ANALYSIS OF PARKING UTILIZATION IN OFFICE AREA (CASE STUDY: KANTOR DINAS PENDIDIKAN ACEH DAN KANTOR KPP PRATAMA BANDA ACEH)

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ABSTRACT-- *Availability of parking space is a thing that must be considered in urban areas so that parking does not occur on the road, especially in office areas. Aceh Education Office and Banda Aceh KPP Office is located in the area of Tgk. H. Mohd. Daud Beureueh Banda Aceh has a parking problem. Lack of parking space in this office causes parking on the road. The purpose of this study is to study the needs of parking lots and alternative parking problem solving based on experts. Data collection is done by observation, primary data collection in the form of parking volume, parking capacity, parking duration, and key informants from experts. the analysis result of parking space needs in these two offices is not enough, The Aceh Education Service Office with 18 units of existing SRP for 4-wheeled vehicles while the actual needs are 28 units, for the KPP Pratama office with 17 units of existing SRP of 4-wheeled vehicles, the actual actual needs of 21 units. based on interviews analysis with relevant agencies, it is necessary to add parking space according with the number of employees and office buildings area that lack of parking space and to make a policy to limit the use of private cars so there will be enough parking space. One of the recommendations for solving the parking problem at the Aceh Education Office and Banda Aceh KPP office is to plan a new parking area by using the vacant land at the location of the former BPD office (land burnt).*

Keyword -- Availability of parking Off-Street Parking, key informant

I. INTRODUCTION

The increasing needs of the community for mobility in their lives can give a positive value to the number of existing transportation movements. This need is followed by increased transportation facilities, both passenger transportation and goods and services. This can cause a fairly high traffic density on some roads and parking on the road.

Lack of parking facilities (courtyards or buildings) in certain areas of the city, causes the road body to become a parking lot. In general, vehicles parked on the road are around places or activity centers such as offices, school, economic activity center or trade center.

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One of the reasons for the increased use of road bodies as parking facilities on road bodies is the result of widening road sections and changes in the direction of traffic flow in certain areas. Banda Aceh City as the Capital of the Province has quite a number of offices. Jalan Tgk. H. Mohd. Daud Beureueh is one of the central office areas because there are several government offices that deal with public services. The Aceh Education Service Office and Banda Aceh KPP have problems relating to the lack of parking space, causing on-street parking. The number of employees and visitors who use private vehicles that are not accommodated in the parking lot that has been caused parking on the road.

The purpose of this study was to analyze parking needs for cars at the Aceh Education Office and Banda Aceh KPP Office based on parking characteristics and the perception of experts to solve parking problems and provide recommendations on parking problems at the Aceh Education Office office and Banda Aceh KPP Office.

II.   LITERATURE REVIEW

1.1   Definition of Parking

According to PP No. 43 of 1993, parking is defined as a vehicle that stops at certain places whether stated by signs or not, and not solely for the purpose of getting people in and off the car or goods. While Hobbs (1995) states that parking is a place to park vehicle on its way to its destination, while the driver or passenger do some business.

2.2   Parking Problems

According to Wells (1985), with only 3 (three) vehicles parked on a 1 km stretch of road, effectively reducing the pavement width from 5.50 m (18 ft) to 4.60 m (15 ft), which can result reduction in effective pavement width due to parking can reduce road capacity.

Although there are various disadvantages, parking on one side of the road is allowed if the roads have about 10 m widht, two-way traffic flow, the volume does not exceed 400 vehicles / hour or in unidirectional traffic with a volume of less than 600 vehicles / hour. Nearby pedestrians are not too crowded and few pedestrians cross the road (Hobbs, 1995).

2.3   Parking Characteristics

According to Hobbs (1995), parking characteristics include: parking accumulation, parking volume, parking duration, parking turnover and parking index. Parking accumulation is the number of vehicles parked in a place at a certain time.

The duration of a car in the sense of Tamin (2003) is the time of a vehicle parked at a place (in units of minutes or hours). Duration = Tout - Tin

Where:

Tin = time when the vehicle entered the parking location;

Tout = time when the vehicle exits the parking location.

Average parking duration is the average length of parking time for all vehicles.

$$D = \frac{(d1 + d2 + \cdots + dn)}{n} \qquad\qquad (1)$$

Where:

d = vehicle duration;

n = number of vehicles parked.

2.3.1. Parking Accumulation

Tamin (2003) states that the accumulation of parking is the number of parking vehicles in a place at a certain time interval, where the number of parking vehicles will never be the same in one place with another place from time to time.

$$\text{Accumulation} = Q_{in} - Q_{out} + Q_s \qquad (2)$$

Where:

Q_{in} = number of vehicles entering the parking location;

Q_{ou} = number of vehicles exiting the parking location;

Q_s = the number of vehicles that were in the parking location before the observation was made.

2.3.2. Parking Substitution Rate

Parking turnover rate is obtained from the number of vehicles that have used the parking lot at certain intervals divided by available parking spaces (Tamin, 2003).

$$Turnover = \frac{Qp}{\text{Petak parkir tersedia}} \qquad (3)$$

Where:

Qp = number of parking vehicles per time period certain, such as from 8.00 until 17.00 WIB

2.3.3.Usage Level

The level of use is obtained from vehicle accumulation at specified intervals divided by available parking spaces multiplied by 100% (Tamin, 2003).

$$\text{Usage Rate} = ((\text{accumulated parking})) / ((\text{parking lot available})) \text{ x10} \qquad (4)$$

2.3.4. Parking Volume

According to Hobbs (1995), parking volume is the number of vehicles included in the parking load (number of vehicles per specified time period, usually per day).

$$V = Nin + X \qquad (5)$$

Where:

Nin = number of vehicles entering (kend);

X = Vehicle that existed before time

observation (kend).

2.3.5 Parking Capacity

Parking capacity is the number of vehicles that can be served by a parking lot during service time (Directorate General of Land Transportation, 1998).

$$KP = S / D \qquad (6)$$

Where:

KP = parking capacity (vehicle / hour);

S = total number of official plots;

D = average parking time (hours / vehicles).

2.3.6 Parking Index

Parking index (IP) is the percentage of the accumulated number of vehicles at a specified time interval divided by available parking space multiplied by 100% or size to express the road length equation and expressed by the percentage of space occupied by parking vehicles (Tamin, 2003).

$$IP = ((Accumulated \times 100\%)) / (Parking\ lots\ available) \qquad (7)$$

Where:

IP <1; meaning that parking capacity is not problematic.

IP = 1; means that the parking capacity is normal / balanced.

IP> 1; means that the parking capacity exceeds the normal capacity.

2.3.7. Number of Parking Plots

Parking lot is the number of vehicles parked at a certain time multiplied by the average parking duration divided by the length of time of observation (Diana, 2010).

$$Z = ((Qp \times D)) / T \qquad (8)$$

Where:

Z = number of parking spaces;

Qp = number of vehicles parked per period certain time, for example from 08.00 to
     17:00 WIB;

D = average parking duration (hours);

T = duration of observation period (hour).

2.4 Parking Space Unit (SRP)

Unit of parking space abbreviated as SRP is an effective size to place a vehicle in this case a passenger car, bus / truck, or motorcycle, both parallel parking alongside the road, parking lot or parking building. SRP must consider the free space and width of the door opening and for certain things if, without explanation, the SRP used is SRP for passenger cars (Directorate of City Transport Traffic System Development). According to Diyanti et al (2003), a large determination of the following considerations:

1. Standard vehicle dimensions;

2. Free space for parking vehicles;

3. Vehicle door opening width.

The determination of parking space units for each type of vehicle has been analyzed in such a way and with several approaches. SRP determination is divided into three types of vehicles and based on SRP determination for passenger cars are classified into 3 (three) groups. For more details in determining the unit of parking space for various types of vehicles can be seen in the following table:

No.	Jenis Kendaraan	Pengguna dan/atau peruntukan fasilitas parkir	SRP dalam m^2
1.	a. Mobil Penumpang Gol. I	Karyawan/pekerja kantor, Tamu / pengunjung pusat kegiatan perkantoran, perdagangan, pemerintahan, universitas.	2,30 x 5,00
	b. Mobil Penumpang Gol. II	Pengunjung tempat olahraga,pusat hiburan/ rekreasi, hotel,pusat perdagangan eceran/ swalayan, rumah sakit, bioskop.	2,50 x 5,00
	c. Mobil Penumpang	Orang cacat	3,00 x 5,00
2.	Bus/Truk		3,40 x 12,50
3.	Sepeda Motor		0,75 x 2,00

Sumber : Direktorat Jenderal Perhubungan Darat (1998).

III. RESEARCH METHODS

3.1 Research sites

The locations chosen for this research are the Aceh Education Office and Banda Aceh KPP, located on Tgk. Daud Beureueh borders on the north of Grapari Telkomsel, on the west of the BPBA office and on the east of Bank Aceh (already on fire). The location limitation of this research is the roads around the Aceh Education Office and Banda Aceh KPP. The road is the Tgk. Chik Kuta Karang which is next to KPP Pratama, Tgk. Chik Malem I is behind the two offices and is next to the Aceh Education Office.

3.2 Method of collecting data

This study uses observation and data collection consisting of primary data and secondary data. Observations were made to determine the condition of parking in the study site.

3.2.1. Primary Data

Primary data is data obtained directly at the Aceh Education Office and Banda Aceh KPP, by conducting surveys and observations in the field, the observations made are as follows:

1. Survey parking needs.

Analysis of parking space requirements is based on parking characteristics, while the data required is data on the number of vehicles, parking duration and parking accumulation at the study site.

a. Parking volume

Data is collected by counting the number of vehicles that have used parking space on one day of observation.

b. Parking Duration

Retrieval of field data using a method based on the biggest difference between arrivals and departures.

c. Parking accumulation

Parking accumulation is the number of vehicles parked in the parking lot at specified intervals, where the number of vehicles parked will never be the same in one place with another place from time to time.

2. Key Informant Interviews

Key informants who will be used as a guest speaker consist of relevant expert officials and experts in the field of transportation. The sample used for experts each amounted to 1 (one) person, taken from each of the relevant agencies, consisting of: Dinas Perhubungan, Komunikasi dan Informatika Aceh, Dinas Perhubungan, Komunikasi dan Informatika Kota Banda Aceh, Kantor Dinas Pendidikan Aceh dan KPP Pratama Banda Aceh, and academic (Civil Engineering lecturer in Tranportation). Interview were conducted directly with the experts by visiting the offices the relevant agencies.

3.2.2. Secondary Data

Secondary data is data that was first collected and reported by people or agencies outside of the researchers themselves. Secondary data were obtained from relevant agencies and existing literature. In this study secondary data in the form of a map of the City of Banda Aceh, Map of the Aceh Education Office and the Banda Aceh KPP, Parking Laws, and related literature.

IV. DISCUSSION RESULT

4.1. Parking Characteristics Analysis

4.1.1. Parking Volume

Table 4.1: Recapitulation of vehicle parking volumes (1/2)

No	Lokasi	Hari Pengamatan	Jumlah Kendaraan Selama 9 Jam (Kend)	Jumlah Rata-rata Kend. (Kend/Jam)
1	Kantor Dinas Pendidikan Aceh	Senin	117	13

Table 4.1: Recapitulation of vehicle parking volumes (2/2)

No	Lokasi	Hari Pengamatan	Jumlah Kendaraan Selama 9 Jam (Kend)	Jumlah Rata-rata Kend. (Kend/Jam)
	Kantor Dinas Pendidikan aceh	Rabu	108	12
		Jum'at	91	10
	Rata - rata		105	12
2	Kantor KPP Pratama Banda Aceh	Senin	111	12
		Rabu	115	13
		Jum'at	90	10
	Rata - rata		105	12

Parking Accumulation

Table 4.2: Highest parking accumulation during the survey period

Hari	Jumlah Kendaraan (Kend)	Jam Akumulasi Tertinggi (Jam)	Akumulasi Tertinggi (Kend/Jam)
1	Kantor Dinas Pendidikan Aceh		
Senin	117	10.00 - 10.15	20
Rabu	108	10.00 - 10.15	28
Jum'at	91	10.00 - 10.15	23
Rata-rata			23,67
2	Kantor KPP Pratama Banda Aceh		
Senin	111	10.15 - 10.30	21
Rabu	115	14.45 - 15.00	19
Jum'at	90	08.45 - 09.00	18
Rata-rata			19,33

Parking Change Rate

Tabel 4.3: Tingkat Pergantian Parkir

Hari	Jumlah Kendaraan (Kend)	Jumlah Petak	Tingkat Pergantian Parkir
1	Kantor Dinas Pendidikan Aceh		
Senin	117	18	6,500
Rabu	108	18	6,000
Jum'at	91	18	5,056
Rata-rata			5,852
2	Kantor KPP Pratama Banda Aceh		
Senin	111	17	6,529
Rabu	115	17	6,765
Jum'at	90	17	5,294
Rata-rata			6,196

Table 4.3 shows that the average value of the level of car parking change at the Aceh Education Office is 5.852 Vehicles / SRP / Hour or every hour a car park serves 6 vehicles, and the average value of the level of car parking change at the KPP Pratama Office Banda Aceh is 6,196 Vehicles / SRP / Hour or every hour a parking lot serves 6 vehicles.

4.2 Parking Duration and Average Parking Duration

Table 4.4 shows that the average duration of car parking reaches more than two hours. This happened because some of the people parked were not only staff / employees at the Aceh Education Office and the Banda Aceh KPP Office but visitors to both offices.

Table 4.4: Average Parking Duration

Lokasi Parkir	Hari	Rata-rata Durasi Parkir (Jam/Kendaraan)
Kantor Dinas Pendidikan Aceh	Senin	2,205
	Rabu	2,142
	Jum'at	1,975
Rata -rata		2,107
Kantor KPP Pratama Banda Aceh	Senin	2,032
	Rabu	2,126
	Jum'at	1,864
Rata - rata		2,007

4.3 Parking Capacity

Parking capacity is the maximum ability of parking spaces to accommodate vehicles. Based on direct observations in the field, the available parking capacity at the Aceh Education Office and Banda Aceh KPP Office is not in accordance with the existing building area and staff / staff. From the survey results and data analysis, it can be seen the parking capacity for vehicles parked at each study location is as in Table 4.5 below:

Table 4.5: Parking Capacity

Lokasi	Jumlah Petak (S)	Rata-rata Durasi Parkir (D)	Kapasitas Parkir KP = S/D
	SRP	Jam/Kend	Kend/Jam
Kantor Dinas Pendidikan Aceh	18	2,107	8,542 = 9
Kantor KPP Pratama Banda Aceh	17	2,007	8,469 = 9

4.4 Parking Index

Table 4.6 shows that parking conditions have a parking index greater than 100% or IP> 1. This shows that in these conditions the accumulation of parking exceeds the existing parking capacity.

Table 4.6: Parking Index

Lokasi	Waktu	Akumulasi	Petak Parkir	Indeks Parkir (%)
Kantor Dinas Pendidikan Aceh	Senin	20	18	111
	Rabu	28	18	156
	Jum'at	23	18	128
Kantor KPP Pratama Banda Aceh	Senin	21	17	124
	Rabu	19	17	112
	Jum'at	18	17	106

4.5 Number of Parking Plots

Parking lots are the number of vehicles parked at a certain time multiplied by the average parking duration divided by the length of time of observation. The following table 4.7 shows the number of parking lots.

Table 4.7: Number of Parking Plots

Lokasi	Jumlah Kendaraan yang Parkir (Qp)	Rata-rata Durasi Parkir (D)	Waktu Pengamatan (T)	Jumlah Petak Parkir (Z)
		Jam	Jam	
Kantor Dinas	117	2,205	9	29
Pendidikan	108	2,142	9	26
Aceh	91	1,975	9	20
Rata -rata				25
Kantor KPP	111	2,032	9	25
Pratama Banda	115	2,126	9	27
Aceh	90	1,864	9	19
Rata -rata				24

Based on the table above, it can be concluded that on Monday and Wednesday, the number of parking lots available is smaller than the parking requirements. The results of the analysis on Friday, the number of parking lots needed is smaller than the available parking lots, this is because many employees do not return to the office after lunch. The results above indicate that there must be an increase in the number of parking lots in both offices.

4.6 Calculation of Parking Amount Needs

Parking facility standards are a guideline for determining parking stalls according to various forms of supply. In this study the standard parking space unit (SRP) used in this study is for 4-wheeled vehicles (2.5 m x 5.0 m). the need for parking lots or parking lots or parking lots based on SRP can be seen in Table 4.8 below:

Table 4.8: Calculation of Parking Amount Needs

Lokasi	Jumlah SRP/ Petak Parkir yang tersedia	Ukuran SRP (M²)	Indeks Parkir Tertinggi	Luas Kebutuhan SRP (M²)	Jumlah SRP/Petak Parkir yang dibutuhkan
	A	B	C	d = c x a x b	e = d/b
Kantor Dinas Pendidikan Aceh	18	12,5	156%	351	28
Kantor KPP Pratama Banda Aceh	17	12,5	124%	264	21

Based on the table above, the number of parking needs in the Aceh Education Office is 28 units while the number of parking lots available is only 18 units, as well as in the Banda Aceh KPP Pratama office, the number of parking needs is 21 units, 17 units are available, it can be concluded that the need Insufficient parking at both offices.

V.   CONCLUSIONS AND SUGGESTIONS

4.2. Conclusion

From the analysis of parking requirements, the following conclusions can be drawn:

1.   The highest parking index in the off street parking office of the Aceh Education Office is seen on Wednesday at 156% / 15 minutes, while the highest parking index at the Banda Aceh KPP office is seen on Monday at 124% / 15 minutes. This indicates that the vehicle volume has exceeded the parking capacity.

2.   The need for parking space currently needed at the Aceh Education Office is 28 units / plot, for the KPP Pratama office the need for parking space is 21 units / plot.

3.   the results of the analysis based on interviews with experts known alternative solutions to parking problems in both offices are:

4.   Aceh's Department of Transportation, Communication and Information needs to add parking lots in accordance with the number of employees and building area to avoid parking on the road.

5.   The Banda Aceh Transportation, Communication and Information Agency emphasized that offices with insufficient parking lots issued a policy to limit the use of private cars so that there was sufficient parking space.

6.   According to Academics, it states that this office is an office that has a small parking area. When viewed from its function, this office is a public service facility that should not only pay attention to parking spaces for employees, but also for visitors so that there is no on-street parking.

5.2 Suggestion

Based on the conclusions obtained from the above research results, it is recommended:

1. Research needs to be conducted using other survey methods, for example the analysis of parking user behavior and the determination of parking policies at the study site.

2. Parking restrictions must be made in the form of markers on parking plots that do not yet have parking markers, so that no vehicles are parked carelessly.

3. It is necessary to look for other locations to be able to add to the existing parking spaces, for example by making parking facilities on the lower floor of a new multi-storey building plan to be built, given the existence of land that is no longer possible so that later it can meet parking demand.

REFERENCES

1. Direktorat Jenderal Perhubungan Darat, 1998, Pedoman Teknis   Penyelenggaraan Fasilitas Parkir, Perhubungan, Jakarta.

2. Direktorat Perhubungan Darat, 1993. Prasarana dan Lalu Lintas Jalan. PP No. 43.

3. Diyanti, A.J., dkk., 2003. Studi Karakteristik Parkir di Lingkungan Kampus Universitas Hasanuddin. Simposium VI FSTPT, Universitas Hasanuddin, Makassar. Hobbs, F.D., 1995. Perencanaan dan Teknik Lalu Lintas, Penerbit UGM Press, Yogyakarta.

4. Tamin, O.Z., 2003. Perencanaan dan Pemodelan Transportasi, Penerbit ITB, Bandung. Undang-undang No.14, Tahun 1992. Lalu Lintas dan Angkutan Jalan.

5. Wells, G.R., 1985. Comprehensive Transport Planning, Charles Griffin, London