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Article

Coastal Vulnerability – Maritime Security Nexus: Insights from the Coast of Java Island

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Abstract: Indonesia, as an archipelagic state with one of the world's longest coastlines, faced significant coastal vulnerabilities, such as erosion, sea-level rise, and mangrove loss, which intersected with maritime security concerns and impacted livelihoods, communities, and sustainability. This study explored the linkage between coastal vulnerability and maritime security, focusing on Java Island. Using qualitative methods and a literature review, it examined Java's critical coastal vulnerabilities and their influence on Indonesia's maritime security. Key issues included environmental degradation, the well-being of coastal communities, marine ecosystem health, maritime crimes, and illegal, unreported, and unregulated (IUU) fishing, analyzed within national development and coastal policy contexts. Findings revealed common ecological threats along Java's coasts, the interconnection between coastal vulnerability and Bueger's Maritime Security dimensions, and the need for a maritime security perspective to address sidelined vulnerabilities during non-crisis periods. This research underscored the importance of integrating coastal vulnerability into maritime security discussions to enhance resilience, preparedness, and proactive policy-making at local and national levels.

Keywords: coastal vulnerability; coastal area; Java Island; maritime security

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1. Introduction

Archipelagic states, including Indonesia, inevitably face perpetual concerns regarding coastal sustainability. With a coastline spanning 95,161 kilometers (Arianto, 2020), Indonesia possesses one

of the world's longest coastlines, making it susceptible to a wide variety of coastal threats. These threats originate from both natural and human-induced factors, necessitating efforts from both national and local governments not only to prevent these dangers but also to mitigate their impact when disasters inevitably strike. To better understand coastal threats, various studies have conducted Coastal Vulnerability Index (CVI) assessments across different regions of Indonesia (Tarigan *et al*., 2024; Wisha *et al*., 2022; Waluyo *et al*., 2021; Irham *et al*., 2021; Sandhyavitri *et al*., 2019; Husnayaen *et al*., 2018). These studies highlight several coastal hazards, including erosion, sea-level rise, flooding, and other threats. Noor and Maulud (2022) emphasize that coastal vulnerability significantly impacts the environment, socioeconomic conditions, and the livelihoods of coastal communities. Coastal vulnerability is a pressing concern for Indonesia, according to Noor and Maulud, Indonesia experienced the highest number of fatalities from coastal disasters in Southeast Asia, with 3,600 deaths reported between 2015 and 2020. Pattipawaej (2024) notes that 40% of Indonesia's coastline has already been affected by erosion. Furthermore, Indonesia has suffered a significant loss of mangrove forests along its coasts, with over 30% of mangrove coverage lost (Arifanti, 2020). These findings align with Susilorini *et al*. (2021), who elaborate on Indonesia's high disaster vulnerability in coastal areas.

The sustainability of coastal areas is directly tied to the livelihoods of coastal communities. This highlights the intrinsic connection between coastal vulnerability and maritime security—both of which involve safeguarding livelihoods and addressing the root causes of coastal disasters through a multidimensional understanding of sustainability. Java Island serves as the focus of this research to examine the interplay between coastal vulnerability and maritime security. As Indonesia's most populous island, Java is home to 151 million people, according to the 2020 census, with a population density that is particularly concentrated along its 828.82 km coastline. This high population density in coastal areas correlates with increased coastal vulnerability. Kartika and Wijayanti (2022) affirm this, noting that Java's coasts are highly prone to hazards and disasters. The risk of experiencing the worst impacts of coastal hazards and disasters constitutes what is understood as coastal vulnerability. Coastal policies must focus not only on preventing disasters but also on reducing the risks associated with their most severe outcomes. This paper argues that discussions of vulnerability intersect with maritime security, as both concepts address threats to shared objectives. Thus, this paper will contribute on several notable discourses. First, it broadens the discourse by integrating coastal vulnerability into the field of maritime security, shifting from the predominantly technical approaches to focus on non-traditional threats affecting livelihoods and sustainability. Second, it provides in-depth insights into coastal vulnerabilities through case studies on Java Island, utilizing findings from previous Coastal Vulnerability Index assessments to highlight the challenges faced by this densely populated and vulnerable region. Lastly, it contributes to the broader field of security studies by identifying and analyzing non-traditional security threats within a maritime context, emphasizing their environmental, socioeconomic, and community impacts.

2. Materials and Methods

2.1. Literature Review

This section will discuss the literature reviews and frameworks that were used as the paper's analytical basis. There were three frameworks which was explained through Literature Reviews, which were; Coastal Vulnerability, Maritime Security, and Non – Traditional Security. Each framework will have a primary literature as it fundamental, supported by other secondary literatures. This is done in order to increase better understanding of each framework used in this paper.

2.1.1. Coastal Vulnerability

The conceptualization of Coastal Vulnerability is a part of Coastal Zone Management, where it is used in risk- based management programs. Establishment of Coastal Vulnerability is based on perceptions revolving various risks on coastal areas, which also classify coastal issues as 'multidisciplinary' (Hamid *et al*., 2019). Bevacqua, *et al*. (2018) in "Coastal Vulnerability: Evolving Concepts in understanding vulnerable people and places" elaborates the definition and components of Coastal Vulnerability (CV), which can be defined as a concept that identify places and people that are vulnerable, susceptible to problems that result from coastal hazards. Although Bukvic, *et al*. (2020) explain that 'vulnerability' in itself is a contested concept as it involves of multitude of issues and may differ based on different factors influencing it, but it at least involves two big elements; the physical and social determination of vulnerability. Thus, this paper identifies three main dimensions of Coastal Vulnerability based on Bevacqua's research. These dimensions constitute of; physical, socioeconomic, and ecological. This literature will be utilized to understand dimensions and existing vulnerabilities in coastal areas. Coastal Vulnerability can be defined as a condition of a certain community/space that leads to inability of those to face coastal threats and dangers (Waluyo *et al*., 2021). 'Vulnerability' involves few components; 1) physical, focuses on degree of exposure toward natural hazard in specific location; 2) socioeconomic, which includes identification of population that is less resilient toward coastal hazard, and how it contributes to the population socioeconomic wellbeing; 3) ecological, focuses on tolerance degree of coastal ecosystem toward hazard (i.e. pollution, climate change, disaster, etc.). These classifications of dimensions also align with past scholars (Bukvic *et al*., 2020; De Serio *et al*., 2018; Lins-de-Barros, 2017). Scholars mostly agreed that it is necessary to understand physical, social, and environmental threats, as well as analyze them through both qualitative and quantitative means. This is to ensure that Coastal Vulnerability analysis would cover all, or at least most aspects of existing vulnerabilities in a coastal area.

2.1.2. Maritime Security

Maritime Security is a relatively new concept in the field of Security Studies, as the discussion of this specific type of studies have recently gained more attention in these past few years. Bueger (2015) in "What is Maritime Security?" explain and categorize matrix/dimensions of maritime security. Bueger began with mentioning that 'Maritime Security' is a buzzword, or to be precise, a concept that is mostly recognized as having 'abstract' definition, or it's a currently contested concept. This identification helps to understand and justify the rather-wide inclusion of sectors in Maritime Security. Thus, to make it more approachable both academically and practically, Bueger defines Maritime security as a concept that covers four dimensions; marine environment,

security, economy, and human security. This research will be the basis of Maritime Security analysis, and to identify what kind of intersectionality would coincide with the concept of vulnerability within coastal vulnerability. Bueger notes that Maritime Security does not have a definite consensus on what it truly constitutes of. However, Bueger did note to avoid using 'laundry list', which means listing existing threats in maritime environment like smuggling, IUU fishing, maritime terrorism, and others, to define the concept.

Kismartini, *et al*. (2024), Li (2023), Wirawan (2022), Otto (2020), Mitchell (2020), and Puspitawati (2017) echo the sentiment, that maritime security is a wide and imprecise concept which constitutes of multidimensionality and sectors, including military, environment, economy, non-traditional security, and so on. However, there are scholars that attempted to accurately define Maritime Security. Cook (2020) agrees that there is no 'universally accepted' definition of Maritime Security, and admits that its definition grows in complexity, but definitely is not limited the narrow and traditional definition of security that involves naval power, weapons, and such. This implies that current Maritime Security recognizes; 1) non-traditional part of security aspects; 2) recognize threats unrelated to traditional security, as long as it does manifest harm on the referent object, or objects that are identified as the ones that need to be secured from threats. Pandey (2023) specify more of such threats, which include, but not limited to; marine pollution, cyber threats, unlawful vessels, and maritime boundaries. Bueger & Edmunds (2017) pointed out how countries have varying definition and scope of maritime security, proving efforts of multiple approaches that attempt to engulf the 'interlinked security complexes' in maritime context. The idea of connecting discussion between the nexus of Coastal Vulnerability and Maritime Security, is based on Bueger's conception of Maritime Security and Li's idea on approaching the concept through the lens of Sustainability. Both attempts to include multitude of issues, due to each issues' vulnerability that needs to be added under the umbrella of 'security' to increase the urgency. In a sense, this is a path toward securitizing those existing vulnerabilities. To reconcile this universality of Maritime Security concept, therefore four dimensions of maritime security; environment, economy, security, and human resilience, were introduced.

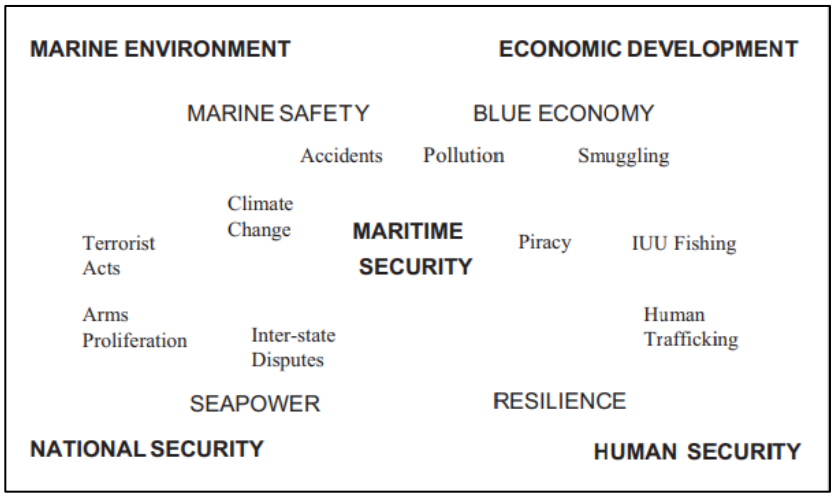

Figure 1. Maritime security conceptualization (Bueger, 2015)

Each dimension has its own measuring indicator and sub-concepts. Marine Environment focuses on Marine Safety, which relates to safety in maritime installation, maritime

environmental sustainability, and overall management of maritime infrastructures. Security focuses on Sea Power, which relates to a state's naval power, international water presence, and to what degree a state can act outside of its sea territory. Economic development concerns the Blue Economy, which relates to economic potential, commercial value, and the availability of sustainable strategy & safe environment to manage marine resource. Human security focuses on Resilience, focuses on the resilience of coastal communities in facing many kinds of threats identified by human security, including food security, coastal hazard, IUU fishing, and such. Based on those elaborations, the nexus between maritime security and coastal vulnerability would meet the intersection mostly in the three components; environment, economy, and human security.

2.1.3. Non-Traditional Security

The context and understanding of security were quite long narrowed into only related to military stuffs and only dealt by states. However, the understanding of security concept in security studies has been long shifted, particularly after the end of the Cold War, where people were gradually becoming more aware of threats and challenges beyond those related to war and military means. 'Wideners', who stretched the definition from traditional to non-traditional, and 'deepeners', who deepen the level of analysis from state-centric to as low as individual-centric, were popping out after imminent global-scale armed conflict threat ended post-Cold War (Rucktäschel & Schuck, 2018). This shift is what has divided security issues to 'traditional security' and 'non-traditional security'. Traditional security is security which is related with military and war stuffs, and known as being state-centric, its entire issue and decision-making procedure to solve the issue is being put entirely in the governmental level. Non – traditional security, however, is a different case. Caballero-Anthony (2016) defines Non-Traditional Security as security issues that stretched its scope beyond state and military-centrist focus, in its widest sense. Kumar (2023) explains that non – Traditional Security threats can be defined as existing challenges that threaten wellbeing and the survival of both people and states, in which those threats originated from non-military sources. These issues are oriented to Anthropocene and wellbeing elements, which includes issues such as infectious diseases, climate changes, environmental degradation, illegal migration, famine, illegal smuggling, trafficking, food shortages, loss of land, and others (Azzqy, 2024; Kumar, 2023; Othman *et al*., 2016). Caballero-Anthony (2016) and Othman, *et al*. (2016) also add that Non - Traditional Security is often transnational in nature, which means in its not entirely domestic nor an entirely interstate in nature. The implication of this means that the existence of these threats is often affected by external influences, for instance, even as simple as a trickle-down effect of globalization like how cyber threats came to be. One of the most prominent discussions of Non – Traditional security is the Human Security concept. Human Security puts individual wellbeing as its main referent object, or the object that must be protected at all cost. This concept was coined by the United Nations Development Programme (UNDP) in its Human Development Report 1994. Later on, Bueger also includes Human Security as one of the main dimensions of Bueger's framework of Maritime Security. This shows the significance of non – traditional security in the maritime

security studies. Non-Traditional Security also has its own context in Maritime Security field, becoming Non-Traditional Maritime Security issues.

Conceptually speaking, Non-Traditional Maritime Security is known as identification of Non-Traditional issues in maritime environment, a responding it accordingly with cooperative activities to prevent contingencies of maritime sector (Lim, 2015). Issues include, but not limited to, maritime crimes, illegal smuggling by the sea, IUU fishing, disaster and calamities, and others. Although maritime crimes are more widely known as the primary non-traditional maritime threats, scholars acknowledge that climate changes, natural disasters, extreme weather, and threats of coastal / blue economy as significant threats to maritime security (Chatterjee, 2014).

"Maritime Security: The Uncharted Politics of the Global Sea" by Bueger *et al*., (2019) describes the political dynamic of Maritime Security, which also involves the discussion of Non-Traditional Security in the discussion. To reconcile the intersectionality of this paper's main nexus, understanding of non-traditional security will be the middle ground between these two, to understand the connect 'existing threats' that exist within both concepts, and therefore as the bridge to understand 'vulnerability' within Coastal Vulnerability as acknowledged 'threats' in maritime security. To wholly understand this framework, this paper took the understanding from Percy in Bueger *et al*., (2019) that explain how most threats in maritime security are of 'not traditional issue' that straddle the limitation between international security and crime, and often involve unconventional threats. Aside from that, Aswani (2020) elaborated on the unseen forces of non-traditional maritime security threats, acknowledging complexity of maritime security and its threats being too overlooked, are a step ahead in direct more attention to whatever happens in the sea. This is particularly important for archipelagic states like Indonesia. Therefore, the utilization of non-traditional security framework is important for both practical implication for the case study and becoming the 'bridging framework' for two other frameworks in order to enhance this paper's comprehensiveness.

2.2. Research Method

This study was a qualitative descriptive research, research that utilize descriptive-mode in elaborating analysis and argumentation to examine research's object (Mappasare & Suyuti, 2019). Authors chose to pursue qualitative research, as the authors attempted to understand the descriptive analysis of coastal vulnerability and dive deeper into the discussion of coastal vulnerability and maritime security concepts. This paper utilized two main methodology, Literature Review and Case Study in the paper. The Literature Review was used as the main analytical method, as it enabled the paper to uses important finding from past research and documentations, as well as supports the paper's finding (Synder, 2019). This research also utilized Case Study, this research was mainly sourced its data from documentary and literary sources, which included various books, scientific journal articles, proceedings, policy papers, news articles, internet-based data, and the others. This data-collection method was chosen to maximize the authors' accessibility into data(s) which were already available in existing sources. This was important to accelerate the research process and effectively arrive at conclusive findings.

3. Results & Discussion

This section will have two sub-sections. The first section maps and analyze types of coastal vulnerability in all directions (north, south, east, and west) of Java Island's coast, through a table visualization. The second section will discuss the intersectionality of maritime security and coastal vulnerability, and how it applies practically for governmental policy making.

3.1. Analyzing Coastal Vulnerability of Java Island's Coast

This part discusses the mapping of coastal vulnerability analysis on some region and coastal areas in Javanese Island, based on existing scientific research. There are three reasons why Java Island's coast is chosen as the main research object of this paper. First, long coastline with huge amount of population concentrated along the area, it is a recipe for various threats and multidimensional issues, thus the identification of coastal threats' trend and types are needed. Second, there are abundance of Coastal Vulnerability analysis of different regions and parts of Java Islands, serving as data for this paper. This abundance of past research has provided this paper a proper data triangulation despite being mostly secondary data-based research. Third, the diverse coastal and maritime challenges along Java Island's provide proper evidence to support the paper's amin argument on the Coastal Vulnerability - Maritime Security intersectionality that is based on the multidimensionality-nature of the threats. Hence Java Island's coast is chosen as the paper's main research object and case study.

Kim & Gim (2020) and Marfai (2014) elaborate several concerns of Java Island's coastal areas, such as floods, sea level rise, ecological destruction, to communities' wellbeing. This is due to the high density of Java Islands met with lots of challenges, resulting into cases of vulnerabilities across the coast. These problems and issues are also reflected in the mapping table below. These data(s) were gathered and analyzed to determine the existing vulnerabilities found by the research, and categorized based on the three components of Coastal Vulnerability according to Bevacqua, *et al*. (2018), which are; physical, socioeconomic, and ecological. The table also adds a finding on Coastal Vulnerability Index (CVI), if any, from the related source. Showing the result of CVI functions as a way to understand the degree of vulnerability an area suffers, or has suffered. This paper observes coastal vulnerability in northern coast through different areas which are; Indramayu, Semarang, Subang. For Southern coast, this paper takes three different areas as well; Purworejo, Bantul, and Pacitan. This paper found each one area for Eastern and Western coasts. For Western Coast it is the Banten's West coast that includes Serang and Cilegon, while in Eastern coast it is Banyuwangi.

Table 1. Java Island coastal vulnerability analysis

Area	Source	Coastal Vulnerability Components			CVI-based Vulnerability Class
		Physical	**Socioeconomic**	**Ecological**	
Purworejo Regency (Southern Coast)	Hidajat, *et al*. (2021)	Prone to geological disaster (tsunami,	19,051 out of 363,179 inhabitants are categorized as vulnerable to disaster		

Area	Source	Coastal Vulnerability Components			CVI-based Vulnerability Class
		Physical	**Socioeconomic**	**Ecological**	
		drought, flood etc.)	Increasing population density every year		
			Low knowledge and apathetic toward disaster		
	Tanasiva, *et al*. (2021)		Low Economic Vulnerability, Moderate Social Vulnerability		
	Kartika & Wijayanti (2022)	58.16% of area is categorized as Low tsunami-prone, 30.40% moderate tsunami-prone, and 7.61% high tsunami prone.		Minimal density of mangrove & other vegetations that may reduce disaster impacts.	
Bantul Regency (Southern Coast)	Choirunnisa & Giyarsih (2018)	74.83% of the area is 'highly susceptible' of coastal erosion.	Large number of demographically disadvantaged population (elderly, children, disabled)		
		Close distance of house and shoreline enables higher physical vulnerability	Large number of poor and unemployed people		
	Widianto & Damen (2014)	High vulnerability towards multi-hazard events (tsunami, erosion and high wave)	Majority of jobs are highly affected by natural condition and resources		
Pacitan Bay (Southern Coast)	Hidayah, *et al*. (2022)		Low preparedness for disasters and understanding for post-disaster recovery	Loss of mangrove forest	79% of area as High – Very High vulnerability
			Majority of jobs threatened by climate change (fisheries, etc.)		
	Mardiatno, *et al*. (2016)	Susceptible to tsunami and its aftereffect	Uncontrolled population and settlement increase around coastal area		

Area	Source	Coastal Vulnerability Components			CVI-based Vulnerability Class
		Physical	**Socioeconomic**	**Ecological**	
	Rahardjo, *et al*. (2022)	Susceptible to high level of Marine Hazards (tsunami, extreme waves, rip currents)	Insufficient effort to reduce marine hazards		
Indramayu Regency (Northern Coast)	Waluyo, *et al*. (2021)	Very High abrasion			Predominantly areas as Moderate - High Vulnerability
	Putiamini, *et al*. (2022)	Prone to *Rob* flooding – damage infrastructure	Majority of Coastal community having no formal or low-level education	Ecological system vulnerable to flooding and can impact local livelihood	
		Insuffiency in responding to *Rob* flooding	Inability to mitigate climate related-hazard due to unwillingness	destruction of mangrove habitats	
		Prone to land subsidence	Generational poverty of coastal communities due to unwillingness to adapt modern-way of marine-related job	Increasing ecological threats due to Land-use changes of swamp-forests into residential, rice fields, or fish farms	
Semarang city (Northern Coast)	Husnaya-en, *et al*. (2018)	Erosion and accretion due to extending usage of beach and physical processes (i.e., high tides, sea level rise, etc.)			45% area as High – Very High Vulnerability
		Loss of public facilities, roads, tourism areas due to shoreline changes			
		Land subsidence rate value ranges			

Area	Source	Coastal Vulnerability Components			CVI-based Vulnerability Class
		Physical	**Socioeconomic**	**Ecological**	
		from 0 to 9.9 cm/year			
	Sidiq, *et al*. (2021)	Land subsidence rate reaching 12 cm/year Damage of infrastructure High sea water inundation	Estimated economic loss reaching IDR 3.5 trillion due to land subsidence	Loss of mangrove forests	
Subang Regency (Nothern Coast)	Handiani, *et al*. (2022)	High to very high vulnerability of erosion and coastal flooding	Mismanagement and ill-planning of coastal development policy Overburdened coastal communities due to coastal megaprojects	Mangrove forest destruction, seawater intrusion, and abrasion.	50% area as High – Very High Vulnerability
	Anwar, *et al*. (2020)	One of the worst abrasion cases in West Java Province		Almost entire area as High Vulnerability	Anwar, et al. (2020)
Banyuwangi Regency (Eastern Coast)	Sagala, *et al*. (2024)	Accretion due to sediment loads Very High Vulnerability toward Sea Level Rise			91% area as Low Vulnerability (with sea level rise as exception)
	Romadhona, *et al*. (2020)	Very High Sedimentation, leads to Accretion			
Serang & Cilegon (Western Coast)	Muzani, *et al*. (2024)	Very highly vulnerable of tsunami due to land utilization that does not put disaster potential in mind High to Very High Vulnerability on Land Elevation in majority of area			-
	Pattipawaej (2024)	Abrasion & Sedimentation occurrences		Mangrove forest conversion to	1 district is characterized as Very High,

Area	Source	Coastal Vulnerability Components			CVI-based Vulnerability Class
		Physical	Socioeconomic	Ecological	
				fish ponds and others	2 districts as High, and 1 district as Moderate

There are few key takeaways from the mapping table above. Explanations provided below will not only describe the table, but also the descriptive explanation of what caused the phenomenon. To further understand the table above, it is also important to profoundly understand the cause and factors of these coastal phenomena.

First, almost all coastal areas of Java Island have high susceptibility of erosion and vulnerability of tsunami. Second, few areas have high susceptibility toward land subsidence that also means a higher exposure to sea-level rise, particularly Semarang and Banyuwangi. This is due to both being affected by sedimentation process, having high population density, and overexploitation of groundwater, as these are the common factors influencing unnatural land subsidence (Hamdani *et al*., 2021). This case is unfortunately happening all over major coastal cities of Java Island, especially the northern coasts where almost all major cities reside (Andreas *et al*., 2018). Third, there is an observed common trend of mangrove forest in majority of coastal regions, which could threaten the coastal ecosystem in the related area. The destruction of those mangrove forest areas is mostly caused by anthropogenic cause, or its destruction is caused by human.

On the other hand, most of socioeconomic issues are related uncontrolled population growth and job vulnerability. This issue of population and land in Java is highly related to land-subsidence. It has been said before that unnatural land subsidence in Java cities is caused by overexploitation of groundwater and high population density. Both of these factors are directly connected, as groundwater exploitation happens mostly in places with high number of populations, to fulfill everyone's need (Bagheri-Gavkosh *et al*., 2021). Hasan & Ridwan (2021) acknowledges that there is a continuous pressure on groundwater supply, and will keep increasing as population increases. Java Island's groundwater exploitation has caused land subsidence on 1-20 cm/year range for most of Java Island's cities (Hasan & Ridwan, 2021). The problem is the fact that groundwater is a finite source, yet everyone needs it and feels the right to access and utilize it, because no one truly 'owns' groundwater. This phenomenon is known as the 'Tragedy of the Commons', whereas a common, finite resource is being exploited by everyone due to it being not-owned. Shalsi *et al* (2019) explained how the tragedy of the commons in groundwater management is something that must be addressed accordingly. This does not only cause the resource (groundwater) to deplete fast, but also contribute to man-made coastal challenges, in this it is the land subsidence. On the issue of job vulnerability, coastal area's job vulnerability is caused by climate changes, global warming, and such. Whereas jobs often taken by fishing communities and farmers depend so much on the natural condition of a coast / sea, thus, factors like climate change that affect the environment so much has unnaturally increased

the vulnerability of these jobs (Untari *et al*., 2022). These problems surely pose a challenge to local communities, local, and national governments.

Lastly, the inefficient and unsustainable shift of land usage is also one of primary causes for coastal challenges. In order to be categorized as 'Low in Vulnerability', a coastal soil should be more resistant toward sedimentation, erosion, and abrasion. That is why mangrove forest and conservations are vital, to decrease the odds of worse damage if disaster / threats strike the coastal area (Untari *et al*., 2022; Barua *et al*., 2020). However, shifting land usage has seen people converting mangrove forest into various things, such as aquaculture, rice fields, oil palm plantations, and other industrializations (Bhowmik *et al*., 2022; Richards & Friess, 2016). These challenges are combination of natural and man-made factors, however, man-made factors have made things much more unnaturally worsening and increasing coastal vulnerability of Java Island's coastal areas over the years. Therefore, there is a need to pay attention and increase the alertness of coastal challenges even more, as progress has been not quite efficient all this time.

The next section will discuss the coastal vulnerability – maritime security nexus, looking at the nexus from Java Island's case, and contributing to the discussion of coastal policies directed to the government.

3.2. Coastal Vulnerability – Maritime Security Intersectionality

Understanding the nexus begin with contextualizing non-traditional security within maritime security, to swiftly include coastal vulnerability in the discussion. Chapsos (2016) captures this by explaining maritime security's linkage with development and human security, as the consequence of undetermined and wide conceptualization of maritime security. Non-traditional security and human security discussion both involve the importance of contemporary challenges to that threatens human and environmental well-being, such as the climate changes, that also affects maritime concerns. Maritime security has important linkage to climate changes in a sense that climate change affects natural system of ocean that results in marine ecological destruction and increasing number of maritime crimes, showing how Human Security and Economic Development dimensions of Maritime Security are the most impacted by climate change (Brenand & Germond, 2024; Germond & Ha, 2019; Germond & Mazaris, 2019; Mazaris & Germond, 2018). This analysis is especially important, given that He & Silliman (2019) emphasizing on coastal areas and zones' being highly threatened by existence of climate change and its stressors. This understanding means the implementation of human security needs to recognize anthropocentric and ecological threats. This is directly connected with how 'Vulnerability' is multi-faceted and has undergone changes as time goes (Ferrol-Schulte *et al*., 2014). In this discourse, Coastal vulnerability should be treated as those 'threats' of maritime security. Author acknowledges that it is arguable that a 'coast' is not a part of 'maritime' area. However, coastal vulnerabilities concern the wellbeing of coastal communities the most, in which the sustainability of coastal communities is also a major concern of maritime security (Germond & Mazaris, 2019; Chapsos & Malcolm, 2017). This paper argues that a state's ability to manage its maritime security is reflected I the state's ability to manage risks exposed by coastal vulnerability.

Looking at the case Java Island's coastal vulnerability, there are several things to note from previous explanations. One, that the most common ecological threat is mangrove forest loss, which is a necessary defense toward physical threats like abrasion and coastal ecosystem's

livelihood. This threat is directly related to at least three dimensions of maritime security; maritime environment, blue economy, and human resilience. Mangrove loss could result in destroying biodiversity, degradation of carbon resources utilization, and overall threatening the ecosystem (Carugati *et al*., 2018). Kumar (2023) describes such environmental degradation as "threat multiplier", as often exacerbated by other factors such as global warming, climate change, and, in the case of mangroves, the intentional shifting of land use from mangrove conservation to fish ponds or other purposes. Moreover, some java coasts have started to utilize mangrove as a spot of ecotourism, which means the loss of mangrove could result in loss of tourism sites which imply economic loss and unemployment. Two, most economic vulnerabilities like threats in job availability and poverty, has relation toward climate change and education. This is directly related to the concept of Blue Economy, which includes coastal community's sustainability, availability of marine resources, and human resource quality to fully realize it. This is reflected well in Java coasts, most notably the Southern Coasts, on how there is still lack of proper management and policies.

Last, most java coasts have high vulnerability toward disasters, both due to physical condition and low-awareness of disaster knowledge. The high vulnerability areas could experience terrible impacts when disaster strikes, it will destroy communities' livelihood around the coast and is predicted to cause high casualties (Hidayah *et al*., 2022). Disaster may not always strike, however, the vulnerability in itself serves as danger toward society and territorial danger as a whole. This is to remind that any disaster-related events mostly become a national concern that may affects a state's security management, as most often than not, a disaster throws the government off. Lastly and most importantly, government and insufficient management is still a prominent issue. This paper argues that this is due to low sense of alertness for government to handle coastal issues, until it bears severe consequences. In fact, Morris & Paoli (2018) conclude that Indonesian Maritime Security Governance in general faces a lot of internal management challenges, such as infrastructure base management and underdeveloped interagency mechanism. In concerns to Coastal Vulnerability issues, these challenges are unfortunately would not be faced any time soon, due to government's focus on threats that are actively inflicting harm, such as IUU Fishing and smuggling issues. This implies that Indonesian policy is still highly reactive, rather than preventive in its implementation. Past research has criticized Indonesia on the fact that despite Indonesia's large maritime power and resources, it is not well kept and utilized due to reasons such as doctrinal error that does not direct national livelihood to maritime sector, undervaluing and mismanaging coastal resources, and (Hudaya & Putra, 2017; Nikijuluw, 2017). Through understanding maritime security and coastal vulnerability nexus, this paper advances the agenda of coastal vulnerabilities being seen through the lens of maritime security. This may or may not kick starts the appeal toward securitizing coastal vulnerabilities, however, at the very least this conception does explicitly relate coastal vulnerabilities to issue of security. Bueger (2015) has touched upon this topic previously, stating that securitization of maritime threats is needed to recognize threats' impact toward livelihoods, and all to largely aim toward desecuritization of sea in long run. This back-and-forth, Bueger argues, is necessary to detangle the paradox on how maritime insecurities result to threat. Thus, a path to securitize vulnerabilities within the landscape of maritime security may be helpful to pursue.

To conclude, this paper argues that the emphasize of this nexus is inevitable, as contemporary security has recognized non-traditional security challenges to be on par, if not more urgent compared to traditional ones, as it directly correlated with people's wellbeing and survivability on day-to-day basis. Coastal vulnerabilities are indeed the concern of maritime security, hence, more scientific discussion related to maritime security should highlight the existence of coastal vulnerabilities as its source of threats.

4. Conclusions

The coastal vulnerability analysis of Java Island's coast has highlighted the importance of understanding coastal vulnerability as a key component of threats to national maritime security. Consequently, the nexus between maritime security and coastal vulnerability is inevitable and should foster more scientific discourse in the future. This paper has demonstrated the practical application of maritime security concepts to address non-traditional security issues, emphasizing the growing relevance of non-traditional concerns beyond the naval or military aspects that typically dominate the field. Acknowledging the limitations of this study, future research should delve deeper into the conceptual debate on what constitutes a "threat" within maritime security in the context of coastal issues. Additionally, future studies could adopt a more specific case-by-case approach to comprehensively examine coastal vulnerability through the lens of maritime security.

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