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MAPPING OF LEADING SECTORS FOR BLUE ECONOMY SUSTAINABILITY IN DONGGALA DISTRICT: A QUALITATIVE APPROACH AND LOCATION QUOTIENT ANALYSIS

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ABSTRACT

Donggala Regency has substantial coastal and marine resources that can underpin a blue economy. Identifying priority sectors is crucial to ensure regional development is effective, sustainable, and inclusive. This study uses a participatory qualitative approach-interviews, field observations, and GIS-based spatial mapping-combined with Location Quotient (LQ) analysis to assess sectoral specialization against a reference region. Qualitative data were thematically analyzed, and LQ values interpreted to gauge each sector's economic contribution. Results indicate development potential clustered in three main areas: agropolitan, minapolitan, and marine tourism. Twelve base sectors were identified as significant economic contributors. The highest LQ scores were recorded for agriculture, forestry, and fisheries (2.46); accommodation and food service activities (1.69); and transportation-warehousing (1.26). These sectors form a strategic foundation for ecosystem-based fisheries management, green logistics, enhanced maritime connectivity, and sustainable marine tourism development in Donggala Regency. Policy alignment and stakeholder engagement are recommended to realize these opportunities fully.

A. INTRODUCTION

The blue economy has become a new paradigm in global development that emphasizes the sustainable use of marine resources for economic growth, improved livelihoods, and the health of marine ecosystems. As the largest archipelagic country, Indonesia places the blue economy as a strategic pillar in the vision of a Golden Indonesia 2045 (Leonardo A. A. Teguh Sambodo et al., 2023). Donggala Regency, with its long coastline and strategic geographical location in the Makassar Strait, has great potential to become the centre of blue economic growth in Central Sulawesi (Laruni, 2026).

The potential of the region includes natural and human resources. (Ariani & Nastiti, 2021; Duha et al., 2024) which are opportunities to improve welfare (Sukirno Putri, 2020). Differences in natural conditions make each region have distinctive potential. (Arih et al., 2021) Several efforts have been made to utilize this potential,

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particularly in the development of marine and fisheries sectors as well as coastal tourism. However, these efforts have not been optimally integrated and still face various limitations in maximizing economic benefits. (Limpele et al., 2023; Rosyidah, 2022). Based on the latest data in 2025/2026, the potential of the marine and fisheries sector in this region reaches an economic value of IDR 5.4 trillion per year. In addition to capture fisheries, the potential for marine tourism (such as in Tanjung Karang and Pantai Pusat Laut) and blue carbon ecosystems (mangroves and seagrasses) are important assets. Various efforts have been undertaken by the government and related stakeholders to develop coastal tourism and manage marine resources. However, several studies and reports indicate that the mapping of these potentials remains partial and sectoral, with limited integration between spatial data and regional economic planning. As a result, existing initiatives have not been fully supported by comprehensive spatial mapping, which constrains the optimal utilization of these resources in supporting regional economic sustainability (Sabran, M. R., 2022).

Regional development is supported by the contribution of the economic sector. (Gatari et al., 2024), so that the development of leading sectors plays an important role in increasing the Gross Regional Domestic Product (GDP) (Hasanah et al., 2021). The Gross Regional Domestic Product (GDP) of Donggala Regency shows a positive growth trend, reaching Rp16.52 trillion in 2024. The agriculture, forestry, and fisheries sectors are still the main contributors (dominating more than 35% of GDP) (BPS Kabupaten Donggala, 2025). However, economic activities in Donggala Regency still rely on traditional fisheries methods, such as small-scale fishing with simple technology. In addition, fluctuations in marine commodity prices have affected the income stability of coastal communities. Therefore, transformation toward high value-added and environmentally sustainable sectors is needed (Pemkab Donggala Larang Penangkapan Ikan Pakai Kapal Modern di Zona Wisata Pesisir - NETIZ.ID accessed on May 21, 2026)

Location Quotient (LQ) analysis is used to identify leading and non-dominant sectors in the GDP structure (Nugraha et al., 2025) as the basis for regional economic development, including the blue economy, which is a sustainable marine and coastal area management activity that has high prospects and supports food and livelihood provision (Campos et al., 2024; Choudhary et al., 2021; Maulani et al., 2022; Voyer et al., 2022). Mapping is a process of managing

geographic information to visualise the earth's surface and solve spatial problems (Nahak et al., 2023). Geographic Information Systems (GIS) can process and analyse spatial and non-spatial data effectively to identify distribution patterns and support the management of the potential of the Murtado area (Perrina & Grace, 2021; Utomo & Puspitasari, 2024; Wulandari et al., 2024), so that in the management of coastal resources, a database is needed through mapping (Widyastuti, 2022). To ensure the effectiveness of development policies, it is necessary to identify the base sectors that have a competitive advantage. Halifah et al (2025) stated that the use of the Location Quotient method makes it possible to determine which sectors are more specialized in Palu City compared to the Central Sulawesi region as a whole. In addition, this method has been widely applied in various regions in Indonesia and other countries to identify leading sectors and regional economic potential. Therefore, the Location Quotient method is considered relevant for analyzing regional economic development, including in Donggala Regency. This analysis, when combined with potential distribution mapping (visualization based on Geographic Information Systems). GIS provides spatial mapping capabilities for identifying the distribution of coastal and marine resources to support blue economy planning and marine resource management (Alyssa et al., 2025). This is important to avoid overlapping marine space utilization and ensure targeted investment allocation (Junaid & Fauziah, 2023).

Although Donggala Regency has significant marine potential, the integration of regional economic data with spatial information on marine resources in development planning remains limited. Several coastal areas in Donggala have also experienced environmental pressures, including coral reef and mangrove degradation reported in recent coastal management and environmental monitoring activities during (2023-2025). Previous research has shown that the Location Quotient (LQ) method is effective in identifying base sectors and can be combined with GIS to map leading sectors, but has not integrated sustainability aspects, such as the blue economy (Gumilar & Yuniyarti, 2021; Ibnu Fauzi Akbar et al., 2023; Irsan & Hasanah, 2024). This condition causes development planning to be less targeted and potentially threatens environmental sustainability. Therefore, mapping leading sectors through a spatial approach becomes crucial to support effective and sustainable blue economy-based development in Donggala Regency.

Based on the background above, the research questions of this study are: (1) What are the leading sectors in Donggala Regency based on Location Quotient (LQ) analysis? (2) How is the spatial distribution of these leading sectors? (3) How can the mapping of leading sectors support sustainable blue economy-based development in Donggala Regency?

Therefore, this study aims to map leading sectors using a qualitative approach and to formulate blue economy investment priorities that are sensitive to the local context for the Donggala Regency Government in realizing sustainable maritime development.

B. METHOD

This research was carried out in Donggala Regency, Central Sulawesi Province (Figure 1). Donggala Regency has 91 non-coastal villages and 76 coastal villages (BPS Kabupaten Donggala, 2025), with a percentage of 54.49% coastal villages and 45.51% non-coastal villages (Statistik, 2024).

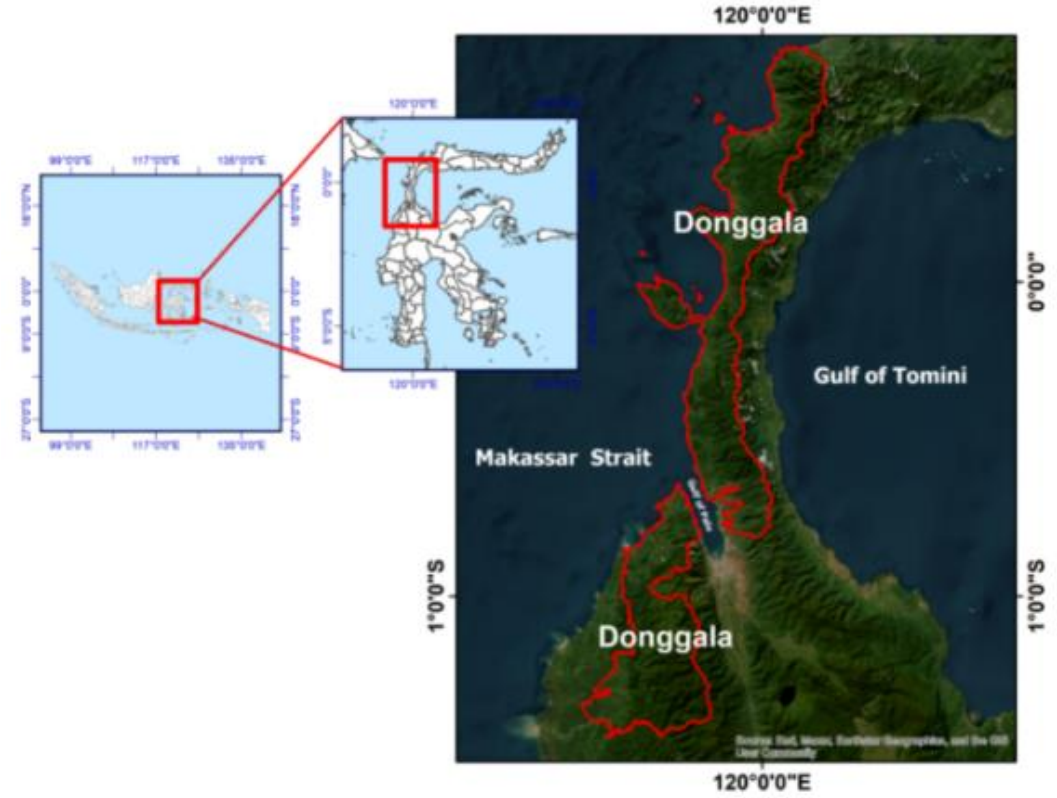

Figure 1. Map of the Research Location

(Source: Google Map Imagery, 2024)

This study uses a participatory qualitative approach enriched with quantitative analysis (LQ). This approach allows for an in-depth understanding of the socio-cultural context while providing comparative indicators of the subsector. The data used in this study consisted of secondary data obtained from the Regional Development Planning Agency (BAPPEDA), Badan Pusat Statistik, the Fisheries Office, Tourism Office, and Agriculture Office of Donggala Regency. The secondary data included coastal resource information and supporting spatial data. Primary data were collected through field observations and documentation. The analysis was conducted using a mixed-method approach combining qualitative and quantitative methods to produce comprehensive and objective research findings.

The quantitative method was employed to identify leading sectors through the Location Quotient (LQ) analysis based on socio-economic data, while the qualitative method was used to interpret regional development conditions and explain the factors influencing sectoral performance. In addition, Geographic Information System (GIS) analysis was applied to spatially map the regional potential. The combination of qualitative and quantitative methods is considered more effective than relying on a single method because it enables both measurable statistical analysis and contextual interpretation, resulting in a more comprehensive understanding of regional economic development (Widyastuti, 2022). The two analysis techniques produce accurate spatial and sectoral information as the basis for the formulation of blue economy development policies in Donggala Regency. The LQ formula used is:

$$LQ = (SI/NI) / (S/N) \ldots\ldots\ldots\ldots (1)$$

Information:
X,Y : Remarks-1
a,b,c : Remarks-2
LQ : Location Quotient Value
Si : GDP Sector i in the analysis area
S : Total GDP in the analysis area
Ni : GDP Sector i in the reference area
N : Total GDP in the reference area

(Saputri et al., 2022).

Of the 17 business fields analyzed, this study focuses on the interpretation of the three sectors with the highest LQ values that are directly related to marine ecosystems and the principles of sustainability within the Blue Economy framework. Furthermore, field checks are carried out in each sub-district and document each sector whose LQ is based on. The 17 business fields were determined based on the Gross

Regional Domestic Product (GRDP) classification published by Badan Pusat Statistik, which categorizes regional economic activities into 17 standard business sectors. The research flow diagram is shown in Figure 2.

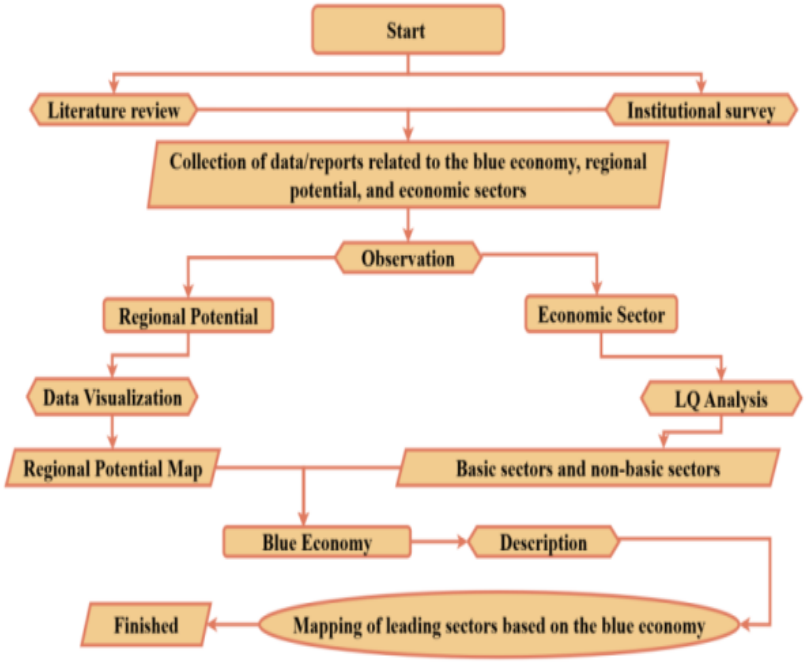

Figure 2. Research Flow

These sectors were used as the basis for the Location Quotient (LQ) analysis in this research. The three sectors are identified from: (1) Agriculture, Forestry and Fisheries Sector; (2) Transportation and Warehousing Sector; and (3) Accommodation and Beverage Provision.

C. RESULT AND DISCUSSION

C.1. RESULT

The research results show that the leading sectors supporting Blue Economy-based regional development in Kabupaten Donggala are agropolitan, minapolitan, and tourism sectors. These sectors were identified based on the analysis of GRDP data and Location Quotient (LQ) values over a five-year period. The findings are also consistent with the regional development priorities established by the Regional Development Planning Agency (BAPPEDA) of Donggala Regency. Furthermore, the spatial distribution of potential areas was analyzed and visualized using Geographic Information System (GIS), as presented in Figure 3.

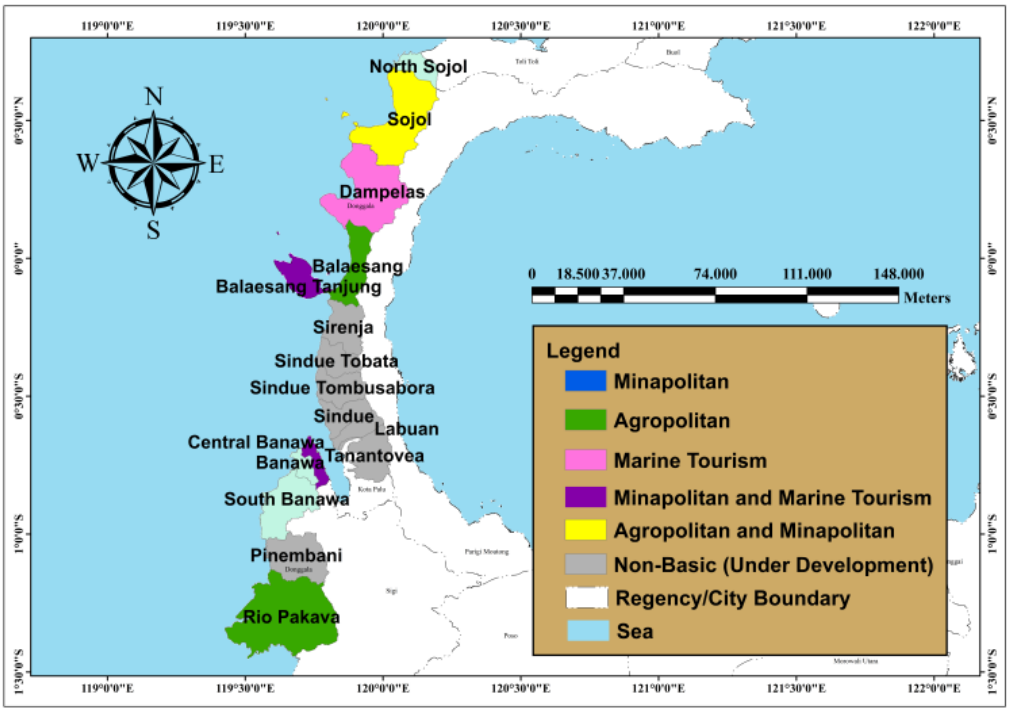

Figure 3. Map of the Region's Potential
(Source: Terrain Map, 2023 Donggala Regency RTRW and 2020-2024 GDP analysis)

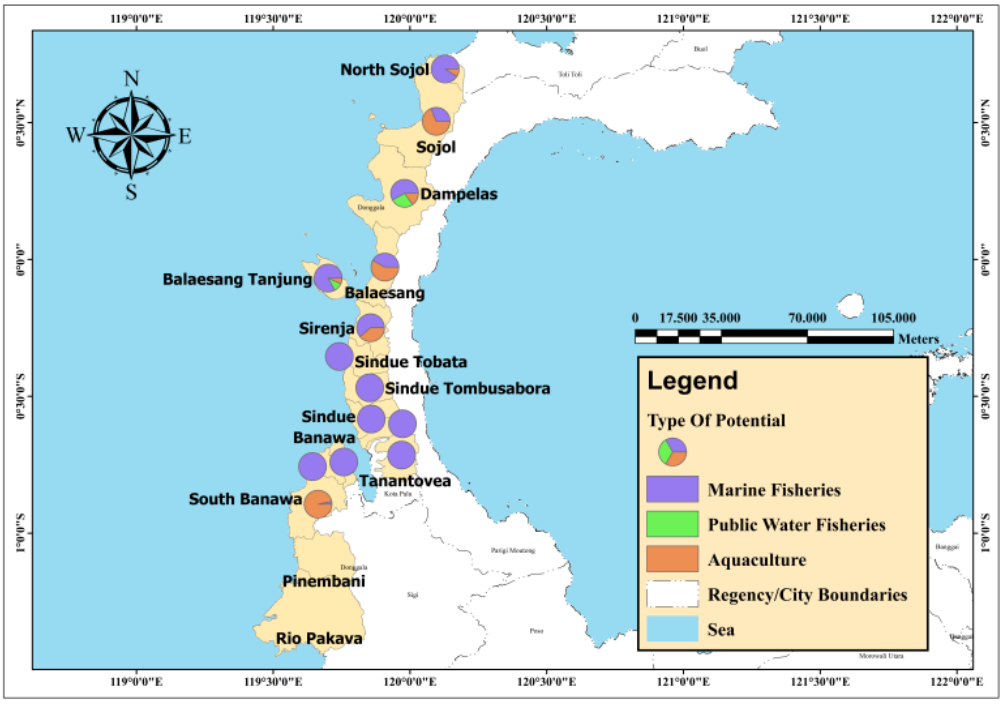

Figure 4. Map of Minapolitan Potential
(Source: Terrain Map, 2023 Donggala Regency RTRW and 2020-2024 GDP analysis)

Indonesia has 17 economic development sectors used in regional economic analysis based on Gross Regional Domestic Product (GRDP) classification. These sectors are important for identifying regional economic potential and determining development priorities. In Donggala Regency, several sectors have significant potential to support blue economy development, namely fisheries, tourism, agriculture, and transportation.

Minapolitan includes marine fisheries, freshwater fisheries, and aquaculture. The data used in this study consist of the distribution of fisheries potential in each sub-district, including marine fisheries, inland fisheries, and aquaculture areas obtained from the Marine and Fisheries Service of Donggala Regency. The spatial distribution of these potentials is presented in Figure 4.

Agropolitan includes food crops, fruits and vegetables. In addition to these main commodities, the Donggala Regency Agriculture Office has noted the existence of other agricultural potential, especially plantation and biopharmaceutical commodities. However, the data is not available in detail based on the sub-district area, so a more specific spatial analysis has not been carried out (Figure 5).

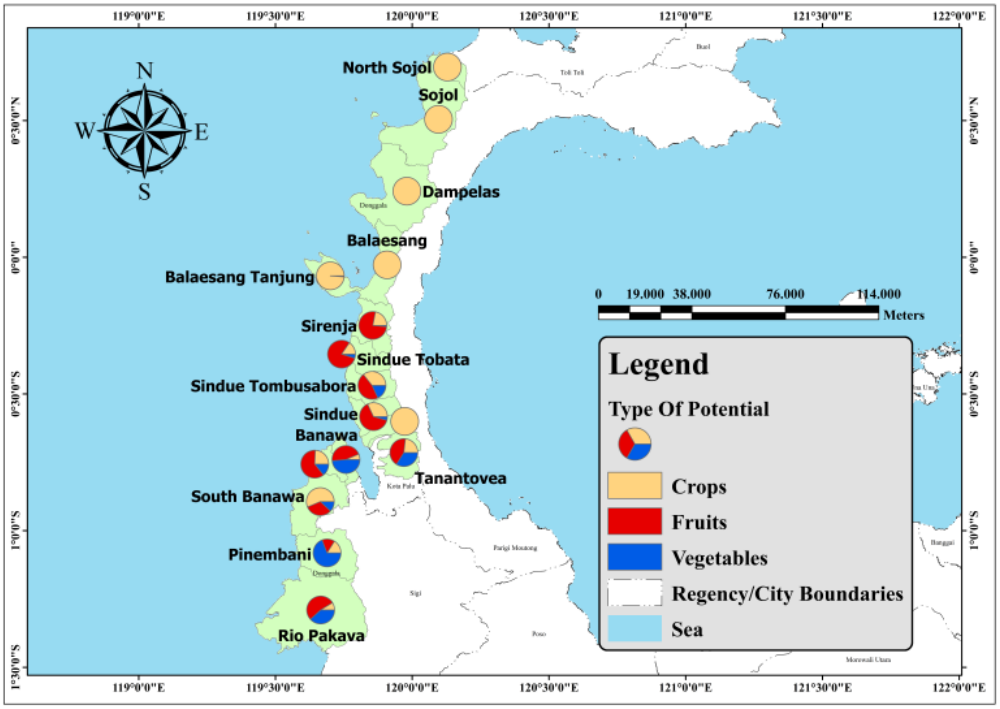

Figure 5. Map of Agropolitan Potential
(Source: Terrain Map, 2023 Donggala Regency RTRW and 2020-2024 GDP analysis)

Marine tourism is a tourism area in Donggala Regency that has strategic value in supporting the development of the blue economy and contributing to sustainable regional economic growth. This potential is shown in Table 1.

Table 1. Donggala Regency Tourist Destinations

No	District	Tourist Destinations	Number of Destinations
1	Banawa	Tanjung Karang, Boneoge, Kulolu Beach, Loli Lotto Waterfall, Lighthouse Tower, Mangrove Tourism	6
2	Banawa Tengah	Hayalan Beach, Marine Center (Pusentasi), Kirana Beach, Karampuana Beach, Bonebula Beach, Kaluku Beach, Powelua Waterfall (Saluntere), Pangasitoli Waterfall, Limboro Peak	9
3	Banawa Selatan	Kaomona Beach, Baturoko Beach, Vativoo Beach, Lera Beach, Lembasada Beach, Tasi Laha (Lino) Lake, Valombo Hill Paragliding, Salusumpu Mangrove Tourism	8
4	Pinembani	Tavanggeli Nature Tourism	1
5	Labuan	Roto Beach, Salumbone Beach	2
6	Sindue	Vatumapida Enu Beach, Pangi Beach Tour, Kavaya Beach, Bolo Bungea Beach, Yellow Bamboo Beach, Bambalibo Vunta Beach, Ue Tombu Bambalino, Mapane Hot Springs, Simbunga Hot Springs, Lingu Hot Springs	10
7	Riopakava	Nggaoliva Waterfall Nature Tour, Hanonale Nature Tour, Anoa Observation, Uwentuvu River Nature Tour, Uwetuvu Cave, Agro Durian, Rafting Tour, Lencebiu Hot Spring Tour, Kahani Hot Springs, Moma Waterfall, Pasa Seha Waterfall, Saleri Waterfall, Batu Koba Nature Tour, Pasa Scha Cave	14
8	Tanantovea	Bale Waterfall, Maliko Waterfall, Mapane Gaya Waterfall, Pompo Waterfall, Camping Ground Tour, Wana Area Coffee Garden Tourism, Clove Grove Agro, Cabbage and Carrot Plantation Agro, Salubay Strawberry Garden (UMKM)	9
9	Sindue Tobata	Tamarenja Agrotourism, Tamarenja Hot Springs	2
10	Sirenja	Parimpi Indah Beach, Labuana Beach, Labuana Fix Beach, Siwalenta Beach, Sibado Hot Springs	5
11	Sindue Tombusabora	Batusuya Beach, Yotje Beach, Labuan Ntongo Beach	3
12	Dampelas	Bambarano Beach, Salur Beach, Majanga Beach, Dampelas Lake	4
13	Balaesang	Molui Indah Beach, Mapane Tambu Hot Springs	2
14	Balaesang Tanjung	Malei Beach, Ketong Village Beach, Ketong Red Shrimp Cave, Rano Lake, Passo Island, Walando Waterfall, Mercusuar	7
15	Sojol Utara	Soget Beach, Karang Indah White Sand Beach, Taring Island, Sombo Waterfall, Lasaini Waterfall	5

(Source: Donggala Regency Tourism Office, 2023 and Field Survey, 2025)

Some sub-districts have a higher number of destinations than others, indicating that there is a concentration of tourism potential that needs to be

managed optimally. Although the available data is quite representative, it must always be updated because there are still some destinations that have not been officially recorded in government documents, so there is a risk of missing out on the planning and development process of regional potential. In addition, of the types of destinations recorded, most of them still focus on natural tourism such as beaches, waterfalls, and agrotourism. Meanwhile, the potential for cultural, historical, and religious tourism has not been thoroughly depicted, even though the existence of this type of tourism is important to support the diversity and attractiveness of regional tourism more holistically. Limited data coverage can affect the accuracy of policy direction, especially in terms of budget allocation, development of supporting infrastructure, and tourism promotion in accordance with local characteristics. The lack of information about the actual condition of the destination and community participation is also a challenge in the development of this sector.

The results of the Location Quotient analysis in Donggala Regency, based on 2020 Gross Regional Domestic Product (GRDP) data, identify base and non-base sectors. In this study, base sectors are sectors with a Location Quotient (LQ) value greater than 1, indicating that these sectors have a comparative advantage and play an important role in the regional economy. Meanwhile, non-base sectors are sectors with an LQ value less than 1, indicating lower specialization and a limited contribution to regional economic growth. The LQ value reflects the level of comparative superiority of the sector in the regional economy, with the results of the calculation presented in Table 2.

Based on Table 2, the base sectors of Donggala Regency during the 2020-2024 period showed dynamic changes. In this study, sectors with an LQ value greater than 1 are classified as base sectors, while sectors with an LQ value less than 1 are categorized as non-base sectors. The results of the LQ analysis indicate that several sectors shifted from non-base to base status in 2023, reflecting emerging regional economic growth potential. Mining and Quarrying changed from a non-base sector during 2020-2022 to a base sector in 2023-2024. Information and Communication also shifted from non-base status in 2020-2022 to a base sector in 2023-2024. Similarly, the Real Estate sector changed from non-base to base status starting in 2023. Meanwhile, the Construction sector experienced fluctuations, changing to a non-base sector in 2023 before returning to a base sector in 2024.

Table 2. Results of the 2020-2024 LQ analysis

No	Business field	Value and type of sector									
		2020		2021		2022		2023		2024	
1	Agriculture, Forestry and Fisheries	1,85	Basis	1,99	Basis	2,18	Basis	2,61	Basis	2,46	Basis
2	Mining and Quarrying	0,88	Non Basis	0,86	Non Basis	0,85	Non Basis	1,06	Basis	1,01	Basis
3	Processing Industry	0,09	Non Basis	0,08	Non Basis	0,07	Non Basis	0,07	Non Basis	0,05	Non Basis
4	Electricity and Gas Procurement	0,40	Non Basis	0,41	Non Basis	0,43	Non Basis	0,50	Non Basis	0,48	Non Basis
5	Water Procurement, Waste Management, Waste and Recycling	2,32	Basis	2,38	Basis	2,59	Basis	3,06	Basis	2,92	Basis
6	Construction	1,52	Basis	1,41	Basis	1,43	Basis	0,17	Non Basis	1,63	Basis
7	Wholesale and Retail Trade; Car and Motorcycle Repair	1,52	Basis	1,53	Basis	1,62	Basis	1,90	Basis	1,77	Basis
8	Transportation and Warehousing	1,24	Basis	1,24	Basis	1,15	Basis	1,33	Basis	1,26	Basis
9	Accommodation and Meal Provision	1,27	Basis	1,39	Basis	1,50	Basis	1,74	Basis	1,69	Basis
10	Information and Communication	0,86	Non Basis	0,89	Non Basis	0,99	Non Basis	1,16	Basis	1,11	Basis
11	Financial Services and Insurance	1,13	Basis	1,20	Basis	1,28	Basis	1,51	Basis	1,41	Basis
12	Real State	0,83	Non Basis	0,87	Non Basis	0,09	Non Basis	1,07	Basis	1,02	Basis
13	Corporate Services	0,52	Non Basis	0,53	Non Basis	0,56	Basis	0,68	Non Basis	0,65	Non Basis
14	Administration, Defense and Social Security Mandatory	1,88	Basis	1,96	Basis	2,11	Basis	2,52	Basis	2,39	Basis
15	Educational Services	0,61	Non Basis	0,65	Non Basis	0,68	Non Basis	0,79	Non Basis	0,75	Non Basis
16	Health Services and Social Activities	0,61	Non Basis	0,61	Non Basis	0,68	Non Basis	0,77	Non Basis	0,75	Non Basis
17	Other services	1,09	Basis	1,14	Basis	1,19	Basis	1,38	Basis	1,33	Basis

(Source: Data processing, 2025)

On the other hand, several sectors consistently remained in the non-base category during the 2020-2024 period, indicating that these sectors primarily served local community needs rather than becoming key contributors to regional economic growth. These sectors include Processing Industry, Electricity and Gas Procurement, Educational Services, and Health Services and Social Activities. Furthermore, among the 12 base sectors, several sectors have significant potential to support blue economy development, as follows:

1. Agriculture, Forestry, and Fisheries (LQ: 2.46) are the main base sectors supporting the blue economy through food supply.
2. Provision of Accommodation and Food and Drink (LQ: 1.69), marine tourism and coastal culinary.

3. Transportation and Warehousing (LQ: 1.26) port logistics services and sea transportation.

To strengthen the findings from the LQ trend analysis during the period 2020 to 2024, the LQ calculation was carried out using GDP data based on the business fields of Donggala Regency and Central Sulawesi Province. Furthermore, it was obtained through a comparison between the proportion of the contribution of each sector to the total GDP in Donggala Regency and the proportion of the same sector at the provincial level.

C.2 DISCUSSION

The results of the analysis show that the potential of the Donggala Regency area aligns with the leading sectors identified by the LQ analysis. The development of agropolitan, minapolitan, and marine tourism supports the base sector with the highest LQ value, so as to strengthen economic growth and blue economy-based. The development of agropolitan, minapolitan, and marine tourism areas supports the leading economic sectors in Donggala Regency. In particular, the agropolitan potential is closely related to the agriculture, forestry, and fisheries sector, which has the highest LQ value of 2.46, indicating its important role in regional economic growth. This emphasizes the role of Donggala Regency in food security and natural resource management, in accordance with the direction of the 2025–2029 National Medium-Term Development Plan (Kementrian Perencanaan Pembangunan Nasional, 2025) and based-economic theory (BPS Kabupaten Donggala, 2025).

The coastal area of Donggala, geographically, covers hills to waters (Figure 6). The distribution of minapolitan sectors such as mangrove areas, marine and inland fisheries, and aquaculture is spread evenly throughout the coastal sub-districts of Donggala except Pinembani dan Rio Pakava (Figure 4). Mangrove forests located in the coastal area of Banawa District, Donggala Regency, show mangrove vegetation growing along the coastline, both naturally and as a result of rehabilitation and cultivation. Mangroves in this region play an important role in resisting coastal abrasion, absorbing carbon emissions, and providing habitats for various types of marine and coastal life (Rahman et al., 2024). Community activities in selling marine fish catches on the side of the road are not far from residential areas. Direct sales by fishermen to consumers in simple locations are not all through fish auction places. In line with Safira et al. (2025), The fisheries sector needs innovation to support sustainable marine aquaculture. This picture shows the sales activities of fish catches both by fishermen and fisher groups, which are the main source of income for coastal communities at the research site. The dynamics of the

residents' economy in increasing the household income of fishermen also reflect the potential for blue economy development. Minapolitan's potential is the main focus of blue economy development. This sub-sector plays a role in improving the welfare of coastal communities through sustainable management. While the implementation of the circular economy in waste management supports environmental sustainability and economic growth, the synergy of the two sectors is important for integrated coastal management and blue economy development (Fadhli et al., 2025; Ya'la et al., 2021).

Figure 6. Agriculture, Forestry, Fisheries Sector
(Source: field survey, 2025)

The potential of marine tourism is supported by the accommodation and food and beverage sector (LQ: 1.69) and the transportation and warehousing sector (LQ: 1.26), which have a great opportunity to support marine tourism and coastal culinary, making marine tourism a leading sector through the synergy of the government and the community (Figures 7 and 8). This is strongly supported by the Government Administration, Defence, and Compulsory Social Security (LQ 2.39) sectors through policy formulation, infrastructure provision, and regulations that encourage sustainable tourism management and impact coastal communities (Allokendek et al., 2024; Muhammad Nawir et al., 2024).

Figure 7. Accommodation and dining provision sector
(Source: field survey, 2025)

Figure 7 is one of the lodging facilities available to support the accommodation needs of the community, both for tourists, business travellers, and guests from outside the region. Along the Palu-Mamuju Axis Road, such as in the Kabonga Kecil Village area, Central Banawa District, there are rows of food stalls and taverns that provide a variety of snacks, cold drinks, and other consumption needs for local people and road users who pass by. In addition, transportation access that supports the tourism sector can be passed from the Gorontalo and North Sulawesi Provinces areas. The existence of small businesses such as food stalls plays an important role .in supporting people's daily consumption needs and encouraging the turnover of the micro-economy in urban areas. In addition, this activity also shows the real contribution of the food and drink sector in fulfilling basic community services in public spaces.

Figure 8. Transport and warehousing sector

(Source: field survey, 2025)

Figure 8 shows public ports, fishing ports, and land freight terminals. This location is included in the transportation and warehousing sector, especially the transportation subsector. Facilities such as passenger ship docks, fishing boats, and land terminals function as nodes for community mobility. The infrastructure reflects the important role of sea and land connectivity in supporting economic activities and the integration of the Donggala coastal area (Figure 3). Banawa District displays a container loading and unloading area, showing the function of the area as a large-scale distribution centre for goods. Large-scale warehouse buildings are located in special areas for logistics warehousing, storage, and distribution of goods. The existence of these warehouses is a vital element in supporting the regional distribution system and supporting the smooth supply chain of goods in the Donggala Regency area. The combination of LQ and qualitative analysis shows 3 supporting sectors of

the blue economy. Specifically, analyze these sectors and sub-sectors:

A) Agriculture, forestry and fisheries

Agriculture in Donggala plays an important role in food security and the local economy. This superior commodity can support the food needs of the community and provide raw materials for the food processing industry of non-coastal communities and coastal communities. In the context of the development of a blue economy of sustainable agriculture in coastal areas, this activity can reduce seawater pollution through waste management and the use of environmentally friendly fertilizers. Practices such as organic farming help maintain soil and water quality and support the food security of coastal communities. Integration between agriculture and fisheries, such as integrated pond systems, also improves land efficiency and productivity. For example: in an integrated pond system, waste from fish farming can be used as organic fertilizer for plants, while plant residues can be used as fish feed.

B) Forestry

Forestry in Donggala has a strategic role in maintaining ecosystem balance and supporting the blue economy through the conservation of mangrove forests in coastal areas that function as natural protectors against abrasion and habitats for various marine species. Mangrove conservation also contributes to carbon sequestration, supporting climate change mitigation (Menjadikan mangrove sebagai pilar ketahanan ekonomi biru - ANTARA News accessed on May 12, 2025).

C) Fisheries

The fisheries sector is at the heart of the blue economy, with a focus on sustainable resource management. Sustainable fisheries practices, such as the use of selective fishing gear and ecosystem-based management, ensure the long-term availability of marine biological resources. With the potential for catch fish reaching 193,000 tons per year (Donggala, 2025), Donggala has a significant comparative advantage. The focus on superior commodities such as tuna, skipjack, and cob (TCT) places Donggala as a strategic player in the global supply chain (Kementerian Kelautan dan Perikanan, 2023). Small-scale fisheries also play a crucial role in food security and job creation for coastal communities. Fisheries are a leading sub-sector in Donggala's blue economy, with a focus on aquaculture (development of freshwater fish farming) and conservation of marine and general aquatic resources (Implementation of marine conservation areas and fishing practices). The positive LQ value indicates that the sector's specialization remains stable despite the challenges of climate change. The

transformation from just "catching" to "processing seafood" in the coastal area of Donggala is the key to increasing added value.

D) Transportation and Warehousing

Donggala Regency is known earlier than Palu City because of its large port. This city is like a bustling coastal town like any other coastal city. The GDP analysis shows that the transportation sector has a strong *forward linkage* for the blue economy. The location of the capital city of Donggala is in Tanjung in the Makassar Strait, which is part of ALKI II (Indonesian Archipelago II Sea Channel). Donggala has a favourable geopolitical position for maritime logistics (Huda & Atikah, 2021). Donggala Port serves as a gateway for the distribution of goods for the northern region of Central Sulawesi. Port efficiency has a direct impact on reducing fisheries logistics costs, thereby increasing the competitiveness of local marine product exports.

E) Accommodation and Meal Provision

This sector is shown as a prospective sector with progressive LQ growth. One of the tourist attractions of Tanjung Karang Beach in Donggala Regency is a leading marine tourism destination with coastal panoramas and the diversity of marine ecosystems of strategic value. (Prihantini et al., 2024) said that marine tourism in Donggala, such as the Tanjung Karang area and Central Sea Beach, is a non-extractive economic driver. This sector represents the face of the "blue economy services" that rely on the beauty of marine ecosystems. Likewise, beach tourism locations in other sub-districts, such as Kaluku Beach, Bambarano Beach, and Pasoso Island, which have been known to foreign tourists (Table 4). The growth of accommodation on the coast of Donggala not only increases GDP but also creates local jobs in the service sector that are more inclusive for women and coastal youth.

To ensure the above three sectors support a Sustainable Blue Economy, the analysis is geared towards three main pillars:

1. Ecosystem-Based Fisheries Management; although the potential for fish reaches 193,000 tons, sustainability requires the implementation of quotas for fishing and the protection of *spawning grounds*. The analysis shows that the increase in LQ value should not be achieved through *overfishing*, but through the optimization of post-harvest technology to reduce *food loss* in the fisheries sector (Pauli, 2010). In addition, it is important to establish an integrated supply chain at the fish port, as well as provide

ice factories or frozen warehouses that are accessible to small fishermen or become the main supplier of marine protein for the IKN. The presence of the Red-White Cooperative government program also strengthens fishermen's cooperatives.

2. Green Logistics and Maritime Connectivity; The transformation of Donggala Port into *a Green Port* is an opportunity for sustainability. The integration of marine transportation with efficient land infrastructure will reduce carbon emissions per unit of GDP output, in line with the principle of maritime decarbonization, which is a global blue economy trend (Suro Adhawati, S. & Mansyur, 2023). In addition, the accessibility sector through Donggala is carried out by road maintenance, port revitalization to attract ships from outside Sulawesi, or utilizing solar power for frozen warehouses.
3. Regenerative Tourism: The accommodation sector must shift from *mass tourism* to conservation-based tourism. GDP revenues from this sector are suggested to be reinvested into mangrove and coral reef restoration, which in turn will strengthen tourist attractions and protect the Donggala coastline from abrasion (Prihantini et al., 2024). Beach attractions in Donggala need to be focused on sustainable accommodation development, with income obligations helping to maintain the ecosystem that is a tourist asset.

The combination of LQ and qualitative analysis shows that Donggala has comparative advantages in small-scale capture fisheries and certain aquacultures. This region plays an important role in supporting the development of the blue economy through increasing the economic activities of coastal communities and regional income. This potential analysis can only be realized if infrastructure, institutional, and market access barriers are overcome. This analysis is consistent with the regional economic literature that emphasizes the importance of integrating quantitative evidence and qualitative context in leading sector planning, namely:

1) Infrastructure investments: community cold storage construction, small dock repairs, and improved road access.
2) Strengthening the value chain: support for small-scale processing, quality certification, and digital market access.
3) Participatory zoning: a mechanism for mediating marine space conflicts and the recognition of community access rights.

4) Institutional empowerment: strengthening cooperatives, access to microfinance, and management training.
5) Gender inclusion and disaster risk mitigation: women's empowerment programs and the integration of disaster risk management in blue economy planning.

Thus, the integration between regional potential and leading sectors strengthens the regional economic structure and encourages the development of a synergistic, sustainable, and local excellence-based blue economy in Donggala Regency. The limitations of the study, namely: access to data from certain sectors; quantitative data is limited, so proxy-based LQ has limitations; Interpretation of data should be careful, including generalization of contextual qualitative findings; replication in other regions requires adaptation. Study areas can be focused on flagship sectors or priority zone divisions. The need for follow-up studies, namely quantitative household surveys, fish stock studies, and economic analysis for investment packages.

D. CONCLUSION

Donggala Regency has diverse regional potential that is focused on the development of agropolitan, minapolitan, and marine tourism. Of the 17 leading sectors, there are three sectors that support the blue economy, namely: Agriculture, Forestry, and Fisheries (2.46), Transportation and Warehousing (1.26), and Accommodation and Food (1.69). This sector is directly related to the potential of the region and is the main driver of economic development based on the blue economy. Integrated methods (qualitative, participatory and LQ) are effective for mapping the flagship subsectors of the blue economy in Donggala. The synergy between fisheries (Production), transportation (Distribution), and tourism (Services) forms the golden triangle of the blue economy in Donggala. If these three sectors are managed with the principle of sustainability, Donggala will not only have a high GDP figure, but also long-term ecological resilience. The research results place small-scale capture fisheries and aquaculture as a priority, while marine product processing and sustainable marine tourism have the opportunity to provide added value when supported by infrastructure and institutions. Implementation requires infrastructure investment, participatory zoning, institutional strengthening, gender inclusion, and disaster risk mitigation. This research needs to be validated in the field with household surveys and fish stock surveys to strengthen the LQ calculation. Likewise,

economic feasibility studies for integrative pilot processing and investment units (cooperatives-supply chain-digital market access) in priority zones.

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