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Sustainable Roadside Parking Solutions in Urban Areas

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ABSTRACT

In order to alleviate the burden regarding parking demand, roadside parking is an essential additional solution to the urban parking problem. However, issues like driving confusion and illegal occupying of road resources arise from the mishandling and misuse of on-road parking, It causes the road's capacity to decrease. In order to alleviate the pressure caused by urban parking concerns, roadside parking is a vital supplementary strategy that is utilized in residential areas to relieve the need for Parking. In order to resolve the on-street parking problem in urban residential neighborhoods, research is being done on the location of on-street parking on Taxila, HMC dual carriageway. Because of the traffic on the current road congestion becomes a significant issue in the Taxila, which HMC dual carriageway system. First, the highest-demand on-road park setting in residential areas are investigated in this article using a combination of manual field survey information and an inquiry survey. The paper outlines the issues, including an imbalance in the supply and demand for parking and unreasonable settings. In order to give answers and preventive measures for various urban residential parking settings, this study bases proposed preventive measures on three levels: parking space settings, parking time environments, plus parking space settings.

KEYWORDS: Heavy Mechanical Complex (HMC), Dual Carraigeway, Peak Intervals

1 INTRODUCTION

Without a question, the most crucial and significant industry for a nation's economy is transportation. Both mobility and the environment are impacted by transportation, or these are two significant aspects of urban economics as well as quality of life that are taken into account. How well a region is supplied by various forms of transportation determines its economic standing. The unchecked growth of metropolitan areas has resulted in an unacceptably large disparity between supply and demand for parking and traffic, which has negatively impacted the environment and caused traffic congestion. accidents.

Parking resources are generally few, and the issue of parking in residential neighbourhoods of certain major and intermediate cities in Pakistan is becoming more and more noticeable. On-road parking has grown in importance as a means of resolving parking issues due to its short construction period, low cost and fast capital turnover. It primarily serves as temporary parking for maintenance trucks and makes up for the scarcity of parking spots at night. However, the

placement of these facilities will have an impact on the volume of traffic on the road. Thus, it is especially crucial to handle on-road parking.

Parking systems are classified into two categories: on-street parking and off-street parking. Large theatres, shopping centres, and offices that are frequented by employers, patrons, and other stakeholders typically have off-street parking available. On the other hand, on-street parking causes traffic congestion because it is carried out directly by market participants, has a single parking space, and is therefore in high demand. It is also considered public property.

Prioritising the creation and use of sophisticated parking management tools, like three-dimensional automatic parking garages and metre charging systems, is currently the focus of foreign researchers studying on-road parking in residential areas. These researchers previously concentrated on parking balance and parking management policy study. The effect of park on dynamic traffic, the planning and administration of parking on public property, and the charging for parking on private property are the key areas of domestic study reflection.

Because of the earlier building phase and the irrational planning and design, the residential sector in the urban district of Taxila is experiencing an imbalance between demand and supply for on-road parking. In addition, there are no appropriate or essential management mechanisms to the on-road driving in the urban area. This results in frequent parking and disorganised arrangements, which substantially disrupts the regular flow of traffic and presents significant challenges for the inhabitants. dimensions.

1.1 Literature Review

The concept of sustainable transportation can be derived from the sustainability definition of the Brundtland Commission. Sustainability in transportation is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable transportation emphasizes the need to coordinate car parking, reduce traffic congestion, increase vehicle mobility, and reduce accidents. Transportation facilities and activities have significant impacts on sustainability in transportation. The role of sustainable transportation has also been addressed by the United Nation's (UN) sustainable development goals. Sustainable transportation can enhance economic growth and improve accessibility. Sustainable transport achieves better integration of the economy while respecting the environment, improving social equity, health, the resilience of cities, urban-rural linkages, and productivity of rural areas.

While many studies have been reported in the literature that examine the use of different off-street parking capacity detection and presentation technologies, only a handful of studies have been performed to monitor on-street parking; mainly, because on-street parking spaces are distributed all over urban centers which are difficult to monitor. Since the cost of on-street parking is generally less than off-street parking (Arnott 2005, Shoup 2006, and Arbitron 2008), most motorists are willing to drive and search more for parking spots; consequently, they contribute to increased congestion and its associated problems, particularly air pollution. Additionally, while searching for a parking location, motorists drive slower than necessary resulting in a stop-and-go traffic pattern that further exacerbates congestion.

Although some experts favor On-street parking as it provides convenience, acts as safety buffer for pedestrians, occupies less space than Off-street parking and encourages shared use of space, but there are researchers who oppose parking on the roads because it causes traffic congestion, traffic crashes, and environmental pollution [3]. Cars spend around 95% of the time parked and only 5% of the time moving, this depicts the importance of a well-organized parking system [4]. According to another survey, out of 8760 hours in year the car runs for an average for only 400 hours leaving 8360 hours when it is parked [5]. To accommodate the huge vehicle volume, cities must have to develop their road and parking systems or else these problems are more likely to get severe, like happens in CBDs. Solution for this is a systemic survey and parking management system, to decongest roads and solve parking and traffic problems [6].

A systematic study will present a sustainable solution for the on-street parking problems and all the other problems created due to on-street parking mismanagement. This research focuses on studying the existing conditions of on-street parking in Taxila and finding measures to relieve on street parking demand and traffic congestion caused by the on-street parking in the peak hours by suggesting alternative solutions.

2 RESEARCH METHODOLOGY

2.1 Study Area

Data is collected on HMC Dual carriageway, Taxila. The location for data collection is selected from main Taxila intersection towards the HMC road. A total of 500m on HMC Dual carriage way were selected for the selection of data depending on the flow of traffic both northward and southward.

Figure 1: Google imagery of Study Area

2.2 Data Collection Plan

The comprehensive process of gathering field data took place on HMC Road Taxila. The survey area was of 500 meters. The poll was completed on the weekends as well as weekdays for duration of 1 hour with 15 minutes time interval. This three survey days were selected randomly and different times on the same location by considering weather condition, political situation etc.

Table 1: Detail of Data Collection on Different Days

Sunday				
Time (PM)	Arrival	Departure	Cars Parked	Peak Interval
12:00	80	0	80	95
12:15	16	11	85	
12:30	19	16	88	
12:45	11	4	95	
Saturday				
Time (AM)	Arrival	Departure	Cars Parked	Peak Interval
10:00	68	0	68	75
10:15	9	8	69	
10:30	12	6	75	
10:45	5	6	74	
Friday				
Time (PM)	Arrival	Departure	Cars Parked	Peak Interval
3:00	15	0	15	17
3:15	4	2	17	
3:30	2	3	16	
3:45	2	2	16	

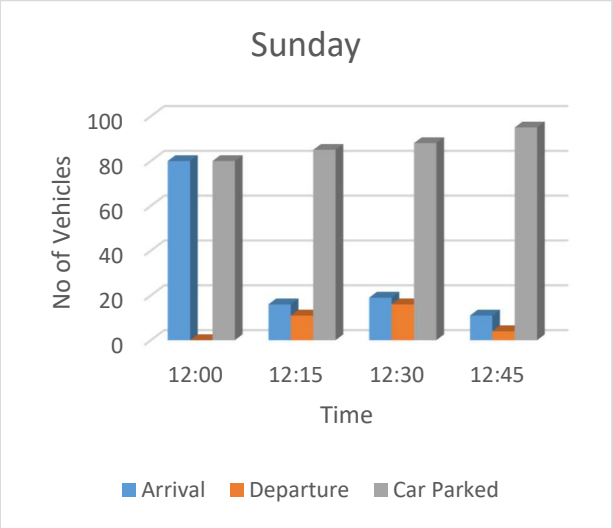
2.3 Data Collection Technique

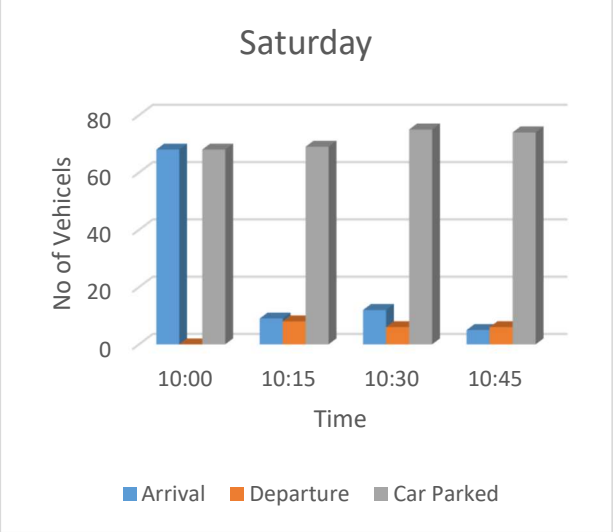
Following research into several methods, weighing the benefits and drawbacks, and considering our data requirements, we chose to use manual survey with an excel sheet printed on which we noted the arrival and departure of vehicles at an interval of 15 minutes for 1 hour on both weekdays and weekend. We collected data on both sides of the carriageway.

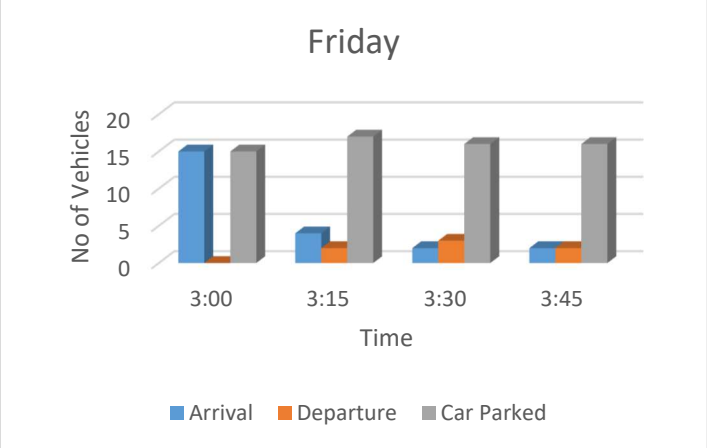
Figure 2: Vehicles Parked on Roadside at site

3 RESULTS AND DISCUSSION

Following the collection of all survey data, Microsoft Excel is used to prepare and analyse the data. We obtained the following conclusions from the data analysis that was done.







The number of parking vehicles on both sides of the road have been collected for a period of 1 hours starting from 12:00PM to 1:00PM on Sunday, from 3:00PM to 4:00PM on Friday and from 10:00 AM to 11:00 AM on Saturday. The collected data have been achieved by four intervals of 15 minutes.

Graphs clearly shows that on weekend number of vehicles parked was more than weekdays. The vehicles parked on Friday can be seen less since the market was almost closed.

4 MAJOR PROBLEMS

- Uneven parking patterns in both on-street lots reduce available space and hence drive up demand for parking.
- Automobiles parked and unparked on streets impede traffic flow and increase the risk of collisions.
- There are street sellers everywhere, which causes problems for parking and traffic flow.
- The need for on-street parking is higher than that of off-street parking since malls and office buildings without private parking depend on it.
- Throughout the duration of the parking survey, it was noted that parkers did not adhere to regulations and guidelines and that bikes, cars, as well as other vehicles were all parked in mixed spots.

5 CONCLUSIONS

Studying the management strategies for on-road parking is essential for resolving parking issues, reducing traffic, and addressing issues related to livelihood. In this essay, the issues surrounding the control of on-street parking in cities are examined and analysed. In order to produce a number of useful outcomes and feasible improvement strategies, the study of on-road parking management strategy focuses on enhancing the on-road parking supervision system, optimising the layout of on-road parking spaces, setting up an efficient installing a sophisticated on-road parking control technique and a charging system for vehicles.

- Given that off-street parking was rarely occupied and on-street parking was frequently, drivers should have been encouraged to park there instead of on the street.
- The need for on-street parking will be reduced if the quantity and the ability of off-street parking spaces are expanded to meet peak parking demand.
- To control the high demand, the parking cost should be fluctuating depending on the time of day and raised for on-street parking during rush hour.
- When trying to maximise capacity, avoid parking in irregular or mixed lots.
- Parkers who park illegally should face fines and tougher enforcement measures.
- All horizontal and other slanted parking should be changed to straight parking to boost the capacity of roads for through automobile and minimise traffic jams during peak hours. Traffic jams were primarily observed in the immediate vicinity the angled parking since these spaces take up a significant amount of route width.
- Two multilevel parking plazas off-street are available at both ends.

6 RECOMMENDATIONS

- Different parking fees should be applied at different times of the day in order to control the increased demand for parking during peak hours.
- When parking demand is at its highest, It is advisable to discourage on-street parking and promote off-street parking. by charging a high parking fee during peak hours. Along with reducing parking on streets, it will help lessen peak-hour traffic delays and congestion.
- To make it easier for cars to park and unpark, street vendors should be moved away from areas where on-street parking is available.
- In order to prevent illegal parking in the second and third rows of on-street parking, law enforcement agencies should implement strict measures.

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REFERENCES

1. Shah Faisal, Rawid Khan, Tariq khan, Manzoor Elahi, Kashif Durrani, Adeel ur Rehman1, Maaz Aziz, Haroon Masood Department of Civil Engineering, University of Engineering and Technology, Peshawar, The Study and Optimization of Parking Facilities in Central Business District: A Case Study of Saddar Peshawar, Pakistan.
2. S. Sabir and G. A. Anjum, Problems and Prospects of Curbside Parking in Lahore: Policy Implications for Effective Management.
3. K. N. Desai and V. Vaidya, Parking study on major corridor of urban area, A case study of Ahmedabad City.
4. Mohammad Rafayet Hossain and Bandhan Dutta Ayon, A Study on On-street Parking Scenario of Developing Countries: A Case Study on Motijheel Commercial Area (Dilkusha Road: Bolaka to Sonali Bank via Phoenix Bhaban).
5. Zhu Xiaoyan, Zhang Xiqiao and Sun Xu, Study on management strategy of the on-street parking in Urban Residential Area.
6. Robert Ebihart Msigwa, Parking Challenges Facing Urban Cities in Tanzania: Evidence from Dar es Salaam City.
7. F. Reza, A. N. Kakon and K. A. Asad, Characterization based on-street parking management in shopping area of a developing country: A study of Dhaka New Market, Bangladesh.
8. Thompson. and Bonsall., 1997, Drivers' response to parking guidance and information systems, Transport Reviews 17(2), 89-104