Analysis of National Maritime Security Strategy as an Effect of Regional Development using SWOT, Fuzzy Multi Criteria Decision Making (FMCDM) and Borda

Volume 25*, Number* 3
September 2019*, pp.* 153-174

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As a country with the largest sea area in Asia, Indonesia encounters major security threats. The aim of this paper is to give an analysis of national maritime security to encounter regional development effect. This paper uses SWOT approach (Strength, Weakness, Opportunity, Threat), Fuzzy Multi-criteria Decision Making (FMCDM) method, and Borda method. SWOT analysis is used to identify internal and external factors in national maritime security, and strategic determination. Fuzzy MCDM (FMCDM) method is used to select the strategy in maritime security control. The Borda method is used to define the sub-strategy from the priorities of the selected strategy.

Keywords: Maritime Security, Indonesia Sea, SWOT Analysis, Fuzzy MCDM Borda Method

1. Introduction

Asia-Pacific is a region in the world that is predicted to be part of the world's greatest history of politics and economics in the 21st century (Rumley, 2005); it can be seen from the increasing number of New Emerging Countries (NEC). Asian economic revival is still led by two countries, namely China and India (Valli & Saccone, 2015). These countries have the largest human resources and the biggest potential markets in the world.

According to Global Trend 2030, the map of the countries in the world will change in 2030 (Phillips, 2008). Asia will overtake North America and Europe in terms of global power, primarily based on the Gross Domestics Product (GDP), population number, military allocation, and investment in technology (Espas, 2011). In these projections, Indonesia is predicted as one of the countries for emerging power in 2030 (McKinsey, 2012). The economic development of Indonesia and regional areas, gives an effect on national security, including maritime security sectors. As one of the ASEAN countries, Indonesia plays an important role in connecting the territorial waters for Asia-Pacific (Heiduk, 2016). With its position of trade and maritime transportation routes (Manurung, 2016), Indonesia has challenges to managing maritime security with various dimensions, including defense and security

perspective. Indonesia can certainly encounter the threats to the maritime aspect. The threat must be well identified to determine maritime security strategy.

The aim of this paper is to provide an analysis of national maritime security to encounter regional development effect. This paper uses a SWOT approach (Strength, Weakness, Opportunity, and Threat), Fuzzy Multi-criteria Decision Making (FMCDM) method, and Borda method. SWOT analysis is used to identify internal and external factors in national maritime security, and strategies determination. Fuzzy MCDM (FMCDM) method is used to select the right strategy in maritime security control. The Borda method is used to define the sub-strategy from the priorities of the selected strategy.

The inscriptive benefit of this paper is to provide literature for Indonesia maritime actors about maritime security strategy. It provides for academic studies for maritime security.

To support the research, this paper has referred to many literatures, such as literature about maritime security. Chapsos and Malcolm (2017) provide an analysis of the training needs of the key player of Indonesia maritime security, which describe how the ability of maritime security in Indonesia can be improved. Zhang (2014) describes obstacles in maritime risk studies and ways to overcome uncertainty of maritime transportation. Klimov (2015) explains the definition of hazard and threat in maritime areas. Bateman (2010) explains the threat effect of Asia-Pacific toward maritime security in South-East Asia. Matthews (2016) explains Indonesia's response in rejecting and accepting multilateral cooperation in the Malacca Strait to establish maritime security stability. Ramadhani (2015) explains enhanced cooperation for all actors in the maritime sector, to reduce the likelihood of increasingly deteriorating power competition. Lin and Gertner (2015) describe the unique risks that maritime territory gives, with different solutions on the projection of state and land-based issues.

Buyukozkan and Guleryuz (2016) describe application of Fuzzy MCDM to select alternative energy with the criteria of quantitative and qualitative analysis. Toklu (2017) explains how the Fuzzy MCDM is used to determine the level of customer loyalty. Suharyo, et al. (2017) explain the application of the Fuzzy MCDM to select the naval base location with political, economic, and technical factors. Lumaksono (2014) uses SWOT analysis to obtain the weight value from the expert, in identifying the internal and external factors of traditional shipbuilding industry. Malik et al. (2013) explain the use of SWOT analysis to determine the external and internal factors for strategy formulation in business schools in the Kingdom of Saudi Arabia. Shahbandarzadeh and Haghighat (2010) explain the integration results of each level and provide a final assessment of the market selection strategy. Junior et al. (2014) explain the method to give a rank to countries by calculating the number of gold medals, silver medals and bronze medals won.

The paper is organized as follows. Section 2 reviews the basic concept of method and maritime security. Section 3 gives the result and discussion of the research. Section 4 describes the conclusion of maritime security strategies in Indonesia.

2. Methodology

2.1 Indonesia Maritime Security

Indonesia is the largest archipelago country in the world with a coastline of about 81,000 km (Astor, Sulasdi, Hendriatiningsih, & Wisayantono, 2014). Indonesia has

more than 17,000 islands, and its marine (Akhira, Hamas, & Puspitasari, 2015) area covers 5.8 million km² or about 80% of the total area of Indonesia (Hozairi, Artana, Masroeri, & Irawan, 2012). Maritime security is influenced by the actions and patterns of interaction between the actors involved. The concept of maritime security lies between two ideas: 1) groups using a traditional security framework, 2) groups using non-traditional framework (Saragih, Barna, & Purwanto, 2016).

According to Buerger (2015), there are three fields to identify the concept of maritime security, such as: 1) Maritime security matrix, 2) "securitization" framework, which provides a means to counteract the threat of maritime security, 3) the theory of security practices with the purpose to understand what actions are carried out in the dimensions of maritime security. The national security dimension relies on a traditional perspective that views national security as an effort to protect the state's sustainability. Therefore, the sea power is represented by naval force as a dominant force in the maritime. Thus, maritime security is identical with the use of naval power (Putra, Hakim, Pramono, & Leksono, 2017). There are several threats to maritime security, such as; 1) threats of violence (piracy, sabotage, and vital objects of terror); 2) navigation threats; 3) the threat of resources, such as damage and pollution of the sea and its ecosystem; 4) the threat of sovereignty (Poerwowidagdo, 2015).

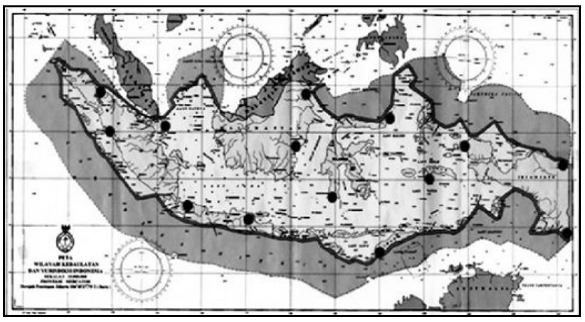

Figure 1 *Map of Indonesia*

There are also several actors involved in maritime security, such as (Chapsos & Malcolm, 2017): 1) Coordinating Ministry of Maritime Affairs; 2) Coordinating Ministry of Politics, Law, and Security; 3) Indonesian Maritime Security Agency (BAKAMLA); 4) Navy (TNI-AL); 5) Indonesian National Police; 6) Dir. Gen. Sea Transportation (Hubla); 7) Dir. Gen. Custom and Excise (Bea and Cukai); 8) Dir. Gen. of Immigration (Ditjenim); 9) Ministry of Marine and Fisheries (KKP); 10) Indonesia Sea and Rescue Agency (BASARNAS).

In the management of national maritime security, stakeholders are required to apply the strategy appropriately. In this case, there are several related strategic criteria, such as

- There is effective communication among stakeholders.
- The Strategy has good information about security and intelligence.
- There is continuous assessment of existing security processes, procedures and technologies.
- Strategy is supported by the ability and the number of adequate personnel.
- The Strategy is supported by policies and funding from the Government.

- There is a good and effective interaction within the organization or between organizations.
- There is consistency in the application of systems, processes and protocols.
- Maritime security strategy should synergize with risk management, quality, environment and other safety systems.
- There are metric measurements, accurate monitoring and reporting procedures.
- There is regular and ongoing training.
- There is an adequate control center.

2.2 SWOT Analysis

SWOT analysis is an effective strategic planning tool for analyzing the organization of internal and external influences (Leanrned, Christensen, Andrews, & Guth, 1965). SWOT analysis consists of internal and external factors. Internal factors (strengths, weaknesses) are used to test assets within an organization. External factors are used (opportunities, threats) to investigate factors in the environment beyond the organizational control that affect organizational performance (Wheelen & Hunger, 1995), (Hill & Westbrook, 1997). Information obtained can be integrated in different matrix combinations of the four factors in determining strategies for long-term progress (Yuksel & Dagdeviren, 2007).

The SWOT analysis shows the right strategy in four categories (SO, ST, WO and WT) (Lumaksono, 2014). Strength-Opportunity (SO) strategy takes advantage of opportunities by using existing strengths. Strength-Threat (ST) strategy uses the strength to eliminate or reduce the effects of threats. Weakness-Opportunity (WO) strategies are used to take benefit from opportunities by external environmental factors with fixing the weaknesses. Lastly, Weakness-Threat (WT) strategies are used to reduce an impact of threat with fixing the weakness (Yuksel & Dagdeviren, 2007).

Table 1 *Matrix SWOT (Malik, Al-Khatani, & Naushad, 2013)*

Internal/External Factor	Strength (S) (Maximal)	Weakness (W) (Minimal)
Opportunity (O) (Maximal)	S-O Strategy (Maximal-Maximal)	W-O Strategy (Minimal-Maximal)
Threats (T) (Minimal)	S-T Strategy (Maximal-Minimal)	W-T Strategy (Minimal-Minimal)

2.3 Fuzzy Multi Criteria Decision Making (F-MCDM)

Zadeh (1965) promoted the fuzzy set theory concept (Chitnis, Sarella, Khambete, & Shrikant, 2015). This concept is defined mathematically by specifying the value of each individual representing the membership class in the fuzzy set (Zadeh, 1965). Consequently, fuzzy theory has become a useful tool for automating human activity with information based on uncertainty. This value represents the rate which the individual is similar to or compatible with the concept shown by the fuzzy set. Thus, an individual can enter in fuzzy formation to a bigger or lesser extent. This membership value is indicated by real numbers, ranged from closed intervals between 0 and 1. Therefore, the fuzzy set introduces obscurity (with the aim of

reducing complexity) by eliminating the boundary that separates class members from non-members gradually.

2.4 Linear Representation

In a linear representation, the mapping to membership level is described as a straight line. This form is the simplest and most appropriate choice for a less obvious approach. There are 2 (two) fuzzy sets derived from linear conditions. The first is the set increment starting from the domain value with the zero membership level [0] to move right into the domain value with the higher membership level (Suharyo, Manfaat, & Armono, 2017).

$$\mu[x] = \begin{cases} 0; & x \leq a \\ \frac{x-a}{b-a}; & a \leq x \leq b \\ 1; & x \geq b \end{cases} \quad (1)$$

Membership Functions: In the second set, this condition is the opposite of the first. The straight line starts from the domain value with the highest membership level on the left side, and then switches to the value of the domain that has a lower membership (Suharyo, Manfaat, & Armono, 2017).

Membership functions

$$\mu[x] = \begin{cases} \frac{b-x}{b-a}; & a \leq x \leq b \\ 0; & x \geq b \end{cases} \quad (2)$$

2.5 Triangular Fuzzy Number (TFN)

In TFN, every single value has a member function that consists of three values. Each value represents the lower, middle and top values.
A = (a1, a2, a3)
TFN membership functions for the image above is as follows

$$\begin{aligned} \mu[x] &= = 0 \text{ for } x < a_1 \\ &= \frac{x-a_1}{a_2-a_1} \text{ for } a_1 < x < a_2 \\ &= \frac{a_3-x}{a_3-a_2} \quad \text{for } a_2 < x < a_3 \end{aligned} \quad (3)$$

2.6 Linguistic Variables

The linguistic variable is a variable that has a description of a fuzzy number and is generally represented by a fuzzy set (Garg, Agarwal, & Choubey, 2015). In this study, a fuzzy triangle number has been used to represent linguistic variables on a scale of 0 to 1 to assess criteria and alternatives. These linguistic variables are represented as very weak (VW), weak (W), medium (M), strong (S), very strong (VS).

Liang (1999) proposes a fuzzy Multi Criteria Decision Making (MCDM) based on ideal and anti-ideal concepts. In this section, it describes the MCDM fuzzy approach introduced by Dursun and Karsak, which is based on fuzzy information integration

and 2-tuple linguistic representation model (Dursun & Karsak, 2010). The settlement procedure used is stated as follows:

Step 1 This step shows the weighted results from a qualitative criterion level assessment to obtain aggregate weighting values.

Step 2 This step shows the result of the preference rating for each alternative based on the existing qualitative criteria.

Step 3 This stage determines the middle value of the fuzzy number. This step sums the value at each level of the linguistic scale and divides the sum with the number of criteria. Mathematical notation is as follows

$$a_t = \frac{\sum_{i=1}^{k} \sum_j T_{ij}}{\sum_{i=1}^{k} n_{ij}} \quad (4)$$

a_t= median fuzzy numbers to levels
T= the level of assessment is very weak, weak, moderate, strong and very strong.
n= amount of linguistic scale factor for an alternative to T-1 of the i-th factor
T_{ij} = numerical value of the scale for an alternative to linguistic T-1 of the j-th factor.

Step 4 This step determines the lower and upper limit values of the fuzzy numbers, where the lower bound value (ct = b (i - 1)) equals the average rate down, while the upper bound value (bt = b (i - 1)) is equal to the above average level.

Step 5 This step determines the aggregate weight of each qualitative criterion. The form of linguistic assessment has a definition of fuzzy triangle number, and then aggregation process is done by finding the aggregate value of the lower limit value of each (ct), mean (at) and upper limit value (bt). The equation is as follows

$$c_t = \frac{\sum_{j=1}^{n} c_{tj}}{n} \quad a_t = \frac{\sum_{j=1}^{n} a_{tj}}{n} \quad b_t = \frac{\sum_{j=1}^{n} b_{tj}}{n} \quad (5)$$

c_{tj} = lower limit value of qualitative criteria to-t by decision makers to-j
a_{tj} = median qualitative criteria to-t by decision makers to-j
b_{tj} = the value of the upper limit to the qualitative criteria-t by decision makers to-j
n = number of assessors (decision maker)

Aggregate value is $N = (c_j, a_j, b_j)$
Where
Nt = Value aggregation weights for qualitative criteria to-t

$$q_t = \frac{\sum_{j=1}^{n} q_{tj}}{n} \quad o_t = \frac{\sum_{j=1}^{n} o_{tj}}{n} \quad p_t = \frac{\sum_{j=1}^{n} p_{tj}}{n} \quad (6)$$

Step 6 This stage calculates the preference value of each alternative based on qualitative criteria. In calculating the aggregate weight, each alternative for each criterion will show fuzzy aggregate values with the following models

q_{itj} = lower limit value alternative to qualitative criteria by the manufacturer to tj.
o_{it} = value alternative to middle qualitative criteria to-t by decision makers to j.
o_{itj} = upper limit value alternative to qualitative criteria by the manufacturer to tj.
N = number of assessors (decision maker).
Aggregate value is M_{itj} = (q_{it}, o_{it}, p_{it}), where:
M_{itj}= weighted aggregation value for the i-th alternative to qualitative criteria to-t.

Step 7 This step calculates the fuzzy index value of each alternative appraisal result for qualitative criteria denoted by Gi. First, we get the value of Mit and Nt, to get the fuzzy match index value for each subjective criteria Gi.

$G_i = (Y_i, Qi, Zi, Hi1, Ti1, Hi2, Ui1), \qquad i = 1,2,.....m$

The fuzzy index values are obtained by operating each element of triangular fuzzy numbers from the numbers 2 and 4 with the following notations

$$T_{i1} = \frac{\sum_{t=1}^{k}(o_{it-}\, q_{it})(a_{t-}\, c_t)}{k} \tag{7}$$

$$T_{i2} = \frac{\sum_{t=1}^{k}[q_{it}(a_{t-}\, c_t)+c_t(o_{it-}\, q_{it})}{k} \tag{8}$$

$$U_{i1} = \frac{\sum_{t=1}^{k}(p_{it-}\, o_{it})(b_{t-}\, a_t)}{k} \tag{9}$$

$$U_{i2} = \frac{\sum_{t=1}^{k}[b_t(o_{it-}\, p_{it})+p_t(a_{t-}\, b_t)}{k} \tag{10}$$

$$H_{i1} = \frac{T_{i2}}{2T_{i1}} \tag{11}$$

$$H_{i2} = -\frac{U_{i2}}{2U_{i1}} \tag{12}$$

$$Y_i = \frac{\sum_{t=1}^{k} q_{it}c_t}{k} \tag{13}$$

$$Q_i = \frac{\sum_{t=1}^{k} o_{it}a_t}{k} \tag{14}$$

$$Z_i = \frac{\sum_{t=1}^{k} p_{it}b_t}{k} \tag{15}$$

Step 8 This step calculates the value of the utility in each alternative to qualitative criteria.

$$U_t(G_t) = \frac{1}{2}\left[H_{i2} - \left({H_{i2}}^2 + \frac{X_R - Z_i}{U_{i1}}\right)^{\frac{1}{2}} + 1 + H_{i1} - \left({H_{i1}}^2 + \frac{X_L - Y_i}{T_{i1}}\right)^{\frac{1}{2}}\right] \tag{16}$$

$$X_R = \frac{1}{2}\left\{2x_1 + 2H_{i2}(x_2 - x_1) + \frac{(x_2 - x_1)^2}{U_{i1}} - (x_2 - x_1)\left[\langle 2H_{i2} + \frac{(x_2 - x_1)^2}{U_{i1}} + 4\frac{x_1 - z_1}{U_{i1}}\rangle\right]^{\frac{1}{2}}\right\} \tag{17}$$

$$X_L = \frac{1}{2}\left\{2x_2 + 2H_{i1}(x_2 - x_1) + \frac{(x_2-x_1)^2}{T_{i1}} - (x_2 - x_1)\left[\langle 2H_{i2} + \frac{(x_2-x_1)^2}{T_{i1}} + 4\frac{x_1-z_1}{T_{i1}}\rangle\right]^{\frac{1}{2}}\right\} \quad (18)$$

The first step to do is by looking for the criteria and preferences of defuzzification value alternative to the criteria in which the defuzzification method used using the centroid method. The formula of defuzzification criteria is as follows

$$\text{Defuzzification } N_{it} = \frac{\left[\left[\int_{c_t}^{a_t}\frac{(x-c_t)}{(a_t-c_t)}xdx + \int_{a_t}^{b_t}\frac{(x-b_t)}{(a_t-b_t)}xdx\right]\right]}{\left[\left[\int_{c_t}^{a_t}\frac{(x-c_t)}{(a_t-c_t)}dx + \int_{a_t}^{b_t}\frac{(x-b_t)}{(a_t-b_t)}dx\right]\right]} \quad (19)$$

t = criteria 1,2,3.....n

While, the formula for determining the value defuzzification alternative preference for qualitative criteria is as follows

$$\text{Defuzzification } M_{it} = \frac{\left[\left[\int_{q_{it}}^{o_{it}}\frac{(x-q_{it})}{(o_{it}-q_{it})}xdx + \int_{o_{it}}^{p_{it}}\frac{(x-p_{it})}{(a_t-p_{it})}xdx\right]\right]}{\left[\left[\int_{q_{it}}^{o_{it}}\frac{(x-q_{it})}{(o_{it}-q_{it})}dx + \int_{o_{it}}^{p_{it}}\frac{(x-p_{it})}{(a_t-p_{it})}dx\right]\right]} \quad (20)$$

i = alternative 1,2,3,.....m;
t = criteria 1,2,3.....n

Step 9 This step calculates the ranking value of each alternative based on qualitative criteria by using the following formula

$$ST_i = \frac{U_T(G_i)}{\sum_{i=1}^{m} U_T(G_i)} \quad (21)$$

ST_i= the value of i-th rank alternatives based on qualitative criteria.

Step 10 This step calculates the ranking value of each alternative based on quantitative criteria by the following formula

$$OT_i = \frac{\sum_{j=1}^{p}[T_{ij}l(\sum_{i=1}^{m} T_{ij})]}{p} \quad (22)$$

T_{ij} = value (score) of the i-th alternative to quantitative criteria to-j
M = number of alternatives
P = number of quantitative criteria
OT_i= the value of the i-th rank alternatives based on quantitative criteria

Step 11 This step calculates the total of ranking value in each alternative to qualitative and quantitative criteria by the following formula

$$FT_i = \frac{ST_i + OT_i}{\sum Vk}, 0 \leq x \leq 1 \quad (23)$$

ST_i = the value of i-th rank alternatives based on qualitative criteria.
OT_i = the value of the i-th rank alternatives based on quantitative criteria

 Vk = number of variables
FT_i = rank total value for the alt to-i

Step 12 This step is selecting the best alternative based on the value of the highest rank.

2.7 Borda Method

Borda Rules are included in the class of ranking rules in which points are awarded according to rank in voter preferences (Caillaux, Sant´anna, Angulo-Meza, & Mello, 2011). Each decision maker must order an alternate option according to the preference specified. One point is given to the highest choice alternative; the second received two points, and so on (Mohajan, 2012).

In this method if there are n alternatives, the first choice of voters is given (m -1) points, the second point (m-2) and so on to the last option, which is 0 points. Then, in each alternative, summaries of all points are given from all decision makers (or by criteria). The alternative is to rank in the order corresponding to the number, the fewer points gained, the better the alternate in the rankings.
The formula describes as (Junior, de-Melo, & Meza, 2014)

$$P_a = \sum_{i=1}^{n} r_{a1} \tag{24}$$

Where P_a is the total number of points obtained by alternative *a* and r_{ai} is the rank of alternative *a* in criterion *i*.

2.8 Flowchart

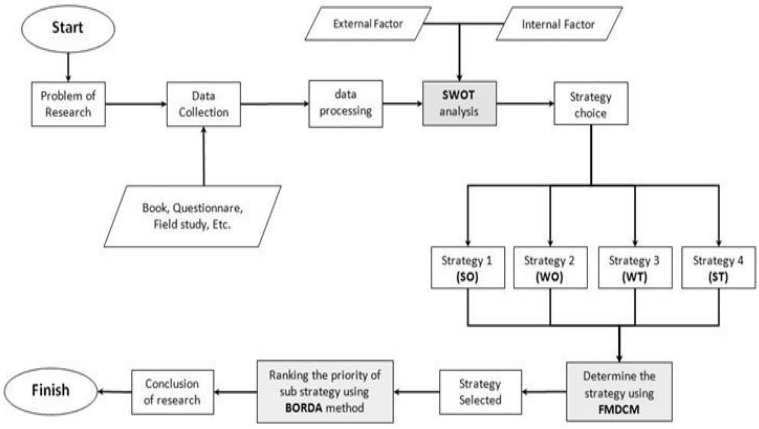

Figure 1 *Flowchart of Research*

3. Result and Discussion

3.1 SWOT Analysis

This subsection describes the results of research conducted in order to develop maritime security strategy with the SWOT analysis approach. SWOT analysis is used to capture expert judgment on internal and external factors, and then the factors of strength, weakness, opportunity, and threat are found.

Based on the results of respondent's judgement, there are several internal factors that become strengths and weaknesses as contained in the Table 2.

Table 2 *Internal Factors from SWOT Analysis*

INTERNAL FACTOR			
STRENGTH (S)		**WEAKNESS (W)**	
S1	Geographical position of Indonesia between two oceans and continents.	**W1**	Maritime security policy that still overlaps between stakeholders.
S2	Physical form and area of country.	**W2**	The high rate of unemployment and social inequality.
S3	Good political stability in the country	**W3**	Natural resources are still managed by many foreign parties.
S4	The national economic growth is quite high.	**W4**	The gap of educational level between regions in the border state of country.
S5	Natural marine resources both inside and on the surface are abundant.	**W5**	Infrastructure development in regional still uneven
S6	Demographic bonus of the population with a large workforce.	**W6**	Vulnerable to illegal levies, abuse of authority and corruption from stakeholders.
S7	Maritime-oriented from the Government Policy	**W7**	Information systems are still vulnerable to attacks from cyber enemy
S8	Free-active politics from the country.	**W8**	Military technology still linger
S9	Character and history as a maritime nation.	**W9**	Welfare for the crew of the Navy and other stakeholders is still limited.

Based on Table 2, it has nine points for strength analysis factor and nine points for weakness analysis factor.

Table 3 *External Factors of SWOT Analysis*

EXTERNAL FACTOR			
OPPORTUNITY (O)		**THREAT (T)**	
O1	Indonesia has the opportunity to become the second largest maritime country in the world.	**T1**	Piracy
O2	As a new hegemony in Asia-Pacific, a counterweight of China and US influence.	**T2**	Illegal Immigration and human trafficking
O3	The high economic growth encourages the growth of goods traffic by sea.	**T3**	Drug trafficking, smuggling of goods, weapons and military technology.
O4	A good national state budget encourages increased strength for the Navy capability and other stakeholders.	**T4**	The threat of terrorism both from inside and outside the country.
O5	Demographic bonus as a large market and abundant labor for the Navy and other stakeholders.	**T5**	Armed attacks, and violations of territorial boundaries from other countries.
O6	The growth of maritime domain awareness for the people.	**T6**	The threat of cyber attack.
O7	The existence of technology transfer for maritime service industry.	**T7**	Hunting and looting of marine resources, and illegal fishing.
O8	Utilization of marine resources for the welfare of the people.	**T8**	As a logistical shift path and war equipment, in case of armed conflict between other countries.
O9	Participation in the determination of world maritime security policy as a member of IMO.	**T9**	Threats from loss of natural resources and outer islands.

Based on Table 3, it has nine points for opportunity analysis factor and nine points for threat analysis factor.

From the result of SWOT analysis, SWOT matrix was obtained, which gives a description about maritime security strategy. The strategy is contained in the SWOT matrix Table below

Table 4 *Matrix Strategy of SWOT Analysis*

		INTERNAL FACTORS			
		STRENGTH (S)		**WEAKNESS (W)**	
EXTERNAL FACTORS		**Strategy I (SO)**		**Strategy II (WO)**	
	Opportunity (O)	**(SO)1**	• Utilization of geographical position as the world's shipping traffic and protection for maritime activities.	**(WO)1**	• Establish an integrated task force with fellow stakeholders in maritime security.
		(SO)2	• Development of maritime industry and technology transfer cooperation with developed countries.	**(WO)2**	• Implementing re-negotiations with foreign parties in the management of marine resources.
		(SO)3	• Increase of State Budget percentage for the development of Navy ability.	**(WO)3**	• Development of educational infrastructure in every coastal area and the addition of teacher amount.
		(SO)4	• Rebuild culture as a maritime nation.	**(WO)4**	• Establish a task force to eradicate corruption and illegal levies on marine sector.
		(SO)5	•Utilization of the abundant labor force in recruitment of Navy combat personnel.	**(WO)5**	• Cooperation with developed countries with technology transfer for military infrastructure development.
		(SO)6	• The use of the country's active-free politics as a mediator for China and US hegemony in Asia-Pacific.	**(WO)6**	• Build a strong foundation of information systems in maritime areas.
		Strategy IV (ST)		**Strategy III (WT)**	
	Threath (T)	**(ST)1**	• Utilization of geographical position as the world's shipping traffic and protection for maritime activities.	**(WT)1**	• Establish an integrated task force with fellow stakeholders in maritime security.
		(ST)2	• Increase of State Budget percentage for the development of Navy ability.	**(WT)2**	• Equitable development of maritime base infrastructure and connectivity, especially in coastal and border areas.
		(ST)3	• Equitable development of maritime base infrastructure and connectivity, especially in coastal and border areas.	**(WT)3**	• Cooperation with friendly countries to the handling of transnational crime.
		(ST)4	• Negotiations with neighboring countries in trans-state sea border agreements.	**(WT)4**	• Empowerment of the maritime industry in coastal areas, for the opening of employment in each region as a consequence of demographic
		(ST)5	• The use of the country's active-free politics as a mediator for China and US hegemony in Asia-Pacific.	**(WT)5**	• Strict action of any criminal offenses at sea.

Based on Table 4, this paper gives four strategies in order to support national maritime security stability. The strategies consists of seven points for strategy I Strength-opportunity (SO); six points for strategy II Weakness-Opportunity (WO); six points for strategy III Weakness-Threat (WT); seven points for strategy IV Strength-Threat (ST).

3.2 Analysis of Fuzzy Multi Criteria Decision Making (F-MCDM)

The next step is to determine the choice strategy by the Fuzzy MCDM (F-MCDM). The choice of strategy that exists after SWOT analysis is given weight in the ranking. Previously, a questionnaire was completed by 6 competent expert assessors (E1; E2; E3; E4; E5; E6) in the field of maritime security.

Scale questionnaire consists of two parts, linguistic scale and numerical scale. The example of linguistic scale is "very weak", "weak", "moderate", "strong" and "very strong", while in numerical scale, interval of values taken are 1-10, as the Table 5.

Table 5 *Questionnaire Scale for Linguistic Level*

Aspect/ Criteria	Very Weak		Weak		Moderate		Strong		Very Strong	
	1	2	3	4	5	6	7	8	9	10

After obtaining the data from the questionnaire, the next step is to recapitulate the results of the questionnaire and data processing. The steps of data processing using MCDM fuzzy algorithm are, as follows

Step 1 The result of qualitative criteria assessment from Expert judgement (E1-E6)

Table 6 *Result of Qualitative Criteria Assessment*

NO	Criteria of Good Strategies	E1	E2	E3	E4	E5	E6
1	There is effective communication among stakeholders.	6	8	7	7	5	7
2	The Strategy has good information about security and intelligence.	9	7	8	8	6	9
3	There is continuous assessment of existing security processes, procedures and technologies.	6	6	9	7	7	8
4	Strategy is supported by the ability and the number of personnel adequate.	4	9	8	8	7	9
5	The Strategy is supported by policies and funding from the Government	8	8	9	9	7	10
6	There is a good and effective interaction within the organization or between organizations.	6	7	8	5	7	6
7	There is consistency in the application of systems, processes and protocols.	5	7	6	8	7	7
8	Maritime security strategy shall synergize with risk management, quality, environment and other safety systems.	7	7	8	8	5	7
9	There are metric measurements, accurate monitoring and reporting procedures.	6	7	8	5	8	7
10	There is regular and ongoing training.	4	7	8	8	6	7
11	There is an adequate control center.	7	6	9	8	8	5

Step 2 The result of preference assessment for each alternative based on existing qualitative criteria.

Table 7 *Result of Preference Assessment*

NO	QUALITATIVE CRITERIA	Strategies	E 1	E 2	E 3	E 4	E 5	E 6
1	There is effective communication among stakeholders.	S1 (SO)	6	6	9	8	7	9
		S2 (WO)	9	8	7	9	9	9
		S3 (WT)	8	7	9	9	9	8
		S4 (ST)	8	6	6	8	9	6
2	The Strategy has good information about security and intelligence.	S1 (SO)	6	6	7	6	8	7
		S2 (WO)	8	7	9	8	7	9
		S3 (WT)	6	7	4	7	6	6
		S4 (ST)	9	9	7	7	9	9
3	There is continuous assessment of existing security processes, procedures and technologies.	S1 (SO)	8	9	8	7	9	8
		S2 (WO)	6	7	7	6	8	9
		S3 (WT)	7	6	7	6	8	7
		S4 (ST)	7	5	7	8	8	7
4	Strategy is supported by the ability and the number of personnel adequate.	S1 (SO)	8	8	9	9	7	8
		S2 (WO)	6	7	5	6	5	6
		S3 (WT)	6	7	8	6	8	7
		S4 (ST)	6	8	7	6	6	7
5	The Strategy is supported by policies and funding from the Government	S1 (SO)	8	8	9	8	9	9
		S2 (WO)	8	7	7	7	8	8
		S3 (WT)	6	8	7	6	8	7
		S4 (ST)	9	7	7	7	8	9
6	There is a good and effective interaction within the organization or between organizations.	S1 (SO)	6	8	8	6	7	7
		S2 (WO)	7	8	6	6	8	9
		S3 (WT)	7	9	8	8	6	6
		S4 (ST)	8	8	7	8	6	8
7	There is consistency in the application of systems, processes and protocols.	S1 (SO)	8	8	7	7	6	6
		S2 (WO)	6	5	5	6	9	6
		S3 (WT)	6	8	7	6	6	5
		S4 (ST)	6	6	7	8	7	7
8	Maritime security strategy shall synergize with risk management, quality, environment and other safety systems.	S1 (SO)	8	8	7	8	9	7
		S2 (WO)	6	7	7	6	8	9
		S3 (WT)	6	6	8	5	5	8
		S4 (ST)	8	8	7	8	9	8
9	There are metric measurements, accurate monitoring and reporting procedures.	S1 (SO)	6	6	8	5	7	6
		S2 (WO)	7	6	8	8	6	6
		S3 (WT)	6	8	7	7	6	6
		S4 (ST)	8	7	7	6	8	8
10	There is regular and ongoing training	S1 (SO)	6	8	7	8	6	7
		S2 (WO)	8	7	7	8	6	7
		S3 (WT)	8	6	7	9	8	6
		S4 (ST)	7	8	9	8	8	9
11	There is an adequate control center.	S1 (SO)	6	8	6	7	8	6
		S2 (WO)	8	7	9	8	6	8
		S3 (WT)	8	8	9	6	6	7
		S4 (ST)	7	8	8	6	8	8

Step 3 The result of middle value from fuzzy number.

Table 8 *Result of Middle Value*

NO	LINGUISTIC LEVEL	E1			E2			E3			E4			E 5			E6		
		ct	at	bt	ct	at	bt	ct	at	bt	ct	at	bt	ct	at	bt	ct	at	bt
1	VERY WEAK																		
2	WEAK																		
3	MODERATE	1	4	5,6667	1	6	7,25	1	6	7,857	1	5	7,75	1	5,5	7,29	1	5,5	7,167
4	STRONG	4	5,66667	7	6	7,25	9	6	7,857	9	5	7,75	9	5,5	7,286	9	5,5	7,167	9,333
5	VERY STRONG	7	9	10	7,25	9	10	7,857	9	10	7,75	9	10	7,286	9	10	7,167	9,333	10,000

Step 4 The Result of Limit Value from the Fuzzy Number

Table 9 *Result of Limit Value*

NO	LINGUISTIC LEVEL	E1			E2			E3			E4			E 5			E6		
		qit	oit	pit	qit	oit	pit	qit	oit	pit	qit	oit	pit	qit	oit	pit	qit	oit	pit
1	VERY WEAK																		
2	WEAK																		
3	MODERATE	1	6	7,6957	1	5,8182	7,6	4	5,6	7,267	1	5,882	7,652	1	5,857	7,71	1	5,917	7,4545
4	STRONG	6	7,69565	9	5,8182	7,6	9	5,6	7,267	9	5,88235	7,652	9	5,857	7,714	9	5,917	7,455	9
5	VERY STRONG	7,69565	9	10	7,6	9	10	7,267	9	10	7,65217	9	10	7,714	9	10	7,455	9	10

Step 5 The result of aggregate weight of each qualitative criterion

Table 10 *Result of Aggregate Weight*

NO	Criteria of Good Strategies	AVERAGE		
		ct	at	bt
1	There is effective communication among stakeholders.	6,68	8,01	9,17
2	The Strategy has good information about security and intelligence.	3,25	6,38	7,92
3	There is continuous assessment of existing security processes, procedures and technologies.	5,79	7,87	8,89
4	Strategy is supported by the ability and the number of personnel adequate.	3,67	6,64	8,24
5	The Strategy is supported by policies and funding from the Government	4,17	6,43	8,29
6	There is a good and effective interaction within the organization or between organizations.	2,58	5,92	7,71
7	There is consistency in the application of systems, processes and protocols.	2,92	6,35	7,95
8	Maritime security strategy shall synergize with risk management, quality, environment and other safety systems.	3,42	6,13	8,01
9	There are metric measurements, accurate monitoring and reporting procedures.	7,38	9,06	10
10	There is regular and ongoing training	7,38	9,06	10
11	There is an adequate control center.	1,67	5,79	7,37

Step 6 The result of preference value of each alternative based on qualitative criteria.

Table 11 *Result of Preference Value*

NO	Criteria of Good Strategies	Strategy	AVERAGE			NO	Criteria of Good Strategies	Strategy	AVERAGE		
			qit	oit	pit				qit	oit	pit
1	Effective communication among stakeholders.	S1 (SO)	6,12	7,85	9,167	7	There is consistency in the application of systems, processes and protocols.	S1 (SO)	3,13	6,4	8,05
		S2 (WO)	6,16	7,78	9,167			S2 (WO)	5,89	7,5	8,88
		S3 (WT)	4,22	7,01	8,509			S3 (WT)	6,44	8,02	9,33
		S4 (ST)	7,03	8,45	9,667			S4 (ST)	4,23	6,97	8,54
2	The Strategy has good information about security and intelligence.	S1 (SO)	3,4	6,67	8,335	8	Maritime security strategy shall synergize with risk management, quality, environment and other safety	S1 (SO)	4,5	7,2	8,73
		S2 (WO)	3,94	6,69	8,279			S2 (WO)	4,22	7	8,53
		S3 (WT)	6,12	7,85	9,167			S3 (WT)	5,85	7,56	9
		S4 (ST)	4,22	6,99	7,215			S4 (ST)	4,19	6,95	8,45
3	There is continuous assessment of existing security processes, procedures and	S1 (SO)	2,31	6,16	7,778	9	There are metric measurements, accurate monitoring and reporting procedures.	S1 (SO)	6,1	7,82	9,17
		S2 (WO)	2,59	6,38	8,11			S2 (WO)	3,94	6,69	8,28
		S3 (WT)	7,56	9	10			S3 (WT)	6,41	8,04	9,33
		S4 (ST)	1,5	5,85	7,564			S4 (ST)	5,04	7,25	8,79
4	Strategy is Supported by the ability and the number of personnel adequate.	S1 (SO)	4,78	6,99	8,478	10	There is regular and ongoing training	S1 (SO)	5,01	7,28	8,78
		S2 (WO)	6,4	8,05	9,333			S2 (WO)	6,4	8,05	9,33
		S3 (WT)	5,85	7,56	9			S3 (WT)	7,56	9	10
		S4 (ST)	5,85	7,56	9			S4 (ST)	6,16	7,78	9,17
5	The Strategy Supported by policies and funding from the Government	S1 (SO)	4,2	6,99	8,558	11	There is an adequate control center.	S1 (SO)	3,97	6,68	8,26
		S2 (WO)	5,29	7,53	8,942			S2 (WO)	5,03	7,27	8,78
		S3 (WT)	6,42	8,01	9,333			S3 (WT)	5,03	7,31	8,74
		S4 (ST)	5,03	7,23	8,663			S4 (ST)	7,03	8,45	9,67
6	There is a good and effective interaction within the organization or between organizations.	S1 (SO)	3,42	6,66	8,328						
		S2 (WO)	5,84	7,54	8,878						
		S3 (WT)	6,1	7,82	9,167						
		S4 (ST)	3,41	6,72	8,284						

Step 7 The result of fuzzy index value from each alternative appraisal result for qualitative criteria.

Table 12 *Result of Fuzzy Index Value*

CRITERIA NUMBER												
Yi	1	2	3	4	5	6	7	8	9	10	11	**AVG**
S1 (SO)	40,8853	11,0495	13,376	17,512	17,49	8,834	9,138	15,37	45,06306	37,02	6,611	20,213
S2 (WO)	41,0973	12,7927	14,978	23,456	22,03	15,07	17,18	14,41	29,06853	47,26	8,387	22,339
S3 (WT)	28,1977	19,9014	43,808	21,434	26,76	15,76	18,78	19,97	47,34887	55,86	8,377	27,837
S4 (ST)	46,9364	13,7045	8,6875	21,434	20,94	8,808	12,33	14,32	37,19194	45,46	11,72	21,958
Qi	1	2	3	4	5	6	7	8	9	10	11	**AVG**
S1 (SO)	49,0245	42,5782	48,448	46,442	44,9	39,45	40,6	44,11	70,82769	65,94	38,69	48,272
S2 (WO)	49,2786	42,7007	50,216	53,465	48,37	44,66	47,61	42,89	60,61768	72,94	42,1	50,441
S3 (WT)	33,8111	50,0926	70,839	50,261	51,45	46,31	50,92	46,36	72,76817	81,5	42,32	54,239
S4 (ST)	56,2802	44,5963	46,012	50,261	46,49	39,76	44,25	42,61	65,69229	70,44	48,96	50,486
Zi	1	2	3	4	5	6	7	8	9	10	11	**AVG**
S1 (SO)	84,0278	66,0349	69,139	69,858	70,96	64,24	64	69,93	91,66667	87,83	60,91	72,6
S2 (WO)	84,0278	65,5948	72,092	76,907	74,14	68,49	70,62	68,28	82,79434	93,33	64,68	74,632
S3 (WT)	78	72,624	88,889	74,161	77,39	70,71	74,24	72,05	93,33333	100	64,44	78,713
S4 (ST)	88,6111	57,1652	67,235	74,161	71,83	63,91	67,95	67,62	87,85714	91,67	71,25	73,569
Ti1	1	2	3	4	5	6	7	8	9	10	11	**AVG**
S1 (SO)	2,2985	10,2472	7,9967	8,3021	6,3	10,82	11,2	7,319	2,872533	3,79	11,19	7,4853
S2 (WO)	2,15714	8,629	7,8885	6,6657	5,058	5,701	5,529	7,544	4,607238	2,766	9,227	5,9794
S3 (WT)	3,70486	5,41084	2,9862	4,7133	3,577	5,738	5,435	4,66	2,713425	2,399	9,41	4,6134
S4 (ST)	1,89239	8,68096	9,0363	6,5767	4,991	11,03	9,41	7,483	3,705741	2,711	5,873	6,4903
Ti2	1	2	3	4	5	6	7	8	9	10	11	**AVG**
S1 (SO)	19,6852	21,2816	27,075	22,339	21,1	19,79	20,27	21,42	22,8921	25,13	20,88	21,988
S2 (WO)	19,0173	21,279	27,349	25,098	21,28	23,89	24,9	20,94	26,94192	22,92	24,49	23,463
S3 (WT)	24,224	24,7804	24,046	23,71	21,11	24,81	26,71	21,73	22,70588	23,24	24,54	23,781
S4 (ST)	18,8498	22,2108	28,288	23,71	20,56	19,92	22,51	20,8	24,79461	22,27	31,37	23,207
Ui1	1	2	3	4	5	6	7	8	9	10	11	**AVG**
S1 (SO)	1,52505	2,56278	1,6519	2,3747	2,931	2,987	2,65	2,888	1,27047	1,418	2,502	2,251
S2 (WO)	1,61164	2,44739	1,7614	2,0534	2,64	2,393	2,214	2,872	1,497376	1,208	2,379	2,0979
S3 (WT)	1,73931	2,02819	1,0179	2,2909	2,476	2,413	2,108	2,696	1,225497	0,944	2,266	1,9277
S4 (ST)	1,4081	0,34624	1,7488	2,2909	2,666	2,814	2,523	2,805	1,446276	1,311	1,916	1,9342
Ui2	1	2	3	4	5	6	7	8	9	10	11	**AVG**
S1 (SO)	-22,6839	-26,019	-22,343	-25,79	-28,99	-27,78	-26,05	-28,71	-22,1094	-23,3	-24,7	-25,32
S2 (WO)	-23,3677	-25,342	-23,638	-25,5	-28,41	-26,22	-25,22	-28,26	-23,674	-21,6	-25	-25,11
S3 (WT)	-23,6127	-24,56	-19,067	-26,19	-28,41	-26,82	-25,43	-28,39	-21,7907	-19,4	-24,4	-24,37
S4 (ST)	-22,3406	-12,915	-22,972	-26,19	-28,01	-26,96	-26,22	-27,82	-23,6111	-22,5	-24,2	-23,98
Hi1	1	**Hi2**	1									
S1 (SO)	1,46875	S1 (SO)	5,6242									
S2 (WO)	1,962	S2 (WO)	5,9842									
S3 (WT)	2,57736	S3 (WT)	6,322									
S4 (ST)	1,78781	S4 (ST)	6,1992									

Table 13 *Result of Fuzzy Index Value*

Strategy	FUZZY INDEX								
	Yi	Qi	Zi	Hi1	Ti1	Hi2	Ui1	Ti2	Ui2
S1 (SO)	20,21335	48,2724	72,5999	1,4687	7,4853	5,6242	2,251	21,987896	-25,32
S2 (WO)	22,33877	50,4407	74,6324	1,962	5,9794	5,9842	2,0979	23,463242	-25,11
S3 (WT)	27,83658	54,239	78,7132	2,5774	4,6134	6,322	1,9277	23,780965	-24,37
S4 (ST)	21,95772	50,4861	73,5689	1,7878	6,4903	6,1992	1,9342	23,206982	-23,98

Step 8 The result of utility value in each alternative to qualitative criteria.

Table14 *Result of Utility Value*

UTILITY VALUE OF ALTERNATIVE STRATEGIES							
XR - S1(S0)	128,812	14,229	189,409	-71,123	10,876	61,553	40,744
- S2(WO)	132,887	15,268	215,098	-76,594	11,769	66,606	40,775
-S3(WT)	136,710	16,616	242,733	-83,994	12,599	71,305	41,010
- S4(ST)	135,320	16,560	234,837	-81,775	12,372	70,019	40,931
XL - S1(S0)	93,095	4,279	144,107	7,709	12,321	69,733	13,821
- S2(WO)	98,679	5,357	166,796	9,310	13,271	75,105	14,465
-S3(WT)	105,644	6,943	192,395	11,182	14,268	80,751	15,918
- S4(ST)	96,707	4,935	176,102	8,741	13,596	76,945	12,348
Ut(Gt) - S1(S0)	4,181	3,912	1,142	1,385			
- S2(WO)	4,435	4,511	1,591	1,460			
-S3(WT)	4,518	5,382	2,015	0,988			
- S4(ST)	4,643	4,344	1,310	1,517	5,350		

Step 9 The result of ranking value on each alternative based on the qualitative criteria.

Table 15 *Result of Ranking Value*

NO	CRITERIA OF STRATEGIES	DEFUZZIFICATION CRITERIA	DEFUZZIFICATION OF ALTERNATIVE STRATEGIES				MULTIPLICATION VALUE OF DEFUZZY (CRITERIA*ALT)			
			S1 (SO)	S2 (WO)	S3 (WT)	S4 (ST)	S1 (SO)	S2 (WO)	S3 (WT)	S4 (ST)
1	Effective communication among stakeholders.	7,950	7,714	7,700	6,581	8,383	61,327	61,214	52,317	66,646
2	The Strategy has good information about security and intelligence.	5,851	6,137	6,303	7,714	6,141	35,902	36,877	45,133	35,929
3	There is continuous assessment of existing security processes, procedures and technologies.	7,517	5,414	5,692	8,855	4,970	40,700	42,789	66,562	37,359
4	Strategy is Supported by the ability and the number of personnel adequate.	6,184	6,748	7,925	7,470	7,470	41,727	49,010	46,193	46,193
5	The Strategy Supported by policies and funding from the Government	6,295	6,581	7,252	7,921	6,975	41,427	45,653	49,862	43,904
6	There is a good and effective interaction within the organization or between organizations.	5,406	6,137	7,419	7,697	6,137	33,175	40,107	41,609	33,175
7	There is consistency in the application of systems, processes and protocols.	5,739	5,859	7,422	7,931	6,581	33,626	42,599	45,519	37,771
8	Maritime security strategy shall synergize with risk management, quality, environment and other safety systems.	5,851	6,810	6,581	7,470	6,530	39,841	38,502	43,703	38,204
9	There are metric measurements, accurate monitoring and reporting procedures.	8,813	7,697	6,303	7,927	7,025	67,835	55,553	69,864	61,919
10	There is regular and ongoing training	8,813	7,025	7,929	8,855	7,700	61,919	69,883	78,040	67,864
11	There is an adequate control center.	4,943	6,303	7,025	7,025	8,383	31,158	34,728	34,728	41,440
						AVERAGE VALUE OF DEFUZZY	32,576	34,461	38,235	34,027

Step 10 The result of ranking value from each alternative based on quantitative criteria.

Table 16 *Result of Ranking Value*

RANKING OF QUALITATIVE CRITERIA

Strategy	Sti
S1 (SO)	0,259
S2 (WO)	0,273
S3 (WT)	0,185
S4 (ST)	0,284

RANKING OF QUANTITATIVE CRITERIA

Strategy	Oti
S1 (SO)	0,253
S2 (WO)	0,247
S3 (WT)	0,230
S4 (ST)	0,269

Step 11 The result of ranking value total in each alternative from qualitative and quantitative criteria.

Table 17 *Result of Ranking Value Total from Linguistic Level*

Strategy	Fti	Ranking
S1 (SO)	0,256	**III**
S2 (WO)	0,260	**II**
S3 (WT)	0,208	**IV**
S4 (ST)	0,276	**I**

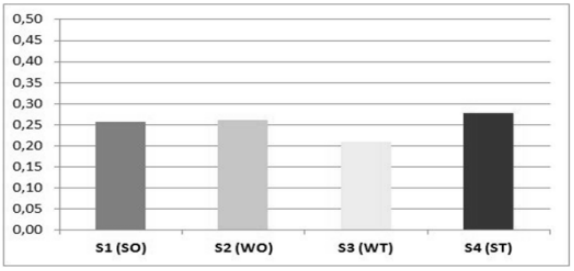

Figure 2 *Diagram of Ranking Value Totals from Linguistic Level*

Step 12 The result of the best alternative based on the value of the highest rank.

Based on Fuzzy MCDM Analysis, this paper generates the weighting of strategies available in maritime security control. Strategy 1 (SO) has a weight of 0.256 as a third rank; Strategy 2 (WO) has a weight of 0.26 as a second rank; Strategy 3 (WT) has a weight of 0.208 as a fourth rank; Strategy 4 (ST) has a weight of 0.276 as a first rank. Then, the strategy chosen is Strategy 4 (ST) as a priority to use in maritime security control.

3.3 Borda Method Analysis

In this research, Borda method is used to provide priority allocation scale to existing sub-strategy and budget allocation in the selected strategy of previous Fuzzy MCDM analysis.

Table 18 *Result of Sub Strategy Weighted*

Code	Strategy IV (ST)	Weight	Priority
(ST)1	Increase the percentage of State Budget for the maritime sector in the development of force of the Navy and other stakeholder to carry out the operation of sea crime action.	0,057	1
(ST)2	Development of maritime infrastructure and connectivity in coastal and border areas to open logistics channels.	0,071	2
(ST)3	Rebuild culture as a maritime nation.	0,168	5
(ST)4	Conducting negotiations with related neighboring countries in handling sea border country transfer agreement	0,089	3
(ST)5	The development of shipping academy infrastructure in every coastal area and the addition of teacher.	0,232	7
(ST)6	Carry out re-negotiations with foreign parties in the management of natural resources controlled by foreigners.	0,221	6
(ST)7	Build a strong foundation and infrastructure for information system in the maritime territory to cope with cyber threats.	0,161	4

Table 19 *Percentage of State Budget Allocation*

Code	Strategy IV (ST)	%
(ST)1	Increase the percentage of State Budget for the maritime sector in the development of force of the Navy and other stakeholder to carry out the operation of sea crime action.	22,857
(ST)2	Development of maritime infrastructure and connectivity in coastal and border areas to open logistics channels.	21,429
(ST)3	Rebuild culture as a maritime nation.	11,786
(ST)4	Conducting negotiations with related neighboring countries in handling sea border country transfer agreement	19,643
(ST)5	The development of shipping academy infrastructure in every coastal area and the addition of teacher.	5,357
(ST)6	Carry out re-negotiations with foreign parties in the management of natural resources controlled by foreigners.	6,429
(ST)7	Build a strong foundation and infrastructure for information system in the maritime territory to cope with cyber threats.	12,50

Based on Table , the sub-strategies weighted. (ST) 1 has a weight of 0,057 as a first priority; (ST) 2 has a weight of 0,071; (ST) 3 with a weight of 0,168; (ST) 4 with a weight of 0,089; (ST) 5 with a weight of 0,232; (ST) 6 has a weight of 0,221; and the last (ST) 7 with a weight of 0,161.

Figure 4 *Percentage diagram of State Budget Allocation*

Based on Borda method from Table , the first priority of sub-strategy from strategy 4 (ST) is increasing of State Budget percentage for the maritime sector in the development of Navy Capability and other stakeholders to carry out the operation of sea crime action with allocation of the budget is 22,587%.

4. Conclusion

The economic development of Indonesia and regional areas gives an effect on national security, including maritime security sectors. Indonesia has challenges to manage maritime security with various dimensions, including defense and security perspective.

Based on SWOT analysis, the paper has given four strategies in order to support national maritime security stability. The strategies consists of seven points for strategy I Strength-opportunity (SO); six points for strategy II Weakness-Opportunity (WO); six points for strategy III Weakness-Threat (WT); seven points for strategy IV Strength-Threat (ST).

Based on FMCDM method, Strategy 1 (SO) has a weight of 0.256 as a third rank; Strategy 2 (WO) has a weight of 0.26 as a second rank; Strategy 3 (WT) has a weight of 0.208 as a fourth rank; Strategy 4 (ST) has a weight of 0.276 as a first rank. Then,

the strategy chosen is Strategy 4 (ST). Based on Borda method, the first priority of sub-strategy from strategy 4 (ST) is increasing of State Budget percentage for the maritime sector in the development of Navy Capability and other stakeholders to carry out the operation of sea crime action with allocation is 22,587%.

For the future work, the integrated method (SWOT-Fuzzy MCDM-Borda) can be applied to other areas of decision making.

5. Acknowledgement

This research is supported by The Indonesia Naval Institute of Technology (Sekolah Tinggi Teknologi Angkatan Laut/STTAL).

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