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## Parking Systems Development's Model in Malang City

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**Abstract.** With a high level of urbanization, Malang City and surrounding areas face complex problems which related to housing and citizen mobility. Citizens' mobility is one of the main problems, because the unavailability of an appropriate public transportation system, which caused residents prefer to use private vehicles. The use of private vehicles has a direct impact on congestion problems in the urban areas and city boundaries. This condition is exacerbated by poorly arranged parking management in Malang. Most of the parking areas in Malang are parking on the roadside which automatically reduces the area of the highway. In addition, parking activities on the roadside have the potential to disrupt the smooth operation which caused by parking activities. The design of the parking area infrastructure which according to the needs based on the characteristics of the used land is very much needed.

**Keywords.** Transportation, Parking, Malang City

### Introduction

Malang is a city with a high population density in East Java. With its strategic geographical location, which borders Malang Regency and Batu City, Malang City can be said to be very suitable for the needs of industrial development, education, business, and tourism. This causes the high level of urbanization in Malang. Transportation is the activity of moving goods and people from the place of origin to the destination (Nasution, 2004). The transportation system is a collection of various components that links to one another with the same destination for removal (Tolley & Turton, 1995). Problems in the transportation sector are very common, especially in big cities where the population circulation rate is very high. Population growth and improvement in the quality of life are the causes of the number of private vehicles increase in big cities (Shen, 1997). Each person who has a vehicle requires an adequate location for parking. With the number of vehicles increase, the need for adequate parking space also increases.

Based on Minister of Transportation Decree No. 66 of 1993 concerning Public Parking Facilities, criteria for adequate parking facilities are:

1. Guarantee the safety and smoothness of traffic

2. Easy to reach by service users
3. If it is in the form of a parking building, it must fulfil construction requirements in accordance to applicable laws and regulations;
4. If it is a parking park, it must have certain limits;
5. In a parking building or parking park, circulation and vehicle parking position are stipulated by traffic signs or road markings
6. Each location which used to park a vehicle is marked in the form of letters, or numbers, which make it easy for service users to find their vehicle.

Parking is a problem that often arises in urban areas around the world. Some large countries face problems relating to lack of adequate parking. Urban areas in developing countries usually depend on private vehicles for their travel activities (Santoso et al., 2011). With the increase in the economy and urbanization, the need for private vehicles also increased rapidly enough to cause an imbalance between the availability of land and the need for parking (Yang et al., 2014).

Parking problems arise due to drivers who want to park their private vehicles near the destination (Behrendt, 1940). The driver's behaviour tends to increase the time needed to find a place to park, the continuation will make them to find places that are easily accessible, for example on the shoulder of the road. Other reasons for illegal parking also arise due to lack of capacity and inadequate law enforcement actions (Spilioupolou & Antonio, 2012).

The high level of illegal parking activity on the roadside on the highway has an impact on local traffic, especially when traffic starts to increase. The main effects caused by illegal parking (Cullinane & Polak, 1992), such as (1) reducing the speed of traffic; (2) reducing the capacity of the highway; (3) hampering traffic and causing traffic jams; (4) the change of transportation modes; (5) loss of opinion from a legal parking area; (6) reduced levels of compliance with applicable law; (7) accidents occur. In studies in Chongqian City and Shanghai, about 30% of congestion are caused by poor parking systems which caused by ineffective parking management (Zhiyan Consulting Group, 2018).

As in the developed countries, parking needs in developing countries depend on the area. Even worse, in developing countries, urban areas are areas that lack of parking area. Poor conditions in the past triggered the sporadic growth of settlements with access to small roads that did not consider the possibility of private vehicles ownership. In narrow village areas, such as *Oro-Oro Dowo*, where residents live along the river, they will put vehicles along the highway because it is not possible to park their vehicles at home. Of course this will trigger traffic jams, and can trigger accidents for pedestrians because most of the sidewalks are used for parking. Pedestrians are forced to walk on the streets, sometimes even in the middle of traffic. Parking infrastructure in Malang can be said to be very minimal, for example parking signs. The lack of confusing parking signs and signage can easily be the cause of problems, such as squabbles and thuggery.

Poorly managed parking can be an opportunity for corruption by local officials or certain groups. The need for informal on-street parking is largely driven by the demand for convenient parking. Drivers are willing to pay for empty spaces, but illegal, ironically only guaranteed by irresponsible parties. Studies by the Inter-American Development Bank in several countries show a variety of data, for example in Mexico the price of street parking is between 0.70 USD and 3.80 USD per hour. In Guadalajara, it ranges from 1.50 USD to 2.30 USD. Fares in Bogota are around 2.70 USD, and in Buenos Aires are in the range of 1 USD to 2.12 USD. The fact that the driver is willing to pay means that there is a real need for this facility. For local governments, this is a wasted opportunity to raise funds. This additional tax can be paid for other projects that the community needs. But instead, the funds go to other parties who should not be entitled.

The 2013 IEA study predicts that by 2050, global parking needs for vehicles will increase almost threefold, from 30,000 square kilometres in 2010 to 80,000 square kilometres in 2050 - equivalent to four times the area of California, USA. An estimated 40% increase occurred in China and India. Then there must be parking reforms in developing countries as a global solution. A study by the Asian Development Bank in 2011 concerning "Parking Policies in Asian Cities," focused on providing insight into parking policies in Asian cities. This study shows that the parking system is very important, not only in the central business district, but also in residential and commercial areas. It should be noted that poor parking conditions also occurred in developed countries in the past, for example in the United States in the 1920s, in Europe in the 1950s, in Japan in the 1960s, and Hong Kong and Singapore in the 1970s. The different states and parking problem resolution are also different, but there are at least valuable lessons from these cases. Therefore, understanding the need for an adequate parking system is an important factor in the development of the transportation system.

### Research Purposes

The purpose of this research is to:

1. Contributing insight into resilience in the community, especially in parking problems in Malang
2. Providing appropriate alternative solutions to overcome parking problems in Malang city

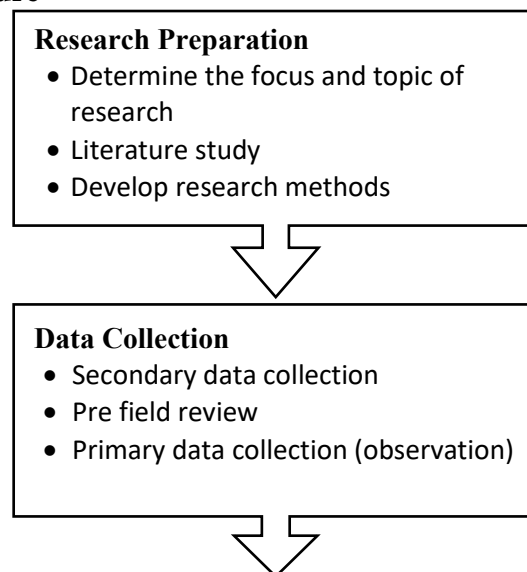
### Methods

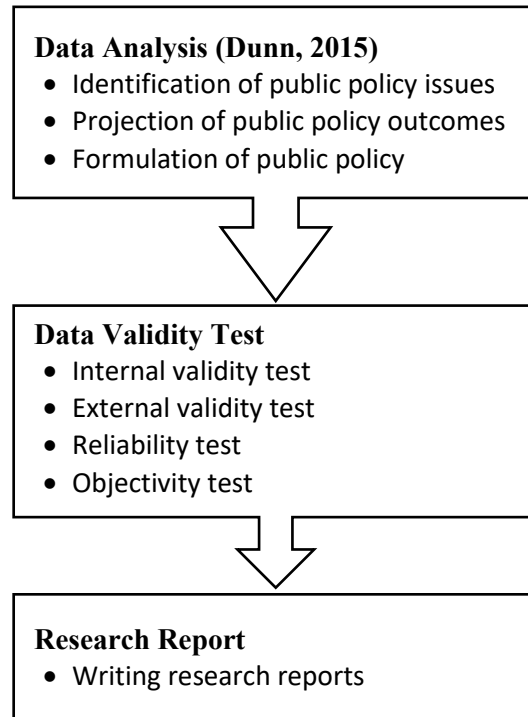
#### A. Research Type and Sample

This type of research is a qualitative descriptive study with direct observation in the field, which is then accompanied by a literature study on parking both from a technical and legal perspective. From the research results obtained, then an alternative settlement will be arranged that can be applied to overcome parking problems in Malang based on social security.

This research was conducted in the city of Malang with a period between February 15, 2020 and May 28, 2020.

#### B. Working Procedure





## **Result and Discussion**

Interview with the Department of Transportation (Head of Traffic and Road Transportation in Malang City, Ir. Ngoedijono, Ms.Tr) regarding the 2014-2016 Strategic Plan prepared by the Department of Transportation (Transportation of 2015), it is known that the main traffic problems in Malang City are 9 main things. One of them is the arrangement of uncontrolled and unsafe parking which is directly or indirectly influenced by the number of existing vehicles.

Parking is an issue that has significance in infrastructure planning both at the local and strategic levels (Young et al., 1991). The problem of parking in Malang City arises because of the high number of private vehicle users. The increasing number of private vehicle users can be caused by population growth and improvement in people's living standards (Shen, 1997). The large number of vehicles is not matched by an adequate parking area.

Cheng (2013) identifies four important aspects that determine the existence of illegal parking, namely policy and regulation, economic, social, and technical. The lack of parking policies, incompetence of existing regulations, and unclear enforcement of laws are included in the policy and regulatory aspects. The economic aspect consists of scenarios that related to rapid economic growth, changes in land use, and the lack of adequate parking. The social aspect consists of the mind-set of road users, the lack of awareness, and the individual personalities of motorists. The design of the parking area is below the standard set, the backward era, and inadequate parking facilities are some of the technical aspects that are problematic and not in accordance with international quality standards. In fact, many new and sophisticated technologies have been introduced for more efficient parking arrangements such as the Radio Frequency Identification (RFID)-based parking assistance (Barone et al., 2014), Smart Transportation System based on License Plate Recognition (LPR) (Tian et al ., 2014), parking vacancy management using inter-vehicle sensor communication (Yamashita & Takami, 2014), smart parking system management using wireless sensor networks (Larisis et al., 2013) and many other examples.

Many factors affect the development of parking area including the number of vehicles that need to be accommodated, the parking angle, the parking circulation system, and the size of the

vehicle to be accommodated (Abdelfatah & Taha, 2014). One other method for creating effective parking zones is to classify areas based on land use, as described by Hobbs (1995). Areas consisting of commercial buildings such as hotels, shops, theatres and offices will be placed in one zone, and residential areas will be placed in different zones. Almost all parking and zoning rules now use this method as a basic reference.

The technology has been widely applied in big cities in Indonesia, one of which is the E-Parking system. Implementation of the E-Parking has received many positive responses and contributed greatly in helping local governments overcome parking problems. For example there is an increase in income from parking fees, reducing leakage of parking revenues, and increasing the quality of public services and accountability in regional financial management, as well as better governance of the parking system (Tribunnews, 2018; Kompas, 2018; Tribunsolo, 2018). Technology adaptation will further increase traffic flow through optimizing the existing road load carrying capacity, coupled with advanced technology and collaboration tools to enable enforcement officers to have greater awareness and accuracy that provides better decision making (Koga, 1998; Yavari et al., 2016; Zanella et al., 2014; Singh et al., 2017; Sumi & Ranga, 2016; Sharif, 2017; Hatim et al., 2018; Patil et al., 2018)

The E-Parking system offers several advantages than a manual parking system (Natasya, 2014), namely:

1. Payment transparency. Payments go directly through the e-parking system or through an official government bank account through the auto debit method
2. Accountability. All types of payments made directly recorded in the database installed on the system. This database can be accessed easily by the administration of the local government so that if there are complaints from customers regarding payments can be effectively resolved.
3. Improve the quality of public services. The user interface of the e-parking system must be easy for the user to understand and can be designed to accept different types of payment according to the payment methods that are widely used.
4. Quality design. The equipment used is made of materials that can withstand weather conditions, are resistant to vandalism, and save electricity because they are operated using solar panels.

Problems with parking problems mostly arise due to the desire of drivers to park near their destination (Behrendt, 1940). This results in the parking of private vehicles along the roadside, thereby reducing the extent of the highway. Parking areas along the shoulder of the road are generally managed by non-governmental parties who control certain areas illegally. Of course this will trigger traffic jams, and can trigger accidents for pedestrians because most of the sidewalks are used for parking (Khan & Lourenco, 2010). Pedestrians are forced to walk on the streets, sometimes even in the middle of traffic. Parking infrastructure in Malang can be said to be very minimal, for example parking signs. The lack of confusing parking signs and signage can easily be the cause of problems, such as squabbles and thuggery. Poorly managed parking can be an opportunity for corruption by local officials or certain groups. The need for informal on-street parking is largely driven by the demand for convenient parking. Although the problem of illegal parking is closely related to the high demand for legal parking lots and the lack of infrastructure in locations that require it, the apathetic behaviour of vehicle drivers also affects the high number of illegal parking cases (Aljoufie, 2016).

Given the limited land, increasing the number of parking area cannot be a sustainable solution, but the implementation of efficient parking management can be an alternative solution that can be offered. A strict parking policy has an important role in developing an organized traffic system in an area to improve driving conditions for road users. It also has a major contribution to optimizing the resources available for parking and is very helpful from the point

of view of sustainable transportation (Parmar et al., 2020). The parking policy to be applied must also be developed in accordance with local conditions (Marsden & May, 2006). In addition, the establishment of certain regulations to control parking activities such as the preparation of parking signs, the basis for charging parking fees, and the appropriate services to obtain a well-controlled parking system (Parmar et al., 2020).

As reported in Decree of the Minister of Transportation No. 66 of 1993 concerning Public Parking Facilities, the requirements for the construction of public parking facilities must include:

1. Can guarantee the safety and smoothness of traffic
2. Easy to reach by service users
3. If it is in the form of a parking building, it must meet construction requirements in accordance with applicable laws and regulations;
4. If it is a parking park, it must have certain limits;
5. In a parking building or parking park, circulation and vehicle parking position are stipulated by traffic signs or road markings
6. Each location (that) used to park a vehicle is marked in the form of letters, or numbers, which make it easy for service users to find their vehicle.

In addition, service quality, as perceived by users can be identified by the presence of satisfaction indicators (Parasuranman et al., 1988) which include:

1. Tangible. This dimension represents the modernity of the equipment, the attractiveness of the facilities, the neatness of the officers, and the completeness of the supporting equipment.
2. Reliability. This dimension is a guarantee that parking facilities can reach the desired destination, facilitate user complaints, perform appropriate services, provide timely services, and demand recording errors.
3. Responsiveness. This dimension includes notification from employees to users about the services provided, fast delivery of services, and employee willingness to help users
4. Guarantee. This dimension is related to employee behaviour, user security, and the ability of employees to answer questions from users.
5. Empathy. These dimensions include individual and special attention from employees to users, timely service processes for all users and in-depth service from employees provided through and under the understanding of the specific needs and desires of users.

## **Conclusion**

The condition of parking in Malang can be considered as less orderly due to the rise of illegal parking activities. The situation is exacerbated by the weak legal certainty to deal with illegal parking on the roadside. The existence of illegal parking, especially those who occupy the roadside can be one of the factors that inhibit traffic. This proves that it is necessary to develop supporting infrastructure facilities and the existence of a technical approach related to the needs based on the characteristics of the parking area must be applied to attract vehicles' users to park on the land that has been provided.

The parking facility design must also pay attention to the social conditions at the location. Communities that previously benefited from illegal parking opportunities also have to be considered. The economic resilience of the community can be made one of the priorities in the new parking lot by giving the community the opportunity to conduct their business under the legal umbrella.

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