BOAT OPERATING COST ANALYSIS: CASE STUDY ON 40- SEATERS CATAMARAN LAKE CRUISE BOAT AT GUNUNG LANG RECREATIONAL PARK, PERAK

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ABSTRACT

This research aims to determine cost impacted activities during lake cruise boat operation and to assess overall cost of the lake cruise boat during operation. The research on boat operating cost estimation focuses on the 40-seaters catamaran lake cruise boat operated at Gunung Lang Recreational Park in Ipoh, Perak. The data of the boat particulars and operation were obtained from the interviews with person in-charge of the operation, site visit and real operation/ trip experience. On the other hand, the fundamental components and relevant gap study on the cruise boat cost estimation were gained through academic writings, articles, and websites. Cost breakdowns based on the data obtained and revenue generated were projected by using a line graph. The fundamental finding of this study provides benefits to boat owners and boat operators in planning and estimating their early cost of cruise boat operation. Besides a techno- economic assessment, the result significantly becomes an appropriate reference for further cost optimization estimation. Nonetheless, more supporting evidence and elaborated methodological approach are necessary for further study.

Keywords: cruise boat, boat operating cost, catamaran lake cruise

1.0 INTRODUCTION

The Gunung Lang Recreational Park, located in the north of Ipoh City, close to the interchange of the North-South Expressway Route E1 (NSE E1). It was in a scenic backdrop of limestone hills of Gunung Lang and Gunung Bilike, which has an area of 30.35 hectares for park and 14.16 hectares of water body as well as flora and fauna. Suitably in line with eco-tourism concept, outdoors activities such as sightseeing, and lake cruising recently increase the demand of tourists. The presence of boat services in Gunung Lang Recreational Park considerably gave impact on the economy of the site. Therefore, proper planning and appropriate costing must be taken into consideration in making the lake cruise operation significantly worth. One of the few types of boats widely being used for transportation of visitor at the park are the 40-seaters lake cruise catamaran boats or also known as Lang 4 and Lang 5, as shown in Figure 1.0. A proper planning for operation costing and revenue assessment needs to be prioritized by boat owners or operators before, during and after the cruise boat operation implemented. On top of that, an effective cruise boat operating cost estimation is another challenge and need to be concerned. A report by Kay, Mannheim, Miller, & Dyer concluded that the base costs of the boats vary significantly depending not only on passenger capacity and speed, but also depending on on-board amenities, hull type, vessel age, marine conditions, and other design features [1]. In terms of operating costs of boat service, it varies depending on an array of factors such as desired speed, fuel price, passenger amenities, marine conditions, and available docking facilities. They also highlighted that cost of service also varies regionally. Costs may be reduced significantly in locations

where there is existing boats service, as docking, maintenance, employment, and other costs may be able to be shared and new services will benefit from the existing supporting infrastructure and skilled labour. This similarly applied to the existing service and operation environment that being implemented at Gunung Lang Recreational Park. This analysed the cost that are being spent on the operation of the cruise boat and the revenues generated. The mentioned components cost will also be projected for a period to identify the overall cost generated. The estimation and analysis are based on some limitations, such as considering a typical route used to operate the boat at Gunung Lang Recreational Park and standardizing the average value of salaries/ wages of the helmsman. The study also considering a typical and consistent data based on the input during data collection especially on the expenses and revenue of the cruise boat operation.

Figure 1: A 40- Seaters Catamaran Cruise Boat Operating at Gunung Lang Recreational Park.

2.0 LITERATURE REVIEW

Gunung Lang Recreational Park, Ipoh, Perak considerably as an urban escape park that preserves and protects limestone hills, presenting its uniqueness of serene natural landscape to the visitors. Supplied with three artificial lakes constructed from a former tin mine and the tranquil blue lake loaded with various species of freshwater fishes, the 111.93 hectares of Gunung Lang were designated as Stage 2 Environmentally Sensitive Areas in the Ipoh Local Plan Study 2020 [2]. Due to its distinctiveness, ecotourism activities such as sightseeing, and lake cruising expand rapidly. Ipoh City Council (Majlis Bandaraya Ipoh) actively anticipates this positive opportunity by providing a lake cruise experience for visitors. They provide lake cruise boats ranging from small size (10 to 12 passengers) up to large capacity boats with a maximum of 40 passengers. Consideration in deciding the capacity and size of boat for lake cruise operation technically invites the pros and cons argument. An appropriate planning and cost estimation crucially needed to avoid unnecessary impacted cost and expenses. It was summarized that, factors such as fuel cost, oil changes, fuel additives, batteries, pumps, and lights are essential in considering boat operating cost estimation [3]. For a note to remember, the operating costs are not directly proportional to the length or overall size of a boat but most often its cost acts exponentially as size increases. The operating costs vary greatly not just depending on the type of boat [4], the fuel cost, for example, will naturally vary depending on the age, size, and design of the boat. Boat operating cost can be influenced by various factors depending on nature of operation and the condition of the boat itself. On top of that, besides keeping a ship running well and looking good, maintenance is essential in optimizing the operational cost of a boat. A regular inspections and scheduled maintenance should be happened according to the ship's book/ manual. These include routine inspections (to check for damage), lube oil change intervals, and major overhauls (when all equipment is taken apart and reassembled) [5]. According to Marine Depot Direct in 2022 the annual cost needed for maintenance of a used boat can goes up to 10% of the boat price while 2% for a new boat. This maintenance may include deck cleaning, painting of the hull, boat detailing and

complete services of the boat. It was also stated that a well-orchestrated maintenance program could eliminate catastrophic equipment failures, as well as optimize the operation of the equipment [6]. The increase of equipment reliability and energy cost saving could possibly stretch up 18% on average. In addition, a practical and productive recreational boat should be operated approximately 75 to 150 hours per year. This condition may set the average life of the boat to be between 10 to 20 years if maintained regularly [7]. It is said that boat owners or boat operators are expected to complete at least once full inspection per year.

It is highlighted that the main issue of this research is to understand the fundamental of boat operating cost estimation. Malaysia is one of the countries with a rich geographical landscape including lakes and rivers. This landscape has open opportunity for individuals and companies to develop and expand tourist attraction activities including water cruise. However, consideration of suitability of boat's types and sizes to be operated and cost to be financed creates a grey area among the owner/ operator. A decent type of boat plays a major role depending on the environment and objective of operation [8]. Unfortunately, some investors in these services are having difficulty identifying the upcoming costs that will affect their business and the operation of the boat. Some may have taken a leap of faith and endure the cost highly operating services. Maintenance and resources of boat in operation vary from one to another but can be projected as equal if sufficient references are available. Therefore, this research is hoped to aid those involved in the industries to understand the fundamental of cost breakdown for cruise boat operation.

This research will provide significant data and information for boat owners and operators for their business and operation. The data presented in this research will provide fundamental information and convincing knowledge for them to relate costs needed for cruise boat operation. With deep understanding on the application of the cost breakdown structure, boat owners and operators may be able to construct their own budgeting and scale it to their preferences. Moreover, individuals or companies who wanted to venture in the industry of operating a passenger boat may find this research beneficial for their early-stage operation.

2.0 RESEARCH METHODOLOGY

The case study for this research specifically focused on the 40 passengers cruise boat operating at Gunung Lang Recreational Lake, Ipoh on the daily basis. The main mission of this research is to determine the cost impacted during a passenger boat routine as well as the overall operating cost related to its operation. Literature reviews were initiated at the earlier part, emphasizing the relevancy of the discussed topic and issue. As an analysis of academic sources on a particular subject, the literature review provided a broad overview of the state of the field and enabling researchers to spot pertinent theories, approaches, and gaps. Thus, several academic writings related to passenger boat or ferry operating cost have been referred to as guidance. These ideas and basis are then quoted to justify the correlation of the topic and data to be collected.

Data collection for the research is categorized into two, which are the primary data and the secondary data. In this research the primary data was collected from research site visits, real operation experience and through interview sessions conducted among the person in-charge of the cruise boat operation. Whereas the secondary data is being collected through reading of academic papers and articles that had been published by other researchers related to the research topic. The interview session was conducted at Gunung Lang Recreational Park, Ipoh, Perak. The interview session involved personnel at the recreational park who participated closely with the operation of a 40-seaters passenger cruise boat. Related questions and answers have been exchanged in the process of collecting relevant information throughout the research activity. Figure 2.0 summarizes the flow of research methodology in ensuring the successfulness of the research.

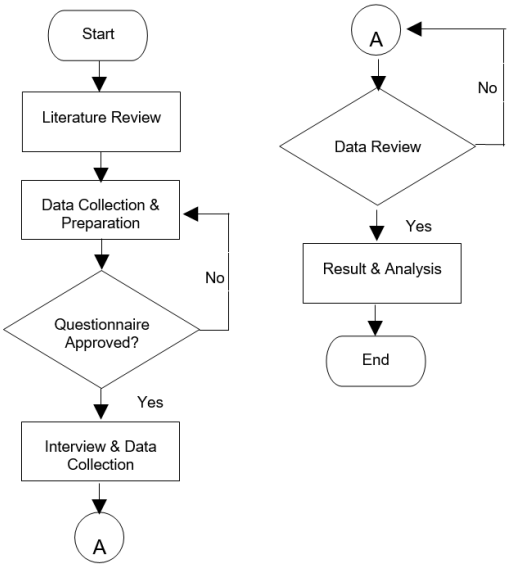

Figure 2: Flowchart of the Overall Project

3.0 RESULTS AND DISCUSSION

A 40 -seaters catamaran cruise boat was highlighted for operating cost estimation and Figure 3.0 shows the overview of general arrangement drawing. Evaluation of the result for costing of the lake cruise boat operation was broke down into several components for details discussion, as listed below:

i. Fuel cost

ii. Manpower cost

iii. Maintenance cost

iv. Insurance cost

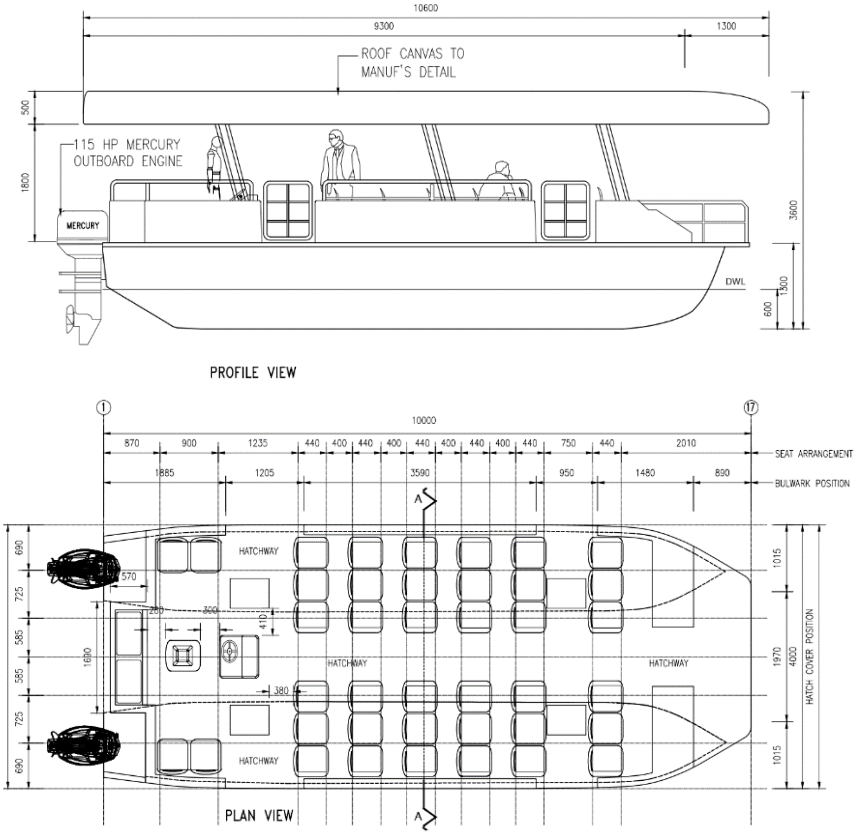

Figure 3: General Arrangement Drawing of 40 Seaters Catamaran Cruise Boat Operating at Gunung Lang Recreational Park

i. Fuel Cost

Based on data gained during the site visit, cruise boat operating route was recorded and shown in Figure 4.0. The route captured considerably a common daily usage during the operation at Gunung Lang Recreational Lake. For typical operating hours as shown in Table 1.0, each trip consumed approximately around nine (9) minutes to complete a single loop of trip. Thus, total trip for one (1) day operation could reach up to 28 numbers of trip. Based on the engine technical specification recorder, fuel consumption for each unit of outboard engine was 5.2 litres per hour, making the total fuel consumption of operational boat for 1 day was 43.68 litres. Taking the fuel price of RON95 (RM 2.05), the cost for 1 day operation was RM 89.54. By taking into consideration of average 30 days of operation per month, the total cost of fuel for every month is RM 2686.20

Figure 4: Gunung Lang Recreational Park Location and Boat Operational Route

ii. Manpower cost

Referring on the primary data gained, there were a total of six (6) crew members that were trained to be the helmsmen of the boat for operation at the Gunung Lang Recreational Park. Nevertheless, only one (1) helmsman was involved per trip during the cruise operation. It was mentioned that the hired helmsmen are paid with salaries according to the official grade from the Malaysia Public Service Commission. The grade awarded to them is H11 – Civil Assistant. The grade offers the salary in the range of RM1218.00 to RM2939.00 per month, as shown in Table 1.0

Table 1: Particulars of Cruise Boat and Operation at Gunung Lang Recreational Lake

Length of Overall	10 meters
Breadth	4 meters
Depth	1.3 meters
Draft	0.6 meters
Displacement of Boat	7.36 tonnes
Capacity of Boat	40 passengers
Operation Hour	9 hours per day
Single Return Trip Period	9 minutes
Total Trip	28 trips / day
Average Speed of Boat	7-8 knots
Number of Engine	2 units
Engine Power	115 HP per engie
Engine Model	Mercury SeaPro
Fuel Consumption	5.2 litres per hour
Number of Helmsman	1 person per trip
Range of Helmsman Wages	RM1218.00 to RM2939.00 per month
Price of Boat	RM 385,000.00

iii. Maintenance Cost

As highlighted in previous chapter, the cost of maintenance per year varies from 2% for new boat and could goes up to 10% of the initial price of the boat. Based on the data gained during the interview session, taking price of the boat RM 385000.00 (refer to Table 1.0), maintenance cost per year for this lake cruise boat was RM 19250.00 per year considering average of 5% maintenance cost for one (1) year. Thus, in proportion it can considered the cost maintenance is RM 641.67 for every month.

iv. Boat Insurance Cost

The details on insurance imposed on the boat operated were obtained through the person in charge from the procurement department of Ipoh City Council (Majlis Bandaraya Ipoh). It was mentioned that the boat paid on the insurance for a total of five (5) years. The insurance paid was the product of the total price of the boat purchased with the depreciation of 17% and insurance premium of 55% for a total of five (5) years. The insurance costs for the boat for 5 years are calculated as follows:

Insurance for 5 years

= (Price of boat purchase) x (Depreciation of Insurance) x (Insurance premium rate)

= (RM 385000) x (0.17) x (0.55)

= RM 35997.50 for a total of 5 years

Thus, the insurance cost for every month could be pro- rated with the value of RM 599.96 per month. As a summary, the Table 2.0 shown is the projection of costs that are categorized based on the cost for a day, a month, and a year.

Table 2: Total Cost of Expenditure for Cruise Boat Operation at GLRP

	Daily	Monthly	Annually
Fuel Cost	RM 89.54	RM 2686.20	RM 32234.40
Maintenance Cost	RM 53.47	RM 1604.17	RM 19250.00
Insurance	RM 20.00	RM 599.96	RM 7199.50
Salaries	RM 83.33	RM 2500.00	RM 30000.00
Total Cost	**RM 246.34**	**RM 7390.33**	**RM 88683.9**

The primary data gained was further assessed to determine the potential income of the cruise boat operation at Gunung Lang Recreational Lake. Based on the published fare rate gained, the fare rate for adults is RM 3.00 whilst RM 1.50 for children. According to the survey and input from the operational department, the lake cruise boat experienced almost full capacity of tourist each trip on the weekend. Meanwhile, the capacity of tourists reduced by an average of half during the weekday's operation. Taking the average ratio of 1:1 for adults and children for every single boat trip, the amount of revenues potentially could be gained was determined and shown in Table 3.0.

Table 3: Average Revenues for Cruise Boat Operation at Gunung Lang Recreational Park

	Number of Passengers	Number of Adults	Number of Children	Average Trip per day	Revenues per day (RM)	Revenues per month (RM)
Weekend (Saturday & Sunday)	40	20	20	28	2520	20160
Weekdays (Monday - Friday)	20	10	10	28	1260	25200
Total Revenues Per Month (Average)						45360

Table 4 shows the data for its initial capital, monthly expenses, accumulated monthly expenses and the generated revenue for the total of 12 months. The capital is the initial cost of purchasing the boat, RM 385000 for the boat operation at Gunung Lang Recreational Park. The monthly expenses were obtained from the total expenses' component breakdown in the previous topic which include fuel consumption costs, helmsmen's wages, maintenance costs, and insurance costs. The accumulated monthly expenses for the first month were then calculated by considering the total monthly expenses and the capital cost of the cruise boat. Furthermore, the subsequent accumulated monthly expenses were obtained from the total of the next monthly expenses with the previous accumulated monthly expenses. Finally, the revenue for a month was calculated from the income determined where it was the total fares for a month (weekdays) and the total fares for a month (weekends).

Table 4: Tabulation of Expenses and Revenue Generated

Months	Capital (Price of Boat) (RM)	Monthly Expenses (RM)	Accumulated Monthly Expenses (RM)	Revenue (RM)
1	385,000.00	7390.33	392,390.33	45,360.00
2	385,000.00	7390.33	399,780.66	90,720.00
3	385,000.00	7390.33	407,170.99	136,080.00
4	385,000.00	7390.33	414,561.32	181,440.00
5	385,000.00	7390.33	421,951.65	226,800.00
6	385,000.00	7390.33	429,341.98	272,160.00
7	385,000.00	7390.33	436,732.31	317,520.00
8	385,000.00	7390.33	444,122.64	362,880.00
9	385,000.00	7390.33	451,512.97	408,240.00
10	385,000.00	7390.33	458,903.30	453,600.00
11	385,000.00	7390.33	466,293.63	498,960.00
12	385,000.00	7390.33	473,683.96	544,320.00

It was projected that Gunung Lang Recreational Park managed to achieve return of investment after the 9th month from the initial operation of the lake cruise boat. From the graph in Figure 5.0, it can be observed that the revenue generated exceeds the accumulated monthly expenses with the value of RM 408,240.00 after 9th month. This shows that the boat operation managed to generate sufficient revenue to cover up the accumulated monthly expenses. This is achievable due to consistent generation of revenue throughout the months of cruise boat operation.

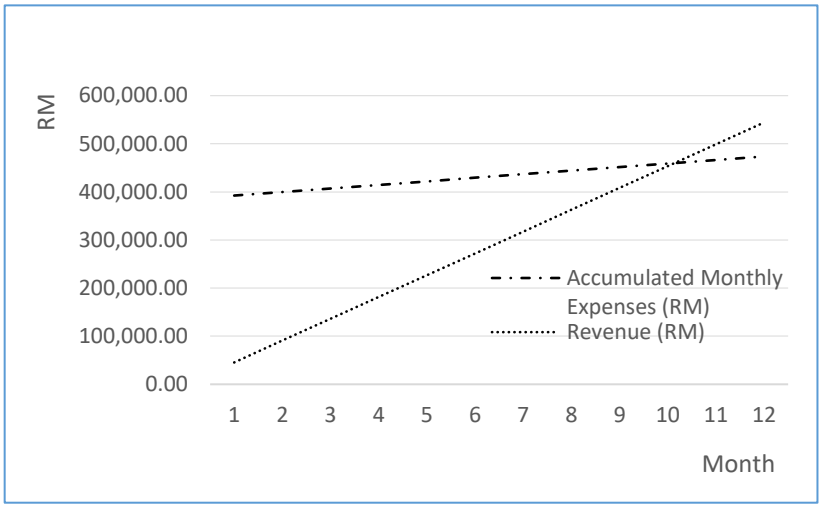

Figure 5: Graph of Return of Investment

4.0 CONCLUSION AND RECOMMENDATION

The cruise boat operating cost has completely determined, by taking into consideration of essential factors such as capital, manpower, maintenance, and insurance cost. The breakdown of overall operating cost is mainly influenced by the accuracy and details of data gained, either from site visits, real operation experience or data collection surveyed. The finding considerably a good reference in facilitating boat operators or owners to initiate their early planning before executing their cruise boat business and operation. The cost impact then was further evaluated to project the revenues gained based on the routine operation basis. Based on the graph plotted, breakeven point significantly identified for techno-economic assessment purpose. With deep understanding on the crucialness of the cost breakdown structure, as well as return of investment awareness, the owners and operators may be able to construct their own budgeting and scale it to their preferences. Moreover, individuals or companies who wanted to venture in the industry of operating a passenger boat may find this research beneficial for their early-stage operation.

For accuracy improvement, more comprehensive data can be collected for better boat operating cost estimation and evaluation. For instance, it would be more extensive if the data collected could be performed daily or weekly to estimate the exact amount of expenses and incomes generated throughout the boat operation. In addition, any other necessary data under special conditions such as public holidays and weather variability preferably might be highlighted. Furthermore, cost such as maintenance cost that are more detailed and specific basis can be collected to improve the data analysis. Case study for other locations of operation with additional cost of docking services and facilities also might be considered in future. This broader finding will significantly provide a better platform of reference for different backgrounds of boat operators and boat owners.

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