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Regional Typology of Maritime Business Profiles Using Subsector Presence and Regional MSME Scale in West Nusa Tenggara

***Hani Hasanah**
Univesitas Islam Syekh-Yusuf, Indonesia

Teuku Fajar Shadiq
Univesitas Islam Syekh-Yusuf, Indonesia

Ahmad
Univesitas Islam Syekh-Yusuf, Indonesia

***Corresponding author:**
Hani Hasanah, Univesitas Islam Syekh-Yusuf, Indonesia. ✉hanihasanah@unis.ac.id

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Abstract

Background: Small-scale maritime enterprises are central to blue-economy development, but fragmented sectoral statistics limit comparable regional profiling and do not support direct inference of business concentration.
Objective: This study aims to develop a regional typology of maritime business profiles in West Nusa Tenggara using recorded subsector presence and the general regional MSME scale context. It applies a descriptive-exploratory documentary design using 2024 Statistics Indonesia data.
Methods: The units of analysis comprise ten regencies and municipalities. Business activities were classified into nine maritime subsectors. The analysis used database harmonization, descriptive percentage comparisons, min–max radar visualization, and regional typology construction. MSME-scale percentages are contextual indicators for all MSMEs and do not represent maritime-specific shares.
Results: Approximately 19,000 units, or about 6% of NTB MSMEs, were classified at the provincial level as maritime-related through the study's researcher aggregation. Across regencies and municipalities, the overall MSME population, not the maritime subset specifically, is dominated by microenterprises (98.95–99.99%). Regional findings therefore describe recorded subsector presence and researcher-classified functional profiles rather than business-count concentration.
Conclusion: The study produces a region-linked analytical database and descriptive typology that can support context-sensitive blue-economy planning while clearly distinguishing observed BPS indicators from researcher-classified regional profiles.

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INTRODUCTION

Indonesia's archipelagic geography makes the sea and coastal areas strategic economic spaces for national development. Maritime economic activities include not only capture fisheries and aquaculture but also seafood processing, the seaweed industry, salt production, marine culinary businesses, seafood trading, maritime support services, and marine tourism. All these activities form a business ecosystem connecting the primary, secondary, and tertiary sectors. From a blue economy perspective, maritime business development must reconcile economic growth, job creation, improved welfare of coastal communities, and the protection of marine ecosystems.

Previous research shows that the success of the blue economy is influenced by the quality of governance, institutional capacity, investment, productivity, technology use, and the sustainability of marine resources. Globally, blue economy strategies increasingly confront a dual challenge: expanding ocean-based livelihoods while addressing the spatial marginalization and

limited upgrading capacity of small-scale coastal enterprises. This makes transparent regional profiling important before inferring concentration, connectivity, or scale transitions from aggregated administrative data.

Indonesia's maritime economic potential is supported by a large national fisheries production base. The Ministry of Marine Affairs and Fisheries recorded that Indonesia's fishery production in 2024 reached approximately 24.57 million tons, consisting of 7.39 million tons of capture fisheries and 17.18 million tons of aquaculture. Aquaculture production includes approximately 6.37 million tons of fish and 10.81 million tons of seaweed. During 2020–2024, fishery production grew at an average of 3.02% per year, while aquaculture and seaweed production grew at approximately 3.84% and 3.13% per year, respectively. In the first quarter of 2025, fishery production reached 5.87 million tons, with a production value of approximately IDR 117.02 trillion (KKP, 2025). This large production base creates opportunities for developing downstream activities such as processing, distribution, trading, culinary businesses, logistics, and support services. However, production growth has not always been accompanied by equitable value distribution because of differences in infrastructure, technology, access to financing, market connectivity, and institutional capacity across regions (Rimmer et al., 2021).

The diversity of subsectors is an important characteristic of Indonesia's maritime business. Capture fisheries and aquaculture are sources of raw materials, while processing industries and marine culinary businesses create value-added products. Seafood trading and maritime support services connect production with consumers, while marine tourism integrates natural resources, services, coastal culture, and the creative economy. Seaweed is also developing as a strategic commodity involving many small-scale cultivators and contributing to household income and women's participation in coastal areas. Nevertheless, the economic benefits of seaweed differ across regions because they are influenced by production quality, access to technology, actors' positions in the value chain, relationships with buyers, and the availability of processing industries (Rimmer et al., 2021). Similar conditions occur in salt production and other fishery products, where regions with abundant production resources do not necessarily have adequate processing and marketing capabilities.

At the business-actor level, maritime businesses operate on a very diverse scale, ranging from household businesses and ultra-micro, micro, small, and medium enterprises to large companies. Differences in business scale are related to asset ownership, production capacity, number of workers, technology use, access to capital, business formality, market reach, and the ability to manage risks. Mutiara & Safitri (2025) found that coastal MSMEs play an important role in increasing community income through seafood processing, culinary businesses, trading, and tourism services. However, business sustainability is still constrained by access to capital, marketing capabilities, human resource quality, infrastructure, weather variability, and business competition. These findings align with Rimmer et al. (2021), which shows the dominance of small-scale actors in seaweed cultivation and identifies limitations in technology, infrastructure, policy coordination, and marketing as barriers to blue economy development at the regional level.

Differences in geographical characteristics cause maritime business structures to be unevenly distributed. Capture fishery activities are generally concentrated around fishing grounds, fishing ports, and fish landing sites. Marine aquaculture and seaweed cultivation depend on water suitability, ecological conditions, and access to production facilities. The salt industry requires specific climatic and land characteristics, while seafood processing tends to develop around production centers, transportation networks, and markets. Meanwhile, culinary and marine tourism develop more extensively in areas with natural attractions, accessibility, amenities, infrastructure, and tourist flows. Therefore, differences in location not only indicate the geographical distribution of businesses but also represent variations in resources, market opportunities, infrastructure, and regional development capacity (Mutiara & Safitri, 2025).

The spatial dimension becomes increasingly relevant because maritime business development faces interregional inequality. Some regions function as raw material production centers but do not yet have adequate processing industries. Other regions develop as trading, services, logistics, culinary, or tourism centers even though they are not major producers of marine commodities. This condition demonstrates a spatial relationship among production centers, processing centers, distribution routes, and consumption centers. Blue economy studies in Indonesia also show that maritime sector growth is influenced by regions' ability to manage

local potential, build infrastructure, attract investment, and align economic development with environmental protection (Sabrina & Putra, 2025). Therefore, data that only show production quantities or the number of business actors are not sufficient to explain the structure and interconnectedness of maritime business ecosystems.

The need for spatial mapping also arises because maritime business data are still scattered across various agencies and statistical systems. Capture fisheries, aquaculture, seaweed, and salt data are generally managed by marine and fisheries agencies; processing industry and MSME data are held by industry or cooperative agencies; trade data are held by trade agencies; while services and marine tourism data are managed by transportation or tourism agencies. BPS (2024) explains that marine and coastal resource statistics are compiled through data compilation from BPS and various central and regional agencies. Although they provide important information on marine resource potential and management, the data are not always presented using the same unit of analysis, subsector classification, reference year, or level of geographical detail. This data fragmentation can limit the ability of governments and researchers to identify business concentrations, inter-subsector connections, and capacity gaps across regions (BPS, 2024).

Various studies over the past five years have provided an important foundation for maritime economic development. Rimmer et al. (2021) examined the contribution of seaweed cultivation to livelihoods and community welfare; Marwa et al. (2024) analyzed factors affecting Indonesia's blue economy growth; Mutiara & Safitri (2025) studied coastal MSME development strategies; Sabrina & Putra (2025) discussed Indonesia's position in developing sustainable fisheries practices in ASEAN; analyzed the adoption of blue economy development frameworks at the regional government level. These studies show that the maritime economy is influenced by interactions among natural resources, business actors, markets, technology, infrastructure, and policy. However, available studies still tend to focus on one commodity, one group of actors, one subsector, or one specific region. Taken together, these studies illuminate livelihoods, growth, MSME strategy, sustainable fisheries, and regional blue economy policy, but they differ in their units of analysis and do not provide a directly comparable region-by-subsector profile for NTB. The present study therefore uses them as complementary rather than repetitive evidence for the research gap.

These limitations indicate a research gap in terms of sectoral, spatial, and business-scale integration. First, previous studies have not extensively integrated activities from upstream to downstream, from capture fisheries and aquaculture to processing, trading, culinary businesses, services, and marine tourism. Second, differences in business scale have not always been included as a basis for classifying maritime business actors, even though business scale determines production capacity, technology, financing, labor, and market reach. Third, available data are more often presented in aggregate statistical form and have not been fully linked to coordinates or administrative areas that enable spatial pattern analysis. Fourth, relatively few studies have produced an integrated database that can be used to compare subsector specialization, business concentration, and business diversification levels across regions (Rimmer et al., 2021).

Based on these gaps, the novelty of this research is the development of a region-linked analytical database and multidimensional maritime business typology that integrates administrative region, recorded maritime-subsector presence, and the general regional MSME-scale composition within a single analytical framework. The mapping covers nine subsectors: capture fisheries, marine aquaculture, seafood processing, seaweed, salt, marine culinary businesses, seafood trading, maritime support services, and marine tourism. Unlike previous studies that are generally sectoral or case-study-based, this research uses documentary analysis and multisource secondary data to build a classification that can be compared across regions. The use of spatial mapping enables the identification of business concentrations, subsector specialization, geographic gaps, proximity between upstream and downstream activities, and the potential for forming maritime business clusters. The novelty is therefore a reproducible administrative-region typology, rather than a claim to business-level geocoding or measured spatial concentration.

This research has academic and practical significance. Academically, it expands blue economy studies from macro and sectoral analysis toward an understanding of the spatial structure of maritime businesses at the regional and business-scale levels. The resulting database can serve as a basis for further research on value chains, competitiveness, business resilience,

digital transformation, green innovation, and sustainable maritime business growth. Practically, the mapping results can support governments in determining priority areas, adjusting financing schemes, developing infrastructure, strengthening upstream-downstream relationships, and designing empowerment programs according to the characteristics of business actors. This information is important because blue economy policies require evidence-based interventions that consider variations in the potential, capacity, and needs of each region.

Based on this background, this study aims to identify and compile data on capture fisheries, marine aquaculture, seafood processing, seaweed, salt, marine culinary businesses, seafood trading, maritime support services, and marine tourism businesses; map their distribution by region; classify actors by subsector and regional MSME-scale context; and develop a regional typology based on the concentration, specialization, and diversity of maritime business activities. The main outputs of the research are a geospatial database and maritime business typology that can be used as a foundation for developing blue economy policies and sustainable maritime business growth in Indonesia.

Literature Review

Blue Economy as the Foundation of Maritime Business

The blue economy is a development approach that integrates the utilization of marine resources, the creation of economic value, the equitable distribution of social benefits, and the maintenance of environmental quality. In the context of maritime business, this approach positions the sea not only as a source of raw materials but also as a space for production, processing, trading, transportation, services, tourism, and innovation. Thus, maritime business encompasses a range of economic activities from the primary sector, such as capture fisheries and marine aquaculture, to the secondary and tertiary sectors, including seafood processing, trading, culinary activities, support services, and marine tourism. Blue economy implementation requires a balance between production growth, resource-use efficiency, benefit distribution, and ecosystem sustainability (Wuwung et al., 2022).

The blue economy concept in Indonesia is developing through the strengthening of marine policies, the establishment of blue economy development frameworks, and the development of indicators to measure economic, social, and environmental performance. However, implementation still faces differences in definitions, subsector classifications, institutional interests, and regional government capacity. Wuwung et al. (2024) found that Indonesia's marine development policies have progressed, but implementation is still influenced by fragmented authority and a non-uniform understanding of the activities included in the blue economy. Sabrina & Putra (2025) also showed that blue economy development requires policy harmonization, regional cooperation, the implementation of sustainable fisheries practices, and the integration of local actors' interests. Meanwhile, Trenggono et al. (2025) developed a marine and fisheries blue economy index that emphasizes the importance of using multidimensional indicators to assess variations in performance across regions.

Maritime business development cannot be adequately measured using production volume or aggregate economic value alone. Regions that produce large quantities of marine resources are not necessarily able to create high value added if processing activities, distribution, product innovation, and market access remain limited. Conversely, regions that are not production centers can play roles as trading centers, logistics hubs, processing centers, culinary centers, or tourism destinations. Marwa et al. (2024) showed that Indonesia's blue economic growth is determined by the relationship between investment, maritime-sector productivity, socioeconomic conditions, and environmental sustainability. Wardhani et al. (2023) found that the substantial potential of fisheries, seaweed, pearls, mangroves, and marine tourism does not automatically improve community welfare if it is not supported by adequate human resources, infrastructure, financing, and policies. Hidayati & de Vries (2025) also emphasized that blue economy benefits can be unevenly distributed when cross-sectoral coordination is weak and local business actors are less involved in decision-making.

Concept and Scope of Maritime Business

Maritime business in this study is defined as business activities whose resources, location, production processes, products, services, or markets have a direct connection to the sea and

coastal areas. This operational definition covers nine subsectors: capture fisheries, marine aquaculture, seafood processing, seaweed, salt production, marine culinary activities, seafood trading, maritime support services, and marine tourism. Cross-subsector grouping is necessary because the maritime economy does not operate as a collection of separate activities but rather as an interdependent ecosystem characterized by flows of raw materials, labor, capital, technology, information, transportation, and markets (Siswanto & Rosdaniah, 2023).

Capture fisheries and marine aquaculture are at the upstream end of the value chain because they produce raw materials for processing, trading, and consumption activities. Seaweed can be positioned as both an aquaculture subsector and a separate industry because it has a broad value chain, ranging from raw material production to applications in food, cosmetics, pharmaceuticals, fertilizers, and industrial materials. The seafood processing industry increases the value, quality, shelf life, and market reach of commodities. Meanwhile, trading, logistics, cold storage, vessel repair, fishing gear supply, and port services support the movement of products from producers to consumers. The relationships between these stages show that maritime business sustainability depends on the strength of the value chain, not merely on the success of primary production units (Mahmud et al., 2026).

Culinary activities and marine tourism expand the utilization of maritime resources into the service sector. Marine culinary activities create value added through processing, presentation, consumption experiences, and local identity, while marine tourism combines coastal ecosystem quality with facilities, transportation, accommodation, recreational activities, and the creative economy. Integration among fisheries, culinary activities, coastal culture, and tourism allows a region to benefit from marine resources without relying entirely on increased exploitation. However, these opportunities are influenced by accessibility, environmental quality, actor skills, infrastructure, promotion, and cross-sectoral coordination. Wardhani et al. (2023) and Sabrina & Putra (2025) showed that diversification of sea-based economic activities can strengthen socioeconomic benefits but requires governance that prevents spatial-use conflicts and resource degradation.

Business Ecosystem and Maritime Value Chain Perspectives

The business ecosystem perspective explains that business performance is influenced by interactions with other actors in the same environment. In maritime business, this ecosystem includes fishers, aquaculture producers, salt farmers, processors, traders, restaurant owners, tourism managers, cooperatives, financial institutions, technology providers, universities, government, and consumers. Each actor has different functions and resources, but their activities are mutually dependent. The absence of cold storage facilities, for example, can reduce the quality of catches and weaken producers' bargaining positions. Similarly, limited processing capacity can cause value added to shift from production areas to other regions with better facilities and market access (Siswanto & Rosdaniah, 2023).

Value chain analysis provides a framework for understanding the relationships among production, collection, processing, distribution, marketing, and final consumption. Di Cintio et al. (2022) showed that mapping actors and transaction relationships in small-scale fisheries can reveal benefit distribution, market barriers, bargaining positions, and opportunities for value enhancement. Espinasse et al. (2023) showed that the development of coastal fisheries and aquaculture does not always follow the same patterns because each is influenced by different production structures, geographical conditions, technologies, and policies. Mahmud et al. (2026) emphasized that fishery value chain analysis needs to consider profitability, sustainability, governance, and benefit equity simultaneously. Therefore, maritime business databases need to record not only the number of business units but also their subsector, location, and business scale as a basis for identifying potential relationships among actors.

The value chain perspective also explains why regions with high subsector diversity can have business ecosystems that differ from those of regions that depend primarily on primary production. The presence of processing, trading, culinary, service, and tourism activities can expand income sources and create demand for labor and local products. Conversely, concentration in a single activity makes regional economies more vulnerable to seasonal changes, commodity prices, supply chain disruptions, and declines in environmental quality. Findings by Hidayati & de Vries (2025) show that subsector diversity does not always produce optimal

benefits when inter-actor relationships are weak. Thus, subsector diversification needs to be considered together with the level of interconnectedness among economic activities within the same region.

Economic Geography and Maritime Business Agglomeration

Economic geography explains that business activities are not randomly distributed but tend to concentrate in locations that offer resources, market access, infrastructure, labor, and institutional support. In the maritime sector, ecological conditions are an initial factor shaping production locations. Capture fisheries follow fish-resource availability and landing facilities; marine aquaculture depends on water quality, currents, depth, and the suitability of water conditions; while salt production is influenced by land conditions, solar intensity, rainfall, and salinity. Downstream activities then develop in response to proximity to raw materials, ports, transportation networks, settlements, and markets (Ma et al., 2025).

Industrial agglomeration occurs when business units concentrate in an area and gain advantages from geographical proximity. These advantages can include input-procurement efficiency, ease of obtaining labor, information exchange, shared facility use, reduced transportation costs, and the formation of specialized markets. Wang et al. (2025) found that aquaculture-industry agglomeration is influenced by natural resource advantages, intersectoral relationships, market demand, and policy support. Ma et al. (2025) also identified strong spatial concentration patterns in the aquaculture industry and differences in industrial composition across regions. In other contexts, Espinasse et al. (2023) showed that fisheries and aquaculture production exhibit variations and nonuniform regional development trajectories. These findings support the use of spatial mapping to identify production centers, specialized regions, and areas with more diverse business structures.

Although agglomeration can increase efficiency, excessively high concentrations of activities can also create environmental pressure, economic dependence, and competition for spatial use. Regions that depend on a single commodity for their economies will be more sensitive to price changes, disease outbreaks, weather conditions, or trade policies. Therefore, typology formation should consider not only the number of businesses but also business density, subsector composition, actor scale, and economic diversification. Wuwung et al. (2022) and Wuwung et al. (2024) emphasized that blue economy measurement needs to combine economic, social, environmental, governance, and regional-variation dimensions so that the concentration of economic activity is not directly interpreted as an indicator of sustainability.

Spatial Mapping of Maritime Business

Spatial mapping is the process of linking attribute data with geographic units, such as provinces, regencies/cities, districts, or coastal villages. In maritime business research, attribute data can include the number of business units, workers, production volume, production value, business legal form, and business scale category. Integrating these data enables the identification of distribution patterns, concentration, service gaps, inter-subsector proximity, and interregional inequality. The spatial approach provides information that cannot be obtained from ordinary statistical tables because it shows the location of an activity and its relationship with other activities within the same geographic space (Ma et al., 2025).

Spatial analysis in this study can use descriptive statistics, frequency distributions, percentages, business density, and subsector proportions by region. If BPS data are available consistently, measures such as the location quotient can be used to identify subsector specialization, while diversification indices can show the level of diversity in business activities. Typology grouping can be developed through cross-tabulation or cluster analysis based on similarities in regional characteristics. The use of standardized indicators is important so that differences in population size, area, and regional economic scale do not produce misleading conclusions. Studies by Wang et al. (2025) show that composite indices, specialization measures, and distribution analysis can help compare marine-sector capacity and structure across regions.

Secondary-data-based mapping also has limitations. Ultra-micro and informal business units are often not fully recorded because they lack legal status, permanent locations, or formal business bookkeeping. In addition, differences in publication year, operational definitions, survey coverage, and administrative units can reduce data comparability. Women's contributions, family

workers, small traders, and informal service providers may also not be visible in official statistics. Fondo et al. (2025) showed that small-scale fishery activities are often underrepresented in statistics, even though they play important roles in income, food security, and the sustainability of coastal communities. Therefore, documentary research needs to include processes for definition verification, classification harmonization, recording of missing data, and evaluation of comparability across sources.

Business Scale in Maritime Business Structure

Business scale is an important dimension because it describes differences in economic capacity among business units. Ultra-micro and micro businesses generally depend on family labor, simple technology, limited capital, and local markets. Small and medium enterprises tend to have a clearer division of labor, larger production capacity, broader access to financing, and interregional marketing networks. Meanwhile, large companies have greater investment capacity, advanced technology, certification, logistics capabilities, and access to national or international markets. These differences affect productivity, value added, bargaining power, formality, and the ability to manage risks (Sihombing et al., 2022).

Small-scale business actors are the dominant component in many maritime subsectors, especially capture fisheries, aquaculture, traditional trading, household processing, and culinary activities. However, their contributions can be underestimated when statistics are more oriented toward formal companies, production volume, or trade value. Sihombing et al. (2022) showed that digitization of blue economy MSMEs is influenced by organizational readiness, the business environment, and technology adoption capability. Di Cintio et al. (2022) found that the value chain structure of small-scale fisheries creates differences in market access and profit distribution. Hidayati & de Vries (2025) showed that local producers can be in a disadvantaged position when dependence on buyers and capital owners is not balanced by coordination or empowerment. Therefore, business scale classification is needed so that mapping does not only describe the locations of activities but also the capacity structure of the actors.

Regional Typology of Maritime Business

Regional typology is the grouping of areas based on similarities in maritime business characteristics. Typology serves to simplify regional diversity without eliminating the main characteristics of each group. Dimensions that can be used include the number and density of businesses, dominant subsectors, level of specialization, activity diversity, business scale composition, production, labor, and the availability of downstream activities. This approach can produce categories such as primary-production-based regions, aquaculture and seaweed regions, processing and trading regions, service and marine tourism regions, and regions with integrated maritime business ecosystems.

Typology formation needs to consider that dominant subsectors do not always indicate sustainable advantages. Regions with high production but minimal processing can be categorized as raw-material centers, while regions with balanced upstream, downstream, trading, and service activities can demonstrate stronger economic integration. Ma et al. (2025) and Wang et al. (2025) showed that industrial composition and agglomeration can differentiate regional development characteristics. Trenggono et al. (2025) emphasized the need for multidimensional indicators to compare blue economy performance across regions. Meanwhile, Wardhani et al. (2023) showed that the presence of several blue economy drivers does not guarantee improved welfare if it is not accompanied by infrastructure, human capacity, and effective economic relationships.

The resulting typology can serve as a basis for differentiated policy formulation. Primary production regions require the strengthening of production facilities, ports, cold storage, and resource protection. Processing regions require reliable raw-material supplies, quality standardization, technology, certification, and waste management. Trading and service regions require connectivity, market information, logistics facilities, and digitalization, while marine tourism regions require environmental management, amenities, safety, and integration with local businesses. Typology-based policy approaches are more relevant than uniform interventions because they consider the specific structures and needs of each region (Sabrina & Putra, 2025).

Synthesis of Previous Research and Research Position

Previous studies have identified several important dimensions in maritime business development. Di Cintio et al. (2022) emphasized the value chain structure of small-scale fisheries; Espinasse et al. (2023) showed variations in fisheries and aquaculture development across regions; Wardhani et al. (2023) revealed the gap between blue economy potential and community welfare; Marwa et al. (2024) examined factors influencing Indonesia's blue economic growth; and Wuwung et al. (2024) reviewed marine policy development and blue economy frameworks. Subsequent research has moved toward multidimensional index development, agglomeration analysis, aquaculture-industry distribution, and relationships between blue economy development and coastal communities (Trenggono et al., 2025).

Although relevant, these studies have not simultaneously integrated capture fisheries, marine aquaculture, seafood processing, seaweed, salt production, culinary activities, trading, support services, and marine tourism into a single geospatial database. Previous studies have more often used one commodity, one subsector, or one region as the unit of analysis. In addition, the business-scale dimension has not always been considered together with the regional and subsector dimensions. This research fills these gaps through the harmonization of BPS secondary data, mapping of business distribution, and typology development based on region, subsector, and business scale.

The position of this research is descriptive-exploratory. Its contribution is not to estimate the effect of one variable on another but to build an information structure that shows how maritime business activities are distributed and grouped. The resulting database and typology can serve as a basis for subsequent explanatory research, for example, to test the effects of agglomeration, diversification, digital capacity, infrastructure, and institutional support on sustainable maritime business growth. The analytical framework of this research is built on three dimensions: the regional dimension, the subsector dimension, and the business-scale dimension.

METHOD

The study used a descriptive-exploratory design with a documentary study approach. The research was directed toward developing a database, identifying business-scale structures, profiling the recorded distribution of subsector presence across administrative regions, and formulating a maritime business typology in West Nusa Tenggara Province. This design was chosen because the research did not test causal relationships but described variations in maritime business characteristics across regions based on published statistical data. Similar approaches have been used to compare the structure and development of fisheries and aquaculture sectors across regions by utilizing secondary statistical data organized according to regional, production, and economic activity dimensions (Trenggono et al., 2025). Because the source data did not provide geocoded business records or regency/city-level counts of maritime businesses, the design did not estimate business density, concentration, or geographic proximity.

The research scope covered all administrative areas in West Nusa Tenggara Province, consisting of West Lombok Regency, Central Lombok Regency, East Lombok Regency, North Lombok Regency, Sumbawa Regency, West Sumbawa Regency, Dompu Regency, Bima Regency, Mataram City, and Bima City. The unit of analysis was the regency/city, while the information units included the number and percentage of business units, business-scale category, industry group, and maritime business subsectors developing in each region. The percentages of micro, small, and medium enterprises were taken from the overall MSME structure of each regency/city and were used only as contextual indicators; they were not interpreted as maritime-specific business-scale shares.

The selection of all regencies/cities was made to obtain a comprehensive picture of maritime economic variation on Lombok Island and Sumbawa Island. The use of administrative units allowed statistical data to be linked to regional boundaries in the mapping process. The region-based approach also showed differences in concentration, specialization, and industrial structure that were not visible when data were presented only at the provincial level. Previous research has shown that fisheries and aquaculture activities have different regional development patterns due to variations in resources, market access, infrastructure, and production structure.

The research used secondary data obtained through searches and documentation of official publications of the Central Bureau of Statistics (BPS) of West Nusa Tenggara Province for 2024. The documents used included provincial statistical publications, regency/city in figures

publications, micro, small, and medium enterprise statistics, industry statistics, fisheries statistics, and tourism statistics that provided information relevant to coastal and maritime economic activities. Supporting data were obtained from BPS dynamic statistical tables when they were consistent in terms of year, region, and operational definitions with the main publications. For data provenance, each extracted value was retained with its publication title, year, geographic unit, variable/table label as reported in the source, and source document reference. Where a single official maritime-business table was unavailable, the manuscript treated the resulting aggregation as researcher-constructed rather than as an official BPS category. Because all data were publicly available secondary statistics and no human participants were involved, informed consent was not applicable to this documentary study.

The data collected included the number of business units, the percentage of businesses by micro, small, and medium scale, industry group classification, and information on capture fisheries, marine aquaculture, seafood processing, seaweed, salt production, marine culinary activities, seafood trading, support services, and marine tourism activities. Based on the compiled data, the number of MSMEs in NTB in 2024 was recorded at 324,624 business units, with approximately 19,000 units, or 6%, placed in maritime industry groups. Estimated figures were maintained according to the source presentation and were not treated as individual business-unit census results. The approximately 19,000-unit figure represented a provincial-level researcher aggregation of source categories associated with maritime activities; it was not used to create regency/city maritime-business counts and was interpreted as an approximate descriptive estimate rather than a census figure.

The use of various BPS tables was undertaken to overcome information fragmentation across subsectors. Fisheries, processing industries, trading, services, and tourism data were not always available in a single publication or under the same classification. Therefore, each piece of data was recorded together with information on the variable name, measurement unit, observation year, region, publication source, and data status. Previous research showed that mapping fishery activities can use various types of data sources and indicators, but differences in geographic scale, period, and actor category must be considered before data are combined. Wuwung et al. (2024) also emphasized the need to integrate sectoral and regional indicators to obtain a more comprehensive picture of the blue economy.

Data collection was carried out through four stages. The first stage involved an inventory of BPS publications containing MSME, industry, marine and fisheries, trading, services, and tourism information. The second stage involved data extraction into a structured worksheet. Each row of data represented a region or business group, while the columns contained the year, number of businesses, percentage, business scale, subsector, and data source. The third stage involved consistency checking to detect differences in regional naming, duplication, data gaps, year mismatches, and unit differences. The final stage involved data harmonization into a database format that could be used for descriptive analysis and spatial mapping.

Subsector classification was carried out by grouping business activities into nine categories, namely: (1) capture fisheries; (2) marine aquaculture; (3) seafood processing; (4) seaweed; (5) salt production; (6) marine culinary activities; (7) seafood trading; (8) maritime support services; and (9) marine tourism. Business units with more than one activity were placed in the subsector that best reflected their main activity based on the classification in the source document. If information on the main activity was unavailable, the unit was retained in a more general category and annotated to avoid unsupported classification. Grouping based on the activity chain allowed the research to distinguish production, processing, distribution, and service functions in the maritime business ecosystem (Mahmud et al., 2026). To reduce overlap, seaweed was retained as a separate category only when the source reported it separately from marine aquaculture; culinary, trading, services, and tourism were classified as maritime only when the source explicitly linked them to seafood, marine, coastal, or maritime activities. Multi-activity records were assigned to the primary activity stated in the source, while ambiguous records remained in the broader source category rather than being forced into a maritime subsector.

Business scale was arranged according to the categories available in BPS data, namely micro, small, and medium enterprises. The analysis used the percentage of each business scale in 2024 to maintain comparability across regions. If differences were found between the number of units and percentages, the data were traced back to the source table. Zero values were

distinguished from unavailable data: zero indicated no recorded units, whereas unavailable data were assigned a special code and were not replaced with a zero value. These scale percentages described all MSMEs in the administrative region. They were not maritime-specific and were therefore used only to contextualize the regional business environment, not to infer the scale composition of maritime businesses.

Analysis began with the presentation of the number, percentage, composition, and distribution of business units by region, scale, and subsector. Cross-tabulation was used to show the relationship between regency/city, business scale, and dominant business clusters. The results were used to identify regions dominated by primary production activities, processing and trading regions, service- and tourism-based regions, and regions with combinations of upstream and downstream activities. This multidimensional approach was consistent with Trenggono et al. (2025), who compared Indonesia's blue economy performance based on several dimensions and regional units, as well as Ma et al. (2025), who analyzed the composition and distribution of aquaculture industries to identify differences in interregional characteristics.

Comparison of business-scale structures was visualized using radar charts. Because the percentage of micro businesses in all regions was in a very high range, while the percentages of small and medium businesses were relatively low, the values of each category were transformed into a relative dominance index of 1–5 through min–max normalization across regions. A value of 1 indicated the lowest relative position and 5 indicated the highest position within the same business-scale category. The transformation was performed separately for micro, small, and medium businesses so that the radar shape described a regency/city's relative position against other regions rather than absolute percentage values. To maintain transparency, the original BPS percentages were still listed in each figure. The use of normalization and regional indices has also been applied in blue economy research to enable comparisons across indicators with different measurement ranges (Trenggono et al., 2025). The normalization was calculated separately for each scale category as $I = 1 + 4[(x - xmin)/(xmax - xmin)]$, where x is the regional percentage and xmin and xmax are the minimum and maximum percentages across the ten regions. Because this transformation magnified small absolute differences, the original percentages remained the primary results, and the 1–5 index was interpreted only as a relative visual aid.

Regional typology was formed based on three components: business-scale composition, subsector diversity, and dominant activity clusters. Subsector diversity was obtained from the number of maritime business categories identified in each region. Dominant-cluster labels were assigned as descriptive researcher classifications based on activities that were repeatedly and explicitly identified in the consulted BPS publications. No quantitative dominance threshold was available; accordingly, these labels were used to summarize recorded regional profiles and were not treated as measures of market dominance.

The processed database was linked by regency/city name and code to administrative-region identifiers for descriptive regional comparison. Because the available data did not contain business-level coordinates or maritime-business-unit counts by regency/city, no quantitative GIS-based concentration, density, proximity, or spatial-join analysis was claimed.

The regional typology was used to compare recorded subsector presence and contextual MSME characteristics between Lombok and Sumbawa. Geographic interpretations were limited to administrative-region profiles; the study did not infer measured business concentration or interregional proximity from the available data.

Data validation was carried out through cross-checking among provincial publications, regency/city publications, and relevant BPS statistical tables. Data originating from more than one document were compared based on year, unit, classification, and region. If differences were found, the research used the publication with the most specific scope and the most appropriate year, while such differences were recorded in the database metadata. This procedure was important because small-scale fishery activities and informal businesses may be underrepresented in official statistics, so the research results had to be interpreted as a picture based on recorded business units (Chollett et al., 2022).

RESULTS AND DISCUSSION

Result

MSME Structure of West Nusa Tenggara Province

The results of BPS NTB 2024 data processing show that the number of MSMEs in West Nusa Tenggara Province reached 324,624 business units. Based on industry groups, trade and retail is the largest group, with an estimated 95,000 units, or about 29% of total MSMEs. Agriculture and plantations ranked second, with approximately 82,000 units, or 25%, followed by non-maritime processing industries, with 48,000 units, or 15%. Meanwhile, the maritime industry is estimated to comprise 19,000 units, or about 6% of total MSMEs in NTB.

The figure of 19,000 units includes capture fisheries, marine aquaculture, seafood processing, seaweed, salt production, pearl production, marine culinary activities, seafood trading, support services, and marine tourism activities. Although its proportion is lower than those of trade and agriculture, the maritime industry occupies a strategic position because it connects primary production, processing, distribution, services, and tourism in coastal areas. The number of units in each group is estimated; therefore, the difference from the official total of 324,624 MSMEs is attributable to rounding.

Table 1
Distribution of NTB MSMEs by Industry Group in 2024

No.	Industry Group	Estimated Number of Units	Percentage	Main Characteristics
1	Trading and retail	±95,000	±29%	Shops, grocery stores, distributors
2	Agriculture and plantations	±82,000	±25%	Food crops, horticulture, livestock
3	Non-maritime processing industry	±48,000	±15%	Food, beverages, handicrafts, furniture
4	Tourism and creative economy	±32,000	±10%	Homestays, culinary, souvenirs
5	Services	±29,000	±9%	Transportation, workshops, laundry, other services
6	Maritime industry	±19,000	±6%	Fisheries, aquaculture, marine products, salt, pearls, marine tourism
7	Micro-scale manufacturing industry	±13,000	±4%	Simple home-based production
8	Digital industry	±6,000	±2%	E-commerce and digital services
	Total by group rounding	±324,000	±100%	
	Official NTB MSME total	324,624		

Source: BPS NTB, 2024 (processed by researcher)

Maritime Business Database by Region

The research database integrates region, subsector, business scale structure, dominant cluster, data year, and source document. Data on the number of maritime business units per regency/city were not available separately in the source tables. Therefore, the research maintained the quantity column as "not available" and used business scale percentages and dominant cluster information to describe the regional structure. This approach avoids generating estimated figures for regencies/cities that lack a documentary basis.

Table 2
NTB Maritime Business Database 2024

Region	Identified Subsectors	Micro	Small	Medium	Dominant Cluster
West	Culinary, trading, pearls,	99.96%	0.03%	0.01%	Services and marine

Lombok	tourism				tourism
Central Lombok	Seaweed, tourism, culinary	99.95%	0.03%	0.02%	Seaweed and marine tourism
East Lombok	Capture fisheries, aquaculture, seaweed, processing	99.84%	0.12%	0.03%	Diversified maritime production
North Lombok	Tourism, capture fisheries, aquaculture	99.25%	0.67%	0.08%	Tourism and fisheries
Sumbawa	Capture fisheries, aquaculture, trading	99.79%	0.16%	0.05%	Production and seafood trading
West Sumbawa	Capture fisheries, trading	98.95%	0.97%	0.09%	Fisheries and trading
Dompu	Aquaculture, salt, shrimp ponds	99.98%	0.02%	0.00%	Aquaculture and salt
Bima Regency	Capture fisheries, salt, aquaculture, trading	99.91%	0.06%	0.03%	Fisheries, aquaculture, and salt
Mataram City	Processing, culinary, pearl crafts	99.98%	0.02%	0.00%	Processing and marine culinary
Bima City	Seafood processing and fish trading	99.99%	0.01%	0.01%	Processing and trading

Source: BPS NTB, 2024 (processed by researcher)

Distribution by Business Scale

The MSME structure in all regencies/cities in NTB is dominated by micro businesses. Their proportions range from 98.95% in West Sumbawa Regency to 99.99% in Bima City. Small businesses account for 0.01–0.97%, while medium businesses account for only 0.00–0.09%. These figures indicate that business activities in NTB, including those related to the maritime sector, still rely on business units with limited capital, labor, technology, and market reach. These percentages refer to the overall MSME population in each regency/city and must not be interpreted as the scale composition of maritime businesses specifically.

West Sumbawa Regency has the highest proportions of small and medium businesses, at 0.97% and 0.09%, respectively. North Lombok Regency ranks next, with 0.67% small businesses and 0.08% medium businesses. Conversely, Dompu Regency and Mataram City have medium-business proportions of 0.00% after rounding. These differences indicate that the capacity to transition from micro to small or medium scale has not developed evenly.

Table 3

Distribution of MSME Scale by Regency/City in 2024

No.	Regency/City	Micro Business	Small Business	Medium Business
1	West Lombok Regency	99.96%	0.03%	0.01%
2	Central Lombok Regency	99.95%	0.03%	0.02%
3	East Lombok Regency	99.84%	0.12%	0.03%
4	Sumbawa Regency	99.79%	0.16%	0.05%
5	Dompu Regency	99.98%	0.02%	0.00%
6	Bima Regency	99.91%	0.06%	0.03%
7	West Sumbawa Regency	98.95%	0.97%	0.09%
8	North Lombok Regency	99.25%	0.67%	0.08%
9	Mataram City	99.98%	0.02%	0.00%
10	Bima City	99.99%	0.01%	0.01%

Source: BPS NTB, 2024 (processed by researcher)

Table 4

Relative Dominance Index of Business Scale Structure

Region	Micro Index	Small Index	Medium Index	Main Radar Pattern
West Lombok	4.88	1.08	1.44	Very dominant micro
Central Lombok	4.85	1.08	1.89	Dominant micro

East Lombok	4.42	1.46	2.33	Dominant micro with early small-scale development
Sumbawa	4.23	1.62	3.22	Dominant micro; medium position relatively better
Dompu	4.96	1.04	1.00	Almost entirely micro
Bima Regency	4.69	1.21	2.33	Dominant micro with limited medium capacity
West Sumbawa	1.00	5.00	5.00	Highest proportion of small and medium businesses
North Lombok	2.15	3.75	4.56	Relatively more tiered structure
Mataram City	4.96	1.04	1.00	Very strong micro dominance
Bima City	5.00	1.00	1.44	Highest micro business dominance

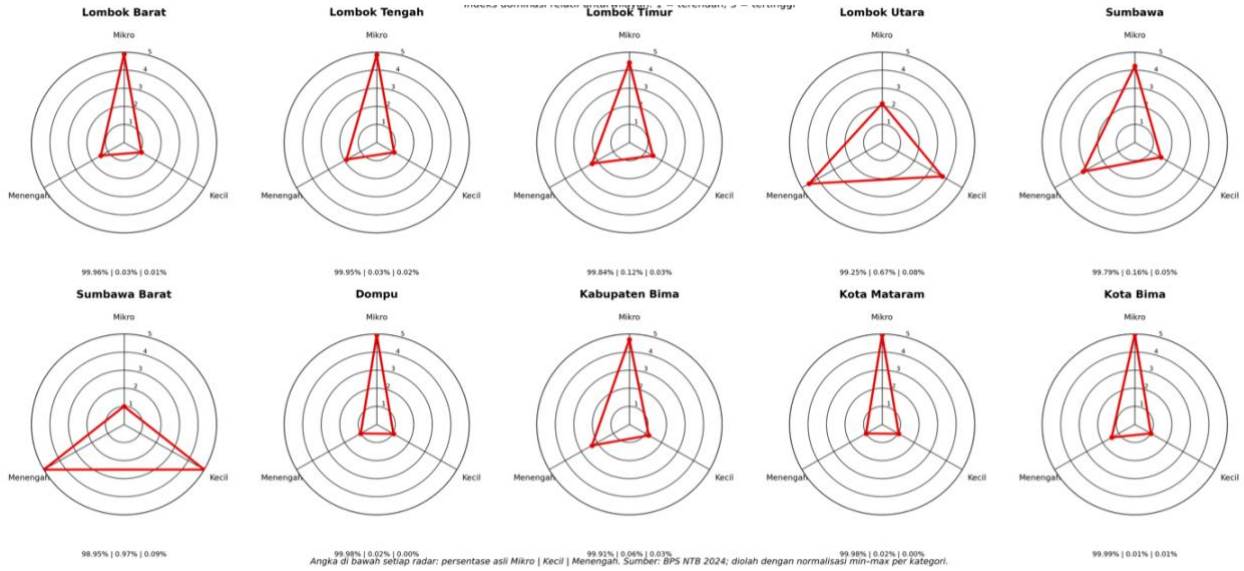

Figure 1. Relative Regional MSME-Scale Index Comparison for 2024

Regional Typology

The typology uses regency/city as the administrative unit and combines recorded maritime-subsector presence with contextual MSME-scale composition and descriptive activity clusters. The classification is intended to summarize regional profiles and economic functions, not to represent measured spatial concentration or business-level distribution.

Table 5
Classification for NTB Maritime Business Regional Typology

Map Code	Typology	Region	Main Characteristics
T1	Diversified maritime production	East Lombok	Capture fisheries, aquaculture, seaweed, and processing
T2	Tourism, culinary, and high-value commodities	West Lombok	Culinary, trading, pearls, and marine tourism
T3	Tourism-fisheries	North Lombok	Marine tourism, capture fisheries, and aquaculture
T4	Seaweed-tourism	Central Lombok	Seaweed, tourism, and marine culinary
T5	Fisheries-aquaculture-trading	Sumbawa	Capture fisheries, aquaculture, and trading
T6	Aquaculture-salt	Dompu	Marine aquaculture, salt, and shrimp ponds
T7	Diversified fisheries-salt	Bima Regency	Fisheries, salt, aquaculture, and

			trading
T8	Processing-trading	Bima City	Seafood processing and fish trading
T9	Processing-culinary-crafts	Mataram City	Processing, culinary, and pearl crafts
T10	Fisheries-trading	West Sumbawa	Capture fisheries and seafood trading

Source: BPS NTB, 2024; researcher classification.

At the administrative-region profile level, Lombok Island shows a strong combination of maritime commodity production, processing, culinary activities, and tourism. East Lombok tends to function as the most diversified production base; Central Lombok and West Lombok connect maritime commodities with tourism; while North Lombok shows a direct link between fisheries and marine tourism. Mataram City functions as a center for processing, culinary activities, and the marketing of value-added products.

Sumbawa Island shows a dominance of fisheries, aquaculture, salt production, and trading activities. Sumbawa Regency is a base for capture fisheries and aquaculture, while Dompu and Bima regencies have strong characteristics in aquaculture and salt production. Bima City takes on downstream functions through fish processing and trading. West Sumbawa has narrower subsector variation but a relatively stronger small and medium business composition compared with other regions.

Discussion

Micro Business Dominance and Challenges of Scale Upgrading

The dominance of micro businesses, which exceed 98% of all businesses in every regency/city, shows that NTB's economic structure is built around very small-scale business units. This condition expands community participation in economic activities but also highlights the limited transformation toward small and medium enterprises. Microbusiness actors generally face limitations in capital, technology, standardization, legal status, production capacity, and market connectivity. In fisheries value chains, these limitations can place producers in a weak bargaining position relative to collectors, wholesalers, or processing companies (Hidayati & de Vries, 2025).

The higher proportion of small and medium businesses in West Sumbawa and North Lombok shows differences in structural capacity across regions. West Sumbawa has the highest relative index for small and medium businesses, while North Lombok is supported by a combination of fisheries, aquaculture, and marine tourism. However, the absolute percentages of both groups remain below 1%. Therefore, the radar results cannot be interpreted as meaning that both regions have balanced business structures. The chart only shows that both regions have relatively more diversified business-scale structures than other regions in NTB.

These findings reinforce the results of Sihombing et al. (2022), which showed that increasing the capacity of blue economy MSMEs is influenced by organizational capability, technology, and the supporting environment. Di Cintio et al. (2022) also found that the position of small businesses in the value chain is determined by market access, inter-actor relationships, and the capacity to upgrade products and processes. Thus, the agenda for scaling up NTB's maritime businesses requires interventions that include financing, production equipment, storage facilities, certification, bookkeeping, digitalization, and market contracts.

Typology Diversity and Regional Specialization

The observed differences are descriptively associated with the recorded presence of subsectors; resource conditions, coastline form, infrastructure, market density, and tourism development are literature-based explanatory possibilities rather than variables measured in this dataset. Espinasse et al. (2023) showed that capture fisheries and aquaculture can develop through different regional trajectories, so uniform sectoral policies are not always suitable for all regions. Here, “diversity” refers only to the count and combination of recorded maritime subsectors, not to a formal economic-diversification index.

East Lombok can be categorized as a diversified maritime production base because it combines capture fisheries, aquaculture, seaweed, and processing. This structure provides

opportunities for forming local value chains from production to processing. However, the high proportion of micro businesses shows that activity integration is not automatically accompanied by improvements in business capacity. Development policies for East Lombok need to be directed toward shared processing facilities, cold-chain infrastructure, standardization, and market development for processed products.

Bima Regency also has high subsector diversity through capture fisheries, aquaculture, salt production, and trading. Unlike East Lombok, seafood processing has not yet emerged as a dominant cluster. This condition indicates an opportunity to strengthen the relationship between raw-material production and the processing industry. The development of post-harvest facilities can help reduce quality losses and retain more value added in production areas.

Integration of Production, Processing, and Markets

The regional profiles suggest potential functional differentiation across the maritime value chain: some regencies record stronger primary-production subsectors, whereas Mataram and Bima City record more processing, trading, or consumption-oriented activities. These patterns are indicative and do not demonstrate actual interregional product flows, transactions, or mutual dependence.

This relationship aligns with the value chain approach, which positions production, collection, processing, distribution, and marketing as interconnected activities. Di Cintio et al. (2022) showed that mapping actors and transaction relationships is needed to understand benefit distribution in small-scale fisheries. Mahmud et al. (2026) also emphasized that fish value chain development needs to integrate profitability, sustainability, and benefit equity. In the NTB context, the co-occurrence of complementary regional functions suggests potential functional linkages between East Lombok and Mataram City and between Bima Regency and Bima City; these are hypotheses for future flow-based investigation rather than demonstrated value-chain corridors.

Nevertheless, the BPS database used does not provide data on product flows across regencies/cities. Therefore, the value chain relationships discussed are interpretations based on subsector combinations and regional functions, rather than results of measuring goods flows. Further research needs to incorporate data on raw-material origins, marketing destinations, transaction volumes, intermediary actors, cold-chain facilities, and logistics costs.

Potential for Tourism and Maritime Business Integration

West Lombok, Central Lombok, and North Lombok show the strongest links between maritime activities and tourism. West Lombok combines marine culinary activities, seafood trading, pearls, and tourism; Central Lombok connects seaweed with tourism and culinary activities; while North Lombok combines marine tourism with fisheries and aquaculture. This integration opens opportunities for income diversification through culinary products, educational tourism, aquaculture visits, fish markets, souvenirs, and coastal cultural experiences.

Tourism potential does not automatically provide equitable benefits to local actors. Wardhani et al. (2023) showed that the large potential of fisheries, seaweed, and tourism in Lombok has not been fully able to reduce poverty due to constraints in financing, human resources, infrastructure, and governance. Hidayati & de Vries (2025) also showed that blue economy benefits can be captured disproportionately by investors or downstream actors when local producers lack bargaining power and access to decision-making. Therefore, tourism integration needs to be designed through partnerships involving fisher groups, aquaculture producers, processors, traders, coastal women, and local microbusinesses.

Policy Implications of Typology for Regional Development

The resulting typology shows that NTB's maritime business policies need to be differentiated based on regional functions. East Lombok requires strengthened processing and logistics to retain value added from fisheries and seaweed products. West Lombok, Central Lombok, and North Lombok need greater integration among local businesses, culinary activities, and tourism supply chains. Sumbawa requires stronger production and trading relationships, while Dompu and Bima Regency need improvements in aquaculture technology, salt processing, and post-harvest facilities. Mataram City and Bima City need to be strengthened as downstream

centers that remain connected to local producers. These recommendations should be read as typology-informed priorities combined with constraints documented in prior literature; the present dataset does not directly measure logistics, technology, post-harvest, or tourism-supply-chain bottlenecks in each region.

This typology-based approach is consistent with Trenggono et al. (2025), which showed the importance of blue economy strategies tailored to regional gaps and characteristics. Ma et al. (2025) found that differences in industrial composition and concentration require policies that consider resource advantages and regional structure. Thus, the resulting region-linked database and descriptive typology can be used to identify priority areas, determine appropriate types of interventions, and avoid applying the same programs to different economic structures.

CONCLUSION

This study shows that the overall MSME structure of West Nusa Tenggara in 2024 is dominated by microenterprises (98.95%–99.99% across regencies/cities). The approximately 19,000-unit (about 6%) maritime figure is a provincial-level researcher aggregation and does not represent a regency/city-level count. Regional findings therefore consist of recorded maritime-subsector presence and researcher-classified functional typologies rather than measured spatial concentration. East Lombok is classified as a diversified maritime production profile; West Lombok, Central Lombok, and North Lombok show combinations of maritime and tourism activities; Sumbawa, Dompu, and Bima Regencies show stronger fisheries, aquaculture, and salt-production profiles; and Mataram and Bima Cities show more processing and trading functions. Radar indices describe only the relative overall MSME-scale context and cannot be interpreted as maritime-specific scale structures.

The research results are limited by the availability and level of aggregation of BPS data. Data on the number of maritime industries are available only as provincial-level estimates, while the number of maritime units by subsector and regency/city is not yet available in the tables used. Dominant cluster information describes the presence of activities but does not show production volume, turnover, labor, or levels of business formality. In addition, informal activities, household businesses, family workers, and the contributions of coastal women may not be fully recorded. Additional limitations include classification uncertainty across heterogeneous BPS sources, possible overlap among maritime subsectors, the absence of maritime-specific microenterprise, small-enterprise, and medium-enterprise shares by region, the descriptive and partly subjective nature of the typology labels, and the absence of geocoded, business-level observations. These constraints prevent quantitative claims about density, concentration, proximity, or actual interregional value-chain flows.

Further research is advised to develop databases at the village and business-unit levels by combining BPS data, data from marine and fisheries agencies, cooperative and MSME agencies, business-licensing data, and field surveys based on geographic coordinates. This development should include the number of business units by subsector, turnover, labor, production capacity, technology, access to financing, market reach, business formality, women's involvement, value-chain connectivity, and environmental indicators. Subsequent analysis can also use panel data, location quotients, diversification indices, cluster analysis, and spatial statistics to test agglomeration patterns and the factors affecting maritime business growth. Validation through interviews, observation, and focus group discussions with business actors and regional governments is needed to ensure that the resulting typology is increasingly accurate and can be used to design maritime business scale-up strategies appropriate to the characteristics of each region.

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AUTHOR CONTRIBUTION STATEMENT

Author 1 contributed to the conceptualization of the research, development of the methodology, data collection, data analysis, interpretation of findings, and preparation of the initial manuscript draft. Author 2 contributed to the refinement of the research framework, validation of analytical procedures, critical review of the manuscript, and improvement of the discussion and theoretical implications. Author 3 contributed to data verification, visualization, manuscript editing, and final review of the article. All authors have read and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

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