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Enhancing Ocean Economy Growth for Regional Development in the Special Region of Jakarta, Indonesia

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ABSTRACT

The ocean economy plays a crucial role in driving regional development and sustainable natural resource management, particularly in metropolitan coastal areas such as the Special Region of Jakarta (Daerah Khusus Jakarta, DKJ). Despite the rapid development of the ocean economy in many regions, there is little comprehensive research on the ocean economy at the metropolitan scale. This work applies to an Input-Output approach to assess the ocean economic activity within the DKJ area, relying on a regional IO matrix from 2016. Alongside come figures on Gross Regional Domestic Product (GRDP), employment creation factors, and measures of influence spread across industries. Emphasis emerges where certain fields show notable interdependencies with marine-related outputs, shaping paths for advancement. Through such patterns, attention shifts naturally toward those branches capable of generating wider ripple effects. The results show that 25% of DKJ's total output comes from the ocean economy, accounting for 19.7% of the province's GRDP in 2016. By 2024, GRDP from the ocean economy reached IDR 721 trillion, with projected output of IDR 1,805 trillion. The two largest contributors are marine construction and marine tourism, followed by the maritime industry and the transportation sectors. Where complex logistics chains are examined, integrated approaches like Blue Urbanism emerge, linking constructed spaces to renewed ecosystems. Within different areas, port networks operate independently yet grow tightly linked under this framework. Evidence gathered supports detailed planning methods aimed at shaping coastal urban economies where industry expands steadily alongside ecological care and fairer community outcomes.

Introduction

Currently, global development is focused on land-based sectors such as mining and agriculture. These "production sectors" have long been an engine of growth; at the same time, however, they are blamed for a series of environmental degradation and social inequalities faced by the world [1]. Similarly, in the Special Region of Jakarta (*Daerah Khusus Jakarta*/DKJ) on the island of Java, there is pressure for development that allegedly benefits all segments of the community across the entire country. DKJ, the nation's economic and political hub, which recorded a Gross Regional Domestic Product (GRDP) of IDR 3,679.36 trillion in 2024, enjoys the highest adjusted per capita expenditure of IDR 18,927 million per year as of 2022. Nevertheless, the region is still characterized by social inequality. Even as the poverty rate fell to 4.14% as of September 2024, DKJ's Gini ratio was 0.43. These two indicators show that despite recording fast and sustainable

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economic growth, the benefits of development in DKJ have not been fairly shared across the population and need to be addressed in terms that are more integrated with their social dimensions [2,3].

Embracing an approach that is more focused on the social and coastal aspects of the development process, moving away from an orientation on land alone, is the approach that is needed by DKJ in addressing and facing these development challenges. In terms of fostering sustainable economic growth, research has shown that development based on the ocean economy is a new pathway to that end, and one that can foster growth and development in a sustainable and resilient way. Unfortunately, in most studies on the ocean economy, the focus has remained on individual sectors, with the extraction of resources as the main commodity [4]. The development potential from linkages or connections between various sectors (industrial linkage) in the ocean economy has yet to be fully realized, even though the approach can offer many development benefits by viewing the ocean economy within a linkage-based development framework. The challenge of governance and management of marine and coastal areas in DKJ has long been addressed. The problem lies in the fragmentation that exists and the inadequate integration in coastal marine management with the wider process of urban development that continues to intensify, which is further complicated by the various government institutions with different authority levels that are at times contradictory [5,6]. Thus, there is a need for research that systematically explains the role of the ocean economy in DKJ's economic growth. The economic development of DKJ will continue to grow to greater heights if it continues to create multipliers of various dimensions through several sectors. A more complete and in-depth analysis of the linkage aspects in the sectors of the ocean economy will play a more strategic role. As such, this study is based on an integrated IO approach, the goal of which is to calculate and analyze the contribution of the ocean economy to output and GRDP, as well as to present an assessment of several indicators of sectoral linkages, namely, multiplier effects, dispersion power, and sensitivity degrees [7,8].

In contrast to previous studies focusing on sectors of the ocean economy as standalone sources of economic growth, this study examines intersectoral links as drivers of metropolitan economic development. This study develops a linkage-based measurement of sectoral contribution to metropolitan economic development by combining traditional IO analysis with employment effects and policy scenarios. Marine sectors are sources of economic growth that generate further economic activity throughout the entire value chain, both backward and forward. The main objectives of this study are to identify the contribution of the ocean economy to the DKJ economy using selected IO indicators and formulate a strategy for the optimal development of sectors in the ocean economy based on linkages and the potential for job creation. This research aims to provide an alternative economic development analytical tool relevant to the sustainable future growth of coastal metropolitan economies and insights for improving coastal governance in DKJ [9–11]. Integrating insights from the IO model with multipliers and employment effects and insights into sectoral linkages and sequences of policy interventions, this study presents an innovative overall framework. Typically, ocean economy sectors are viewed as raw-material-based industries. However, this study, a pioneering contribution to metropolitan ocean economics research, goes beyond that by treating marine industries as an integral part of the metropolitan economic system and providing an empirical basis for marine governance that is sustainable, resilient, and equitable for DKJ [12–14].

Materials and Methods

Research Location

Located along the northern coast of Java Island, this research was conducted within the administrative borders of DKJ (Figure 1). The area encompasses five cities ranging from Central to North Jakarta, with the Thousand Islands regency completing the administrative division. These six areas define the spatial scope of the research and capture the diverse urban, coastal, and marine characteristics of DKJ [15]. DKJ remains the main center of national business and economic activity, and its economy grew by 4.90% in 2024, contributing approximately 16.7% to Indonesia's GDP. At the same time, the province had a population of approximately 11.1 million in 2024, indicating very high development pressure in terms of infrastructure, services, and land use [16,17]. These characteristics make DKJ a relevant case for examining ocean economy development in a metropolitan coastal setting, particularly because the contribution and development potential of marine-related sectors are shaped by strong interactions between densely urban mainland areas and coastal island territories.

Figure 1. Map of DKJ showing five administrative cities (Central Jakarta, West Jakarta, South Jakarta, East Jakarta, and North Jakarta) on the mainland of Java, together with the Thousand Islands in Jakarta Bay. The map presents the six administrative areas that serve as the observation units for this study.

Data Used

This study was conducted from June to August 2025 using secondary data. The primary dataset is the IO Table of the DKJ region based on producer prices (covering 52 industries) from 2016 [18], together with official labor force statistics for DKJ Province in the same year [19]. While the 2016 IO table is the latest provincial dataset by the Central Statistics Agency (*Badan Pusat Statistik*/BPS), it remains a valid tool for structural analysis, unlike short-term economic shifts. We ensured that the results remained relevant by cross-referencing them with updated 2023–2024 macroeconomic indicators, such as recent GRDP and employment figures. Furthermore, simple scaling was applied to bring sectoral outputs in line with current trends. In this study, the 2016 IO table is applied, although it has inevitable shortcomings, such as fixed technical coefficients and no input substitution between producing goods and materials. Some interesting results emerged, including GRDP contributions to unemployment and income elasticities, as well as variables of employment multipliers, which provide a detailed analysis of DKJ's economy. The results were used as basic facts to identify which sectors need to be prioritized for development.

Research Methodology

This study employs the IO approach as the main method to analyze the contribution of the ocean economy to regional development and establish linkages and relationships between different subsectors within the DKJ economy. This study was conducted in a series of steps.

Identification and Aggregation of Sectors Within Ocean Economy using the IO Framework

Structure within the ocean economy was captured through adjusted groupings in the IO table. It comprises 52 economic sectors was aggregated into seven ocean economy sectors: (1) fisheries, (2) marine tourism, (3) mining, (4) maritime industry, (5) marine transportation, (6) marine construction, and (7) marine services, following the classification outlined by Kusumastanto [20] and consistent with the national IO classification [21]. Analysis gains clarity when examining ocean economies using this method. Consistency appears when comparing outcomes against earlier research and standard data systems reported nationally.

Calculation of GRDP

This study employs the input-output (IO) framework to assess the role of ocean economy sectors in the regional economy of DKI Jakarta. In line with previous studies, the IO approach is used to examine sectoral

contributions, intersectoral linkages, and production effects of marine-related sectors within the regional economic system [22,23]. The estimation of GRDP is derived from the expenditure components available in the DKI Jakarta IO Table, which include household consumption, consumption by non-profit institutions serving households, gross fixed capital formation, changes in inventories, government expenditure, exports and imports. These components are used to capture the economic value generated by the sectors under analysis, in accordance with the standard GRDP expenditure approach [24]. The GRDP calculation in this study adopts a sectoral focus instead of merely replicating conventional macroeconomic accounting and is used to support an IO analysis that highlights the structural contribution of ocean economy sectors to regional development in DKJ.

Analysis of output multipliers, input multipliers, sensitivity index, and dispersion index

IO table analysis is conducted using various methods, including output multiplier analysis, input multiplier analysis, dispersion index, and sensitivity index. The output analysis aims to assess the extent to which an increase in the final demand in each sector affects the output of other sectors within the economy, both directly and indirectly. The output multiplier is calculated using Equation 1.

$$MXS_j = \sum_{i=1}^{n} C_{ij} \quad (1)$$

Where:
MXS_j = Output multiplier for sector j,
C_{ij} = Element of the Leontief inverse matrix $(I\text{-}A)^{-1}$.

This method refers to the Leontief approach, which identifies inter-sectoral linkages and calculates the multiplicative effects of overall economic activity growth [10,25]. The input multiplier is then calculated to indicate the extent of the output increase across various sectors in response to the rising input demand from a specific sector [26]. In other words, this multiplier measures how the input requirements of all sectors influence total production because of changes in the input demand in sector i. The input multiplier was calculated using Equation 2.

$$MXS_i = \sum_{j=1}^{n} C_{ij} \quad (2)$$

Where:
MXS_i = Output multiplier for sector j,
C_{ij} = Element of the Leontief inverse matrix $(I\text{-}A)^{-1}$.

Subsequently, to enhance the analysis of intersectoral linkages, the dispersion power index is employed as a metric to assess a sector's capacity to transmit the effects of changes in final demand to the output of the entire economy (backward linkage effect). The dispersion power index is a quantitative measure used in input-output analysis to evaluate the extent to which a given sector influences the output of other sectors in response to variations in final demand. This index indicates the extent of a sector's backward linkages within the overall economic structure of the economy. The dispersion power index was obtained using Equation 3.

$$b_j = \frac{n \sum_{i=1}^{n} C_{ij}}{\sum_{i=1}^{n} \sum_{j=1}^{n} C_{ij}} \quad (3)$$

Where:

b_j = Dispersion index,

C_{ij} = Element of the Leontief inverse matrix $(I\text{-}A)^{-1}$,

$\sum_{i=1}^{n} C_{ij}$ = Effect of an increase in the final demand in sector i on the output of a specific sector.

The sensitivity index shows how responsive a sector is to demand shifts originating from other sectors in the economy (i.e., forward linkages). It is derived by summing the elements in a specific row of the Leontief inverse matrix and then normalizing the result against the overall average across sectors. A value greater than one (> 1) indicates that the sector is highly responsive and has the capacity to meet such demand [26]. The index is calculated using Equation 4:

$$f_j = \frac{n \sum_{j=1}^{n} C_{ij}}{\sum_{i=1}^{n} \sum_{j=1}^{n} C_{ij}} \quad (4)$$

Where:
f_j = Sensitivity index
C_{ij} = A component of the Leontief inverse matrix, expressed as $(I\text{-}A)^{-1}$
$\sum_{j=1}^{n} C_{ij}$ = An increase in the final demand for sector j affects the output of a specific sector.

Employment multiplier analysis

We used the employment multiplier to track total job generation (direct and indirect) resulting from a one-unit shift in a sector's final demand [27]. To evaluate how sectoral expansion affects broader employment, we employ a metric that multiplies the output multiplier matrix by a labor coefficient matrix [28]. Found in Equation 5, this method draws its workforce figures from BPS records [19].

$$ML_j = \frac{\sum_{i=1}^{n} T_i + C_{ij}}{T_i} \quad (5)$$

Where:
ML_j = The specific employment multiplier for sector j,
T_i = Labor coefficient for sector I, expressed as persons per unit of rupiah,
C_{ij} = An element of the Leontief inverse matrix, denoted as $(I\text{-}A)^{-1}$, and
n = The number of sectors represented in the IO table.

The ocean sector shows significant potential for job growth along the DKJ coastline. Using official statistics is crucial; it transforms the employment multiplier from a theoretical value into a practical metric for tracking sectoral job creation.

Formulating a Strategy for Ocean Economy Development

Data collected in the research stages will be used to devise development strategies to achieve an optimal ocean-based economy in DKJ for national and regional growth and sustainable ocean governance, in line with the marine economic potential of DKJ in a sustainable and optimal manner. They will be used as the basis to develop development strategies that are adapted to the economy in DKJ; hence, sustainable optimization of marine resources can be achieved in a sustainable and optimal manner. It uses specific data obtained from the IO framework in the form of several GRDP contributions, sectoral multipliers, and sensitivity and dispersion indices. These data are used to determine the prospective sectors that have potential connections with the ocean economy to be prioritized and developed in the development strategies framework to support sustainable growth in DKJ's coastal areas. While IO is an effective tool for conducting intersectoral analysis, it typically relies on several standard assumptions, contains fixed technical coefficients, and assumes sectoral homogeneity. The table used for this analysis is the 2016 IO table, which, while powerful for examining intersectoral trade in recent years, likely does not capture several important changes in the region, including rapid technological innovation and significant changes in prices over time. Therefore, the findings of this study should not be considered universally accurate in all contexts but rather provide a basis for understanding certain limitations and constraints that should be considered when applying the results.

Results and Discussion

Results

Grouping stems insight: fifty-two IO table classifications merge into seven ocean economy sectors, detailed in Table 1. Shifts within a single segment echo through linked areas, shaping broader economic patterns across maritime domains. Accuracy improves when regional impacts are studied by acknowledging such interdependencies among sectors. Data guided choices gain strength where relationships matter most [29]. What begins as classification turns into clarity.

Table 1. The DKJ region organizes ocean-based activities into seven distinct groups for the 2016 IO study. These groupings extend toward ocean support operations; each assigned a unique code. Rather than relying on generalizations, local data shapes the boundary between ocean economy output and wider economic activity. Where differences might seem subtle, they still reveal which sectors depend directly on marine assets.

Sector	Code	Sub-sector
Fisheries	I-07	Fisheries
Marine Tourism	I-40	Accommodation Services
	I-41	Food and Beverage Services
Mining	I-08	Oil, Gas, and Geothermal Mining
	I-09	Coal and Lignite Mining
	I-10	Metal Ore Mining
	I-11	Other Mining and Quarrying

Sector	Code	Sub-sector
Maritime Industry	I-27	Other Manufacturing, Repair and Installation of Machinery and Equipment
	I-29	Gas Supply and Ice Production
Marine Transportation	I-36	Marine Transportation
	I-37	River, Lake, and Ferry Transport
Marine Construction	I-31	Construction
Marine Services	I-39	Warehousing and Supporting Services for Transportation, Postal, and Courier Activities
Non-Ocean-Based Economy		

Even though DKJ splits its 52 IO areas into seven ocean economy sections (Table 1), links between operations stay firm. While fisheries supply still backs community nutrition, economic flow mostly follows port networks and major industrial sectors. One case shows Tanjung Priok tying harbor functions to manufacturing hubs in West Java along with Banten.

Where Muara Baru meets Sunda Kelapa, construction work suggests commerce grows while seaward safeguards advance. Although arrangements differ, unity emerges through application of a technique linking factory production types to a stable fifty two element system [18]. Beginning with OCEANOMICS concepts [20], this model fits Indonesia's 2016 IO data from BPS [21], maintaining harmony with official economic records and industry labels.

The Connection Between Output and GRDP

Output value in economics counts all goods and services made by production over a given time, regardless of internal use or sale. While GRDP tracks gross value added by region annually, its emphasis moves toward wider economic formation instead of narrow increments. This study separates the regional economy into two segments: one linked to ocean-based activity, another not. Because of this split, differences in contribution to output and GRDP emerge more clearly as seen in Figure 2, the results take shape through deliberate comparison.

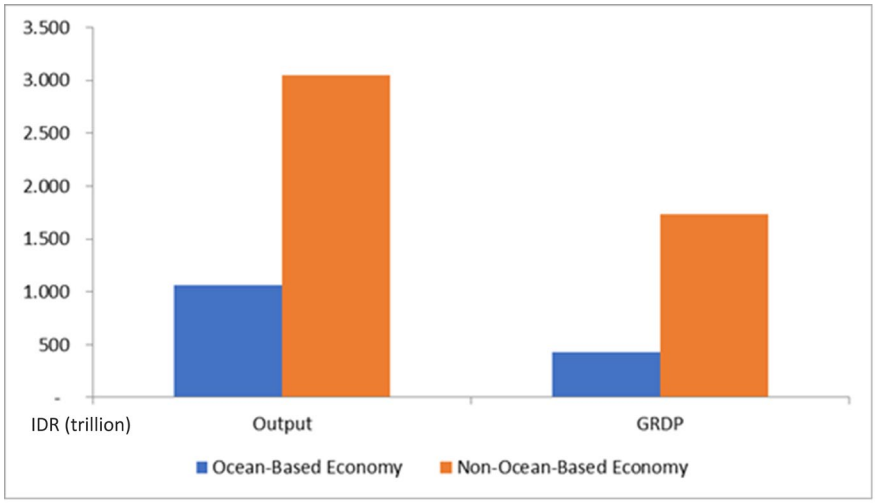

Figure 2. Comparing output and GRDP in ocean and non-ocean economies in DKJ. GRDP results, displayed in trillions of Rupiah, favour those industries unrelated to marine activity. While ocean-based areas generate value, their contribution trails behind others in both output and gross regional domestic product. This difference reflects how extensive production remains concentrated outside maritime domains. Not every coastal economy outperforms inland counterparts in national financial metrics.

Figure 2 shows that the ocean-related part of the economy produces IDR 1,059 trillion, approximately one-fourth of DKJ's full output, which reaches IDR 4,110 trillion. The value generated within this segment, its GRDP, is IDR 425 trillion, making up nearly 20 percent of the area's total GRDP, recorded at IDR 2,159 trillion. Even so, broader economic movement comes mostly from activities beyond marine connected fields, as seen in both goods made and earnings formed.

Despite varying sizes and economic focuses, stability in performance and worth generation appears evident. Shown in Figure 3, the outlook up to 2024 relies on GRDP figures from DKJ. Sector with wide patterns imply steady function, even amid structural contrasts.

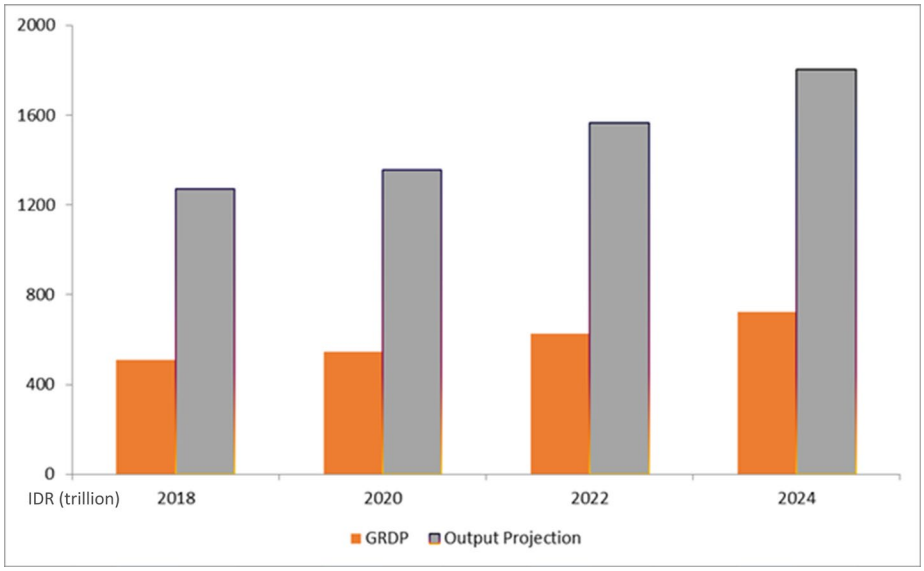

Figure 3. Projected ocean economy output in DKJ through 2024 based on regional gross regional GRDP trends. Historical GRDP figures are shown alongside projected ocean economy output, measured in trillion Rupiah across specific years. As seen here, projected outputs tied to ocean economy sectors rise above general economic patterns within the area. With each projection, the scale tilts further toward maritime contributions compared to broader regional production. Over time, these projections reveal how rapidly ocean economy may expand, given current trajectories. Though drawn from different sources, both sets align on timing, offering a clear view of shifting emphasis.

Despite fluctuations elsewhere, DKJ's ocean economic activity shows an upward movement over time, as shown in Figure 3. From 2018 onward, the ocean economy generated a GRDP reaching IDR 510.35 trillion. Output recorded that year stood at IDR 1,271.68 trillion. Over time, expansion has held consistent throughout the period observed. Despite global economic strains challenging resilience recently, sustained activity momentum through 2020, producing IDR 1,357.36 trillion. While many sectors weakened, advancement continued without pause.

By 2022, momentum was gaining clarity, unfolding more clearly through to 2024. Output surged fast: IDR 1,563.99 trillion that year, then IDR 1,804.74 trillion by 2024. At the same time, GRDP moved parallel, hitting IDR 724.28 trillion near year-end due to a widening reach of sea-related activities throughout DKJ. A rise in funding for coastal infrastructure and marine transportation links to stronger regional economies, according to analysis cited in reference [30]. Close inspection of such aggregate figures demands examining each segment of the ocean-based domain separately. Following that approach, total economic output divides into seven unique groupings, illustrated by Figure 4. The scale of contribution varies widely between areas, where extensive industries outweigh traditional methods of exploiting nature.

Measured by output, marine construction leads ocean-based work. Though massive projects like expanded harbors and seawalls define trade routes, they also guard against erosion and rising tides. Following that comes marine transportation along with services aiding vessels at sea. While tourists boost local businesses, unseen systems manage freight flow through ports and channels.

The maritime industry upkeep and making goods play large roles, whereas mining maintains steady yet narrow effects on regional financial data. In contrast, fisheries keep low results when measuring total output or GRDP. Building projects and factory activities stand out, suggesting urban growth tied to transport routes and coastal infrastructure patterns. The lead held by these sectors points toward expansion centered on physical frameworks near shorelines.

Even with improvements in how coastlines are developed and managed, imbalance remains visible. Where fishing gets little room to exist, vulnerability increases and industrial growth alters shores, displacing those who depend on them. Advancement lacking protection may quietly undermine extended security; in areas where communities face highest risk, availability of food might diminish without warning [31].

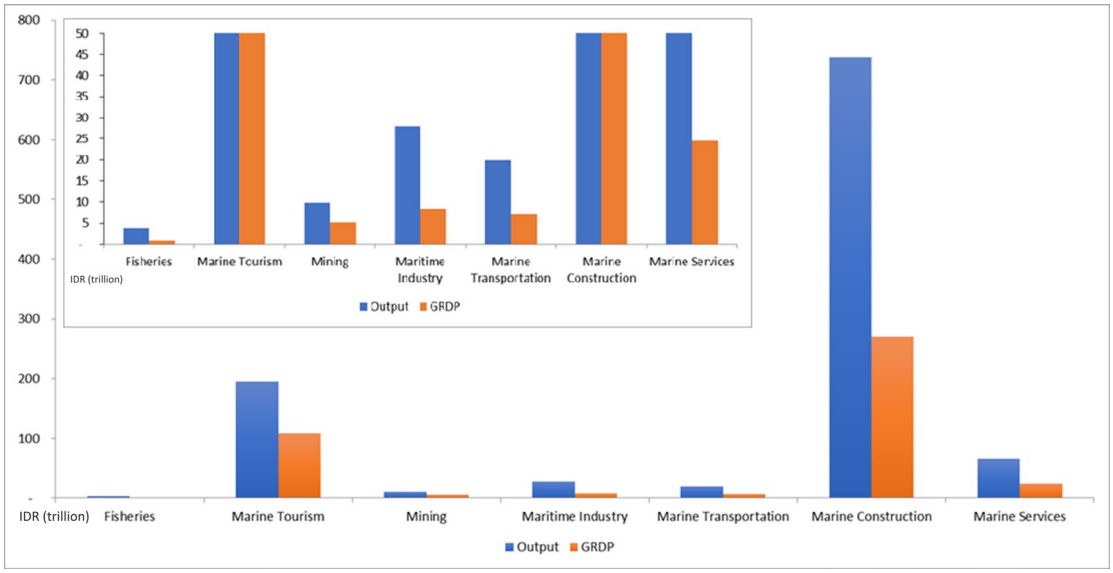

Figure 4. Illustrating output alongside GRDP across seven ocean-based industries within the DKJ, measured in trillions of Rupiah. For every field, a pair of columns appears, with blue reflecting overall production, orange showing GRDP share. Though Marine Tourism, Marine Construction, and Marine Services register substantial outputs, their respective shares in GRDP differ noticeably, suggesting unequal levels of value retention. Such variation reveals disparities in how effectively each area contributes to regional economic performance.

Managing the Ocean Economy: Multipliers and Spread Effects

Ocean driven efforts shape DKJ's regional economy, though sustained success rests on careful governance aligning diverse needs with ecological limits. Under OECD guidelines for sustainable practice [12], analysis unfolds using targeted financial markers: indirect impacts emerge together with reaction patterns, whereas paths of recovery and distribution of earnings come under review. Coastal influence varies across settlements; results transform as economic conditions evolve, revealing disparities in resilience and opportunity.

Emerging patterns depend less on results than on movement, adjustment, or blockage of benefits across strained networks. Grounded in measurable evidence, the structure of policy finds backing through flow dynamics with amplified inputs and outputs calculated using Equations 2 and 3. Visualized in Figure 5, these reveal how much each segment contributes inside the coastal production web.

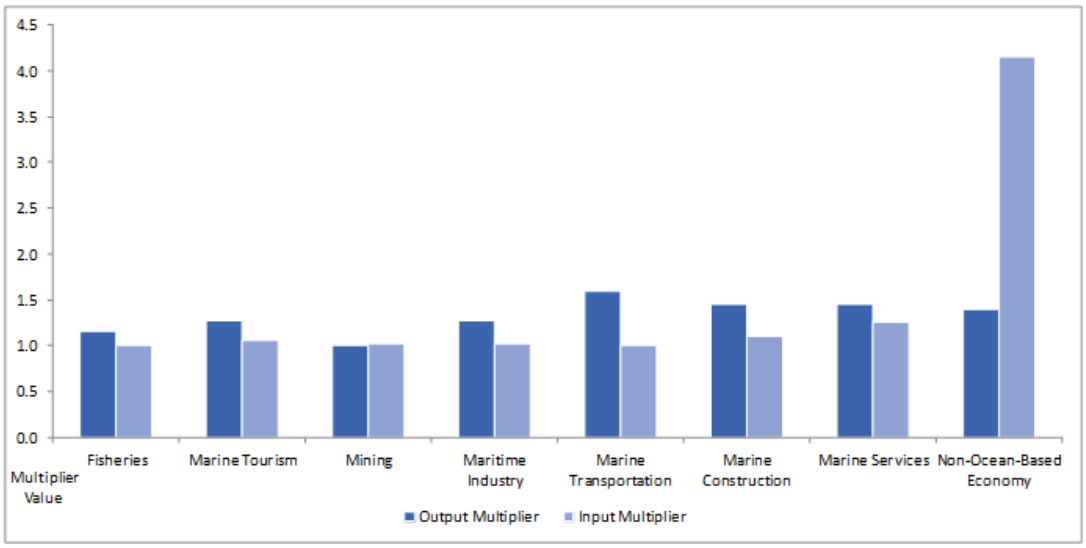

Figure 5. Input and output multipliers across seven ocean economy sectors along with the land-based economy within the DKJ region. Output effects appear as dark blue bars; lighter shades reflect input requirements, both expressed as scaled multiplier figures. Interconnections among fields become visible, as changes in demand ripple outward in measurable ways.

Figure 5 illustrates how DKJ's marine operations connect across sectors in a tiered framework. One additional unit generally triggers 1.33 units of total output, sustained by broad ripple impacts through linked industries. Yet hidden within this average are certain areas generating far greater returns than others, these segments fuel most of the area's economic push forward.

Across sector like Marine Transportation, which has measured at 1.60, and matching scores in Marine Construction and Services, both recorded at 1.46, influence stretches further into neighboring sectors. Higher than average values here mean expenditure flows past core activities, stimulating output in connected fields via longer supply routes. From such ripple effects, downstream segments gradually absorb increased demand pressure.

Diffusion, not separation, marks the close of this sequence. In Marine Transportation, a powerful effect on outputs combines with deep dependency on supplies with growth clocks in at 1.01, though shifts elsewhere leave traces here. Numbers like 1.11 and 1.26 support the view: offshore building and related work link tightly to sectors before and after them. Shaped by wide influence outward, maritime industry leans forward; even so, its inward draw stays light, measured at 1.02.

Though small, fisheries along with Marine Tourism create indirect gains felt by families and local enterprises. Owing to its reliance on outside inputs with evident in a 4.09 dependence value, the land-based portion draws much from beyond regional borders. In contrast, ocean-based endeavors maintain growth from within, adding depth to internal stability. Earlier findings now guide analysis of sector relationships, applying the spread index alongside sensitivity measures derived through Equations 4 and 5.

Figure 6 offers a clearer view, uncovering how sectors react over time. Groupings emerge through reaction styles rather than categories. Motion happens before it can be recorded. What part each plays appears when moments are studied carefully.

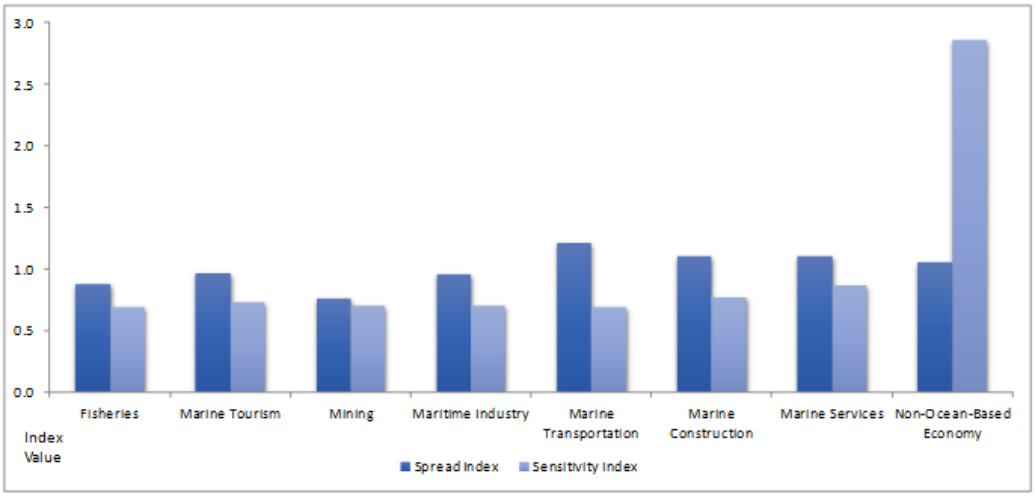

Figure 6. Illustrating differences in Spread and Sensitivity Indices between ocean and non-ocean economies. Across various sectors, values for both indices are displayed, offering a measure of impact range alongside reaction strength. Each bar reflects how deeply or broadly disruptions travel through specific domains. Patterns diverge clearly when comparing reach versus reactivity among fields.

Figure 6 reveals patterns in how industries link across DKJ's economy. Not by naming sectors alone, but through behavior with some propel shifts while others adjust after the fact. At 1.21, Marine Transportation holds the highest spread, signaling influence over later stages via outward connections. Because its sensitivity is only 0.69, disruptions from external sources have little effect on it.

Comparable influence appears in Marine Construction and Marine Services, both recording a spread score of 1.10. Notably different, Marine Services displays strong reaction strength, registered at 0.86, which is the highest seen in ocean-based sectors and evidence of growth tied closely to progress nearby. Still, values hover near 1.0 in Fisheries, Marine Tourism, and the Maritime Industry, suggesting balanced, narrow scope regional links persist. Though similar in scope, patterns of interaction diverge sharply beyond surface numbers.

Yet mining displays narrow outreach of only 0.75 on the spread index, indicating sparse ties across broader economic circuits. What stands out is how the inland area behaves: despite a spread of just 1.05, reaction intensity jumps to 2.86. Such a gap suggests sensitivity to forces originating elsewhere and shifts not shaped

by regional choices. When viewed together, these traits lead clearly to a single conclusion: coastal systems maintain balance through wide connections, whereas landlocked output changes fast under outer influence, showing that varied ocean related growth routes hold significant weight in DKJ.

Employment Multiplier Analysis

Should changes in consumer needs affect hiring patterns, the analysis of the employment multiplier spans eight sectors, maritime alongside land-driven industries. Derived using Equation 6 and shown in Figure 7, these figures reflect the overall workforce integration potential across the area. Despite varying economic bases, each sector uniquely contributes to regional labor uptake under shifting demand conditions.

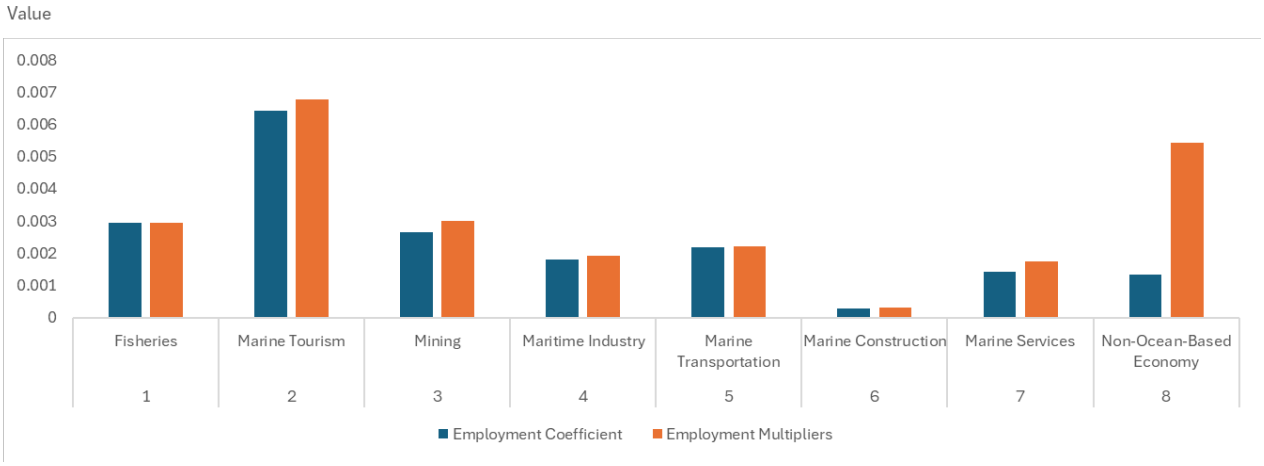

Figure 7. Employment metrics split between ocean and inland economy in DKJ. Seven sectors appear here, each marked by its job creation capacity through coefficients and multipliers. Marine tourism stands out, along with certain non-ocean areas, due to elevated multiplier values. These numbers suggest broader ripple effects on labor demand beyond direct hiring.

Where workforce growth leans on outside pathways, steadier recruitment holds within central roles elsewhere. Depending on economic priorities, impacts unfold in distinct ways, scattering unevenly among sectors. As activity shifts, figures change and highlighting gaps in how jobs take shape across ocean versus land-based work.

Employment coefficients are shown in Figure 7, mapping labor requirements within DKJ's ocean-based sectors. Instead of total jobs, each figure reflects workers needed per unit produced. A marked reliance on manpower emerges clearly in Marine Tourism along with Marine Services. compared to Maritime Industries or Marine Construction, those two demand roughly 0.006 additional labor units per rise in output. This contrast highlights increased human presence within standard tasks. Through these indicators, dependence on labor emerges clearly. Yet observable patterns reveal how central people remain in everyday operations.

From Ma [32], signs of this pattern take shape through analysis linking movement of people to workforce changes in linked regions. Owing to close ties with visitor habits, roles in urban transport, dining, and lodging rise noticeably. Growth occurs not only directly but also through ripple effects boosting job numbers in support areas. When consumption rises, the total employment effect becomes clearer, capturing jobs formed both immediately and downstream.

Expansion of support now aligns more closely with Picken's [33] view: growth in coastal tourism brings measurable benefits to nearby communities, provided management remains attentive. Offshore construction, despite specialized skills, tends to generate narrower economic spillovers across adjacent areas. Because impacts differ, advancement may lean toward activities with broader reach through local systems. Effects extend beyond immediate jobs and reverberations appear within fisheries, maritime transit corridors, and essential structures underpinning ocean-based development.

Development Strategy for the Ocean-Based Economy

Beginning the process involves a phased strategy designed to strengthen ocean economic activity in DKJ, structured around primary, supporting, and supplementary sectors. At the heart of efforts lies maritime industry, followed by marine transportation, offshore assistance roles, along with wider blue economy tasks. These domains, supported by extensive intersectoral networks, account for significant portions of overall output and local earnings, evident in ripple impacts across related fields. Figures indicate marine construction

surpasses others in results, recording IDR 737.47 trillion in output, responsible for IDR 270.39 trillion toward GRDP. Coming after is marine provision of services: its generated value reaches IDR 65.18 trillion, representing an addition of IDR 24.49 trillion to regional GDP.

Findings align with prior analysis from Sapanli et al. [34], showing strong maritime industries exert broad economic influence. Through legal backing, first established by Law No. 32 in 2014, updated under Law No. 6 in 2023, and further strengthened by Presidential Regulation No. 16 in 2017, national frameworks guide ocean-related progress along with coordinated growth patterns. At regional levels, DKJ integrates these aims into harbor planning, transport networks, and clustered manufacturing areas; clear guidelines during implementation reduce uncertainty for investors, fostering smoother interaction among government units.

Despite modest income compared to core industries, workforce involvement distinguishes marine tourism and related services. Not only does it employ more people than most ocean-based activities, but figures confirm its value at IDR 195.35 trillion, adding IDR 108.90 trillion to GRDP. Given this reality, building regional expertise gains importance and paired with innovative approaches to shoreline management. Few expect the trend concealed within these totals.

Progress emerges where regulations evolve. Through revised conditions under Law No. 18 of 2025, adjusting prior clauses in Law No. 10 of 2009, approvals advance more swiftly for firms operating in cultural industries, lodging, and dining. As administration synchronizes with investment flow, transformation appears [35,36]. A separate emphasis rests on Extraction sectors: Fisheries and Mining. Though yields remain low relative to alternate fields, Fisheries generated IDR 3.64 trillion while Mining reached IDR 9.88 trillion.

Despite challenges, core operations persist, this happens mainly due to accessible food supplies along with broader income opportunities. When newer shipboard technology merges with improved logistics networks, advancement follows naturally. Legal power originates under Act 31 from the year 2004, later updated, aiming at extensive use of ocean-based assets. Lately, studies highlight that digital coordination channels combined with more efficient distribution corridors play a central part in raising performance and value within Indonesia's ocean economic operations [37].

Discussion

Starting in 2018, ocean economic output in DKJ rose continuously, beginning at approximately IDR 510 trillion. Rather than isolated industries functioning apart, the marine economy functions through deep interconnections across segments. As illustrated in Figure 3, both past trends and future projections indicate steady expansion. Growth shows no interruption throughout the observed period.

Even amid worldwide upheavals starting in 2020, production reached IDR 542 trillion within two years. That climb occurred while general conditions remained fragile with national metrics shifted unpredictably, meanwhile faith among investors eroded rapidly throughout the public health crisis [38,39]. Growth continued regardless of surrounding turbulence, although economic signals varied widely, given falling assurance in markets tied to the COVID 19 pandemic's impact [40].

Still, the pace held steady. With two more years added, the figure climbed to IDR 626 trillion by 2022. Looking forward, projections suggest a rise toward IDR 721 trillion by 2024. At the same time, output predictions surge, starting from IDR 1,273 trillion in 2018 and reaching about IDR 1,805 trillion in 2024. This expansion originates in an approach focused on ocean assets, shaped by three linked aspects: first, wider economic effects shown through ripple outcomes; after this, the ability of marine environments to recover and endure; finally, engagement by shoreline populations woven into decision processes.

Beneath lies a design, quiet in its motion, where Marine Construction appears first, then Marine Tourism follows, not twin forces, but balanced ones. Built spaces rise along coasts and beyond; here, materials arrive after long chains of industrial effort. Elsewhere, people shift across waters, fueling small ventures while staying apart from making things. Next emerge two others: the Maritime Industry takes third place, Marine Transportation holds fourth, both tying ports, routes, and systems into wider reach. From depth comes order, not through sameness, instead through shifting relations.

Stability forms where goods meet labor, shaped by steady exchange. Through connected industries, momentum builds emerging without central control. The IO framework supports economic expansion, though output frequently outweighs ecosystem limits. Ripple effects spread from Marine Construction efforts; still, damage to nature remains unmeasured, shifting outside accountability.

Heavy expansion in these areas commonly strains environmental systems, threatening vital habitats and diversity of sea life around Jakarta Bay [41,42]. Though benefits appear clear at first sight, long-term impacts could weaken fundamental ecological supports. In light of frameworks such as the ASEAN Blue Economy model and assessments from the OECD, DKJ's strategy reveals growing difficulties separating development from damage to nature [43–45]. While global focus turns increasingly toward measuring ecosystem value, advancement in DKJ's maritime industries continues to rely heavily on resource removal, further complicated by persistent shortcomings in cooperation among agencies managing coastal zones [46].

Differences remain clear when comparing central districts with remote locations such as Kepulauan Seribu, where access gaps endure. Even though maritime mobility plays a vital role across regions and aligns with broader equity goals [43,44], its advantages tend to stop at city transport centers rather than extend toward isolated communities [47]. As sea levels rise, adjusting financial planning might transform how DKJ manages shore areas [48,49]. Rather than rely on outdated static methods, present efforts should adapt to rising tides and vanishing ecosystems by merging terrestrial and marine systems while adopting longer views that center on fishing households [50].

Funds flow through shifting ocean pathways, shaping durable fishing systems while shielding shore regions from collapse [49]. Through alignment of state level maritime rules with answerable capital models, steady activities emerge within broader sea-based economies [51]. Earlier data combined with coming outputs, seen alongside current regulations, allows DKJ to guide growth without harming equity or natural limits.

Conclusion

Among regional activities in DKJ, the ocean economy represents nearly a quarter, delivering 25.8% of overall output alongside 19.7% of GRDP. Interdependence defines these sectors, where supply networks span widely, altering perceptions of coastal city resilience. Rather than focusing narrowly on individual industries, development approaches could connect marine infrastructure with visitor services via integrated "Blue Urbanism" areas that include mandatory environmental offsets. Though separate at first glance, such systems function as linked components within broader economic patterns.

Should advantages extend to people living at edges, employment opportunities on island may grow through scattered hub designs along with varied financial backing. Even when present records appear reliable, future research will rely on shifting methods. Observing environmental changes and spatially varying economic patterns that shift by place can balance progress alongside rising water threats near Jakarta Bay.

Conflicts of interest

There are no conflicts to declare.

AI Writing Statement

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