

Comparison of On-Street Parking Management in Ermita-Malate Manila and Makati Central Business District

Arian BULACTIAL^a, Federico DIZON^b, Mark Wesley GARCIA^c, Grace GUETA^d, Judylyn VALDEZ^e

^{a,b,c,e} Undergraduate students,

^aAssociate Professor, 'De La Salle University-Manila, 2401 Taft Avenue Manila 1004, Philippines

^aE-mail: arian_0000_18@yahoo.com

^bE-mail: dizonfederico3@gmail.com

^cE-mail: mwcg_539@yahoo.com

^dE-mail: padayhag.grace@yahoo.com

^eE-mail: judayvaldez@yahoo.com

Abstract: Ermita-Malate and Makati Central Business District (CBD) are the center of business and commerce in the Philippines. On-street parking is rampant in Ermita-Malate even in areas that do not allow it including national roads, public transportation and truck routes. In Makati CBD, on-street parking facilities are widely used for short-term businesses. Parking management is crucial for an efficient use of available parking resources. This paper aims to compare the on-street parking management between the two study areas. Survey was done and the current on-street parking conditions in Ermita-Malate were identified. Parking demand in Makati CBD was determined as well. From the data gathered, it was found out that Ermita-Malate has existing parking ordinances but are not properly implemented. Several recommendations were made including the three-hour parking rule from Makati CBD to maximize the use of the facilities. An on-street parking map was generated for Ermita-Malate area to serve as a guide to motorists.

Keywords: On-street parking, parking management, cost analysis, parking map, Philippines

1. INTRODUCTION

Two of the busiest areas in Metro Manila are Ermita-Malate and Makati CBD. These areas have various business establishments, institutions, malls, and restaurants that people are making trips to for their transactions or to spend their leisure time.

Ermita houses different government institutions and offices including Supreme Court of the Philippines, Department of Tourism, Philippine General Hospital and Rizal Park which is the most prominent public park in the country. Educational institutions like University of the Philippines-Manila and Manila Science High School can also be found here. Similarly, numerous institutions and universities are in Malate area like Bangko Sentral ng Pilipinas (Philippine Central Bank), De La Salle University and Manila Zoological and Botanical Garden. It can be easily accessed by Light Rail Transit-1 or with the main roads like Taft Avenue and Roxas Boulevard.

Figure 1 shows the total population by municipality in Manila. Ermita caters to more government and educational institutions and offices than Malate that is more on the residential side.

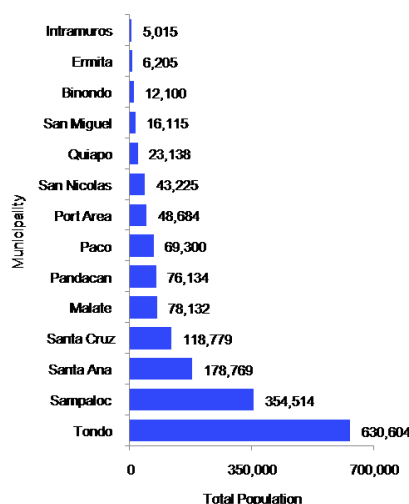


Figure 1. Total population by municipality in Manila (2007)

On the other hand, Makati is labeled as the financial capital of the country. Various multinational companies have their headquarters located in this area. Makati CBD is vastly growing with the increasing number of offices and condominiums. Its daytime population is estimated to double from almost half a million on a working weekday due to the volume of people conducting business or shopping. High-end malls like Glorietta and Greenbelt can also be found here.

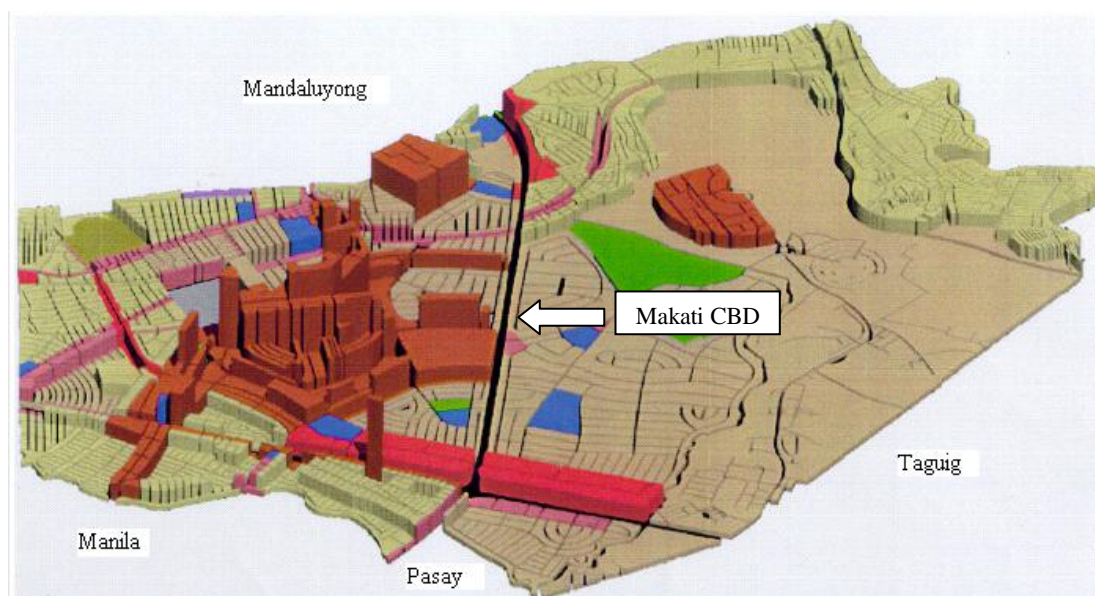


Figure 2. Makati City 2020 Building Projection

Parking facilities are provided in these areas which can either be off-street or on-street. On-street parking facilities are properly managed and maintained in Makati CBD with Makati Parking Authority (MaPA). Sufficient parking slots for vehicles, motorcycles, and food trailers, among others are provided in Makati CBD. However, on-street parking in Ermita-Malate is not efficiently used. People in Ermita-Malate tend to park anywhere possible. The

lack of off-street parking facilities leads the drivers to park on-street that is prohibited in some areas. Aside from the possible disruption to the flow of vehicular traffic, improper on-street parking can also cause several accidents. Parking management is essential so that the flow of traffic would not be totally disrupted. Parking rules and laws should be followed to ensure safety among the drivers and passengers inside the vehicle.

The objective of the study is to compare the parking management of Ermita-Malate and Makati CBD. In particular, it aims to determine the similar characteristic of on-street parking demand in Makati CBD and Ermita-Malate areas. It also aims to identify the good parking management practices in Makati and assess these practices that can be applied in Ermita-Malate. To aid the current situation of on-street parking in Ermita-Malate, it also aims to generate an on-street parking map in this area since Makati CBD has its own on-street parking map. This study intends to identify the financial aspect in improving the on-street parking of Ermita-Malate as well.

The study is limited to Ermita-Malate and Makati CBD. It focuses on the demand of on-street parking in Makati CBD. Makati CBD is subdivided into three villages, namely Salcedo Village, Legazpi Village, and some parts of the Apartment Ridge. The data for the on-street parking demand is also limited to the working hours of the MaPA attendants, which is from seven am until five pm. The parking demand is considered to determine if there are significant differences between the two study areas. The study is also concerned on the parking management of the two study areas. It also focuses on the financial implication of the improvement of on-street parking facilities. For the on-street parking map, the parking spaces considered are no parking, residential, driveways and illegal parking. Ermita and Malate is divided into three and four areas, respectively. Main and secondary roads/streets are particularly considered for this. The study covers the regulations/policies of on-street parking implemented in Makati and the actual situation in Ermita-Malate. Due to the lack of off-street parking and improper on-street parking management in Ermita-Malate area, drivers tend to park along the streets improperly, which will cause traffic congestion. This study can help in reducing the congestion of vehicles due to improper parking and helps improve the quality of on-street parking in Ermita-Malate. With the on-street parking map, it can also assist the drivers in determining the areas where they can park legally.

2. REVIEW OF RELATED LITERATURE

2.1 Supply and Demand

In a study done by Go et al (2010), it discusses whether parking facilities supplied by the establishments follow the requirements of the National Building Code of the Philippines, and to know if there's enough supply of off-street parking facilities to satisfy the parking demand in the study area. According to their study, those establishments who follow the National Building Code easily reached its full capacity early in the day, so they allow double parking thus over capacity results in their parking, or others tend to park their cars along the streets. Based from the surveys done, majority of the motorists prefer off-street parking buildings, off-street parking lots, on street parking in succession. The longer the parking duration, the more distant the people are willing to walk to their destination.

This study is relevant to the study because it shows that on-street parking will be seen along the road if there's lacking supply of off-street parking facilities. It clearly states that on-street parking is the last resort of the people if off-street parking is not available anymore. Determining which areas have higher parking demand is needed in creating a better parking model to satisfy the necessity of the motorists.

It is known that on-street parking is seen as a problem of crisis proportions in some cities in the study. These observations are not necessarily in conflict. Even a small number of vehicles, when parked in ways that are especially disruptive, and if they park for a long period such as the whole working day, can cause heavy traffic. In the study conducted by the Asia Development Bank (2011) about the parking policy in Asian cities, street parking crises are often localized in high-profile commercial areas or streets. While parking itself is widely seen in these cities as hindering traffic flow, there was surprisingly little concern about the impact on congestion of motorists searching for parking. Lack of awareness of the parking search externality does not prove that it is not important.

This study is relevant to the study since this article tackles about the importance of on-street parking although on-street parking is one of the main causes of traffic problem in an area. Even if a state provides abundant supply of off-street parking, there will always be on-street parking that can be seen. This is because people choose their parking areas where it is near to their destination, and they choose their parking places based on their accessibility and convenience. The study also suggests that there is a need to give consideration on the time consumed by motorists in searching for their parking slot on street since this may also cause traffic.

2.2 Parking Studies

In a study by Migliore (2002), it aims to internalize the network congestion costs in the user perceived costs. He used two techniques and it was applied in a part of the Palermo (principal town of Sicily). First is the marginal park pricing and the other one is the optimization algorithm and M.S.A. with the limit of capacity.

From the test, simulations have shown that the result obtained from the marginal pricing method and the optimization algorithms with the method of successive averages are the same. However, the marginal pricing method has been less time consuming (about 80%) than the competitive technique. The increasing of the social surplus functions has been about 5% and the congestion peaks in the parking areas have been cut. In particular the results of the simulation have shown a strong reduction of the long-lasting parking. Finally, the last technique has been used in order to obtain parking fares able to contain the parking demand under the limit of capacity.

The results of this simulation have shown a strong reduction of the social surplus function. This suggests the adoption of different solution in order to reduce the level of congestion in the urban areas. Road pricing can be a way in order to optimize the transport system and its performance but cannot be the solution of the problem.

This study was useful to the study since it suggests creating possible solutions for the on-street parking by determining the proper way of pricing the parking fee. In the paper, it has been proved that the calculated parking fares are a local maximum of the non-convex function estimating the social surplus generated by traffic fares. The existence of the solution of the fixed-point problem has been proved by the Brower theorem and an algorithm to solve it has been proposed.

2.3 Parking Scheme

In the study of Oyon-oyon et. al (2008) about the on-street parking scheme for Ermita and Malate Districts, City of Manila, due to the fact that the area is surrounded by many establishments, there is an insufficient supply of parking facilities to accommodate the vehicles, thus ending up parked along the streets which hinders the flow of traffic on the

narrow roads of Ermita and Malate Districts. In order to solve the problem, they proposed a new parking scheme to improve the traffic flow wherein vehicles are prohibited to park along main roads, narrow roads, and driveways, and at the same time, revenue will increase due to the fact that other areas will be utilized for on-street parking. They concluded that there's excess in demand even after improving the design of the parking facility. The real problem lies not only on the designing of a perfect parking scheme, but also to the over-demand of parking facilities given that the number of people going to Ermita and Malate is rapidly increasing.

This is necessary to the study because by studying the proper designing of a parking scheme, it identifies the beneficial and harmful effects of on-street parking. Using this research, the cost of the suggested new parking facility can also be satisfied and suggestions for new and improved parking facility to lessen the traffic that is caused by on-street parking can be made.

The map of Makati-CBD on-street parking facility can be accessed through the website of the MaPA. It is indicated in the map, through the use of color-coding, the parking slots for cars, motorcycles, reserved parking for private establishments, and also the loading and unloading zones for public and private vehicles. This map has been a very helpful tool to commuters and motorists that drive to this area. It also shows the management of on and off street parking in Makati CBD is very organized. Figure 3 shows the on-street parking map in Makati CBD.

This is very relevant to the study because we can use this map as basis to generate a map in Ermita-Malate. The legends or color-coding on the proper division of serviceability along the streets will be done by identifying what type of cars that travels in the area. With the on-street parking map, motorists will have an idea where they can park legally and safely, and it will also guide them in searching for parking slots along the streets of Ermita-Malate, which eliminates the impact of drivers who moves slow or stay in the path of vehicles while finding their parking slot and therefore lessens vehicular congestion.

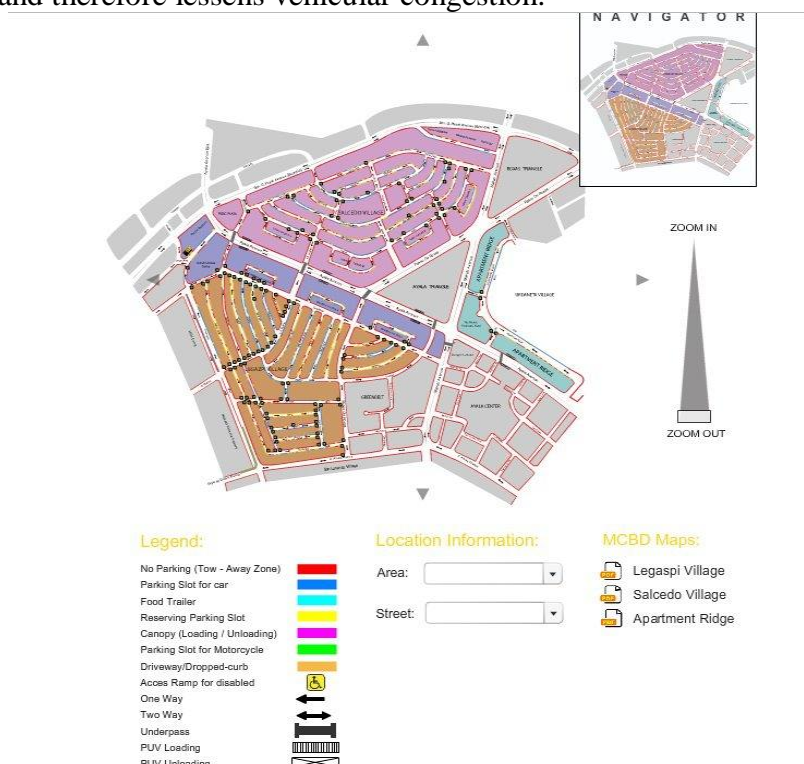


Figure 3. Makati CBD's on-street parking map



Figure 4. Zoomed image of color-coded Makati on-street parking map

This agreement contains the rules and regulations the driver should follow before or while parking his/her vehicle. The duration and amount of money for the payment in the parking facility is also stated. In making sure that the agreement is clear, the terms that should be followed are written. The names of the leaders and officials concerning the parking facility were written in this paper. This paper is like a contract that you have to follow in making reservation of the on-street parking facility. This information is very useful for the researchers since we are studying about the parking management in both areas, this agreement should be regulated in Ermita-Malate area. The map is useful so that we could estimate how the on-street parking in Makati is being utilized.

2.4 Recommended Parking Regulations and Parking Management

Parallel on-street parking is a typical and quite evident in many streets. There are already proposed improvements to make it safer for motorists to pass through, but for the study done by the Pedestrian and Bicycle Information Center (PBIC) about the on-street parking enhancements, the researchers observed that having a diagonal on-street parking will not only provide additional parking spaces but also can be used as safety precautions to create friction and prevent drivers from driving fast, which may also improve the pedestrian environment.

This is necessary for the study because there is a need for a better parking management along areas with high demand for parking. This study uses techniques, which may help researchers increase the supply of on-street parking spaces, and provide a safe environment for the pedestrian by eliminating vehicular accidents such as slipping due to high speed. Although this is the case, it can only be applied along the wide roads of the area since parking cars diagonally will be likely to consume the space of the road that may result in vehicular congestion mostly during peak hours.

A study conducted by Anagnostopoulos, et al (2002) aims to have the selection of the optimal parking angle of the vehicles parking. The method used to identify the best parking angle was based on a multicriteria approach for which the Analytic Hierarchy Process (AHP) was used. The AHP has been selected due to its efficacy in analyzing a problem by

decomposing it into subsystems, its inclusion of possible interactive effects and its power to handle several criteria.

The parking cost greatly affects the decision of the motorist where to park their cars. There are places in which parking is relatively cheap therefore vehicles parked on that certain area tends to stay longer. Meanwhile, on places with high cost of parking fee, people will either look for a cheaper parking space, or limit their stay so that the price won't get higher. In the study of Cerreño (2002), it provides a comprehensive review of on-street policy, planning, management, and operations, all of which supply a foundation upon which to base further discussion and assessment about on-street parking. Touching upon a variety of topics, including pricing, curb management, meter technologies, and enforcement. The purpose of this report is to determine the impact that on-street parking has on transportation, development, and land-use; and to identify and review comprehensively "on-street" parking policies and management practices in large cities. She proposed the congestion or value pricing in which a vehicle can only stay a maximum of 3-hour parked on the street. Another is the use of the meter technologies like the smart cards, in-vehicle meters, and free flow parking since its beneficial in maintaining revenues and maximizing the number of spaces on a given street.

The study is related to the present study since it is necessary to control the supply of parking due to the fact that the demand of parking is increasing. The study by Cerreño found some practices suitable to address the problem like limiting the number of hours a vehicle can park, or increasing the parking fee of on-street parking for the successive hours. These practices, if applied to the parking management in Makati and Ermita-Malate, it can improve the condition of parking supply and demand in the area.

In the study done by the Makati Parking Authority (2008), they stated that the constant heavy traffic along the streets of the Makati Central Business District (MCBD), brought about by traffic congestion caused by illegal on street parking which had been adversely affecting the interest of the general public, could best be resolved if the Government would exercise its police power to control traffic conditions in the said district and to legalize on-street parking. Thus, several ordinances imposing reasonable parking regulations and traffic schemes, some of which were recommended by MAPA, were immediately enacted and put into effect.

This study is related to the research since it suggests techniques on how to properly regulate the on-street parking along an area. The demand of vehicles entering a place is uncontrollable. The off-street parking facilities are mostly full. Through the use of enforcers to control parking and traffic conditions like implementing a limit on parking duration for on-street parkers, others can get their chances on that certain parking slot.

2.5 Cost Analysis

According to Sewell et al (n.d.), cost analyses can provide estimates of what a program's costs and benefits are likely to be, before it is implemented, improve understanding of program operation, and tell what levels of intervention are most cost-effective and reveal unexpected costs. But cost analysis cannot tell whether the program is having a significant net effect on the desired outcomes or not and if the least expensive alternative is always the best alternative.

This was related to the study as it gives an insight that the initial cost should not be the only one that is considered when building a new infrastructure. Its life span should also be taken into consideration. It was also stated that other factors other than the materials might affect the cost of the project. The materials used should also be taken into consideration. This affect the cost analysis, as the price will differ depending on the material used. It also

states that the price of materials may vary in time and that there may be a discount if the amount of materials ordered is of a large amount. The benefits of cost analysis were also stated as well as what cost analysis does not cover.

3. METHODOLOGY

This study involves four major phases in the collection and analysis of data. First is the on-street parking map in Ermita-Malate. This was conducted by roving around the study area. Parked cars, driveways, no parking signage, residential places and vacant spots were considered in creating the on-street parking map. Ermita was divided into three areas while Malate was divided into four areas. It was assumed that the slot where the cars parked will be there or cars will take that same spot throughout the day. The colors that were used in the on-street parking map are red, blue, black, pink and green. Red indicates that there was no car parked in that spot and there is a no parking signage in that place. Blue indicates that the vehicle parked in that area is for residences. Black indicates that cars parked in that spot although there are “no parking signage” parks illegally. Pink indicates that there is a driveway in that spot. Green indicates that there are cars that are parked in that spot.

The second phase of the study was determining the efficiency of the parking facilities in Ermita-Malate through surveys questionnaires that were distributed to the motorists around the area. This phase also involved the identification of the trip-generating Questions that were asked included determined their family’s average monthly income, the number of cars owned by the family, how often they visit Ermita-Malate and their purpose of visit, the length of time they usually park, the amount they usually pay for parking, the amount that they are willing to pay for an hour of parking and some suggestions regarding the parking facility in Ermita-Malate.

The third part of the study focuses on the demand for on-street parking in Makati CBD. The data that was used came from the MaPA. The data that was taken from MaPa was on October 19, 2012, which was a Friday. In the data that was taken, parking started at seven am and ended at five pm. The data that were gathered included the plate number of the cars, their time-in and time-out. The on-street parking data was graphed to know how many cars go in the area every 30 minutes. Parking duration and turnover rate was computed. The following equations were used:

$$TR = \frac{N_t}{S * T_s} \quad (1)$$

where,

TR : turnover rate
 N_t : total number of vehicles observed
 S : number of parking slots
 T_s : time of study in hours

$$D = \frac{\Sigma(N_x * X * Y)}{N_t} \quad (2)$$

where,

D : average parking duration
 N_x : number of vehicles parked
 X : number of intervals parked
 Y : length of intervals
 N_t : total number of vehicles parked

In determining the parking management practices in Ermita-Malate and Makati CBD, interview was conducted in Manila City hall and MaPA. Financial aspects on how they maintain the on-street parking were also asked.

4. ANALYSIS

As Ermita-Malate area was surveyed, the researchers were able to determine the existing on-street parking condition in the area. In order to simply show the data gathered, an on-street parking map for the current parking situation in the area was generated. Since Ermita and Malate have a lot of minor and major arteries, Ermita and Malate were divided into three and four zones, respectively.

The researchers observed the on-street parking in Ermita-Malate and determined the places where cars were parked then created an on-street parking map. The parameters that were considered were illegal parking, residence, driveway, no parking and parking of cars. Illegal parking was defined as places or slots where cars were parked although a no parking signage has been placed; it is designated in the form of color black. Residence was defined as places where homeowners park their cars; it is designated in the form of color blue. Driveway is defined as a short road leading from a public road or street to an establishment; it is designated in the form of color pink. No parking is defined as places where no car was parked or there is a no parking signage; it is designated in the form of color red. Parking is defined as places where cars are parked; it is designated in the form of color green. The cars that were observed are not only private cars but also public cars, specifically jeepneys and pedicabs.

4.1 Ermita

Ermita has a lot of no parking. There are a couple of establishments present in the area but only few of them provide sufficient off-street parking facilities for their customers. This is the reason why motorists resolve in on-street parking near their place of destination. Drivers prefer parking their vehicles right next their destination for their convenience, but due to the fact that there is a limited on-street parking slots available, they will, in turn, resolve to illegal parking which is evident in the map generated for Ermita.

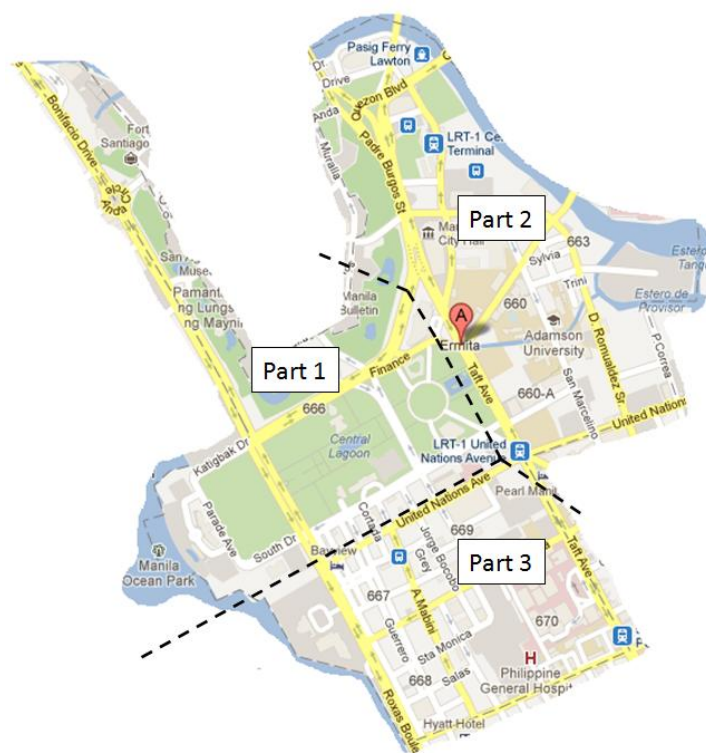


Figure 5. Map of Ermita divided into three parts

Bonifacio Drive, Katigbak Drive, Paradise Avenue and South Drive are the streets that compose part 1 of Ermita Area. Illegal parkers are located in some portions of Bonifacio Drive. Parkers are located in Katigbak Drive, Paradise Avenue and South Drive.

Padre Burgos St., Quezon Boulevard, D. Romualdez Sr., and United Nations are the streets that compose part 2 of Ermita area. Places where cars are parked are located near LRT Central, Sylvia, 660-A and a portion of San Marcelino. Illegal parkers are located in D. Romualdez Sr. Corner Cabral.

Roxas Boulevard, United Nations and Taft Avenue bound part 3 of Ermita area. Illegal parkers can be found in parts of Padre Faura, Jorge Bocobo, A. Mabini and Guerrero. Streets where cars are parked were in Roxas Boulevard, portions of United Nations Avenue and A. Mabini.

4.2 Malate

There are also a lot of establishments in Malate but they are mostly comprised of residences or dwellers. The blue lines in the map indicate private residential parking areas, which cannot be parked by anyone. They park their cars on both sides of the narrow road, which make it difficult for the motorists to pass and slow down the flow of traffic. The researchers also considered the driveways of buildings and houses specified by pink lines.

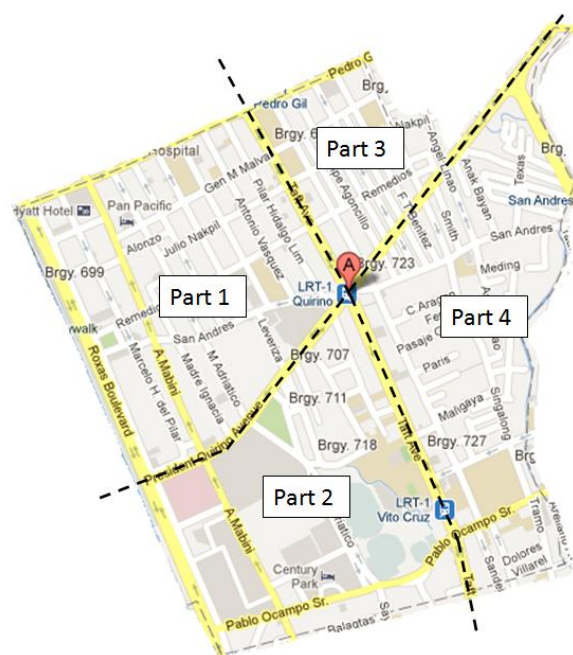


Figure 6. Map of Malate divided into four parts

Pedro Gil, Taft Avenue, Roxas Boulevard and Pres. Quirino Avenue bound part 1 of Malate area. Illegal parkers are located in some portions of Mother Ignacia near the corner of Pres. Quirino Avenue and in some portion of A. Mabini near corner of Alonzo. Residence is located in some portion of M. Adriatico near Pres. Quirino Avenue Green, red and pink colors indicate parking and no parking are all over the area.

Pres. Quirino Avenue, Roxas Boulevard, Pablo Ocampo Sr. and Taft Avenue bound part 2 of Malate area. Illegal parkers are located in some portion of Taft Avenue, Asuncion near Pres. Quirino Avenue and in some portions of A. Mabini. Residences are located in Leveriza, Asuncion, Fidel A. Reyes near Pres. Quirino Avenue and the street after Fidel A. Reyes.

Pedro Gil, Taft Avenue, and Pres. Quirino Avenue bound part 3 of Ermita-Malate area. Places where residences occupy parking slots are from San Pascual, Modesto and a portion of San Pedro. Green, red and pink colors, which indicate parking and no parking, are all over the area.

Taft Avenue, Pres. Quirino Avenue, and Pres. Sergio Osmena Sr. highway bound part 4 of Malate area. Illegal parkers are located in Singalong near Fermin and in Pablo Ocampo Sr. Most of the residences in this area are located at the upper right and upper part of the area. From the middle to lower parts the residences are located in C. Aragon, Fermin, Pasaje Galvan, Paris, Maligaya, Dony Ysidro, Dolores and some parts of Dominga.

4.3 Makati CBD

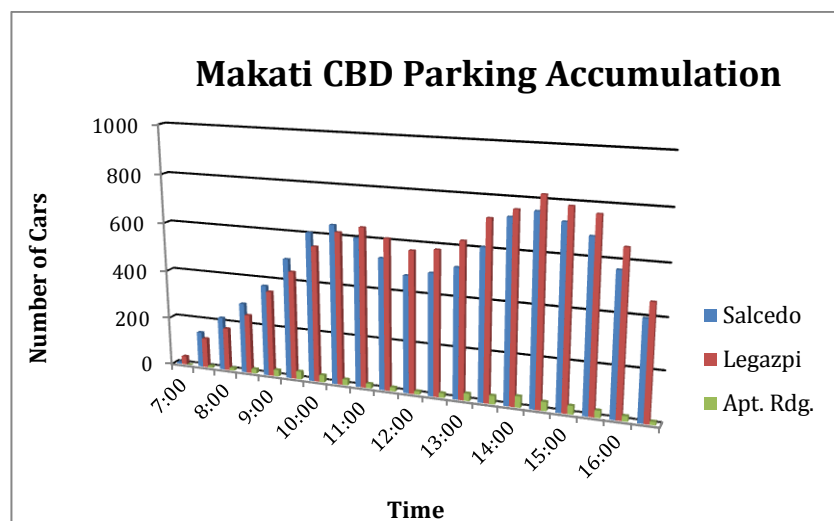


Figure 7. Makati CBD parking accumulation

The graph shows the total parking accumulation for the Makati CBD. It can be observed that there are more vehicles that occupy the parking slots in the afternoon, in which its peak is during the 2:30 pm interval.

Legazpi Village has relatively greater parking accumulation than the other two study areas in the CBD. Legazpi is composed mainly of banks, several schools and offices. Because of this, there are more people who park their cars mostly just for a short-term visit. On the other hand, Salcedo Village houses numerous office buildings, condominiums and some restaurants. Parts of Apartment Ridge have the least on-street parking since it is just a small part of the study area.

In determining the on-street parking demand in Makati CBD, turnover rate and average parking duration were computed. Table 1 shows the parking demand data of Ermita-Malate from the study of Go et. al. It was found out that the turnover rate for the on-street parking in Makati CBD was 0.367 veh/sp-hr. Comparing it with the turnover rate for summer which has a value of 0.399 and 0.502 for academic, the turnover rate in Ermita-Malate is a little bit higher than in Makati CBD. It is taken in consideration here that Ermita-Malate area is bigger than Makati CBD and has a variety of offices and establishments in the area. For the duration, the average parking duration in Makati CBD is 1.164 hr/vehicle. This is lower than the average parking duration in Ermita-Malate since in Makati, they limit the parking time to three hours to maximize the use of the on-street parking facilities. Also, since there are a lot of offices and business establishments in the area, most of the transactions are short-term only so it is expected that the parking duration is lower in Makati CBD.

Table 1. Parking Demand Data of Ermita-Malate (Go, 2010)

		Duration	Turnover Rate	Min. Duration	Max. Duration	Standard Dev.	Variance
Area 1	Summer	3.637	0.107	1.292	7.895	1.942	3.773
	Academic	4.027	0.099	0.929	9.611	2.495	6.223
Area 2	Summer	3.018	0.108	0.750	5.336	1.291	1.666
	Academic	6.564	0.233	0.750	5.636	1.137	1.293
Area 3	Summer	2.704	0.184	1.355	5.000	1.650	2.723
	Academic	2.877	0.170	1.300	7.625	2.193	4.809

Table 2. Computation for estimated parking facility cost

Signage: P2, 500.00 per sign	Enforcers and ticketing machines
Paint+Labor: P22.50 per meter	100 Units * 90 = P9, 000.00
Rent: P90.00	100 Enforcers * 419 = P41, 900.00
Minimum wage: P419	Total Cost per Day = P50, 900.00
P 50,900.00/40: 1273 vehicles	

For the number of enforcers and the ticketing machines, since the rent of the machines is 90 per day multiplied by the number of enforcers will result to 9000 pesos. The minimum daily wage in Metro Manila is 419 pesos multiplies by the number of enforcers will be equivalent to 41900 pesos. The sum of these two will be equivalent to 50900 pesos which will be the daily cost for the enforcement for the on-street parking in Ermita-Malate. To be able to earn money, the number of vehicles that will park in the area should be more than 1273 vehicles. If the number of vehicles exceeds this 1273, then the project will be able to earn money.

5. CONCLUSION AND RECOMMENDATIONS

The on-street parking facilities in Ermita-Malate area needs improvement since most of the on-street parkers stay for a very long period and they park in areas where parking is not allowed. The laws and ordinances are not implemented properly, thus, the motorists tend to ignore these. The streets have no proper markings and there are almost no signages on the streets. It is not clear as to where it is allowed to park and there are no enforcers that collect the parking fees and enforce the rules and regulations.

Recommendation

The area of Ermita-Malate should impose better parking rules and regulations and these should be strictly implemented. No parking signs should be visible in the areas where parking is prohibited. Motorists will have an idea where parking is allowed so that they will not be caught for illegal parking, which means the amount of illegal parkers, will also be reduced. The generated on street parking map may also be used as a tool in determining which areas on-street parking may be allowed and where the signage should be put so that the motorists will be informed where parking is allowed or not.

The three-hour parking rule may also be implemented so that the turnover rate may be increased for the on-street parking. More parking facilities should also be constructed so that the demand will be met by the supply of parking spaces. Off-street parking facilities are harder to increase since some areas are residential areas so off-street parking facilities should be increased instead. The open lot parking facilities should be constructed into a building parking facility so that the number of slots will be increased.

Strict implementation should be practiced so that the project will be successful. The enforcers should be alert and should do their assigned tasks properly and they should implement the rules and regulations of the on-street parking.

Figures 8 and 9 show the recommended on-street parking map generated for Ermita-Malate area. This was made in accordance to NBCP.



Figure 8. Recommended Ermita on-street parking map



Figure 9. Recommended Malate on-street parking map

References

- Allison L. C. de Cerreño, Ph.D. (December 2002). The Dynamics of On-Street Parking in Large Central Cities. Retrieved from <http://www.michaelwalker.ca/files/rudin.pdf>.
- Anagnostopoulos, K.P., Dimitriou, D., Stephanis, B. & Vavatsikos, A. (2002). Evaluation of a Transportation Project with the Analytic Hierarchy Process: Best Parking Angle Selection. *Urban Transport VIII*, 2, 161-168.
- Amusan L.M (n.d.) Study of Factors Affecting Construction Cost Performance in Nigerian Construction Sites. Retrieved from Covenant University.
- Asia Development Bank (2011). Parking Policy in Asian Cities. Retrieved from <http://cistup.iisc.ernet.in/Urban%20Mobility%20th%20March%202012/parking-policy-asia.pdf>.
- Benitez, F., Brebbia, C. A. & Sucharov, L. J (2002). *Urban Transport VIII*. Southampton, UK: WIT Press.
- Chance, B. (2009). Parking Problems- Potential Solutions[powerpoint slides]. Retrieved from http://www.chancemanagement.com/downloads/presentations/CMA_MEPS2009_OnStreet.pdf
- ECMT (2007) Managing Urban Traffic Congestion. Retrieved from <http://www.internationaltransportforum.org/jtrc/CongestionSummary.pdf>
- Gresham Smith and Partners (June 2002). On-Street Parking. Retrieved from http://www.bgky.org/publicworks/planningdesign/transportation/pdf/On-Street_Parking.pdf
- Hobeika, A. G. (2002). Travel Time Predictions in Urban Networks. *Urban Transport VIII*, 4, 385-394.
- Homburger, W. (1996). *Fundamentals of Traffic Engineering 14th Edition*. Institute of transportation studies University of California, Berkely
- Land Use Plan. Retrieved from: http://www.makati.gov.ph/portal/uploads/staticmenu/docs/5._land_use_plan.pdf
- Litman, T. (2012) Smart Congestion Relief: Comprehensive Analysis Of Traffic Congestion Costs and Congestion Reduction Benefits. Retrieved from http://www.vtpi.org/cong_relief.pdf
- Litman, T. (2011, February 18). Parking Management Retrieved from http://www.vtpi.org/park_man.pdf
- Lovric, I., Marusic, D. (2002). Selecting An Optimal Traffic System for Cities. *Urban Transport VIII*, 2, 141-150.
- Mauricio, I., Santos, R., Regidor, J., Tiiglaio, N., (October, 2003). Travel Time and Delay Analysis using GIS and GPS. Retrieved from <http://www.easts.info/2003proceedings/papers/0688.pdf>
- Makati Central Business District. Retrieved from: <http://wikimapia.org/12726976/Makati-Central-Business-District-Downtown-Makati>
- Makati Central Business District. Retrieved from: <http://www.makeitmakati.com/makati-central-business-district>
- Makati Central Business District. Retrieved from: <http://www.makati.gov.ph/portal/main/index.jsp?main=60&content=2944&menu=0>
- Makati City. Retrieved from: <http://www.visitmyphilippines.com/index.php?title=MakatiCity&func=all&pid=498&tbl=0>
- Makati Parking Authority (2008) About MAPA. Retrieved from: http://makatiparking.com.ph/about_us/about_mapa.html

- Makati Parking Authority (2008). Locate on-street parking. Retrieved from <http://www.makatiparking.com.ph/map/makati.html>
- Makati Parking Authority (2008). On-Street Parking Slot Reservation Agreement. Retrieved from <http://makatiparking.com.ph/files/Makati%20On-street%20Parking%20Reservation%20Agreement.pdf>
- Makri, M.-C, Brodde (2002). Accessibility Indices and Planning Theory. *Urban Transport VIII*, 1, 37-46.
- Mark Henric T. Go, Myron Julius O. Manguera (September 2010). Assessing Parking Demand and Supply of Establishments in Ermita-Malate Area City of Manila. Retrieved from De La Salle University
- Migliore, M. (2002). The Perception of Network Congestion by Using Parking Fees. *Urban Transport VIII*, 6, 449-458.
- Oyon-oyon, G., Sudaria, G., Yang, P.J.,(2008) On-street Parking Scheme for Ermita and Malate Districts, City of Manila. Retrieved from De La Salle University.
- PBIC (n.d).On-Street Parking Enhancements. Retrieved from <http://www.walkinginfo.org/engineering/parking.cfm>
- Republic Act No. 4136 from Lawphil Project (2000). Retrieved from http://www.lawphil.net/statutes/repacts/ra1964/ra_4136_1964.html
- Roess, R. et al. (2004). *Traffic Engineering third edition*. Upper Saddle River, New Jersey 07458, Pearson Prentice Hall.
- Sewell,M.; Marczak,M. Using Cost Analysis in Evaluation. Retrieved from: <http://ag.arizona.edu/sfcs/cyfernet/cyfar/Costben2.html>
- Sigua, Ricardo G. (2008) Fundamentals of Traffic Engineering (p. 94), The University of the Philippines Press. Retrieved from De La Salle University.