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Analysis of Gross Tonnage (GT) Capacity Installed On Traditional Wooden Ships In Penajam Paser Utara

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KEYWORDS
Wooden Ship
Gross Tonnage
empirical method
analytical method
PNBP

ABSTRACT – To identify the GT of traditional wooden boats built at PPU, an investigation of the GT on the boat is carried out. The GT of the North Penajam Paser traditional wooden ship was identified using domestic regulations issued by the government through the Ministry of Transportation, PM No. 45 of 2021, and PP No. 85 of 2021 concerning Non-Tax State Revenue (PNBP) of the Directorate General of Sea Transportation. Before being operated, every ship must be measured to determine the length, width, depth, and tonnage of the ship by the measurement method according to Law Number 20 of 1997 concerning PNBP. Ship data obtained from previous study is used for determining gross tonnage, namely Lpp: 17.76 m, LoA: 21.90 m, Lwl: 19.06 m, B: 4 m, H: 2 m, T: 1.40 m, and Cb: 0.50 m. Calculating ship tonnage has two methods, namely the empirical method and the analytical method. Based on the calculation, the GT values are 14.79 and 14.16, respectively. The total amount of PNPB on ships based on analytics is IDR 5,600,704.74. The total empirical PNPB amount is IDR 8,43,031.01. The difference between analytical and empirical PNBP is IDR 242,327.01. The difference between GT based on analytical and GT empirical methods is 0.63. The comparison level between the two methods is 4%.

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INTRODUCTION

Penajam Paser Utara (PPU) Regency) is one of the areas of East Kalimant. The PPU also acts as a center for traditional wooden shipmakers. One of the shipyards that makes/builds traditional wooden ships in PPU is the Joint Business Group (KUB) yard. The type of ship built at the KUB shipyard is a fishing vessel. Fishing vessels are part of a fishing unit that has an important role in supporting the success of fishing operations, both as a means of transportation from the fishing base to the fishing ground and vice versa and as a means of accommodating and storing caught fish [1]. Therefore, the ability of a fishing vessel to accommodate the catch shows how big or small the profit capacity can be [2].

PPU has become very famous for making wooden ships, and this matter received attention from the Government. However, there is no GT planning in making traditional wooden ships at PPU because traditional wooden ship craftsmen only build the physical ship. In addition. Regarding basic knowledge and skills in naval architecture. It was identified that they lack understanding of engine reparation and maintenance [3], ship dimensions [4], and lack of safety awareness [5]. Moreover, the wooden ship in PPU has been studied for some research topics, it was investigated by laminating the frame with fiberglass to strengthen the bending strength [6] and designing the cooling system for its cargo hold [7]. Moreover, the most recent study evaluated the transversal strength using numerical simulation [8]. In the present study, the GT capacity of the ship built at the location will be determined.

The GT capacity is used as a basis for determining the amount of the fishery business levy that the applicant must remit to the Directorate General of Capture Fisheries as Non-Tax State Revenue (PNBP). In principle, the state revenue aspect is supported by two main elements, namely tax revenue and non-tax state revenue [9]. Until now, the size of fishing vessels about their management has always been reviewed based on Gross Tonnage (GT), which is a description of capacity and load capacity to calculate various things related to the productivity of fishing businesses.

Furthermore. Many fisheries management policies in Indonesia are viewed from the size of the Gross Tonnage (GT) of fishing vessels [2]. Therefore, to identify the GT of traditional wooden ships built at PPU, an investigation of the GT on the ship was carried out. The GT of the North Penajam Paser traditional wooden ship was identified using domestic regulations issued by the government through the Ministry of Transportation, PM No. 45 of 2021 [10], and PP No. 15 of 2016 concerning Types and Tariffs for Non-Tax State Revenues Applicable to the Ministry of Transportation [11].

METHOD

Data Collection

For GT calculations, the required data is secondary data. the data was obtained from previous research, namely the volume below the measuring deck of the PPU traditional wooden ship. Figure 1 illustrates the lines plane of the wooden ship in PPU.

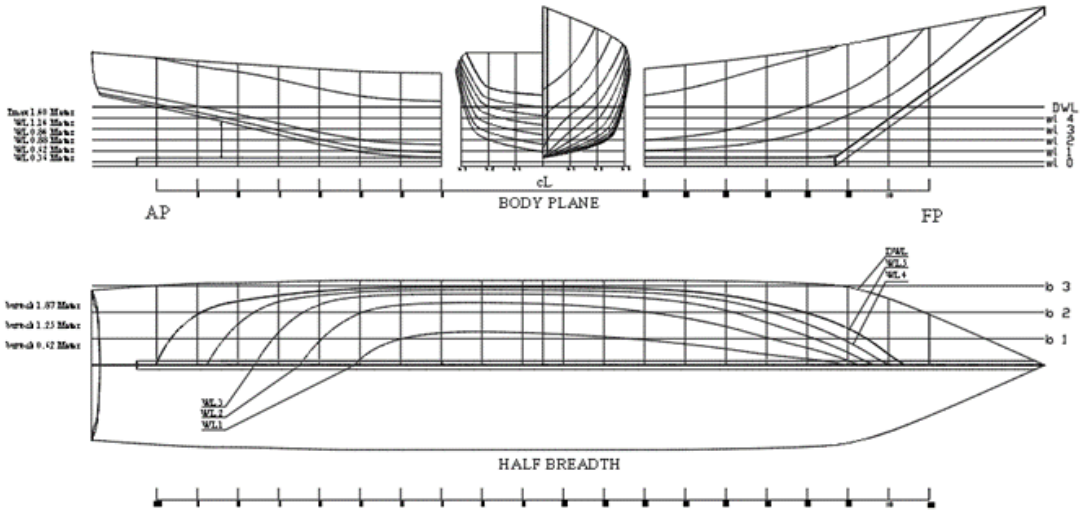

Figure 1. Lines Plan of a Wooden Ship

GT Determination

1.Empirical Method

Data analysis in this research used qualitative methods, using PM No.45 of 2021 concerning Ship Measurements and PP No.85 of 2021 concerning Types and Tariffs for Non-Tax State Revenues Applicable to the Ministry of Maritime Affairs and Fisheries. To get the gt value on a ship using the empirical formula, namely

$$GT = 0.25 \times V \quad (1)$$

Where

V = vessel volume ($V1 + V2$) (2)

$V1$ = Volume below the measuring deck

$V1 = p \times l \times d \times f$, (3)

p : ship length (98%) (m)
l : ship width (m)
d : 85% of the ship's gauge deck (m)
f : vessel factor (0.85; 0.70 and 0.50)

$V2$ = Volume of the rooms above the -closed measuring deck

$V2$ = pxl(r) xt (r), with (4)

p : room length (m)
l(r) : average width of the room (m)
t : average height of the room (m)

2.Anatycal Method

The data processing used in this research is an analytical method to calculate the volume of the room below the ship's measuring deck and the volume of the rooms in the ship's superstructure. The formula for calculating GT capacity is as follows:

Gross Tonnage (GT) = K1 XV (5)

With K1 = 0.2 + 0.02 log 10 V (6)

V = total volume of the room

Non-Tax State Revenue (PNBP)

Data on Non-Tax State Revenue (PNBP) comes from primary data. Primary data was obtained from PP No. 85 of 2021 concerning Types and Tariffs for Non-Tax State Revenues Applicable to the Ministry of Maritime Affairs and Fisheries which are calculated based on the gross tonnage of the ship [12].

RESULTS AND DISCUSSION

GT Capacity Calculation

1.Empirical Method

The data on the ships studied to determine gross tonnage are as follows.

Lpp : 17.76 m
LoA : 21.90 m
Lwl : 19.06m
B : 4 m
H : 2m
T : 1.40m
Cb : 0.50

The dimensions of the ship above were obtained from previous research, namely a plan drawing of a wooden fishing boat in North Penajam Paser (Figure 1).To get the gt value on a ship using the empirical formula, namely

GT= 0.25 x V

With,

V = vessel volume (V1 + V2)
V1 = Volume below the measuring deck

then for the volume of the ship below the measuring deck is

V1 = (17.76 x 98%) x 4 x (2 x 85%) x 0.5
= 17.40 x 4 x 1.7 x 0.5
= 59.17 m^3

For V2, there are no buildings on the ship's measuring deck

Then GT = 0.25 x 59.17 m^3
= 14.79

NT = 0.3 x 14, 79
= 4.44

2.Anatycal Method

The first step for calculations using analytics on ships is the division of stations as in PM 45 of 2021 concerning Ship Measurements, where the distance between station is divided into 6 as shown in Figure 2.

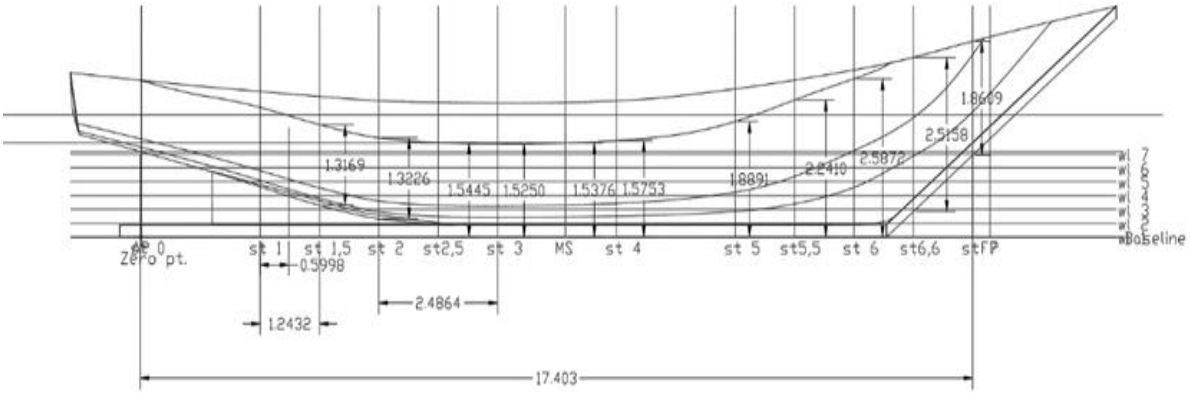

Figure 2. Cross-sectional distribution of the ship

The distance between stations 1, 2, 3, 4, 5, 6, and 7 is 2.4864 m. For distance 1, 1.5; 2, 2.5; 5, 5.5; and 6, 6.5, is 1.2432 m. On the front and back sides of the ship there is an increase in construction height, more precisely an increase in sheer where this increase is included in the area calculation.

Table 1. Height of sheer increase in each cross-section

Numbers cross section	1	1.5	2	2.5	3	4	5	5.5	6	6.5	7
Total height	0	1.62	1.41	1.55	1.65	1.58	1.93	2.59	3.64	3.91	3.52
Curved Deck	0	0.30	0.08	0.01	0.13	0.04	0.35	0.70	1.05	1.40	1.66
Curved Gldk correction	0	0.10	0.03	0.00	0.04	0.01	0.12	0.23	0.35	0.47	0.55
Calculation Height	0	1.52	1.38	1.55	1.61	1.57	1.81	2.36	3.29	3.44	2.97
The distance of the dividing point from the height	0	0.30	0.27	0.31	0.32	0.31	0.36	0.47	0.65	0.68	0.59

After calculating the increase in sheer of the ship, the next step is to calculate the area of each cross-section as shown in Figure 3.

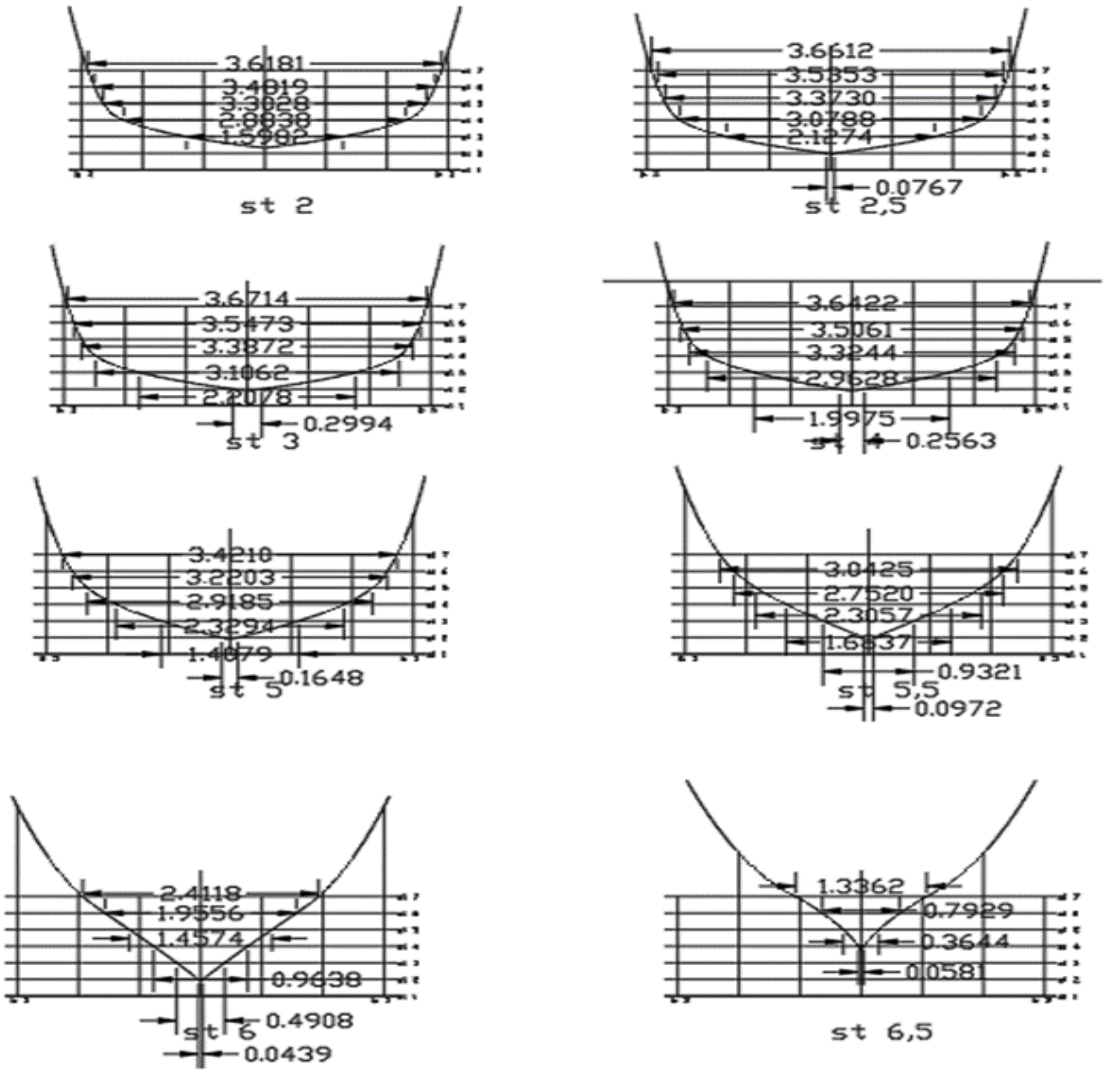

Figure 3. The Ordinate of each cross section

Table 2. Ordinat values for each cross section

No		Width										
7		0,00	3,46	3,62	3,66	3,67	3,64	3,42	3,04	2,41	1,34	0,00
6	4	0,00	3,29	3,48	3,54	3,55	3,51	3,22	2,75	1,96	0,79	0,00
5	2	0,00	2,93	3,30	3,37	3,39	3,32	2,92	2,31	1,46	0,36	0,00
4	4	0,00	1,64	2,88	3,08	3,11	2,96	2,33	1,68	0,96	0,06	0,00
3	1,5	0,00	0,00	1,60	2,13	2,21	2,00	1,41	0,93	0,49	0,00	0,00
2	2	0,00	0,00	0,00	0,08	0,99	0,26	0,16	0,10	0,04	0,00	0,00
1	0,5	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

In Table 2 there are values 1 to 7, Simpson factor values 1, 4, 2, 4, 1.5, 2, and 0.5. Because the number of cross-sections is 6, there must be additional values so that the value sought is more accurate. To be able to use the Simpson method by adding a factor of 0.5 and 1.5. Thus, the Simpson interval calculation is more accurate. In Table 2 the cross-sectional areas are input based on the values obtained from Figure 3 for the ordinates of each cross-section. Length under measuring deck 17.4 meters 6, The distance between the points divides the length = 2.90 meters.

Table 3. Calculation of Area Size using Simpson

Cross-section number	factor	Cross-sectional area	Product
1	0.5	0.00	0.00
1.5	2	2.93	5.86
2	1	3.50	3.50
2.5	2	4.14	8.28
3	1.5	4.53	6.80
4	4	4.17	16.68
5	1.5	4.10	6.15
5.5	2	4.24	8.48
6	1	3.90	3.90
6.5	2	1.26	2.52
7	0.5	0.00	0.00

In Table 3, there is a calculation to obtain the value of the volume of a traditional PPU ship, which is the sum of each product from cross-sections 1 to 7. So, the volume of the space below the measuring deck is obtained by multiplying one third of the point distance divided by the length of the measuring deck by the number of multiplications:

Volume of space under measuring deck:

$$1/3 \times jp \times \sum Lp$$

With,

jp : point distance for measuring deck length; And

∑Lp : the sum of the results of multiplying the cross-sectional areas with the factors referred to in the cross sectional areas of Table 3.

So,

$1/3 \times jp \times \sum Lp = 1/3 \times 2.9 \times 62.17$

$= 0.97 \times 62.17 = 60.12\ m^{\wedge 3}$

So, The volume of space below the measuring deck is 60.12 $m^{\wedge 3}$

Because PPU ships do not have a building volume above the measuring deck, to get the ship's GT value, the calculation is carried out as follows:

Gross Tonnage (Gross Tonnage/GT) = K1 XV

With K1 = 0.2 + 0.02 log 10 V

V = total volume of the room

So the GT value based on analytics is:

K1 = 0.2 + 0.02 log 10 V = 0.02 + 0.02 log 10 (60.12)

= 0.24

GT = 0.24 x 60.12

= 14.16

NT = 0.3 x 14.16

= 4.25

Calculation of Non-Tax State Revenue (PNBP)

PNBP was obtained from PP No. 85 of 2021 concerning Types and Tariffs for Non-Tax State Revenues Applicable to the Ministry of Maritime Affairs and Fisheries which are calculated based on the gross tonnage of the ship. The result of the calculation is shown in Table 4 and 5.

Table 4. Types and rates of PNBP based on GT

Types of PNBP	Unit	Tariff (Rupiah)	Analytical Rates (Rupiah)	Empirical Rates (Rupiah)	Tariff Differences	GT analytics	Empirical GT
Fishing Rod	Per GT	25,000.00	354,077.31	369,813.75	15,736.44	14.16	14.79
Tuna Fishing Line	Per GT	35,000.00	495,708.23	517,739.25	22,031.02	14.16	14.79
Fishing Rod	Per GT	25,000.00	354,077.31	369,813.75	15,736.44	14.16	14.79
Types of PNBP	Unit	Tariff (Rupiah)	Analytical Rates (Rupiah)	Empirical Rates (Rupiah)	Tariff Differences	GT analytics	Empirical GT
Fish Transporting Vessels Operating from Fishing Areas (WPPNRI)	per GT per year	150,000.00	2,124,463.86	2,218,882.50	94,418.64	14.16	14.79
Types of PNBP	Unit	Tariff (Rupiah)	Analytical Rates (Rupiah)	Empirical Rates (Rupiah)	Tariff Differences	GT analytics	Empirical GT
Fish Transporting Vessels Operating from Fishing Areas (WPPNRI)	per GT per year	150,000.00	2,124,463.86	2,218,882.50	94,418.64	14.16	14.79

Table 5. Types and rates of PNBP based on Ship Length

Types of PNBP	Unit	Tariff (Rupiah)	Rates are based on ship length (Rupiah)
Mooring Services for Fishing Vessels			
Ships measuring >5-30 GT	per meter of ship length 1/4 etmal	IDR 500.00	Rp. 8,700.00
Berthing Services for Fishing Vessels			
Ships measuring >5 -30 GT	per meter of ship length 1/4 etmal	Rp. 4,000.00	Rp. 69,600.00
Mooring and Anchoring Services for Damaged Ships (Floating Repair) Waiting for Repair and Maintenance Turns Before Boarding	per meter of ship length per etmal	Rp. 3,000.00	Rp. 52,200.00
Boat Mooring and Anchoring Services Waiting for the Good Weather Season	per meter of ship length per etmal	Rp. 1,000.00	Rp. 17,400.00
		Total	Rp. 130,500.00

Determining the type and rate of PNBP on ships based on GT, the total analytical and empirical PNBP comparisons are obtained and shown in Table 6.

Table 6. Total PNBP rates

PNBP	Analytical Rates (Rupiah)	Empirical Rates (Rupiah)	Tariff Difference (Rupiah)
Total	5,600,690.58	5,843,031.75	242,341.17

CONCLUSION

Based on the results of research on calculating ship GT using two methods, based on analytics and GT calculations empirically, GT based on analytics has a value of 14.16. GT calculation based on empirical methods 14.79. The difference between GT based on analytical and GT empirical methods is 0.63. the comparison level between the two methods is 4%. As for Calculation of PNBP with 2 different GT calculations, total amount of PNPB on the ship based on analytics is IDR 5,600,690.58, while the total amount of empirical PNPB is IDR 5,843,031.01. The difference between analytical and empirical PNBP is IDR 242,341.17. PNBP rates are calculated based on PP No.85 of 2021.

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