COLLEGE RESEARCH PROJECT

ON

MARITIME SECURITY AND NATIONAL DEVELOPMENT IN BRAZIL: AN APPRAISAL OF THE BRAZILIAN NAVY

BY

CAPT AN NOGUEIRA
(BRAZILIAN NAVY)
PARTICIPANT COURSE 32

NATIONAL DEFENCE COLLEGE
ABUJA – NIGERIA

JUNE 2024

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BY

CAPT AN NOGUEIRA (536450-7)
(BRAZILIAN NAVY)
NDC COURSE 32

A Research Project Submitted to the National Defence College Nigeria in Partial Fulfilment of the Requirements for the Award of Fellow of the National Defence College (fdc)

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A ABDULLAHI
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Supervisor

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Name: AN NOGUEIRA **Rank:** Captain

Service/MDA: Brazilian Navy **Service No:** 536450-7

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DEDICATION

To my family, friends and above all, God Almighty for His grace and kindness to see me through the course.

ACKNOWLEDGEMENT

First and foremost, all praises and thanks to God, the Almighty, for his blessings throughout my studies and for completing the research successfully.

I also thank the Commandant of the Brazilian Navy, Fleet-Admiral Marcos Sampaio Olsen for assigning me to attend the NDC course 32. I want to express my profound gratitude to my research supervisor, Cdre A Abdullahi for his invaluable guidance and commitment throughout the research. His painstaking dynamism, vision, and patience have deeply inspired me. I would like to acknowledge all members of Faculty for shaping my thoughts during my studies and I would also like to acknowledge the NDC's research fellow Judith, my sponsor participant and friend Capt (NN) IF Okoloagu, and my research assistant Mr. J Ogbaje for their support in this difficult journey.

My completion of this project could not have been accomplished without the support of all resource persons, too numerous to mention, who spared their time to grant me interviews. Finally, let me wholeheartedly appreciate my loving and supporting wife for her understanding and taking care of the home front, as well as my little daughter Elis, who bravely tackles the challenge of living in a foreign country. Thanks for all that you do. Grateful.

ABSTRACT

The resource endowments in the maritime domains of littoral states offer benefits if properly protected and exploited for national advancement and well-being of the citizens. This underpins the imperatives of maritime security by relevant naval, marine, coastal and/or maritime forces in creating safe and secure atmosphere for stimulating and driving maritime socio-economics for enhanced national development. In Brazil, the Brazilian Navy (BN) seeks to provide adequate protection for the maritime domain and safeguard the maritime interest of Brazil through improved maritime security for enhanced national development. However, there are maritime threats that still seek undermine maritime security and impede national development. This necessitated this study titled: "**Maritime Security and National Development in Brazil: An Appraisal of the Brazilian Navy**". The main objective of this study is to appraise the role of BN in providing maritime security with a view to proffering viable strategies for enhanced national development in Brazil.

The methodology adopted in this study was essentially field research, with quantitative and qualitative analyses. A field survey was used to collect data from primary and secondary sources through administration of questionnaires, and interviews. The data collected were analysed qualitatively to arrive at deductions. These were in the light of the Structural Functional Theory (SFT), which states that a society exists by the functioning together of the entities that form it. The findings were presented descriptively using Tables and Annexes.

The study established a direct relationship between maritime security and national development. It revealed some issues such as policy framework for maritime security and naval platforms among others. This revealed some challenges such as poor policy focus on domestic maritime security needs, insufficient Offshore Patrol Vessels (OPV) among others. Hence, the findings were that if all the issues including naval platforms among others were addressed, the provision of maritime security by BN will enhance national development in Brazil.

The study proffered some strategies such as prioritised optimisation of SisGAAz, and domestic building of more OPV with supplementary acquisitions offshores among others. As such, it recommended that the BN should consider domestic building of more OPV with supplementary acquisitions offshores by First Quarter 2025. among others. If the strategies and recommendations are implemented, Brazil would reap significant benefits of improved maritime security regulation with enhanced national development in the country.

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ENCLOSURE:

ABBREVIATIONS/ACRONYMS

AI	Artificial Intelligence
AMRJ	Rio de Janeiro Navy Arsenal
BAF	Brazilian Armed Forces
BJW	Brazilian Jurisdictional Waters.
BMSRF	Brazilian Maritime Security Regulatory Framework
BN	Brazilian Navy
CAMAS	South Atlantic Maritime Area Coordinator
CITRA	Augmented Reality Tactical Image Console
ComPAAz	Maritime Operations and Blue Amazon Protection Command
CTF-151	Combined Task Force 151
DD	Defence Diplomacy
DGePM	Programme Managing Directorate
DPE	Denial of Port Entry
DUP	Denial of Use of Ports
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organisation
FAO	Food and Agriculture Organisation
FGB	Federal Government of Brazil
GDP	Gross Domestic Product
GFW	Global Fishing Watch

HF/DF	High-Frequency Direction Finding
IBAMA	Brazilian Environmental Protection Agency
IBGE	Brazilian Institute of Geography and Statistics
IDESF	Institute for Economic and Social Development of Borders
IoV	Inspection of Vessels
ISR	Intelligence, Surveillance and Reconnaissance
IUU	Illegal, Unreported and Unregulated
JCET	Joint Combined Exchange Training
JCG	Japan Coast Guard
JMSDF	Japan Maritime Self-Defense Force
MEC	Ministry of Education
MMAF	Maritime Affairs and Fisheries
MMAR	Ministry of Marine
MOD	Ministry of Defence
MOP	Marine Operational Environment
MSA	Maritime Situational Awareness
MSC	Maritime Surveillance Capability
MSLE	Maritime Surveillance and Law Enforcement
MSM	Maritime Security Matrix
MSSF	Maritime Security Strategic Framework
MSuA	Maritime Surveillance Assets

NavOb	Naval Objectives
NDP	National Defence Policy
NDS	National Defence Strategy
NSM	Navy Strategic Map
NSMPA	National System of Marine Protected Areas
NSP	Navy Strategic Plan
NTCS	Naval Traffic Control System
NTM	Naval Traffic Monitoring
OECD	Organisation for Economic Co-operation and Development
OPV	Offshore Patrol Vessels
PEM 2040	Brazilian Navy Strategic Plan 2040
PLA Navy	People's Liberation Army Navy
PS	Patrol Ship
R&D	Research and Development
RCA	Royal Canadian Navy
REOI	Request for Expressions of Interest
RSN	Republic of Singapore Navy
S&D	Security and Defence
SAF	Singapore Armed Forces
SCS	South China Sea
SFT	Structural Functionalism Theory

SGD	Sea Guardian Drones
SisGAAz	Blue Amazon Management System
SLOC	Sea Lines of Communication
SMS	Surveillance Management System
SPSS	Statistical Product and Services Solutions
SVT	Satellite Vessel Tracking
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
USA	United States of America
USN	United States Navy
USNSW	US Naval Special Warfare
VMS	Vessel Monitoring System
VMS	Vessel Monitoring System
ZOPACAS	Zone of Peace and Cooperation of the South Atlantic

DEFINITION OF TERMS

1. **Maritime**. Maritime refers to anything related to the sea or navigation on the sea. It encompasses activities, industries, and resources associated with the oceans and seas.

2. **Maritime security**. Maritime security involves protecting the maritime domain from threats such as piracy, terrorism, illegal trafficking, and environmental damage. It includes measures taken by governments and organizations to ensure the safety and security of maritime activities.

3. **Blue Economy**. The blue economy refers to sustainable economic activities that take place in the marine environment. It focuses on harnessing the potential of oceans, seas, and coastal areas for economic growth while preserving their health and resources.

4. **Littoral Nation**. A littoral nation is a country that has a coastline along a particular body of water, such as an ocean or sea. These nations often have strategic interests in maritime affairs due to their proximity to waterways.

5. **Maritime Threat**. A maritime threat is any danger or risk posed to maritime security or activities. This can include piracy, smuggling, territorial disputes, environmental hazards, or military aggression at sea.

6. **Naval Platform**. A naval platform refers to a vessel or structure used by a navy for various purposes such as defense, surveillance, transportation, or

combat operations at sea. Naval platforms can include ships, submarines, aircraft carriers, and other specialized vessels.

7. **Sea Power**. Sea power is the ability of a nation to use its naval forces effectively to achieve strategic objectives at sea. It involves not only having a strong navy but also understanding how to leverage maritime capabilities for diplomatic, economic, and military purposes.

CHAPTER 1

INTRODUCTION

BACKGROUND TO THE STUDY

1. The resource endowments in the maritime domains of littoral states often offer benefits if properly protected and exploited for national advancement and well-being of the citizens. The maritime domains comprising the ocean, sea, and other economic-bearing water bodies often serve as a vast base for economic activities. These include trade, valuable resources exploitation and extraction for the economic prosperity of littoral nations. These resources are solid minerals, hydrocarbons and fishes among others, making maritime areas vital and attractive but prone to threats. Hence, states often emplace measures for maritime security to guarantee the protection of their maritime domains.

2. Maritime security entails the aspect of national security that caters for the protection of ocean, marine and waterbodies related political economics, geopolitics, development safety and well-being. It includes the protection and sustainability of the maritime environment itself, the resource endowments and the maritime-based and maritime-borne economies and industries. Hence, maritime security covers the protection of shipping, fishing and fishery industries, water-borne transportation and beneath the sea resources from all

threats and threat enablers. Such threats from both internal and external sources include Illegal, Unreported and Unregulated (IUU) fishing smuggling, illicit trafficking and piracy among others. Thus, littoral nations pursue maritime security as a veritable precondition to enhance national development.

3. National development involves improvements in the productive capacity of a nation and its people, entities, industries and institution evident with economic growth, quality of living and well-being. This includes provision of basic and advanced personal and national needs, covering job creation, revenue generation, enterprise building, production infrastructure and industrial growth as well as accelerated technological start-ups. Thus, developed or developing littoral nations deem maritime security as a precondition for stimulating economic prosperity for enhanced national development. Ideally, maritime security positively correlates with national development indices, underpinning the key role of marine defence forces or protection agencies. This creates the enabling environment for maritime economics, economies and industries to thrive for enhanced national development.

4. Japan as a maritime nation is favourably endowed with maritime resources and as such depends largely on the seas for national prosperity. Japan through its Navy, known as the Japan Maritime Self-Defense Force (JMSDF) and the Japan Coast Guard (JCG) defends the nation’s maritime domains with

various maritime security measures. These are Maritime Surveillance and Law Enforcement (MSLE), patrols, and sharing surveillance data collected by Sea Guardian Drones (SGD) in real-time (Agawa, 2019; Prosser, 2023). The JMSDF employs information gathering and intelligence analysis technologies to ensure maritime security. This boosts Japan's economic security which is inextricably linked to Stable Sea Lines of Communication (SLOC) and other maritime-based economic activities (Prosser, 2023). This enables JMSDF to achieve sustained maritime security for seamless maritime economic activities.

5. One of the major maritime threats confronting Japan is the IUU fishing among others in its Exclusive Economic Zone (EEZ). Since 2015, the JMSDF and JCG began intensifying the MSLE measures against vessels that engaged in IUU fishing. These include Satellite Vessel Tracking (SVT), Denial of Port Entry (DPE), Denial of Use of Ports (DUP) and Inspection of Vessels (IoV) (Kyodo News, 2021; Mofa, 2022). Adequate maritime security measures and efforts by JMSDF and JCG boosted the country's marine transportation, ocean exploration, seafood competitiveness, tourism, recreation and coastal resilience. For instance, the IUU fishing vessels were reduced from 100 to 10 reported cases from 2018 to 2022. This significantly boosted blue economy of Japan particularly in the area of seafood competitiveness with significant output improvement. Consequently, Japan on average produced 4.2 million

tonnes of fish, including molluscs and crustaceans worth US$13.78 billion. The fishing industry supports over 3.5 million jobs, with seafood sector alone supporting 202,430 jobs (Organisation for Economic Co-operation and Development (OECD) 2021; Huy, 2022; Klein, 2023a; Klein, 2023b). Thus, maritime security by Japanese Navy, the JMSDF with synergy from JCG increased blue economy thereby enhancing national development in Japan.

6. Argentina has vast maritime bases and abundant maritime resources. These include the area of its EEZ measured 200 nautical miles (370,4 km) from any point of the 4,725km Argentinean coast and several islands encompassing 2 marine zones in strategic locations, enabling Argentina to have over 70 ports and harbours (Helms, 2019; Pitta, 2020). The resources and industries include solid minerals, oil, seafood, fishing and fisheries such as shrimp, squid and lobster, river and maritime transportation, maritime tourist sites and shipping (Villasante et al, 2015; Pita, 2020; Oceana, 2023). This makes maritime security a precondition for the optimisation of its maritime environment and resources for enhanced national development in the country. Some of the major maritime security threats in Argentina include piracy, illicit trafficking and IUU fishing among others (Kiss, 2020; Moore, 2021; Ramirez & Ford, 2022). In 2014, Argentina established the National System of Marine Protected Areas (NSMPA) in its national waters for improved military protection, maritime safety and security regimes (Seas, 2014). The Argentine

Navy as one of the 3 branches of the Armed Forces of Argentina combats maritime threats in the country (Pike, 2023). This is key to beneficial social and economic exploitation of the maritime environment and resources for enhanced national development in Argentina.

7. Between 2016 and 2019, the Argentine Navy combated piracy, IUU fishing and overfishing by over 600 foreign vessels which caused Argentina over US$25.5 million annual losses (Molinari, 2021). The maritime security efforts during 2018-2022 enabled the fishing industry to on average, produce and export fish products worth over US$2 billion. Also, shipbuilding, fishing and maritime tourism supported over 3.27 million jobs (OECD, 2021; Villa, 2023; Trusteddocks, 2023; Lopez, 2023a). Thus, maritime security by the Argentine Navy enhanced national development in Argentina.

8. Brazil is a littoral nation with 5.7 million km^2 waters comprising its EEZ maritime environment known as Blue Amazon with a vast maritime economic base and resources (Wiesebron, 2017). The resources and industries include oil, solid and metallic minerals, maritime tourism, trades, ports, transport and shipping, fishing, and fisheries, among others (Carvalho & Moraes, 2021). These maritime resources are vital for boosting the economy for enhanced national development in Brazil. However, there are some potential and active threats that seek to impede the optimisation of the maritime

environment and resources in the nation. These are IUU fishing, drugs and arms trafficking, and piracy, among others (Nunes et al, 2023). Hence, the Brazilian Navy (BN) pursues the protection of maritime environment to improve maritime security for enhanced national development in Brazil.

9. Maritime security efforts of the BN include Naval Traffic Monitoring (NTM), Vessel Monitoring System (VMS) and the Maritime Operations and Blue Amazon Protection Command (ComPAAz) (Abreu, 2023; Pramod & Barroso, 2018; BN, 2022). These efforts enabled the tourism industry, with maritime tourism to add about US$32.99 billion to the Brazilian economy annually (Abreu, 2023; Lopez, 2023b). Also, maritime tourism, fishing, shipbuilding and shipping provide over 3.5 million direct or indirect jobs, while fishing exports earned US$23.8 million annually (Food and Agriculture Organisation (FAO), 2020; Malheiros, 2023). Relatedly, in 2021, Brazilian authorities dismantled an international cocaine trafficking ring that feigned industrial fishing boats and activities to transport drugs into its international waters for pickup by foreign vessels (Ford, 2021). Furthermore, in 2022, Brazil arrested 60 vessels and destroyed IUU fishing related ferries and seized 1.01 tonnes of fish, 800kg of seafood and 11 Amazon River turtles (Madureira, 2023). These efforts aided by BN’s moderate surveillance infrastructure to monitor fishing operations within its EEZ.

10. The BN has 42 Ships able to be deployed in maritime security operations, which are 6 frigates and 2 corvettes from its fleet, 3 Offshore Patrol Vessels (OPV), 20 patrol ships, and 11 patrol craft for inshore operations, the entire maritime security operational framework is showing in the chart in Annex A (BN, 2024). However, despite the efforts of the BN, various maritime threats such as IUU fishing, and illicit trafficking, among others still persist. The persistence is attributable to some problems such as outdated national maritime policy framework and incompatibility of maritime MSA awareness infrastructures. Others are long response time/slow inter-modal military mobility, limited functional platforms and inadequate budgetary coverage.

11. The purpose of this study therefore, is to proffer strategies to improve BN's capacity at ensuring maritime security for enhanced national development in Brazil. The researcher is motivated by the desire to improve the capabilities of BN in providing maritime security for enhanced national development in Brazil.

STATEMENT OF THE RESEARCH PROBLEM

12. Maritime security by relevant naval, marine, coastal and/or maritime forces remains vital for creating conducive atmosphere for stimulating and driving maritime socio-economics for enhanced national development. The BN desires to provide adequate protection for the maritime domain and safeguard

the maritime interest of Brazil through improved maritime security for enhanced national development. Hence, the BN has made consistent effort at ensuring security in the maritime domain to enhance national development.

13. For instance, in 2018, through the maritime security enhancement by BN, the fishing industry provided about 1.08 million full time jobs to fishermen (FAO, 2020). However, in 2023, Brazilian Environmental Protection Agency (IBAMA), conducted and recorded the largest-ever seizure of shark fins, with 28.7 tonnes, representing estimated 10,000 sharks poached and killed (Madureira, 2023). Hence, poaching and IUU fishing among other maritime threats still remain potent due to inadequate surveillance assets, patrolling, among others. The situation persists due to inherent gaps in areas such as policy framework, surveillance system capability, intelligence data, state of maritime platforms, and operational readiness. It is against this backdrop that this study seeks to find answers to the following questions:

a. What are the issues associated with the role of BN in providing maritime security and national development in Brazil?

b. How does the role of BN in providing maritime security contribute to national development in Brazil?

c. What are the challenges of BN in providing maritime security for enhanced national development in Brazil?

d. What are the prospects for improving the role of BN in providing maritime security for enhanced national development in Brazil?

e. What strategies could improve the role of BN in providing maritime security for enhanced national development in Brazil?

OBJECTIVES OF THE STUDY

14. The main objective of this study is to appraise the role of BN in providing maritime security with a view to proffering viable strategies for enhanced national development in Brazil. The specific objectives are to:

a. Examine the issues associated with the role of BN in providing maritime security and national development in Brazil.

b. Assess the contributions of the role of BN in providing maritime security on national development in Brazil.

c. Identify the challenges of BN in providing maritime security for enhanced national development in Brazil.

d. Discuss the prospects for improving the role of BN in providing maritime security for enhanced national development in Brazil.

e. Proffer strategies could improve the role of BN in providing maritime security for enhanced national development in Brazil.

SIGNIFICANCE OF THE STUDY

15. This study is significant as the outcome could contribute to policy improvement, performance improvement, further research and expand the frontiers of knowledge. These are discussed subsequently.

16. **Policy Improvement**. Policy makers will find the study useful in enacting new policies or reviewing extant ones for the role of BN in providing maritime security for enhanced national development in Brazil. Hence, the potential beneficiaries of the outcome of this research for policy improvement are BN and by extension, the Brazilian Armed Forces (BAF) and the Brazilian Ministry of Defence (MOD).

17. **Performance Improvement**. The performance improvement benefit of the outcome of this research involves better outputs by relevant Services and other stakeholders. These include the BN and BAF. This could be in the area of improved driving of the role of BN in providing maritime security for enhanced national development in Brazil.

18. **Further Research**. The study will be useful to students and other researchers by inspiring further study for interrogating the nexus between maritime security and national development. The outcome of the study will then serve as a reference material.

19. **Body of Knowledge.** The study will also benefit the general public

as it will add to the existing body of knowledge on maritime security and national development. The knowledge could be beneficial to academia and the general public.

SCOPE OF THE STUDY

20. The study will be delineated by time, space and content boundaries. These are discussed subsequently.

21. **Time Boundary**. The study covered the period from 2014 to June 2024. This period was chosen because it covers the period that the Federal Government of Brazil (FGB) increased efforts to optimise the role of BN in providing maritime security through various institutional and policy reforms.

22. **Space Boundary**. The study covered the coastal states of Brazil, comprising the states of Pará, Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, Bahia, Espírito Santo, Rio de Janeiro, São Paulo, Paraná, Santa Catarina and Rio Grande do Sul. This is in line with the disposition of the BN Units that provide security in the Brazilian maritime domain.

23. **Content Boundary.** The research is essentially an appraisal of broad efforts of FGB. This covers the role of BN and BAF in improving and utilising maritime security for enhanced national development in the country.

CHAPTER 2

LITERATURE REVIEW

24. This chapter presents the conceptual discourse of the variables and establishes the relationship between them. It also reviews related studies to identify the gaps the study seeks to fill. The chapter also adopts a theoretical framework for the study and shows examples maritime security and national development in Mexico and Indonesia to draw lessons for the study. It then gives an overview of maritime security and national development in Brazil.

CONCEPTUAL DISCOURSE

25. The variables in this study are maritime security and national development which are the independent and dependent variables respectively. These variables are conceptualised, and their relationship established.

MARITIME SECURITY

26. Various scholars and authors have provided diverse shades of perspective in conceptualising and operationalizing the term. However, this study considered the views of BN, Siebels and Bueger. The BN, through the Brazilian Navy Strategic Plan (PEM) 2040 (2020) state that maritime security aims to neutralize the actions of antagonistic forces, which may combine interests, ideological, political, and economic motivations contrary to the development of Brazil as well as to neutralize actions that cause serious damage to the marine environment and the Brazilian coast. This view appears

to be only more reactionary than proactive. This definition did not capture the essential attributes required for this study. Hence, not adopted.

27. Siebels (2020a) sees maritime security as measures employed by owners, operators and administrators of vessels, port facilities, offshore installations and other maritime entities to protect against seizures, sabotage and piracy. This views covers the protection of maritime affairs, but as a private sector concern. It is thus not suitable for the study.

28. Bueger (2015) views maritime security as a vital part of maritime protection matrix for guaranteeing the overall well-being of the sea and its environments, affiliated elements, entities, and activities. It involves the employment of national powers through state policies and institutions with relevant stakeholders in maritime domain protection through naval power and sea power projections in wartime and peacetime. He further stated that maritime security requires proactive, pre-emptive and preventive deterrence, mitigation, preparedness and response in providing protection against all maritime threats and threat enablers, using surveillance and interdiction among other measures. Bueger's view aptly covers the essential elements of maritime security and highlights the measures in ensuring maritime security which situate the basis for the research, accordingly, it is adopted for this study.

NATIONAL DEVELOPMENT

29. National development has been conceptualised from various perspective by different institutions and scholars. Generally, it connotes the sustained

improvement and advancement of a country's economic, social, political, and environmental conditions over time. It encompasses efforts to enhance the well-being, prosperity, and quality of life of the population, as well as the overall progress and competitiveness of the nation as a whole. For this study, the views of Nwapi, Vaisey and Naseemullah were considered.

30. Nwapi (2018) sees national development as economic, political and modernisation, change and increase in different spheres of life of an nation. In economic terms, it involves rise in productive factors and processes, more widespread provision of goals and services with greater and more robust utilisation of a nation’s resources. This view covers increase in productive factors, but without specifying the factors. Thus, it is not adopted for this study.

31. According to Vaisey (2023), national development entails general improvement in a government’s ability to raise the standard of living for its populace economically, politically, socially, environmentally, culturally, scientifically and materially. This view captured the broad categories of sectors for achieving national development, without indicating specific indices. This definition is restrictive. Hence, the view is not adopted for this study.

32. Naseemullah (2023) sees national development as aggregate improvements in a nation’s productivity across all its sectors, economic growth and human development. It covers better job creation, revenue generation,

enterprise building, production infrastructure and industrial growth and technological start-ups across the economic sectors of a nation for overall national well-being. This is through several interactions between key actors vital for development outcomes over time, both in the domestic and international contexts and structures. This view aptly covered key attributes of national development. It is deemed suitable and adopted for this study.

RELATIONSHIP BETWEEN MARITIME SECURITY AND NATIONAL DEVELOPMENT

33. The key attributes of maritime security include the employment of national powers, as well as the proactive, pre-emptive and preventive deterrence, of all maritime threats. On the other hand, the attributes of national development include aggregate improvements in a nation's productivity, economic growth human development, job creation, revenue generation, enterprise building and overall national wellbeing. Hence, the employment of national powers, as well as the proactive, pre-emptive and preventive deterrence, of all maritime threats would enhance aggregate improvements in a nation's productivity, economic growth human development, job creation, revenue generation, enterprise building and overall national wellbeing.

34. Conversely, the failure to employ national powers, and proactive, pre-emptive and preventive deterrence measures to curb all maritime threats would reduce aggregate improvements in a nation's productivity, economic growth

human development, job creation, revenue generation, enterprise building and overall national wellbeing. Hence, a sustained maritime security efforts would enhance national development, likewise, a weak maritime security would impede national development. Therefore, there is a direct relationship between maritime security and national development. The establishment of the relationship between the 2 variables have paved the way for the review of some related studies on maritime security and national development. This is in order to identify gaps which this study seeks to fill.

REVIEW OF RELATED STUDIES

35. This section provides a thematic review of related studies particularly in view of the issues that this study sought to address. In this regard, there are several published and unpublished studies in the field of maritime security and national development, with the literature differing in approach and context. Accordingly, the works of McNicholas (2016), Emerick de Magalhaes et al (2023), Bueger (2015), Dhenim (2020) and Brume-Eruagbere (2017) were reviewed to identify gaps, which the study seeks to fill.

36. McNicholas (2016) in his book titled, “Maritime Security: An Introduction, adopted an exploratory research. The book specifically detailed the fundamentals of shipping, its threats, and vulnerabilities to the links in the cargo supply chain. It then proffered strategies, policies, and practical measures

which have proven to be effective in mitigating maritime threats. McNicholas also highlighted the laws and international conventions which codify maritime crime and the legal authority for response in the United States of America (USA). The book offers ample insights on maritime security, but it did not cover the relevance of related policy framework in the USA. Hence, this study would explore how policy framework could enhance the role of BN in providing maritime security for enhanced national development.

37. Emerick de Magalhaes et al (2023) in their work titled "Improving Maritime Domain Awareness in Brazil through Computer Vision Technology" adopted mixed research. The work discussed the Brazilian maritime authority's efforts in monitoring and controlling vessels in specific maritime areas using data from the Naval Traffic Control System (NTCS). It states that anomalies in vessel locations signal security threats or illegal activities, such as drug trafficking and illegal fishing. Hence, the authors posited that reliable Maritime Situational Awareness (MSA) is vital to reduce threat occurrences. The study agrees with Bannister and Neyland (2015) and Iphar et al (2020) on improving MSA and detection. However, beyond the provision of data-driven framework, it did not centrally cover the concern of surveillance system capabilities which could be employed by the military like the BN in providing maritime security. These gaps thus form part of what this study sought to interrogate.

38. Bueger (2015) in his work titled, “What is maritime security?”, adopted applied research. The work stated that maritime security is a multi-stakeholder endeavour, requiring actors to include it in their overall national security mandate. Hence, Bueger suggested a Maritime Security Matrix (MSM) to offer protection that can make maritime domains threat-free using data as a key basis for building maritime domain resilience. However, he failed to identify the relevance of data in terms of intelligence in providing maritime security for enhanced national development. This is another gap this study sought to fill.

39. Dhenim (2020) in his work titled “Navy Strategic Plan PEM 2040”, adopted descriptive research. He posited that the Navy Strategic Plan (NSP) 2040 is the most relevant guiding document of the BN. He based his assertion on the fact that the NSP 2040 naturally aligns with the Brazilian Magna Carta and its top defence documents. Among these documents, the Naval Policy published in 2019 provided elements for the Navy Strategic Map (NSM) containing Naval Objectives for the BN. Dhenim (2020) aptly pointed the need for NSM, which in turn ought to address naval platforms as a key factor. This study then sought to cover naval platforms in the role of BN in providing maritime security for enhanced national development in Brazil.

40. Brume-Eruagbere (2017) in her work titled, “Maritime Law Enforcement in Nigeria: The Challenges of Combatting Piracy and Armed

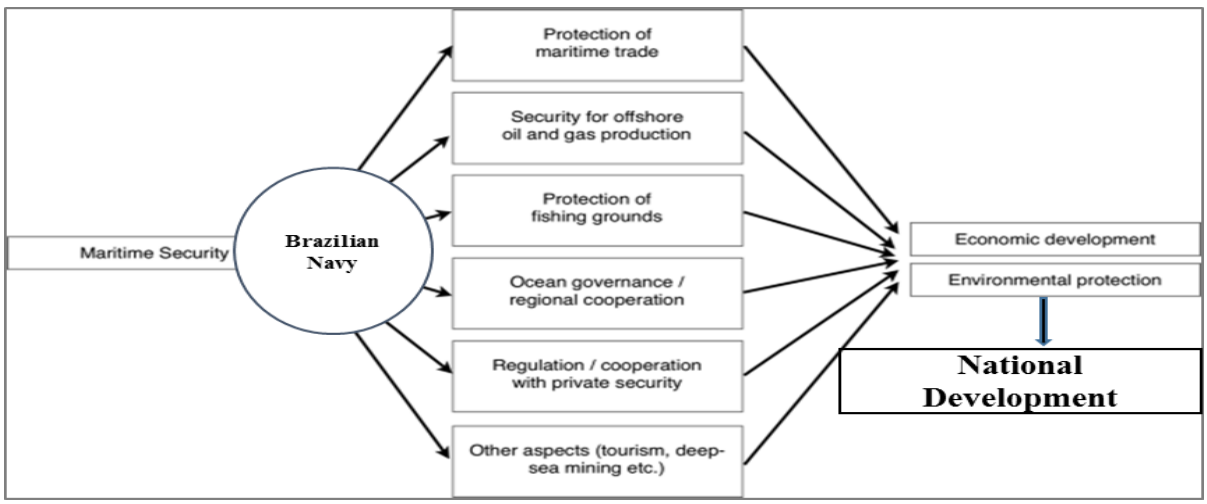
Robbery at Sea", adopted a qualitative research. The work assessed the trends in piracy and its causes. She outlined the international, regional and national legal framework in place to combat piracy and armed robbery at sea. Both Brume-Eruagbere (2017) and the study by Otto and Jermberg (2020) agreed on the challenges of combating piracy and armed robbery at sea in Nigeria including flawed synergy. The studies dwelt well on the challenges and way forward which require operational readiness that was not covered in detail. This study therefore sought to cover how operational readiness at sea could enhance the role of the BN in providing maritime security for enhanced national development in Brazil.

41. **Identified Gaps in Literature**. The reviewed works posited vital insights on maritime security and national development from varied perspectives. However, the studies did not sufficiently address the likely factors that if unresolved would continue to make maritime security undermine national development in Brazil. Thus, this study sought to fill observed gaps in areas such as policy framework, surveillance system capability, intelligence data, naval platforms and operational readiness. This is fundamental so as to achieve viable improvements in the provision of maritime security by the BN for enhanced national development in Brazil. As such, this study identified a suitable underpinning theoretical framework to situate the variables.

THEORETICAL FRAMEWORK

42. The interplay of maritime security and national development could be situated using a theory such as Securitisation Theory propounded by Barry Buzan, Ole Woever, and Jaap de Wilde. Also, the Systems Theory by Ludwig Von Bertalanffy Structural Functionalism Theory (SFT) by Talcott Parsons and Anthony Giddens suffice. However, the SFT was chosen as the underpinning theoretical framework to situate this study. It states that society exists by the functioning together of the individual entities and units that form it (Parsons, 2017; Orsini, 2024). It holds that, components and systems, sectors or entities must work together to guarantee the overall well-being of the society. The SFT Model is captured as depicted at Figure 2.2 below.

Figure 2.1: Diagram of Structural Functionalism Theory



Source: Adapted by Researcher, 2023 from: Siebels (2020b).

43. In Figure 2.1 above, maritime security from SFT perspective offer 6 broad blocks of protection which can improve safety, security and blue

economy for enhanced national development. The SFT states 4 functional imperatives in a society which are adaptation, goal attainment, integration, and latency or pattern maintenance (Minott, 2016). For adaptation, a society must adjust to cope with its external environment in case of threats. For functioning, a society must first define its goals such as securitisation and development.

44. Holmwood (2015) criticises SFT for not considering that society is naturally more complex system than it holds, by merely assuming that functioning together will yield best results in all cases. Despite these criticisms, the study still finds SFT relevant based on the fact that all societies and their sub-systems have individual and collective roles performed by qualified persons or institutions. In this regard, maritime security is provided by BN to enhance national development as a vital component of the Brazilian society. Hence the theory is able to explain that a relationship exists between maritime security and national development. It is thus, safe to state that if all stakeholders perform their role optimally, maritime security would enhance national development in Brazil. The application of SFT in maritime security and national development, especially in blues economy is further shown at Annex B. The adoption of the SFT now paves the way for considering the examples of maritime security and national development in Mexico and Indonesia, with a view to drawing lessons for the study.

EXAMPLES OF MARITIME SECURITY AND NATIONAL DEVELOPMENT IN MEXICO AND INDONESIA

45. This section discusses maritime security and national development in Mexico and Indonesia. These countries were chosen because both have demonstrated how providing maritime security by the maritime forces national enhanced development aspirations to draws lessons for the study.

MARITIME SECURITY AND NATIONAL DEVELOPMENT IN MEXICO

46. Mexico has bountiful maritime resources including solid minerals and fisheries among others (Embamex, 2023). This makes maritime security a precondition for resources optimisation for enhanced national development in the country. In 2016, Mexico moved the National Maritime Authority from transportation to the Ministry of Marine (MMAR) for improved military protection and maritime security regimes (Nordfjeld & Dalaklis, 2018b). The Mexican Navy equipped with 68,200 force strength, 189 ships and 130 aircraft combat maritime threats (Pike, 2023a). Naval platforms are key for secure maritime resources exploitation for enhanced national development in Mexico.

47. In 2018, the Mexican Navy combated IUU fishing and transshipment of fish contraband by over 1,000 illicit traders and poachers with deterrent operational readiness and actions. As such, the navy protected Mexico’s long coastline and a fishing fleet of over 100,000 small vessels (Brown, 2020).

Hence, the Mexican Navy arrested over 321 IUU fishing vessels (Offshore Staff, 2023; Nero, 2023). The maritime security efforts by the Mexican Navy during 2018-2022 enabled the fishing industry to produce an average of 1.7 million tonnes of fish worth US$2.80 billion. It is also, supporting over 1.27 million jobs (OECD, 2021; Villa, 2023). Thus, maritime security provision by the Mexican Navy assisted enhancing national development in Mexico.

MARITIME SECURITY AND NATIONAL DEVELOPMENT IN INDONESIA

48. In Indonesia, maritime security is pursued by the Indonesian Navy pursuant to Law No 34/2004 covering maritime governance (Pike, 2023b). Hence, the navy enforces the maritime laws and security line with national laws and ratified international laws. The Indonesian Navy also engages in other duties relevant to the projection of naval power in sea defence (Kembara, 2021; Amelia et al, 2021). Maritime security efforts by the Indonesian Navy boosts maritime resource exploitation and economic development in Indonesia.

49. The Ministry of Maritime Affairs and Fisheries (MMAF) oversees maritime resource exploitation such as strict fishing regimes with law enforcement provided by the navy (MMAF, 2020). In 2017, Indonesia sought more effective control of its marine ecosystems and combat IUU fishing with Advanced Oceanography Surveillance, digital satellite imaging, robotics and artificial intelligence (Pudjiastuti, 2018; Miguez, 2020). From 2017 to 2019,

the Indonesian Navy curbed IUU fishing by over 34 per cent with US$813 million savings, including the seizure of over 300 illegal boats (Miguez, 2020). Thus, maritime governance enforcement by Indonesian Navy boosted maritime security and enhanced national development in Indonesia.

LESSONS FOR THE STUDY

50. The lessons drawn from the Mexico and Indonesia examples are the need for maritime security governance, robust naval platforms and essentials of deterrent operational readiness. These lessons are discussed next.

51. **The Need for Maritime Security Governance**. Maritime security governance is a lesson drawn from both Mexico and Indonesia example. Mexico moved its maritime authority to the MMAR for improved governance in maritime security regimes, while Indonesia enforced maritime laws. These regime efforts boost safer maritime resource exploitation for enhanced national development. Thus, maritime security governance is a lesson for the study.

52. **The Necessity of Robust Naval Platforms**. Robust naval platforms is a lesson drawn from Mexico example. The Mexican Navy deploys ample naval equipment and weaponry to curb IUU fishing for safer fishing to boost national development. Thus, robust naval platforms is a good lesson for the study.

53. **Essentials of Deterrent Operational readiness**. Deterrent operational readiness is a lesson drawn from the Mexico example. The Mexican Navy

combated IUU fishing and transshipment of fish contraband, illicit traders, and poachers with deterrent operational readiness, boosting fishing economy. Thus, deterrent operational readiness is a viable lesson for the study. The lessons for the study now lead to the overview of maritime security provided by the Brazilian Navy and national development in Brazil.

OVERVIEW OF MARITIME SECURITY PROVIDED BY THE BRAZILIAN NAVY AND NATIONAL DEVELOPMENT IN BRAZIL

54. Brazil has a large coastline in the South Atlantic with about 9,000km in length and a maritime area of 5,7 million km^2 (Silva, 2017). However, between the 1960s and 1970s, its advantaged position still did not amply yield desired maritime benefits. This was due to or poor national policy focus in maritime security due to wavering political trends (Duarte, 2015; Silva, 2017). Hence, policy framework arises as a basic concern in the role of the BN in maritime security for enhanced national development in Brazil.

55. By the 1990s, when the United Nations Convention on the Law of the Sea (UNCLOS) came into force in 1994, Brazil tried to optimise its implementations. Hence, Brazil showed high motivation in maritime sector development, launching 4 main plans between 1997 and 2017. These include the Brazilian Continental Shelf Survey Plan (Leplac or the Blue Amazon) (Silva, 2017). The evolution of the Blue Amazon broadened the scope of duties

for the BN, prioritising maritime security. It began to record notable drives in improving surveillance system capability and the need for intelligence data for actionable intelligence in providing maritime security.

56. From 2017 - 2021, the Brazilian agenda for the sea broadened beyond various plans, to undertaking more maritime security initiatives (Silva, 2017; Barros-Platiau & Barros, 2021). This was to create maritime environmental resilience through proper military equipping and equipment, particularly through adequate naval platforms. This involved the resumption of shipbuilding by the Rio de Janeiro Navy Arsenal (AMRJ). In December 2022, the BN received Patrol Ship (PS) “Maracanã” and the "Tamandaré” Class Frigate to its operational units. More deliveries are scheduled for the period between 2025 and 2029 (BNNA, 2022; BN, 2024). These efforts are further buoyed by the pursuit to attain sufficient operational readiness at sea as a precondition for boosting maritime security for enhanced national development (Wetzel, 2023; Patrick, 2023; Oliveira, 2023). The overview has raised some critical issues which include policy framework, surveillance system capability and intelligence data. Others are adequate naval platforms and operational readiness. These issues shall be discussed further in Chapter 4.

CHAPTER 3

METHODOLOGY OF THE STUDY

57. Chapter 3 articulates the research methodology employed in conducting this study, reflecting the quality of data collected and applied, to establish the validity of the study's outcome. Accordingly, the methodology addresses 7 key aspects, namely: research design, sources of data, population/sampling process, methods of data collection, instruments of data collection, methods of data analysis and methods of data presentation. Thereafter, the chapter highlighted limitations to the study. The details of the methodology are discussed subsequently.

RESEARCH DESIGN

58. The research design for the study was applied research that employed an empirical approach. Both qualitative and quantitative data types were collected and analysed in relation to maritime security and national development. Descriptive methodology was adopted to describe efforts of the BN in maritime security and its impacts on national development in Brazil.

59. Survey research design was used to validate record from primary and secondary sources of data. This entailed using a combination of unstructured interview and use of questionnaire. The justification for the chosen research design is that it provides the advantage of triangulation to enhance the reliability and verify the replicability of the research outcomes. Hence, it

enabled a robust appreciation of the interplay between maritime security by the BN and national development in Brazil. Furthermore, the research strategy provided the latitude for viable and robust evaluation of maritime security by BN for enhanced national development in Brazil. In addition, the research purpose was descriptive approach using the analysed data without manipulation of the environment, while the research choice adopted quantitative and qualitative analyses, making the study approach largely a mixed method. This enabled ample data collection on the promotion of maritime security by BN for enhanced national development in Brazil.

SOURCES OF DATA

60. The data for the study were obtained from primary and secondary sources. These are discussed subsequently:

61. **Primary Sources**. Primary data for this study were unprocessed facts obtained directly from BN and BAF with the BN as the main body of the FGB responsible for maritime security. The individuals include BN and BAF personnel at the strategic, operational, and tactical levels, while other sources were entities linked to maritime activities such as fishing associations. These were covered with particular focus on promoting maritime security for enhanced national development in Brazil. In this regard, the detailed list of resource persons interviewed is contained at Annex C.

62. **Secondary Sources**. Secondary data were facts, other than those obtained directly from primary sources. These are data that have undergone some form of processing and interpretation obtained from books, journals, newspapers, official publications, seminar and conference proceedings. Others were lectures notes, policy papers, unpublished materials, news magazines, online library and verifiable Internet sources. Data were also collected from the libraries of the National Defence College and the National Library.

POPULATION/SAMPLING PROCESS

63. The population/sampling process for the study included population of the study, sample size and sampling technique. These are discussed subsequently.

64. **Population of the Study**. The population of the study comprised the total strength of BN and BAF totalling 360,000. Stakeholders in the fishing and shipping industries as well as other ocean-borne trade actors and beneficiaries totalling about 416,500 (Brazilian Navy Administration Directory, 2022). The Armada Corp Officers are the Operational Officers of the BN solely deployed for safeguarding Operational assets within the maritime domain. They are saddled with the responsibility of ensuring maritime security including the protection of IUU fishing within the maritime environment, safeguarding the activities of maritime tourism and shipping industries across different locations

in the country. The estimated population of the study, therefore, is the Armada Corp Officers, which, serves as respondents for the field survey.

65. **Sample Size**. The relatively large size of the population made it difficult to collect data from every member of the population. The sample size for the study was calculated to be 400 using the Taro Yamane formula. Details of the calculation is at Annex D. The degree of accuracy desired was 95 per cent with an error margin of 5 per cent for a considered population of 766,500.

66. **Sampling Technique**. The study adopted non-probabilistic sampling techniques using purposive or convenience sampling. The strength of this sampling technique is that it allows for the systematic representation of opinions of professionals and authorities in the field of study. However, the weakness of the technique is that it targets a particular group of people, using stratified randomly to gather strategic, operational and level information. Some of whom were difficult to locate for interview or administration of questionnaire. It also reflected research biases in the selection of respondents due to the peculiarities of the data required. Such weaknesses were eliminated through verifications from 2 or more sources and references.

METHODS OF DATA COLLECTION

67. The methods of data collection for the study included document analysis and field method. These are discussed subsequently.

68. **Document Analysis**. Document analysis was used to collect data from secondary sources. The data were collected from published and scholarly works. This was useful in clarifying basic concepts of maritime security and operational effective as well as validating primary data.

69. **Field Methods**. Field methods were used to collect data from primary sources. The researcher administered open and close-ended questionnaire to relevant institutions and persons with a sample at Annex E. Primary data were also collected through structured and unstructured interviews conducted one-on-one and by telephone with the interview guide sample at Annex F.

INSTRUMENTS OF DATA COLLECTION

70. Different instruments of data collection were applied for the document analysis and field methods. These are discussed subsequently.

71. **Document Analysis**. Instrument of data collection for the document analysis were research notebook and coding schemes. These allowed for proper analysis of related literature relevant to the study.

72. **Field Method**. Instrument of data collection for the field method were field notebook, recording devices and questionnaire including the Likert scale and open-ended questions in the interview guide. These allowed for expression ample opinions by respondents and adequate record keeping of data and responses on the subject matter.

METHODS OF DATA ANALYSIS

73. The data generated from the questionnaire administered were analysed quantitatively and qualitatively, subjecting them to numeric and comparative examinations. This was to highlight trends with a view to making deductions / interpretations on the provision of maritime security by BN for enhanced national development in Brazil.

74. The research also utilized content, narrative, discourse and framework analysis for the qualitative data. Conversely, the quantitative analyses were more scientific as data were coded to isolate and eliminate defective data. In this study, data were analysed, using computer programmes like the Statistical Product and Services Solutions (SPSS), including descriptive and inferential statistics for quantitative data analysis. This was based on facts with for logical deductions and validations of the data collected from primary sources.

METHODS OF DATA PRESENTATION

75. Data generated were presented using tables, graphs and charts. Some were also presented in descriptive forms. Some of the data were presented as Annexes and enclosures. These are to further give clarification on some of the assertions made in the study.

LIMITATIONS OF THE STUDY

76. Some limitations of the study include weakness in sampling technique where in terms of generalising situation of maritime security by BN. This may not fully represent maritime security across the Blue Amazon. However, efforts were made to overcome this limitation through comparative and trend reviews and study of past and present documents. Also, the geographical distance between Nigeria and Brazil made physical administering of questionnaires for respondents quite difficult, and some questionnaires were not returned or filled properly. The respondents were people who worked previously in maritime security related areas. Telephone and virtual interviews with respondents over longer distances and scholarly publications were exploited.

77. Additionally, the researcher encountered instances of language barrier which impeded communications, for instance, there is no separate word for safety and security in Portuguese. However, the used google translator aided by taking English lessons. Hence, all the limitations to the study were mitigated and as such, they did not significantly affect the depth and validity of the research findings. The next chapter discusses the data presentations and analysis of the study.

CHAPTER 4

DATA PRESENTATION AND ANALYSIS

78. This chapter provides information and analysis of the sample. It also presents and analyses the data on issues associated with the role of BN in providing maritime security for enhanced national development in Brazil. Consequently, it examines the data presentation and analysis of contributions and challenges. Finally, it discusses the results and offers prospects for prospects for improving the role of BN in providing maritime security for enhanced national development in Brazil.

INFORMATION AND ANALYSIS OF THE SAMPLE

79. The information and analysis of the sample include the sample size and questionnaire distribution, respondents' attributes and demography, and the data validity. This also include sample representativeness as discussed subsequently.

80. **Demography of Respondents**. The respondents comprised male officers of the BN across the Operational Branch, Research and Development (R&D), the Naval Industry and representatives of the fishing industry. All the respondents have the requisite education, years of experience ranging from 20 to 35 years in their respective services and industries. These are further shown in the demography and attributes of respondents are at Annex G. These attributes make it possible for the respondents to provide useful information for the study.

81. **Distribution of Questionnaires**. The sample size for the study is 400, determined with the aid Taro Yamane Formula based on a study population of 776,500. To provide for unreturned copies of questionnaire, 410 copies of questionnaire were distributed to respondents.

82. **Questionnaire Return Rate**. A total of 410 copies of the questionnaires were administered and 381 were returned. This number is higher than the calculated sample size of 400, providing for improved confidence level and reduced error margin. The returned questionnaires indicate return rate of 92.93 per cent. The high return rate indicates an appreciable level of diligence in the planning, development, transmission and retrieval of the research instrument by the researcher. The breakdown of the distribution of questionnaires and return rate is at Annex H.

83. **Validity of the Sample**. The questionnaires returned were checked to ensure the validity of responses. From the 381 returned questionnaires, 370 were properly filled and valid while 11 were invalid. Hence, the validity of the sample is 97. 11 per cent, showing a high reliability of the research process and were further used for the research analysis.

84. **Representativeness of the Sample**. The study used 2 categories of respondents including the BN and BAF among as providers of maritime security which received 270 questionnaires. On the other hand, 130 questionnaires were

sent to maritime economic actors and beneficiaries as respondents. The sample such as age academic qualification, and years of experience to test the population representation. It can be inferred that respondents were matured and educated enough with ample years of experience to provide valid responses to the questions. The data presentation and analysis of the issues associated with the role of BN in providing maritime security and national development in Brazil is discussed next.

DATA PRESENTATION AND ANALYSIS OF ISSUES ASSOCIATED WITH THE ROLE OF BRAZIL NAVY IN PROVIDING MARITIME SECURITY AND NATIONAL DEVELOPMENT IN BRAZIL

85. This section presents and analyses data of issues associated with the role of BN in providing maritime security and national development in Brazil. The issues include policy framework for maritime security, Maritime Surveillance Capability (MSC) and maritime security intelligence data. Others are naval platforms and operational readiness. These issues are discussed subsequently.

POLICY FRAMEWORK FOR MARITIME SECURITY

86. Policy framework for maritime security involves governmental action plans that are guided by law to guarantee the marine environment and its values in littoral nations. Hence, effective policy framework for maritime security will improve the role of naval forces in providing maritime security for enhanced national development in a coastal state. It is vital in enabling the provision of maritime security by BN to enhance national development in Brazil.

87. The Royal Canadian Navy (RCA) in Canada is guided by the nation's Maritime Security Strategic Framework (MSSF) 2020 in providing maritime security in the Canadian maritime zones. The MSSF has 5 security activities, including MSA, Safeguarding, Responsiveness, Resilience and Collaboration (Hickey, n.d.; Canada, 2023). In 2017, the RCA during an anti-drug trafficking mission seized of over 14 tonnes of cocaine. Also, in 2021, the RCA conducted 4 drug interdiction operations in 3 days in it Operation ARTEMIS, seizing illicit narcotics worth over US$14.4 million. (Germano, 2017; Combine Maritime Forces, 2021). The operations aided in sanitising Canada's maritime environment for better flows of maritime economic activities. Consequently, in 2018, marine shipping, facilitating international trade, added US$30 billion to Canada's Gross Domestic Product (GDP), while fishing added US$7.633 billion in 2021 (Council of Canadian Academies, 2018; Statics Canada, 2021; Ganter et al, 2021). Thus, maritime security efforts by RCA guided by the MSSF enhanced national development in Canada.

88. In Brazil, the policy framework for maritime security is embedded in various defence, intelligence, or security policies or strategies at Services or national levels. These include the National Defence Strategy (NDS), National Defence Policy (NDP), Defence Diplomacy (DD) and Complementary Law 97/99 (LC 97/99). The NDS for example, seeks to integrate the operations of the 3

branches of the BAF. This is to enhance their effectiveness in combating hostile forces against Brazil and its national interests including its maritime space with autonomy in defence technologies as key objective (Marques & Maia, 2020; Donadelli, 2021). Other policies that guide the BN form the Brazilian Maritime Security Regulatory Framework (BMSRF) for Brazil's maritime zones. These include the Zone of Peace and Cooperation of the South Atlantic (ZOPACAS) led by Brazil under the United Nations (UN) General Assembly since 1986 (Edwards, 2023), the Naval Policy (2019), and the South Atlantic Maritime Area Coordinator (CAMAS). These policies seek to direct the Brazilian Navy's actions and to improve its MSA in providing maritime security for enhanced national development in Brazil.

89. Furthermore, there is the Brazilian Navy Strategic Plan 2040 (PEM 2040). However, A. R. S. Selles (personal communication, 15 February 2024) noted that the BMSRF lack sufficient domestic benefits for Brazil due to much focus on assistance to other nations and regions, but that cannot be a limitation. In 2022 for instance, BN assumed the command of the Combined Task Force 151 (CTF-151) in Manama, Bahrain as a multinational task force that combat piracy in Africa (Aeroflap, 2022; Defence Media Activity, 2024). Renato L. Fernandes (personal communication, 25 April 2024) corroborating A. R. S. Selles averred the BN providing assets to act outside our jurisdiction or even to carry out exercises, in a

time of such scarce resources, could this harm its ability to provide maritime security. Hence, poor policy focus on domestic maritime security needs such as the assignment of assets to external commitments impedes maritime security provision by BN for enhanced national development in Brazil. This policy framework for maritime security a key consideration.

90. The field survey sought respondents' views on the relevance of policy framework for maritime security to the provision of maritime security by BN for enhanced national development in Brazil. The outcome is indicated at Table 4.1.

Table 4.1: Respondents' Views on the relevance of policy framework for the provision of maritime security by BN for enhanced national development in Brazil

Serial	Options	Frequency	Percentage
(a)	(b)	(c)	(d)
1.	Very relevant	226	61.08
2.	Relevant	65	17.57
3.	Indifferent	22	5.95
4.	Irrelevant	48	12.97
5.	Very irrelevant	9	2.43
Total		**370**	**100%**

Source: Researcher's Field Survey, 2024.

91. From Table 4.1 above, 61.08 per cent of respondents indicated policy framework for maritime security is very relevant in enabling the provision of maritime security by BN to enhance national development in Brazil. Another 17.57 per cent said it is relevant, 12.97 per cent indicated irrelevant, 2,43 per cent indicated very irrelevant, while 5.95 per cent were indifferent. A. R. S. Selles (personal communication, 15 February 2024) added that policy framework for maritime security is vital, but poor policy focus on domestic maritime security

needs is a major impediment. Thus, policy framework for maritime security is a key factor in enabling the provision of maritime security by BN to enhance national development in Brazil.

MARITIME SURVEILLANCE CAPABILITY

92. Maritime surveillance capability involves the ability, design and systems for methodical observation of sea and inland water bodies including vessel tracking, threat detection, search and rescue support. It is vital for enabling the provision of maritime security by BN to enhance national development in Brazil. Adequate MSC is key in enabling the provision of maritime security by naval forces to enhance national development in a country.

93. In China, the People's Liberation Army Navy (PLA Navy) has robust Maritime Surveillance Assets (MSuA), boosting their MSC. These include High-Frequency Direction Finding (HF/DF) technologies, Satellites, and Land-based radar, among others (Chang, 2021). These MSuA as further highlighted at Annex I enable the PLA Navy to detect, identify and track ships at sea among its maritime Intelligence, Surveillance and Reconnaissance (ISR) tasks. In 2023, the PLA Navy, deploying its MSuA, using over 50 ISR and combat vessels, conducted offensive and defensive realistic combat condition drills in the South China Sea (SCS) (Xuanzu, 2023). Such drills are deliberate routines by the PLA navy in demonstrating its MSC aspect of Sea Power as deterrence to maritime threats.

These, in turn, boost maritime security in China's region of the SCS. China generates food for the populace and earns over US$80 million as average annual revenue from fish and seafood in this maritime area (Cohn, 2024). Thus, MSC boosts the provision of maritime security by PLA Navy for enhanced national development in China.

94. In Brazil, the BN has a Vessel Monitoring System (VMS) for monitoring its fishing fleet that it introduced in 2007. However, several IUU fishing vessels still evade the VMS with 7 out 9 likely evading the system successfully (Chagas et al, 2015). To mitigate the threat, BN is developing a surveillance management system (SMS) for its coastline, including the maritime area of pre-salt oil reserves of the Blue Amazon, namely the Blue Amazon Management System (SisGAAz). To this end, the US$10 billion SisGAAz project is in 4 Phases expected to be completed in 10 years between 2014 and 2024 (Burity, 2014). Phase I was developed from 2016 to 2019 to cover coastal areas from Sao Paulo to Espírito Santo states. Phase 4 to be developed from 2023 to 2025 is to cover inland river systems as contained in the full overview of SisGAAz at Enclosure 1. The SisGAAz requires the BN to sufficiently develop its MSuA and integrate an array of surveillance systems for all-inclusive protection of offshore spaces and assets to facilitate economic development.

95. Despite the efforts by BN, C. A. A. B. Dias (personal communication, 11

April 2024) noted that while it was commendable that BN is pursuing SisGAAz through internal development efforts, the process cannot fully execute the 4 Phases within the stipulated periods. J. C. Freitas (personal communication, 18 April 2024) corroborating C. A. A. B. Dias opined that adequate MSuA are so crucial for boosting MSC, both indigenous development and acquisition should be adopted as a viable approach. He added that this will minimise the impediment of slow-paced indigenous development of MSuA. The field survey sought to ascertain whether MSC is relevant to the provision of maritime security by the BN to enhancing national development in Brazil. The survey outcome is indicated at Table 4.2.

Table 4.2: Respondents' Views on whether maritime surveillance capability is relevant to the provision of maritime security by the BN to enhancing national development in Brazil

Serial	Options	Frequency	Percentage
(a)	(b)	(c)	(d)
1.	Very relevant	243	65.68%
2.	Relevant	56	15.14%
3.	Indifferent	17	4.59%
4.	Irrelevant	34	9.19%
5.	Very irrelevant	20	5.40%
Total		**370**	**100%**

Source: Researcher's Field Survey, 2024.

96.Table 4.2 shows that 65.68 per cent of respondents agreed that MSC is very relevant to the role of BN in providing maritime security for enhanced national development in Brazil. Another 15.14 per cent agreed that it is relevant, while 4.59 per cent were indifferent, 9.19 per cent indicated irrelevant and 5.40 per cent indicated very irrelevant. C. A. A. B. Dias (personal A. A. B. Dias

(personal communication, 11 April 24) noted that the pursuit of advanced MSuA shows that MSC is key in providing maritime security by BN for enhanced national development in Brazil. Thus, MSC is a concern in the provision of maritime security by BN for enhanced national development in Brazil.

MARITIME SECURITY INTELLIGENCE DATA

97. Maritime security intelligence data refers to information collected and analysed to ensure the safety and security of maritime activities, such as vessel movements, piracy threats, IUU fishing activities, and other maritime security concerns or threats. Adequate maritime security intelligence data is key in enabling the provision of maritime security by naval forces to enhance national development in a country.

98. In Singapore, Republic of Singapore Navy (RSN) is the maritime Service branch of the Singapore Armed Forces (SAF). It is responsible for defending the country against all seaborne threats. The RSN uses maritime security intelligence data obtain through intelligence operations across its ISR functions. The utilisation of analysed actionable intelligence enable the RSN to play a crucial role in ensuring the safety and security of maritime activities in Singapore. This data includes information on vessel movements, threats, risks, and other relevant factors that help in maintaining maritime security (Lee, 2021; Durlik et al, 2023). With maritime security intelligence data, the RSN employs predictive intelligence

analysis to combat threats with advanced technologies such as Artificial Intelligence (AI) and data analytics (Dsta, 2024). This enables RSN to detect suspicious IUU fishing activities in Singapore's waters, predict future incidents based on established patterns from maritime security intelligence data analytics. During 2016-2022 the RSN foiled pirate attacks, illegal oil bunkering arresting 7 leaders, and arresting IUU fishing vessels (UN, 2024; Dsta, 2024; Tan, 2015; Manifold Times, 2019). The use of AI and Big Data in maritime security intelligence data and predictive analytics allows RSN to take proactive measures. It aids adequate and timely maritime security resources allocation for marine resources protect, IUU fishing, and other maritime threats prevention for enhanced maritime security to boost licit maritime transactions.

99. In Brazil, the BN is already applying Computational Intelligence in maritime security intelligence data gathering, analysis and sharing. This is considered as having a great potential in Security & Defence (S&D) applications. Nevertheless, such potential seems to be still under exploited, while the application of AI which is greater and more advanced as a disruptive technology is also limited (Cococcioni, 2018; Emerick de Magalhaes et al, 2023). In 2018, the BN installed remote sensor Maritime Monitoring System known as Augmented Reality Tactical Image Console (CITRA) to combat organised crime in the Guanabara Bay (Barretto, 2018). According to C. G. Cardoso (personal

communication, 11 April 2024), the BN has been using Computational Intelligence technologies in maritime security intelligence data gathering, analysis and sharing to boost maritime security. However, the application of AI technologies is still limited. Thus, limited application of AI technologies in maritime security intelligence operations impedes maritime security intelligence data utilisation by the BN for enhanced national development in Brazil.

100. The field survey sought opinion of respondents on whether maritime security intelligence data are essential factors in the provision of maritime security by BN for enhanced national development in Brazil. The survey outcome is at Table 4.3.

Table 4.3: Respondents' Views on whether maritime security intelligence data are essential factors in the provision of maritime security to enhance national development in Brazil

Serial	Options	Frequency	Percentage
(a)	(b)	(c)	(d)
1.	Very essential	258	69.73
2.	Essential	68	18.38
3.	Indifferent	15	4.05
4.	Not essential	19	5.14
5.	Very irrelevant	10	2.70
Total		**370**	**100%**

Source: Researcher's Field Survey, 2024.

101. Table 4.3 shows that 69.73 per cent indicated that maritime security intelligence data are very essential factors in the provision of maritime security by BN for enhanced national development in Brazil. Another 18.38 per cent said they are essential, 4.05 per cent were indifferent, while 5.14 per cent indicated not essential while 2.70 per cent indicated very irrelevant. C. A. A. B. Dias (personal

communication, 11 April 2024) noted that a full adoption of AI applications in maritime intelligence operations by the BN such as AI-powered drones would boost its maritime security in Brazil. However, AI is not yet clearly deployed by BN in maritime security operations. Thus, maritime security intelligence data is critical in the provision of maritime security by BN for enhanced national development in Brazil.

NAVAL PLATFORMS

102. Naval platforms refer to the various types of ships and vessels used by navies for maritime military purposes, including aircraft carriers, destroyers, frigates, submarines, and patrol boats. These platforms are essential for conducting naval operations, such as protecting sea lanes, enforcing maritime law, and projecting sea power. The ability to project dominant and deterring sea power with adequate naval platforms is vital in enabling BN to provide maritime security for enhanced national development in Brazil. This is premised on the fact that modern navies invest heavily in naval platforms to attain sea power dominance to improve maritime security for enhanced national development in a nation.

103. Since 2013, the Indonesian Navy often ranked between number 4 and 6 globally in terms naval platforms as it possesses ample ships and vessels. These boost its sea power projection in securing the vast Indonesian archipelago with regional influence. The Indonesian Navy with 75,000 naval personnel has a fleet

of over 324 warships, 4 submarines, 50 ircraft, 168 offshore patrol vessels and 30 amphibious assault ships. These are funded by about US$9 billion annual budget (Sajen, 2024). These relative formidable naval platforms enable the Indonesian Navy to achieve ample deterrence to maritime threats that seek distabilise economic activities on Indonesian waters. Since the Indonesian Navy has been enforcing government banned foreign fishing boats from its waters and measures at deterring IUU fishing and piracy, covering the Malacca Strait, among others (Gokkon, 2024). This reduced foreign fishing activity in Indonesia by over 90 per cent, and total fishing by 25 per cent, since 2014. The Indonesian Navy efforts successfully reduced the nation's annual losses to IUU fishing alone from over US$5.7 billion to US$3 billion in 2023 (Gokkon, 2024). Thus, robust naval platforms aid the Indonesian Navy in providing maritime security for enhanced national development in Indonesia.

104. The BN has surface, submarine and auxiliary vessels in its inventory. These include 100 ships in commission, which are 53 Combat ships, 42 auxiliary ships, 4 conventional attack submarines and one Multipurpose Aerodrome Ship (BN, 2024). The Navy also operates other diverse type of vessels including for search and rescue, inshore and fast interdiction duties, while accumulating coastguard and river guard roles. However, S. E. F. Luiz (personal communication, 11 April 2024) noted that in view of Brazil's vast maritime space

and inland waters, current stock OPV in BN do not suffice for desired deterrence of maritime threats. This impedes the provision of maritime security by BN for enhanced national development in Brazil.

105. The field survey sought opinion of respondents on whether naval platforms are key in the provision of maritime security by BN for enhanced national development in Brazil. The survey outcome is indicated at Table 4.4.

Table 4.4: Respondents' Views on whether naval platforms are key in the provision of maritime security by BN for enhanced national development in Brazil

Serial	Options	Frequency	Percentage
(a)	(b)	(c)	(d)
1.	Strongly Agree	243	65.68
2.	Agree	44	11.89
3.	Indifferent	16	4.32
4.	Disagree	38	10.27
5.	Strongly Disagree	29	7.84
Total		**370**	**100%**

Source: Researcher's Field Survey, 2024.

106. Table 4.4 above reveals that 65.68 per cent of respondents strongly agreed that naval platforms are key in the provision of maritime security by BN for enhanced national development in Brazil. Another 11.89 per cent agreed, while 10.27 per cent disagreed, 7.84 per cent strongly disagreed and 4.32 per cent were indifferent. S. E. F. Luiz (personal communication, 11 April 2024) agreed that only about 3 OPV are insufficient for the BN to effectively cover Brazil's maritime territories. Hence, availability of naval platforms is crucial in the provision of maritime security by BN for enhanced national development in Brazil.

OPERATIONAL READINESS

107. Operational readiness refers to the preparedness for prompt deployment of naval forces in jurisdictional waters to demonstrate sea power, protect national interests, and maintain maritime security. It is an important aspect of a country's defence strategy and can help deter potential threats and maintain stability in the region. Other purposes of operational readiness at sea include conducting maritime patrols, drills, actual combats, search and rescue operations, humanitarian assistance, and disaster relief. Between November 2023 and March 2024 for example, the Republic of Korea Navy or South Korean Navy (ROK Navy or SKN) conducted about 4 major naval drills. These were the Combined Maritime Counter-Special Operations Exercise with the United States Navy (USN) and the Firing Operation Drills to test and enhance combat readiness simulating enemy aggression (Williams, 2023; Times of India, 2024). Also, the first Live-Fire Drills of the new year and the Joint Combined Exchange Training (JCET) with a US Naval Special Warfare (USNSW) Unit (Uddin, 2024; Meiller, 2024). These deliberate demonstrations of naval drills project ample deterrent naval might and presence at sea by the SKN. These aid operational readiness at sea in boosting the provision maritime security by SKN for enhanced national development in ROK.

108. In Brazil, the BN and USN conducted bilateral naval drills and exercises

during the 63rd Unitas Operation in September 2022, off the coast of Rio de Janeiro (USN, 2022). Aside the 2022 bilateral naval drill between USN and BN, the BN participated in the Exercise Obangame Express 2022. It was a multinational maritime exercise in West Africa in its 11th Iteration in Senegal that had 32 nations in participation (Sanchez, 2022). A. R. S. Selles (personal communication, 15 February 2024) observed that the BN has been noted for limited conduct of naval drills that sufficiently project it as a major modern naval force to friendly and enemy forces. limited conduct of naval drills portray weak operational readiness at sea as a viable deterrence to other maritime threats.

109. The field survey sought respondents' opinions on whether operational readiness at sea is a key factor in the provision of maritime security by BN for enhanced national development in Brazil. The survey outcome is indicated at Table 4.5.

Table 4.5: Respondents' Views on whether operational readiness at sea is a key factor in the provision of maritime security by BN for enhanced national development in Brazil.

Serial	Options	Frequency	Percentage
(a)	(b)	(c)	(d)
1.	Very essential	269	72.70
2.	Essential	32	8.65
3.	Indifferent	12	3.24
4.	Not essential	34	9.19
5.	Very irrelevant	23	6.22
Total		**370**	**100%**

Source: Researcher's Field Survey, 2024.

110. Table 4.5 shows that 72.70 per cent of respondents indicated that operational readiness at sea is a very essential factor in the provision of maritime

security by BN for enhanced national development in Brazil. Another 9.61 per cent indicated that it is essential, 3.45 per cent were indifferent, 9.36 per cent believed that it is not essential, while 5.91 per cent believed that is very irrelevant. A. R. S. Selles (personal communication, 15 February 2024) averred that operational readiness at sea is a crucial means of creating deterrence to threats and boosting the provision of maritime security. Thus, operational readiness at sea is important in the provision of maritime security by BN for enhanced national development in Brazil. Having examined the key issues, the contributions are discussed next.

DATA PRESENTATION AND ANALYSIS OF CONTRIBUTIONS OF THE ROLE OF BRAZIL NAVY IN PROVIDING MARITIME SECURITY ON NATIONAL DEVELOPMENT IN BRAZIL

111. There are some contributions of the role of BN in providing maritime security on national development in Brazil. These contributions are job creation, revenue generation, shipbuilding industrial growth and fish production and exports as discussed next.

JOB CREATION

112. In Brazil, the maritime security by BN plays a key role in the economy, by enabling the maritime sector to contribute to both direct and indirect job creation. From 2014 to 2020 the direct and indirect employment in the fishing industry

alone in maritime sector in Brazil were estimated to average 3.5 million jobs (Food and Agriculture Organisation (FAO), 2024). Also, during 2015-2023, the shipping industry on average supported over 2.5 million direct and indirect jobs (Stipp, 2023). The direct and indirect jobs offer a comprehensive view of the overall contribution of maritime security provided by BN for the sector to support employment in Brazil.

113. According to A. F. I. Carneiro (personal communication, 17 April 2024), the provision of a safe and secure maritime environment enables the sector to stimulate maritime economics job creation. Job creation in the maritime sector contribute to improve labour force participation rate in Brazil shown at Table 4.6.

Table 4.6: Brazil Labour Force Participation Rate in Brazil

Serial	Year	Participation Rate	Annual Change	Remark
(a)	(b)	(c)	(d)	
1.	2022	56.39%	1.56%	
2.	2021	54.83%	3.39%	
3.	2020	51.44%	-5.60%	
4.	2019	57.04%	0.90%	
5.	2018	56.14%	0.11%	
6.	2017	56.03%	0.88%	
7.	2016	55.15%	0.22%	
8.	2015	54.93%	-	

Source: Compiled by Researcher

From: https://www.macrotrends.net/global-metrics/countries/BRA/brazil/labor-force-participation-rate

114. Table 4.6 shows that labour force participation rose from 54.93 per cent in 2015 to 56.03 per cent in 2017 and peaking 57.04 per cent in 2017. A. F. I. Carneiro (personal communication, 17 April 2024) was of the opinion that the role

of BN in providing maritime security forms a vital in maritime sector contribution to employment and national development in Brazil. Thus, the job creation is a contribution of the role of BN in providing maritime security to national development in Brazil.

REVENUE GENERATION

115. Offenses such as smuggling and embezzlement are practicing that harm Brazilian traders, importers, and producers who operate legally. These practices also discourage investment by legitimate entrepreneurs in Brazil and contribute to job losses. With tax evasion, millions of reais are no longer collected from public coffers and are subsequently donated to society through public health and education policies, among others. Furthermore, counterfeit goods imported illegally also violate trademark rights and have the potential to put the health of the population at risk. In 2019, Brazil lost R$291.4 billion to the illegal market and R$193 billion in taxes were not collected due to products that enter Brazil irregularly, from fertilizers to cigarettes and electronic products (Institute for Economic and Social Development of Borders (IDESF), 2020). In providing maritime security, the BN is not generating revenue but creates the conducive atmosphere for revenue generation by and in the sector.

116. According to A. F. I. Carneiro (personal communication, 17 April 2024), the BN is not a revenue generation agency, but it enables revenue generation

through the seizure of smuggled products in naval patrol operations in the provision of maritime security. He further noted that Cigarette smuggling, for example, a very common activity on the coast of the North of the country, generates enormous losses to public coffers. It is estimated that, between 2012 and 2018, around R$94.4 billion were not collected on cigarettes tax by the Federal Revenue Service, as a result of this illegality. However, the BN has been combating the illegality and improving revenue generation for the FGB. Thus, revenue generation is a contribution of the role of BN in providing maritime security to national development in Brazil.

SHIPBUILDING INDUSTRIAL GROWTH

117. The shipbuilding industry in Brazil is a sea-based industry that boosts maritime transport infrastructure with its growth supported by the maritime security provided by the BN. Hence, Brazil has a significant shipbuilding and ship repair industry, with 3 key locations in Rio de Janeiro, Sao Paulo, and Bahia. The industry primarily focuses on constructing offshore support vessels like platform supply vessels, anchor handling tugs, and diving support vessels (TrustedDocks, 2024; Moura & Botter, 2022; Sirimanne, 2022; Maritime Activity Reports, 2024). Since 2015, the enabling environment created by the provision of maritime security by the BN, enabled the shipbuilding industry was able to gain growth and expansion.

118. Petrobras for example, increased its fleet from 60 vessels in 2014 to 110 vessels 2020, while in 2022, Brazil's national vessel ownership by registry had a commercial value of US$16.58 billion (Sirimanne, 2022; Maritime Activity Reports, 2024). This was with the aid of subsidy initiatives Merchant Marine Fund (MMF) by the FGB to promote new builds, vessel repairs, and infrastructure development. These include the US$1.3 billion subsidy in 2024 to support local shipyards (The Maritime Executive, 2024). Thus, shipbuilding industrial growth was aided by the FGB subsidy and maritime security provided by the BN.

119. According to J. C. Freitas (personal communication, 18 April24), asserted shipbuilding industrial growth was a result of the positive impact of the role of BN in providing maritime security on Brazil. He also noted that shipbuilding industrial growth enhances national development in the nation. Thus, shipbuilding industrial growth is a contribution of the role of BN in providing maritime security to national development in Brazil.

FISH PRODUCTION AND EXPORTS

120. Fish production and exports in Brazil are a significant part of guaranteeing food security and foreign exchange earnings in the nation, as large producer and exporter of fish in the world. Brazil has a diverse range of fish species that are caught with high demands both domestically and internationally. In terms of export, Brazil produces sufficient fish to meet domestic products with surplus for

exports to countries around the world. Hence, through fish production and exports, the maritime sector protected by the BN boosts food security, thereby enhancing national development in Brazil.

121. Fish production in Brazil increased from 551,900 metric tons 2020 to 559,000 metric tons in 2021, representing about 1.2 per cent increase (Ozbun, 2022). Fish production volume in Brazil 2013-2021 is further shown at Annex J. Fish export revenues in Brazil increased rose from US$23.8 million in 2022 to US$ 24.7 million in 2023 (Embrapa, 2023; Malheiros, 2024). According to R. S. Mattos (personal communication, 18 April 24), fish production for food and exports boost food security and enhanced national development in Brazil. E. C. da Silva (personal communication, 17 April 24) also added that fish production and exports are because the BN create the enabling environment with the provision maritime security. Thus, fish production and exports are a contribution of the role of BN in providing maritime security on national development in Brazil. The contributions now lead to data presentation on the challenges in the provision of maritime security by BN for enhanced national development in Brazil.

DATA PRESENTATION AND ANALYSIS ON CHALLENGES IN THE ROLE OF BRAZIL NAVY IN PROVIDING MARITIME SECURITY AND NATIONAL DEVELOPMENT IN BRAZIL

122. There are some challenges in the provision of maritime security by BN for enhanced national development in Brazil. The challenges are poor policy focus on domestic maritime security needs, slow-paced indigenous development of MSuA and limited application of AI technologies in maritime security intelligence operations. Others are insufficient OPV and limited conduct of naval drills. These challenges are discussed subsequently.

POOR POLICY FOCUS ON DOMESTIC MARITIME SECURITY NEEDS

123. Poor policy focus on domestic maritime security needs is a challenge characterised by more focus on maritime policies that align more to external cooperation with other nations or regions. Since 2019, Brazil maintains high diplomatic priorities, while its maritime security and safety agenda for the Blue Amazon requires more vigorous implementation. Hence, the BMSRF is more predominantly foreign looking than domestic which makes the various policies that support maritime security and safety to be lobally and regionally inclined. A study by Platiau and Barros (2022) indicates that Brazil's somewhat foreign looking maritime security policies are attributable to the fact that there are no direct threats from regional enemies. Nonetheless, A. R. S. Selles (personal communication, 15 February 2024) opined that despite that Brazil enjoys a

relative profound national and regional peace which also include its maritime domains, it should not only focus on offering international assistance. C. A. A. B. Dias (personal personal communication, 11 April 2024) corroborated A. R. S. Selles when he opined adequate implementation of the SisGAAz will improve the preparedness of BN in provision of maritime in the Blue Amazon of Brazil. Hence, the implementation of the SisGAAz and other inward looking maritime security policies would stimulate and boost maritime economics for enhanced national development in Brazil.

124. In 2019, 'the black August' oil spill incident that polluted vast parts of Brazil's coastline, affecting 42 cites was alleged to be a criminal oil dumping (Platiau & Barros, 2022; Deutsche Welle, 2019). It killed over 2.3 million sea animals including turtles, fish, and dolphins among other animals (Deutsche Welle, 2019; Craveiro et al, 2021). The pollution indicated a tipping point for Brazil to revisit and redirect its maritime security policies inwards for increased domestic benefits.

125. The field survey sought respondents' views on whether poor policy focus on domestic maritime security needs impedes the provision of maritime security by BN for enhanced national development in Brazil. The survey result is at Table 4.7.

Table 4.7: Views on whether poor policy focus on domestic maritime security needs impedes the provision of maritime security by BN for enhanced national development in Brazil

Serial	Options	Frequency	Percentage
(a)	(b)	(c)	(d)
1.	Strongly Agree	209	56.49%
2.	Agree	76	20.54%
3.	Indifferent	24	6.48%
4.	Disagree	29	7.84%
5.	Strongly Disagree	32	8.65%
Total		**370**	**100%**

Source: Researcher's Field Survey, 2024.

126. Table 4.7 shows that 56.49 per cent of respondents strongly agreed that poor policy focus on domestic maritime security needs impedes the provision of maritime security by BN for enhanced national development in Brazil. Another 20.54 per cent, 7.84 per cent disagreed and 8.65 per cent strongly disagree, while 6.41 per cent were indifferent. A. R. S. Selles (personal communication, 15 Feb 24) buttressed these findings when he asserted that while the BMSRF is inextricably connected to Brazilian diplomacy and geopolitics, poor inward policy focus such as low SisGAAz implementation is a challenge. Thus, poor policy focus on domestic maritime security needs impedes the provision of maritime security by BN for enhanced national development in Brazil.

SLOW-PACED INDIGENOUS DEVELOPMENT OF MARITIME SURVEILLANCE ASSETS

127. Slow-paced indigenous development of MSuA is challenge that impedes the BN from attaining full MSC in Brazil's maritime areas. The VMS so far,

enable the BN, other maritime managers and relevant authorities to keep track of vessels and their activities along Brazilian Jurisdictional Waters (BJW). However, there are still high violations of compliance with regulatory measures in curbing IUU fishing (Global Fishing Watch (GFW), 2024). In 2021, Brazil began to share its VMS data with GFW to make the movements of over 1,500 industrial fishing vessels visible on the GFW map (GFW, 2024). However, there was still the need for fuller capturing of IUU fishing activities within Brazilian waters, but the VMS is insufficient and is partly obsolete.

128. J. C. Freitas (personal communication, 18 April 2024) noted that the VMS since 2007 is key in the provision of maritime security by BN in addition to its various internal developmental efforts. However, the indigenous efforts alone are not enough to meet the maritime security needs and the Phases1-4 schedules in the SisGAAz. He added that, the BN is aware of the gap. Hence, in 2022, the BN Programme Managing Directorate (DGePM) published a Request for Expressions of Interest (REOI) for the supply of Maritime Monitoring Systems. In this regard, the field survey sought opinions on whether slow-paced indigenous development of MSuA impedes the provision of maritime security for enhanced national development in Brazil. The outcome is shown at Table 4.8.

Table 4.8: Respondents' Views on whether slow-paced indigenous development of MSuA impedes the provision of maritime security for enhanced national development in Brazil

Serial	Options	Frequency	Percentage
(a)	(b)	(c)	(d)
1.	Strongly Agree	231	62.43%
2.	Agree	55	14.86%
3.	Indifferent	21	5.68%
4.	Disagree	38	10.27%
5.	Strongly Disagree	25	6.76%
Total		**370**	**100%**

Source: Researcher's Field Survey, 2024.

129. Table 4.11 shows that 62.43 per cent of respondents strongly agreed that slow-paced indigenous development of MSuA impedes the provision of maritime security for enhanced national development in Brazil. Another 14.86 per cent agreed, 10.27 per cent disagreed and 6.76 per cent strongly disagreed, while 5.68 per cent were indifferent. In view of these findings, J. C. Freitas (personal communication, 18 April 2024) opined that domestic efforts at developing MSuA by BN alone won't suffice meet emerging maritime security needs across Brazilian waters. As such, there is the need for acquisition from foreign and domestic defence industries. Thus, slow-paced indigenous development of MSuA is a barrier to the provision of maritime security by BN for enhanced national development in Brazil.

LIMITED APPLICATION OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN MARITIME SECURITY INTELLIGENCE OPERATIONS

130. Limited application of AI technologies is a challenge that hinders the role of BN in the provision of maritime security for enhanced national development in

Brazil. It entails partial integration in maritime security intelligence operations with negative impacts impeding maritime security for enhanced national development. In 2018, the BN began to operate the CITRA covering vessels in Rio de Janeiro's eastern zone, and 14 other municipalities to combat maritime organised crimes, including weapons and drug trafficking among other crimes., in real-time. (Barretto, 2018). However, C. G. Cardoso (personal communication, 26 April 2024) noted that the system is made of fixed sensors and cameras that form the monitoring and control system, including radars functions on advanced technologies, but not totally AI-enabled or AI-powered.

131. The field survey sought opinions on whether limited application of AI technologies in maritime security intelligence operations impedes the provision of maritime security for enhanced national development in Brazil. The survey outcome as shown at Table 4.9.

Table 4.9: Respondents' Views on Whether Limited application of AI technologies in maritime security intelligence operations Impedes the provision of maritime security for enhanced national development in Brazil

Serial	Options	Frequency	Percentage
(a)	(b)	(c)	(d)
1.	Strongly Agree	225	60.81%
2.	Agree	54	14.59%
3.	Indifferent	22	5.95%
4.	Disagree	37	10%
5.	Strongly Disagree	32	8.65%
Total		**370**	**100%**

Source: Researcher's Field Survey, 2024.

132. Table 4.9 above shows that 60.81 per cent of the respondents strongly agreed that limited application of AI technologies in maritime security

intelligence operations impedes the provision of maritime security for enhanced national development in Brazil. Another 14.59 per cent agreed, 10 per cent disagreed, while 8.65 per cent strongly disagreed and 5.95 per cent were indifferent. Buttressing these findings, C. G. Cardoso (personal communication, 26 April 2024) stated that criminals are already exploiting disruptive technologies such as AI and Blockchain to perpetrate maritime crimes. Hence, the use of lesser technologies by the BN would impede its maritime security and defence efforts. Thus, limited application of AI technologies is a hinderance in the provision of maritime security by BN for enhanced national development in Brazil.

INSUFFICIENT OFFSHORE PATROL VESSELS

133. Insufficient OPV is a challenge hampering the role of BN in the provision of maritime security for enhanced national development in Brazil. It refers to unsatisfactory coverage of a nation's territorial waters by available ocean patrol of naval platforms agencies. In 2023, the BN reported that it was improving the provision of security and protection for Brazil's maritime resources. This was through the supply of 3 OPVs and associated crew training to BN troops. In this regard, the BN signed a contract worth £133 million with BAE Systems for the supply the OPVs and ancillary support services. The BN noted that the acquisition of the 3 OPVs from BAE Systems would make an important contribution to both

its ability to provide security and protection to Brazil's Jurisdictional Waters (BAE Systems, 2024). They would also aid the BN to deliver on its commitments to enhancing national security and development in Brazil. However, S. E. F. Luiz (personal communication, 11 April 2024) noted that the addition of 3 OPVs is an increase in the inventory of the BN, but they are still not adequate. Hence, insufficient OPV undermines the provision of maritime security by the BN for enhanced national development in Brazil.

134. The field survey sought opinions on whether insufficient OPV impedes the provision of maritime security for enhanced national development in Brazil. The survey outcome is shown at Table 4.10.

Table 4.10: Respondents' Views on if insufficient OPV impedes the provision of maritime security for enhanced national development in Brazil

Serial	Options	Frequency	Percentage
(a)	(b)	(c)	(d)
1.	Strongly Agree	246	66.49%
2.	Agree	52	14.06%
3.	Indifferent	18	4.86%
4.	Disagree	18	4.86%
5.	Strongly Disagree	36	9.73%
Total		**370**	**100%**

Source: Researcher's Field Survey, 2024.

135. Table 4.10 shows that 66.49 per cent of respondents strongly agreed that insufficient OPV impedes the provision of maritime security for enhanced national development in Brazil. Another 14.06 per cent agreed, 4.86 per cent were indifferent, while 4.86 per cent also disagreed and 9.73 per cent strongly disagreed. Buttressing these findings, S. E. F. Luiz (personal communication, 11

April 2024) without ample OPV, a naval platform can seem to be all together inadequate. Thus, insufficient OPV is a hindrance in the provision of maritime security by BN for enhanced national development in Brazil.

LIMITED CONDUCT OF NAVAL DRILLS

136. Limited conduct of naval drills is a challenge that impedes the role of BN in the provision of maritime security for enhanced national development in Brazil. It entails rare performance of naval exercises for capacity building or sea power projection with the demonstration of effect, persistence, and influence by a navy. In Brazil, the BN is noted for combined naval drills in collaboration with other navies especially with African naval forces in various African coasts in 2016, 2022 and 2023 (Sanchez, 2022; DefenceWeb, 2023; Lionel, 2023). However, according to A. R. S. Selles (personal communication, 15 February 2024), the BN has not been conducting frequent naval exercises or drills in Brazil compared to what obtained with ROK Navy in Singapore. Renato L. Fernandes (personal communication, 25 April 2024) corroborating A. R. S. Selles noted that the BN has a huge reputation outside South American that it needs to also project within its national and regional territories. However, its limited conduct of naval drills domestically is an impediment.

137. The field survey also sought opinions on whether limited conduct of naval drills impedes the provision of maritime security for enhanced national

development in Brazil. The survey outcome as shown at Table 4.11.

Table 4.11: Respondents' Views on whether limited conduct of naval drills impedes the provision of maritime security for enhanced national development in Brazil

Serial	Options	Frequency	Percentage
(a)	(b)	(c)	(d)
1.	Strongly Agree	249	67.30%
2.	Agree	40	10.81%
3.	Indifferent	16	4.32%
4.	Disagree	32	8.65%
5.	Strongly Disagree	33	8.92%
Total		**370**	**100%**

Source: Researcher's Field Survey, 2024.

138. Table 4.11 shows that 67,30 per cent of respondents strongly agreed that limited conduct of naval drills impedes the provision of maritime security for enhanced national development in Brazil. Another 10.81 per cent agreed, while 4.32 per cent were indifferent, 8.65 per cent disagreed and 8.92 per cent strongly agreed. In addition, A. R. S. Selles (personal communication, 15 February 2024) averred that if the BN is not perceived to possess ample operational readiness at sea by foes or threats within Brazil's maritime space, such perception could undermine its maritime security efforts. Thus, limited conduct of naval drills is an impediment to the provision of maritime security by BN for enhanced national development in Brazil. The data analysis of the challenges now leads to the discussion of results.

DISCUSSION OF RESULTS

139. This section presents the discussion of results of the research. The discussion correlates the reviewed related studies, the underpinning theoretical

framework, issues involved, contributions and challenges, regarding maritime security and national development in Brazil. Basically, the conceptual relationship is that a direct relationship exists between maritime security and national development. There was the need to further understand the interlinks in the provision of maritime security by BN for enhanced national development in Brazil from existing related works on the subject. This for example, includes positions of the relevant authors on how policy framework focus affected the provision of maritime security by the USN in the USA. This current research therefore interrogated the policy in terms of the role of BN in the provision of maritime security for enhanced national development in Brazil. The varied perspectives offered ample insights despite some gaps in literature which this research sought to fill using a suitable theoretical framework and field surveys.

140. The SFT adopted for the study offer a model for maritime security analysis. Impliedly, the theory connects maritime security and national development for naval forces to combat a nation's maritime threats towards enhancing national development. Thus, by inserting the research variables in SFT, effective maritime security provided by the BN would enhance national development in Brazil, if the identified underlying issues were addressed.

141. The identified issues in this study arose as vital concern due to their inherent respective challenges which must be mitigated. Hence, it could be inferred from

the study that the issue of policy framework for maritime security is a major consideration in the provision of maritime security by BN for enhanced national development in Brazil. This is due to the inherent challenge of poor policy focus on domestic maritime security needs. The analysis of data also showed that, MSC is a vital issue, because there is the impediment of slow-paced indigenous development of MSuA. Furthermore, the analysis of maritime security intelligence data exposed the challenge of limited application of AI technologies in maritime security intelligence operations. Similarly, the analysis of naval platforms brought to fore the challenge of insufficient OPV. Moreover, the issue of operational readiness at sea exposed the challenge of limited conduct of naval drills. These challenges impede the provision of maritime security for enhanced national development in Brazil.

142. Furthermore, the study analysed that maritime security has a broad range of contributions to national development in Brazil. Some contributions that were analysed include job creation, revenue generation, shipbuilding industrial growth and fish production and exports as contributions to national development in Brazil. Accordingly, the impinging factors underscore the need for the role of BN in providing maritime security for enhanced national development in Brazil. It is thus, evident from the study that if the challenges in the provision of maritime security are fully mitigated, national development will be enhanced in Brazil. This

is because, the analyses, reviewed related studies and SFT indicate that maritime security have strong positive contributions to national development in Brazil. There is thus, the need to boost maritime security by overcoming the challenges of the issues for enhanced national development in Brazil with the aid of some prospects. The prospects are highlighted in the next section.

PROSPECTS FOR IMPROVING THE ROLE OF BRAZIL NAVY IN PROVIDING MARITIME SECURITY FOR ENHANCED NATIONAL DEVELOPMENT IN BRAZIL

143. There are some prospects for improving the role of BN in providing maritime security for enhanced national development in Brazil. These prospects are the Brazilian Navy Strategic Plan 2040 (PEM 2040), the implementation of the over the horizon radar OTH-0100 and the adoption of the Blue Amazon concept. These are discussed next.

BRAZILIAN NAVY STRATEGIC PLAN 2040

144. In 2019, the BN unveiled the PEM 2040 as a naval strategy that provides elements for NSM with innovative Naval Objectives (NavOb) for the BN. The PEM 2040 contains a strategic section, describing relevant aspects of naval strategy, such as the Marine Operational Environment (MOP), threats to it, and the Naval Strategic Concept. Conversely, its executive portion describes the NSM, and NSA to achieve the set NavOb of the BN. By analysing the MOP, the PEM 2040 holds that Brazilian sea and waterways are vital for national prosperity.

This can be achieved through economic exploitation of marine resources for energy production and foreign trade in a safe and secure maritime environment provided by the BN. Thus, PEM 2040 holds a good prospect for improving the role of BN in providing maritime security for enhanced national development in Brazil.

IMPLEMENTATION OF THE OVER THE HORIZON RADAR OTH-0100

145. The OTH-0100 radar, a technical achievement of IACIT company, stands out as one of the few in the world with the ability to monitor vessels at distances of up to 200 Nautical Miles from the coast. Its main innovation lies in the ability to track non-cooperative vessels, those that do not transmit AIS (Automatic Identification System) signals, also known as “ghost ships” (Barros, 2024). In February 2024, representatives of the Brazilian Navy, through Navy DGePM, marked the official start of the contract for the supply of data from the advanced OTH-0100.

146. The operationalization of the OTH 0100 is an important milestone in the MSC boosting aspect of SisGAAz. It is expected to meet the top strategic priority of the BN in monitoring and controlling its BJW (Trade, 2022). Thus, the implementation of the over the horizon radar OTH-0100 by the DGePM is a prospect for improving the role of BN in providing maritime security for enhanced national development in Brazil.

ADOPTION OF THE BLUE AMAZON CONCEPT

147. The Maritime mentality is the degree of awareness of society and government decision makers about the importance of Maritime Power and its constituent elements for the nation's life, as well as the feeling of belonging men and women to the Brazilian maritime community, whose synergistic interaction favours expansion of this power for national interests. Hence, seeking to expand the maritime mentality in Brazilian society, the "Blue Amazon" concept was included in several official Brazilian Institute of Geography and Statistics (IBGE) and Ministry of Education (MEC) documents (BN, n.d.). This initiative creates conditions to shape public opinion toward influencing the Brazilian political class to direct greater resources into the maritime sector, including security. Thus, adoption of the Blue Amazon concept is a prospect for improving the role of BN in providing maritime security for enhanced national development in Brazil. The consideration of these prospects leads to a discussion of the research findings, conclusion and recommendations which will be covered in Chapter 5.

CHAPTER 5

RESEARCH FINDINGS CONCLUSION AND RECOMMENDATIONS

160. This chapter presents the summary of research findings and the strategies to mitigate the challenges of BN in providing maritime security for enhanced national development in Brazil. It also presents conclusion, recommendations, implementation outline and suggestions for further studies.

SUMMARY OF RESEARCH FINDINGS

161. The summary of research findings provides highlights of the outcomes of the research with decisive statements on the research questions. These are based on the data analysis and discussion of results. Thus, in the course of the research, the following findings were made:

a. A strong direct relationship exists between maritime security and national development. Improvements in the role of BN in providing maritime security will strongly enhance national development in Brazil

b. Efforts in ensuring the role of BN in providing maritime security for enhanced national development in Brazil would be better improved if the associated issues are resolved. The issues include policy framework for maritime security, MSC and maritime security intelligence data. Others are naval platforms and operational readiness at sea. These issues are discussed subsequently.

c. Also, the role of BN in providing maritime security for enhanced national development in Brazil can be improved with all the contributions. Contributions of the role of BN in providing maritime security on national development in Brazil. These are job creation, revenue generation, shipbuilding industrial growth and fish production and exports

d. By mitigating all the inherent challenges, the role of BN in providing maritime security can be better improved to enhance national development in Brazil. The challenges are poor policy focus on domestic maritime security needs, slow-paced indigenous development of MSuA and limited application of AI technologies in maritime security intelligence operations. Others are insufficient OPV and limited conduct of naval drills.

e. Despite the challenges there are some prospects for improvements. These are the PEM 2040, the implementation of the over the horizon radar OTH-0100 and the adoption of the Blue Amazon concept.

f. The discussion of results showed the relevance of the data analysed integrated views from the literature review. This includes the lessons from other countries such as the essentials of enforcing ethical standards among others

g. The study situated both variables in the SFT as the suitable theoretical framework adopted. It states that society exists by the functioning together of the individual entities and units such as the BN that form the Brazilian society.

162. Having highlighted the summary of findings, the strategies that will mitigate the challenges shall be discussed next.

STRATEGIES TO IMPROVE THE ROLE OF BRAZIL NAVY IN PROVIDING MARITIME SECURITY FOR ENHANCED NATIONAL DEVELOPMENT IN BRAZIL

163. There are some strategies to improve role of BN in providing maritime security for enhanced national development in Brazil. These are prioritised optimisation of SisGAAz, accelerated acquisition of MSuA from foreign and domestic defence industries and markets and fast-tracking of the integration of AI technologies in maritime security and intelligence operations. Others are domestic building more OPV with supplementary acquisitions offshores and conducting of more frequent naval exercises or drills in Brazil. These strategies are discussed subsequently.

PRIORITISED OPTIMISATION OF THE BLUE AMAZON MANAGEMENT SYSTEM

164. Prioritised optimisation of SisGAAz by BN would mitigate the challenge of poor policy focus on domestic maritime security needs. The objective is to ensure that Brazil focuses its attention on addressing domestic maritime

security needs of the country over international and regional collaborations. This would guarantee adequate internal security with positive impact on economic activities which more beneficial to the citizens. This strategy can be achieved by adjusting the status quo in the role of BN in providing maritime security, whereby external assistance seems to outweigh the extent of meeting internal maritime security needs. In this regard, the BN needs to emphasize the implementation and driving of prioritised optimisation of SisGAAz internally. This will refocus the efforts of BN in providing maritime security to domestic needs for enhance national development in Brazil.

165. The processes leading to the implementation and driving of optimisation of SisGAAz are to be funded from the annual budgets of the BN. This could commence by the First Quarter of 2025.

ACCELERATED ACQUISITION OF MARITIME SURVEILLANCE ASSETS FROM FOREIGN AND DOMESTIC DEFENCE INDUSTRIES AND MARKETS

166. Accelerated acquisition of MSuA from foreign and domestic defence industries and markets would mitigate the challenge of slow-paced indigenous development of MSuA. The objective is to develop robust surveillance capability towards improving the provision of maritime security by the BN for enhanced national development. This would ensure adequate monitoring of the entire maritime domain in order to safeguard the resources and protect maritime activities towards enhancing national development. It will also minimise the

violations of compliance with regulatory measures in curbing IUU fishing. The strategy could be achieved by timely purchase of MSuA by BN from friendly foreign defence industries and domestic ones. This will improve the role of BN in providing maritime security to enhance national development in Brazil.

167. The MSuA acquisition will be funded from the annual and special budgets of the BN. The BN could ensure that accelerated acquisition of maritime surveillance assets from foreign and domestic defence industries and markets begins by Second Quarter 2025.

FAST-TRACKING THE INTEGRATION OF ARTIFICIAL IINTELLIGENCE TECHNOLOGIES IN MARITIME SECURITY AND INTELLIGENCE OPERATIONS

168. Fast-tracking the integration of AI technologies in maritime security and intelligence operations would mitigate the challenge of limited application of AI technologies in maritime security intelligence operations. The objective is to provide real time maritime monitoring and control system for proactive maritime security and intelligence operations. This would ensure high degree of situational awareness and facilitate timely response security threats in the maritime environment. The strategy could be achieved by BN embarking on accelerated acquisition or indigenous invention of relevant AI technologies. This will improve the role of BN in providing maritime security to enhance national development in Brazil

169. The acquisition or indigenous invention of relevant AI technologies could be funded from the annual and special budgets of the BN. The BN could ensure fast-tracking the integration of AI technologies in maritime security and intelligence operations begins by Second Quarter 2025.

DOMESTIC BUILDING OF MORE OFFSHORE PATROL VESSELS WITH SUPPLEMENTARY ACQUISITIONS OFFSHORES

170. Domestic building of more OPV with supplementary acquisitions offshores would mitigate the challenge of insufficient OPV. The objective is to ensure robust presence at sea towards curbing illicit activities and maritime crimes that negatively impact security for enhanced national development. This strategy can be achieved through diligent indigenous vessel building efforts by the BN or be complemented with procurement from friendly nations. This will improve role of BN in providing maritime security for enhanced national development in Brazil.

171. The process could funded through the research and development budgets of the relevant science, technology and innovation units of the BN and the annual budgets of BN. The BN could ensure that the domestic building of more OPV with supplementary acquisitions offshores begins by First Quarter 2025.

CONDUCTING OF MORE FREQUENT NAVAL EXERCISES OR DRILLS IN BRAZIL

160. The conduct of more frequent naval exercises or drills in Brazil would mitigate the challenge of limited conduct of naval drills. The objective is to ensure proactive and preventive presence at sea towards deterring threats, illicit activities and maritime crimes that negatively impact national development. This will create the needed sea power projections to boost role of BN in providing maritime security for enhanced national development in Brazil.

160. The process could be funded through the annual budgets of the BN. The BN could ensure that conducting of more frequent naval exercises or drills in Brazil begins from Second Quarter 2025.

IMPLEMENTATION OUTLINE

161. A proposed implementation plan for the strategies has been outlined to cover 3 phases. The detailed implementation outline is at Annex K.

162. Also, there are activity timeline and Performance Measurement Evaluation (PME). These are at Appendices 1 and 2 to the implementation outline respectively.

SUITABILITY ACCEPTABILITY FEASIBILITY AND ETHICS TEST

163. The proffered strategies were subjected to the Suitability, Acceptability, Feasibility and Ethics (SAFE) Test. The SAFE Test is at Annex L.

164. Also, there is the risk assessment and mitigation. This is at Annex M.

CONCLUSION

165. The study examined role of BN in providing maritime security and its attendant contributions to national development in Brazil. The study adopted the field survey method to obtain respondents' views on the subject matter. It established a direct relationship between maritime security and national development in Brazil. The study was situated in the SFT adopted. Theory successfully explains maritime security and national development. This was by identifying society exists by the functioning together of the individual entities and units that form the society. This includes the role of BN in providing maritime security and its contributions to national development in Brazil.

166. The study observed that despite current efforts to improve maritime security, several factors still hinder the attainment of desired enhancement of national development in Brazil. Examples from Mexico and Indonesia provided viable lessons for the study. These include need for maritime security governance, robust naval platforms and essentials of deterrent operational readiness. Thus, the highlighted countries have put in place measures for improving maritime security by their respective naval forces for enhanced national development. An overview of maritime security revealed some important issues which require to be addressed. These issues include policy

framework for maritime security, maritime surveillance capability and maritime security intelligence data. Others are naval platforms and operational readiness at sea. The ability of the BN to resolve these issues will enable improvements in maritime security regulation to enhance national development in Brazil. However, the BN needs to overcome the inherent challenges of the issues.

167. Some of the challenges are poor policy focus on domestic maritime security needs, slow-paced indigenous development of MSuA and limited application of AI technologies in maritime security intelligence operations. Others are insufficient OPV and limited conduct of naval drills. Despite the challenges, analysis of data generated for the study revealed that role of BN in providing maritime security had some contributions to national development in Brazil. These include job creation, revenue generation, shipbuilding industrial growth and fish production and exports. In addition to the contributions, there are prospects for improving role of BN in providing maritime security for enhanced national development in Brazil. These prospects are the PEM 2040, the implementation of the over the horizon radar OTH-0100 and the adoption of the Blue Amazon concept.

168. The study then proffered some strategies to improve role of BN in providing maritime security for enhanced national development in Brazil. Accordingly, the BN could ensure that prioritised optimisation of SisGAAz

begins by First Quarter 2025. Additionally, the BN could ensure that accelerated acquisition of maritime surveillance assets from foreign and domestic defence industries and markets begins by Second Quarter 2025. Furthermore, The BN could ensure that fast-tracking of the integration of AI technologies in maritime security and intelligence operations begin by Third Quarter 2025. All these are to ensure that role of BN in providing maritime security significantly enhances national development in Brazil.

169. Also, the BN could ensure that the domestic building of more OPV with supplementary acquisitions offshores begins from First Quarter 2025. More so, the BN could ensure that conducting of more frequent naval exercises or drills in Brazil begins from Second Quarter 2025. These will enable role of BN in providing maritime security for enhanced national development in Brazil.

RECOMMENDATIONS

170. It is recommended that the BN should:

a. Prioritise the optimisation of SisGAAz by First Quarter 2025.

b. Ensure accelerated acquisition of maritime surveillance assets by Second Quarter 2025.

c. Fast-track the integration of AI technologies in maritime security and intelligence operations by Third Quarter 2025.

d. Consider domestic building of more OPV with supplementary acquisitions offshores by First Quarter 2025.

e. Conduct more frequent naval exercises and drills by Second Quarter 2025.

171. **Suggestions for Further Studies**. The outcome of the research is by no means exhaustive. Future researchers could seek to address other aspects of maritime security and national development in Brazil that have not been covered in this study. This is by exploring for example, how the integration of disruptive of technologies such as Blockchain and Robotics in providing maritime security can improve national development in Brazil.

172. Furthermore, the issues identified in the study were not exhaustive. Future researchers could consider extending this study to address the interactions of maritime security in Brazil from the perspective of enhancement of human security, internal security management and national security in Brazil.

Annexes:

A. Brazilian Maritime Security Framework.

B. Application of SFT in Maritime Security and National Development in Blue Economies.

C. List of Resource Persons Interviewed.

D. Calculation of Sample Size.

E. Questionnaire Sample.

F. Interview Guide Sample.

G. Demographic Data of Respondents.

H. Questionnaire Distribution & Return Rate.

I. Highlights of the PLA Navy MSuA.

J. Fish Prod Vol in Braz 2013-2021.

K. Implementation Outline.

L. SAFE Test.

M. Risk Assessment and Mitigation.

Appendices:

1. Activity Timeline.

2. The PME

Enclosures:

1. An Abridged Overview of SisGAAz.

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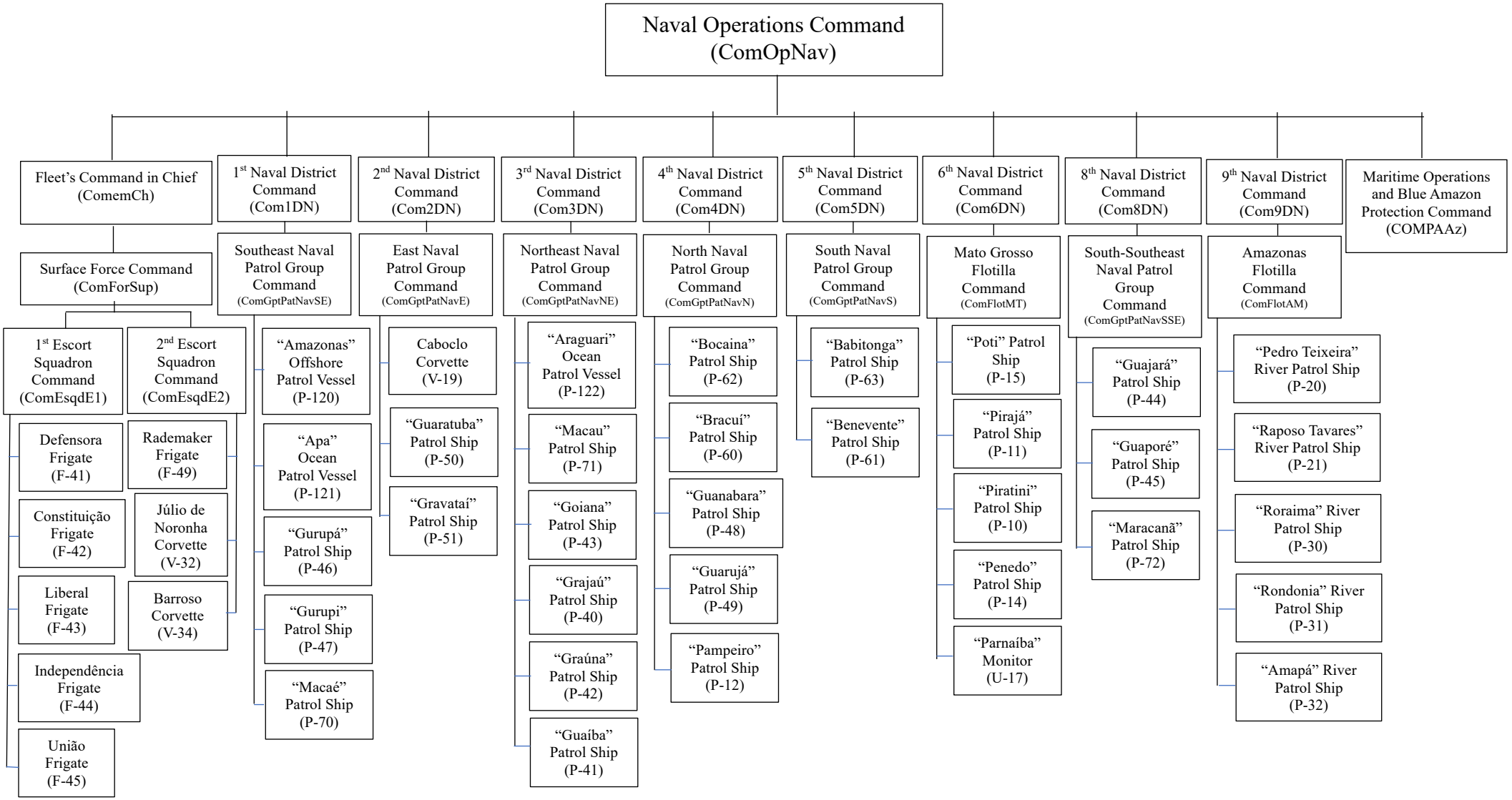
ANNEX A TO NDC/DARAS/165/G DATED 7 JUN 24

BRAZILIAN MARITIME SECURITY OPERATIONAL FRAMEWORK



Source: summary of Brazilian Navy Organizational Structure (https://marinha.mil.br/estrutura-organizacional)

ANNEX B TO
NDC/DARAS/165/G
DATED 7 JUNE 24

APPLICATION OF STRUCTURAL FUNCTIONALISM THEORY IN MARITIME SECURITY AND NATIONAL DEVELOPMENT IN BLUE ECONOMIES

Serial	Description	Remark
(a)	(b)	(c)
1.	Structural functionalism is a sociological theory that views society as a complex system whose parts work together to promote stability and solidarity. This theory can be applied to various aspects of society, including maritime security and national development in blue economies.	
2.	**Maritime Security:** In the context of maritime security, structural functionalism can be used to analyze how different components within the maritime domain interact to ensure the safety and security of maritime activities. This theory emphasizes the interconnectedness of various institutions, such as navies, coast guards, port authorities, and international organizations, in maintaining order and protecting maritime interests.	
3.	Structural functionalism suggests that each component plays a specific role in ensuring the smooth functioning of the maritime security system. For example, navies are responsible for defending territorial waters and conducting operations at sea, while coast guards focus on law enforcement and search-and-rescue missions. By understanding these roles and how they complement each other, policymakers can develop more effective strategies for enhancing maritime security.	
4.	Furthermore, structural functionalism highlights the importance of cooperation and coordination among different actors involved in maritime security. By fostering collaboration between states, international organizations, and private stakeholders, countries can address common challenges such as piracy, illegal fishing, human trafficking, and environmental threats more efficiently.	
5.	**National Development in Blue Economies:** When it comes to national development in blue economies - which encompass all economic activities related to oceans and seas - structural functionalism can provide insights into how various sectors interact to promote sustainable growth and prosperity.	
6.	In this context, structural functionalism emphasizes the interdependence of different industries within blue economies, such as shipping, fishing, aquaculture, tourism, offshore energy production, marine biotechnology, and conservation efforts. By recognizing how these sectors rely on each other for resources, markets, infrastructure, and regulatory frameworks, policymakers can design holistic development strategies that maximize economic benefits while minimizing negative impacts on marine ecosystems.	
7.	Moreover, structural functionalism underscores the role of governance structures in facilitating cooperation among stakeholders in blue economies.	

	By establishing clear rules, regulations, incentives, and monitoring mechanisms, governments can create an enabling environment for businesses to thrive while safeguarding marine resources for future generations.	
8.	In conclusion, the application of structural functionalism theory in maritime security and national development in blue economies offers a valuable framework for understanding the complex interactions between different actors and institutions involved in these domains. By adopting a systems thinking approach informed by this theory, policymakers can make more informed decisions that promote sustainable development and enhance security in maritime spaces.	
9.		

Source: Compiled by Researcher, 2024.

From:

Sewell, (2015);

https://www.britannica.com/topic/structural-functionalism

ANNEX C TO
NDC/DARAS/165/G
DATED 7 JUN 24

LIST OF RESOURCE PERSONS INTERVIEWED

1. Captain André R. S. Selles - Chief of Operations of the Fleet's Command in Chief of Brazilian Navy – date of interview on 15 February 2024.

2. Captain Carlos A. A. B. Dias – Commandant of the Maritime Operations Center (COpMar)– date of interview on 11 April 2024.

3. Captain Sergio E. F. Luiz – Brazilian Navy Attaché in the United Kingdom and Ex-Commandant Ocean Patrol Vessel (OPV) "Apa" from January 2018 to January 2020 – date of interview on 11 April 2024.

4. Captain Alessander F. I. Carneiro – Ex-Commandant of the North Naval Patrol Group Command (ComGptPatNavN) – date of interview on 17 April 2024.

5. Captain Naval Engineer (NE) Josmar C. Freitas - Industry-related advisor to the Defense Industry Joint Committee of the Navy Programme Managing Directorate (DGePM) – Date of interview on 18 April 2024.

6. Captain Renato L. Fernandes – Brazilian Advisor of the South Atlantic Maritime Area Coordinator (CAMAS) in the Uruguai – Date of interview on 25 April 2024.

7. Capitain Caio G. Cardoso – Former Director of Naval Systems Analysis Center of Brazilian Navy – Date of Interview on 26 April 2024.

8. Mr. Edson C. da Silva - President of the Artisanal Fishermen of the São Francisco Canal Association in Rio de Janeiro (APACSF), Director of the Maritime Workers Union of the Rio de Janeiro State (USTRJ) and Artisanal Fishing Advisor at the Municipal Secretariat for Solidarity Economy of the city of Rio de Janeiro – date of interview on 17 April 2024.

9. Mr. Robson da S. Mattos – President of the Fishermen and Shellfish Farmers Association of Marambaia Island (APMIM) in Rio de Janeiro – date of interview on 18 April 2024.

10. Lieutenant Colonel Aviator Fabrício Nery Fernandes - Commandant of 3º Squadron of the 7º Aviation Group (3º/7º GAV) of the Brazilian Air Force (FAB) – date of interview on 16 March 2024.

ANNEX D TO
NDC/DARAS/165/G
DATED 7 JUNE 24

CALCULATION OF SAMPLE SIZE

The Taro Yamane formula for the calculation of sample size with confidence level of 95 per cent and error margin of 5 per cent is given by:

The Taro Yamane's formula was used to calculate the sample size.

Yamane's formula is;

$$n = \frac{N}{1+N(e^2)}$$

n = Sample Size

N = Population = 776,500
e = Error Margin = 0.05

$$\text{Therefore, } n = \frac{776,500}{(1+ 776,500 \times 0.05^2)} = \frac{776,500}{1,941.2525} = 400$$

This was approximated to 400.

Therefore, a sample size of 400 was used for this study.

Source: Researcher's Analysis, 2024.

Source: Research Calculation, (2024). Sample Size Calculation Using Taro Yamane Formula.

ANNEX E TO
NDC/DARAS/165/G
DATED 7 JUN 24

A SAMPLE OF THE QUESTIONNAIRE ON MARITIME SECURITY AND NATIONAL DEVELOPMENT IN BRAZIL: AN APPRAISAL OF THE BRAZILIAN NAVY

National Defence College
Herbert Macaulay Way
Abuja
P.M.B 323

December 2023

Dear Respondent,

1. I am a participant of Course 32 of the National Defence College Nigeria. I am carrying out a research study titled **"Maritime Security and National Development in Brazil: An Appraisal of the Brazilian Navy (BN)"**. The study seeks to appraise the issues associated with the provision of maritime security by BN for enhanced national development in Brazil to proffer strategies and mitigate identified challenges.

2. I humbly wish to request you kindly spare time to answer the questions. I assure you that all information provided will be treated with utmost confidentiality and used for academic purpose only.

3. Grateful for your kind cooperation.

Yours faithfully,

AB PARTICIPANT
Capt
Participant

SECTION A (SOCIO-DEMOGRAPHIC OF RESPONDENTS)

4. Gender: ☐ Male ☐ Female

5. Age (year): ☐ 21 – 30 ☐ 31 – 40 ☐ 41 – 50 ☐ 51 and above

6. Working Experience: (Year) ☐ 0 – 5 ☐ 6 – 10 ☐ 11 – 20 ☐ 21 and above

7. Academic Qualification: ☐ Secondary School Certificate ☐ OND/ Diploma ☐ Graduate/ HND ☐ Post Graduate

8. Professional Field: ☐ Media/ Expert ☐ Security Force ☐ Others (Specify)

SECTION B: (GENERAL QUESTIONS)

PART 1: QUESTIONS RELATED TO ISSUES ASSOCIATED WITH THE ROLE OF BRAZIL NAVY IN PROVIDING MARITIME SECURITY AND NATIONAL DEVELOPMENT IN BRAZIL

Serial	Statement	Very Relevant	Relevant	Irrelevant	Very Irrelevant	Indifferent
(a)	(b)	(c)	(d)	(e)	(f)	(g)
9.	Do you agree that policy framework for maritime security is a relevant factor in the provision of maritime security by BN for enhanced national development in Brazil?					

10.	Do you agree that maritime surveillance capability is a relevant concern in the provision of maritime security by BN for enhanced national development in Brazil?					
11.	Do you agree that maritime security intelligence data is an essential factor in the provision of maritime security by BN for enhanced national development in Brazil?					
12.	Do you agree that naval platforms are key in the provision of maritime security by BN for enhanced national development in Brazil?					
13.	Do you agree that naval presence at sea is an essential consideration in the provision of maritime security by BN for enhanced national development in Brazil?					

14. What other **pertinent issues** can you think of regarding the provision of maritime security by BN for enhanced national development in Brazil

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PART 2: QUESTIONS RELATED TO EFFECTS OF THE ROLE OF BRAZIL NAVY IN PROVIDING MARITIME SECURITY ON NATIONAL DEVELOPMENT IN BRAZIL

Serial	Statement	Strongly Agree	Agree	Disagree	Strongly Disagree	Indifferent
(a)	(b)	(c)	(d)	(e)	(f)	(g)
15.	Do you agree that job creation is an effect of the role of BN in providing maritime security on national development in Brazil?					
16.	Do you agree that naval defence spending is an effect of the role of BN in providing maritime security on national development in Brazil?					
17.	Do you agree that shipbuilding industrial growth is an effect of the role of BN in providing maritime security on national development in Brazil?					
18.	Do you agree that fish production and exports are an effect of the role of BN in providing maritime security on national development in Brazil?					

19. What other **effects** can you think of, regarding the provision of maritime security by BN for enhanced national development in Brazil?

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PART 3: QUESTIONS RELATED TO CHALLENGES IN THE ROLE OF BRAZIL NAVY IN PROVIDING MARITIME SECURITY AND NATIONAL DEVELOPMENT IN BRAZIL

Serial	Statement	Strongly Agree	Agree	Disagree	Strongly Disagree	Indifferent
(a)	(b)	(c)	(d)	(e)	(f)	(g)
20.	Do you agree that poor policy focus on domestic maritime security needs is a challenge that hinders the provision of maritime security by BN from enhancing national development in Brazil?					
21.	Do you agree that slow-paced indigenous development of Maritime Situational Awareness (MSA) is a challenge that hinders the provision of maritime security by BN from enhancing national development in Brazil?					
22.	Do you agree that limited application of Artificial Intelligence (AI) technologies in maritime security intelligence operations is a challenge that hinders the provision of maritime security by BN from enhancing national development in Brazil?					
23.	Do you agree that insufficient Ocean Patrol Vessels (OPV) is a challenge that hinders the provision of maritime security by BN from enhancing national development in Brazil?					
24.	Do you agree that infrequent conduct of naval drills is a challenge that hinders the provision of maritime security by BN from enhancing					

	national development in Brazil?					

25. What other critical **challenges** can you think of, regarding the provision of maritime security by BN for enhanced national development in Brazil?

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26. In your opinion, what **prospects** within the last 5 years would you suggest to improve the provision of maritime security by BN for enhanced national development in Brazil?

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27. What **strategies** could you would you suggest to improve the provision of maritime security by BN for enhanced national development in Brazil?

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Appreciation: I thank you very much, Sir/Madam for kindly accepting to participate in this study, and for your prompt return of this questionnaire. Best regards always and God Bless.

Source: Researcher's Formulated Questionnaire, December, 2023.

ANNEX F TO
NDC/DARAS/165/G
DATED 7 JUNE 24

INTERVIEW GUIDE SAMPLE

National Defence College
Herbert Macaulay Way
PMB 323
Abuja.

December 2023

Dear Respondent,

INTERVIEW GUIDE ON MARITIME SECURITY AND NATIONAL DEVELOPMENT IN BRAZIL: AN APPRAISAL OF THE BRAZILIAN NAVY

1. I am a participant of Course 32 National Defence College, Nigeria and currently conducting a research on **Maritime Security and National Development in Brazil: An Appraisal of the Brazilian Navy (BN)**. The study seeks to appraise the issues associated with the provision of maritime security by BN for enhanced national development in Brazil to proffer strategies and mitigate identified challenges.

2. I humbly wish to request you kindly spare time to answer the questions. I assure you that all information provided will be treated with utmost confidentiality and used for academic purpose only.

3. Grateful for your kind cooperation.

Yours faithfully,

AB PARTICIPANT
Col
Participant

INTERVIEW GUIDE

1. In your view, what are the issues associated with the role of BN in providing maritime security and national development in Brazil?

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2. In your opinion, how does the role of BN in providing maritime security affect national development in Brazil?

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3. In your opinion, what are the challenges of BN in providing maritime security for enhanced national development in Brazil?

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4. In your own view, what are the prospects for improving the role of BN in providing maritime security for enhanced national development in Brazil?

……

5. Also, what would you suggest as strategies that could improve the role of BN in providing maritime security for enhanced national development in Brazil?

……

ANNEX G TO
NDC/DARAS/165/G
DATED 7 JUNE 24

DEMOGRAPHIC DATA OF RESPONDENTS

Table 4.1a: Distribution of Respondents by Sex

Gender	Frequency	%
Male	370	100
Female	0	0
Total	370	100

Source: Researcher's Field Survey, 2024

Table 4.1b: Distribution of Respondents by Age

Age Group (Years)	Frequency	%
18-30 years	106	28.65
31-45 years	150	40.54
46-60 years	107	28.92
61-Above	7	1.89
Total	370	100

Source: Researcher's Field Survey, 2024

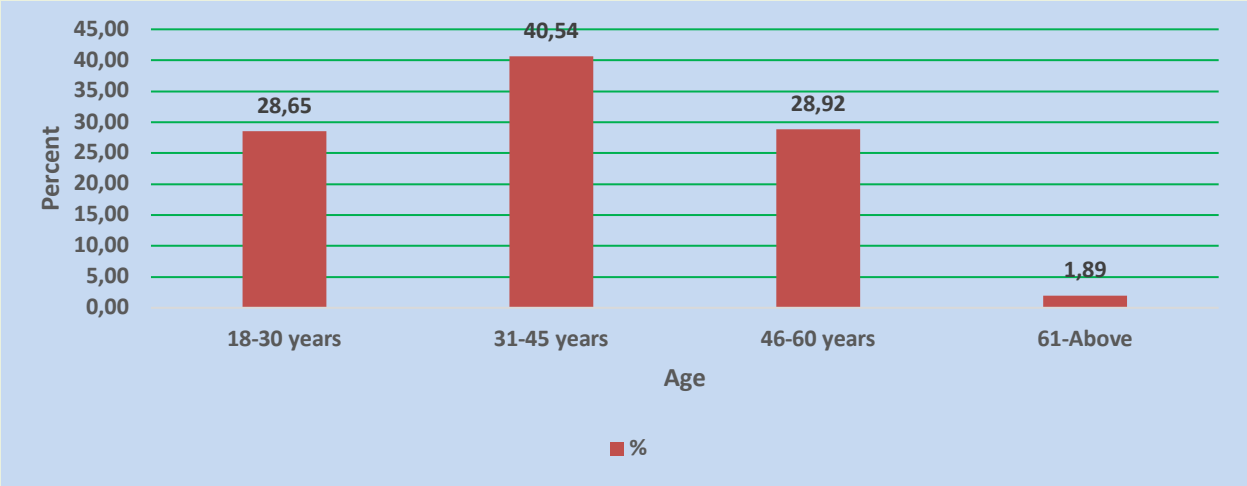


Table 4.1c: Distribution of Respondents by Educational Qualification

Educational Qualification	Frequency	%
GCE/Equivalent	7	1.89
OND/Equivalent	48	12.97
HND/BSc	176	47.57
MSc/PGD	92	24.86
PhD	47	12.71
Total	370	100

Source: Researcher's Field Survey, 2024

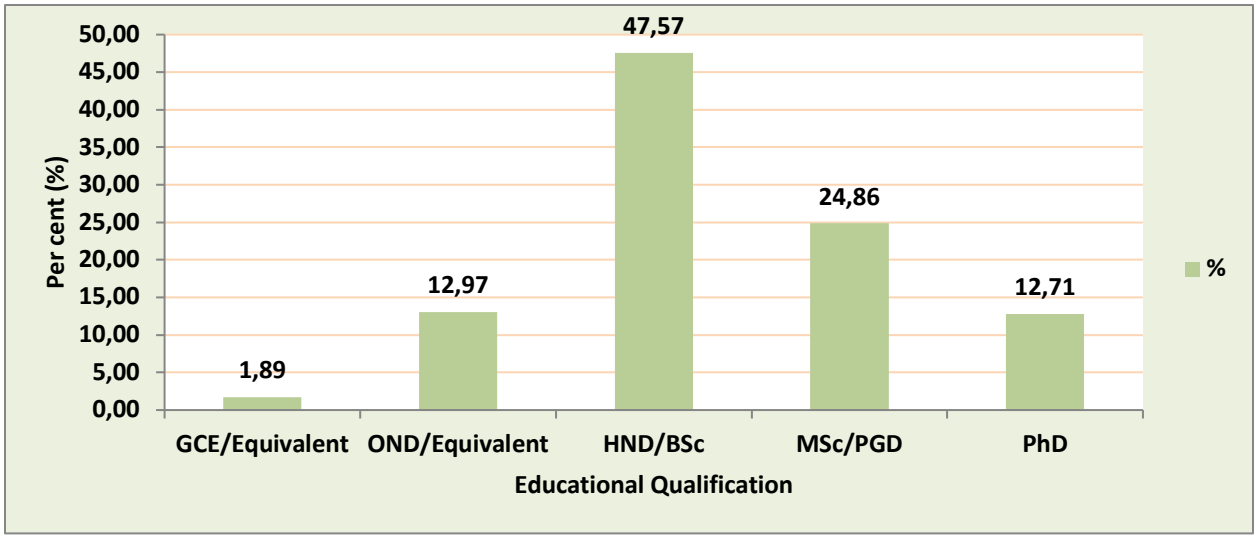
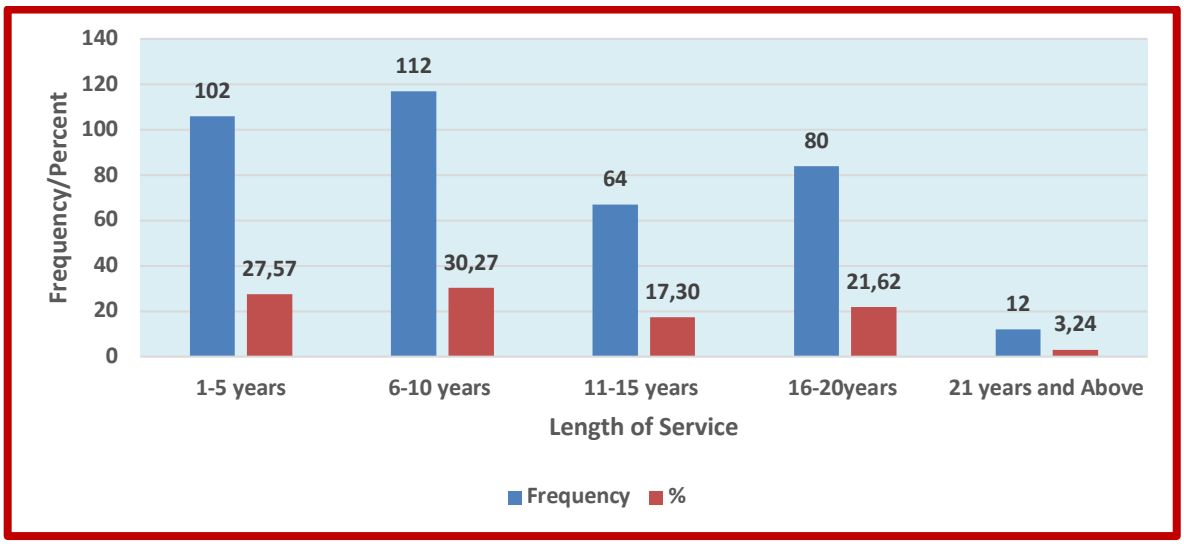


Table 4.1d: Distribution of Respondents by Length of Service

Length of Service	Frequency	%
1-5 years	102	27.57
6-10 years	112	30.27
11-15 years	64	17.30
16-20years	80	21.62
21 years and Above	12	3.24
Total	370	100

Source: Researcher's Field Survey, 2024



ANNEX H TO
NDC/DARAS/165/G
DATED 7 JUNE 24

QUESTIONNAIRE DISTRIBUTION AND RETURN TABLE

Serial	Respondents	Quantity	Number Returned	Number Unreturned	Returned %	Unreturned %	Total %	Remark
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
1.	Group 1	75	73	2	97	3	100	
2.	Group 2	35	31	4	89	11	100	
3.	Group 3	75	74	1	99	1	100	
4.	Group 4	25	24	1	96	4	100	
5.	Group 5	35	35	0	100	0	100	
6.	Group 6	15	14	1	93	7	100	
7.	Group 7	70	69	1	99	1	100	
8.	Group 8	35	31	4	89	11	100	
9.	Group 9	35	30	5	86	14	100	
	Total Respondents	400	381	19	95.2	4.8	100	

Source: Researcher's Field Survey, 2024

ANNEX I TO
NDC/DARAS/165/G
DATED 7 JUNE 24

HIGHLIGHTS CHINA'S PEOPLE'S LIBERATION ARMY NAVY MARITIME SURVEILLANCE ASSETS

China's Maritime Intelligence, Surveillance, and Reconnaissance Capability: Detecting, identifying, and tracking ships at sea are among the most fundamental intelligence, surveillance, and reconnaissance (ISR) tasks that any country must perform if it wants to exert control over a maritime area—a goal China has long sought to achieve in the waters off its eastern seaboard. So, it is hardly surprising that China, especially after the early 2010s, has significantly boosted its ISR capabilities in those waters, and none more so than in the South China Sea.

Certainly, considerably less escapes China's notice in the South China Sea today than in the past, judging by how much faster Chinese maritime forces react to events there. Given reasonably good ISR data on a ship's position, course, and speed, Chinese naval or coast guard vessels patrolling the area can now be expected to intercept it without much trouble. That ability has already helped Beijing better assert its sovereignty over the waters within its self-proclaimed "nine-dash line" in the South China Sea. But Beijing has not stopped there. It continues to heavily invest in ever more precise and timelier ISR collection assets in the area, leading one to wonder whether China's real intention is to develop an ISR network capable of targeting ships far out to sea. Such a network could enable China to defend the region with long-range guided weapons and perhaps even create a naval bastion for its sea-based nuclear deterrent.

Chinese ISR Collection Assets

The ISR collection assets that China has assembled in the South China Sea span a wide range of technologies. Each holds certain advantages and disadvantages. If properly woven together into a robust network, they offer Chinese commanders an increasingly accurate and persistent picture of maritime activity in the area.

High-frequency direction finding. Of all the ISR technologies that China employs, high-frequency direction finding (HF/DF) has probably been in use the longest. By collecting electronic emissions from a ship, an HF/DF site can assess a line of bearing to it. With lines of bearing from at least two suitably spaced HF/DF sites,

they can then estimate that ship's position with reasonable accuracy. Generally, the more HF/DF sites there are and the closer they are to their intended target, the better their estimates will be. That is why satellite imagery from 2018 revealing a new HF/DF site on Chinese-occupied Mischief Reef in the Spratly archipelago was notable. If operational, the site would undoubtedly improve China's HF/DF collection in the region.

Still, HF/DF accuracy has its limits, considering the technology's dependence on atmospheric conditions, which tend to vary. The South China Sea's highly turbulent weather during the summer and fall would compound its collection challenge. Moreover, the large number of electronic emissions from cellular telephone networks, commercial land-based transmitters, and civilian aircraft and ships all around the South China Sea would make it even more difficult for HF/DF sites to segregate and identify the emissions from a particular ship of interest.

Satellites. Given the limitations of HF/DF technology, China has understandably sought to strengthen its maritime ISR with satellites. Of course, not all satellites are equally capable. Even apart from differences in onboard sensors, the orbits of satellites have a big impact on how useful they are. Geostationary satellites are designed to "hover" over the earth and thus are useful for continuous monitoring of a specific area. On the other hand, they can only do so at very high altitudes of 36,000 km, reducing the fidelity of the data they can collect. In contrast, satellites orbiting the earth at relatively low altitudes can collect far more accurate data. Because they must circle the earth, they only spend a brief time over an area, leaving big gaps in their collection.

For China to collect ISR data accurate enough for weapons guidance, it would have to operate satellites from low-earth orbit. To gain the sort of persistent ISR coverage that would be needed to target moving ships, China would need a constellation of multiple satellites. And that is apparently what China has sought to create. Between 2017 and 2019, China put at least 15 ISR satellites into low-earth orbit. The last three were placed at 600 km above the earth at an orbital inclination of 35 degrees, well-suited to monitoring the tropics. No doubt, China's new satellite constellation has reduced the gaps between observations. While not publicly known, some of its satellites likely cover the South China Sea.

Possibly augmenting its space-based ISR above the region, China launched the first of ten remote-sensing satellites in 2019. They are part of what China calls its Hainan Satellite Constellation project, which is designed to "maintain uninterrupted observation" of the South China Sea. While the satellites are

nominally under the civilian control of the Chinese Academy of Sciences' Institute of Remote Sensing and Digital Earth, the data that it collects are likely to have dual-use applications. At the very least, the data will give China an understanding of the normal patterns of maritime activity (not to mention electronic emissions) in the region. The constellation's remaining satellites are slated to be in orbit by the mid-2020s.

Land-based radar. China also has at its disposal a large number of terrestrial radars. Indeed, radar is the principal all-weather means to perform wide-area surveillance; and China has one of the largest radar networks in the world. China has even built massive over-the-horizon backscatter (OTH-B) radar sites, which use the ionosphere and the surface of the sea, to detect aircraft and ships thousands of kilometers away. In 2004, China bought its first such OTH-B radar from Russia. Like older HF/DF technology, such radars can be beneficial for long-range detection and identification. Due to their use of long radar wavelengths, their precision is limited, as sensor performance suffers from adverse propagation effects. Plus, they are subject to the vagaries in the ionosphere and sea state.

Coastal radars are much more helpful for reliable tracking and targeting of ships at sea, but most have a difficult time reliably peering beyond 200 to 250 km offshore. Hence, it was no surprise that China announced plans to further expand its coastal radar network in 2014. Nor was it surprising that among the first facilities that China built on its artificial islands in the Spratly archipelago were radars, given their distance from the Chinese mainland. Radars surely give China more persistent and precise situational awareness in the South China Sea. Even so, the region's waters are expansive, and big coverage gaps remain between China's land-based radar sites.

Sea-based radar. One way to close those coverage gaps would be to build radar sites on the sea. And that is what China set about doing in 2016. It began construction on its "Blue Ocean Information Network," an array of radars built on unmanned semi-submersible platforms around the South China Sea. Designed to either float in deeper waters or be moored in shallower waters, each platform stands between 10 to 20 meters above the water and has a surface area of about 250 to 300 square meters. As of 2020, five such platforms have been constructed around Hainan Island and one near the Paracel Islands.

According to the Chinese journal Electronic Science & Technology, China plans to expand the "Blue Ocean Information Network" in "key maritime areas of [Chinese] jurisdiction" and start full construction of the marine network by 2025.

The network is designed to "meet the urgent needs of military and civilian authorities for the acquisition of information in China's jurisdictional maritime areas." Naturally, that is likely to raise concerns among China's neighbors, considering the ease with which the Chinese military could access the data from the network's radars. In addition, depending on their power output, the radars could be used for not only detection, identification, and tracking, but also for the targeting of ships at sea. Adding to such concerns, the Chinese military's China Military Online website characterized the platforms as a "new system to defend islands and reefs in the South China Sea" in 2019.

Air-based radar. As recently as the early 2010s, China's airborne ISR over the South China Sea was still rudimentary, largely consisting of long-range patrols by Chinese H-6 bombers using their onboard surveillance radars rather than more powerful ones found on dedicated airborne early warning (AEW) aircraft. By the mid-2010s, however, China had swapped out the H-6 bomber with the KJ-200, China's first entirely domestically built AEW aircraft, on those patrols. More recently, China has begun to replace the KJ-200 with the KJ-500, its latest AEW aircraft, which is fitted with an improved phased-array radar capable of simultaneously tracking 60-100 airborne targets out to 470 km.

In 2017, the first KJ-500 AEW aircraft appeared at Lingshui naval air base on Hainan Island. In May 2020, China even dispatched a KJ-500 to the airstrip on Chinese-controlled Fiery Cross Reef in the Spratly archipelago. And then, in December 2020, satellite imagery spotted five KJ-500s on Lingshui's aircraft apron. Given that China is currently estimated to have only 15 KJ-500s in its entire inventory (and its naval air force has only seven of those), the presence of five KJ-500s at a single naval air base is noteworthy. If all of them are permanently stationed there, then China could maintain at least one KJ-500 over the South China Sea at all times.

Beyond its manned platforms, China has deployed a number of ISR-capable unmanned aerial vehicles (UAV). Of course, the payloads of such UAVs are far smaller than those of AEW aircraft, which means that their radars are likely to be less powerful and, thus, have shorter detection ranges. Nevertheless, their ability to loiter overhead for long stretches allows them to conduct what is called "persistent surveillance." If employed at the right places and times, they can fill gaps in AEW or satellite coverage over the South China Sea.

Certainly, China has ploughed significant resources into the development of UAVs since the early 2000s. Though it is unclear how many ISR UAVs China

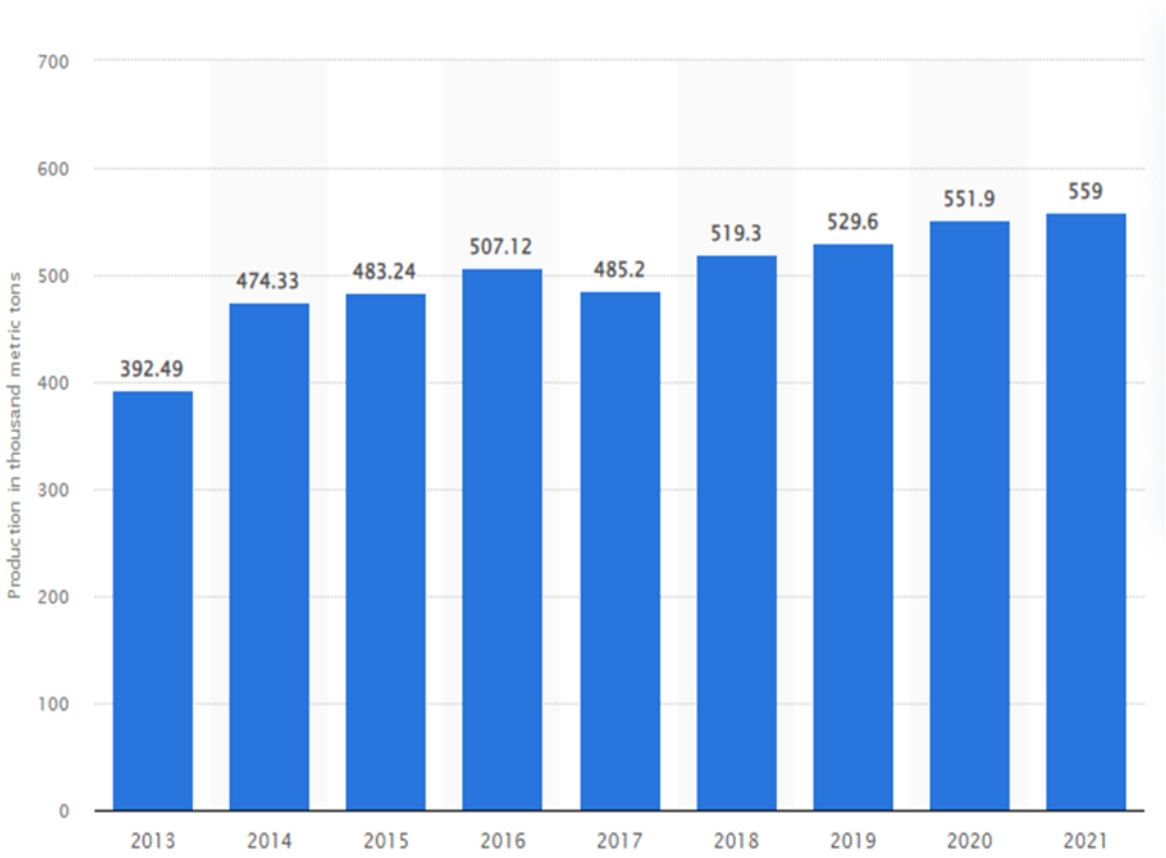
currently has in service, a few have been spotted at Lingshui naval air base since 2016. These included three BZK-005 and two WZ-7 (“Soar Dragon”) high-altitude long-endurance reconnaissance UAVs. Satellite imagery also revealed a BZK-005 on Woody Island in the Paracel archipelago. And, in 2018, Japan’s report of a BZK-005 patrolling above the East China Sea seemed to confirm that China had begun to use such UAVs for maritime ISR

Source: Compiled by Researcher, 2024.

From: https://www.fpri.org/article/2021/05/chinas-maritime-intelligence-surveillance-and-reconnaissance-capability-in-the-south-china-sea/

ANNEX J TO
NDC/DARAS/165/G
DATED 7 JUNE 24

FISH PRODUCTION VOLUME IN BRAZIL 2013-2021



Source: https://www.statista.com/statistics/1073590/brazil-fish-production-volume/

ANNEX K TO
NDC/DARAS/165/G
DATED 7 JUNE 24

IMPLEMENTATION OUTLINES FOR THE RECOMMENDATIONS

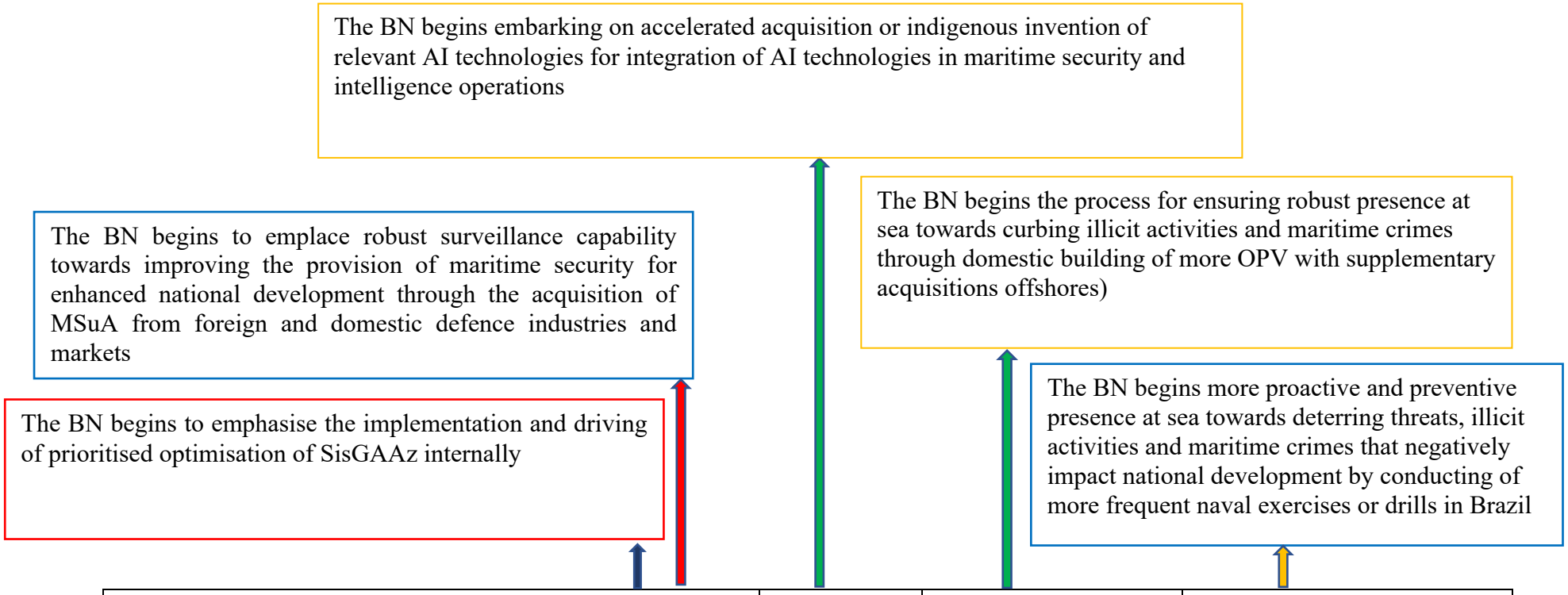
Serial	Strategies	Implementation Plan			Action
		Phase 1 **(0-6 months)**	**Phase 2 (7 - 12 months)**	Phase 3 (**Above 12 months**)	
(a)	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**
1.	Prioritised optimisation of SisGAAz	The BN begins to emphasise the implementation and driving of prioritised optimisation of SisGAAz internally	The BN deepens the implementation and driving of prioritised optimisation of SisGAAz internally	Monitoring, implementation and consolidation	BN
2.	Accelerated acquisition of MSuA from foreign and domestic defence industries and markets	The BN begin to emplace robust surveillance capability towards improving the provision of maritime security for enhanced national development through acquisition of MSuA from foreign and domestic defence industries and markets	The BN deepens its surveillance capability towards improving the provision of maritime security for enhanced national development through acquisition of MSuA from foreign and domestic defence industries and markets	Monitoring, implementation and consolidation	BN
3.	Fast-tracking of the integration of AI technologies in maritime security and intelligence operations	The BN begins embarking on accelerated acquisition or indigenous invention of relevant AI technologies for integration of AI technologies in maritime security and intelligence operations	The BN intensifies acquisition or indigenous invention of relevant AI technologies for integration of AI technologies in maritime security and intelligence operations	Monitoring, implementation and consolidation	BN
(a)	**(b)**	**(c)**	**(d)**	Monitoring, implementation and consolidation	**(f)**

4.	Domestic building of more OPV with supplementary acquisitions offshores	The BN begins the process for ensuring robust presence at sea towards curbing illicit activities and maritime crimes through domestic building of more OPV with supplementary acquisitions offshores	The BN deepens presence at sea towards curbing illicit activities and maritime crimes through domestic building of more OPV with supplementary acquisitions offshores	Monitoring, implementation and consolidation	BN
5.	Conducting of more frequent naval exercises or drills in Brazil	The BN begins more proactive and preventive presence at sea towards deterring threats, illicit activities and maritime crimes that negatively impact national development by conducting of more frequent naval exercises or drills in Brazil	The BN begins more proactive and preventive presence at sea towards deterring threats, illicit activities and maritime crimes that negatively impact national development by conducting of more frequent naval exercises or drills in Brazil	Monitoring, implementation and consolidation	BN

Source: Researcher's Planning, May 2024.

APPENDIX 1 TO
ANNEX K TO
NDC/DARAS/165/G
DATED 7 JUNE 24

ACTIVITY TIMELINE FOR THE PROFFERED STRATEGIES



Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
2025	2025	2025	2025

Source: Researchers' Implementation Plan, 2024.

APPENDIX 2 TO
ANNEX K TO
NDC/DARAS/165/G
DATED 7 JUNE 24

PERFORMANCE MEASUREMENT EVALUATION FOR STRATEGIES

1. **Objective**. Implement strategies to improve the role of BN in providing maritime security for enhanced national development in Brazil.
2. **Strategies**. Strategies to improve the role of BN in providing maritime security for enhanced national development in Brazil are prioritised optimisation of SisGAAz, accelerated acquisition of MSuA from foreign and domestic defence industries and markets as well as fast-tracking of the integration of AI technologies in maritime security and intelligence operations. Others are domestic building of more OPV with supplementary acquisitions offshores, and conducting of more frequent naval exercises or drills in Brazil.

Serial	Recommendations	Expected Outcome ⟷ Months (From 0 to 36)	Least Expected Performance Scores	Remarks
(a)	(b)	(c)	(d)	(e)
1.	The BN should prioritised the optimisation of SisGAAz by First Quarter 2025	The BN and all maritime security enforcers are receptive and compliant implementation of recommendation	4	
2.	The BN should ensure accelerated acquisition of maritime surveillance assets from foreign and domestic defence industries and markets by Second Quarter 2025	The BN is receptive of recommendation to ensure accelerated acquisition of maritime surveillance assets from foreign and	3	

		domestic defence industries and markets		
3.	The BN should fast-track the integration of AI technologies in maritime security and intelligence operations by Third Quarter 2025	The BN is receptive of recommendation to fast-track the integration of AI technologies in maritime security and intelligence operations	4	
4.	The BN should consider domestic building of more OPV with supplementary acquisitions offshores by First Quarter 2025	The BN is receptive of recommendation to consider domestic building of more OPV with supplementary acquisitions offshores	3	
5.	The BN should conduct more frequent naval exercises or drills by Second Quarter 2025	The BN receptive of recommendation to conduct more frequent naval exercises or drills	4	

Performance Indicators Scale: 1 – **Poor**, 2 – **Fair**, 3 – **Good**, 4 – **Very Good** and 5 – **Excellent Source**: Researcher's Inference, 2024.

ANNEX L TO
NDC/DARAS/165/G
DATED 7 JUNE 24

SAFE TEST FOR PROFFERED STRATEGIES

Serial	Proffered Strategy	SAFE Test Criteria and Assessment Score (Score Value 0 = Poor, 5 = Very Good)								Remark
		Suitability		Acceptability		Feasibility		Ethics / Values		
		Strategy fits overall objectives and improves subject area	Strategy deals with the identified challenge(s)	Strategy is reasonable and agreeable to stakeholders	Strategy fosters cooperation and supports expected benefits of the stakeholders	Resources / competencies to execute strategy currently exist, or can be obtained	Resources can be integrated into strategic effort for different implementation phases	Strategy is legal / ethical and embodies organisational values	Strategy aligns with best practices, is durable and enduring	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1.	Prioritised optimisation of SisGAAz	5	4	5	5	5	5	5	5	Strategy meets SAFE Test criteria
2.	Accelerated acquisition of MSuA from foreign and domestic defence industries and markets	5	5	5	5	4	5	5	5	Strategy meets SAFE Test criteria
3.	Fast-tracking of the integration of AI technologies in	5	4	5	4	2	3	5	5	Strategy meets SAFE Test criteria

	maritime security and intelligence operations									
(a)	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**
4.	Domestic building of more OPV with supplementary acquisitions offshores	5	5	5	5	4	5	5	5	Strategy meets SAFE Test criteria
5.	Domestic building of more OPV with supplementary acquisitions offshores	5	4	5	4	2	3	5	5	Strategy meets SAFE Test criteria

Source: Researcher's Analysis, May, 2024.

Key:

Very High Rating - 5

High Rating - 4

Medium Rating - 3

Low Rating - 2

Very Low Rating - 1

ANNEX M TO
NDC/DARAS/165/G
DATED 7 JUNE 24

RISK ASSESSMENT AND MITIGATION

Serial	Strategies	Inherent Risks	Mitigation	Remarks
(a)	(b)	(c)	(d)	(e)
1.	Prioritised optimisation of SisGAAz	Slow take off	Continuous monitoring and Quality compliance/assurance.	
		Poor implementation	Improved engagement with stakeholders	
2.	Accelerated acquisition of MSuA from foreign and domestic defence industries and markets	Delayed fund for take off	Priority attention with prompt funding	
		Initial Stakeholder apathy	Robust stakeholder integration and trust building	
		Institutional weakness	Sustained capacity development.	
3.	Fast-tracking of the integration of AI technologies in maritime security and intelligence operations	Slow take off/assimilation	Priority attention.	
		Initial Stakeholder apathy	Robust stakeholder integration and trust building	
		Institutional weakness	Sustained capacity development.	
4.	Domestic building of more OPV with supplementary acquisitions offshores	Slow take off	Capital investments.	
		Competing imperatives	Cost-benefit analysis, periodic review.	
		Economic constraints	Innovative approaches	
5.	Conducting of more frequent naval exercises or drills in Brazil	Slow take off	Continuous monitoring and Quality assurance.	
		Institutional weakness	Sustained capacity development.	

Source: Researcher's Analysis, 2024.

Information on Brazilian Navy's Coastal Surveillance System - SisGAAz

Genard Burity
January 2014

Overview

On January 17 2014, the Brazilian Navy launched the details of the bidding process for the Coastal Surveillance/Management System, known as SisGAAz (Sistema de Gerenciamento da "Amazonia Azul"), at the Naval War College in Rio de Janeiro. The Brazilian Navy is developing a surveillance management system for its coastline, including the maritime area of pre-salt oil reserves, commonly referred to as the "Blue Amazon". The project, which is expected to be completed in a period of 10 years with an estimated cost of about US$10 billion, will integrate an array of surveillance platforms to create a comprehensive surveillance system to protect offshore assets, and facilitate economic development. This report intends to provide U.S. companies further information on the project.

Project Overview

SisGAAz coastal surveillance system will monitor the Brazilian Exclusive Economic Zone and extended continental shelf, as well as river networks and the maritime area of pre-salt oil reserves.

The Blue Amazon (AAZ) consists of the area of Exclusive Economic Zone and the Continental Shelf, extending public ownership of the country up to 350 nautical miles along the coast. SisGAAZ is being designed to provide surveillance to an area of the size of the Amazon rain forest, totaling 4.5 million km^2, through which flow 95% of Brazilian foreign trade and where 80% of the country's oil is found.

With SisGAAZ, the Brazilian Navy aims to implement a surveillance and monitoring system establishing an integrated set of measures to react to a threat or an emergency. Therefore, SisGAAz proposes to raise:

a) The efficiency of the monitoring of maritime and river traffic;
b) The efficiency of the management and control of the activities and operations undertaken;
c) The capacity to integrate, share, analyze and present information, and;
d) The provision of a set of functions to support the decision making process and contribute to the control of the required action.

The SisGAAz System is considered and defined by the Brazilian Navy as a Defense System (strategic for national defense), as described in Law No. 12.598, approved in March 2012.

At the official launch of the project, held at the Naval War College in Rio de Janeiro, Vice Admiral (VADM) Antônio Carlos Frade Carneiro, Director of the Navy's Office of Strategic Projects (DGePEM), conducted a detailed presentation on the main objectives of the project, which will be managed by the Company for Engineering and Naval Projects (Engepron) and by Foundation Ezute (new name of Fundação Atech).

The Request for Proposal (RFP) was formally presented with detailed guidelines for bidders to follow. The project is estimated to be fully completed in a period of 10 years with an estimated cost of US$10 billion.

Deadlines and Selection Process

VADM Carneiro addressed a 500 seat auditorium, made up mostly of private sector representatives interested in the project.

During his speech, VADM Carneiro outlined the importance of the sea to Brazil's economic development and national security, and the importance of monitoring Brazil's waters to ensure the state's presence, efficiency in resource development, combat crime, environmental protection, operational inter-operability, and rescue operations.

The Navy (through its Office of Strategic Projects (DGePEM)) plans to contract a Strategic Defense Brazilian company (this company must be EED - Empresa Estratégica de Defesa - certified) to coordinate all work on the project, which will be the Navy's only interlocutor. This main contractor will coordinate with other sub-contractors, which are expected to include small to medium-size businesses that will create jobs in Brazil and can include foreign companies.

The proposed timeline for the project is:

- January 17, 2014: submission of draft RFP;
- February 17, 2014: deadline for companies to submit questions and critiques to the draft RFP;
- March 19, 2014: definitive version of RFP issued;
- July 16, 2014: all proposals due;
- November 25, 2014: shortlist of two to three companies released (chosen by a Navy committee)
- June 1, 2015: winner announced;
- By December 31, 2015: contract signed

VADM Carneiro said the principal criteria in the selection process would include long-term operating costs, cost/benefit considerations, and quality of the system proposed, and that national content, incorporation of local partners, and technology transfer would also be primary factors.

U.S. commercial defense companies contemplating a defense contract in Brazil will be required to deal with the technology transfer issue. Navigating through the Brazilian offset policies will demand U.S. companies to emphasize technological development proposals in which technology transfers, cooperation, co-production are properly addressed.

For that reason it is even more important for U.S. bidders on defense projects to build strong local partnerships and cultivate a reputation on both the civilian and military sides of the government that emphasizes their willingness to share their technologies and contribute to Brazil's industrial and technological capacity.

VADM Carneiro emphasized that the Navy had not specified a particular vision, to include the associated technology, as it wanted proposals to be as innovative and wide- ranging as possible. The Navy expects companies to perform site surveys in order to understand specific problems in the region to be covered.

While initial reports states the project is valued at about US$10 billion, VADM Carneiro said price would not be the determining factor in the Navy's decision, and that once specific proposals were submitted, the Navy expected further negotiations to refine the final cost. Although VADM Carneiro did not mention a figure directly, he hinted that the Navy was looking for bids of no more than R$13 billion, or approximately US$5.5 billion at current rates.

Implementation of SisGAAZ

VADM Carneiro said the project will be rolled-out in four phases:

- Phase I - to be developed from 2016 to 2019 - coastal areas from Sao Paulo to Espirito Santo.
- Phase 2 - to be developed from 2020 to 2022 – coastal areas from Amapá to Bahia.
- Phase 3 - to be developed from 2021 to 2023 – coastal area of Bahia and south from Sao Paulo.
- Phase 4 - to be developed from 2023 to 2025 – inland river systems.

The project also aims to integrate existing systems of the Navy with the Defense Ministry, the Brazilian Army, Air Force and other federal agencies. It aims to create the Operations Center (OC) of the Naval Operations Command (ComOpNav) and deploy monitoring systems in the surveillance areas and. Other goals include, meteorological monitoring and monitoring surveillance areas, including oil basins.

As outlined in Brazil's national defense strategy, local content provision and technology transfer will be crucial factors in the bidding process. VADM Carneiro emphasized that Brazilian companies should be the technology transfer repository as a way to guarantee technological and productive capability continuity. Capacity to maintain the systems established would be a determinative factor, as the Navy does not want to have to rely on imports to maintain any part of the system. A revision of the contract's financial terms would take place after the first phase was completed, with both the Navy and the main contractor allowed to propose amendments.

It is expected that Brazilian companies will be positioned to make use of the advantages of the status of being a strategic defense company, a certification awarded by the federal government to 26 companies by the end of 2013, which are entitled to tax reduction for the sale of their products and services to the armed forces. To receive the benefits of Law 12.598/12, companies need to meet certain requirements such as majority national control, Brazilian domain of technology and commitment to keep the production line in the country. According to VADM Carneiro, Law 12.598/12 allowed the creation of a propitious environment for companies in Brazil, especially for Small and Medium sized companies, to develop the capacity to absorb strategic technologies as well as offering greater opportunities to participate in large programs like SisGAAz.

Conclusion

It is important for U.S. companies to note that the main way to establish a relationship with the Brazilian Navy, regarding the SisGAAZ project, would be through one of the Strategic Defense Companies (EED).

The first round of EED certifications, released last November 28 by Brazil´s Ministry of Defense, certified the following 26 Brazilian companies:
AEQ, Akaer, ARMTEC, Atech, Avibras, Axur, BCA, Bradar, Condor, Dígitro, Embraer, EMGEPRON, Flight Technologies, Forjas Taurus, Grupo Inbra, IACIT, IAS, Imbel, Mectron, Nitroquímica, Nuclep, Orbital Engenharia, Opto, Rustcon, Spectra Tecnologia e Vertical do Ponto.

From this list, 24 are associated with the ABIMDE (Brazilian Association of manufacturers of Defense and Security Materials) and will benefit from tax exemptions. A new round of EED certified companies will be evaluated by the Joint Committee on Defense Industry (CMID) to later compose the group of EEDs.

U.S. companies looking to participate in the project need to consider partnering with one of these certified Brazilian firms. Major Brazilian defense companies have already started considering potential partnerships. For example, the OAS Group's defense arm, established in 2012, is partnering with Israeli company IAI and Brazilians IACIT and Modulo. Queiroz Galvão Group is considering partnering with U.S. firms Lockheed Martin and Rockwell Collins.

For further information about the SisGAAz Project or any related information, please contact the U.S. Commercial Service at:

Daniele Andrews, Business Development Specialist – Daniele.andrews@trade.gov
Genard Burity, Business Development Specialist – Genard.burity@trade.gov

Web Resources

- Law 12.598/2012 - http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/Lei/L12598.htm
- Defesanet - http://www.defesanet.com.br/sisgaaaz/noticia/13835/Grupos-se-preparam-para-disputa-de-megalicitacao-da-Marinha/ and http://www.defesanet.com.br/sisgaaaz/noticia/13964/SisGAAz-%E2%80%93-Um-projeto-ambicioso/
- Infodefensa - http://www.infodefensa.com/latam/2014/01/23/noticia-marinha-brasil-sistema-gerenciamento-amazonia.html and http://www.infodefensa.com/latam/2013/11/29/noticia-ministro-defesa-certifica-empresas-estrategicas-brasil.html
- Naval - http://www.naval.com.br/blog/2014/01/21/oas-ja-tem-consorcio-para-disputar-projeto-da-marinha/
- Fundação Ezute - http://www.ezute.org.br/ezute/noticias/Noticias.html.10
- Sao Paulo Valor Online, published jointly by Folha and Globo (http://www.valoronline.com.br)