians in the maintenance and repair of the electric bus to overcome the limitations of after-sales service.
- 3) WT3 - Conduct an MoU with electric bus manufacturers, for the manufacture of charging stations, procurement of generators, HR training, and after-sales service guarantee.

The complete SWOT Matrix can be seen in Table 8 (see Appendix Page)

4. Determining the SWOT Quadrant.

To determine the SWOT quadrant using the formula (Ommani, 2011):

$$(x, y) = \left( \frac{\sum S - \sum W}{2}, \frac{\sum O - \sum T}{2} \right)$$

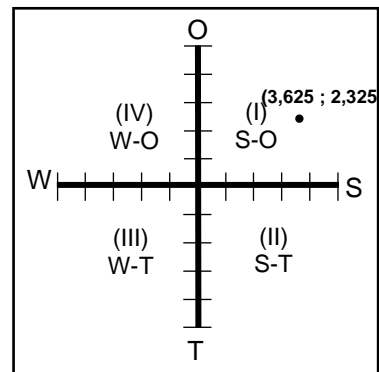
Then the calculation results are obtained as can be seen in Table 9 (see Appendix Page).

Calculation:

$$(X; Y) = \left( \frac{28,28 - 21,03}{2} \right); \left( \frac{26,27 - 21,62}{2} \right)$$

$$(X; Y) = (3,625; 2,325)$$

From the calculation results, quadrant 1 is obtained so that the strategy is the Strength-Opportunity (S-O) strategy. S-O Strategy is a strategy that utilizes Strength (Internal Strength Factor) to seize an Opportunity (External Strength Factor). Complete S-O Strategy can be seen in Table 8 (see Appendix Page).



**Figure 3.** SWOT Quadrant

Source: Processed by Authors, 2020

5. Determining strategies priority from SWOT Matrix using QSPM.

The basic principle of the Quantitative Strategic Planning Matrix (QSPM) is to determine which strategy is better to do first based on an assessment of internal and external factors, research that has been done, an assessment of the pros and cons of each alternative, conduct analysis and determine which strategy is will be done first (David et al., 2009).

In Table 10 (see Appendix Page), it can be seen that there is Attractiveness Score (AS) and Total Attractiveness Score (TAS), AS is given by the author based on the strategy's attractiveness given the respective external or internal factor, where 4 is the best and 1 is the least attractive, and TAS is the result of AS multiple by Weight in each factor, while STAS is cumulative of TAS in each strategy. STAS with the highest point means it is the most prioritized strategy among others.

From the results of the QSPM in

Table 10 (see Appendix Page), the results show that the strategies that have to be prioritized first are SO3 with the highest STAS scores 13.11, which is collaborating with Bus Companies to become a pioneer in electric bus implementation in Indonesia's Airport and improve the Eco Airports Status, then SO4 with STAS scores 11.5, then SO1 with STAS scores 10.07 and SO2 with STAS scores 9.01 respectively.

## CONCLUSIONS AND RECOMMENDATION

This study concludes answers to the research objectives. The strategies of electric bus implementation at Soekarno-Hatta International Airport using SWOT analysis and Quantitative Strategic Programming Matrix (QSPM) are:

- 1) SO3 - Collaborating with Bus Companies to become a pioneer in electric bus implementation in Indonesia's airports and improve the Eco Airports Status.
- 2) SO4 - Promote electric bus implementation in the near future to get positive media coverage, increase the status of eco airports, and get recognition from the international community.
- 3) SO1 - Requesting support from the government for Electric Bus implementation at Soekarno-Hatta Airport to increase energy security.
- 4) SO2 - Conduct an MoU with PLN for electricity supply, infrastructure, and discount electricity prices for charging electric buses, thereby reducing operational costs.

By starting to implementing this in the Soekarno-Hatta Airport, therefore in the future, we hope that we can use electric buses for all Airports in Indonesia thus increase Indonesia's eco airport status, energy security, and national resilience.

Recommendations for further researchers related to the implementation of electric buses at Soekarno-Hatta Airport in the next study is conducting a study about

Transition Phase Recommendations to assist Management of Angkasa Pura II and stakeholders in budgeting provision for electric bus implementation at Soekarno-Hatta Airport.

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**Appendix****Table 1.** List of Expert Informants

<b>Code</b>	<b>Position</b>	<b>Information</b>
I1	On Behalf of Manager Public Transportation Services Soekarno-Hatta Airport	Key Informant
I2	Researcher in the Field of Electrical Technology, Center for Energy Conversion Technology, Agency for the Assessment and Application of Technology	Key Informant
I3	Head of Technology Development and Educational Support, Research and Development Center for Road and Railway Transportation, Ministry of Transportation	Key Informant
I4	Coordinator of KP3 TKL, Research and Development Center for Electricity Technology, New Energy, Renewable Energy, and Energy Conservation, Ministry of Energy and Mineral Resources	Key Informant
I5	Young Researcher in the Field of Automotive Engineering, Research Center for Electric Power and Mechatronics, Indonesian Institute of Sciences	Key Informant
I6	Marketing Manager of Mobil Anak Bangsa Ltd.	Secondary Informant
I7	Account Executive for Technology Development and Standardization of PLN Ltd.	Secondary Informant
I8	Head of Sub-Directorate for Mobile Source Air Pollution Control, Directorate General of Pollution and Environmental Damage Control, Ministry of Environment and Forestry	Secondary Informant

Source: Processed by Authors, 2020

**Table 2.** Interview Guideline

<b>No.</b>	<b>Interview Guideline</b>	<b>Index</b>								<b>Mean</b>
		I1	I2	I3	I4	I5	I6	I7	I8	
1.	President Regulation 55/2019	4	4	4	4	4	4	4	4	4
2.	Electric Vehicle for Public Transportation	4	4	4	4	4	4	4	4	4
3.	Electric Vehicle Research and Development	3	3	3	4	4	1	2	4	3
4.	Electric Vehicle Production	4	4	3	3	3	1	3	4	3,1
5.	Electric Vehicle Licensing	4	4	4	1	1	1	2	1	2,25
6.	Handling of Electric Vehicle Battery Waste	1	3	4	4	4	1	2	3	2,75
7.	Production and Licensing of Charging Station	1	4	1	4	4	1	4	1	2,5
8.	Implementation of Electric Vehicle in Soekarno-Hatta Airport	4	4	4	4	4	4	4	4	4

Note:

1 = Not really Involved / Supported

2 = A bit Involved/ Supported

3 = Involved /Supported

4 = Strongly Involved / Supported

Source: Processed by Authors, 2020

<b>Table 3. SWOT Questionnaire</b>	
SWOT Questionnaire	
<b>Strengths</b>	<b>Wi R</b>
S1 Decrease shuttle buses operational cost for long term	
S2 Decrease noise level in landside area	
S3 Decrease air pollution in landside area	
S4 Increase Eco Airport Index	
S5 Increase airport energy security	
S6 Increase airport branding	
S7 Become a role model of electric buses implementation	
<b>Weaknesses</b>	<b>Wi R</b>
W1 No budget provided for implementation of electric buses	
W2 Charging station infrastructure is inadequate	
W3 No binding policy regarding implementation of electric buses	
W4 Lack of human resources who master the maintenance and repair of electric buses	
W5 The source of electricity is still dependent on PLN (renewable energy is insufficient)	
<b>Opportunities</b>	<b>Wi R</b>
O1 Discount on the basic electricity tariff from PLN for charging electric buses	
O2 Fiscal / tax incentives from the government	
O3 Government policy that supports electric vehicles	
O4 PERU Bus companies can provide electric buses for rent	
O5 Positive media coverage	
O6 Received recognition from the International World for Eco Airport	
O7 Chance of profit from Carbon Trading	
<b>Threats</b>	<b>Wi R</b>
T1 Limited electric bus manufacturers	
T2 Limited after-sale service	
T3 Low resale price	
T4 Limited electric vehicles market	
Note:	
1 = Strongly Disagree	
2 = Disagree	
3 = Agree	
4 = Strongly Agree	

Source: Processed by Authors, 2020

<b>Table 4. Weight (Wi) Informant</b>				
<b>Strengths</b>	<b>I1,</b>	<b>I2</b>	<b>I3</b>	<b>∑Wi</b>
S1,	2,	2,	1,	5,
S2,	1,	1,	,2	4,
S3,	1,	1,	,2	4,
S4,	2,	2,	,1,	5,
S5,	1,	1,	1,	3,
S6,	1,	2,	1,	4,
S7,	2,	1,	2,	5,
Total,	10,	10,	10,	30,
<b>Weakne,sses</b>	<b>I1,</b>	<b>I2</b>	<b>I3</b>	<b>∑Wi</b>
W1,	4,	2,	1,	7,

W2,	3,	2,	1,	6,
W3,	1,	,2,	1,	4,
W4,	1,	,2,	2,	5,
W5,	1,	2,	5,	8,
Tota,l	10,	10,	10,	30,
<b>Opportuniti,es</b>	<b>I1,</b>	<b>I2</b>	<b>I3</b>	<b>∑Wi</b>
O1,	2,	1,	1,	4,
O2,	2,	2,	1,	5,
O3,	2,	2,	2,	6,
O4,	1,	1,	,1	,3,
O5,	1,	2,	2,	5,
O6,	1,	1,	.,2	4,
O7,	1,	1,	,1	3,
Tota,l	10,	10,	,10	30,
<b>Threats,</b>	<b>I1,</b>	<b>I2</b>	<b>I3</b>	<b>∑Wi</b>
T1,	3,	3,	3,	9,
T2,	2,	2,	3,	7,
T3,	2,	2,	2,	6,
T4,	3,	3,	2,	8,
Tota,l	10,	10,	10,	30,

Source: Processed by Authors, 2020

**Table 5. Rating (R) Informant**

<b>Strength</b>	<b>I1.</b>	<b>I2.</b>	<b>I3.</b>	<b>I4.</b>	<b>I5..</b>	<b>I6.</b>	<b>I.III7.</b>	<b>I8.</b>	<b>∑R</b>
S1.	4.	2.	3.	4	4.	3.	.4	4.	28.
S2.	4.	3.	4.	3	4.	4.	.2	4.	28.
S3.	3.	4.	4.	4	4.	4.	.2	4.	29.
S4.	4.	4.	4.	4	4.	4.	.4.	4.	.32
S5.	4.	3.	3.	3	3.	4.	3.	4.	.27
S6.	3.	3.	3.	3	3.	4.	3.	4.	.26.
S7.	3.	3.	3.	3	3.	4.	4.	4.	27.
<b>Weakness</b>	<b>R1.</b>	<b>R2.</b>	<b>R3.</b>	<b>R4</b>	<b>R.5</b>	<b>R6.</b>	<b>R.7</b>	<b>R8.</b>	<b>∑R</b>
W1.	2.	2.	2.	2	3.	3.	2.	3.	19.
W2.	3.	2.	3.	3	3.	1.	3.	3.	21.
W3.	3.	3.	2.	3	3.	3.	4.	3.	24.
W4.	2.	3.	3.	3	2.	1.	3.	3.	.20
W5.	3.	2.	3.	3	3.	3.	2.	3.	22.
<b>Opportunity.</b>	<b>R1.</b>	<b>R2.</b>	<b>R3.</b>	<b>R4</b>	<b>R5.</b>	<b>R6.</b>	<b>R7.</b>	<b>R8.</b>	<b>∑R .</b>
O1.	3.	3.	4.	2	4..	3.	2.	4.	25.
O2.	3.	2.	4.	3	4.	4.	..4.	4.	28.
O3.	4.	3.	3.	3	4.	3.	4.	4.	28.
O4.	3.	3.	2.	3	3.	2.	3.	4.	23.
O5.	3.	3.	3.	3	3.	4.	2.	4.	25.
O6.	3.	3.	3.	3	4.	4.	3.	4.	27.
O7.	4.	2.	3.	3	3.	4.	3.	4.	26.
<b>Threat</b>	<b>R1.</b>	<b>R2</b>	<b>R3.</b>	<b>R4</b>	<b>R5.</b>	<b>R6.</b>	<b>R.7</b>	<b>R8.</b>	<b>∑R</b>
T1.	3.	2.	2.	3.	3.	2.	4.	3.	.22.
T2.	3.	3.	3.	3.	3.	4.	4.	2.	25.

T3.	2.	3.	2.	2.	2.	3.	2.	2.	18.
T4.	2.	3.	2.	3.	2.	4.	3.	2.	21.

Source: Processed by Authors, 2020

**Table 6.** Weight (W) Calculation

Strengths	I1,	I2	I3	ΣW	W,
S1,	2,	2,	1,	5,	0,17,
S2,	1,	1,	,2	4,	0,13,
S3,	1,	1,	,2	4,	0,13,
S4,	2,	2,	,1,	5,	0,17,
S5,	1,	1,	1,	3,	0,1,
S6,	1,	2,	1,	4,	0,13,
S7,	2,	1,	2,	5,	0,17,
Weaknesses	I1,	I2	I3	ΣW	W,
W1,	4,	2,	1,	7,	,0,23
W2,	3,	2,	1,	6,	,0,2
W3,	1,	,2,	1,	4,	0,,13
W4,	1,	,2,	2,	5,	0,,17
W5,	1,	2,	5,	8,	0,2,7
Opportunities	I1,	I2	I3	ΣW	W,
O1,	2,	1,	1,	4,	0,,13
O2,	2,	2,	1,	5,	0,,17
O3,	2,	2,	2,	6,	0,,2
O4,	1,	1,	,1	,3,	0,,1
O5,	1,	2,	2,	5,	0,,17
O6,	1,	1,	,,2	4,	0,,13
O7,	1,	1,	,1	3,	0,,1
Threats,	I1,	I2	I3	ΣW	W,
T1,	3,	3,	3,	9,	0,,3
T2,	2,	2,	3,	7,	0,,23
T3,	2,	2,	2,	6,	,0,,2
T4,	3,	3,	2,	8,	0,,27

Source: Processed by Authors, 2020

**Table 7.** Score (S) Calculation

Strengths	W.	ΣR ..	S.	S(N)
S1.	0,17.	28.	4,76.	0,17
S2.	0,13.	28.	3,64.	0,125
S3.	0,13.	29.	3,77.	0,135
<b>S4.</b>	<b>0,17.</b>	<b>.32</b>	<b>5,44.</b>	<b>0,19</b>
S5.	0,1.	.27	2,7.	0,10
S6.	0,13	.26.	3,38.	0,12
S7.	0,17	27.	4,59.	0,16
Weaknesses	W	ΣR .	S.	S(N)
W1.	0,23.	19.	4,37.	0,21
W2.	0,2.	21.	4,2.	0,20
W3.	0,13	24.	3,12.	0,15

W4.	0,1.7	.20	3,4.	0,16
<b>W5.</b>	<b>0,2.7</b>	<b>22.</b>	<b>5,94.</b>	<b>0,28</b>
<b>Opportunities.</b>	<b>W</b>	<b>ΣR</b>	<b>S..</b>	<b>S(N)</b>
O1.	0,13.	25.	3,25.	0,12
O2.	0,17.	28.	4,76.	0,18
<b>O3.</b>	<b>0,2.</b>	<b>28.</b>	<b>5,6.</b>	<b>0,21</b>
O4.	0,1.	23.	2,3.	0,09
O5.	0,1.7	25.	4,25.	0,16
O6.	0,1.3	27.	3,51.	0,14
O7.	0,1	26.	2,6.	0,10
<b>Threats</b>	<b>W.</b>	<b>ΣR</b>	<b>S.</b>	<b>S(N)</b>
<b>T1.</b>	<b>0,3.</b>	<b>22.</b>	<b>6,6.</b>	<b>0,31</b>
T2.	0,23.	25.	5,75.	0,265
T3.	0,2.	18.	3,6.	0,17
T4.	0,2.7	21.	5,67.	0,255

Source: Processed by Authors, 2020

**Table 8.** SWOT Matrix

IFAS	Strengths	Score	Weaknesses	Score
EFAS Strategies	S1 – Decrease shuttle buses operational cost for long term	0,17 0,125 0,135	W1 – No budget provided for implementation of electric buses	0,21 0,20 0,15
	S2 – Decrease noise level in landside area	<b>0,19</b> 0,10	W2 – Charging station infrastructure is inadequate	0,16
	S3 – Decrease air pollution in landside area	0,12 0,16	W3 – No binding policy regarding implementation of electric buses	<b>0,28</b>
	<b>S4 – Increase Eco Airport Status</b>		W4 – Lack of human resources who master the maintenance and repair of electric buses	
	S5 – Increase airport energy security		<b>W5 – The source of electricity is still dependent on PLN (renewable energy is insufficient)</b>	
	S6 – Increase airport branding			
	S7 – Become a role model of electric buses implementation			
Opportunities	Score	S-O Strategies	W-O Strategies	
O1 – Discount on the basic electricity tariff from PLN for charging electric buses	0,12 0,18 <b>0,21</b>	SO1. Requesting support from the government for Electric Bus implementation at Soekarno-Hatta Airport in order to increase energy security	WO1. Minimizing budget provision by asking for government support, in collaboration with autobus companies and PLN	
O2 – Fiscal / tax incentives from the government	0,09 0,16	SO2. Conduct an MoU with PLN for electricity supply, infrastructure and discount electricity prices for charging electric buses, thereby reducing operational costs	WO2. Build a charging station with the support of the government, PLN and cooperation with an autobus company	
<b>O3 – Government policy that supports electric vehicles</b>	0,14 0,10	SO3. Collaborating with Bus Companies in order to become a pioneer in electric	WO3. Make a policy on electric bus implementation at Soekarno-Hatta Airport based on government policy and utilizing fiscal incentives	
O4 – Bus companies can provide electric buses for rent				
O5 – Positive media coverage				

O6 – Received recognition from the International World for Eco Airport	bus implementation in Indonesia’s Airport and improve the Eco Airports Status.	WO4. Creating a more reliable and renewable energy infrastructure for electric energy in order to get positive media coverage, international accreditation for Eco Airport and carbon trading opportunities.
O7 – Chance of profit from Carbon Trading	SO4. Promote electric bus implementation in the near future to get positive media coverage, increase the status of eco airports and get recognition from the international community.	

Threats	WO	S-T Strategies	W-T Strategies
<b>T1 – Limited electric bus manufacturers</b>	<b>0,31</b>	ST1. Conduct an MoU with domestic bus producers to reach a good price agreement and guaranteed after-sales service	WT1. Minimizing the budget provision for the procurement of electric bus from domestic electric bus manufacturers by requesting generator facilities and after-sales services
T2 – Limited after-sale service	0,265	ST2. Pioneering the implementation of electric bus at airports so that it can be followed by other airports in Indonesia and encourages the growth of the electric vehicles market in Indonesia	WT2. Training policy for technicians in maintenance and repair of electric buses to overcome limitations of after-sales service
T3 – Low resale price	0,17	ST3. Using electric bus to create community appeal that increases resale prices	WT3. Conduct an MoU with electric bus manufacturers, for the manufacture of charging stations, procurement of generators, human resource training and after-sales service guarantee
T4 – Limited electric vehicles market	0,255		

Source : Processed by Authors, 2020

**Tabel 1.** Cummulative of Each Factor Score

Factor	S	W	O	T
ΣScore	28,28	21,03	26,27	21,62

Source: Processed by Authors, 2020

**Table 10.** QSPM

Factor	Weight	SO1.		SO2.		SO3.		SO4.	
		AS.	TAS.	AS.	TAS.	AS.	TAS.	AS.	TAS.
S1.	0,17.	3.	0,51.	4.	0,68.	4.	0,68.	4.	0,68.
S2.	0,13.	3.	0,39.	2.	0,26.	4.	0,52.	4.	0,52.
S3.	0,13.	3.	0,39.	2.	0,26.	4.	0,52.	4.	0,52.
S4.	0,17.	3.	0,51.	2.	0,34.	4.	0,68.	4.	0,68.
S5.	0,10.	3.	0,3.	2.	0,2.	4.	0,4.	4.	0,4.
S6.	0,13.	3.	0,39.	2.	0,26.	4.	0,52.	4.	0,52.
S7.	0,17.	3.	0,51.	2.	0,34.	4.	0,68.	4.	0,68.
W1.	0,23.	4.	0,92.	3.	0,69.	3.	0,69.	2.	0,46.
W2.	0,20.	4.	0,8.	4.	0,8.	2.	0,4.	2.	0,4.
W3.	0,13.	2.	0,26.	2.	0,26.	3.	0,39.	3.	0,39.
W4.	0,17.	2.	0,34.	1.	0,17.	4.	0,68.	2.	0,34.

W5.	0,27.	2.	0,54. .	4.	1,08.	2.	0,54.	2.	0,54.
O1.	0,13.	3.	0,39. .	4.	0,52.	2.	0,26.	3.	0,39.
O2.	0,17.	4.	0,68.	4.	0,68.	4. .	0,68.	4.	0,68.
O3.	0,20.	4.	0,8.	4.	0,8.	4.	0,8.	4.	0,8.
O4.	0,10.	1.	0,1.	1.	0,1.	4.	0,4.	4.	0,4.
O5.	0,17.	2.	0,34.	2.	0,34.	3.	0,51.	4.	0,68.
O6.	0,13.	1.	0,13.	1.	0,13.	2.	0,26.	4.	0,52.
O7.	0,10.	2.	0,2.	1.	0,1.	2.	0,2.	3.	0,3.
T1.	0,30.	2.	0,6.	1.	0,3.	4.	1,2.	3.	0,9.
T2.	0,23.	1.	0,23.	1.	.0,23.	3.	0,69.	1.	0,23.
T3.	0,20. .	1.	0,2.	1	.0,2.	3.	0,6.	1.	0,2.
T4.	0,27. .	2.	0,54.	1.	0,27.	3.	0,81.	1.	0,27.
STAS.			10,07.		9,01.		13,11.		11,5.
Priority			3. .		4. . .		1. .		2.

Source: Processed by Authors, 2020