An Analysis of The Road Parking At The Area of Laelangi Market In Baubau City, Southeast Sulawesi Province - Indonesia

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Abstract: An increasing number of vehicles showed better economic level in society, resulting in increased mobility of people and give rise to the movement of high and needs space parking facility. The phenomenon that occurs at the area of Laelangi market in Baubau city is parked vehicles occurred on the road and have an impact on traffic congestion on the peak hours, it will conduct research of the phenomenon. This research aims to develop a concept of spatial parking and explain the capacity and effectiveness of parking based on the parking layout and needs parking area on Laelangi market in Baubau city, so it becomes an input to the policy makers. This research uses descriptive quantitative method to analyze the characteristics of the park to find parking capacity, the volume of parking, the accumulated parking, usage levels of parking, and the parking demand both two wheelers and four wheels that use the parking area during the week (Monday up to Sunday) begin at 06.00 pm until 18.00 pm. The results showed that the concept of spatial planning is necessary a parking on the location of Laelangi market in Baubau city and recommend vertical parking spaces (Parking Garage) due to the availability of parking spaces, as well as management parking good to be a source of Local Revenue.
Keywords: Road parking, , space capacity, the growth of the vehicle.

I. INTRODUCTION

In the rapid development and progress of the region, the need for parking is very important to accommodate community activities and traffic of the city. Urban areas with population densities and high economic levels resulting in personal vehicle ownership rate are high and a problem in parking provision. Increased construction in particular city business centers was not yet able to provide sufficient parking area, so that the road around it is used for parking space, causing traffic problems (speed decreased and increased travel time).

Parking service facilities is a substantial problem that often occurs in large cities and towns that are developing in Indonesia, is also happening in Baubau city. This is due to the difficulty of obtaining parking spaces, especially in the area of offices and shopping centers. The parking issue was predominantly due to the limited available land and high land prices. Also due to an imbalance between the ratio of vehicles to be accommodated with the existing parking area, so that the areas of parking a vehicle will run over along the way at shopping centers and offices, and the impact on the problem of congestion in the region. This happened at the Laelangi market in Baubau city.

According to Abubakar et al, 1998. Parking is defined as a state of no movement of a vehicle that is not temporary; parking included in the definition is any vehicle that stops at certain places either by manual signs or not, and not solely for the sake of raising or lowering the people or logistics [1]. According Morlok 2010. Parking facilities are classified according to three main characteristics, the first is whether the parking is provided on the road or off the road, which both depends on whether the park was carried out by the driver himself and by special parking attendant and the third is the difference facility single storey or storey parking lot [2].

Availability of the parking on the area of Laelangi market is urgently needed, the authority to determine the provision of parking facilities are to be fully authorized by the local government. The absence of parking area at the areas of Laelangi market traders and visitors to use the street to park the vehicle, both of which use two-wheeled vehicles and four wheels, resulting in reduction of the width of the road that always leads to chaos and congestion at these locations.

II. OBSERVATIONS AND METHODS

This research was conducted in the area of Laelangi market in Baubau city as in Figure 1. The selection of this area is caused at the Laelangi market surrounded by roads namely Kartini Road, Sudirman Road, Mongensidi and D.I. Panjaitan Road which the segment is already happening streets parking chaos resulting in accumulation of vehicles that cause congestion on the road segment. If the area of the parking lot is not created

for a special parking place, then it will cause problems in the future congestion on road segments that exist around the market of Laelangi in Baubau city.
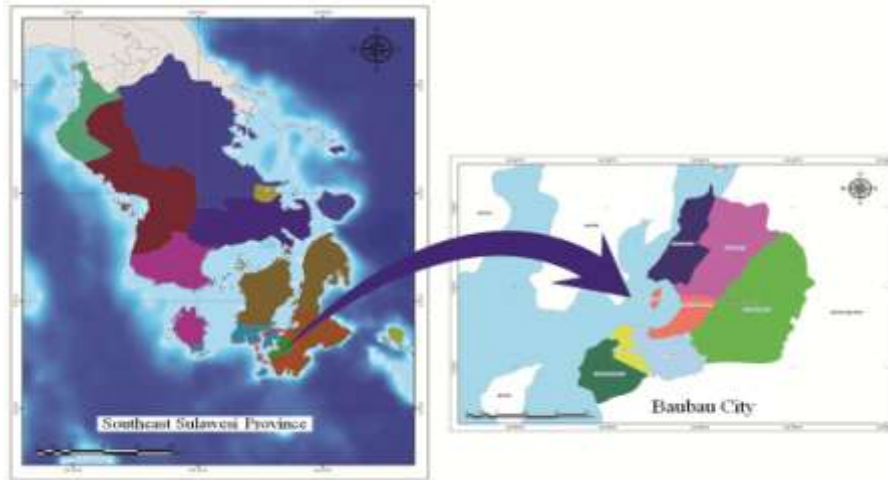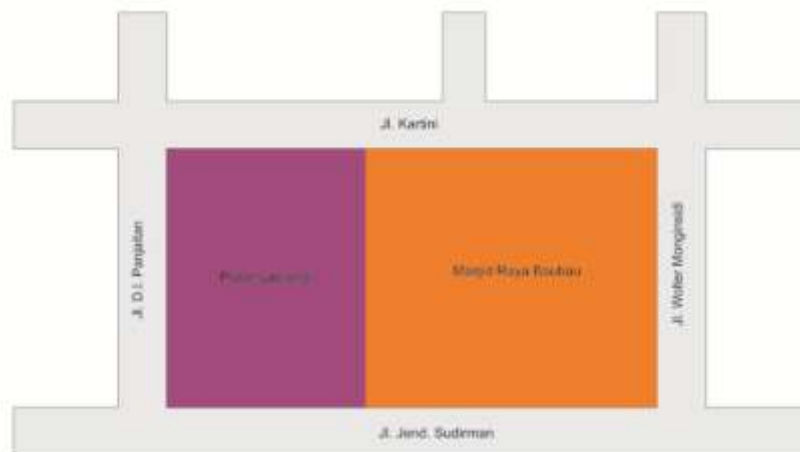

Figure 1. Locus of Research

Figure 2. Locus of Research

Data retrieval is done by Surveyor on the area activities parking of vehicles on the road at the site of the research that Laelangi market in Baubau city as shown in Figure 2. The Surveyor placed on each road namely R. A. Kartini Road, Sudirman Road, Mongensidi and D.I. Panjaitan Road. Each surveyor on the road section will record the number of vehicles as well as vehicles parked long time, as well as measure the dimensions of the road into a parking area either vehicle two-wheeled or four or pickup and truck/canvas porters. Observations were made for seven days (a week) and starts at 06.00 pm until 18.00 pm every day by dividing four periods of analysis that are; Period I   is an analysis of parking that occurs between the hours of 6:00   to   09:00   a.m, Period II is an analysis of parking that occurs between the hours of 09:00 to 12:00 am, Period III   is an analysis of parking that occurs between the hours of 12:00 to 15:00 pm, and Period IV is an analysis of parking that occurs between the hours of 15:00 to 18:00 pm.

Data were analyzed using quantitative methods in accordance problems occurred by analyzing the characteristics of parking related to the large number of parking needs to be provided Hobbs in 1995 [3], based on the capacity of the road, parking capacity of the road, the volume of parking, the accumulation of parking of vehicles parked at a spot on specific time which shows the parking load per a specified time period, calculated as follows:

The capacity of the road

$$C = C_o \times FC_W \times FC_{sp} \times FC_{sf} \times FC_{cs} \qquad (1)$$

$$C = C_o \times FC$$

Where:

C = capacity of roads (pcu/hour)
Co = basic capacity (pcu/hour)
FC = Correction factors
FCw = adjustment factor width of traffic lanes
FCsp = adjustment factor separation direction
FCsf = adjustment factor due to side friction
FCcs = adjustment factor size cities

Accumulated Parking = $Ei - Ex + X$ (2)

by:

Ei = Entry (vehicles entering the parking area)
Ex = Exit (exit the vehicle parking area)
X = the number of vehicles that have been parked before the observation

The duration of parking is the span of a vehicle parked in a parking space in one unit of time, whereas to determine the average length of the parking of all vehicles during the time of the survey can be seen from the following formula Oppenlender 1995. [4] Calculated using the formula:

$$D = \frac{\Sigma(Nx).(X).(I)}{Nt} \quad (3)$$

D : average parking duration (h/vehicle).
$\Sigma(Nx)$: The number of vehicles parked for x interval
X : The number of intervals.
I : The time interval surveys (h).
Nt : The total number of vehicles during the survey period.

Parking space requirement is calculated using the formula:
KRP = Parking Volume x SRP (motorcycle/car)

Parking Turn over (PTO) that parking turn over rate indicates the level of use of a parking space in a certain time unit. Parking turn over rate indicates the level of use of parking space, calculated by the formula:

$$PTO = \frac{\text{The number of vehicles entered in one period}}{\text{Accumulated maximum parking in one day}} \quad (4)$$

Parking Index is the percentage of the number of parked vehicles occupy parking area; can be determined by using the formula:

$$IP = \frac{\text{Accumulated Parking}}{\text{Parking capacity}} \quad (5)$$

Parking Space Unit (PSU) is a measure of the effective area to park one vehicle (passenger car, bus/truck or motorbike), including free space and door openings. PSU can also be said to be the size of a parking space requirements for a vehicle with a comfortable and safe with the amount of space as efficiently as possible.

III. RESULTS

There are on average approximately 950 to 250 two-wheelers and four-wheeled vehicles were recorded entering and exiting the parking area on the road around the market of Laelangi in Baubau city. Accumulated number of vehicles on Saturday as much as 1,020 two-wheeled vehicles, and on Wednesday as much as 276 four-wheeled vehicle that is a day that the number of vehicles at most. The surge in parking vehicles occurred in the period II to period III is due in that period is the peak activity in the market of Laelangi in Baubau city, while the surge in vehicle exit or leave the park during the period IV which in these hours is the time the activity was ending. On Monday, the number of two-wheeled vehicles parked there were 32 motorcycles, while the four-wheel vehicle that is parked recorded on Sunday as many as 14 cars.
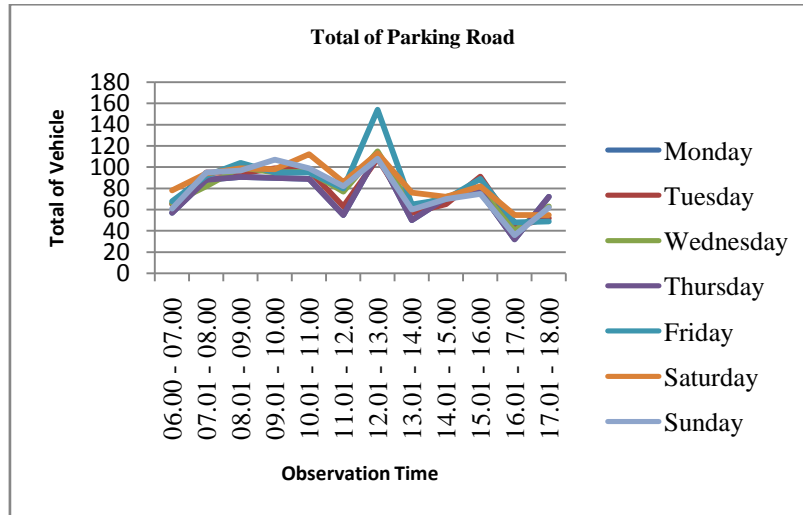
Figure 3. Total Accumulated Parking Two Wheel Vehicles
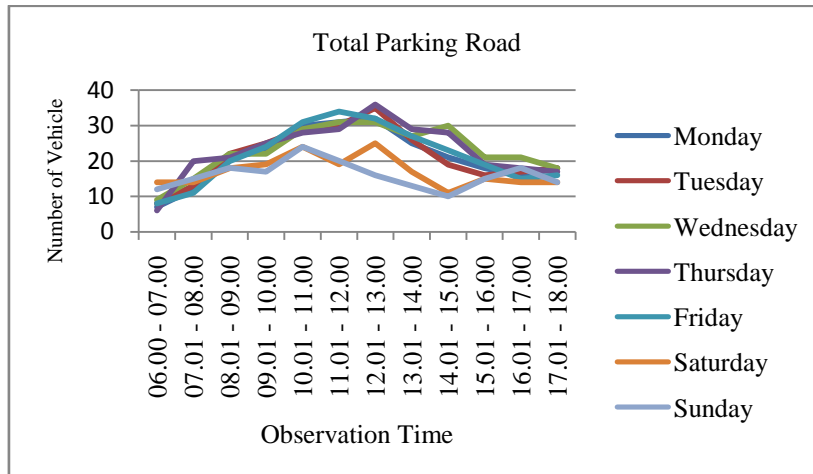

Figure 4. Total Accumulated Four Wheel Vehicle Parking

Volume parking is calculated by assigning the highest accumulation of a vehicle parked for two wheels and four wheels. Number of parking two-wheeled vehicle that is highest on Saturday by the number of motor vehicles in 1020, while the number of four-wheeled vehicles parking highs on Wednesday that as many as 276 cars.

Parking space requirement is obtained by calculating the amount of Parking Space Units (PSU) obtained by shifting the overall volume of vehicles with the highest parking standard PSU each vehicle type.

Count KRP two-wheeled vehicles:
The number of KPR standards = 1428.00 m^2/motors
Count KPR four-wheeled vehicles:
The number of KPR standard = 3450.00 m^2/car

In the calculation of Parking Turn over (PTO) is known that parking turnover rate for cars and motors on the fourth observation period, one plot parking two vehicles used by 2 vehicles for two hours.

IV.   DISCUSSION
Road capacity on the area of Laelangi market in Baubau city reduced due to the parking of vehicles on the road; this can be seen in Figure 5.
The Capacity of Kartini Road:
FC   = 1.25 x 1.00 x 0.80 x 0.83 = 0.83
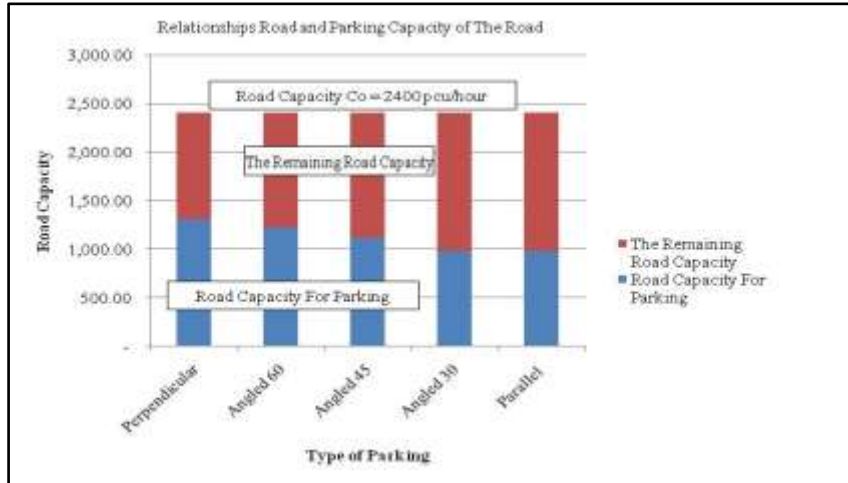C   = 2900 x 0.83 = 2407.00 pcu/hour

Figure 5. The Capacity of Kartini and Jend. Sudriman Road

The capacity of Wolter Monginsidi road:
FC = 1.25 x 1.00 x 0.85 x 0.83 = 0.8819
C = 2900 x 0.8819 = 2557.44 pcu/hour

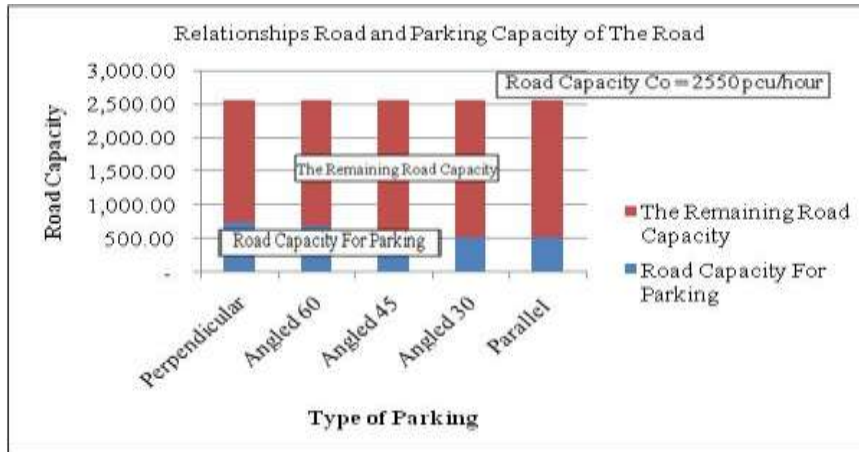**Figure 6.** The Capacity of Wolter Monginsidi Road

The Capacity of D.I. Panjaitan Road:
FC   = 1.25 x 1.00 x 0.75 x 0.83 = 0.7781
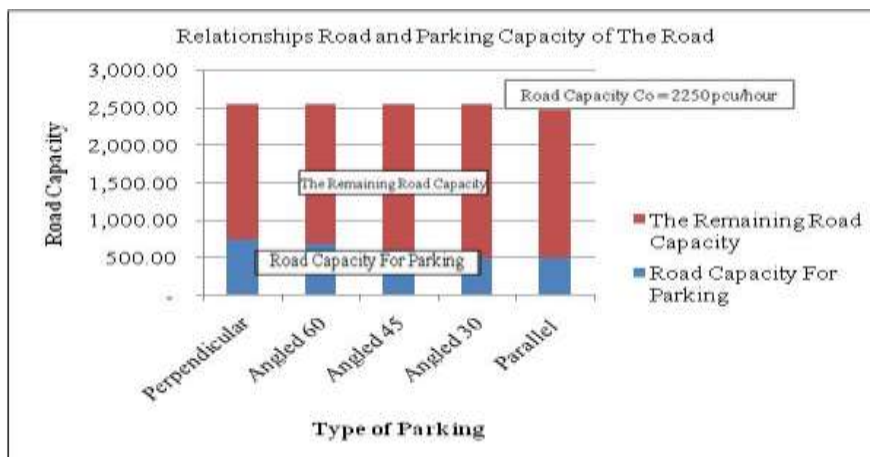C   = 2900 x 0.7781 = 2256.56 pcu/hour

Figure 7. The Capacity of D.I. Panjaitan Road

In the calculation of the need for parking spaces obtained for four-wheeled vehicles the number of parking spaces that there are 123 parking plots, while plots of parking spaces for two-wheeled vehicles provided are 436 parking plots. Needs a parking space when compared with the accumulated maximum parking where maximum accumulation for four-wheel vehicles was 276 cars and for two-wheeled vehicles are 950 motors, for the days not too crowded as in the early morning activities and afternoon at the end of community activities. These conditions indicate parking plots available do not meet, for four-wheel vehicles need at least 2400.00 m^2 of parking spaces, while the two-wheeled vehicle requires 1237.60 m^2 of parking space. At certain times greatly increased the number of vehicles up to two times as much as on the day of the week before the day of Eid.

From the calculation for the PTO can be seen that in each hour, good parking space four-wheeled vehicle and two wheels can only serve two vehicles only. PTO low value indicates that the vehicle is parked in a long term. From the calculation results can be seen an increase PTO is highest in the period II. This period is hours of 09:00 to 12:00 at which time the public's flurry of activity both traders and visitors who are shopping for daily needs in the research location of Laelangi market in Baubau city. With parking time of approximately 15 minutes up to 90 minutes for one vehicle, compared with the existing parking spaces at odd hours, the busiest (period II) vehicles coming in abundance, but the parking area is there to be used less.

The movement of people in the study site of Laelangi market in Baubau city that vary according to the needs of each lead to differences in the timing and space vehicles as transport people and logistics, one of which is a parking space. Today, with the increasing number of two-wheeled vehicles or four wheels greatly affect parking facilities. Density parking occurring on the streets in the research location indication can be seen from the volume of vehicles both two-wheelers and four-wheeled vehicles that have exceeded the number of plots parking is ideal, even though conditions in the study site were not so crowded, with conditions on the area of Laelangi market in Baubau city require a parking space arrangement well ordered in accordance with criteria required in planning will parking.

The solutions offered to solve the problem of the parking area of research by making a parking area by no longer using the road to park the vehicle. Making parking using vertical parking system due to the available land at the research sites were very narrow, using a model of vertical parking will eat far more accommodating both two-wheeled vehicles and four-wheeled vehicles.

The diversity of the purpose of each vehicle should be created zone for four-wheeled vehicles, and for two-wheeled vehicles are placed one floor and a parking space reserved for persons with disabilities.

V. CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the discussion is concluded that the parking capacity of the road at the research location of Laelangi market in Baubau City is very dense so the site is often the case clutter cause congestion on the street around the study site, especially during the peak of activity in the market of Laelangi in Baubau City. The need for a special location for a parking space at the location of such research is needed considering the number of vehicles continues to increase is, recommended to the Local Government authorities as development in the area to the make special parking area around the market of Laelangi in Baubau city.

The number of vehicles parked four-wheel vehicles as much as 276 cars and need a parking space 3450.00 m^2, while land-street parking available is 1537.00 M^2 and for two-wheeled vehicles are motorcycles 1020 m^2 1428.00 need a parking space, the parking lot road is 436.00 m^2.

Parking availability orderly and proper management, it will be a source of Local Revenue, which is not managed by the Government.

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