STRATEGY FOR DEVELOPING PROCESSED FISHERY AND MARINE PRODUCTS IN BONTANG CITY THROUGH REGIONAL RESEARCH AND INNOVATION (RID) ECOSYSTEM APPROACH

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Abstract

This study, entitled Strategy for Developing Processed Fishery and Marine Products in Bontang City through the Regional Research and Innovation (RID) Ecosystem Approach, analyzes strategies for strengthening marine-based regional economic potential in an extractive-industry-dependent region. The research aims to identify strategic directions for developing processed fishery and marine products as a leading sector to support economic diversification in Bontang City. The study employs a mixed qualitative–quantitative approach using the Regional Research and Innovation ecosystem framework, which examines six elements: policy and infrastructure, institutional capacity, partnerships, innovation culture, regional integration, and global alignment. Data were collected through Focus Group Discussions with regional stakeholders and analyzed using Standard Gap Analysis with a Likert scale and SWOT analysis. The results reveal substantial gaps between current and expected ecosystem conditions. Based on these findings, nine strategic initiatives are proposed to strengthen institutional capacity, innovation support, and collaborative partnerships for sustainable fisheries-based regional economic development.

Keywords: Regional Research and Innovation Ecosystem; Processed Fishery Products; Regional Economic Diversification; Regional Development Strategy; Bontang City

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INTRODUCTION

Since Indonesia's independence until today, the nation's economy has largely relied on the exploitation of natural resources, a pattern commonly found in developing countries (Septianda, 2024). This reliance has resulted in a resource curse, which remains a significant obstacle to achieving a more balanced and sustainable economic structure (Sholikin, 2020). Regions rich in commodities enjoyed rapid growth during periods of high global demand, but often failed to broaden their economic base, exposing them to risks when international prices fall. East Kalimantan illustrates this issue clearly; its economy is heavily centered around oil, gas, and mining, creating deep-rooted dependencies that affect fiscal health and social well-being (Fitrian, 2018; Maulina, 2021). Bontang City, whose growth has been driven by oil, gas, and petrochemical sectors, shows a similar situation. Although these industries have significantly boosted the local economy, the overwhelming reliance on extractive sectors has left it vulnerable, with over 70% of its GRDP stemming from oil and gas, mineral and coal, and petrochemical industries (BPS Kota Bontang, 2025).

Furthermore, the dependence of the Bontang City economy on the extractive industry can be clearly seen from the Regional Revenue Realization data in the Bontang City Regional Budget structure which is still dominated by Transfer to Regions (TKD) accounts in the form of Central Government Transfer Revenue including Revenue Sharing Funds (DBH), General Allocation Funds (DAU), Special Allocation Funds (DAK), and Regional Incentive Funds (DID). In Figure 1, it can be explained that in the period 2017 to 2024, the average percentage of Central Government Transfer Revenue realization was 71% of the Regional Revenue realization in the Bontang City Regional Budget. Meanwhile, the comparison of DBH realization achievement to Regional Revenue realization in the Bontang City Regional Budget is, on average, at 59%. The contribution of the extractive industry to the Revenue Sharing Fund component is an average of 78%. This reinforces that Bontang City's dependence on the extractive industry is very large.

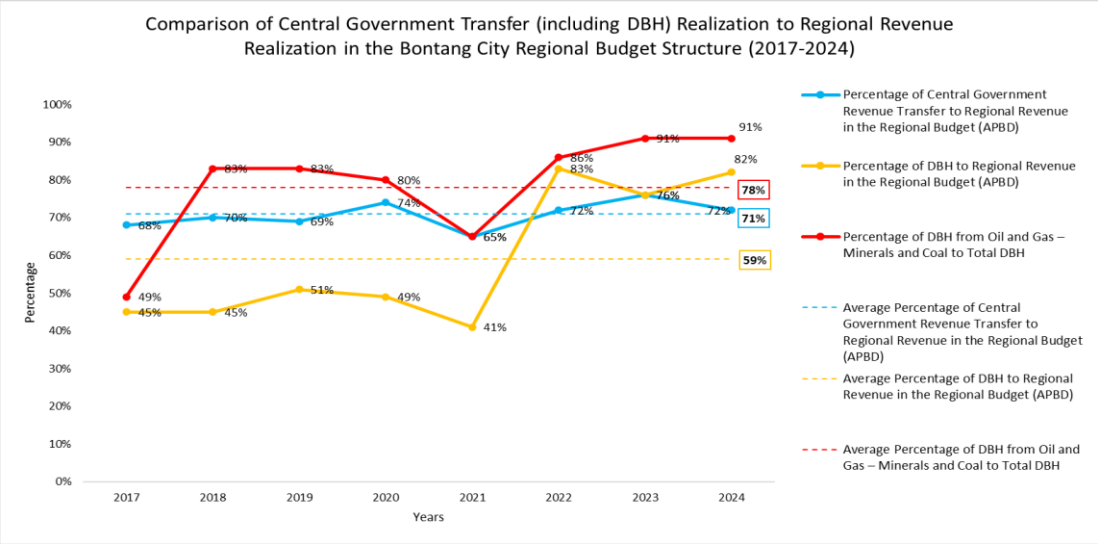

Figure 1.
Comparison of Central Government Transfer to Regional Revenue
Source: Processed Data, APBD Portal, Ministry of Finance (Kementerian Keuangan, 2025)

This high level of dependency has proven vulnerable to changes in national policies and economic dynamics. This is reflected in the drastic decline in projected 2026 Revenue Sharing Fund (DBH) revenues. On September 23, 2025, the Mayor of Bontang announced that the DBH allocation in 2026 would decrease by approximately 80 percent compared to the previous year. Based on the submitted estimates, if Bontang City still received Rp1.23 trillion in DBH in the current year, it would reach only Rp377.36 billion in 2026 (Aziz, 2025). This will impact budget planning and city development. This significant decline illustrates the vulnerability of regional fiscal conditions that depend heavily on extractive or non-renewable industries. This situation underscores the urgency of implementing fiscal policies that are more oriented towards economic diversification, increasing non-extractive, renewable resource-based local revenue (PAD), and strengthening productive spending across other potential sectors (Hidayat et al., 2024).

In regional economic development, this situation calls for diversification. Regions should expand strengths beyond non-renewable, extractive industries. Diversification reduces reliance on these sectors and builds a more sustainable, inclusive, and resilient economy amid global shifts. According to Bontang City's Long-Term Plan (RPJPD) 2025-2045, diversity in growing and stable sectors indicates a healthy economy (Pemerintah Kota Bontang, 2024). The goal of diversification is such diversity. Success is shown by less reliance on specific industries. Growth in sectors, agriculture (rice, maize, horticulture), fisheries (aquaculture, marine capture), manufacturing (food processing, light and heavy industries), services (finance, education, health), tourism (eco- and cultural tourism), and technology (digital services, startups), builds a solid foundation.

A region's top economic sectors often form local identity and pride. When these sectors are strong, various derivative products emerge, building on regional advantages (Setiajatnika & Astuti, 2022). These products add value to local resources and create unique traits that other regions struggle to copy. For example, marine fisheries regions can develop value-added products such as frozen fish, fish crackers, shredded fish, shrimp paste, or seaweed cosmetics, all of which command a higher price than the raw commodity.

Based on various regional documents and previous research, processed fishery and marine products are among the alternative potential strengths in the effort to diversify the economy in Bontang City. The results of the study by the East Kalimantan Province Investment and One-Stop Integrated Services Agency revealed that one of the superior products of Bontang City from the processing industry sector is processed marine products, based on an analysis of the conditions of mapping the distribution of business actors and the accumulation of labor absorption, increasing the quality of attraction, improving the quality of infrastructure, increasing promotion and investment, increasing cooperation, increasing community participation, and increasing protection (DPMPTSP Provinsi Kalimantan Timur, 2024). Putra et al. (2026) research identifies 11 regional superior alternatives beyond non-renewable resource industries, providing options for regional economic diversification. Using the ROC (Rank Order Centroid) method in Bontang City, processed fishery and marine products ranked as the top priorities.

The local government's commitment to developing added value in the fisheries and maritime sector is reflected in various development planning documents. The Bontang City Maritime Affairs, Fisheries, and Agriculture Office includes the "Productivity of Fisheries Business Processing" indicator among its annual improvement targets in its fisheries sector

development program (DKP3 Kota Bontang, 2021). Furthermore, the East Kalimantan Provincial Industrial Development Plan 2019–2039 and the Bontang City Industrial Development Plan 2023–2043 also identify the fisheries and seafood processing industry as one with significant development potential (Perda Nomor 10 Tahun 2019 Rencana Pembangunan Industri Provinsi Kalimantan Timur Tahun 2019 -2039, 2019; Perda Nomor 12 Tahun 2023 Rencana Pengembangan Industri Kota Bontang Tahun 2023-2043, 2023). These documents state that the fish processing industry encompasses products such as preserved fish (frozen, dried, and smoked), fish fillets, and various processed products made from fish, seaweed, and other marine products. This demonstrates that the local government views the processing sector as a key arena for generating additional economic value from marine resources.

In terms of competitiveness, Bontang City's capture fisheries production base provides a concrete foundation. Bontang City's marine capture fisheries production from 2018 to 2024 showed an upward trend with slight fluctuations. Production rose from 17,429 tons in 2018 to 21,219 tons in 2019, then declined to 20,392 tons in 2020, before gradually increasing to 21,922 tons in 2022. Peak production occurred in 2023 at 25,069.49 tons, followed by a slight decline to 24,549.77 tons in 2024 (BPS Kalimantan Timur, 2025).

In East Kalimantan, Statistics Indonesia (BPS) data show that marine capture fisheries production from 2018 to 2024 was dominated by Kutai Kartanegara Regency, with an average annual production of 50,506.97 tons, valued at approximately IDR 1.8 trillion. Based on average production, Bontang City ranks second among the recorded regencies/cities, with an average annual production of 21,698.18 tons valued at 987.86 billion rupiah. This position places Bontang above Berau, Paser, Samarinda City, East Kutai, North Penajam Paser, and Balikpapan City, thus confirming its relatively strong production capacity within the provincial capture fisheries structure (BPS Kalimantan Timur, 2025). Bontang's contribution to East Kalimantan's total production is also relatively stable, averaging 16.03% during the observation period. Likewise, when measured in terms of value (rupiah), Bontang City consistently contributes an average of 21.45% to the total value of marine capture fisheries in East Kalimantan.

In 2024, Bontang City ranked among the top regencies and cities in East Kalimantan for total marine capture fisheries commodity volume. Bontang supplied 24,549.77 tons, accounting for about 14.77 percent of the province's production (BPS Kalimantan Timur, 2025). This is less than Kutai Kartanegara, which leads the province in overall fisheries output. Bontang focuses on primary commodities that command higher prices and have a greater economic impact within the province.

Table1.
Marine Capture Fisheries Volume (Commodities) in 2024

No	Regency/City/ Province	Volume (Commodity) Marine Capture Fisheries (tons)					
		Skipjack/ Cakalang	Mackerel/ Tongkol	Tuna	Shrimp	Other Commodities	Total Volume
1	Paser	-	367.00	-	3,439.92	7,054.37	10,861.29
2	Kutai Barat	-	-	-	-	-	-

No	Regency/City/ Province	Volume (Commodity) Marine Capture Fisheries (tons)					
		Skipjack/ Cakalang	Mackerel/ Tongkol	Tuna	Shrimp	Other Commodities	Total Volume
3	Kutai Kartanegara	-	928.04	-	23,597.85	51,778.25	76,304.13
4	Kutai Timur	89.42	404.50	152.97	1,401.04	5,235.90	7,283.83
5	Berau	0.80	997.48	133.87	2,813.86	21,284.63	25,230.64
6	Penajam Paser Utara	92.61	359.55	106.49	649.62	4,509.86	5,718.13
7	Mahakam Ulu	-	-	-	-	-	-
8	Kota Balikpapan	201.04	829.46	13.52	398.97	2,982.80	4,425.80
9	Kota Samarinda	426.63	585.97	439.13	1,480.48	8,962.61	11,894.83
10	Kota Bontang	1,929.37	5,225.67	950.38	284.49	16,159.86	24,549.77
Kalimantan Timur		2,739.86	9,697.68	1,796.37	34,066.22	117,968.28	166,268.42
Bontang City Contribution (%)		70.42%	53.89%	52.91%	0.84%	13.70%	14.77%

Source: Processed data, BPS East Kalimantan Province 2025

Bontang stands as the undisputed leader in East Kalimantan's pelagic fisheries, a dominance most evident in the production of skipjack (70.42%), mackerel (53.89%), and tuna (52.91%). all representing over half of the province's totals (BPS Kalimantan Timur, 2025). This makes Bontang a major center for pelagic fisheries with both quantitative and structural advantages.

Several studies on identifying and developing regional superior potential have used a range of methods. Setiawan (2023), for example, stressed the diversification of economic sectors to reduce inequality and increase regional resilience. Strengthening local sectors, such as MSMEs and sustainable tourism, is a relevant strategy for equitable growth. Similarly, Setiajatnika & Astuti (2022) combined regional sector analysis with SWOT and AHP analyses. Their strategy aims to enhance regional competitiveness by strengthening human resources, infrastructure, innovation, and institutions.

Although previous studies have identified and analyzed regional potential and formulated development strategies using AHP and SWOT analyses, most still focus on economic sectoral aspects without comprehensively considering the regional research and innovation ecosystem as a strengthening element or lever for regional competitiveness. This is the research gap that this study fills. The novelty of this research lies in the integrative approach between mapping and developing regional potential using the regional research and innovation ecosystem framework and SWOT analysis. Therefore, the purpose of this study

is to formulate a development strategy for Bontang City's regional potential using the regional research and innovation ecosystem framework.

REVIEW OF LITERATURE

In developing regional superior potential, various strategic approaches can be used to increase regional competitiveness. One emerging approach is the regional research and innovation ecosystem, which emphasizes collaboration among government, research institutions, universities, industry, and the community to build productive innovation networks (Lima et al., 2024; Rong et al., 2021). Within this framework, superior products are viewed not merely as economic commodities, but as the result of dynamic interactions among regional development actors who create and utilize innovation (Bilberg et al., 2016; Osarenkhoe & Fjellström, 2022). When research institutions and universities conduct applied research relevant to local potential, the resulting innovations can increase the added value and competitiveness of superior regional products (Rong et al., 2021).

Conceptually, a research and innovation ecosystem is a system formed through interactions between government, research institutions, universities, industry, and the community. This interaction enables the creation, dissemination, and application of knowledge and technology relevant to local needs (Cooke et al., 1997). Therefore, strengthening leading sectors cannot be separated from a healthy innovation ecosystem, where research and innovation are the main drivers of increased regional productivity and competitiveness.

The importance of collaboration among innovation actors is illustrated by the triple helix concept introduced by Etzkowitz & Leydesdorff (2000), which highlights the synergy between government, universities, and industry in generating economically valuable and sustainable innovations. This synergy leads to concrete benefits: local governments, through targeted policies, facilitate research incentives, develop industrial clusters, and build innovation infrastructure, directly accelerating innovation outcomes (Lima et al., 2024; Osarenkhoe & Fjellström, 2022). Furthermore, the effective transfer of knowledge and technology from universities to businesses, especially MSMEs, enables these enterprises to innovate more rapidly and effectively, thereby boosting the local economy's growth capacity (Bilberg et al., 2016; Lima et al., 2024). Regional case studies demonstrate that science- and technology-based product advancements tangibly increase global competitiveness, create jobs, raise community income, and diversify regional economies (Lima et al., 2024; Rong et al., 2021).

In the context of regional development policy in Indonesia, the book "Developing Regional Innovation Systems: A Policy Perspective" by Tatang A. Taufik also explains the importance of regional innovation systems. The book emphasizes that innovation is a cross-sectoral development policy instrument that involves integrating the roles of government, universities, the business world, and the community. Public policy serves as a primary driver in creating synergy among stakeholders, strengthening institutions, and directing the use of local resources for regional development (Tatang A. Taufik, 2005). Likewise, Skaggs & Wright (2016) see open innovation as a process shared among organizations and shaped by regulations, policies, and economic forces. Innovation, therefore, evolves within an ecosystem of diverse, interacting actors.

BRIN Regulation Number 5 of 2023 defines a regional research and innovation ecosystem as the interconnected elements that support the research and innovation value chain in a region (Peraturan Badan Riset Dan Inovasi Nasional Republik Indonesia Nomor 5 Tahun 2023 Tentang Tata Kelola Riset Dan Inovasi Di Daerah, 2023). These elements include local governments, universities, research institutions, industry, and communities working together in specific roles: local governments coordinate and resource the process through the Regional Research and Innovation Agency (BRIDA); universities and research institutions contribute knowledge and research outputs; industry applies and commercializes innovations; and communities provide input and context. Article 23 clarifies that local governments, through BRIDA, are responsible for developing these ecosystems using six main elements: research policy and infrastructure; institutional capacity; partnerships; innovation culture; regional research integration; and alignment with global developments (Peraturan Badan Riset Dan Inovasi Nasional Republik Indonesia Nomor 5 Tahun 2023 Tentang Tata Kelola Riset Dan Inovasi Di Daerah, 2023).

Table 2.
Elements and Sub-Elements of the Regional Research and Innovation

Element 1: Regional Research and Innovation Infrastructure Policy Sub-Elements: 1. Reform of regional research and innovation policies; 2. Establishment of research and innovation databases; 3. Development of basic research and innovation infrastructure; 4. Provision of research and innovation budgets; 5. Improved protection and utilization of intellectual property.	Element 2: Institutional Capacity and Support for Research and Innovation Sub-Elements: 1. Strengthening collaboration between regional research and innovation stakeholders; 2. Provision of supporting facilities for research and innovation in regions tailored to regional capabilities.	Element 3: Research and Innovation Partnerships Sub-Elements: 1. Strengthening inter-institutional partnerships; 2. Increasing the diffusion of innovation; 3. Increasing good practices and dissemination of research and innovation results to innovators.
Element 4: Research and Innovation Culture Sub-Elements: 1. Promotion and campaigns for innovation; 2. Appreciation of innovation achievements; 3. Development of research-based start-up companies; 4. Inventory, development, and protection of	Element 5: Integration or coherence of research and innovation in the regions Sub-elements: 1. Initiatives for the development of research and innovation in the regions based on regional needs for the promotion of regional	Element 6: Alignment with global developments Sub-elements: 1. Increasing awareness of international issues that influence the development of research and innovation ecosystems in the regions;

community knowledge and/or technology.	development programs (PUD); 2. Implementation of innovation cluster development based on superior regional products; 3. Policy alignment between the central government and regional governments.	2. Strengthening international cooperation.

Source: BRIN (BRIN Regulation No. 5 of 2023 concerning Regional Research and Innovation Governance)

Conceptually, the regional research and innovation ecosystem framework in BRIN regulations is related to the regional innovation system concept proposed by Tatang A. Taufik (2005) and the open innovation concept developed by Skaggs and Wright (2016). All three view innovation as a strategic instrument for enhancing regional competitiveness, with academic literature providing the conceptual basis and BRIN regulations providing an implementation framework for local governments.

In this study, the identified leading potentials were analyzed to assess the extent to which the region's research and innovation ecosystem supports their development. This is crucial because the success of developing leading sectors is determined not only by the availability of economic resources but also by institutional support, research capacity, technological infrastructure, and collaborative networks between development actors (Asheim et al., 2015).

To assess these conditions, this study used gap analysis. Gap analysis identifies differences between actual and desired conditions, revealing performance gaps and strategies to address them (Channon, Derek; Sammut-Bonnici, 2015). Gupta (2020) adds that this method is used in performance evaluation, digital strategies, and human resource management.

Kim & Ji (2018) explain that gap analysis involves four main stages: identifying the current (as-is) condition, formulating the desired (to-be) condition, comparing the two conditions to identify gaps, and developing an action plan to address these differences. The initial stage of the analysis emphasizes the objective mapping of actual conditions using performance indicators, surveys, organizational reports, and stakeholder perceptions.

In practice, gap analysis can be conducted using two approaches: standard gap analysis and weighted gap analysis. Standard gap analysis directly calculates the difference between actual and ideal conditions. It does not assign weights to indicators. In contrast, weighted gap analysis assigns different weights, indicating higher strategic improvement priorities (Kim & Ji, 2018).

Gap analysis identifies differences between actual and ideal conditions. It also helps uncover the underlying causes and guides the formulation of improvement strategies. In some studies, this method is integrated with SWOT analysis. Together, they generate more comprehensive strategies. (Pratiwi & Winarni (2019) used gap analysis to identify product

weaknesses in a company. They then applied SWOT analysis to help formulate strategies to close these gaps. The study shows that these strategies not only address internal weaknesses but also capitalize on external opportunities. Gap analysis and SWOT serve as complementary approaches. Gap analysis gives a quantitative basis for identifying gaps, while SWOT offers a strategic framework for addressing them.

RESEARCH METHOD

This study uses a qualitative-quantitative approach to analyze how ready Bontang City's regional research and innovation ecosystem is to support regional superior potential. The research maps and analyzes the ecosystem as the foundation for strengthening prioritized potential.

The analytical framework uses six elements: (1) regional research and innovation policies and infrastructure, (2) institutional capacity and support, (3) research and innovation partnerships, (4) research and innovation culture, (5) regional integration of research and innovation, and (6) alignment with global developments. These form a matrix mapping actual (as-is) and expected (to-be) conditions.

Primary data collection was conducted through Focus Group Discussions (FGDs) with stakeholders involved in research, innovation, and regional economic development. The study respondents came from the Bontang City Regional Apparatus Organizations (OPD) and other stakeholders involved in developing the region's potential. The FGDs were conducted to complete the regional research and innovation ecosystem framework matrix and identify various problems and challenges to developing the region's leading potential.

Data analysis was conducted using Standard Gap Analysis combined with a Likert scale to assess the condition of each element of the regional research and innovation ecosystem. Respondents were asked to rate the actual condition of each indicator using a Likert scale (1-5). Next, a gap score was calculated by comparing the actual (as-is) condition with the desired (to-be) condition. The results of this analysis were used to identify gaps in each element of the research and innovation ecosystem and to prioritize interventions needed to support the region's leading potential.

The final research phase involved formulating a strategy to develop the region's top strengths by integrating the ecosystem gap analysis with a SWOT (Strengths, Weaknesses, Opportunities, Threats) assessment. SWOT analysis identified internal and external factors affecting Bontang City's development. The resulting strategy addresses gaps in the research and innovation ecosystem while considering strengths, weaknesses, opportunities, and threats. This approach aims to deliver a more focused and sustainable plan for developing regional strengths.

RESULTS AND DISCUSSION

Mapping and Analysis of the Development of Processed Fishery and Marine Products

The development of processed fishery and marine products in Bontang City is a strategic part of efforts to strengthen the local economy based on the potential of marine resources. To support this, an integrated, adaptive, and regionally-focused research and innovation ecosystem is needed. Mapping the condition of the research and innovation ecosystem for the development of processed fishery and marine products is conducted to

determine the actual and expected conditions and whether there are gaps or inconsistencies between the two. This gap analysis is crucial for identifying weaknesses and opportunities for improvement across the six main elements of the regional research and innovation ecosystem framework: policies, institutional capacity, partnerships, innovation culture, cross-sector integration, and alignment with global developments.

In compiling the mapping and analysis of the development of processed fishery and marine products in Bontang City, the Regional Research and Innovation Ecosystem Framework was used, with a Gap Analysis Standard and a Likert Scale with a meaning of 1-5. Gap analysis was used to measure the difference between the current condition (CI) and the desired condition (Condition Aspiration/CA) for each element of the Regional Research and Innovation Ecosystem. The gap value was obtained by subtracting CA from CI and used as an indicator of the level of readiness and the need for policy intervention to develop the superior potential of the Bontang City region.

In this study, gap values were grouped into four categories to simplify interpretation and prioritization: no gap (0.00), low (>0.00–≤1.50), moderate (>1.50–≤2.50), and high (>2.50–≤4.00). The higher the gap value, the greater the need for policy intervention and strengthening of the regional research and innovation ecosystem. Table 4.10 below summarizes the results of mapping and analyzing the development of processed fishery and marine products in Bontang City. These results were obtained through FGDs with relevant stakeholders. Participants included the Regional Development Planning, Research and Innovation Agency; the Food Security, Fisheries and Agriculture Agency; the Cooperatives and MSMEs Agency; the Information and Informatics Agency; the Youth, Sports and Tourism Agency; the Education and Culture Agency; the Environmental Agency; the Regional Secretariat (Legal Section, Government Section); and universities in Bontang City.

Tabel 3.
Results of RID Ecosystem Mapping and Analysis Using Standard Gap Analysis and a Likert Scale for the Development of Processed Fishery and Marine Products

Elements and Sub-Elements of the Regional Research and Innovation Ecosystem	Score Current Condition (CA)	Score Expected Condition (CI)	Score Gap Score (CA-CI)	Gap Category
1. Regional Research and Innovation Infrastructure Policy	**1.80**	**5.00**	**3.20**	**High**
- Reform of regional research and innovation policies;	2.00	5.00	3.00	High
- Establishment of research and innovation databases;	2.00	5.00	3.00	High
- Development of basic research and innovation infrastructure;	1.00	5.00	4.00	High
- Provision of research and innovation budgets;	2.00	5.00	3.00	High

- Improved protection and utilization of intellectual property.	2.00	5.00	3.00	High
2. Institutional Capacity and Support for Research and Innovation	**2.00**	**5.00**	**3.00**	**High**
- Strengthening collaboration between regional research and innovation stakeholders;	3.00	5.00	2.00	Medium
- Provision of supporting facilities for research and innovation in regions tailored to regional capabilities.	1.00	5.00	4.00	High
3. Research and Innovation Partnerships	**1.67**	**5.00**	**3.33**	**High**
- Strengthening inter-institutional partnerships;	1.00	5.00	4.00	High
- Increasing the diffusion of innovation;	1.00	5.00	4.00	High
- Increasing good practices and dissemination of research and innovation results to innovators.	3.00	5.00	2.00	High
4. Research and Innovation Culture	**2.75**	**5.00**	**2.25**	**Medium**
- Promotion and campaigns for innovation	4.00	5.00	1.00	Low
- Appreciation of innovation achievements;	4.00	5.00	1.00	Low
- Development of research-based start-up companies;	2.00	5.00	3.00	High
- Inventory, development, and protection of community knowledge and/or technology.	1.00	5.00	4.00	High
5. Integration or coherence of research and innovation in the regions	**1.67**	**5.00**	**3.33**	**High**
- Initiatives for the development of research and innovation in the regions based on regional needs for the promotion of regional development programs (PUD);	1.00	5.00	4.00	High
- Implementation of innovation cluster development based on superior regional products;	2.00	5.00	3.00	High

- Policy alignment between the central government and regional governments.	2.00	5.00	3.00	High
6. Alignment with global developments	**1.50**	**5.00**	**3.50**	**High**
- Increasing awareness of international issues that influence the development of research and innovation ecosystems in the regions	2.00	5.00	3.00	High
- Strengthening international cooperation	1.00	5.00	4.00	High

From Table 3, the Results of Mapping and Analysis of the RID Ecosystem with Standard Gap Analysis and Likert Scale in the context of Developing Processed Fishery and Marine Products can be visualized as in Figure 2. It can be seen in Table 2 and Figure 2 that of the Six Elements of the RID Ecosystem of Bontang City in the Development of Processed Fishery and Marine Products, it is known that two (2) Elements have a current condition/actual condition (CA) score above or equal to 2.00, namely Institutional Capacity and Supporting Capacity for Research and Innovation (2.00) and Research and Innovation Culture (2.75). There are four (4) elements with scores below 2.00: Research and Innovation Infrastructure Policy in the Region (1.80), Research and Innovation Partnership (1.67), Integration or Coherence of Research and Innovation in the Region (1.67), and Alignment with Global Developments (1.50). And one element with a current condition score of 2.75: Research and Innovation Culture. Therefore, the current average score for the Bontang City RID Ecosystem is 1.90. This aligns with the average Bontang City IDSD Innovation Capability Index score for the 2022-2024 period, which was 2.05 (out of 5.00).

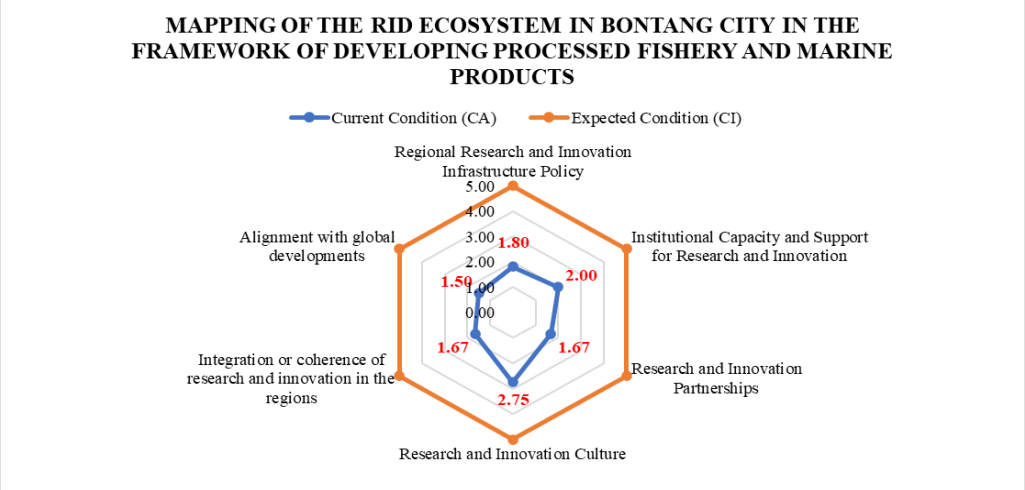

Figure 2.
Results of the Regional Research and Innovation (RID) Ecosystem Mapping in Bontang City for the Development of Processed Fishery and Marine Products

The Research and Innovation Culture element, compared with the other five elements, has the smallest gap (2.25) and can be said to be closest to the desired or ideal condition (CI).

However, there are still gaps in this element, and improvements can be made to close them and bring them closer to the desired condition.

Formulation of Development Strategy for Processed Fishery and Marine Products

The strategy for developing Bontang City's superior potential is an integrative stage. It connects the identification of superior potential, the mapping of development priorities, and the gap analysis of the regional research and innovation ecosystem. The previous subsection presented a gap analysis that highlighted differences between the current and desired conditions. It also discussed areas that work well and elements that still need policy support and strengthening.

Based on this mapping and gap analysis, the development strategy is not only focused on optimizing existing potential but also on closing the identified structural, institutional, and policy gaps. Within this framework, a SWOT analysis is used as the primary analytical tool for formulating a gap-closing strategy by integrating internal factors, including regional strengths and weaknesses, with external factors, including opportunities and threats, that influence the development of the region's superior potential. The following is a gap-based SWOT analysis of the Bontang City Regional Research and Innovation Ecosystem:

Internal Factors

- **Strengths**

Table 4.
SWOT Analysis Aspect Strengths

Code	Description Strength	RID Element	RID Sub-Element
S1	The existence of existing centers for processed fishery and seafood products in several areas of Bontang City (such as Bontang Kuala and Loktuan) indicates the establishment of a base for downstream seafood processing activities	Integration or coherence of research and innovation in the regions	Implementation of innovation cluster development based on superior regional products
S2	Several processed fishery products have basic certifications (Halal, PIRT, MD, CPPOB), serving as initial capital for quality and competitiveness	Element 6 - Alignment with global developments	Increasing awareness of international issues that influence the development of research and innovation ecosystems in the regions
S3	Regional government holds general promotions and competitions (Gemari, cooking competitions, SI PEENA/Bontang Innovation Awards) to encourage innovation in processed fishery products	Element 4 - Research and Innovation Culture	Promotion and campaigns for innovation; Appreciation of innovation achievements

Code	Description Strength	RID Element	RID Sub-Element
S4	The availability of regulations related to regional innovation and industrial development plans as an initial policy umbrella for the development of superior regional products, especially processed fishery and marine products.	Element 1 - Regional Research and Innovation Infrastructure Policy	Reform of regional research and innovation policies
S5	Several partnerships and collaborations have been established to develop processed fishery and marine products with regional stakeholders	Element 2- Institutional Capacity and Support for Research and Innovation	Strengthening collaboration between regional research and innovation stakeholders
S6	There are mentoring and training activities for fishery product diversification, sharing good practices with processors and marketers	Element 3 - Research and Innovation Partnerships	Increasing good practices and dissemination of research and innovation results to innovators

- **Weaknesses**

Table 5.
SWOT Analysis Aspect Weaknesses

Code	Description Weaknesses	RID Element	RID Sub-Element
W1	Regional policies are general and do not target the development of superior regional products, especially processed fisheries and marine products.	Element 1 - Regional Research and Innovation Infrastructure Policy	Reform of regional research and innovation policies
W2	Insufficient infrastructure (incubators, innovation centers, technoparks), lack of research and innovation support (websites, pilot projects), and absence of a specific updated database for entrepreneurship and product development.	Element 1 - Regional Research and Innovation Infrastructure Policy; Element 2- Institutional Capacity and Support for Research and Innovation	Development of basic research and innovation infrastructure (Element 1); Establishment of research and innovation databases (Element 1); Penyediaan anggaran Riset dan Inovasi (Elemen 1); Provision of supporting facilities for research and innovation in regions tailored to regional capabilities (Elemen 2)

Code	Description Weaknesses	RID Element	RID Sub-Element
W3	There is no sustainable sectoral research and innovation funding scheme (a structured, ongoing mechanism for providing financial resources to specific research and innovation areas), particularly for the development of processed fishery and marine products.	Element 1 - Regional Research and Innovation Infrastructure Policy	Provision of research and innovation budgets
W4	There is no dedicated unit managing Intellectual Property Rights (Sentra HKI).	Element 1 - Regional Research and Innovation Infrastructure Policy	Improved protection and utilization of intellectual property
W5	Local knowledge and community technology (traditional practices and innovations developed within the local community) have not been formally inventoried and protected.	Element 4 - Research and Innovation Culture	Inventory, development, and protection of community knowledge and/or technology
W6	Lack of research and innovation partnerships (collaborative efforts between organizations and government bodies) between stakeholders producing and using innovation in the regions, as well as strategic partnerships between the regions and the central government for the development of processed fishery and marine products.	Element 3 - Research and Innovation Partnerships	Strengthening inter-institutional partnerships
W7	Lack of technology transfer models and strategies (methods and plans to move innovation from one group to another) for micro-enterprises (small businesses with minimal employees and capital) in the development of Processed Fisheries and Marine Products.	Element 3 - Research and Innovation Partnerships	Increasing the diffusion of innovation

Code	Description Weaknesses	RID Element	RID Sub-Element
W8	Lack of research and innovation initiatives exist for processed fisheries and marine products.	Element 5 - Integration or coherence of research and innovation in the regions	Initiatives for the development of research and innovation in the regions based on regional needs for the promotion of regional development programs (PUD)

External Factors

- **Opportunities**

Tabel 6.
SWOT Analysis Aspect Opportunities

Code	Description Opportunities	RID Element	RID Sub-Element
O1	Support for national policies related to strengthening regional innovation ecosystems and downstream research.	Element 5 - Integration or coherence of research and innovation in the regions	Policy alignment between the central government and regional governments
O2	Opportunities for developing innovation clusters based on superior regional products, particularly processed fisheries and marine products.	Element 5 - Integration or coherence of research and innovation in the regions	Implementation of innovation cluster development based on superior regional products
O3	Potential partnerships with research and innovation entities (universities, R&D institutions, and incubators) for the development of superior regional products, particularly processed fisheries and seafood.	Element 3 - Research and Innovation Partnerships	Strengthening inter-institutional partnerships
O4	Increasing market demand for value-added processed food products, particularly processed fisheries and marine products.	Element 6 - Alignment with global developments	Strengthening international cooperation
O5	Opportunities for adapting national/international standards (improving certification) and international cooperation to develop and market superior regional products, particularly	Element 6 - Alignment with global developments	Increasing awareness of international issues that influence the development of research and innovation ecosystems in the regions; Strengthening

Code	Description Opportunities	RID Element	RID Sub-Element
	processed fisheries and marine products.		international cooperation
O6	Potential for developing research-based start-up companies in entrepreneurship for superior regional products, particularly processed fisheries and marine products.	Element 4 - Research and Innovation Culture	Development of research-based start-up companies

- **Threats**

Table 7.
SWOT Analysis Aspect Threats

Code	Description Threats	RID Element	RID Sub-Element
T1	Competition with regions that have advanced innovation clusters and fisheries systems.	Element 5 - Integration or coherence of research and innovation in the regions	Implementation of innovation cluster development based on superior regional products
T2	Dynamics and policy asymmetry across levels of government (central and regional) in the development of research, innovation, and industry.	Element 5 - Integration or coherence of research and innovation in the regions	Policy alignment between the central government and regional governments
T3	Increasingly stringent national and global market demands for quality standards, food safety, and product sustainability.	Element 6 - Alignment with global developments	Increasing awareness of international issues that influence the development of research and innovation ecosystems in the regions
T4	Rapid development of fishery product processing technology and innovation outside the region.	Element 3 - Research and Innovation Partnerships	Increasing the diffusion of innovation

Based on the results of the development strategy formulation using the SO–WO–ST–WT Matrix, nine (9) strategies were generated, as follows:

❑ **SO-1 Strategy**. Development of innovation clusters for processed fishery and seafood products, integrated with existing production centers, partnerships with research	❑ **WO-1 Strategy**. Formulation and strengthening of policies for the development of superior regional products based on processed fishery and seafood. (W1, W3, W4, W5, W7, W8 – O1).

and innovation entities, and the incubation of research-based startups in entrepreneurship to develop superior regional products. (S1, S5 – O2, O3, O6). ❑ **SO-2 Strategy**. Strengthening the promotion, branding, and positioning of processed fishery and seafood products based on research and innovation, as well as certification, to expand access to national and global markets. (S1, S2, S3 – O1, O4, O5). ❑ **SO-3 Strategy**. Diversification and development of processed fishery products based on applied research through collaboration and partnerships with research and innovation entities. (S1, S5 – O1, O3).	❑ **WO-2 Strategy**. Provision and strengthening of infrastructure, supporting facilities, and innovation research databases, as well as sustainable funding schemes, to support the development of superior regional products. (W2, W3 – O2). ❑ **WO-3 Strategy**. Establishment and strengthening of institutions for the inventory, protection, and utilization of intellectual property and local knowledge (or community technology) through strategic partnerships between local and central governments. (W4, W5, W6 – O1, O3).
❑ **ST-1 Strategy**. Improving the quality, certification, and differentiation of processed fishery products based on local identity to face inter-regional competition and the demands of national and global market standards. (S2 – T1, T3). ❑ **ST-2 Strategy**. Utilizing processing centers and innovation promotion activities as learning media, as well as technology and marketing adaptation. (S1, S3, S6 – T4).	❑ **WT-1 Strategy**. Synchronization of policies across government levels (central and regional) related to micro-enterprise assistance in developing processed fishery and marine products based on research and innovation. (W1, W2, W3, W4, W5, W7, W8 – T1, T2, T4).

The strategy for developing processed fishery and marine products in Bontang City, using the ecosystem framework approach, is implemented in an integrated, simultaneous manner by each regional apparatus according to its respective affairs. However, the intensity or emphasis with which strategies and programs are implemented across the elements and sub-elements of the RID ecosystem can vary according to the region's needs and capabilities. Emphasis can be placed on strengthening elements of the regional research and innovation ecosystem that are in a high-gap category, for example, the Element of Research and Innovation Policy and Infrastructure, Research and Innovation Partnerships, Integration or Coherence of Research and Innovation in the Region, and Alignment with Global Developments. However, strategies and programs are still implemented in other RID elements (lower gap category) at varying levels of intensity and emphasis.

CONCLUSION

Based on the research results, during the mapping and analysis phase of the development of processed fishery and marine products, of the six elements of the RID ecosystem, five elements were categorized as having high gaps (>2.50–≤4.00): Regional Research and Innovation Infrastructure Policy; Institutional Capacity and Support for Research and Innovation; Research and Innovation Partnerships; Integration or Coherence of Research and Innovation in the Region; and Alignment with Global Developments. One element of the RID ecosystem was categorized as having a moderate gap (>1.50–≤2.50): Research and Innovation Culture.

The analysis of gaps in the regional research and innovation ecosystem and the formulation of development strategies, using SWOT Analysis and the SO–WO–ST–WT Matrix, yielded 9 strategies. These strategies are intended to address gaps in the elements/subelements of the RID Ecosystem in order to develop superior regional processed fishery and marine products. The strategies and programs across the six elements of the RID ecosystem are implemented in an integrated, simultaneous manner, but the level, intensity, and emphasis can vary to adapt to the region's needs and capabilities.

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