

Optimization of Parking Areas at the Bintaro Market– Bekasi City

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ABSTRACT

The problem with the Bintara Market is that there are many semi-permanent stalls in the parking lot, so that many visitors park their vehicles outside the market. There is a parking lot for motor bikes, usually passengers leave parking spaces owned by residents around the market which are managed privately at a cost of five thousand rupiah for one parking without security guarantees. Study aims to find how optimization of parking manage is carried out, how much it costs to optimize parking management, how much potential retribution income is after optimizing the increase in parking space at the Bintara Market. The method used to collect data using observation, field survey data records with supporting documentation as well as secondary data and literature. Optimization results obtained of 850 motorcycle parking spaces and 250 SRP car parking spaces, as well as the potential parking income of IDR 3,860,000/day, so that the required cost for optimization was IDR 2,109,848,925. The potential in next five years is IDR 6,948,000,000. The payback period is 2.25 years or exactly 2 years and 3 months.

Keywords: *Parking Spaces, Optimization, Survey and secondary data*

1. INTRODUCTION

Bintara Market which is located in the Bintara sub-district, Bekasi City. Uniquely, this market is opposite the Cakung Railway Station in the Pulogebang Urban Village area, East Jakarta City, only 20 meters away, while Cakung Station is a facility owned by the Ministry of Transportation as a place to pick up and drop passengers. Passengers boarding from this station are residents who live in the city of East Jakarta and the city of Bekasi. Train passengers use public transportation, online motorcycle taxis, or private vehicles to get to this station. The problem with the Bintara Market is that there are many semi-permanent stalls in the parking lot, so that many visitors park their vehicles outside the market. There is a parking lot for motor bikes, usually passengers leave parking spaces owned by residents around the market which are managed privately at a cost of five thousand rupiah for one parking without security guarantees. Optimization of the parking area needs to be done so that the mountains want to entrust their private vehicles at the Bintara market with relatively affordable costs and more guaranteed security. The results of the Bintara market parking retribution can increase the regional income of Bekasi City, and further improve services to the community. Optimization of the parking area must be done in

order to increase parking capacity so that regional income can increase, also semi-permanent buildings in the parking lot can be relocated. Based on the explanation above, the research objective is to know the parking management optimization planning, cost planning, and income that can be achieved by the manager, from the Bintara Market. This research also provides an overview of the potential income in the next 5 years, as well as calculating the payback period.

2. METHODS

The method used in this research is a quantitative research method. The location of the research was carried out at the Bintara Market, which is located in the Bintara Village, Bekasi City, West Java Province. Vehicle surveys are carried out 12 hours / day from 06.00 to 18.00, for 3 days (Saturday, Sunday and Monday) by eight surveyors with the distribution of the location as follows four people are placed at the market gate, two people in front of the Bintara on duty to observe/record the flow of vehicles on the road and two more people are placed in front of the market to observe/record the flow of pedestrians.

2.1 Data Collection:

Data needed in these study are primary data and secondary data. Primary data are data obtained from observations in field by conducting a traffic flow survey, while secondary data is obtained by seeking information from the Bekasi City Transportation Service. The data obtained from the survey results are as follows

- a. Vehicle type and volume
- b. Number of pedestrians
- c. Arrival and exit times from the parking area along with the vehicle plate number
- d. Road technical data

The number of surveyors at the research sites are as follows: Parking volume surveyors (2 people x 2 points = 4 people), Crossing volume surveyors (2 people x 1 point = 2 people), traffic flow surveyors (2 people x 1 point = 2 people)

2.2 Flow:

The research begins by determining in advance the objectives and methods to be carried out and then preparing a survey form for collecting primary data and other secondary data.

Parking Accumulation with the Formula:

$$\text{Accumulation} = Q_{in} - Q_{out} + Q_s \tag{1}$$

Q_{out} = Vehicles that leave the parking location

Q_s = Vehicles that were already at the parking location before the observations were made

Parking Duration

$$D = \frac{\sum f \cdot x}{\sum f} \tag{2}$$

D= average duration (hours/vehicle) ;

f = Number of vehicle frequencies (vehicle):

x = the median value of the duration of parking vehicles.

Parking Turnover Rate

$$TR = \frac{N_t}{(S) \cdot x(T_s)} \tag{3}$$

TR = Number turnover parking (vehicle/lot/hour)

S = Number total *stall*/lot legal (lot)

Ts = survey period (hour)

Nt = Total number of vehicles at the time of the survey (vehicles)

Parking Capacity

$$KP = \frac{S}{D} \tag{4}$$

KP = parking capacity (vehicle/hour)

S = Total lot parking

D = Average of duration parking (hour/vehicle) [7]

Indeks Parking

$$IP = \frac{\text{Akumulasi Parkir}}{\text{Petak Parkir Tersedia}} \times 100 \tag{5}$$

Table 1. Analysis of Unit Price for Optimizing the Parking lot of the Bintara Market

Item	Unit	Quantity	Unit Price	Amount
Man Power				
Worker	day	0,0283	150.000	4.245
Foreman	day	0,0028	175.000	490
		Amount		4.735
Material				
Asphalt Sprayer	Kg	0,9857	9.000	8.871
Karosene	Lt	0,143	11.000	1.573
		Amount		10.444
Tool				
Asphalt Sprayer	hour	0,0028	60.000,0	168
Compressor	hour	0,0031	150.000,0	465
Dump Truck	hour	0,0028	200.000,0	560
		Amount		1.193
Total Man power, Material, Tool				16.372
Overhead & Profit 10%				1.637
Unit Price/Liter (Tack Coat)				18.010

Where:

Q_{in} = Vehicles that enter the parking lot

Table 2. Analysis of Unit Price for Optimizing the Parking lot of the Bekasi

Item	Unit	Quantity	Unit Price	Amount
Man Power				
Pekerja	day	0,0413	150.000	6.195
Mandor	day	0,0034	175.000	595
			Amount	6.790
Material				
Filler	Kg	21,56	9.000	194.040
Asphalt	Lt	57,75	11.000	635.250
Agregat Kasar	m3	0,4993	250.000	124.825
Agregat Halus	m3	0,2547	250.000	63.675
			Amount	1.017.790
Tool				
Asphalt Mixing Plant	hour	0,0466	4.900.000	228.340
Genset	piece	0,0466	325.000	15.145
Wheel Loader	hour	0,0218	380.000	8.284
Dump Truck	hour	0,5489	200.000	109.780
Asphalt Finisher	hour	0,0151	830.000	12.533
Tandem Roller	hour	0,1975	430.000	84.925
Tire Roller	hour	0,0402	385.000	15.477
Tools	Ls	1	20.000	20.000
			Amount	494.484
Total Man power, Material, Tool				1.519.064
Overhead & Profit 10%				151.906
Unit Price/m3 (Asphalt AC-WC)				1.670.970

Parking Space Requirement

$$S = \frac{Nr \cdot D}{T \cdot f} \tag{7}$$

S = Total space requirements

Nr = Total number of vehicles at the time of the survey

D = Average of duration parking (hour/vehicle)

T = Survey period (hour)

F = Reduction factor due to parking changes, the value is between 0.85 to 0.95 road segment capacity

3. RESULTS AND DISCUSSION

3.1 Parking Characteristic

The parking vehicle survey is a data collection process by recording the vehicle plate number along with the

time of entry or exit at the Bintara market parking location. The data obtained is then compiled using the help of MS - Excel. This survey process is assisted by 8 surveyors who are distributed at the entrance or exit gates to the Bintara Market. This the parking survey data collection was carried out for 3 days, namely Saturday, Sunday and Monday representing working days and holidays. Based on the building area data in Table 3. The total building area is 10700 m², the land area used for parking is the total area minus the total building area 27,283.76 m² - 10,700 m² = 16,583.76 m²

Table 3. Total Building Area

Building	Length (meter)	Width (meter)	Area (m ²)
A	70	70	4900
B	40	25	1000
C	40	25	1000
D	40	25	1000

E	40	25	1000
F	180	20	1800
Total	10700		

3.1.1 Accumulation

The highest accumulated value of car parking on Sundays at 16.00 – 16.15 as many as 58 vehicles, this illustrates that on Sundays there are more visitors to the Bintara market while the accumulated value of bicycle parking is by car/family, while the highest motorbike is on Monday in the afternoon at 15.00 - 15.15 as many as 96 vehicles from the data can be seen using a motorcycle is considered more flexible than a car.

3.1.2 Vehicle Volume

Parking volume is number of vehicles parked in a certain place or parking area for a certain time. The volume of vehicles is obtained by adding up the vehicles that enter the parking location with the existing vehicles cumulatively. Base on survey data, it can be seen that volume of car vehicles for Saturday is 105 vehicles, Sunday is 119 vehicles and Monday is 245 vehicles while the volume for motorcycles for Saturday is 514 motorcycles, Sunday is 633 motorcycles and for Monday amounting to 751 motorcycles.[8]

3.1.3 Parking Duration

Duration states the time span of a vehicle parked somewhere in minutes or hours [1]. Parking duration is calculated using 1hour intervals. Assumes that many visitors on Sundays leave their vehicles to continue their journey by train. The duration of motorcycle parking can be seen that the volume of visitor vehicles with a maximum parking duration of 1-2 and 2-3 hours, but we can find out the average duration of the total visitors is 8.6 hours in the same way the duration of vehicles on Sunday seen longer than Saturday, because Sunday is a holiday, many housewives relax buying vegetables and other needs in preparing food and others.

3.1.4 Turnover

Turnover is the number of parking vehicles turnover in units of vehicles/SRP/hour, obtained by dividing the number of vehicles or parking volume by the number of parking spaces/plots at a certain time period. In this study, the parking lot of the non-commissioned officer market was unorganized which specializes in parking for motorbikes and cars. Survey data shows that 20% of visitors use cars and 80% use motorbikes. For further analysis, the authors focus on using Monday data, because

Monday shows the number of visitors is more than the average another survey day.

3.1.5 Parking Capacity

Parking capacity maximum number of vehicles that can be served on parking area. The size of a parking capacity will determine number of vehicles that can be fill.[8]

$\text{Parking Capacity} = 221/6.2 = 35.6$ or 36 SRP/Hour/Vehicle. With the same calculation for motorcycle capacity, we get 103 SRP/Hour/Vehicle

3.1.6 Parking Index

Parking index is a comparison between parking accumulation and its parking capacity.

Example of calculating car parking on Monday Accumulated Parking = 39 vehicles

$\text{Parking Capacity} = 36 \text{ SRP/Hour/Vehicle}$

$\text{Parking Index} = (39/36) \times 100\% = 108\%$

In the same way for motorcycles, 93% is obtained so that car parking needs to be handled in terms of parking space requirements.

3.1.7 Parking Fee

The development and administration of government in the regions requires financing in running the government, for that the regional government will optimize local revenue (PAD), seek to empower the private sector in financing development activities, sources of regional income are obtained from regional taxes, regional levies, wealth management results and others. Retribution contributes but the management of each region is different. The Bintaramarket levy and parking fees are one of the significant regional revenues in the city of Bekasi [9].

Contribution analysis, parking retribution is used to determine the contribution of parking retribution receipts in supporting regional income. This analysis is calculated by comparing the realization of parking retribution revenue with the realization of local revenue (PAD). The values of the parking characteristics above during the covid 19 pandemic, the number of vehicles has decreased in the number of vehicles, thus planning for optimizing connectivity based on trandlines by adding capacity/capacity to the parking lot. The planning for the capacity of the parking lot of the Bintara Market:

- a. Private car totaling 250 vehicles
- b. Motorcycles totaling 850 vehicles
- c. Truck cars totaling 6 units
- d. City Transport Cars totaling 12 units
- e. Bikes totaling 100 units

So the potential for parking revenue is

- a. Motorcycle 850 x IDR 3,000 = IDR 2,550,000
- b. Car 250 x IDR 5,000 = IDR 1,250,000
- c. Truck 6 x IDR 10,000 = IDR 60,000
- Total Income per day = IDR 3,860,000

certainly requires very large funds and will affect the company's finances in the long term.

$$PP = n + (a : b) \times 1 \text{ year}$$

PP = Payback Period

n = terms of investment payback period

Table 4. Cost estimation

Item	Unit	Qty	Unit Price	Amount
Preliminary				
Semi perment demolition	ls	1,00	20.000.000	20.000.000
Cansteen demoliton	ls	1,00	2.000.000	2.000.000
Measurement	ls	1,00	5.000.000	5.000.000
Mobilization & Demobilization	ls	1,00	10.000.000	10.000.000
Parking Lot Area				
Tack coat	ltr	20.000,00	18.009,53	360.190.600
AC - WC t=6 cm	m3	995,03	1.670.970,40	1.662.658.325
Finishing				
Parking sign painting	ls	1,00	20.000.000,00	20.000.000
Parking sign board	pieces	20,00	1.500.000,00	30.000.000
Total				2.109.848.925

From this analysis, the contribution of parking per day in the parking area of Pasar Bintara is IDR. 3,860,000 or IDR 115.800.000/month

Total Income next five years: IDR 115.800.000 x 12 month = IDR. 6.948.000.000

3.1.1 Cost Estimate

Optimization of parking spaces plays an important role in regional development, thus the handling of the optimization of the Bintara Market is carried out by adding parking spaces, and repairing parking lots. The budget required is presented in Table 4. Based on Table 4 above, it shows that the total cost required in optimizing the parking area of the Bintara Market is IDR. 2,109,848,925.

3.1.2 Payback Period

Payback period is a calculation that shows the length of time (usually in years) an investment will be able to return. The payback period is needed to show the comparison between the initial investment and the annual cash flow. An investment plan must be thoroughly analyzed. Investment plan analysis is basically research on whether or not a project can be implemented successfully. Analysis of the investment plan can also be done to weigh the business idea and the possibility of the business idea being implemented. Every investment project

a = Cumulative amount of cash flows in the last year (n)
 b = Cash flow in the year after the cumulative current cash flow (n + 1)

$$PP = 1 + (2,109,848,925 - 1,389,600,000 : (4,168,800,000 - 1,389,600,000)) \times 1 \text{ year}$$

$$= 1 + 0,25$$

$$= 1,25 \text{ year}$$

From the example of the payback period above, it can be seen that the payback period is 2.25 years or exactly 2 years and 3 months. Investment projects do not only involve a payback period for decision analysis. The recommended research for the future is on planning integration between transportation modes and market connectivity with train stations

4. CONCLUSION

Results of the analysis and discussion of the data from the survey of vehicles and pedestrians in the parking area of the Bintara Market, it can be concluded as follows:

- Characteristics of Bintara's Market Parking
 - a. The highest accumulated value of car parking on Sundays at 16.00 – 16.15 as many as 58 vehicles, this illustrates that on Sundays there are more visitors to the Bintara market while the highest accumulated value of motorbike parking is on Monday in the afternoon at 15.00 -15.15 as many as 96 vehicles from the data.

It can be seen that using a motorbike is considered more flexible

- b. The highest volume of car vehicles on Monday was 245 vehicles and on the same day the highest volume for motorcycles was 751 motorcycles.
- c. The duration of car parking at the Bintara market is 7.9 Sundays at most, Sundays are holidays for many buyers to buy vegetables and other needs.
- d. Turnover for parking cars and motorbikes on Monday, the turnover value is 1.1 or 1 vehicle/SRP/Hour, meaning that at that location the number of vehicles parked is smaller than number of available parking lots.
- e. The size of a parking capacity will determine number of vehicles that can be accommodated. Car parking capacity is 36 SRP/Hour/Vehicle while motorcycle is 103 SRP/Hour/Vehicle.
- f. The index for car parking is 108%. While for motorcycles, 93% is obtained, so that for parking cars, it exceeds the parking index

- **Potential Income of Parking Fee**

The parking levy for the Bintara market is one of the significant regional revenues in the city of Bekasi. The potential for parking income is 850 motorbikes x IDR 3,000 = IDR 2,550,000; Car 250 x IDR 5,000 = IDR 1,250,000; Truck 6 x IDR 10,000 = IDR 60,000 then Total Income per day = IDR 3,860,000. From this analysis, the contribution of parking per day in the parking area of Pasar Bintara is IDR 3,860,000 or IDR 115.800.000/month. Total Income next five years : IDR 115.800.000 x 12 month = IDR. 6.948.000.000

- **Cost Estimate**

Handling the optimization of parking spaces and crossing people can be obtained, the budget required for repairing parking lots, parking spaces is IDR 2,109,848,925.

- **Payback Period**

Payback period is 2.25 years or exactly 2 years and 3 months

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