The Contribution of Fisheries Sector in Regional Development of Karo Regency North Sumatra Province, Indonesia

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

This research aims to analyze the growth of the fisheries sector, analyze the commodity market strength of the fisheries sector and analyze the strength of the fisheries sector's base and non-base sectors in regional development in Karo Regency. The method used in this study was a quantitative method using secondary data cross-section and time series which were then analyzed using descriptive statistics, and qualitative methods using primary data obtained through interview questionnaires. Analysis of the data used was growth index analysis, Trade area capture (TAC) analysis, full factor analysis (PF) and minimum requirement approach (MRA) analysis. The results of the growth index analysis show that the Gross Domestic Product (GDP)of the fisheries sector in the Karo Regency has increased by 95% in the period 2009-2018. The results of the 2009-2018 TAC analysis showed that the TAC value> population indicated that the regency was able to capture the opportunities of trade in fisheries products in other regions. PF value of the fisheries sector> 1 can attract customers from other regions and has a specialization in terms of fishery product markets. MRA analysis results in 2017 obtained the largest base multiplier in Bulang District with a value of 12.9 which means that every 120 workers in the base sector are expected to create 9 workers in the non-base sector.

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1. INTRODUCTION

Regional dimension development, in general, is often referred to as regional economic development in the context of the macroeconomy, for example, regional development in both provinces and cities. The purpose and objectives of regional development are to advance economic growth and regional competitiveness, as well as reduce disparities between regions and develop community life. Gross Regional Domestic Product (GRDP) is one indicator of the level of development progress and community welfare in an area.

Karo Regency is one of the areas in North Sumatra Province which is located in the highlands of the Bukit Barisan mountains at an altitude of 120-1600 m above sea level. The district capital is Kabanjahe, which is 75 km or 1.5 hours by road from Medan City, the capital of North Sumatra Province. Geographically, Karo Regency is located between 2° 50'-3° 19' North Latitude and 97° 55'-98° 38' East Longitude with an area of 2,127.25 Km^2 or 2.97% of the area of North Sumatra Province. To the north it is bordered by Langkat and Deli Serdang regencies, to the east by Simalungun and Deli Serdang regencies, to the south by Dairi and Toba Samosir regencies, to the west by Southeast Aceh Regency/NAD Province [1]. Karo Regency is an Upstream River Area and a Wampu/Ular Watershed, a sub-Laubiang River Basin, with an area of 2,127.25 Km^2, all of which empties into the Malacca Strait. In general, this sub-watershed is used to irrigate rice fields as an effort to increase agricultural production [1].

The basic sector or leading sector can encourage economic activity and support the creation of prosperity in an area, namely through production, exports, and job creation. Therefore, it is necessary to identify the leading sector in an area first in economic development planning [2].

Fisheries potential in Karo Regency, must continue to be advantage. Development resources are utilized to achieve comparative advantage and competitive advantage for the development of an existing company and a new company, as well as to maintain its economic base owned by the region concerned [3]. Not only in the capture fisheries sector, but also in the aquaculture sector. Popular aquaculture in Karo Regency is in the form of ponds and ponds. Based on the potential of the marine area, it can be said that pond fisheries have not been optimally utilized because the area utilized for ponds is lower than that of ponds. The less optimal utilization of the fishery sector must be addressed so that the fisheries sector is able to provide a dominant effect on the development of the Karo Regency area [4].

This research aims to determine the contribution of the fisheries sector in the regional development of the Karo Regency by analyzing the growth of the fisheries sector, the strength of the fisheries commodity market and the strength of the base and non-base sectors in Karo Regency.

2. METHODS AND MATERIALS

2.1 Time and Place

This research was conducted in Karo Regency, North Sumatra Province in January 2021 - February 2021. Primary data were obtained through interviews with fisheries communities and fisheries stakeholders in Karo Regency. Secondary data were obtained through the Central Statistics Agency of Karo Regency, the Department of Maritime Affairs, Fisheries and Food Security of Karo Regency, the Central Statistics Agency of Karo Regency.

2.2 Data Analysis

Analysis of the data used in this research is quantitative and qualitative. The quantitative analysis used is:

2.2.1 Analysis of growth indices

Analysis of Growth Indices is used to view the growth of the fisheries GDRP in a given period. To calculate the growth indices is used the following formula:

$$G I_i = \left(\frac{Y_{it}}{Y_{ibase}} \right) x\ 100$$

Where:

$G I_i$ = The ratio of economic variables to bemeasured (Rp)

Y_{it} = Economic variables to be measured in a certainperiod

$Y_{i.base}$ = The same economic variable in the baseyear

2.2.2 Analysis of trade area capture (TAC)

Analysis of Trade Area Capture (TAC) to measure the strength of the commodities market fisheries at the same time linkages with socioeconomic indicators such as income and the buying ability society. The TAC formula from fisheries in region A can be formulated as follows:

$$TAC_\alpha = \frac{AS_\alpha}{PCS_{base}\left(\frac{PCI_\alpha}{PCS_{base}}\right)}$$

Where:

AS_a = The actual sales value of fisheries commodities in the area "a" (Rp)

PCS_{base} = Per capita sales of fish products in the base area (Rp)

PCI_a = Per capita income for the area analyzed (Rp)

PCI_{base} = Per capita income in the base area (Rp)

If the figure obtained from TAC > total population in the analyzed area, it can be said that the population has a pattern of spending on fishery products that is greater than the base area (eg national). On the other hand, if TAC < population, the area loses potential for fishery trade and has a lower spending pattern than the national one. TAC essentially measures purchases by local residents (residents) as well as outsiders (non-residents).

2.2.3 Analysis of pull factor (PF)

Pull Factor (PF) analysis aims to measure the attractiveness of an area for a commodity, in this case fishery products. The pull factor is used to separate the influence of outside residents (non-residents) from TAC. Pull Factor (PF) can be calculated using the following formula :

$$PF_\alpha = \frac{TAC_\alpha}{P_\alpha}$$

Where:

TAC_a = Trade Area Capture in the area "a" (Rp)

P_a = Number of population in the area "a" (People)

If the value PF > 1 then market fishery products in A region able to attract customers from other regions. Conversely, if PF< 1 then A region losing customers against markets of the other competitor.

2.2.4 Analysis of minimum requirement approach (MRA)

Analysis of Minimum Requirement Approach (MRA) is used to measure how big strength of the base sector by measuring base multiplier. The Minimum Requirements Approach (MRA) can be formulated as follows:

$$X_\alpha^i = \left(\frac{E_a^i}{E_a} - \frac{E_{minpeer}^i}{E_{minpeer}}\right) E_a^i$$

Where:

E_a = number of workers in the area (People)

E_i = number of fisheries workers in the *peer* area (People)

E_i = number of workers in the *peer* area (People)

Calculation of the MRA in this study using a variable workforce (E = Employment) as one of the indicators. The formula above States that the basic employment sectors 'i' (in this case fisheries) in A region is the multiplication of the total labor of the sector "i" in A region with a different share of the fishery sector with share a minimum share of the nearest sector (peer).

3. RESULTS AND DISCUSSION

3.1 The Contribution of Fisheries Sector in Regional Development Analysis of Growth Indices

Growth Indices analysis were used to monitor the growth of GRDP in the Karo Regency in a certain period. Calculations used the variable Gross Regional Domestic Product (GRDP) of the Karo Regency based on Constant Prices According to Business F eld in 2009 - 2018 as an indicator. The results of the calculation of the Fisheries Growth Index can be seen in Table 1.

The growth index of Karo Regency in 2009-2018 obtain a ratio of 195 from the results of the division between GRDP in 2018 and GRDP in 2009 as the base year. Based on

these values it can be concluded that the GDRP of the Karo Regency fisheries sector has fluctuated, but overall has increased by 95% within ten years because the aquaculture sector and the fishing sector have increased every year. The growth index calculation is used GDP data with constant prices on business to eliminate the impact of inflation on regional income. Also, the increase in the GDP of the fisheries sector in the Karo Regency is allegedly due to the establishment of the Karo Regency as a growth center which causes a greater concentration of regional development to be carried out in Karo Regency. This caused significant growth in almost all sectors in Karo Regency.

Table 1. The results of calculation of growth indices at constant price year 2009 – 2018

Karo Regency GDRP based on constant prices according to bussines field 2009 – 2018				
Year	Fisheries sector GDRP in 2009	Fisheries sector GDRP In 2018	*Growth Indices*	Fisheries sector GDRP
	$Y_{i.base}$	Y_{it}	GI_i	(%)
2009	7.272.726.000	14.214.602.400	195	95

Source: Central Bureau of Statistics Karo Regency [5]

Table 2. Calculation result of trade area capture in the Karo Regency 2009 – 2018

Year	P_a	AS_a	PCS_{base}	PCI_a	PCI_{base}	TAC_a
2009	370.619	7.272.726.000	19623,19	2.462.600	18.381.031	2.766.328
2010	350.960	68.003.641.808	193764,65	2.630.300	21.236.780	2.833.616
2011	354.242	11.515.877.700	32508,50	2.755.900	23.997.864	3.084.673
2012	358.823	1.890.079.975	5267,44	2.858.900	26.180.000	3.285.874
2013	363.755	2.779.220.313	7640,36	2.959.700	34.600.000	4.252.432
2014	382.622	53.050.085.775	138648,81	2.957.100	38.040.000	4.922.032
2015	389.591	32.703.252.202	83942,52	3.049.600	41.020.000	5.240.367
2016	396.598	26.362.572.745	66471,77	3.150.500	44.560.000	5.609.398
2017	403.207	24.259.851.455	60167,24	3.260.300	47.980.000	5.933.770
2018	409.680	14.214.602.400	34696,84	3.354.900	51.420.000	6.279.098
$\bar{x}$	378.010					4.420.759

Source: Central Bureau of Statistics Karo Regency [5]

Table 3. Calculation results of fisheries sector pull factor 2009 – 2018

Year	P_a	TAC_a	PF_a
2009	370.619	2.766.328	7,5
2010	350.960	2.833.616	8,1
2011	354.242	3.084.673	8,7
2012	358.823	3.285.874	9,2
2013	363.755	4.252.432	11,7
2014	382.622	4.922.032	12,9
2015	389.591	5.240.367	13,5
2016	396.598	5.609.398	14,1
2017	403.207	5.933.770	14,7
2018	409.680	6.279.098	15,3
	$\bar{x}$		11,6

Source: Central bureau of statistics karo regency [5]

Table 4. Inter–district fisheries sector workforce shares in Karo Regency 2017

District	Total workforce	Total fisheries workforce	Share workforce
Mardingding	10.384	82	0,0079
Laubaleng	10.824	65	0,0060
Tiga Binanga	11.905	58	0,0049
Juhar	7746	607	0,0784
Munte	11539	177	0,0153
Kuta Buluh	6210	31	0,0050
Payung	6475	43	0,0066
Tiganderket	7679	90	0,0117
Simpang Empat	11169	74	0,0066
Namanteran	7787	8	0,0010
Merdeka	8461	19	0,0022
Kabanjahe	39570	70	0,0018
Berastagi	26821	48	0,0018
Tigapanah	18141	70	0,0039
Dolat Rayat	5050	10	0,0020
Merek	10971	85	0,0077
Barusjahe	12843	322	0,0251

Source: Central Bureau of Statistics Karo Regency [7]

Table 5. Calculation of minimum requirement approach for inter-district fisheries sector In Karo Regency 2017

District	*Share Sektor*	*Minimum Shares Peer*	*Total Employment Sektor*	*Total Employment*	*Basic Employment*	*Basic Multiplier*
Mardingding	0,0079	0,0010	82	10.384	71,62	145,0
Laubaleng	0,0060	0,0010	65	10.824	54,18	199,8
Tiga Binanga	0,0049	0,0010	58	11.905	46,09	258,3
Juhar	0,0784	0,0010	607	7746	599,25	12,9
Munte	0,0153	0,0010	177	11539	165,46	69,7
Kuta Buluh	0,0050	0,0010	31	6210	24,79	250,5
Payung	0,0066	0,0010	43	6475	36,53	177,3
Tiganderket	0,0117	0,0010	90	7679	82,32	93,3
Simpang Empat	0,0066	0,0010	74	11169	62,83	177,8
Namanteran	**0,0010**	**0,0010**	**8**	**7787**	**Reference Region (*peer*)**	
Merdeka	0,0022	0,0010	19	8461	10,54	802,9
Kabanjahe	0,0018	0,0010	70	39570	30,43	1300,4
Berastagi	0,0018	0,0010	48	26821	21,18	1266,4
Tigapanah	0,0039	0,0010	70	18141	51,86	349,8
Dolat Rayat	0,0020	0,0010	10	5050	4,95	1020,2
Merek	0,0077	0,0010	85	10971	74,03	148,2
Barusjahe	0,0251	0,0010	322	12843	309,16	41,5

Source: Central Bureau of Statistics Karo Regency [7]

3.2 Analysis of Trade Area Capture (TAC)

The TAC calculation (Table 2) carried out in this study used the variable value of actual fish sales in Karo Regency (ASa) which was adopted through the value of fisheries production in Karo Regency, the per capita value of fish product sales in North Sumatra Province (PCSbase), per capita income in Karo Regency (PCIa), and per capita income in North Sumatra Province (PCIbase).

TAC calculation results illustrate the number of residents who bought fishery products, If seen from the calculation results and the average of the fisheries sector TAC in the Karo Regency in 2009-2018, the fisheries sector TAC in Karo Regency is greater than

the population in Karo Regency (TAC> Pa), In 2009, the TAC value was greater than the population (2.766.328 > 370.619), then in 2013 the TAC value was greater than the population (4.252.432 > 363.755), then in 2015 the TAC value was greater than the population (5.240.367 > 389.591), then in 2016 the TAC value was greater than the population (5.609.398 > 396.598), then in 2017 the TAC value was greater than the population (5.933.770 > 403.207), and in 2018 the TAC value was greater than the population (6.279.098> 409.680), So it can be concluded that the fisheries sector of the Karo Regency can capture the opportunities of trade in fisheries products in other regions, The TAC essentially measures purchases by residents and outsiders, Based on previous research in Bogor Regency by Hasiholan [6], the TAC value of Karo Regency and Bogor Regency is greater than the total population, This indicates that Bogor regency and Karo Regency can capture trade opportunities in other regional fishery products, The advantages of the fisheries sector in Bogor Regency are the large number and value of aquaculture production while the advantages of the fisheries sector in the Karo Regency are the amount and value of large capture fish- eries production. For example, the superior commodity of grouperin the Karo Regency can capture the opportunities of trade in fisheries products in other regions and even penetrate foreign markets.

3.3 Analysis Pull Factor (PF)

The PF calculation in this study uses the TAC value in Karo Regency and the population in Karo Regency, Details of the calculation of the PF value of Karo Regency in 2009-2018 can be seen in the following Table 3.

The average PF fishery sector in Karo Regency in 2009-2018 shows that the PF value of the fisheries sector in the Karo Regency is greater than 1, This is due to the increased contribution of the fisheries sector in the GRDP in the Karo Regency and the high market demand from other regions for commodities Karo Regency fisheries, especially fishery products, So it can be concluded that the Karo Regency can attract customers from other regions or Karo Regency has a specialization in fishery products, if the PF value > 1 indicates that the fishery product market in the region can attract

customers from other regions in the vicinity, Conversely, if PF <1 then the region loses customers to other competing markets, Based on previous research the PF value of the Karo Regency and Bogor Regency is more than 1 (> 1) [6]. This means that these two regions can attract customers from other regions, The power to attract better customers is found in Karo Regency, The main commodity of the fishery which becomes specialization of the Karo Regency are *Oreochromis niloticus* and *Cyprinus carprio*, This commodity can meet regional demand and attract customers from other regions in North Sumatra Province, outside North Sumatra Province to foreign countries.

3.4 Analisis Minimum Requirement Approach (MRA)

The MRA calculation in this study uses the labor variable (E = Employment) as an indicator, The MRA technique uses areas that have the same characteristics that are used as a reference or peer, In this study, other areas used as a comparison are all districts in Karo Regency, which amount to 17 districts, namely: Kabanjahe, Berastagi, Tigapanah, Dolat Rayat, Merek, Barusjahe, Simpang Empat, Naman Teran, Merdeka, Payung, Tiganderket, Kuta Buluh, Munte, Juhar, Tigabinanga, Lau Baleng, dan Mardinding, Calculation of labor share values between regions is explained in the following Table 4.

The share value is obtained by comparing the number of fisheries work arrangements with the total workforce in a district, Based on the data obtained it can be seen that the sub-district that has the lowest share value is the Namanteran District, This happens because the number of workers is relatively large in Namanteran District, but the number of fisheries workers is relatively small for the number of workers, Besides that, Namanteran District does not have a sea area so fisheries workers, especially fishermen, tend to be little or nonexistent, The district with the highest share value is the Juhar District, This is due to Juhar District located This is because Juhar District has a large area because it consists of 25 villages. In addition, the total workforce that is not too much in Juhar District also causes the share value of the fishery sector in the district to be higher. The share value of the Namanteran District fisheries sector is the

lowest so it is used as a peer area, Details of the 2017 Karo Regency District MRA calculation results are explained in the following Table 5.

The data variables obtained in Table 5 can be used to calculate the base multiplier of the fisheries sector which is calculated based on the ratio between the total workforce in the fisheries sector divided by basic employment, Juhar District in the MRA analysis has a basic multiplier value of 12.9, This shows that every 12 workers created by the base sector will produce 0.9 workers in the non- base sector, Or for every 120 workers in the base sector is expected to create 9 workers in the non-base sector, Padang city has a basic multiplier value of 177.6 which shows that every 177 workers in the base sector are expected to be able to produce 0.6 workers in the non-base sector, Based on these data the multiplier effect of Padang City is lower than that of Juhar Subdistrict, this is because Padang City is considered as an area prone to earthquake and tsunami disasters, this is a problem in developing the fisheries sector in Padang City.

3.5 Aspiration of Fisheries Development in Karo Regency

The implementation of regional development must be based on a development plan prepared based on the conditions, potential, and capability of the resources owned by the region. The Regional Government gives authority to the regions to draw up regional development plans which are an integral part of the national development planning system, based on the 2016-2021 Karo Regency Regional Long Term Development Plant (RLTDP), several missions will be formulated to be achieved in the development of Karo Regency as, Realizing Karo as an International Standard Airport, Creating Karo Regency as one of the Centers for National Economic Growth, Creating a Prosperous Community, Creating Government, Private and Civil Society.

The above mission is a general mission in the medium term to be achieved by the Karo Regency government regional development cannot be separated from the aspirations that develop in the community, The Karo Regency fishing community has its aspirations in developing the Karo Regency area, Based on the results of interviews with the fishing com-munity, people hopes that the government will provide

services to the community by the process, the government is more professional in implementing policies and on target, assisting the community in a periodic and scheduled time, the government must meet frequently with the community in the field to find out complaints from the community.

The aspirations of the Karo Regency community towards the government tend to be non-specific only focused on the obligations that are supposed to and should be carried out by the government and based on the conditions felt by the community.

4. CONCLUSION

The fisheries sector of the karo regency can capture the opportunities of trade in fisheries products in other regions, the tac essentially measures purchases by residents and outsiders, the pull factor (pf) value of the karo regency fisheries sector in 2009-2018 was more than 1 (pf> 1), this means that karo regency fishery products can attract customers from other regions, the best value of the basic multiplier in the karo regency is in juhar district, which is 12.9, this means that every 120 workers in the base sector, is expected to create 9 workers in the non-base sector based on these results it is expected that an increase in fisheries production, especially aquaculture in karo regency to be able to compete with karo regency capture fisheries production.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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