Influence of Fisheries Subsector on the Gross Regional Domestic Product (GRDP) in the 3 Pilot Project Provinces of WPP 718 (2011-2022)

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Abstract

This research was carried out because of the maritime-based sustainable development program in the Joko Widodo era which wanted to advance the fisheries sector in terms of social, economic and environmental sustainability. The WPP 718 Pilot Project sees large natural resource potential in the fisheries sector in the provinces of Papua, West Papua, Maluku. However, the economic growth of the fisheries sector in the three provinces is not in line with the amount of existing fisheries production. Therefore, this research wants to analyze the influence of Capture Fisheries Production Volume, aquaculture production volume, fisheries sector farmer exchange rate, and natural resource revenue sharing funds on Gross Regional Domestic Product in 3 provinces of the WPP 718 pilot project 2011-2022. This research is quantitative research using secondary data. The research method used is Autoregression Distributed Lag (ARDL). This method is used to look at the long term and short term for each variable. The results of the research show that the variables Capture Fisheries Production Volume, aquaculture production volume, fisheries sector farmer exchange rate in the short and long term have a positive and insignificant effect on the Gross Regional Domestic Product in 3 provinces pilot project WPP 718 2011-2022. The natural resource profit sharing fund variable has a significant positive effect on Gross Regional Domestic Product in the 3 provinces of the WPP 718 pilot project in 2011-2022. The implication of this research is that the government must be able to make policies by mapping so that it knows potential areas so that the funds are right on target and used optimally. Apart from that, the government must optimize the results of Capture Fisheries Production Volume by making strict regulations regarding illegal vessels and the operating times of vessels. Meanwhile, increasing aquaculture production by developing entrepreneurship programs for the community. Then the government can improve the distribution and logistics system to reduce transportation costs and speed up the distribution of production results from fisheries farmers to consumers. Apart from that, there also needs to be policy support from the government to develop fisheries markets in each region so that they can be highly competitive so that the welfare of fishing communities increases along with the purchasing power of the people. This limitation is that the data available to support this research is limited and the area coverage is not yet extensive.

Keywords: Fisheries Production, Natural Resources, PDRB, Autoregressive Distributed Lag

1.0 Introduction

Fisheries and agriculture sectors are one of the main sources of income for the Asia-Pacific countries. Fisheries sector, especially in island nations, can contribute between 1% and 30% of the Asia-Pacific countries' GDP. The FAO *(Food and Agriculture Organization)* recommends

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for Asia-Pacific countries implement sustainable resource management due to their dependence (Pradana, 2021).

In the era of Joko Widodo precidency, he focused on development in the maritime region, and Indonesia participated in one of the SDGs programs, namely Blue Economy (Prayuda and Sary, 2019). Which was supported by FAO in developing legislation to sustain natural resources in the Asia-Pacific countries that are increasingly threatened by climate change. This concept was introduced in 2010 (Fabiola, 2022). The goal of the blue economy is to preserve resources and promote economic growth in the marine and fisheries sectors (Zamroni et al., 2019).

According to the *Central Statistics Agency* or *Badan Pusat Statistik (BPS)* at 2016, Indonesia's economy experienced a decline from 2011 to 2015. Indonesia's economy grew by 6.5 percent in 2011 compared to 2010. However, in 2015, its growth slowed down to 4.79 percent compared to 5.02 percent in 2014. Java contributed 57.5%, Sumatra 23.6%, Kalimantan 9.7%, Sulawesi 4.6%, and the remaining provinces.

West Papua is an example of another province. West Papua has many natural resources, including forests, minerals, oil, natural gas, and the sea. However, from 2011 to 2022, the economy of West Papua experienced a decline due to export restrictions, commodity price increases, and fuel price hikes (Sogen & Harling, 2013). In addition, the province of Papua also experienced economic growth dominated by mining. When looking at economic growth without mining, it slowed down in 2015 to 8.11 percent, compared to 8.81 percent in 2014. The main fields of business dominance are agriculture, forestry, and fisheries (BPS Papua, 2015).

Economic performance of Maluku has fluctuated from 2011 to 2014. With an average growth rate of 6.4%, economic growth is dominated by the agricultural, forestry, and fisheries sectors (Badan Perencanaan Pembangunan Nasional, 2021). This economic growth can be influenced by the Regional Gross Domestic Product (GDP) as a benchmark (Shaulim, 2018). The economic data tool known as Regional Gross Domestic Product (GDP) is used to evaluate the economic development performance of a region. This performance can indirectly impact the efforts of the community to improve their quality of life (Rosi, 2023).

Gross Regional Domestic Product (GRDP) based on income approach is the total amount of compensation received by factors of production participating in the production process in a certain area or region within a specific period, usually one year. The GRDP of key sectors is crucial in indicating the core of the economy in a region (Priyono, 2019).

According to Coordinating Ministry for Maritime Affairs and Investment (2020), the development of fisheries supports the targets of the National Medium-Term Development Plan 2020-2024. In its management, fisheries and marine sectors face issues such as the need for strengthening management and institutional capacity in fisheries management areas (WPP), suboptimal fisheries productivity, and the need for improved harmonization of marine and land spatial planning (Presidential Regulation of the Republic of Indonesia, 2020). The performance of fisheries development, especially aquaculture, during the period 2015-2019 showed that the fisheries sector was able to positively contribute to the national economy, national food security, and the improvement of community welfare.

Gross Regional Domestic Product of the fisheries sector per province (million rupiah)

Province	Year											
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Papua	4,892	5,321	5,659	5,910	6,369	6,405	6,736	6,868	6,991	6,993	7,142	7,353
West Papua	2,101	2,285	2,514	2,703	2,804	2,954	3,216	3,236	3,347	3,221	3,186	3,172
Maluku	2,653	2,877	3,018	3,203	3,234	3,322	3,472	3,645	3,854	3,897	4,026	4,280

Source : Badan Pusat Statistik, 2023

In order to improve the regional economy based on the potential of the marine and fisheries sectors, there are three locations that serve as pilot projects for the development of WPP areas (Coordinating Ministry for Maritime Affairs and Investment, 2020). According to WPP-NRI 718, there are three provincial governments responsible for managing fishery resources: Papua, West Papua, and Maluku (Ministry of Marine Affairs and Fisheries, 2014). Table 1.1 shows the poverty rates in the provinces of Papua, West Papua, and Maluku (Badan Pusat Statistik, 2023).

Average Fisheries Volume 2011-2022 (Million Tons)

No	Province	Tangkap	Budidaya
1	Papua	250.760,50	13.917,41
2	West Papua	161.399,25	43.878,52
4	Maluku	553.230,77	556.983,00

Source: Ministry of Marine Affairs and Fisheries, 2023

Based on the average volume of fisheries, contribution of the fisheries sector in Papua province to Indonesia's GDP was 4.98 percent from 2018 to 2021. Furthermore, West Papua province only contributed 5.54 percent to Indonesia's GDP during the same period. Meanwhile, Maluku province had a significant contribution to Indonesia's GDP through the fisheries sector, averaging 12.65 percent from 2018 to 2021 (Ministry of Maritime Affairs and Fisheries, 2023). Additionally, the natural resource revenue sharing (DBH SDA) can be used to assess a region's ability to manage taxes from natural resources. According to Gulo (2022), the Gross Regional Domestic Product (PDRB) can be significantly influenced by DBH SDA.

This research aims to investigate how the volume of fisheries (capture and aquaculture), natural resource base (NRB) in the fisheries sector, and the regional gross domestic product (GDP) in the fisheries sector in the provinces of Papua, West Papua, and Maluku from 2011 to 2022 impact the regional gross domestic product (GDP). The variable of exchange rate for fish farmers is also included in this research.

1.1 Research Problem

According to the Coordinating Ministry for Maritime Affairs and Investment at 2020, the development of fisheries can support development programs in the National Medium-Term Development Plan 2020-2024. In its management, fisheries and marine sectors face issues such

as the need for strengthening management and institutional capacity in fisheries management areas (WPP), suboptimal fisheries productivity, and the necessity for improving the harmonization of marine and land spatial planning (Presidential Regulation of the Republic of Indonesia, 2020).

Administratively, the fisheries management area (WPP) designates three provinces, namely Papua, West Papua, and Maluku, as pilot project areas for fisheries management. These provinces have a small contribution to national economic growth but have significant potential, especially in terms of natural resources. According to Suharno and Alamudi Mauamar (2022), despite their strategic role in contributing to exports, food security, and national GDP, the fisheries subsector is still insufficiently prioritized. Additionally, small improvements in the primary sectors such as agriculture and fisheries can have a significant impact on community income (Suryahani et al., 2006).

Based on the explanation, the main research problem can be formulated as follows:

a. How does the production volume of capture fisheries affect the GDP of the fisheries sector in the 3 pilot project WPP provinces in Indonesia from 2011 to 2022?
b. How does the production volume of aquaculture fisheries affect the GDP of the fisheries sector in the 3 pilot project WPP provinces in Indonesia in the short and long term from 2011 to 2022?
c. How can the GDP of the fisheries sector be influenced by the exchange rate for fisheries sector farmers in the 3 pilot project WPP provinces in Indonesia in the short and long term from 2011 to 2022?
d. How can the GDP of the fisheries sector be influenced by the revenue sharing from natural resources (DBH SDA) in the 3 pilot project WPP provinces in Indonesia in the short and long term from 2011 to 2022?

The research area consists of the 3 pilot project provinces in Indonesia, namely Papua, West Papua, and Maluku. This research was conducted in 2023 using data from the period 2011-2022.

Based on the background, the purpose of this research is as follows:

a. Analyzing the impact of Capture Fisheries Production Volume on the GDP of the fisheries sector in the 3 pilot project provinces of WPP in Indonesia in the long term and short term from 2011-2022.
b. Analyzing the impact of Aquaculture Fisheries Production Volume on the GDP of the fisheries sector in the 3 pilot project provinces of WPP in Indonesia in the long term and short term from 2011-2022.
c. Analyzing the impact of exchange rates for the fisheries sector on the GDP of the fisheries sector in the 3 pilot project provinces of WPP in Indonesia in the long term and short term from 2011-2022.
d. Analyzing the impact of revenue sharing from natural resources (DBH SDA) in the fisheries sector on the GDP of the fisheries sector in the 3 pilot project provinces of WPP in Indonesia in the long term and short term from 2011-2022.

2.0 Literature Review And Hypothesis Development

2.1 Economic Growth Theory

Economic growth is defined as an increase in production capacity to enhance output. It is measured using Gross Domestic Product (GDP) and Gross Regional Domestic Product (GRDP) for each country (Adiasmita, 2013). Based on this theory, this research aims to examine economic growth driven by GRDP and natural resources in the fisheries sector.

2.2 Gross Regional Domestic Product (GRDP)

Gross Regional Domestic Product (GRDP) is the total value added produced by all business units in a specific area or region, or the total value of final goods and services produced by all economic activities in a specific area or region during a certain period of time (in rupiah) (Priyono, 2019).

2.3 Fishery Resources (Production Volume)

In the calculation of fish stocks, the production volume of fisheries is determined by the wet weight of each fishery result, both from capture and aquaculture. Therefore, this fisheries production volume is generated by households that produce both capture and aquaculture results (Suparmoko, 1989). Currently, global fisheries have exceeded 250 percent of what is needed for sustainable development. Subsidies in the fisheries sector have led to unemployment, as developing countries are considered to lack a better fleet. Meanwhile, the growth of the fisheries industry in developing countries actually requires stimulus from these subsidies. Ultimately, this can lead to poverty in coastal communities (Fauzi, 2005).

2.4 Farmers' Exchange Rate in the Fisheries Subsector

According to research by Aulia Aisyah (2023), the Fishermen's Exchange Rate Index is one of the indicators commonly used to measure the welfare level of fishermen and has a positive and significant impact on the Regional Gross Domestic Product in the long term (Maryono and Agam, 2022). The Farmers' Exchange Rate in the fisheries subsector is the comparison of the price index received by farmers in both capture and aquaculture fisheries with the price index paid (Central Statistics Agency, 2023).

2.5 Revenue Sharing in the Fisheries Sector

According to Law No. 33 of 2004 Article 14 letter d, the Fisheries Revenue Sharing Fund is a fund from the state revenue in the fisheries sector that is divided into two parts: twenty percent for the government and eighty percent for all districts/cities. The regional portion of eighty percent is distributed proportionally to districts/cities throughout Indonesia. Fisheries revenue sharing is obtained from non-tax state revenue in the fisheries sector originating from Fisheries Exploitation Levy (P3) and Fisheries Revenue Levy (PHP). Fisheries Exploitation Levy is a state levy imposed on holders of Fisheries Business Licenses and/or Foreign Vessel Utilization Approvals (PPKA) as compensation for the opportunity provided by the government to conduct fisheries activities in the Fisheries Zone of the Republic of Indonesia. (Ministry of Finance, 2017).

3.0 Methods

This research has the scope of economic development. The objects of this research are the volume of fisheries (capture and cultivation), natural resource base (NRB) in the fisheries sector, exchange rates for farmers in the fisheries sector, and the Gross Regional Domestic Product (GRDP) in the fisheries sector. This research is limited to the GRDP in the three pilot project provinces of the Indonesian Exclusive Economic Zone (WPP) from 2011 to 2022.

This quantitative research collects factual data and then processes and interprets it. The type of data referred to as quantitative data consists of numbers generated from the measurement characteristics of each variable (Daymon, 2007). The objects in this research are the Production Volume of Capture Fisheries, the production volume of aquaculture fisheries, the exchange rate for fish farmers, the revenue sharing fund (DBH SDA) in the fisheries sector, and the fisheries sector's Gross Regional Domestic Product (GRDP) in the 3 pilot project provinces of WPP.

Analysis technique using ARDL, also known as Autorregressive Distributed Lag, is a regression model that utilizes the current and past values of explanatory variables, or lags. Additionally, this model also incorporates lagged values of the dependent variable as one of the explanatory variables. The autoregressive (AR) and distributed lag (DL) models are combined to form this ARDL model. While DL (Distributed Lag) uses past data of the dependent variable among independent variables, AR (Autoregressive) utilizes one or more past data points of the dependent variable (Porter, 2017). This research involves 3 provinces over an 11-year period (2011-2022), thus utilizing two types of data: cross-section and time series, known as panel data.

The advantage of the Autoregressive Distributed Lag (ARDL) model is that it avoids autocorrelation issues by obtaining both long-term and short-term estimates simultaneously. Since both can be used with a smaller sample size, they are both effective. In addition, the ARDL technique allows for differentiation between dependent and independent variables. This method identifies non-linearities and emphasizes the asymmetric effects between economic variables in the short and long term. (Zaretta and Yovita, 2019). This method's analysis steps are conducted as follows: first, the unit root test. Next, the second step is the optimal lag test. Third, the ARDL estimation. Finally, the cointegration test.

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3.1 Stationary Test

The data are static if averaged and the variance does not change over time. This stationary test serves to avoid spurious regression where the determination coefficient is high but does not have a significant relationship (Djalal and Usman, 2002). The first stage is to ensure whether the data is stationary at the level level, differencing 1 (Hazam and Jatipaningrum, 2022).

3.2 Bound Test Cointegration

According to Widarjono (2009), Cointegration Test is conducted to examine the possibility of spurious regression. This can occur when the determination coefficient is sufficiently high, but the relationship between independent and dependent variables is not meaningful.

The results of the Cointegration Test have the following hypotheses:

a. Ho = data is not cointegrated
b. Ha = data is cointegrated

According to (Gujarati & Porter, 2015). Co-integrity test does not matter whether the I(0) or I(1) are stationary or not. The statistical value of the cointegration test was compared with the t-value at the probability value of 5%. If the statistical value is greater than the critical value or probability value, then the observed variables are mutually integrated or have a long-term relationship. If the statistical value is lower than the probability value, then the observed variable is not cointegrated.

3.3 Optimum Lag Determination Test

Optimal lag is the length of lag that has a significant effect or response. In the ARDL model, determining optimal lag is a very important stage to know how each variable affects the others. Optimum lag can also avoid autocorrelation problems (Gujarati and Porter, 2015).

3.4 ARDL Estimation Test

ARDL (Autorregressive Distributed Lag) model is a regression model that includes the current and past values of explanatory variables, as well as incorporating lagged values of the dependent variable as explanatory variables. This ARDL model is a combination of autoregressive (AR) and distributed lag (DL) models. AR involves using one or more past data points of the dependent variable among the independent variables, while DL utilizes current and past (lag) data of the independent variables. (Porter, 2017). The equations obtained from the ARDL model are divided into 2 parts (Gujarati and Porter, 2015).

Short-Term Model

$$\alpha_{0i} + \sum_{i=1}^{n} \alpha_{1i} \Delta(Y_i)_{t-j} + \sum_{i=1}^{n} \alpha_{2i} \Delta(X_i)_{t-j} \quad \text{.....(1)}$$

Long-Term Model

$$\beta_{11}(Y_i)_{t-1} + \beta_{21}(X_i)_{t-1} \text{.....(2)}$$

Thus, this research model becomes:

$$\Delta Y_{jt} = \alpha_{0i} + + \sum_{i=1}^{n} \alpha_{1i} \Delta Y_{i,t-1} + \sum_{i=1}^{n} \alpha_{2i} \Delta VPPT_{i,t-1} + \sum_{i=1}^{n} \alpha_{3i} \Delta VPPB_{i,t-1} + \sum_{i=1}^{n} \alpha_{4i} \Delta PDRB_{i,t-1} + \sum_{i=1}^{n} \alpha_{5i} \Delta NTNP_{i,t-1} + \sum_{i=1}^{n} \alpha_{6i} \Delta DBH_{i,t-1} + \beta_{1i} Y_{j\,t-1} + \beta_{2i} VPPT_{j\,t-1} + \beta_{3i} VPPB_{j\,t-1} + \beta_{4i} PDRB_{j\,t-1} + \beta_{5i} NTNP_{j\,t-1} + \beta_{6i} DBH_{j\,t-1} u_{jt} \text{.....(3)}$$

Information:

- Y = Fisheries sector GDP
- VPPT = Capture Fisheries Production Volume
- VPPB = Aquaculture production volume
- NTNP = Farmers' exchange rate in the fisheries subsector
- DBH = Fisheries Sector Revenue Sharing Fund

- α_{1-6} = Short-term coefficients
- β_{1-6} = Long-term coefficients
- J = Region
- I = Lag
- t = Time
- u = *error term*
-

3.5 Classical Assumption Test

a. Normality test used to see whether or not the residual in the normal distributed data can be valid when passing the t-test. There are several ways to detect such residues. First, through a residual histogram. This research will use the Jarque-bera Test method.

   Jarque-Bera test has a basis for decision-making (Widarjono, 2009), namely:
   a) If the significance α > 0.05, then it is normally distributed.
   b) If the significance α < 0.05, then it is not normally distributed.

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c. Multicollinearity test is used to indicate the linear relationship among independent variables in a regression model (Sumodiningrat, 2012). The presence of multicollinearity issues may be indicated when the model has large standard errors and low statistical values.

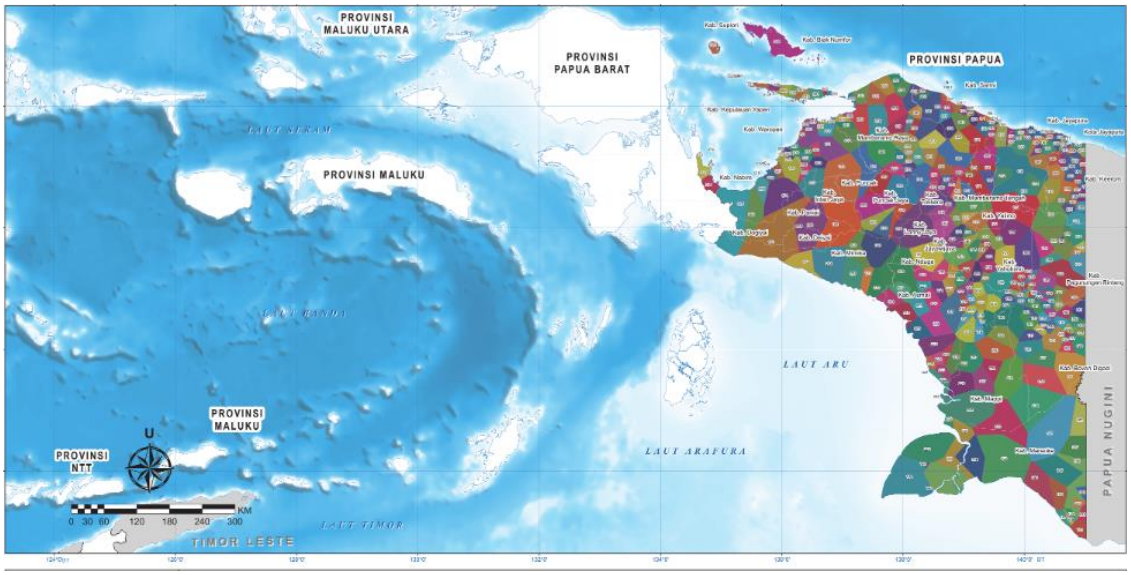
   One way to detect multicollinearity is by examining the Variance Inflation Factor (VIF) values.
   Then, decision-making is based on the following criteria (Widarjono, 2009):
   a) Tolerance value > 0.10 indicates no multicollinearity.
   b) Tolerance value < 0.10 indicates multicollinearity.

d. Stability test, namely the cumulative sum of recursive (CUSUM) and cumulative sum of recursive squares (CUSUM), can be used to measure the stability of the ARDL model both in the long term and in the short term. According to Pesaran et al. (2001), the cumulative sum of recursive (CUSUM) and cumulative sum of squares of recursive (CUSUM) tests are good indicators of stability in this model. If the stability test graph shows a significant level of 5 percent, it indicates model stability.

e. *Goodness of fit test*, namely the cumulative sum of recursive (CUSUM) and cumulative sum of recursive squares (CUSUMQ), can be used to measure the stability of the ARDL model both in the long term and in the short term. According to Pesaran et al. (2001), the cumulative sum of recursive (CUSUM) and cumulative sum of squares of recursive (CUSUMQ) tests are good indicators of stability in this model. If the stability test graph shows a significant level of 5 percent, it indicates model stability.

4.0 Research Results and Discussion

The province of Papua has an area of 81,049.30 km2. The largest province in Indonesia covers 19.33% of the country. Geographically, Papua spans 312,224.37 km2 and is situated between 130°-141° East Longitude and 2°25' North Latitude–9° South Latitude (Papua Government Bureau, 2005).



Source: Ministry of Education and Culture, 2022

This research area consists of the 3 pilot project provinces in Indonesia, namely Papua, West Papua, and Maluku. This research was conducted in 2023 using data from the period 2011-2022. Based on the background, the purpose of this research is as follows:

- Analyzing the impact of Capture Fisheries Production Volume on the GDP of the fisheries sector in the 3 pilot project provinces of WPP in Indonesia in the long term and short term from 2011-2022.
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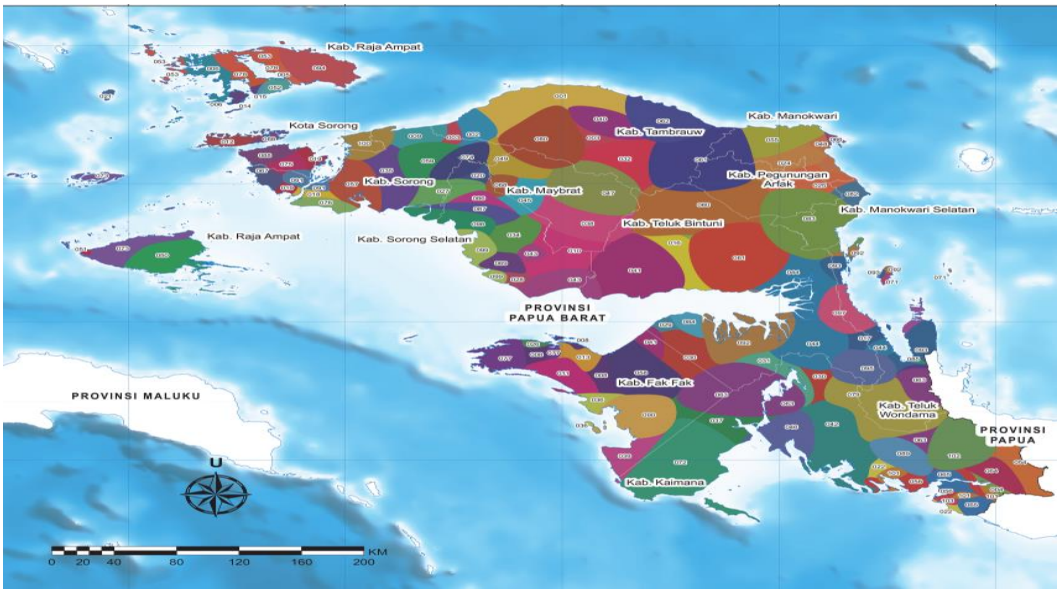
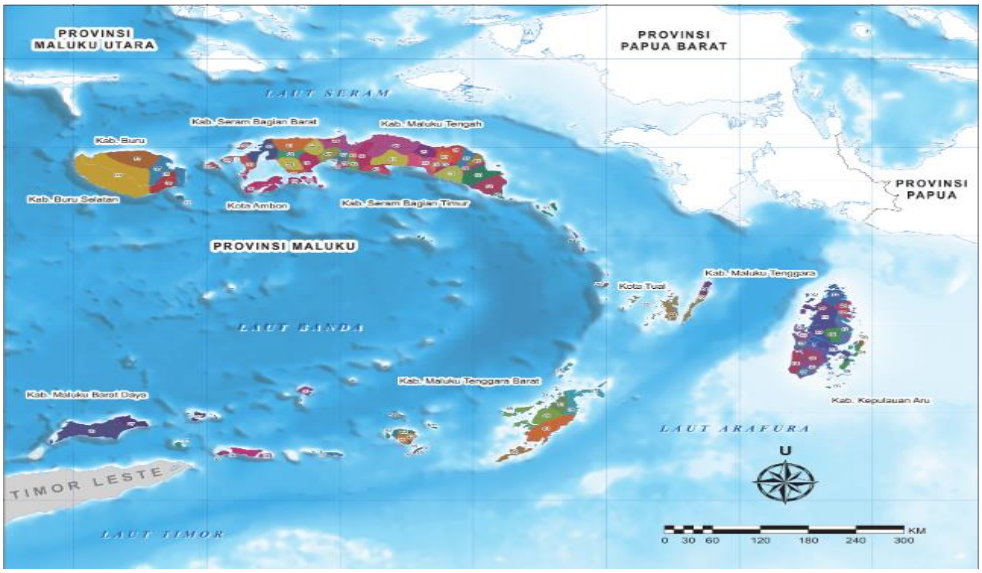
- Analyzing the impact of revenue sharing from natural resources (DBH SDA) in the fisheries sector on the GDP of the fisheries sector in the 3 pilot project provinces of WPP in Indonesia in the long term and short term from 2011-2022.

West Papua is located in the westernmost part of the island of Papua. This province is the result of the division of the Papua province as stipulated in Law Number 45 of 1999. Then, based on Government Regulation Number 24 of 2007, West Irian Jaya was granted special autonomy status and its name was changed to Papua Barat. The Papua Barat province consists of the Bird's Head region of the Papua island and the surrounding islands.



Source: Ministry of Education and Culture, 2022

Maluku Province has a land area of 712,480 km2, with 92.4 percent being ocean and the remainder being land. The Maluku Province holds a crucial position as it lies between most of the Western and Central regions of Indonesia, as well as between Australia and Timor Leste. This makes it an important international transit route through three Indonesian archipelagic sea lanes (ALKI), with significant implications for the economy, trade, and investment.



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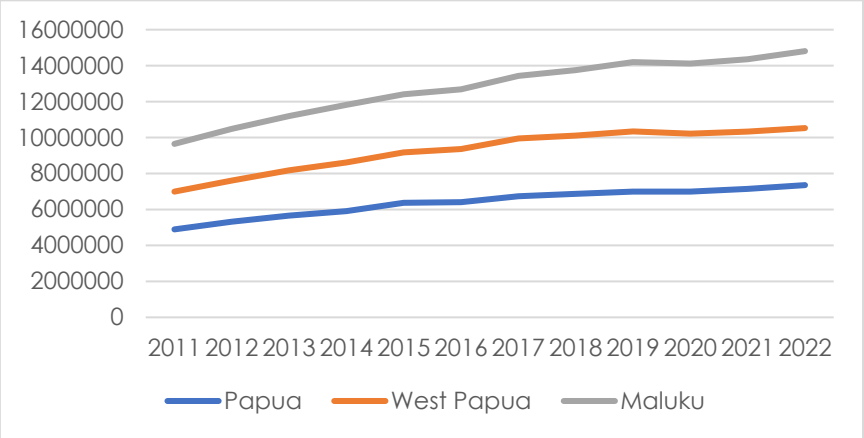
Based on the field of business, it can also be seen by sector, including the fisheries sector. Here is a table that explains the GDP based on constant prices in the fisheries sector in the 3 pilot project provinces of WPP 718 from 2011-2022.

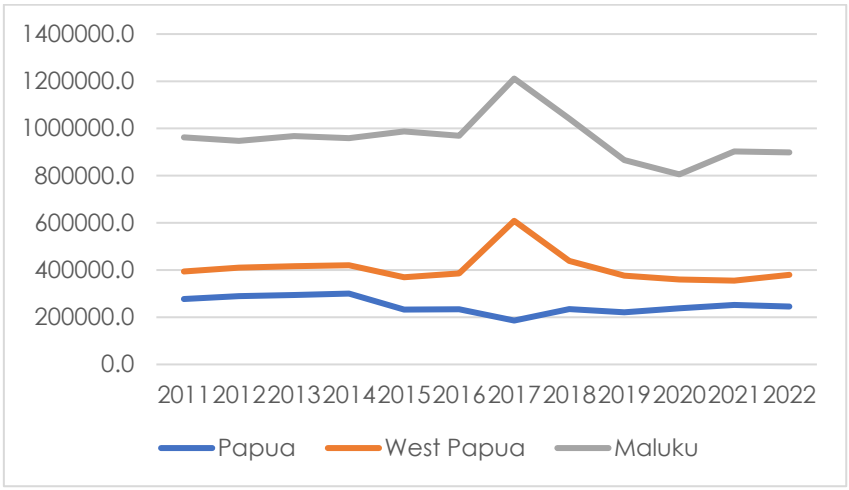


Source : Badan Pusat Statistik (2021)

Based on the graph, it shows that the Gross Regional Domestic Product (GRDP) based on constant prices in the fisheries sector in those 3 provinces has experienced an increase over the years. Maluku Province is one of the regions with a relatively high GRDP in the fisheries sector based on constant prices compared to the other 2 provinces.

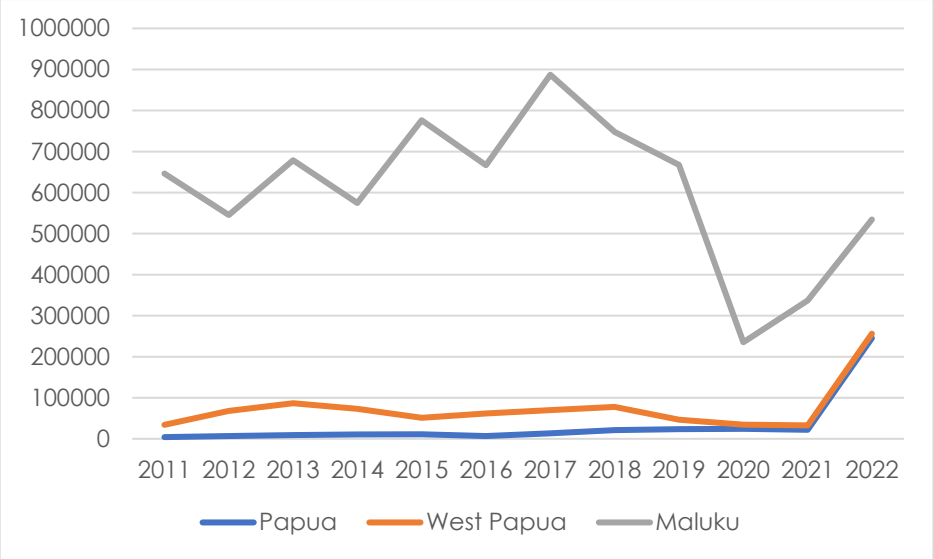
Capture Fisheries Production Volume represents all the catch obtained from fishing. Capture Fisheries Production Volume can be used as a production factor that supports the Gross Regional Domestic Product (GRDP) in the fisheries sector.

The graph below explains the Capture Fisheries Production Volume in the 3 pilot project provinces of WPP 718 from 2011 to 2022.



Source : Badan Pusat Statistik (2021)

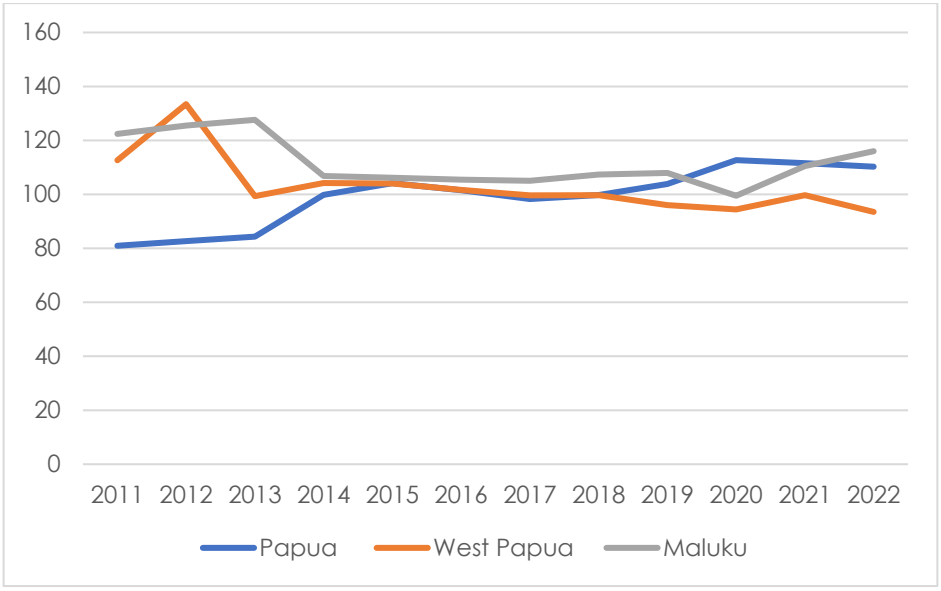
The production volume of aquaculture represents all the results of fish/animal cultivation activities. Aquaculture production volume can be used as a production factor that supports the Gross Regional Domestic Product (GRDP) in the fisheries sector. The graph below explains the aquaculture production volume in the 3 pilot project provinces of WPP 718 from 2011 to 2022.



Source : Badan Pusat Statistik (2021)

Exchange rate for farmers is the result of comparing the price index received with the price index paid by farmers. Exchange rate for farmers in the fisheries subsector is considered to reflect the welfare of the community in the fisheries sector, and it can affect the Gross Regional Domestic Product of the fisheries sector.

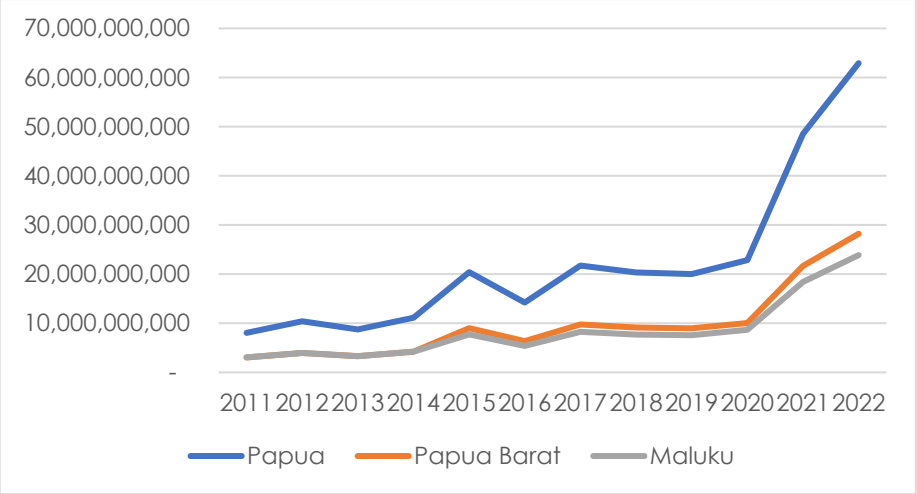
The graph below explains the exchange rate for farmers in the fisheries subsector in the 3 pilot project provinces of WPP 718 from 2011 to 2022.



Source : Badan Pusat Statistik (2021)

Revenue Sharing Fund (DBH), which comes from the state budget and is allocated to regions based on a certain percentage, is used to meet the needs of the regions in implementing decentralization. DBH significantly influences regional expenditures and the development process, particularly in improving the regional Gross Regional Domestic Product (PDRB).

The following graph below explains the revenue sharing fund for the fisheries sector in the 3 pilot project provinces of WPP 718 for the years 2011-2022.



Source : Badan Pusat Statistik (2021)

4.1 Analysis Result

4.1.1 Stationary Test

Results of Stationary Test Using the Dickey Fuller Augmented Method (level)

Variable	Prob	Information
LNPDRB	0,3644	Not Stationary
VPPT	0,4893	Not Stationary
VPPB	0,4215	Not Stationary
DBH SDA	0,0209	Stationary
NTNP	0,0179	Stationary

Source: data processing results, 2024

Revenue Sharing Fund (DBH), which comes from the state budget and is allocated to regions based on a certain percentage, is used to meet the needs of the regions in implementing decentralization. DBH significantly influences regional expenditures and the development process, particularly in improving the regional Gross Regional Domestic Product (PDRB).

Three out of five variables are not stationary at the level level, so a stationery test is needed at the first level of difference. The results of the stationarity test at the firsst difference level with the Augmented Dickey-Fuller method are shown in the following table:

Results of Stationary Test with the Dickey-Fuller Augmented Method (First Difference Level)

Variable	Prob	Information
LNPDRB	0,0000	Stationery
VPPT	0,0000	Stationery
VPPB	0,0000	Stationery

DBH SDA	0,0000	Stationery
NTNP	0,0000	Stationery

Source: data processing results, 2024

The results show that all variables in this research are stationary and research can be continued to the next stage.

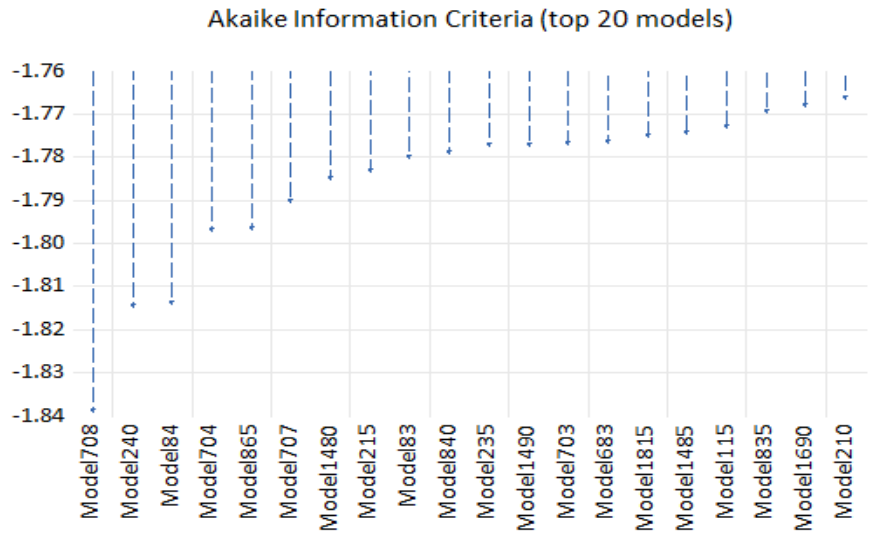
4.1.2 Optimum Lag Determination Test

Results of Lag Length Test on VAR

LAG	LOGL	LR	FPE	AIC	SC	HQ
0	-1753,450	NA	3,70e+41	109,9031	110,1322	109,9791
1	-1680,779	118,0903	1,92e+40	106,9237	108,2978*	107,3792
2	-1648,104	42,88607*	1,35e+40	106,4440	108,9632	107,2791
3	-1613,017	35,08705	1,01e+40*	105,8136	109,4479	107,0282
4	-1579,307	23,17570	1,32e+40	105,2692*	110,0786	106,8634*

Source: data processing results, 2024

The selected lag in each test is distributed, so estimation using ARDL can be conducted. Then, Akaike Information Criteria (AIC) method is used to determine the optimal lag in this research. The figure below shows the results of the optimal lag determination test.



Source: data processing results, 2024

Based on the Akaike Information Criteria (AIC), the best lag length selected from the top twenty highest quality models. The optimal lag test indicates that in model 708 with ARDL (3,4,1,3,2), the variable LNPDRB has an optimal lag of 3, the variable VPPT has an optimal lag of 4, the variable VPPB has an optimal lag of 1, and the variable NTN has an optimal lag of 2.

4.1.3 Bound Test Cointegration

Based on the Akaike Information Criteria (AIC), the best lag length selected from the top twenty highest quality models. The optimal lag test indicates that in model 708 with ARDL (3,4,1,3,2), the variable LNPDRB has an optimal lag of 3, the variable VPPT has an optimal lag of 4, the variable VPPB has an optimal lag of 1, and the variable NTN has an optimal lag of 2.

Bound Test Cointegration Results

F-Statistic	Significance	I0 Bound	I1 Bound
3,489523	10%	2,2	3,09
	5%	2,56	3,49
	2,5%	2,88	3,87
	1%	3,29	4,37

Source: data processing results, 2024

ARDL Estimation

Variable	Coefficient	Prob.
LNPDRB (-1)	0,158251	0,5414
LNPDRB (-2)	0,008777	0,9850
LNPDRB (-3)	1,283027	0,0348
VPPT	2,54E-07	0,3302
VPPT(-1)	1,29E-07	0,6526
VPPT(-2)	-8,59E-08	0,7281
VPPT(-3)	-3,62E-07	0,1393
VPPT(-4)	-4,70E-07	0,0827
VPPBP	-3,02E-07	0,1878
VPPBP (-1)	5,05E-07	0,0527
DBH SDA	8,50E-12	0,0015
DBH SDA(-1)	-1,26E-11	0,0014
DBH SDA (-2)	-1,29E-11	0,0351
DBH SDA (-3)	-1,87E-11	0,0622
NTPN	0,007004	0,2140
NTPN (-1)	-0,010811	0,0837
NTPN (-2)	0,003308	0,1764
C	-6,218007	0,0121

Source: data processing results, 2024

Variables LNPDRB(-3), VPPBP(-1), DBH SDA, DHB SDA (-1), and DBH SDA (-2) each have a probability of less than alpha 0.05. The R-Squared generated from the regression results is 0.977856, which shows that the variables VPPBP, VPPT, DBH SDA, NTPN can explain 97.78 percent of GDP. Meanwhile, other variables are only able to explain 2.22 percent for PDRD.

Short-term Estimation

Variable	Coefficient	Prob.
LNPDRB (-1)	0,158251	0,5414
LNPDRB (-2)	0,008777	0,9850

LNPDRB (-3)	1,283027	0,0348
VPPT	2,54E-07	0,3302
VPPT(-1)	1,29E-07	0,6526
VPPT(-2)	-8,59E-08	0,7281
VPPT(-3)	-3,62E-07	0,1393
VPPT(-4)	-4,70E-07	0,0827
VPPBP	-3,02E-07	0,1878
VPPBP (-1)	5,05E-07	0,0527
DBH SDA	8,50E-12	0,0015
DBH SDA(-1)	-1,26E-11	0,0014
DBH SDA (-2)	-1,29E-11	0,0351
DBH SDA (-3)	-1,87E-11	0,0622
NTPN	0,007004	0,2140
NTPN (-1)	-0,010811	0,0837
NTPN (-2)	0,003308	0,1764
C	-6,218007	0,0121

Source: data processing results, 2024

Based on short-term estimates, it shows the results of the influence between variables:

- The LNPDRB variable (-1) is not significant because it has a probability of more than alpha, which is 0.5414 with a positive relationship of 0.158251.
- The LNPDRB variable (-2) is not significant because it has a probability of more than alpha, which is 0.9850 with a positive relationship of 0.008777.
- The LNPDRB variable (-3) is significant because it has a probability of less than alpha, which is 0.0348 with a negative relationship of 1.283027, where every increase of 1 unit of the previous three periods of GDP has decreased by 1.283027 percent in 3 provinces of the WPP 718 pilot project in 2011-2022.
- The VPPT variable is not significant because it has a probability of more than alpha, which is 0.3302 with a coefficient of 2.54E-07.
- The VPPT variable (-1) is not significant because it has a probability of more than alpha, which is 0.6526 with a coefficient of 1.29E-07.
- The variable VPPT (-2) is not significant because it has a probability of more than alpha, which is 0.6526 with a coefficient of 8.59E-08.
- The VPPT variable (-3) is not significant because it has a probability of more than alpha, which is 0.1393 with a coefficient of 3.62E-07.
- The VPPT variable (-4) is not significant because it has a probability of more than alpha, which is 0.0827 with a coefficient of 4.70E-07.
- The VPPBP variable is not significant because it has a probability of more than alpha, which is 0.1878 with a negative relationship of 3.02E-07.
- The VPPBP variable (-1) is not significant because it has a probability of more than alpha, which is 0.0527 with a positive relationship of 5.05E-07.
- The DBH SDA variable is significant because it has a probability of more than alpha, which is 0.0015 with a positive relationship of 8.50E-12, where every increase of 1 unit this year of GDP has increased by 8.50E-12 percent in 3 provinces of the WPP 718 pilot project in 2011-2022.
- In the DBH variable, SDA (-1) is significant because it has a probability of less than alpha of 0.0014 with a negative relationship of 1.26E-11 where every increase of 1 unit in the previous period of GDP experienced a decrease of 1.26E-11 percent in 3 provinces of the WPP 718 pilot project in 2011-2022.

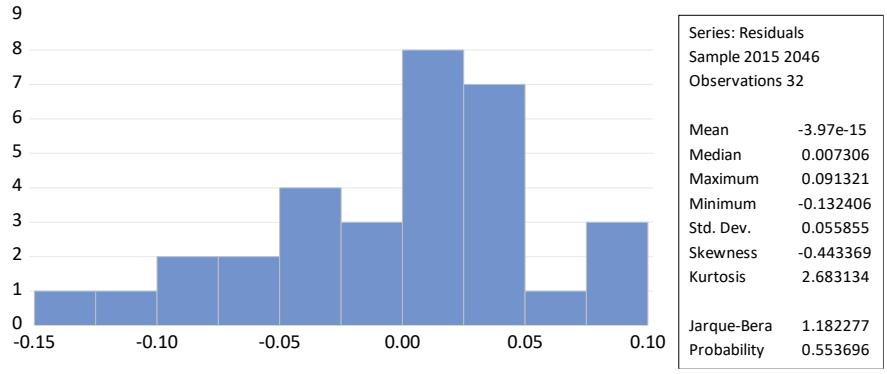
- DBH SDA (-2) is significant because it has a probability of less than alpha of 0.0351 with a negative relationship of 1.29E-11 where every increase of 1 unit of the previous two periods of GDP has decreased by 1.29E-11 percent in 3 provinces of the WPP 718 pilot project in 2011-2022.
- DBH SDA (-3) is not significant because it has a probability of 0.0622 with a negative relationship of 1.87E-11
- The NTPN variable is not significant because it has a probability of 0.2140 with a negative relationship of 0.007004
- NTPN (-1) is insignificant because it has a probability of 0.0837 with a negative correlation of 0.010811
- NTPN (-2) is insignificant because it has a probability of 0.1764 with a positive relationship of 0.003308.

Long-term Estimation

Variable	Coefficient	Prob
VPPT	1,19E-06	0,0765
VPPBP	-4,49E-07	0,3144
DBH SDA	7,94E-11	0,0000
NTPN	0,001107	0,9143
C	13,81612	0,0000

Source: data processing results, 2024

Normality Test



Source: data processing results, 2024

Normality test results in this research indicate a normal distribution. This can be seen from the probability value which is greater than 0.05, with a value of 0.553696.

Heteroscedasticity Test

	Prob.	Alpha
Prob. F(10,23)	0,7516	0,05
Prob. Chi-Square(10)	0,6090	
Prob. Chi-Square(10)	0,9876	

Source: data processing results, 2024

Based on the table above, it states that there is no heterokedasticity. This is based on the probability value of Chi-Square being greater than alpha 0.05.

Multicollinearity Test

Variable	Centered VIF
VPPT_X1_	4,857722
VPPBP_X2_	5,899764
DBH_SDA_3_	1,234389
NTNP_X4_	1,289687
C	NA

Source: data processing results, 2024

Based on the table above, this research does not indicate multicollinearity. This can be seen from the Variance Inflation Factor (VIF) value which is smaller than 10.

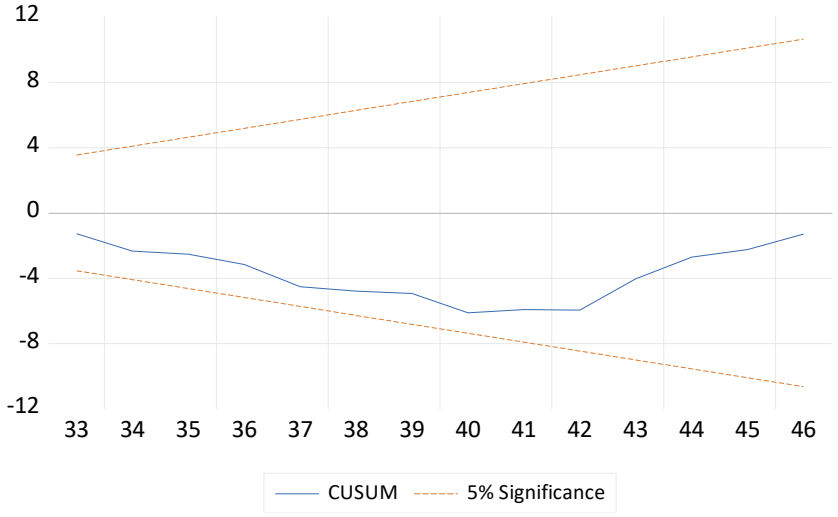
Speed of Adjustment

CointEq(-1)	coefficient	Prob.
	- 0,450054	0,0000

Source: data processing results, 2024

This research has a negative ECT value of 0.450054. This means that this study has met the validity requirements on equilibrium at a rate of 45 percent per year.

CUSUM Test Result



Source: data processing results, 2024

Stability of the ARDL model estimate can be seen from the plot in the form of a solid diagram in blue between two dotted lines in red which is a stability control of CUSUM values that do not cross the boundary line at a significant level of 5 percent, meaning that the parameters of the ARDL(3,4,1,3,2) model have been stable.

Coefficient Determination	
R-Square	0.977856

Source: data processing results, 2024

Determinant coefficient can be seen from the R-Square value of 0.977856. This means that 97.85 percent of independent variables have an effect on the dependent variable. Then 2.15 percent was influenced by other variables that were not included in this research.

Uji F	
F-statistic	36,36674
Prob(F-statistic)	0,000000

Source: data processing results, 2024

F-test can be observed from the F-value of 36.36674 with a statistical F-probability of 0.000000, which is smaller than 0.05. The conclusion is that the independent variables in this study collectively can have an impact on the dependent variable.

T-statistic Test

Variable	Coefficient	Prob.	t-statistic
VPPT	0,158251	0,5414	1,008700
VPPT(-1)	0,008777	0,9850	0,459953
VPPT(-2)	1,283027	0,0348	-0,354720
VPPT(-3)	2,54E-07	0,3302	-1,567372
VPPT(-4)	1,29E-07	0,6526	-1,868588
VPPBP	-8,59E-08	0,7281	-1,384595
VPPBP (-1)	-3,62E-07	0,1393	2,116026
DBH SDA	-4,70E-07	0,0827	3,917375
DBH SDA(-1)	-3,02E-07	0,1878	-3,960369
DBH SDA (-2)	5,05E-07	0,0527	-2,332067
DBH SDA (-3)	8,50E-12	0,0015	-2,026116
NTPN	-1,26E-11	0,0014	1,301821
NTPN (-1)	-1,29E-11	0,0351	-1,862066
NTPN (-2)	-1,87E-11	0,0622	1,423984
C	0,007004	0,2140	-2,880791

Source: data processing results, 2024

The results of the analysis were obtained as follows:

- The Variable of Capture Fisheries Production Volume with a probability value of 0.3302 so that there is an insignificant positive influence between the variable of Capture Fisheries Production Volume and Gross Regional Domestic Product.
- The Captive Fisheries Production Volume variable (-1) has a probability value of 0.6526, thus there is an insignificant positive influence between the Captive Fisheries Production Volume variable and the Gross Regional Domestic Product.
- The Captive Fisheries Production Volume variable (-2) has a probability value of 0.7281, thus there is an insignificant positive influence between the Captive Fisheries Production Volume variable and the Gross Regional Domestic Product.
- The Captive Fisheries Production Volume variable (-3) has a probability value of 0.1393, thus there is an insignificant positive influence between the Captive Fisheries Production Volume variable and the Gross Regional Domestic Product.

- The Captive Fisheries Production Volume variable (-4) has a probability value of 0.0827, thus there is an insignificant positive influence between the Captive Fisheries Production Volume variable and the Gross Regional Domestic Product.
- The variable of aquaculture production volume with a probability value of 0.1878 so that there is a negative and insignificant influence between the variable of aquaculture production volume and Gross Regional Domestic Product.
- The variable of aquaculture production volume (-1) has a probability value of 0.0527, thus there is a significant positive influence between the variable of aquaculture production volume (-1) and Gross Regional Domestic Product.
- The variable of natural resource profit-sharing fund has a probability value of 0.0015, thus there is a significant positive influence between the variable of natural resource profit-sharing fund and Gross Regional Domestic Product.
- The variable of natural resource revenue sharing fund (-1) with a probability value of 0.0014 so that there is a negative and significant influence between the variable of natural resource profit sharing fund (-1) and Gross Regional Domestic Product.
- The variable of natural resource revenue sharing fund (-2) with a probability value of 0.0351 so that there is a negative and significant influence between the variable of natural resource profit sharing fund (-2) and Gross Regional Domestic Product.
- There is a significant negative relationship between the variable of funds for natural resource yield (-3) and Gross Regional Domestic Product. This is because this variable has a probability value of 0.0622.
- The fishery sector farmer exchange rate variable (-1) has a probability value of 0.2140, thus there is an insignificant positive influence between the fishery sector farmer exchange rate variable (-1) and the Gross Regional Domestic Product.
- The exchange rate variable of farmers in the fisheries sector (-2) with a probability value of 0.0837 so that there is a negative and insignificant influence between the exchange rate variable of farmers in the fisheries sector (-2) and the Gross Regional Domestic Product.
- The exchange rate variable of farmers in the fisheries sector (-3) has a probability value of 0.1764, thus there is a positive and insignificant influence between the exchange rate variable of farmers in the fisheries sector (-3) and the Gross Regional Domestic Product.

5.0 Conclusion

5.1 Conclusion of this research:

1. Capture Fisheries Production Volume (VPPT) and VPPT (-1) in the short term have a positive and insignificant influence on Gross Regional Domestic Product (GDP) in 3 provinces of the WPP 718 pilot project. Then VPPT (-2), VPPT (-3), VPPT (-4) in the short term have a negative and insignificant influence on the Gross Regional Domestic Product (GDP) in 3 provinces of the WPP 718 pilot project. Furthermore, in the long term, Capture Fisheries Production Volume (VPPT) has a positive and insignificant impact on the Gross Regional Domestic Product (GDP) in the 3 provinces of the WPP 718 pilot project.

2. The volume of aquaculture production (VPPB) in the short term has a negative and insignificant influence on the Gross Regional Domestic Product (GDP), (VPPB (-1)) in the short term has a positive and significant influence on the Gross Regional Domestic Product (GDP). Then, the volume of aquaculture production (VPPB) has a negative and insignificant impact on the Gross Regional Domestic Product (GDP) in the long term in 3 provinces of the WPP 718 pilot project.

3. Natural resource revenue sharing fund (DBH SDA) in the short term has a positive and significant influence on the Gross Regional Domestic Product (GDP) in 3 provinces of the WPP 718 pilot project. In addition, the variables DBH SDA (-1) and DBH SDA (-2) have a negative and significant influence on the Gross Regional Domestic Product (GDP) in 3 provinces of the WPP 718 pilot project. Furthermore, the Natural Resources Revenue Sharing Fund (DBH SDA) in the long term has a positive and significant influence on the Gross Regional Domestic Product (GDP). On the other hand, DBH SDA(-3) has a negative and insignificant influence on GDP in 3 provinces of the WPP 718 pilot project.

4. Exchange rate of farmers in the fisheries sector (NTPN), NTPN (-2) in the short term has a positive and insignificant influence on the Gross Regional Domestic Product (GDP) in 3 provinces of the WPP 718 pilot project. The NTPN variable (-1) has a negative and insignificant influence on the Gross Regional Domestic Product (GDP) in the 3 provinces of the WPP 718 pilot project in the short term. In the short term, the NTPN variable (-2) has a positive and insignificant impact on the Gross Regional Domestic Product (GDP). Furthermore, in the long term, it has a positive and insignificant impact on GDP in the 3 provinces of the WPP 718 pilot project.

5.2 Implication

1. Increase in the production volume of capture fisheries, both capture and aquaculture fisheries, and the exchange rate for fish farmers can enhance long-term and short-term GDP, although not significantly. In this regard, when the production volume of capture fisheries and aquaculture fisheries increases, it can have a multiplier effect on community income. When the exchange rate for fish farmers improves, the welfare of the community also improves. Therefore, the government must optimize the results from the production volume of capture fisheries and enhance aquaculture production by developing entrepreneurship programs for the community in Papua, West Papua, and Maluku provinces to boost GDP.

2. Increase in revenue sharing from natural resources in the short and long term can enhance the regional gross domestic product (PDRB). This is because the community receives financial assistance from the government in the form of revenue sharing from natural resources to improve fishery production and increase community income. Therefore, the government must be able to create policies to ensure that these funds are distributed accurately and used optimally in Papua, West Papua, and Maluku provinces to boost GDP.

5.3 Limitation

Limitations are the data available to support this research is limited and the coverage of the area is not wide. Further research is expected to expand the scope of the area and the use of more data. In addition, further research is also expected to be able to use different analysis tools such as data panels and time series. Then consider other potential variables that are not yet present in this study such as the number of fishery production households, the technology used, and investment.

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