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NAVAL BASE CAPABILITY DEVELOPMENT STRATEGY IN REALIZING MARITIME SECURITY IN THE BALI STRAIT

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ABSTRACT

Maritime security means that maritime areas are capable of being controlled, safe, and free from various threats or disturbances. The Indonesian Navy Base is part of the Integrated Fleet Weapons System (SSAT) which has the additional function of carrying out maritime security in its working area in the form of maritime security operations by mobilizing all the strength and capabilities it has. The Bali Strait is one of the straits with the densest shipping traffic in Indonesia. The Indonesian Navy, as the driving force for implementing maritime defense and security, has the XYZ Naval Base and the PQR Naval Base which are in direct contact with the Bali Strait. Dynamic System modeling method is used to determine the reciprocal relationships between variables, which is then carried out by model simulation to obtain the best alternative scenario. The scenario results from the modeling and simulation that have been carried out can be a consideration for the leadership of the Indonesian Navy in determining the appropriate and optimal strategy for developing the capabilities of Naval Base XYZ and Naval Base PQR so that they are able to realize maritime security in the Bali Strait. The Dynamic System modeling method is used to determine the reciprocal relationships between variables, which is then carried out by model simulation to obtain the best alternative scenario. The scenario results from the modeling and simulation that have been carried out can be a consideration for the leadership of the Indonesian Navy in determining the appropriate and optimal strategy for developing the capabilities of Naval Base XYZ and Naval Base PQR so that they are able to realize maritime security in the Bali Strait.

Keywords: *Maritime Security, Naval Base Capability, Bali Strait, Dynamic Systems.*

1. INTRODUCTION

Indonesia has declared itself before the international world as an archipelago country (Archipelagic State) which was strengthened by the ratification of the United Nations Convention on the Law of the Sea (UNCLOS) in 1982. Through the ratification of the United Nations Convention on the law of the sea which was ratified in the Republic of Indonesia Constitution Number 17 of 1982, the territory of Indonesia consists of 17,504 islands with a land area of up to 1.9 million km2, and the waters surrounding it reach 6.4 million km2 and a coastline that extends up to ± 108,000 km. Indonesia has prepared 3 (three) Indonesian Archipelagic Sea Lanes (ALKI) as peaceful passageways for ships and aircraft of other countries. Apart from ALKI, several seas and straits in Indonesia have a vital role in world maritime interests. The term "Chokepoint" is usually applied to a narrow path in the form of a strait or canal that connects two large parts of the world. 4 (four) of the 10 (ten) chokepoints in the world are in Indonesia, namely the Malacca Strait, Sunda Strait, Lombok Strait and Ombai-Wetar Strait.

The government's policy regarding domestic maritime governance is not only focused on developing and strengthening ALKI and the Strait which is a Chokepoint. One of the water areas that has received the government's attention is the Bali Strait. The strait, which has a maximum width of 82 km (51 miles) and an average depth of 50 m, is the water that connects Java Island with Bali Island. With complex and dynamic threats at sea, maritime security requires the contribution and synergy of all components, especially maritime stakeholders around the Bali Strait. Maritime stakeholders responsible for maritime security are not only the Indonesian Navy, several maritime stakeholders include the Indonesian Navy, Maritime Security Agency (Bakamla), Water and Air Police (Polairud), Ministry of Maritime Affairs and Fisheries (KKP), Directorate General of Sea Transportation

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(Dirjenhubla) through the Sea and Coast Guard Unit (KPLP), the National SAR Agency (BASARNAS), the Directorate General of Customs and Excise (DJBC), the Directorate General of Immigration (Dirjenim), as well as the local Regional Government (Pemda), have the obligation and authority to maintain maritime security. Second Fleet through the ALKI II Security Operation which involved the warship and the Indonesian Navy's Air force. The existence of Naval Base XYZ and Naval Base PQR whose working areas are in direct contact with the Bali Strait Maritime Security Agency (Bakamla), Water and Air Police (Polairud), Ministry of Maritime Affairs and Fisheries (KKP), Directorate General of Sea Transportation (Dirjenhubla) through the Sea and Coast Guard Unit (KPLP), National SAR Agency (BASARNAS), Directorate General of Customs and Excise (DJBC), the Directorate General of Immigration (Dirjenim), as well as the local Regional Government (Pemda), have the obligation and authority to maintain maritime security.

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2. LITERATURE REVIEW

2.1 Dynamic Systems Method

Defining that dynamic systems is a method for improving learning in complex systems. Furthermore, this method is illustrated like a simulation in an airplane cockpit for management to understand complex dynamics in learning, understand sources of resistance (obstacles) in policies and design more effective policies. Understanding this complexity, dynamic systems are based on the theory of non-linear dynamics and feedback control developed in the disciplines of mathematics, physics and engineering.

Dynamical systems try to study part of the overall system, but this does not mean ignoring the observed system with the environment. In the language of dynamic systems, variables that do not have a significant influence on the observed system will become limitations in the analysis of the dynamic system, thereby making the observed system a closed system.

When analyzing a system that has a feedback relationship, partial analysis cannot be carried out. Weaknesses in carrying out partial analysis make dynamic systems superior in analyzing systems that have feedback relationships (feedback loops) or cause and effect relationships (causal loops). In carrying out dynamic system analysis, steps are needed to be able to produce a good model of the observed system.

The following are the stages carried out in dynamic system modeling (Sterman, 2000).

a. Articulation Problems. This step is to identify key variables and concepts. This will determine the time horizon and dynamic problem characteristics to facilitate policy formulation.

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b. Dynamic Hypothesis. The main task in this step is to develop a causal circle diagram that explains the causal relationship between variables and convert the causal circle diagram or cause and effect diagram into a stock and flow diagram.

c. Formulation. Causal loop diagrams are converted into stock and flow diagrams, such as levels, levels, and additional equations. In addition, it must consider parameters, behavioral relationships, and initial conditions.

d. Testing. The model is tested by comparing the simulated behavior of the model to the actual behavior of the system.

e. Policy Formulation and Evaluation. In the final stage, various policies will be evaluated. The interaction of different policies can also be considered, as many elements of real systems are highly interrelated.

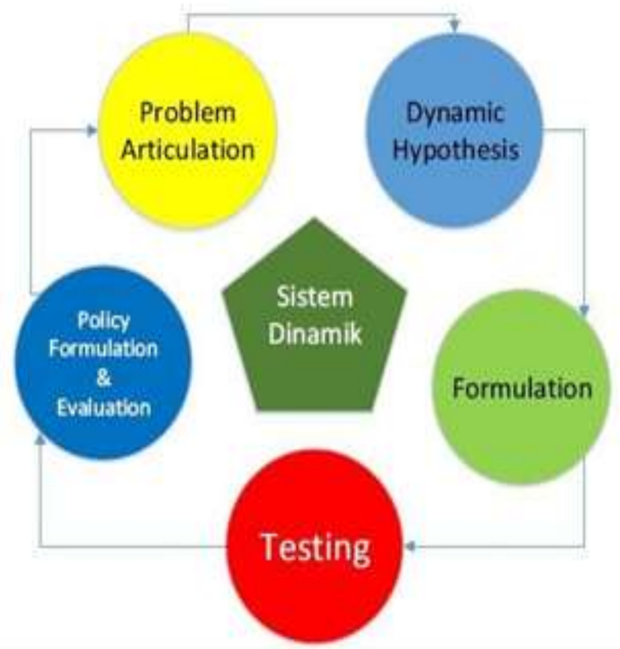

Figure 1. Dynamic System Modeling

2.2. Dynamic System Variables

Describing the behavior of a model is very necessary for designing dynamic system simulation models. In the dynamic system model, there are 3 (three) types of variables, namely: Level/Stock, Rate/Flow and Auxiliary.

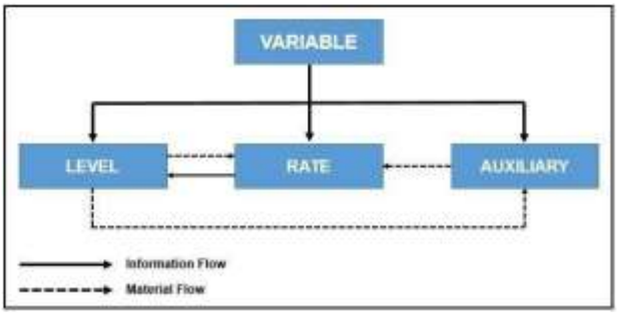

Figure 2. Types of Dynamic System Models

One software that can run dynamic system simulation models by taking into account the three types of variables above is System Thinking Educational Learning Laboratory with Animation (STELLA).

Table 1. STELLA Software Symbol

NO	SYMBOL	INFORMATION
1		FLOW/RATE
2		LEVEL/STOCK
3		CONVERTERS
4		CONNECTORS

Below is an explanation of the terms and symbols used in STELLA software:

a. Rateis the activity, movement or flow that contributes to the change per unit time in the Level variable. Rate is the only variable that influences the Level variable.

b. Levels are variables that can accumulate over a period of time. The Level variable is influenced by the Rate variable. The symbol for a Level is a rectangle with the variable name listed at the top of the symbol.

c. Converterholds constant values, defines external inputs for the model, computes algebraic relationships, and serves as a repository for graphical functions. In general, converting input into output. The Converter name is displayed at the bottom of the symbol.

d. Connectors used to connect various model elements. Connections can be between Levels, between Converters, Rate to Converter, Converter to Rate, and Level to Converter.

2.3 Research Framework

Maritime security in the Bali Strait is a condition that is influenced by the Capabilities of the XYZ Naval Base and the PQR Naval Base, the Role of Maritime Stakeholders, and the Role of Injasmar as well as Maritime Threats that arise and continue to change based on the dynamics of the

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system. Naval Base Capability Variables consist of Strength, Ability, and Operation Pattern.

With the conditions of system dynamics continuing to change, an analysis of the strategic environment and threat developments is needed to be able to develop a strategy for developing the capabilities of Naval Base XYZ and Naval Base PQR. Furthermore, using the Dynamic Systems approach method, a strategic environment and threat-based Naval Base capability development model was prepared, so that a simulation of maritime security values in the Bali Strait was obtained as expected.

2.4 Dynamic Systems Modeling

The stages of variable identification and model conceptualization are the stages of initial introduction to the entire system that will be modeled in the research. This stage is carried out to obtain the variables and parameters that will be used in modeling. Starting with identifying variables from the entire system that influence maritime security in the Bali Strait through an input-output diagram.

After identifying the variables that influence the system, the next stage is to conceptualize the model by creating a Causal Loops Diagram (CLD) which shows the cause-and-effect relationships and interrelationships between variables. The causal loops diagram was then developed into a stock and flow diagram in STELLA software to obtain an overview of maritime security values in the Bali Strait.

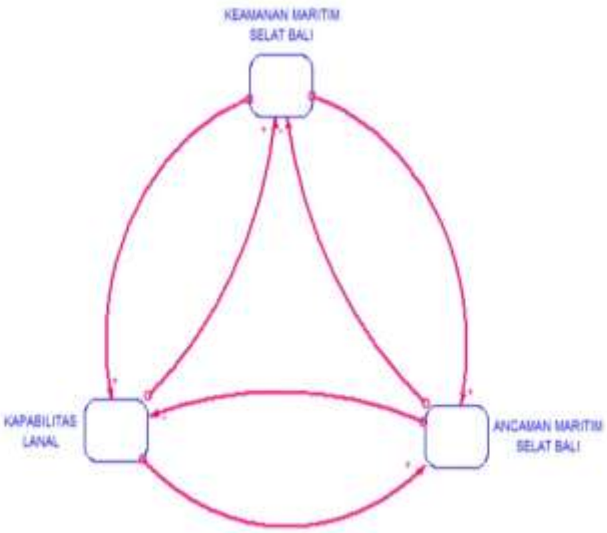

Figure 3. Main Model of the System

From the main model obtained, the research was developed to a more detailed stage by describing the main model into several sub-models, including:

a. Sub-model of Indonesian Navy Base Capability.
b. Sub-model of Maritime Threats in the Bali Strait.

From the several sub-models obtained, these variables will go through the next stages, namely:

a. Model Validation Stages. At this stage, external and internal model validation is carried out. External validation involves several sources and experts in the problem being modeled. Internal validation is carried out by testing model behavior, data validation tests, and extreme condition tests.
b. Model Simulation Stages. A simulation of Naval Base's capability development model was carried out through simulation model formulation, initial model running, and scenario implementation. The model formulation is based on the conceptualization of the model that has been created, then the relationship between variables is mathematically formulated according to stocks and flows. In this formulation, the parameters, feedback and initial conditions of the system are also approached.
c. Policy Scenario Stages. A scenario taking scheme is carried out to determine changes in maritime security values from the model that has been created by changing the conditions, implementation time, and/or development of the maritime security model, so that an output is produced that is different from the initial (existing) conditions. Then a comparison is made with the existing output and analyzed whether it produces significant changes or not.
d. Stages of Analysis and Drawing Conclusions. At this stage, analysis and interpretation of the model is carried out and the impact of the implemented policy scenarios on Naval Base's capability development is determined. The final stage of this research is the preparation of conclusions and suggestions. It is hoped that Naval Base's main strategy for developing capabilities in facing maritime security threats in accordance with the desired maritime security values in the Bali Strait can be formulated

3. RESEARCH METHODS

This research is a descriptive study using quantitative methods, where data and information related to research problems obtained through literature studies and field interviews are analyzed quantitatively, and then interpreted according to the meaning contained in the data and information. Data collection techniques are carried out through library research and in-depth interviews with parties who are considered competent and have information and data related to research problems.

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4. DISCUSSION AND RESULTS

4.1. Data Collection

In this research, researchers collected data from documents, journals, questionnaires and interviews. Research data is grouped into two, namely primary data and secondary data. Primary data is obtained by carrying out interviews with expert sources who are considered credible and have experience with the research object. Apart from that, brainstorming and filling out questionnaires by experts were also carried out. Meanwhile, secondary data was obtained through a literature review of reference books, journals, laws, regulations, instructions for use, and other documents related to the research object. Furthermore, the data that has been collected is processed using the Dynamic Systems research method.

4.2 Primary data

Primary data was obtained through interviews and brainstorming with expert sources in their fields. The parties who became experts included: (1) Commander Naval Base XYZ represented by Naval Post Gilimanuk Commander; (2) Commander Naval Base PQR; (3) Fleet Operations Staff Officer II; (4) Naval Base HIJ Planning and Budget Staff Officer; and (5) KSOP Tanjungwangi PQR Port. Through this interview, variables were obtained that influence the capabilities of Naval Base XYZ and Naval Base PQR which are closely related and thus have an impact on the value of Maritime Security in the Bali Strait.

Apart from interviews with expert sources, questionnaires filled out by experts are primary data collection instruments for gathering information and providing actual assessments about the condition of the research object.

4.3 DataSecondary

Secondary data for this research was obtained through literature studies of documents such as reference books, journal archives, regulations, manuals, articles, reports, as well as citing data from previous research. This secondary data relates to prominent activities and events that occur around the Bali Strait which are related to the maritime security situation and the role of Naval Base and maritime stakeholders who play a role in dealing with maritime threats that occur around the Bali Strait.

4.4 Research Discussion

Identifying variables is the first step in conceptualizing a strategy for developing the capabilities of Naval Base XYZ and Naval Base PQR in facing maritime threats in the Bali Strait. The purpose of this implementation is that the variables that influence this system are then grouped into a Main Model and 2 (two) Submodels, namely: (1) Naval Base Capability Submodel, and (2) Maritime Threat Submodel in the Bali Strait. The following are the results of the variable identification shown.

Table 2. Variable Identification

NO	VARIABLES	DESCRIPTION
1	NAVAL BASE CAPABILITY	The level of strength, abilities and title patterns of Naval Base XYZ and Naval Base PQR
2	MARITIME THREAT IN THE BALI STRAIT	Activities that endanger and disrupt the use of the Bali Strait
3	MARITIME SECURITY IN THE BALI STRAIT	Assessment of conditions and security situation in the waters of the Bali Strait

4.5 Causal Loop Diagram Structure

The implementation model for Naval Base's capability development strategy in dealing with maritime threats in the Bali Strait is created in a Causal Loop Diagram (CLD). This CLD shows the system relationship between variables that have passed the identification stage. This diagram also shows the cause and effect relationship and interconnection of each variable that influences the system.

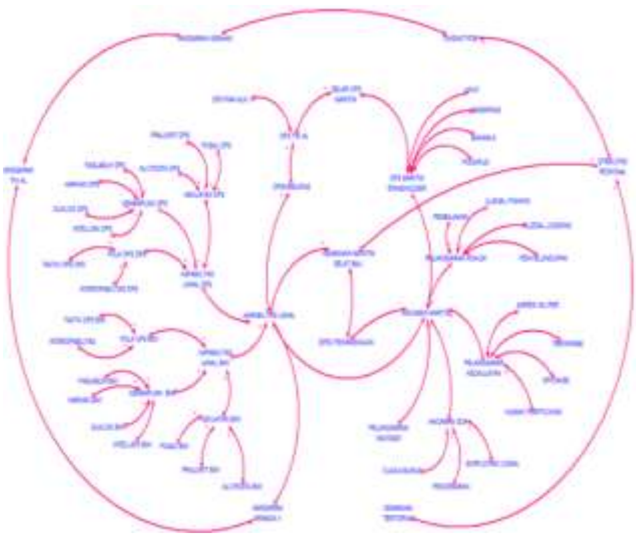

Figure 4. Causal Loop Diagram

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4.6 Stock Flow Diagram Structure

The Stock Flow Diagram structure created is a more detailed explanation of the system previously shown by the Causal Loop Diagram. On the diagram

The following are the variable relationships that influence the Causal Loop Diagram:

a. Maritime security in the Bali Strait is influenced by the capabilities of the Naval Base in the Bali Strait, namely the XYZ Naval Base and the PQR Naval Base, as well as the Maritime Threats that occur.

b. Naval Base's capabilities are formed from 2 (two) core variables, namely Naval Base XYZ and Naval Base PQR which have joint authority in the Bali Strait. Each Naval Base is influenced by variable strengths, capabilities and operating patterns. the strength variable consists of patrol WARSHIP, Naval Post, and Soldier.

c. Maritime Threats in the Bali Strait The variables that form maritime threats in the Bali Strait consist of navigation violations, law violations, sovereignty violations, and natural resource threats. Law violations are formed from the variables of piracy, smuggling, illegal logging and illegal fishing.

The strategy implementation model for developing Naval Base XYZ's capability and Naval Base PQR's capability in facing Maritime Threats in the Bali Strait was created by compiling a Stock Flow Diagram (SFD) based on the CLD that has been prepared. The SFD created is a more detailed explanation of the system previously demonstrated by CLD. In this diagram, the influence of time on the relationship between variables is considered, so that each variable is able to show the accumulated results for the level/stock variable, and the variable which is the rate of system activity for each time period is called rate/flow. In this case the rate is the only variable that influences the level. Meanwhile, the converter is a variable that is a flow of information that has a constant value. To connect variables to each other, connectors are used, namely connecting the converter to the converter, connecting the converter to the rate, connecting the level to the rate, and connecting the level to the converter.

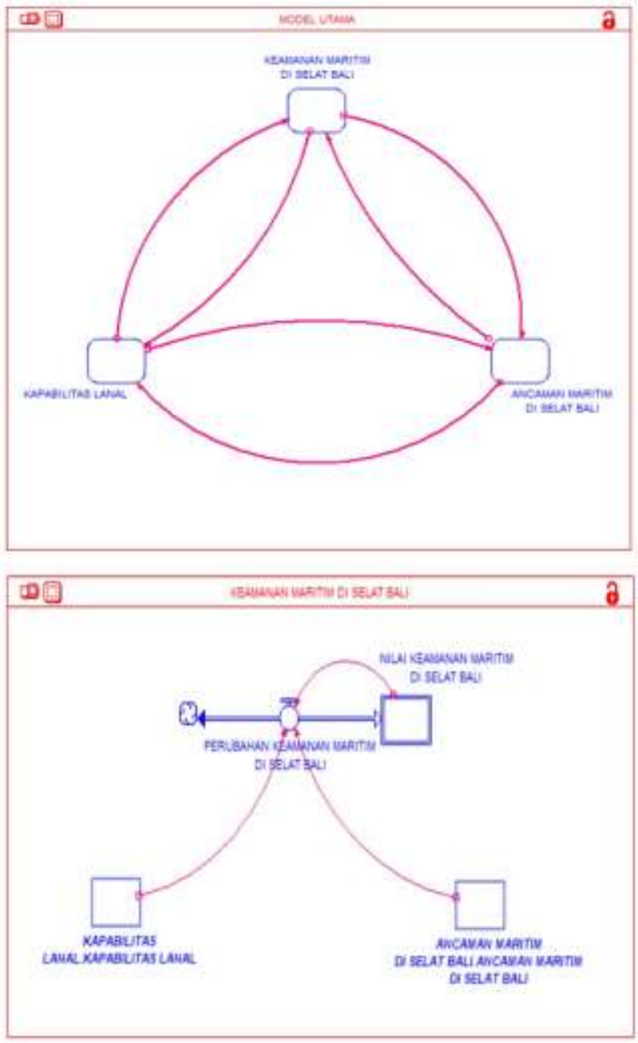

Figure 5. Main Model SFD

4.7 Naval Base Capability Submodel

Naval Base Capability Submodel as a system for measuring the value of Naval Base capability which is influenced by system dynamics in the form of strength variables, capabilities and operating patterns. The Strength variable is formed from the subvariables patrol warship, Naval Post, and Soldier. The capability variable is obtained from the subvariables faslabuh capability, maintenance and repair capability (Naval Maintenance Institution), intelligence capability, and logistics support capability (duklog). The Operation Pattern variable is formed from the operational tactics and interoperability sub-variables.

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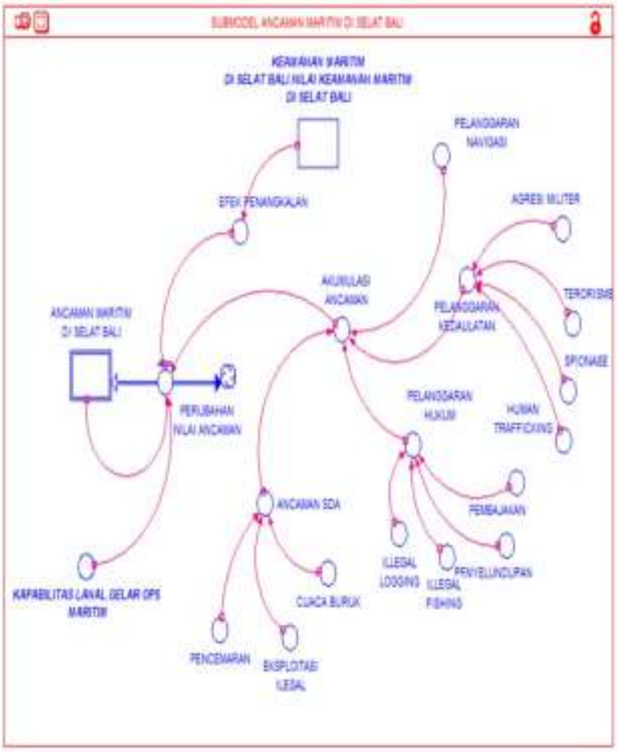

Figure 6. Naval Base Capability Sub model

4.8 Maritime Threat Submodel Structure in the Bali Strait

Submodel of Maritime Threats in the Bali Strait as a system for measuring maritime threats that occur in the Bali Strait where this aspect is influenced by system dynamics in the form of navigation violation variables, law violations, sovereignty violations, and threats to Natural Resources (SDA).

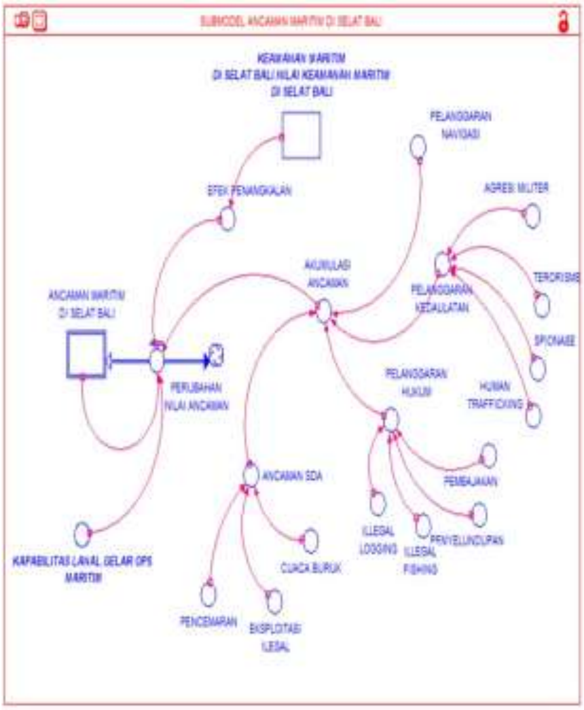

Figure 7. Maritime Threat Submodel in Bali

4.9 Verification and Validation

4.9.1 Model Verification

Model Verification is the stage of testing the suitability of the model structure by checking for errors in the model simulation program in the software. This is done by examining the formulation, equations and parameters used in the variable model. Model verification is carried out by checking errors in the model both in variable units and errors that occur in the model created. If there are no errors in the model, then the model can be categorized as verified.

Figure 8. Model Verification

4.9.2 Model Validation

Validation is carried out to ensure that the model created has completely met the modeling objectives. Validation is carried out by comparing the model structure and its behavior with the structure and behavior of the system in actual conditions.

a. Structural Model Test. This form of validation aims to see whether the model structure is in accordance with the factual system in the real world.

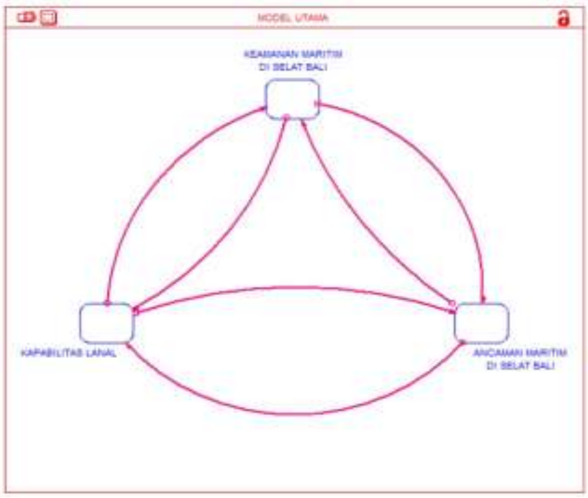

Figure 9. Main Model Structure Test Results

b. Constraint Adequacy Test. In dynamic systems, model constraints are adjusted to suit the modeling objectives. Through interviews and

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variable identification questionnaires, variables are selected that are tailored to the purpose of creating the model.

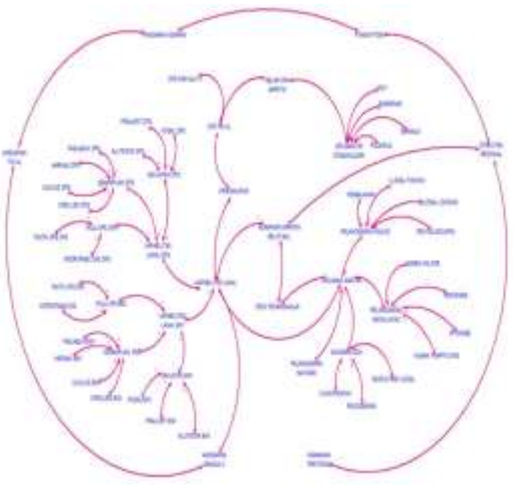

Figure 10. Causal Loop Diagram Structure Test Results

c. Test Model Parameters. Validation of this model is carried out by looking at two interrelated variables, and comparing the logic results in the real system with the simulation results.

1) Positive Loop. The relationship between the Naval Base Capability variable and Maritime Security in the Bali Strait is unidirectional. Increased Naval Base Capability results in increased Maritime Security. The decline in Naval Base Capability has an impact on reducing the value of maritime security.

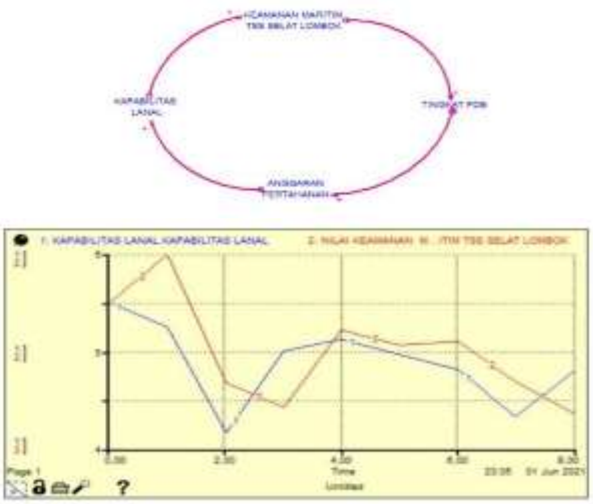

Figure 11. Test Positive Loop Parameters

2) Negative Loop. The relationship between the Maritime Threat variables and Maritime Security in the Bali Strait is inversely proportional. If Maritime Threats increase, the Maritime Security value will decrease. On the other hand, if Maritime Threats decrease, Maritime Security will increase.

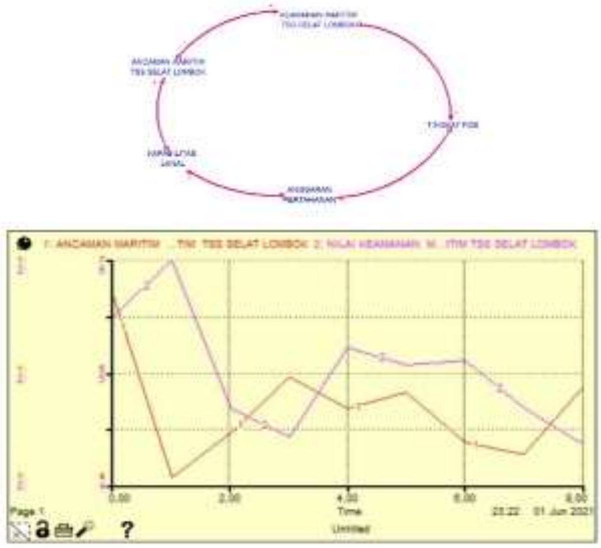

Figure 12. Test Negative Loop Parameters

d. Test Extreme Conditions. This extreme condition test is carried out by entering the largest extreme value and the smallest extreme value on the measured and controlled variables. Apart from ensuring that the model functions properly, the results of this test will also show structural errors and errors in the parameter values entered in the model.

e. Test Model Behavior. This form of validation is carried out to find out whether the model created has the same behavior as actual conditions so that it can represent the system. Testing is carried out by comparing simulation data with real system conditions using past data. To find the average error value, you need to compare the average value of the actual data with the average value of the simulation data.

$$\mathbf{E} = |(\mathbf{S} - \mathbf{A})/\mathbf{A}|$$

Information:
A : Actual Data
S: Simulation Results
E: Variance of error values between actual data and simulation results. If E < 0.1 then the model is declared valid.

4.10 Analysis of Base Value Model Simulation Results

Based on the results of the model simulation by entering initial values for each variable according to the assessment of expert sources, the model was run to determine the values of Naval Base

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Capability, Maritime Security, and Maritime Threats in the Bali Strait.

Table 3. Baseline Value Model Simulation

Untitled Table — 11:19 03/10/2022 — Table 1 (Untitled Table)

Time	KAPABILITAS LANAL KAPABIL	ANCAMAN MARITIM DI SELAT	NILAI KEAMANAN MARITIM DI
0	5,00	5,00	5,00
1	4,75	3,80	5,50
2	3,86	4,19	4,17
3	4,51	4,94	3,92
4	4,62	4,51	4,72
5	4,47	4,74	4,57
6	4,31	4,07	4,51
7	3,82	3,91	4,19
8	4,30	4,75	3,86
9	4,74	4,82	4,54
10	4,98	5,40	4,78
11	4,75	4,49	5,19
Final	4,45	4,73	4,64

From Table 3. above, it shows that there has been a change in the value of Naval Base Capability and Maritime Threats in the Bali Strait which has an impact on the value of Maritime Security in the Bali Strait. By inputting data on maritime security values, model simulation results were obtained with changes in maritime security values up to the 12th year ranging from 4.64. Based on the maritime security assessment index, this value is included in the "Less Safe" category, while the traffic capability value in the 12th year is at 4.45 which can be categorized as "Less Capable" in the traffic capability assessment index.

4.11 Development Strategy Scenario

After passing the research stage, the next stage is to determine the Naval Base capability development strategy through scenarios prepared and simulated using Dynamic System Modeling. However, before determining alternative scenarios, researchers classified development strategies based on variables that influence the increase in strength, capability and operational patterns in XYZ Naval Base Capability and PQR Naval Base Capability. The value of the variables in this model simulation can be increased while still taking into account reality conditions which allow it to be carried out on a real system within a predetermined time period. Increasing this variable can increase the value of Naval Base Capability so that it is able to face Maritime Threats in order to realize and improve Maritime Security in the waters of the Bali Strait. The classification of development strategies that can be carried out in Naval Base XYZ and PQR is as follows.

Table 4. Naval Base Development Strategy

A. POWER DEVELOPMENT STRATEGY	
1	Increasing the number and modernization of PATROL WARSHIP
2	Add monitoring facilities to NAVAL POST
3	Increase the quantity and quality of human resources for Naval Base soldiers
B. CAPABILITY DEVELOPMENT STRATEGY	
1	Increase Faslabuh's carrying capacity for operational units
2	Improving the capabilities of operational and security elements
3	Improving Intelligence capabilities in operational and security services
4	Increase the quantity and quality of Logistics Support
C. STRATEGY FOR DEVELOPING OPERATION PATTERNS	
1	Improve and develop operational tactics
2	Increasing interoperability between elements and other stakeholders

4.12 Scenario 1 XYZ Naval Base Capability Development

In this scenario, improvements are made to the variables in the PQR Naval Base Capability Submodel. The variables that were improved were the variables that had the highest influence weight, namely patrol warship Strength, Naval Maintenance Institution Capability, and interoperability. The patrol warship Strength variable was increased to 8, Naval Maintenance Institution Capability at 8, and Interoperability was increased to a scale of 8. Meanwhile, the XYZ Naval Base Capability Submodel did not experience an increase and other variables ran according to normal simulation conditions. By adding values to the variables above, it is hoped that it will have a significant impact on increasing the overall Naval Base Capability value which in turn will influence the Maritime Security value in the Bali Strait so that it can increase from the results of the initial model simulation.

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Table 5. Scenario Value of PQR Road Development Scenario

09:25 31/10/2022 Table 1 (Untitled Table)

Time	ANCAMAN MARITIM DI	KEAMANAN MARITIM DI	KAPABILITAS LANAL
0	6,00	5,00	5,00
1	3,60	5,50	5,43
2	4,25	4,51	4,31
3	5,06	4,28	5,02
4	4,61	5,03	5,24
5	4,84	4,92	5,06
6	4,17	4,95	4,96
7	4,02	4,58	4,54
8	4,90	4,28	4,86
9	4,93	4,88	5,30
10	5,50	5,11	5,47
11	4,58	5,48	5,42
Final	4,87	5,00	5,04

Based on Table 11 above, you can see the change in the Naval Base Capability value after increasing the values of the PATROL WARSHIP, Naval Maintenance Institution, and Interopability variables. The simulation results for the change in the Naval Base Capability value for the 12th year on a scale of 5.04 are obtained, which is included in the "Capable" category. Meanwhile, the Maritime Security score in the 12th year is on a scale of 5.00 which is included in the "Less Safe" category.

4.13 Scenario 3 Combination Development

This development scenario is a combination of the XYZ Naval Base Capability development scenario and the PQR Naval Base Capability development scenario. The conditions of the variables that form the two submodels with the highest influence weight will be improved according to the two previous scenarios. Meanwhile, other variables run according to normal simulation conditions.

Table 6. Value of Combination Development Scenarios

09:30 31/10/2022 Table 1 (Untitled Table)

Time	ANCAMAN MARITIM DI	KEAMANAN MARITIM DI	KAPABILITAS LANAL
0	6,00	5,00	5,00
1	3,60	5,50	6,04
2	4,30	4,82	4,90
3	5,14	4,60	5,53
4	4,70	5,34	5,82
5	4,93	5,26	5,63
6	4,27	5,28	5,81
7	4,12	4,94	5,20
8	5,01	4,86	5,41
9	5,03	5,21	5,86
10	5,60	5,44	5,98
11	4,68	5,79	6,01
Final	4,97	5,35	5,62

From the display in Table 8 above, the simulation results of changes in Naval Base Capability values in the 12th year on a scale of 5.62 are obtained which can be classified in the "Capable" category. Meanwhile, the Maritime Security score in the 12th year was on a scale of 5.35 which was included in the "Safe" category.

The following is a comparison of the Naval Base Capability values under normal conditions, simulation conditions with the XYZ Naval Base Capability development scenario, the PQR Naval Base Capability development scenario, and the combined development scenario. The simulation results have implications for changes in Maritime Security values in the Bal Strait.

Table 7. Comparison of Scenario Results

VARIABLES	BEGINNING	SCENARIO 1 NAVAL BASE DPS	SCENARIO 2 BWI NAVAL BASE	SCENARIO 3 COMBINATIONS
NAVAL BASE CAPABILITY	4.45*less fortunate*	5.02 *capable*	5.04 *capable*	**5.62** ***capable***
SECURITY MARITIME	4.64*less safe*	4.98*less safe*	5.00*less safe*	**5.35** ***safe***

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From the comparison table above, it can be seen that the combined development scenario between Naval Base XYZ and Naval Base PQR capabilities has significant changes in model simulation results compared to other scenarios. This scenario is able to change Naval Base Capability from an assessment index of 4.45 (Less Capable) to 5.62 (Capable). Meanwhile, the Maritime Security score in the Bali Strait moved from an assessment index of 4.64 (Less Safe) to an assessment index of around 5.35 (Safe). This scenario can be taken into consideration in implementing Naval Base Capability development strategies to deal with Maritime Threats that occur in the Bali Strait.

5. CONCLUSION AND SUGGESTIONS

5.1 Conclusions

From the results of data collection and processing, as well as analysis and interpretation of the results of data processing that has been carried out, the conclusions that can be drawn in this final assignment are:

a. Identification of variables that influence the analysis of the formulation of strategies for developing Naval Base Capabilities in realizing Maritime Security in the Bali Strait on the level of capability of Naval Base XYZ and Naval Base PQR are Strength, Capabilities and Operational Patterns.

b. The structure of the Maritime Security assessment model in the Bali Strait in PQR and the level of Maritime Threats that occur in the waters of the Bali Strait. Through model simulations, several Naval Base Capability development scenarios were obtained that influence the value of Maritime Security in the Bali Strait.

1) The initial condition assessment is given by an expert, the values and weights are included in the modeling system formulation, from running this simulation, changes are obtained that occur in the Maritime Security value in the Bali Strait over 12 years (2022 to 2034 period), with the results of the model simulation obtained Capability Naval Base is worth 4.45 (Less Capable) and Maritime Security conditions are worth 4.64 (Less Safe).

2) The Naval Base XYZ Capability development scenario focuses on increasing the variables that have the highest degree of importance in Naval Base XYZ such as the patrol warship Strength variable with an increase up to scale 7, the Naval Maintenance Institution Capability variable on scale 7, and Interopability on scale 8. The results of the model simulation show an increase in the Naval Base Capability value to 5.02 (Capable) and the Maritime Security score is 4.98 (Less Safe).

3) PQR Naval Base Capability development scenario, where the patrol warship Strength variable is increased to scale 8, Naval Maintenance Institution Capability on scale 8, and Interopability on scale 8. The results of the model simulation show an increase in the Naval Base Capability value to 5.04 (Capable) and the Maritime Security value to 5.00 (Less Safe).

4) The combined development scenario combines improvements in the variables that form the two submodels with the highest influence weights in the XYZ Naval Base Capability and PQR Naval Base Capability submodels, while other variables run according to normal simulation conditions. The results of the model simulation obtained an increase in the Naval Base Capability value to 5.62 (Capable) and the Maritime Security value to 5.35 (Safe).

c. The Naval Base Capability development strategy that can be implemented in dealing with Maritime Threats in the Bali Strait is to increase the number and quality of patrol warship, increase maintenance and repair capabilities (Naval Maintenance Institution) to support patrol warship in patrolling, and increase operational interoperability so that operations can run effectively and efficiently.

5.2 Suggestions

This research has formulated a strategy for developing Naval Base Capabilities in realizing Maritime Security in the Bali Strait where the main strategy and modeling simulations can be developed according to developments in system dynamics that occur. There are several suggestions that can be given for further research, namely:

a. Future research can develop a road map for implementing the Naval Base Capability development strategy in the face of the long-term plan for defense equipment development by the Indonesian Ministry of Defense.

b. Further research can examine the impact of the development of maritime tourist attractions around the waters of the Bali Strait on Maritime Security and Territorial Security in the Bali and Java Island areas.

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