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Development of Strategic Decision Making In Supporting National Maritime Defense

Avando Bastari [1], Sutrisno *[2], Ayip Rivai Prabowo [3]

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Abstract: State defense is essentially all efforts that are universal in nature and are carried out with an awareness of the rights and obligations of all citizens, belief in their strength to maintain the survival of the nation, state, just and prosperous. The marine defense strategy model is one part of the Archipelago State Archipelago Marine Defense Strategy, referring to the dynamics of development of the Strategic Environment and the capabilities of available national resources. In assessing the maritime defense strategy of the archipelago, it is determined by the influence and interrelationships between one aspect and another. As a complex system, an analysis is needed to get a score on the assessment of the maritime defense strategy of the archipelago, which consists of aspects of developing Navy strength, aspects of the Integrated Fleet Weapon System, and aspects of Potential Threats. Then it is compiled in a dynamic model that can represent a value in the assessment of the maritime defense of the archipelago country which is projected based on the time dimension up to the next 15 years. In this thesis, the researcher uses a System Dynamic model approach that is integrated with the Fuzzy Weighted method to obtain a weight assessment of the value of each variable and sub-variable. The results of the formulation and simulation of the model with a dynamic system approach in the assessment of the maritime defense strategy of the archipelago, obtained scores for each strategy scenario as follows: (1) Fleet In Being strategy with an index value of 5.72, (2) Blockade scenario of 5.72, (3) Decisive Battle scenario 5.73, (4) combination scenario between fleet in being and blockade 5.72, (5) combination scenario of the fleet in being and decisive battle 5.78, (6) scenario of the combination of blockade and decisive battle 5 .73 and the value of the defense of the marine dimension based on the current capability of the SSAT in the 15th year of 5.9 is included in the category of alert/quite safe.

Keywords: *Defense Strategy, Marine Environment, Fleet in Being, Blockade, Decisive Battle, System Dynamic, Fuzzy Weighted*

1. Introduction

Indonesia's position, which is between the continents of Australia and the Asian continent as well as the Pacific Ocean and the Indian Ocean, de jure geographically, Indonesia is the largest archipelagic country in the world as stated through the ratification of the 1982 United Nations Convention on the Law of the Sea (UNCLOS). The total area covers 1.9 million km2 of land and 6.4 km2 of water area with a coastline of 108,000 km2. The Indonesian Sea consists of 3.11 million km2 of archipelago waters, 0.29 million km2 of territorial waters, and 3.0 million km2 of the exclusive economic zone (EEZ). As well as the number of islands 17,504 both large and small islands [2].

The archipelagic state marine defense strategy model is one part of the Archipelago Sea Defense Strategy (SPLN) referring to the dynamics of development of the strategic environment and the capabilities of available national resources, in the implementation of the SPLN consisting of a deterrence strategy, a layered defense strategy and a maritime control strategy [1]. Meanwhile, the SPLN battlefield is divided into three regions. The defense field that supports its territory from outside the ZEEI (Exclusive Economic Zone) boundaries, the main defense field covers the territorial sea up to the EEZ, as well as areas of resistance starting in the territorial sea and archipelago waters [19].

In essence, the sea has four main functions that can provide benefits to the country in times of peace and war, namely as follows: (1) the sea as a resource where a sea is a gathering place for resources, both biological and energy that play an important role for the country such as marine life. , petroleum and natural gas; (2) the sea is the main connecting element of trade activities in promoting peace and prosperity on a global scale; (3) the sea as a medium of information and dissemination of ideas; (4) the sea as an attribute of power where the state uses the sea to control its territory [17].

The potential defense threat that will occur along with the increasing global political tension caused by the competition between the two great powers, namely America and China. The trade war between the two countries has an impact on the world economy, in addition to that, the display of military strength of the two countries in the South China Sea area is also a threat to stability in the Southeast Asian region [15]. The rivalry between these two great powers has further increased global political uncertainty. China's claim that the South China Sea (SCS) as a whole belongs to China through the theory of the nine-dash line or 9 (nine) dotted lines that stretch between the South China Sea area, resulting in conflicts with countries around the SCS including Indonesia, Philippines, Vietnam, Malaysia and Thailand [16]. The threat to security and stability in the South China Sea region is one of the main factors in the surge in the increase in China's military defense budget [5]. In May 2020 China announced an annual defense budget of RMB 1.268 trillion or $178.6 billion, marking a 6.6 percent increase from its 2019 budget of RMB 1.189 trillion or

[1] *Indonesia Naval Technology College, STTAL Surabaya Indonesia*
[2] *Indonesia Naval Technology College, STTAL Surabaya Indonesia*
[3] *Indonesia Naval Technology College, STTAL Surabaya Indonesia*

** Corresponding Author Email:okolsrisuharyo@gmail.com*

$172.3 billion [3].

China's high intensity in the South China Sea by holding large-scale military exercises, continuously building military bases by strengthening and placing aircraft carriers, large combat ships (destroyer and frigate) at Chinese naval bases around the South China Sea. This could violate China's commitment to avoid activities that would complicate, or escalate disputes, affect peace and stability in the surrounding South China Sea region. The number of violations of fishing activities is increasing, where every caught fisherman often says that they are still in their territory, this is very dangerous because their claim means the same as an acknowledgment of sovereignty over their territory [14]. China Coast Guard (CCG) ships, Vietnam Coast Guard (VCG) which accompany their fishing activities in catching fish, are protection against marine activities such as catching fish which often come into contact with certain state authorities, this situation can of course be dangerous because it has been in contact with the geopolitical and geostrategic affairs of a country [11]. Foreign fishermen who commit violations can find out strategic information on maritime border guarding forces or act as spies (espionage) in data collection [12].

The problem that can be taken in this research is that at this time the need for Naval Operations Staff or the Naval Control Command Centre to be able to make decisions and assess 3 (Three) Archipelago State Marine Defense strategies, namely **(a) Fleet in being strategy, (b) Blockade strategy and (c) Decisive in Battle strategy** [8]. To be able to carry out this assessment, we need a model that can perform analysis or simulation with an assessment scenario of the 3 (three) strategies where the variables to be simulated include the strength of the Navy in dealing with current threats, threats that will come from within as well as from outside as well as 3 (three) Fleet in being strategies, Blockade strategies and Decisive in Battle strategies to get the value of the maritime defense of the archipelago [7].

The advantage of using an approach with the dynamic system method is that the dynamic system has a very good ability to explain the behaviour and characteristics of the system being observed [13], in this case, the character explanation is a model of marine defense assessment, while its behaviour is a defense strategy to be used implemented. Being able to explain the causal relationship and the consequences of changing the state of each variable well and with the simulation concept it has, modelling using dynamic systems has flexibility in its application and also does not interfere with the real system being observed [4]. So the purpose of this research is to develop dynamic system-based modelling that can present an assessment of the maritime defense strategy of the archipelago.

The problem statement in the research is "How to formulate a decision-making scenario that can represent the value of the archipelago's maritime defense strategy based on a dynamic system?" To answer these problems, several research questions can be derived as follows:

a. What variables influence the formulation of the value of the maritime defense strategy of the archipelago country?

b. How to determine the value of a naval defense strategy based on the ability of the Navy's strength?

c. How to formulate and choose the best scenario in the assessment of the maritime defense strategy of the archipelago?

2. MATERIALS AND METHODS

This material and method section discusses the identification of variables, Causal Loop Construction and Stock Flow Diagrams, dynamic systems methods, strategic theories and concepts of archipelagic warfare as well as the juridical basis which contains laws or regulations that support the implementation of this research. In the section containing the stages of research that refer to the scientific stage, every research requires a research framework (methodology). As a foundation so that the research process runs systematically, structured, and directed. This research methodology includes the stages of the research process or the sequence of steps that must be carried out in carrying out research [10]. The process of data analysis, research results, and discussion, as well as model preparation, is carried out in several stages which include: (a) Identification of Aspects, Variables, and Criteria, (b) Model Development, (c) Model Validation and (d) Scenario Simulation to be carried out to obtain the value of the defense of the marine dimension using the STELLA 9.1.3 software simulation.

2.1. Variable Identification.

The initial step is to identify the variables that affect the marine dimension defense assessment model and conceptual understanding, which consists of a subsystem of the strength development aspect and the subsystem of the potential threat aspect. Each subsystem is built by unique factors and interacts dynamically according to time and conditions.

Table 1. Identification of Main Variables

Grand Model - Main Variable of Marine Defense	
Variable	**Description**
1. Marine Environment Defense value	Marine Dimension Defense Condition Assessment
2. Naval force development	A process/step that is carried out in forming, adding, and complementing the capabilities of the strengths possessed
3. SSAT	Integrated fleet weapon system consisting of Navy Ships, Aircraft, Marines, and Bases
4. Potential of threats	Every potential/estimated threat that may occur, be it Military, Non-Military, and Hybrid threats.

Table 2. Identification of Naval Forces Development Aspects

Sub Model – Naval Forces Development Aspect		
	Variable	**Description**
1	Defense Budget	The budget provided by the government to organize Defense
2	Navy Budget	Budget provided by the Ministry of Defense for the Navy
3	National Defense Policy	Guidelines for implementing the national defense system as a reference in planning, implementing, and monitoring
4	Diplomacy	Navy cooperation/negotiation relationship
5	Marine Environment defense area control	Fostering the potential of the national territory into the defense of the marine aspect
6	Human Resources	The quality and quantity of the Navy's human resources
7	Education	The learning process is given in the form of theoretical knowledge and the form of skills
8	Training	A process of forming abilities and skills in preparing their readiness

Table 3. Identification of SSAT Aspect

Sub Model - SSAT Aspect		
No	**Variable**	**Description**
1	Navy Ships	Republic of Indonesia warships
2	Striking Forces	The power of a warship that can hit/destroy
3	Supporting Forces	The power of warships that can assist the operation
4	Patrolling Forces	The strength of a warship that can carry out patrols
5	AKPA Ability	Ability to carry out anti-surface warfare
6	AKS Ability	Ability to carry out anti-submarine/underwater warfare
7	PAU Ability	Ability to carry out anti-air warfare.
8	SEWACO	Weapon systems, sensors, and control (command) integrated into warships/Navy Ships
9	Electronic battle	Ability to carry out electronic warfare to avoid jamming from enemy warships.
10	Aircraft	Navy aircraft
11	Fixed Wing	Navy aircraft using fixed wings
12	Rotary Wing	Navy aircraft of the helicopter type
13	Marine	Naval troops serving in the field of land combat.
14	Base	Naval Base/Headquarters
15	Logistics	The need for goods/services for the Navy
16	Fuel Supply	Availability of fuel and lubricating oil and spare parts
17	Water Supply	Fresh Water Availability
18	Intelligence Ability	Performance of early detection of threats, analysis, evaluation of data maritime, counter-intelligence, and clandestine

Table 4. Identification of Potential Threat Aspect

Sub Model - Potential Threats Aspects		
No	**Variable**	**Description**
1	Military Threat	Threats from the Military
2	Sabotage	Movement of a group/person who wishes to separate themselves from a union, nation, or group to gain support.
3	Embargo	A policy made by the Government of a country, where this policy regulates the prohibition of trade transactions
4	Espionage	Snooping and spying activities to gather information
5	Border Violation	Activities carried out illegally crossing national borders
6	Violation of foreign ships	Illegal activities of foreign warships in contravention of international law of the sea
7	Military Invasion	Actions originating from outside Navy Ships
8	Non-Military Threat	Threats from outside the military
9	Propaganda	A series of messages that aim to influence the opinions and behavior of a community or group of people
10	Piracy	The activity of seizing other people's goods or rights
11	Drugs	Illegal drugs
12	Loss of natural resources and leading islands	Reduced and shifted natural resources/islands in a way that is against the law
13	Terrorism	Activities to spread fear by using violence
14	Cyber Attack	Activities to change or destroy network systems, programs/information stored in computer networks
15	Hybrid Threat	Activities that use chemical, biological, nuclear, radiation, and explosive weapons

2.2. Causal Loop Construction and Stock Flow Diagrams - National Environment Marine Defense Assessment

The construction of Causal Loop and Stock Flow Diagrams is one of the steps in the structure of cause-and-effect relationships in the maritime defense assessment model system for the archipelago in dealing with any potential threats that will come. The construction of causal loop diagrams and stock-flow diagrams is done based on the time dimension [20]. The causal loop diagram is described in a stock-flow diagram which contains information flow and data processing as well as providing formulations for the data [6] so that the results obtained are outputs in providing an overview of the value of the maritime defense of the environment.

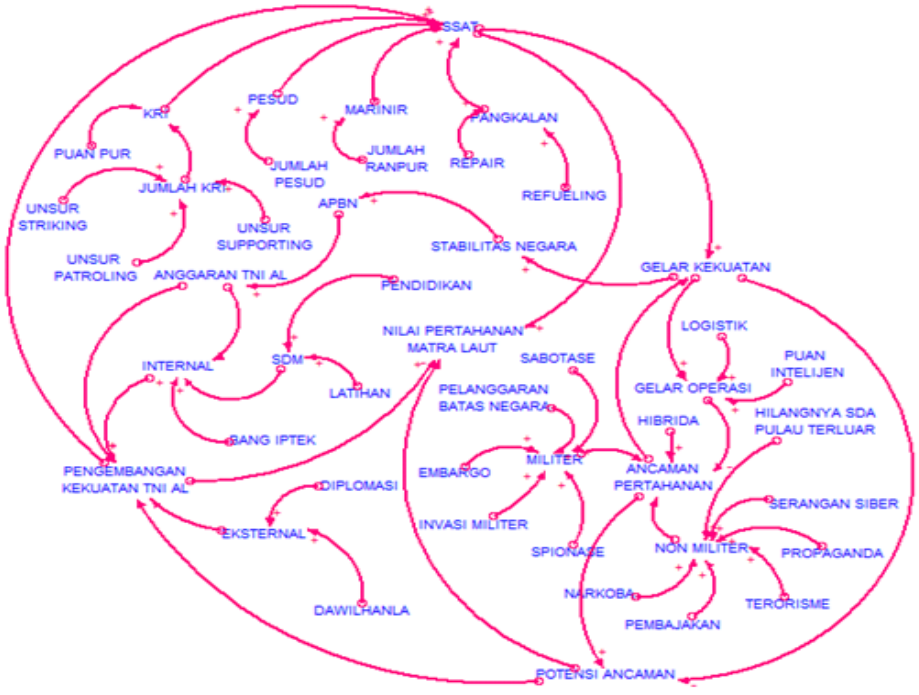

Figure 1. Causal Loop Diagram - National Environment Marine Defense Assessment

2.3. Stock and Flow - Sub Variable Aspects of Naval Forces Development

The implementation of the sub-model of strength development as a system for assessing the defense strategy of the marine dimension, which is influenced by the development of power consists of state defense policy, control of marine defense areas, natural resources, the Navy budget, diplomacy, and development of science and technology.

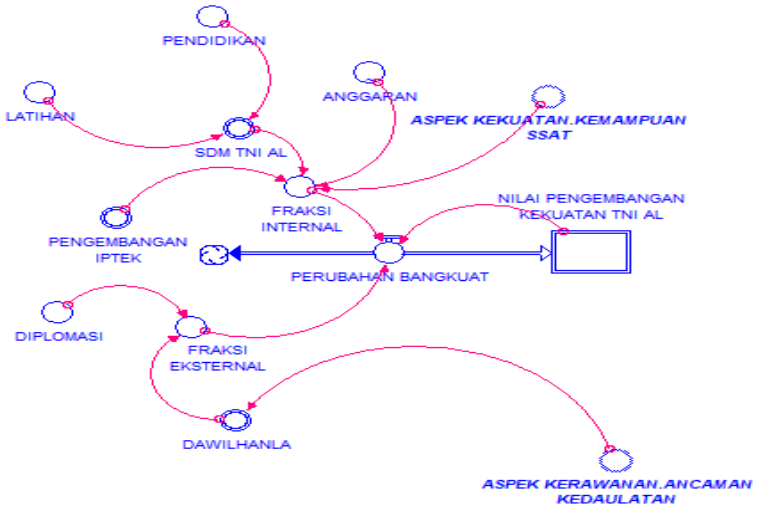

Figure 2. Stock And Flow -Sub Variable Aspects of Naval Forces Development

2.4. Stock and Flow - Sub Variable Aspect of SSAT

The implementation of the sub-model of force development as a system in assessing the defense strategy of the marine dimension, which is influenced by the development of forces consisting of SSAT (Navy Ships, Aircraft, Marines, Naval Bases) and Human Resources.

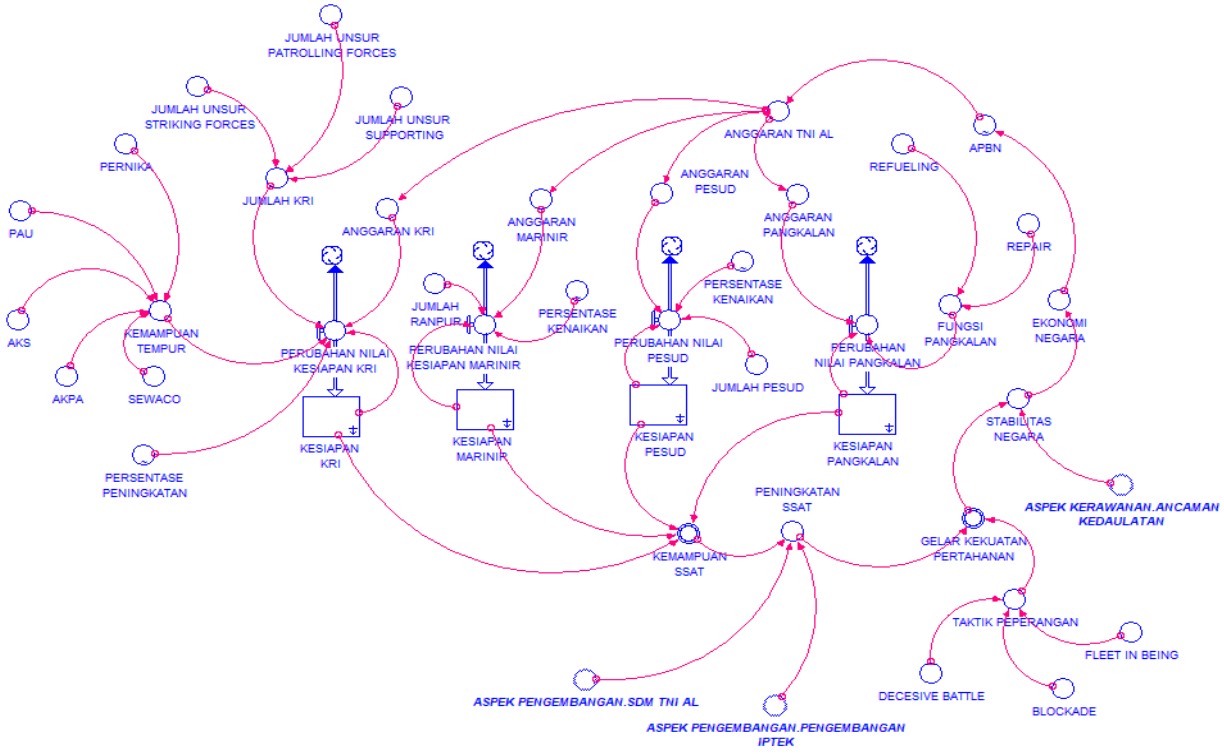

Figure 3. Stock And Flow - Sub Variables Aspects of SSAT

2.5. Stock and Flow - Sub Variables Aspects of Potential Threats

Sub-model of potential threats as a system in measuring a defense assessment of the sea dimension which is influenced by dynamics consisting of variables of Potential Military Threats, Non-military and Hybrids, where Potential Military Threats consist of sub-variables, espionage, embargo, military invasion, violation national borders, sabotage. The non-military threat potential variables consist of propaganda, piracy, drugs, and loss of natural resources/outermost islands as well as nuclear, biological, chemical, and radiation hybrid potential threats. The stock of the defense value of the sea dimension is a formulation of the relationship of Potential Threats that gets input from the assessment of strength development and SSAT.

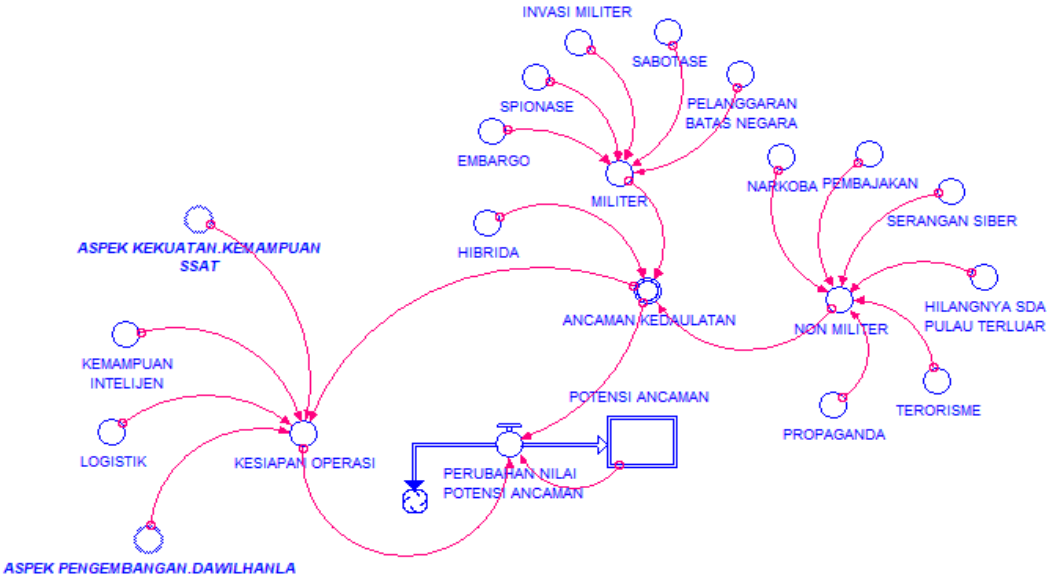

Figure 4. Stock and Flow - Sub Variables Aspects of Potential Threats

4. RESULT AND DISCUSSION.

4.1. Archipelago's Environment Marine Defense Strategy Scenario Assessment

The use of strategy in assessing the defense of the sea dimension is one of the factors that can affect the assessment of the defense of the sea dimension. The archipelago war strategy used by the Navy today still refers to the Archipelago Sea Defense Strategy (SPLN). Where in the implementation of the SPLN itself is divided into 3 (three) namely deterrence strategies, layered defense strategies, and sea control strategies, while the SPLN battlefield is divided into 3 (three) areas, namely the buffer defense field (ZEEI), the main defense field (covering the territorial sea up to ZEEI) and areas of resistance (territorial seas and archipelago waters). The use of the archipelago war strategy is carried out within the SPLN main defense area. Strategies that support the implementation of the archipelago wars that can be carried out are the Fleet In Being, Blockade, and Decisive Battle strategies. The value of Fleet In Being, Blockade, and Decisive Battle strategies is obtained.

	Benefit	Opportunity	Cost	Risk	Average
Fleet In Being	0.060	0.156	0.183	0.183	0.145
Blockade	0.066	0.244	0.137	0.190	0.160
Decesive In Battle	0.042	0.266	0.074	0.127	0.127

Figure 5. Graph of Archipelago's Environment Marine Defense Strategy Scenario Assessment

It is assumed that the assessment of the defense value of the marine dimension is adjusted to the current capabilities of the SSAT strength of the Indonesian Navy, especially on the elemental strength of the Navy Ships, with the value of potential threats remaining under the assessment given by experts/resource persons on current conditions, while the value of the defense strategy has not been entered because to get the initial value (existing) that already exists. Where the results of the implementation of the scenario simulation that is run using the time dimension of 15 years in the future, the value of Naval Force Development is at an index of 5.7, the value of the SSAT strength is at an index of 5.4, the value of potential threats is at an index of 6.3 and the value of marine defense is obtained. the average value on the index is 5.7, which means that the value of the maritime defense of the archipelagic country is currently still in the Alert/Sufficiently Safe category. The value of the defense of the marine dimension from the 1st year to the 15th year.

Table 5. Assessment of the Archipelago's National Marine Defense Strategy

Time Year -	Marine Defense Value	Naval Forces Development Aspects	SSAT Aspects	Potential Threats Aspects
0	5,0	5,0	5,0	5,0
1	5,0	5,4	5,1	6,2

2	5,6	5,5	5,1	6,3
3	5,7	5,7	5,1	6,5
4	5,8	5,7	5,2	6,4
5	5,8	5,7	5,3	6,4
6	5,8	5,7	5,3	6,3
7	5,8	5,6	5,3	6,2
8	5,7	5,8	5,4	6,5
9	5,9	5,8	5,4	6,5
10	5,9	5,9	5,5	6,6
11	6,0	5,8	5,5	6,3
12	5,9	5,9	5,5	6,4
13	5,9	5,9	5,6	6,5
14	6,02	5,8	5,6	6,2
15	**5,8**	**5,8**	**5,7**	**6,2**

4.2. Fleet In Being, Blockade, and Decisive Battle Strategy Assessment Scenarios

The use of Fleet In Being, Blockade, Decisive Battle and Combination strategies in scenarios to obtain an assessment of the maritime defense of the archipelago, where the scenario implementation is carried out assuming the strategic value is the existing value and the SSAT strength is adjusted to the existing SSAT capabilities, as for the value assigned can be obtained from the simulation results after being processed by the STELLA 9.1.3 Software as follows:

a. Fleet In Being Strategy

Table 6. Assessment of Fleet In Being Strategy Scenarios

***Fleet In Being* Strategy**	**Value**	
	Existing	**Scenario (10%)**
	0,145	0,159
Amount of Navy Ships	Value of Navy Ships Assumed Fixed	
Striking Forces	4	4
Patrolling Forces	52	52
Supporting Forces	-	-

It can be seen that in the condition of the Fleet In Being strategy scenario, it is assumed that the strategy value is the existing value and the SSAT strength is adjusted to the appropriate amount after the simulation model is run until the 15th year. It can be seen that the graph of the country's stability variable follows the trend of the graph of the defense degree variable, where the average value of the country's stability is at the index of 5.5. When the value of the Fleet In Being strategy is increased by 10%, the country's stability value is at an index of 5.6. This means that there is an increase in the value of 0.1 when the strategy value is increased by 10%, while the average value of the defense of the marine dimension in this simulation is 5.72, which is included in the category (Alert/Safe Enough)

b. Blockade Strategy.

Table 7. Assessment of Blockade Strategy Scenarios

***Blockade* Strategy**	**Value**	
	Existing	**Scenario (10%)**
	0,160	0,176
Amount of Navy Ships	Value of Navy Ships Assumed Fixed	
Striking Forces	35	35
Patrolling Forces	19	19
Supporting Forces	4	4

After the simulation model is run until the 15th year. It can be seen that the graph of the country's stability variable follows the trend of the graph of the defense degree variable, where the average value of the country's stability is at the index of 5.6. When the value of the Blockade strategy is increased by 10%, the country's stability value remains at the index of 5.6. This means that there is no increase in the value when the strategy value is increased by 10%, while the average value of marine defense in this simulation is 5.72 which is included in the (Alert/Safe Enough) category.

c. Decisive Battle Strategy.

Table 8. Assessment of the Decisive Battle Strategy Scenario

***Decisive Battle* Strategy**	**Value**	
	Existing	**Scenario (10%)**
	0,127	0,140
Amount of Navy Ships	Value of Navy Ships Assumed Fixed	
Striking Forces	35	35
Patrolling Forces	52	52
Supporting Forces	11	11

After the simulation model is run until the 15th year. It can be seen that the graph of the country's stability variable follows the trend of the graph of the defense degree variable, where the average value of the country's stability is at the index of 5.6. When the value of the Decisive Battle strategy is increased by 10%, the country's stability value remains at the index of 5.6. It means that there is no increase in the value when the strategy value is increased by 10%, while the average value of the defense of the marine dimension in this simulation is 5.73 which is included in the category (Alert/Safe Enough)

4.3. Optimistic Scenario of Marine Spear Defense Value

The optimistic scenario of the assessment of the defense of the sea dimension is a condition where to get the value of the defense of the sea dimension in the index value ranges from 6.1 to 8.0 (Safe)

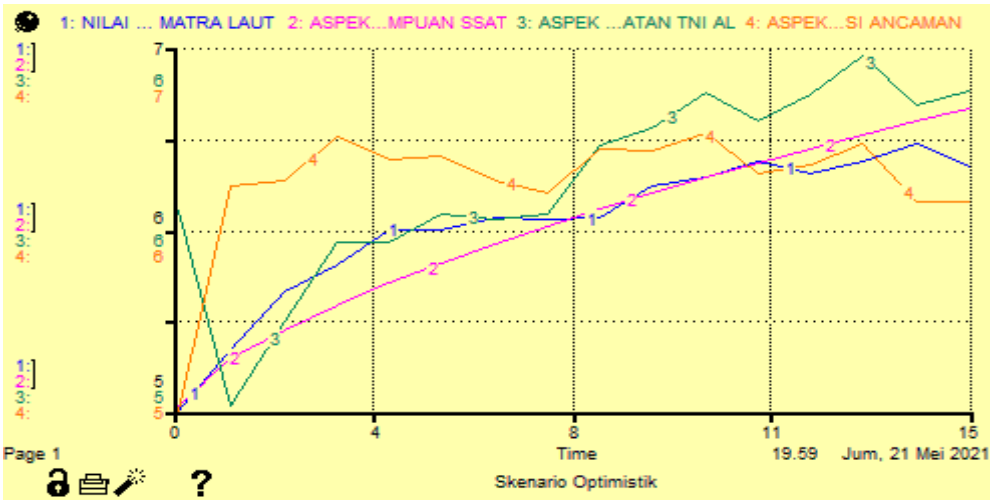

Figure 7. Graph of the Archipelago's Optimistic Scenario Assessment of the National Defense Strategy

It can be seen in the simulation of an optimistic scenario for the assessment of the maritime defense of the archipelago, wherein the simulation is assumed to increase the value of the SSAT strength aspect by 30% and in the aspect of developing the strength of the Navy by 30% and the value of the potential threat aspect which is assumed to be constant, where the graph of the value of the potential threat shows a trend. decreases with increasing time, while the graph of the value of the aspect of the strength and development of the Navy's strength shows an increasing trend, so from the graph, it shows an increase in the value of the defense of the marine dimension after the simulation is run until the 15th year, the value of the defense of the marine dimension in the 15th year is at index 6.4 is included in the Safe/Safe category. The following is the change in value in the optimistic scenario of the marine defense assessment as listed in the following Table:

Table 9. Assessment of Marine Defense in all aspects.

Time Year -	**Marine Defense Value**	**Naval Forces Development Aspects**	**SSAT Aspects**	**Potential Threats Aspects**
0	5,0	6,0	5,0	5,0
1	5,3	5,5	5,3	6,2
2	5,7	5,7	5,5	6,3
3	5,8	5,9	5,6	6,5
4	6,0	5,9	5,7	6,4
5	6,0	6,0	5,8	6,4
6	6,1	6,0	5,9	6,3

7	6,1	6,0	6,0	6,2
8	6,1	6,2	6,1	6,4
9	6,2	6,2	6,2	6,4
10	6,3	6,3	6,3	6,5
11	6,4	6,3	6,4	6,3
12	6,3	6,3	6,5	6,4
13	6,4	6,4	6,5	6,5
14	6,5	6,3	6,6	6,2
15	**6,4**	**6,3**	**6,7**	**6,2**

5. CONCLUSION

The modeling process using dynamic systems has been completed. Furthermore, in this chapter several conclusions will be drawn referring to the results of the study as follows:

a. Variables in the main aspects that affect the value of the Environment State Marine Defense Strategy-Assessment model are as follows:
   1) The aspect of the development of the Navy's strength consists of sub-variables that mutually influence the value of the aspect of developing the strength of the Navy such as state defense policy, control of the marine defense area of human resources, development of science and technology, SSAT, diplomacy, and budget
   2) The SSAT aspect consists of sub-variables that mutually influence the value of the SSAT aspect including combat capability (readiness of Navy Ships, Aircraft, Marines, and Bases), SSAT improvement, defense force titles, and state stability.
   3) Aspects of Potential Threats consist of sub-variables that influence each other on the value of potential threat aspects such as threats to sovereignty (military, non-military and hybrid threats) and operational readiness (aspects of strength, intelligence capability, logistics, and development aspects of control of marine defense areas).

b. From the results of the formulation and simulation with a dynamic system approach in the assessment model of the maritime defense strategy of the archipelago, it was found that in the 15th year the value of sea defense at an index of 5.87 was included in the category of alert/quite safe.

c. The strategic scenario model implemented to obtain an assessment of the maritime defense strategy of the archipelago is as follows:
   1) The scenario of using the Fleet in Being strategy, where the condition of the SSAT strength in terms of quality and quantity does not have an advantage with the assumption that the simulation value of the Fleet In Being strategy is increased by 10% and the value of Navy Ships remains constant. 5.72 is included in the category of alert/fairly safe.
   2) The scenario of using the Blockade strategy, where the condition of the SSAT's strength is superior to carry out a siege with the assumption that the use of sea power (Navy Ships) is fixed and the value of the strategy is increased by 10%, the value obtained at the index of 5.72 is included in the alert category/fairly safe.
   3) The scenario of using the Decisive Battle strategy, wherein principle the use is carried out by all Navy forces, assuming the value of the use of force is fixed and the value of the strategy is increased by 10%, then the value obtained at index 5.72 is included in the alert category/quite safe.
   4) Scenario Combination Strategy, combination 1 between Fleet in Being and Blockade strategies, the combination of 2 strategies Fleet in Being and Decisive Battle as well as a combination of 3 scenarios blockade and decisive battle, wherein this combination it is assumed that the value of each strategy is fixed and the SSAT ability is increased by 15% so that the simulation results obtained are combination 1 at index 5.72, combination 2 at index 5.78 and combination 3 at index 5.73.

FUTURE WORK

After researching the assessment model for the maritime defense strategy of the archipelago, there are several suggestions and inputs to improve this research.

a. It is hoped that the next research will determine an object that will be used as an assumption of potential threats so that it can be used as a balance of power in calculating combat calculations.
b. It is hoped that the next research will give a value to the variable of combat capability of Navy Ships adjusted to the technical conditions of the ship to get the value of readiness of Navy Ships.
c. In addition to the 3 (three) main aspects in this research which include aspects of the development of the Navy's strength, aspects of the SSAT, and aspects of potential threats, it is necessary to have other aspects developed in subsequent research to measure more deeply the value of the maritime defense of the archipelago.

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