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Evaluation of On-Street Car Parking on El-Wasea Street in Sebha – Libya

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Keywords:
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Traffic Movement
Car Parking
On-street car parking
Road Capacity

ABSTRACT

On-Street parking characterizes most urban streets, especially in the urban centers where it is considered an attractive facility for drivers. However, inappropriate on-street parking could adversely affect the capacity and the driving speeds of the adjacent road and can cause severe delays, especially on busy roads. In addition, it can pose danger to the safety of road users if not managed properly. This paper tries to study and analyze the car parking on El-Wasea Street in Sebha city, and its impact on traffic behavior. The study reveals that parking on the street does not follow any kind of order, parking spaces are not appropriately provided for parking, and in some places along the street parking took parts of traffic lanes endangering traffic safety, especially during peak hours. The paper included some recommendations on how to rearrange the On-street parking on El-Wasea Street, which is expected to solve parking of cars, or at least mitigate, the adverse impacts of parking on the traffic movement on the street.

تقييم محطات الانتظار على الشارع الواسع بمدينة سبها – ليبيا

أحمد محمد الحضيري

قسم الهندسة المدنية، كلية الهندسة، جامعة سبها، ليبيا

الكلمات المفتاحية:
النقل والمواصلات
حركة المرور
محطات الانتظار
الانتظار بجانب الطريق
سعة الطريق

الملخص

تعد محطات الانتظار على جوانب الطرق السمة المميزة لمعظم الطرق الحصرية خصوصاً في مراكز المدن، حيث تعتبر من المرافق الجاذبة للسائقين. غير أن الوضع غير المناسب لمحطات الانتظار على جانب الطريق قد يتسبب في حدوث آثار سلبية على سعة الطرق وسرعة السير عليه، وقدد يتسبب في حدوث تأخيرات جمة خصوصاً على الطرق المكتظة. بالإضافة إلى ذلك فإن هذا النوع من محطات الانتظار قد يتسبب في تعريض سلامة مستخدمي الطرق للخطر إذا لم تتم إدارتها بشكل سليم. تحاول هذه الورقة دراسة وتحليل محطات الانتظار على الشارع الواسع في مدينة سبها، وآثارها السلبية على سلوك المرور على الطريق. حيث بينت الدراسة أن الانتظار على الطريق لا يتبع أي نوع من التنظيم، مساحات الانتظار غير مهيئة للاستخدام كمحطات للانتظار، كما تتعدى هذه المساحات على أجزاء كثيرة من حارات المرور وتتسبب في تعريض سلامة المرور للخطر خصوصاً في ساعات الذروة. وقد تضمنت الورقة بعض التوصيات المتعلقة بكيفية ترتيب محطات الانتظار على الشارع الواسع، حيث يتوقع أنها سوف تؤدي إلى حل مسألة انتظار السيارات أو على الأقل الحد من آثارها السلبية على حركة المرور على الطريق.

1. Introduction

Transportation is an important and crucial activity [1]. It plays an essential role in the development of societies and their economic activities [2]. It is a means to access business activities, education, employment, and commercial and recreational opportunities that facilitates the movement of people and goods from a given point of origin to a specific destination [3].

Most travel is carried out by cars. This has resulted in traffic congestion that compromises the efficiency of the transportation system and the quality of life [4]. With the increasing use of cars, demand for parking has increased, and the search for parking spaces become a serious

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problem that affects car travel time, safety [5], and the overall performance of roads [6].

Parking spaces become an integral part of the urban setting and important land use [7]. The availability of less space for parking is a serious problem that confronts the urban planner and traffic engineer, as it plays a crucial role in the management of traffic and congestion mitigation [8].

As it is well-known, parking is classified into two types: On-Street parking and Off-Street parking. Off-Street parking is also divided into two categories: at-grade parking and multi-story parking. On-Street parking characterizes most urban streets, especially in the urban centers where it is considered an attractive facility for drivers. However, inappropriate on-street parking could adversely affect the capacity and the driving speeds of the adjacent road [9] and can cause severe delays, especially on busy roads [10]. In addition, it can pose danger to the safety of road users if not managed properly [11].

In some cases, on-street parking affects vehicular lanes, bike lanes, or sidewalks. It also displaces access functions to adjacent properties such as passenger loading zones or commercial delivery zones [12].

2. Location of Study

Sabha has been designated by the National Policy as one of the most important cities in the Fezzan Region [13]. It is the regional capital of Fezzan and is located in the south western part of Libya [14]. The city is a turning point towards the other cities and villages in the region and to the other regional centers in country.

The city center of Sebha, also called Qaaied, is the administrative center of Sebha municipality and the Fezzan region. In addition to the government affairs, the center collects various types of activities and land uses; administrative, educational, commercial, bank, police, justice, public services and utilities, and some other activities [14].

El-Wasea Street, (previously named after Emhemmad El-Megarief), is one the most important streets in the city center of Sebha; most of the prescribed functions are located alongside the street. As presented in Figure 1, the street starts and ends within the center boundaries, and is aligned parallel to Jamal Abdul-Nasser Street [15]. The street is a two-way 4-lane undivided Street, about 1.35 km long and about 26 m in width [14].

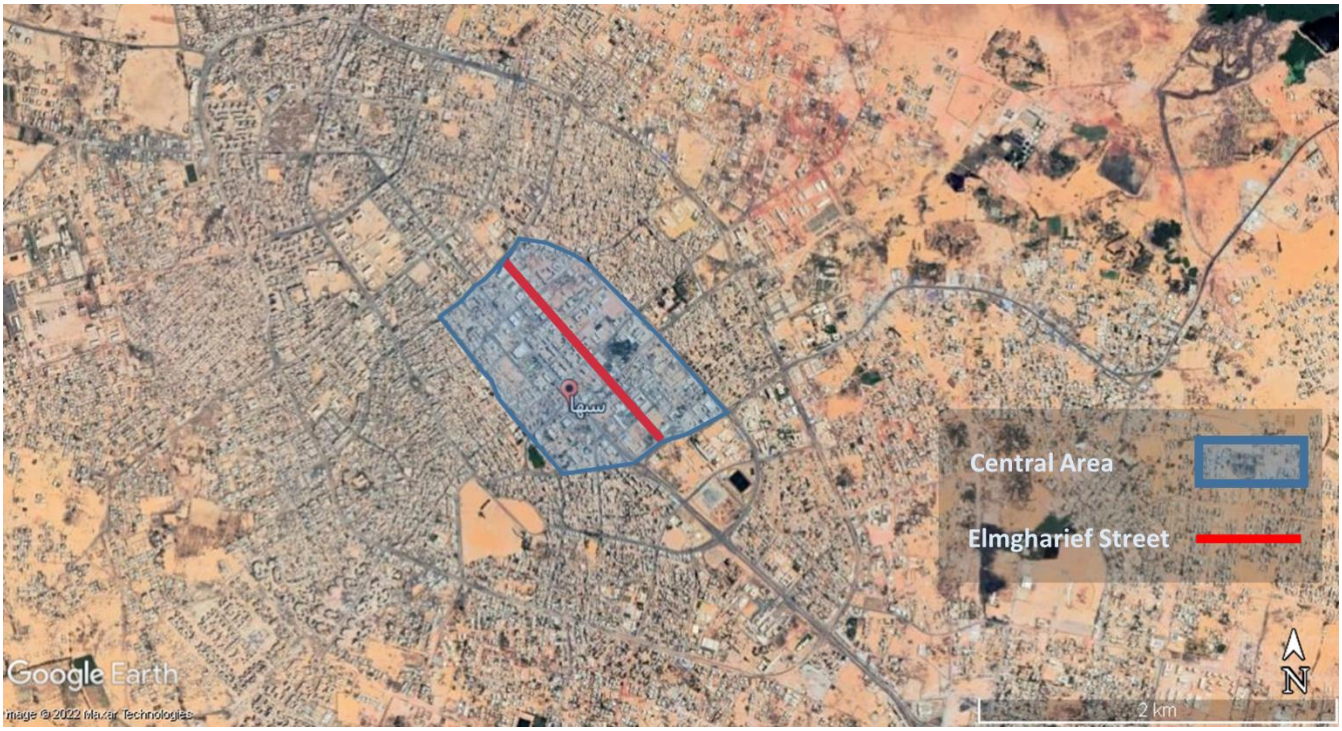

Figure 1. Location of El-Wasea Street [16]

A Street as such usually faces parking problems, which affects its capacity. Very long distances on both sides of the Street are occupied by excess parking of cars, which are not well organized. Although parking is allowed on El-Wasea Street, it needs more attention.

The nearby areas for Off-street parking are either located within the administrative building blocks or are located in improper places. As a result of searching for appropriate parking, the traffic stream is vulnerable to frequent delays and safety issues.

3. Methodology

On-street parking areas are spontaneously distributed on both sides of El-Wasea Street. However, one can notice some places that have more parking concentration than the others, and some are parking-free.

For the study purposes, four traffic observation points (O1, O2, O3, and O4) and five parking observation points (P1, P2, P3, P4, and P5) had been selected. (See Figure 2). These represent the places where most on-street parking issues occurred. These were found to give better understanding about the characteristics of the traffic movement and parking activity.

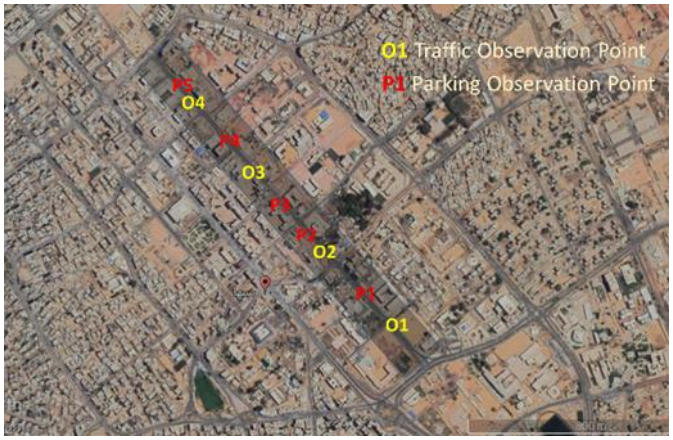

Figure 2. Location of the Observation Points [16]

A traffic and parking survey was conducted manually (using the most traditional counting technique). The data was collected in April 2016, for five normal consecutive days (i.e., Sunday through Thursday) out of which the averages were used. The data gathering includes the Street characteristics, the traffic movement by type of vehicles (private car, medium-size, and large-size vehicles), and the parking characteristics.

Actually, due to the current circumstances that are related to the shortage of fuel, one can notice a decrease in traffic movement within the study area, especially in the afternoon and the evening. This is not a normal situation, yet sometimes the traffic movement faces some turbulent state that need a special concern, especially during the peak hours.

4. Analysis and Discussion

4.1 Characteristics of the Street

Figure 3 presents a view at E-Wasea Street. As stated earlier, El-Wasea Street is considered a wide 2-way street that has no median, instead it is divided by road markings. The number of lanes is four (two lanes per direction). The total width of the traffic lanes is about 17 meters. The pedestrian walkway on each side of the street is about four meters wide.

Figure 3. A view at El-Wasea Street [17]

The street lack for maintenance and traffic control measures. There is no clear definition for the traffic lanes, no pedestrian crossing, no traffic lights, no signs and proper markings. In general, the Street needs to be rearranged to perform well and to fulfil the traffic movement and parking requirements.

4.2 Traffic Volumes

The average 6-hour daily traffic volume on the street is about 14.5 thousand vehicles per day, 50.5 % of which (i.e., 7.3 thousand vehicles) are in the North-West direction, while the rest 49.5 % of which (i.e., 7.2 thousand vehicles) are on South-East direction. Figure 4 exhibits the average daily traffic at various observation points on the street. It should be noted that traffic volumes through the intersections are not included within the framework of this study.

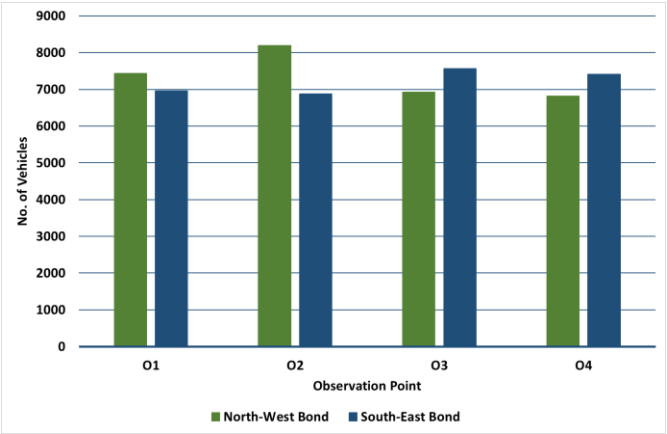

Figure 4. Average Daily Traffic on El-Wasea St.

Referring to the previous figure, the observation point O2 witnessed the highest North-West direction traffic volume (about 8.2 thousand vehicles), while O3 witnessed the highest South-East direction traffic volume (about 7.6 thousand vehicles).

Figure 5 exhibits the average 6-hourly volumes on the street from 09:30 to 15:30. The average hourly volume is about 1,460 vehicles per hour with a standard deviation of about 380 vehicles per hour. The peak hour lasts from 10:30 to 11:30 with an average volume of about 2,180 vehicles per hour, i.e., about 15.2 % of the average 6-hour daily traffic volume. It should be noted that according to the field survey, more than 97 % of traffic is performed by passenger cars, and commercial vehicles do not exceed 3 % of the total traffic.

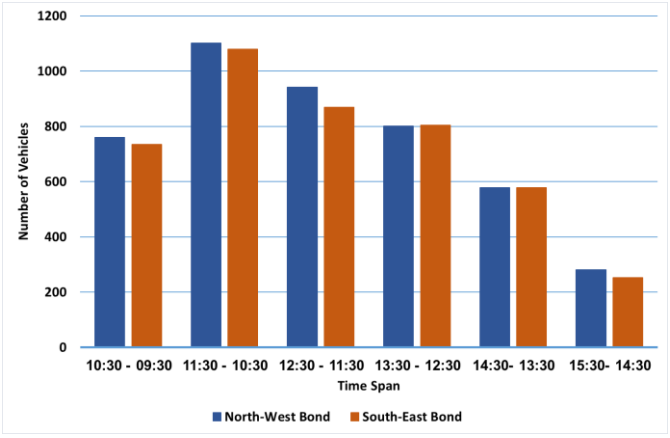

Figure 5. Average Hourly Traffic from 09:30 to 15:30

As shown in the last figure the traffic volume tends to decrease after 11:30 to reach the minimum situation at 14:30. According to the field experience, the traffic volume tends to increase at 17:00 and lasts until 19:00. However, the traffic volumes during the evening hours are usually less than those in the morning hours.

4.3 Parking Characteristics

El-Wasea Street is not provided with proper on-street parking. However, due to the need for parking, drivers park their cars spontaneously on the street. In some places along the street parking takes parts of the right lanes so their width is minimized if not compromised. This situation is noticed especially during the peak hours and nearby some commercial and public services.

Figure 6 exhibits the total 6-hour (from 09:30 to 15:30) parking on the street for the weekdays Sunday through Thursday. The average 6-hour daily parking on the street is about 895 vehicles, divided into 5 locations as stated in section 2. The average parking is about 180 vehicles per location. Location P5 has the highest number of parked vehicles, about 295 vehicles.

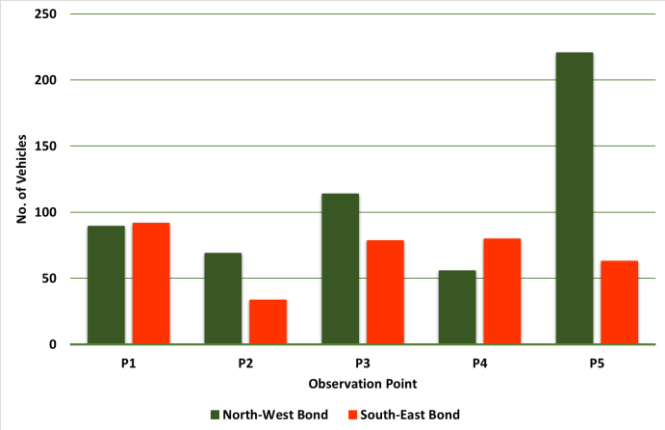

Figure 6. Average Daily Car Parking on El-Wasea St.

Figure 7 exhibits the total 6-hour daily parking at the observation point P5 on the street. The figure shows the little variation in car parking between the different days of the week. The highest number was recorded on Monday about 970 PCUs, while the smallest was on Thursday about 835 PCUs.

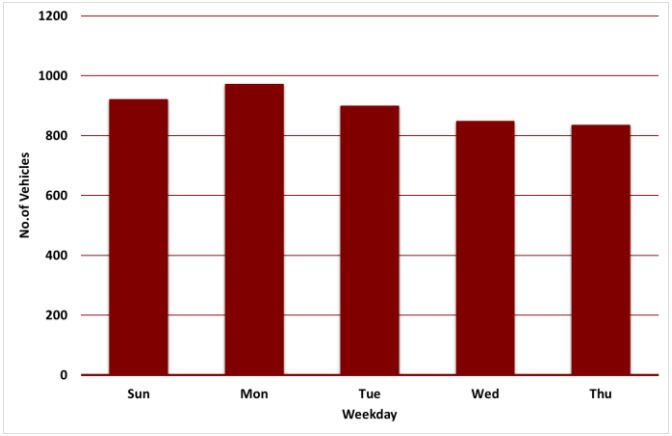

Figure 7. Total Daily Car Parking from 09:30 **to** 15:30 at P_5

Figure 8 exhibits the average hourly car parking at the observation point P5, from 09:30 to 15:30. The average hourly car parking is about 47 PCUs per hour. The peak parking of cars occurs between 12:30 to 13:30, with about 71 PCUs. It should be noted that the type of parking does not follow any kind of order and affects the performance of the street causing some sort of congestion.

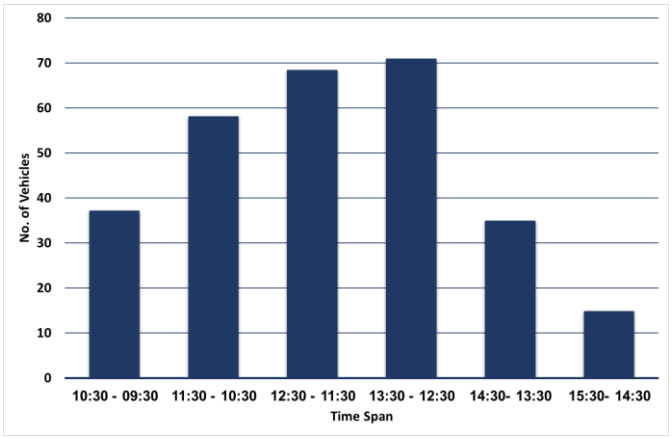

Figure 8. Average Hourly Car Parking from 09:30 to 15:30 at P_5

The following Table 1 presents some other characteristics of parking at P5 on El-Wasea Street. As stated previously, the parking is not organized and does not follow any type of organization. Instead, drivers choose to park their cars at an angle of about 30 ° to the street alignment. This gives a little pet more space than parallel parking. However, this minimizes the width of the street and therefore affects the capacity of the traffic lanes.

Table 1. Parking Characteristics at P5

No.	Factor of Analysis		Weekday				
			Sun.	Mon.	Tue.	Wed.	Thu.
1	Average daily Parking (PCUs)		182	240	205	190	201
2	Parking index		0.77	1.01	0.86	0.80	0.85
3	The peak hour of parking	time	11:30 - 12:30	11:30 - 12:30	12:30 - 13:30	12:30 - 13:30	12:30 - 13:30
4		PCUs	48	63	51	46	58
5		index	1.20	1.58	1.28	1.15	1.45

* Source: The author's estimations

The table shows that the 6-hour daily parking indices (i.e., the ratio of number of parking vehicles to the available parking lots) are acceptable, except for Monday which exceeded 1. Again, the daily peak hour parking indices exceeded 1, which means that the parking spaces are not capable of handling the requirements for parking.

5. Conclusions

On-Street parking is a well-known phenomenon, especially within the city centers, that has several effects on the urban setting and the movement of traffic. The study reveals the following comments:

- Car parking on El-Wasea Street does not follow any kind of order, parking spaces are not appropriately provided for parking.
- Car parking on the street is mainly angled, while the width of the street does not allow but for parallel parking to the edge of the street.
- The traffic lanes along the street are mainly affected by car parking, by narrowing their widths, especially during the peak hours.
- Although the traffic movement is not in a normal situation, still it is affected by parking on the street during peak hours.
- Potential spaces for parking on the street are not enough to fulfill the requirements.
- Off-Street parking areas are not well prepared to serve the different activities along the street.
- In general, there is no strict rules and regulations applied for the management of the traffic movement and the car parking.

6. Recommendations

The following recommendations would ensure that there would be effective parking systems on streets while ensuring that there is pedestrian safety.

- Redesign the available space to insure providing proper parking on El-Wasea Street,
- Applying strict traffic rules and regulations, for the management of traffic movement and car parking operations.
- Promoting the use of the available Off-Street parking areas by applying good and motive measures, such as: providing proper entrances, marking the parking lots, providing the parking with shadow potentially by planting trees, provide the parking with the direct contact to the different nearby activities, and so on.
- Creation of new well-planned and designed Off-Street Parking, and
- Applying restrictive measures to On-Street parking, such as: limiting the parking time, and pricing the parking utility**.**

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