Proceedings of International Conference : Problem, Solution and Development of Coastal and Delta Areas
Semarang, Indonesia – September 26th, 2017
Paper No. C-66

FEASIBILITY REVIEW OF INVESTMENT DEVELOPMENT OF PARKING BUILDING
(Case Study At Telogorejo Hospital Semarang)

Wan Okto Ariyansah
Sultan Agung Islamic University, Department of Civil Engineering
Jl. Raya Kaligawe Km.04, Semarang, Jawa Tengah, Indonesia
wanoktoariyansah88@gmail.com

Abstrak-Telogorejo Hospital Semarang is one of the centers of activities in the field of health services in the city of Semarang. The increasing number of patients, visitors, doctors, and employees using private vehicles resulted in increased volume of incoming vehicles, making it difficult to get adequate parking space. Lack of parking space causing inhibition of traffic flow, so require parking facility in the form of parking building. This study aims to analyze the characteristics of parking, parking space requirements and analyze the feasibility of investment in the construction of parking lots, especially in Telogorejo Hospital Semarang. so it can get the conclusion that the feasibility of investment in building parking Parking Hospital Telogorejo Semarang either this can be seen from the results of Telogorejo Hospital Analysis Semarang using BCR method to get the value of 1.41. Value 1.41> 1 which means the project is feasible to be implemented, because it has a high benefit value. And using the NPV method generated profit obtained is Rp. 41,622,088,410 The value of profits obtained is not so great but there is no minus (loss). Using the IRR method generated 15.58% which is above the provisions of BAPPENAS that is equal to 15.58%.

Keywords: *Feasibility, Investment of Parking Building Construction*

1. Introduction

Semarang city which is the capital of Central Java Provinceexperienced a fairly rapid development of the city. This development must be balanced with facilities and infrastructure for the population which also increased from 1993 to 2000 increased by 11.58% (BPS Kota Semarang, 2000). One source that is considered potential to contribute to the revenue of the original region is from the parking sector. Based on the City Regulation of Semarang No.9 Year 1987 the type of parking imposed in Semarang City is Public Parking, Special Parking, Parking Park, Vehicle Custody and Parking Building. Thus the public demand for transportation services to move higher and with us look at the pattern of socio-economic life of today's society that tends to obtain ease, speed and accuracy in various services.

The hospital is a facility unit for public services in this case the care of the sick. As a public facility, the hospital must provide services to the community without having to take into account the profit and loss. In addition it is expected that the hospital as an activity unit should be able to contribute as well as satisfactory service to the users of the hospital. Telogorejo Hospital Semarang is a type B hospital that is one of the centers of activities in the field of health services in Semarang City. The increasing number of patients, visitors, doctors, and employees using private vehicles resulted in increased volume of incoming vehicles, making it difficult to get adequate parking space. Lack of parking space causing inhibition of traffic flow, so require parking facility in the form of parking building

1.1. Parking

Parking is a non-moving state of a temporary vehicle with the driver leaving the vehicle or stopping for a while / long enough as needed (Zaini, 2004). The existence of

parking activities led to the existence of parking buildings. The parking building itself is a specially designed place to serve and organize, even make use of space to organize a parking activity.

Based on the purpose of parking can be divided into (Abu Bakar, 1998): (1) Passenger parking is parking that is used to raise and lower passengers. (2) Parking of goods ie parking used for loading and unloading of goods.

1.2. Parking Requirement Analysis Method

There are several methods used to determine the parkingneeds (Tamin, 2008), namely:

1) Method based on vehicle ownership
   This method assumes a relationship between the area the parking lot with the number of vehicles recorded in the city center. The higher the population, the need for parking space will increase because of increased vehicle ownership
2) Method based on building floor area
   This method assumes that the need for parking space is closely related to the number of such activities, such as: shopping centers, shops and so forth
3) Method based on the largest difference of arrival and departure
   Parking requirements obtained bycalculating the largest accumulation at intervals of observation. Parking accumulation is the number of vehicles parked at a certain place at a certain time interval, where the number of parking vehicles will never go to a place with another place from time to time.

1.3. The Parking Space

The Parking Space Unit (SRP) is an effective broad measure for putting a vehicle (passenger car, bus / truck, or motorcycle), including free space and door open width. SRP is used to measure the capacity of parking spaces. In relation to vehicle safety against impacts or scratches of other vehicles or parts of buildings (pillars, walls, or columns) then required free space side and direction of elongated direction. Here is a table of Parking Space Unit size determination

Table 1.The Parking Space

No	Transportation Type	The Parking Space(m2)
1	Passenger car class I	2.30 x 5.00
	Passenger car class II	2.50 x 5.00
	Passenger car class III	3.00 x 5.00
2	Bus / TruCk	3.40 x 12.5
3	Motorcycle	0.75 x 2.00

Source: Abubakar, 1998

In the picture below is the unit of parking space for two-wheeled vehicles (two) according to the provisions in the Ministry of Transportation of the Republic of Indonesia. The length and width is 2 meters x 0.75 meters.

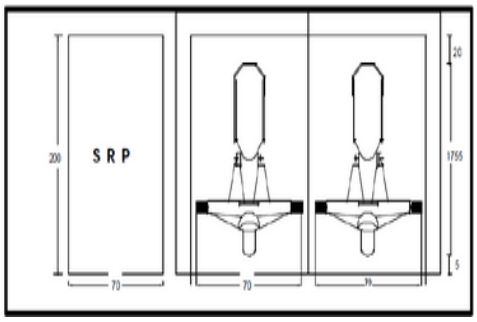

Figure 1.
Unit Parking Space For Motorcycles (in Centimeters)
Sumber : Abubakar 1998

In Figure 2.2 below is SRP for 4 wheel vehicles (four) and Table 2.3 is the size of two-wheeled vehicles for groups I, II, III.

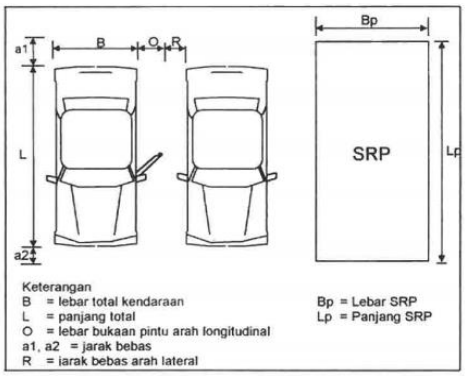

Figure 2
The Parking Space for car
Source : Abu Bakar, 1998

Table 2
Unit Parking For Private Vehicles

Class I	B = 170 O = 55 R = 55	a1 = 10 1 = 470 a2 = 20	Bp =230 = B+O+R Lp = 500 = L+a1+a2
ClassII	B = 170 O = 75 R = 5	a1 = 10 1 = 470 a2 = 20	Bp =250 = B+O+R Lp = 500 = L+a1+a2
Class III	B = 179 0 = 80 R = 50	a1 = 10 1 = 470 a2 = 20	Bp =300 = B+O+R Lp = 500 = L+a1+a2

Sumber : Abubakar 1998

Table 2 above SRP for four wheel vehicle types distinguished on its groups I, II, III. Unit Parking Space (SRP) for bus or truck car, the amount is affected by the size of the vehicle to be parked, whether small, medium or large. The concepts used as a reference for the parking space unit (SRP) of goods or bus cars can be seen also in the following table:

Table 3
Parking Space Unit Size for Bus / Truck vehicle

Bus/medium Truk	B = 200 O = 80 R = 40	a1 = 20 1 = 800 a2 = 20	Bp = 320 = B+O+R Lp = 500 = L+a1+a2
Bus/big Truk	B = 250 O = 80 R = 50	a1 = 30 1 = 1200 a2 = 20	Bp =380 = B+O+R Lp = 1250 = B+O+R

Source: Abubakar 1998

1.4. Parking Characteristics

Parking characteristics are intended as the basic properties that provide an assessment of parking services and parking problems that occur at the study site. Based on the characteristics of parking, it will be known parking conditions that occur at the study sites such as parking volume, parking time, parking capacity.

1.5. Volumeof Parking

Parking volume is the number of vehicles included in the parking charge ie the number of vehicles per specific time period. The time the vehicle used for parking, within minutes or hours, states long parking. The amount of parking is needed to determine the use of parking spaces in the study sites. (Hobbs, 1979).

1.6. Duration of Time Parking

Duration of Time Parking or parking duration is the time spent by parkers on parking spaces. Length of parking is stated in hours. A parking space will be able to serve more vehicles if used for vehicle parking in a short time compared to parking spaces used for parking the vehicle for a long time. According to the time spent on parking, parking can be classified as follows:

1) Short Time Parking
2) Parking Time Medium
3) Old Time Parking

From the length of the parking will be known the time spent for each parker parked his parking lot on every plot. Meanwhile, to know the length of parking on each vehicle in an area used the average length of parking.

The formula used to calculate the average length of parking (Oppenlander, 1976):

$$D = \frac{(Nx)\times(X)\times(1)}{Nt} \quad \text{.....2.1}$$

D : Average duration of parking or duration (hour / vehicle)
Nx : Number of vehicles parking for x intervals (vehicle)
X : total parking interval
I : Survey time interval (hours)
Nt : Jumlahtotal vehicle during survey time (vehicle)

1.7. Parking Capacity

Parking space capacity is the ability of a parking space that can accommodate vehicles, in this case is the volume of vehicles parking facilities. The vehicle parking user facility is viewed from the process of arriving, parking, and leaving the parking space. A review of the above events will provide the capacity of the parking facility. The formula used to calculate the parking capacity:

$$\frac{KP}{D} = S \quad \text{.....2.2}$$

KP : Parking capacity (vehicle / hour)
S : Total number of available official plot (plot)
D : Average parking duration (hour / vehicle)

1.8. Substitution Rate (Parking Tumover) and Level of Use

The turnover rate is obtained by the number of vehicles that have utilized the parking lot at a certain time interval divided by the available parking space. The formula used is as follows (Opperlender, 1976):

$$TR = \frac{Nt}{S \times Ts} \quad \text{.....2.3}$$

TR = Turnover rate (vehicle / SRP / hour)
Nt = Total number of vehicles during survey time
S = total stall (SRP)
Ts = Long period of analysis / survey time (hours)

1.9. Parking *Suppl*

The ability to provide parking is the size limit of the number of vehicles accommodated for a certain period of time (during survey time). The formula used is as follows(Oppenlender, 1976):

$$Ps = \frac{\Sigma(S \times Ts) \times f}{D} \quad \text{.....2.4}$$

Ps = The capacity of parked vehicles
S = Total of parking lots
Ts = Period of parking time
D = Average time of parking (hour / vehicle)
F = The abandonment factor due to parking change, (0,85 – 0,95)

1.10. Indeks Parking

Parking index is the comparison between parking accumulation with parking capacity. This value can show how much parking capacity has been filled. This IP quantity indicates whether the parking capacity is problematic or not. The formula for calculating the parking index.

$$IP = \frac{\text{Akumulasi Parkir}}{\text{Kapasitas Parkir}} \quad \text{.....2.5}$$

IP <1 means that parking capacity is not problematic
IP =1 means the need for balanced parking, normal capacity
IP >1 means the parking requirement exceeds the normal capacity

1.11. Parking plot requirements

Parking plot requirements are derived from the Parking and Parking Capacity index. Of the two formulas 2.3 and 2.5 above the required parking lot plots.

$$\text{Parking capacity} = \frac{\text{Accumulated parking}}{\text{Indeks Parking}} = \frac{\text{total Stall Parking (S)}}{\text{Duratin of Parking (D)}}$$

$$\text{Total Stall Parking} = \frac{\text{Accumulated} \times \text{durastion of parking}}{\text{Indeks Parking}} \quad \text{.....2.6}$$

2. Method

2.1. Research Site

The location of this research at Tlogorejo Hospital Semarang. Traffic lanes around the hospital include busy lane and the number of patients who use the parking area so it is necessary to note the arrangement of vehicles that enter the area Tlogorejo Hospital Semarang, and the building provided for parking

2.2. Method Of Collecting Data

Determination of data sources can be primary and secondary. Both data are performed in the current condition or the latest data. The accuracy and validity of the data should be investigated if there is a possibility of error due to both the change of land function and the data base that has been collected.

1) Primary Data

Primary data is data obtained directly in the field. Primary data obtained directly by the researchers on the research is to conduct a survey of counting vehicles in and out performed during operational time.

2) Secondary data

Secondary data is data obtained from formats that have been arranged or structured through other parties (institutions or agencies). Secondary data consist of 9 (nine) floor parking buildings, parking building cost from related sources, parking tariff cost, both progressive tariff and fixed tariff from parking manager, and estimated operational cost and parking management. Sukarno in Central Java Province obtained from BPS Central Java Province.

3. Result And Discussion

3.1. Result

3.1.1. Parking needs

The parking demand model analyst is intended to obtain a formula in the form of a regression equation that can be used as a basis for determining standard parking requirements. From the accumulation of vehicle parking throughout the day observation, conducted data analysis to calculate the average accumulation of vehicle parking that occurred at the shopping center.

3.1.2. Parking Conditions at Tlogorejo Hospital Semarang

Based on observations made by the authors show the availability of parking as follows:

Table 4. Availability of Parking Space

No.	Area	Parking space	unit
1	Basemen	300	petak
2	P1	42.00	Petak
3	P2	89.00	Petak
4	P3	92.00	Petak
5	P4	92.00	Petak
6	P5	92.00	Petak
7	P6	92.00	Petak
8	P7	92.00	Petak
9	P8	92.00	Petak
10	P9	92.00	Petak

3.1.3. Analysis of Tlogorejo Hospital Semarang

In the construction of Tlogorejo Hospital Semarang, an investment cost of Rp 68,350,000,000 is issued at the beginning and only happens once during the construction period. The components of this investment cost consist of construction costs and land purchase

1) Initial Investment

The total construction cost of construction cost is Rp.68,350,000,000. Purchase of land done by the owner, calculated the value of purchase price of land is 900.000 / m2.

2) Vehicle Parking Volume Prediction in Tlogorejo Hospital Parking Building Semarang

Prediction of parking volume that will use parking building of Tlogorejo Hospital Semarang until 10 years ahead with growth rate 9,13% per year can be seen in Parking Volume in parking building of Tlogorejo Hospital Semarang per time period limited by parking capacity during that period if the prediction of parking volume has passed the capacity then the parking volume in that year and so on equal to the volume of parking capacity.

Table 5
Total Parking Parking Prediction

No.	year	Car Volume	Motorcycle Volume
1	2017	1099200	241584
2	2018	1199636	263658
3	2019	1300071	285732
4	2020	1400507	307806
5	2021	1500942	329880
6	2022	1601378	351953
7	2023	1701813	374027
8	2024	1802249	396101
9	2025	1902684	418175
10	2026	2003120	440249
11	2027	2103555	462323
12	2028	2203991	484397
13	2029	2304426	506471
14	2030	2404862	528544
15	2031	2505297	550618
16	2032	2605733	572692
17	2033	2706168	594766
18	2034	2806604	616840
19	2035	2907039	638914
20	2036	3007475	660988

Source: Primary Data, 2017

3) Income

Revenue from Tlogorejo Hospital building Semarang from the tariff set multiplied by the volume of vehicles parking. The pricing of parking facility services will be different for each region. To fix the price of the parking facilities is depends on the price of parking facilities. The pricing of parking facilities for the parking of Tlogorejo Hospital Semarang with the first two alternatives in accordance with the provisions of the manager of Tlogorejo Hospital Semarang Rp.2000 / jam for motorcycle and the next hour Rp. 1500 / hour, for car parking fee charged Rp. 3.000 / jam and the next hour is Rp. 3000 / hour, because the average length of parking in the parking building exceeds 1 hour

Table 6. Jumlah Prediksi Volume Parkir

No.	Year	Income (car)	Income (motorcycle)
1	2017	Rp 3,297,600,000.00	Rp 483,168,000.00

No.	Year	Income (car)	Income (motorcycle)
2	2018	Rp 3,598,906,522.69	Rp 527,315,765.03
3	2019	Rp 3,900,213,045.38	Rp 571,463,530.06
4	2020	Rp 4,201,519,568.08	Rp 615,611,295.08
5	2021	Rp 4,502,826,090.77	Rp 659,759,060.11
6	2022	Rp 4,804,132,613.46	Rp 703,906,825.14
7	2023	Rp 5,105,439,136.15	Rp 748,054,590.17
8	2024	Rp 5,406,745,658.84	Rp 792,202,355.20
9	2025	Rp 5,708,052,181.54	Rp 836,350,120.22
10	2026	Rp 6,009,358,704.23	Rp 880,497,885.25
11	2027	Rp 6,310,665,226.92	Rp 924,645,650.28
12	2028	Rp 6,611,971,749.61	Rp 968,793,415.31
13	2029	Rp 6,913,278,272.30	Rp 1,012,941,180.34
14	2030	Rp 7,214,584,795.00	Rp 1,057,088,945.36
15	2031	Rp 7,515,891,317.69	Rp 1,101,236,710.39
16	2032	Rp 7,817,197,840.38	Rp 1,145,384,475.42
17	2033	Rp 8,118,504,363.07	Rp 1,189,532,240.45
18	2034	Rp 8,419,810,885.77	Rp 1,233,680,005.47
19	2035	Rp 8,721,117,408.46	Rp 1,277,827,770.50
20	2036	Rp 9,022,423,931.15	Rp 1,321,975,535.53
		Rp 123,200,239,311.50	Rp 18,051,435,355.31

Source: Primary Data, 2017

Based on Table 4:13 that income for 20 Years in front of parking building Tlogorejo Hospital Semarang amounted:

Car : Rp123,200,239,311.50
Motorcycle :Rp 18,051,435,355.31+
Total : Rp 141,251,674,666.80

3.1.4. PresentWort Cost

Presentwort cost is the sum of all construction and operational costs of the building.

cost of building construction = Rp. 68,350,000,000.00
Operational cost of building = Rp. 31,279,586,256.00 +
Total = Rp. 99,629, 586,256.00

3.1.5. Analysis BCR

$$BCR = \frac{\sum benefit}{\sum cost}$$

$$= \frac{Rp\ 141,251,674,666.00}{Rp.99,629,586,256.00} = 1.41$$

BCR = 1.41 > 1 , so the construction of Tlogorejo Hospital Semarang is feasible to be implemented.

3.1.6. Analisis NPV

NPV = Benefit – Cost
= Rp 141,251,674,666.00 -Rp. 99,629, 586,256.00

= Rp. 41,622,088,410

3.1.7. Analysis IRR

The feasibility of building construction can be determined after we calculate the IRR value. IRR calculation using trial and error method. By using Present Worth method try with interest rate i = 14% and i = 20%. that the 14% IRR Analysis with 14% factor value obtained in the next 20 years is Rp 123,874,600,548.59 And 20% IRR Analysis with 20% i factor value obtained in the next 20 years is Rp 101,054,951,418.00

i = 14% ; Present worth =(Rp123,874,600,548- Rp.68,350,000,000)
= +Rp. 55,524,600,548.00

i = 20% ; Present worth =(Rp101,054,951,418.– Rp.68,350,000,000)
= +Rp. 32,704,951,418.00

From these results to get the interest rate IRR = 0, it is necessary to interpolate:

$$\frac{i-14}{20\%-14\%} = \frac{0-55{,}524{,}600{,}548.00}{32{,}704{,}951{,}418.00-55{,}524{,}600{,}548.00}$$

$$i = 14\% + \frac{0-55{,}524{,}600{,}548.00}{32{,}704{,}951{,}418.00-55{,}524{,}600{,}548.00} x(20\%-14\%)$$

= 15.58

4. Conclusion and Suggestion

4.1. Conclusion

Based on the results of the analysis in the previous chapters then the researchers can give some conclusions as follows:

1) Characteristics of parking at Telogorejo Hospital Semarang covering volume, accumulation, duration, turnover rate, capacity and parking index is sufficient parking area provided
2) The need for parking space at Telogorejo Hospital Semarang seen from Parking and Parking Capacity index, for parking capacity at Telogorejo Hospital Semarang is sufficient.
3) The feasibility of investment in the construction of Telogorejo Hospital Hospital parking can be seen from Telogorejo Hospital Semarang analysis using BCR method to get the value of 1.41. Value 1.41> 1 which means the project is feasible to be implemented, because it has a high benefit value. And using the NPV method generated profit obtained is Rp. 41,622,088,410 The value of profits obtained is not so great but there is no minus (loss).
4) Using the IRR method generated 15.58% which is above the provisions of BAPPENAS that is equal to 15.58%.

4.2. Suggestion

1) It is necessary to make parking boundaries in the form of a line of markers on parking lots that have not been equipped with parking marks, so that no vehicles are parked carelessly and conducted research using other survey methods, such as using interview surveys thereby reducing the demand for parking at the study site.
2) Need to find another location to be able to increase the existing parking space for example by making parking facilities on the floor under the plan of new buildings that will be built, considering the existence of land that is not possible anymore so that later can meet the demand for parking.

References

Abubakar, I.1998.Pedoman Perencanaandan Pengoperasian Fasilitas Parkir, Direktorat Jenderal Perhubungan Darat Departemen Perhubungan. Jakarta.

Adler, H.A., 1982. Evaluasi Ekonomi Proyek-Proyek Pengangkutan, Pedoman dengan 15 studi kasus, Penerbit UniversitasIndonesia, Jakarta.

Badan Pusat Statistik. 2000. Indikator sosial ekonomi indonesia. Badan Pusat Statistik Indonesia. Jakarta.

Departemen Perhubungan. 1996. Keputusan Direktur Jendral Perhubungan Darat Tentang Pedoman Teknis Penyelenggaraan Fasilitas Parkir, Jakarta

Direktorat BSLLAK, (1998). Pedoman Teknis Penyelenggaraan Fasilitas Parkir . Jakarta

Direktorat Jenderal Perhubungan Darat, 1995, Petunjuk Teknis Lalu Lintas dan Angkutan Jalan, Departemen Perhubungan, Jakarta

Giatman, M. 2006. Ekonomi Teknik. Jakarta: PT. Raja Grafindo Persada.Indriantoro, N dan Bambang, S. 2002. Metodologi Penelitian Bisnis.Yogyakarta: BPFE-Yogyakarta.

Hobbs, F.D, 1995, Perencanaan dan Teknik Lalu Lintas, Edisi Kedua, Gadjah Mada University Press, Yogyakarta

Kasuma Narendra IG. 2011. Analis Kelayakan Finansial Rencana Pembangunan Gedung Parkir Bertingkat Di Pasar Lokitasari. Program Magister. Program Studi Teknik Sipil. Universitas Udayana.

Kodoatie, R.J. 1995. Analisis Ekonomi Teknik, Penerbit Andi Offset, Yogyakarta.

Lisan Fashikhul M. 2015 Studi Kelayakan Pembangunan Gedung Parkir Ponpes Amanatul Ummah Desa Kembang Belor Kecamatan Pacet Mojokerto, Jurnal Teknik Sipil. Universitas 17 Agustus 1945 Surabaya.

LPKM - ITB, 1997, Modul Pelatihan, Studi Kelayakan Proyek Transportasi, Lembaga Pengabdian kepada Masyarakat ITB bekerjasama dengan Kelompok Bidang Keahlian Rekayasa Transportasi Jurusan Teknik Sipil ITB, Bandung

Oglesby, Clarkson H; Hicks, R Gary. (1993) Teknik Jalan Raya edisi keempat. Erlangga. Jakarta.

Oppenlender, J.C. 1976. Manual of Traffic Engineering Studies, Institute of Transportation Engineering Washington DC.

Soeharto, I. 1995. Manjemen Proyek (Dari Konseptual sampai Operasional). Gelora Aksara Pratama.

Sugita Inyoman. 2011. Kajian Kelayakan Finansial Pembangunan Gedung Parkir Universitas Udayana Di Jalan Sudirman Denpasar. Program Magister. Program Studi Teknik Sipil. Universitas Udayana.

Tamin, O.Z. 2008. Perencanaan, Pemodelan dan Rekayasa Transportasi, Edisi Ketiga, ITB, Bandung.

Warpani, Suwardjoko. 1990. Merencanakan Sistem Perangkutan. Bandung : Penerbit ITB.