

Comparative analysis parking spaces in the city of Gradiška

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Abstract: We live in an era of global urbanization, which largely represents the expansion of existing cities and the creation of new ones, but at the same time the reduction of rural settlements. The number of people living in cities is increasing day by day. If the organization of the city is good, the work is done well, it has a predisposition to become a smart city. In order for a city to become smart, it needs to keep up with the times, follow trends, the development of technology, infrastructure, have intelligent transport systems and the like. Interruption of vehicle movement for a period of time longer than 3 minutes constitutes parking. A parking space is a limited part of the road intended for parking vehicles. It can be part of a garage, parking lot or street. A parking lot is a space intended exclusively for parking vehicles.

Keywords: parking space, urban environment, parking features...

INTRODUCTION

Parking lots can be private or public. A public parking lot is a part of the traffic area intended exclusively for parking cars. The time period of parking in the public parking lot can be limited or unlimited. It is characteristic of public parking lots that they are classified by parking zones. Private car parks are usually built by legal institutions for the needs of their employee members or clients.

In order for a parking lot to be considered good, certain criteria must be met:

- The parking lot is located in an accessible location in the immediate vicinity of all or most of the contents and attractions of the population;
- The parking lot has an aesthetically acceptable external and internal appearance;
- In the parking lot, there is a possibility to quickly and easily find a free parking space with the help of a guidance system;
- The parking lot is provided with lighting during the night, which ensures the confidence and safety of the parking lot users;
- The parking lot is regularly maintained and cleaned.

Cars used to represent luxury, while today they represent a necessity for daily life activities. [4] The increase in the degree of motorization of the population not infrequently creates a problem in terms of stationary

traffic. There is an increasingly frequent need for a parking place, more. In urban areas, the problem is the same for everyone because there is a lack of parking spaces. It often happens that due to the lack of parking spaces, drivers resort to parking in residential areas. Parking in residential areas is a new problem itself. [2]

The subject of this paper is the investigation of parking characteristics in the parking lots in the streets of Dr. Mladen Stojanović, Vidovdanska (near the Cultural Center) and the parking lot of the "Kozara" building, which are located in the central area of Gradiška. The location itself (Dr. Mladen Stojanović Street) is very attractive and busy. Until recently, the planned parking lot was unorganized with numerous obstacles, unmarked parking spaces, and did not have an adequate method of payment. The parking space in Vidovdanska street is also very attractive due to the proximity of all important municipal institutions, banks, services and the like. The parking lot of the "Kozara" building is specific and is more in the domain of parking for building tenants. [3] [6] [7] This research was conducted in order to improve the functioning of the parking system, after arranging the plot.

Data that must be collected and presented by this research:

- surface accessibility,
- available number of parking spaces,

- parking mode;
- type and characteristics of parking,
- vehicle retention time,
- frequency of parking,
- purpose of parking,
- the most necessary item for users (walking time to the destination, price of a parking space);
- remarks and suggestions of users of parking services.

In order to improve parking services, a survey of parking users was conducted on July 12, 2023 - Wednesday. The counting of vehicles at the given location was carried out in the period from 07:00 a.m. to 1:00 p.m. At the very beginning of the research, a record of the vehicles found was made.

LOCATION AND CHARACTERISTICS OF PARKING

Pictures 1, 2 and 3 show the appearance of the parking lot located in Dr. Mladen Stojanović Street. The parking lot located in Dr. Mladen Stojanović Street includes 36 paid parking spaces, 2 spaces for people with disabilities and 5 reserved spaces. Due to the proximity of the residential complex, there are several annual preferential tenancy tickets in the collection. The number of monthly tickets charged varies depending on the time of year.



Picture 1. View of the parking lot (spaces for persons with disabilities)



Picture 2. View of the parking lot in Dr. Mladen Stojanović Street

Table 1. Characteristics of parking in Dr. Mladen Stojanović Street

| Parking lot location | Dr. Mladen Stojanović Street | | |
|---------------------------|------------------------------|---------------------------------|---------------------------|
| Type of parking lot | Closed | | |
| Parking lot organization | 90° | | |
| Number of parking spaces | Under payment 36 | For persons with disabilities 2 | Reserved parking spaces 5 |
| Illegally parked vehicles | 5 | | |
| Number of vehicles found | 21 | | |



Picture 3. Illegally parked vehicles in Dr. Mladena Stojanović Street

Table 2. Characteristics of parking in Vidovdanska Street (near the Cultural Center)

| Parking lot location | Vidovdanska Street (near the Cultural Center) | | |
|---------------------------|---|---------------------------------|---------------------------|
| Type of parking lot | Closed | | |
| Parking lot organization | 90° | | |
| Number of parking spaces | Under payment 35 | For persons with disabilities 1 | Reserved parking spaces 0 |
| Illegally parked vehicles | 15 | | |
| Number of vehicles found | 27 | | |



Picture 4. View of the parking lot in Vidovdanska Street (near the Cultural Center)

Picture 4 shows the parking lot in Vidovdanska Street (near the House of Culture). This parking space has 35 paid parking spaces, 1 space for people with disabilities and no reserved spaces. Due to the proximity of the residential complex, there are several annual preferential tenancy tickets in the collection. The number of monthly tickets charged varies depending on the time of year.

In the attached tables, you can see the basic characteristics of the parking lot that are the subject of this research. All three parking lots are in the central city area. The type of parking lot is closed for all three. The number of parking spaces is almost the same. However, the obvious difference is the number of vehicles that were found in parking lots before 7:00 a.m. when the survey began. The reason for this is the residential complexes located nearby.

Table 3. Characteristics of the parking lot near the Kozara building

| Parking lot location | Parking lot of the Kozara building | | |
|---------------------------|------------------------------------|---------------------------------|---------------------------|
| Type of parking lot | Closed | | |
| Parking lot organization | 90 ^a | | |
| Number of parking spaces | Under payment 36 | For persons with disabilities 2 | Reserved parking spaces 0 |
| Illegally parked vehicles | 1 | | |
| Number of vehicles found | 3 | | |

TIME OF VEHICLE DETENTION

The length of parking can be divided into:

- very short parking (15-30 minutes),
- short (from 30 - 120 minutes),
- medium length (from 2-6 hours),
- long (from 6 to 10 hours),
- very long (more than 10 hours);
- permanent (24 hours and more).

Short-term parking is predominantly present in urban areas and tourist areas, while long-term parking is characteristic of the perimeter of a narrow or wider ring of an area. [4]

Table 4. Duration of parking in fifteen-minute intervals at the parking lot in Dr. Mladena Stojanović Street

| Retention time | Vehicle number | Numerical value expressed in % |
|------------------|----------------|--------------------------------|
| up to 15 minutes | 39 | 37.14% |
| 15-30 | 21 | 20.00% |
| 30-45 | 12 | 11.43% |
| 45-60 | 10 | 9.52% |
| 60-75 | 5 | 4.76% |
| 75-90 | 5 | 4.76% |
| 90-105 | 2 | 1.90% |
| 105-120 | 2 | 1.90% |
| over 2 hours | 9 | 8.57% |
| in total | 105 | 100.00% |

From the results attached, obtained by this research, it can be seen that there is an evident difference in the number of vehicles for the same time period. Based on the collected data, which was created by surveying the parking lot users, it was established that the parking lot users on Dr. Mladen Stojanović Street most often use it to go shopping (close to shops and greater convenience for people with disabilities).

Table 5. Duration of parking in fifteen-minute intervals at the Vidovdanska Street parking lot (near the Cultural Center)

| Retention time | Vehicle number | Numerical value expressed in % |
|------------------|----------------|--------------------------------|
| up to 15 minutes | 29 | 48.33% |
| 15-30 | 12 | 20.00% |
| 30-45 | 7 | 11.66% |
| 45-60 | 3 | 5.00% |
| 60-75 | 2 | 3.33% |
| 75-90 | 1 | 1.66% |
| 90-105 | 1 | 1.66% |
| 105-120 | 2 | 3.33% |
| over 2 hours | 3 | 5.00% |
| in total | 60 | 100.00% |

Table 6. Duration of parking at fifteen-minute intervals in the parking lot of the Kozara building

| Retention time | Vehicle number | Numerical value expressed in % |
|------------------|----------------|--------------------------------|
| up to 15 minutes | 7 | 13.20% |
| 15-30 | 5 | 9.43% |
| 30-45 | 5 | 9.43% |
| 45-60 | 4 | 7.54% |
| 60-75 | 3 | 5.66% |
| 75-90 | 5 | 9.43% |
| 90-105 | 2 | 3.77% |
| 105-120 | 3 | 5.66% |
| over 2 hours | 19 | 35.84% |
| in total | 53 | 100.00% |

SURVEY RESULTS

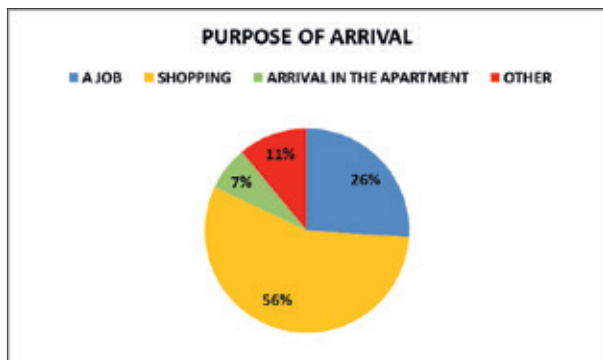
Parking is the process of settling and idling the vehicle, which is limited in time from departure to leaving, i.e. the departure of the vehicle from that space, while the user continues with the activities that were a consequence of the transportation. [5] The method of planning and dimensioning of areas intended for vehicle parking, in addition to the space and surroundings, can also affect

the safety of road traffic. [1] [9] Users of parking services park in certain parts of the city for a specific purpose, whether it is for work, school, recreation, shopping, returning to the apartment, and the like. [1] [8] There are many reasons.

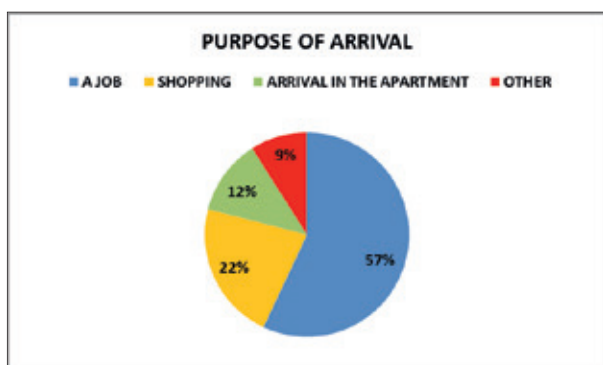
Analyzing the collected data, it was determined that the leading purpose is shopping with 56% and work with 26%. The processed collected data can be seen in the following pictures, for the parking space in Dr. Mladen Stojanović Street.

Analyzing the collected data, it was determined that the leading purpose is business with 57% and shopping with 22%. The processed collected data can be seen in the following pictures, for the parking space in Vidovdanska Street (near the Cultural Center).

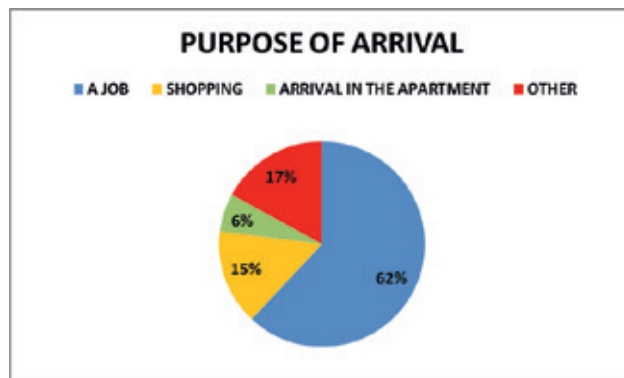
Analyzing the collected data, it was determined that the leading purpose is work with 62% and other with 17%. The processed collected data can be seen in the following pictures, for the parking area of the “Kozara” parking building.



Picture 5. The percentage value of the purpose of coming to the parking lot in Dr. Mladena Stojanović Street

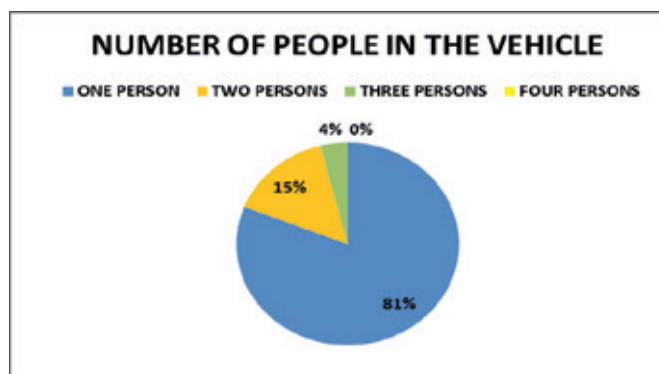


Picture 6. The percentage value of the purpose of coming to the parking lot in Vidovdanska Street (near the Cultural Center)

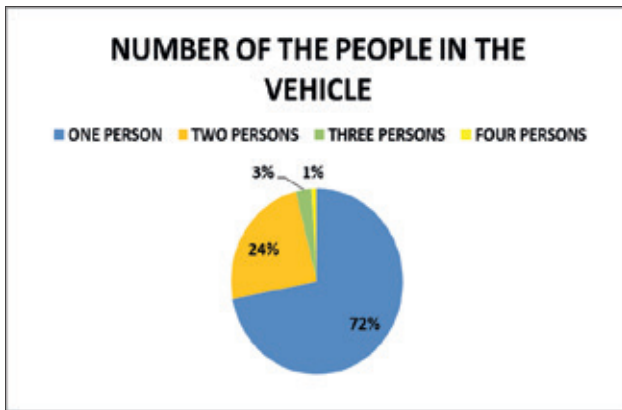


Picture 7. The percentage value of the purpose of coming to the parking area of the Kozara building

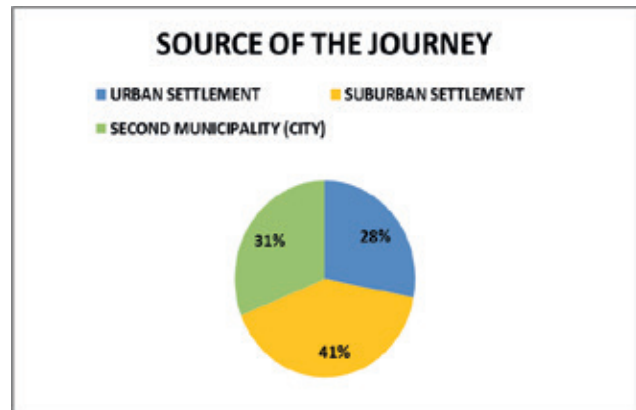
Although all three parking spaces are in the city center, the collected and processed data revealed interesting facts. The parking lot in Dr. Mladen Stojanović Street is mostly used for shopping purposes. Parking space in Vidovdanska street is used for business and private business needs, this is supported by the fact that city and municipal institutions are nearby while the parking area of the “Kozara” building, according to the data, is mostly used for business purposes. Pictures 8, 9 and 10 show the percentage value of the number of people in the car who parked. In Dr. Mladen Stojanović Street, 81% of users came alone in a car, 15% two people, 4% three people. In Vidovdanska Street, 72% came with one person, 24% with two people, 3% with three people, and 1% with four people. While for the parking lot of the “Kozara” building, 92% are for one person in a car, 7% for two people, and 1% for three people.



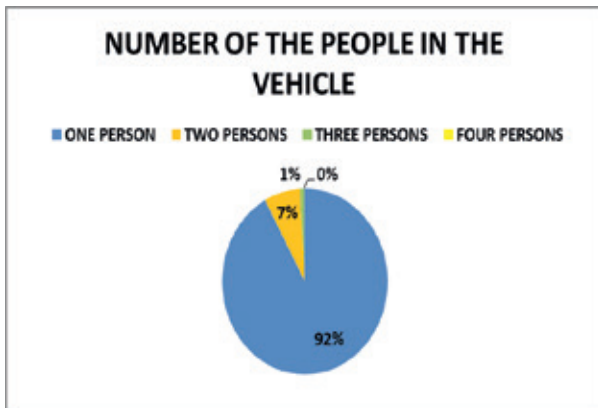
Picture 8. The number of people in the vehicle in the parking area in Dr. Mladena Stojanović Street



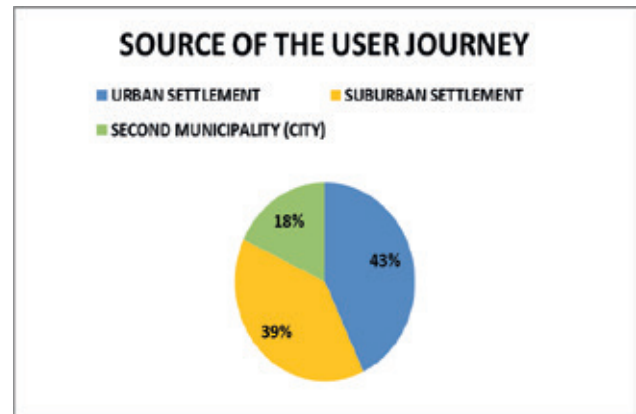
Picture 9. Number of people in the vehicle in the parking lot in Vidovdanska street



Picture 12. The source of user travel at the parking area in Vidovdanska Street



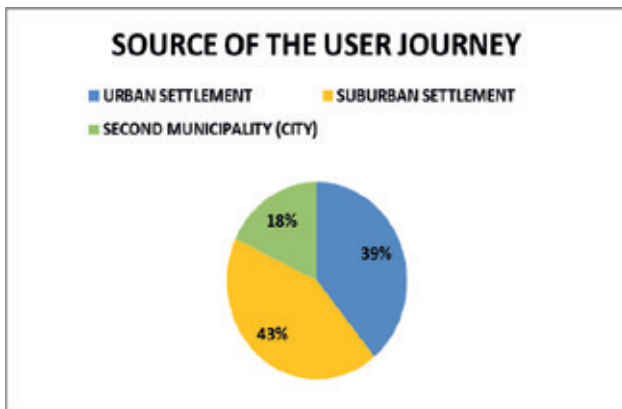
Picture 10. Number of people in the vehicle in the parking area of the Kozara building



Picture 13. The source of user travel in the area of the Kozara building

According to the collected and processed data, it can be seen that for all three parking lots, the maximum number of arrivals per person in a car was determined. The arrival of one person in a car is a problem. Because of such cases, the use of public city transport or cycling is promoted.

Pictures 11, 12 and 13 show the distribution of users according to the source of travel. The largest number of users comes from suburban settlements, then from urban settlements and from other municipalities. Certain deviations are possible during holidays, vacations and the like.



Picture 11. The source of user travel in the parking area in Dr. Mladena Stojanović Street

From the above pictures it can be seen that the majority of users came from suburban areas. Changes may vary depending on population migration.

Transport service quality parameter

One of the questions mentioned in the survey was related to what the users perceive as the most important item in parking: that there are spaces, the price of the service, the distance from the destination. Most of them declared that the most important thing for them is to have a place.

With the fact that they would still give up parking if the price of the parking service per hour costs 2 KM.

In the survey, there was a question related to the alternative way of getting to the desired place, where the majority said they would come: by public transport (52%), by bicycle (29%), on foot (19%).

Remarks and suggestions

Within the requested data, during the survey, users were given the opportunity to express suggestions or objections to the existing way of service. The largest number of respondents complained about the lack of parking spaces. Also, the parking spaces for people with disabilities, which are really too few, stand out. In

Dr. Mladen Stojanović Street, they have two parking spaces for people with disabilities. However, according to the data obtained from the survey, it can be seen that this parking lot is mostly at the service of citizens who make purchases. Vidovdanska street has only one place for people with disabilities. Very unfavorable considering the proximity of city and municipal institutions that most citizens visit on a weekly basis.

CONCLUSION

On 12th July 2023, a survey was carried out of the parking payment system in Dr. Mladen Stojanović Street, Vidovdanska and the parking lot of the "Kozara" building in Gradiška. Time period of performance from 07:00 a.m-1:00 p.m. The requested data has been collected and processed. Analysis of the given data determined the following:

- The parking lots that are the subject of this research are located in the central city core;
- Although all three parking spaces are located in the central part of the city, there are interesting differences;
- Non-prescribed parking spots were also determined by recording on the fly. Certain illegally parked vehicles belong to tenants of a nearby residential complex (they have privileged annual tenant cards), while other vehicles were not parked in places that were not marked as parking spaces.
- Regarding the retention time itself, the results are different. In Dr. Mladen Stojanovića Street and Vidovdanska Street, vehicles mostly stopped for shorter time intervals (15-30 minutes). While in the parking area of the "Kozara" building, it is a longer time interval, over 2 hours;
- The survey found that about 43% of parking lot users come from suburban areas, 37% from urban areas, and 22% from other municipalities;
- The user's suggestions and remarks are expressed in the form of complaints about the insufficient number of parking spaces.

LITERATURA

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