



IDENTIFYING PARKING PROBLEMS IN THE CITY OF SUMGAYIT: ANALYSIS BASED ON SURVEYS AND FIELD MONITORING

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Abstract

This article presents a comprehensive analysis of urban parking problems based on questionnaire surveys and field monitoring methods. The main objective of the study is to identify discrepancies between parking demand and existing parking supply, assess parking-related difficulties, and determine problematic areas. Questionnaire surveys were conducted to investigate the main challenges experienced by parking users and evaluate their perceptions of existing parking conditions. Field monitoring was carried out to examine parking characteristics, parking space utilization, parking intensity, and spatial variations in parking demand. The findings indicate that parking demand exceeds available capacity, particularly around markets and supermarkets, resulting in parking space shortages. Furthermore, differences in parking space utilization were observed across various urban areas. Based on the findings, problematic parking zones were identified, existing conditions were evaluated, and opportunities for improving parking management were analyzed. The results provide insights into more efficient parking organization and utilization of existing urban parking resources.

Key words: *parking problems, survey results, vehicles, supermarket, shopping mall*

1. Introduction

In modern cities, the acceleration of the urbanization process and the increase in the population lead to a continuous increase in the demand for transport systems. The increase in population and economic activity increases the intensity of trips, creates conditions for the increase in the number of individual cars, and as a result, forms an additional burden on the road transport infrastructure. This process leads to the emergence or deepening of parking problems, especially in city centers and around centers of attraction. Studies show that parking problems are mainly observed near shopping centers and markets [1]. About 30% of the city's transportation network consists of cars looking for parking spaces, causing traffic jams. The main problem caused by parking is the reduction of the average speed of movement and the ability to release [2]. When determining parking areas, it is necessary to take into account the parking options of drivers. The main factors for drivers are the payment rate, the search time of the parking space and the pedestrian distance [3].

Mass use of private cars in city centers causes a serious transport problem. It is viewed as a multimodal transport network where drivers travel the first part of the road by private car and the rest by parking facilities on public transport or on foot to reach city centers where the entry of cars is restricted. This proposal is not just like finding the shortest distance in the "Park-and-Ride"

model; considers it a multi-criteria decision-making process such as total travel time, parking fees and the risk of not finding free space in the parking lot [4]. Analysis of parking time shows that during morning peak hours, drivers park their vehicles for an average of 8 hours, and those in the evening park for 12 hours [5]. Multi-storey parking systems are used to eliminate land deficiencies in the parking area [6].

2. Metodologiya

In this study, questionnaire surveys and field monitoring methods were employed to identify parking problems in urban areas, assess existing parking facilities, and determine discrepancies between parking demand and supply. The research methodology consists of two main stages: investigating users' parking behavior and the difficulties they encounter through questionnaire surveys, and evaluating actual parking conditions in selected areas based on field monitoring.

3.Results and Discussion

Characteristics of the study area and trends in parking demand. Designated parking areas for private vehicles have been established on specific streets and avenues in the city of Sumgayit. These zones are intended to allow drivers to park their vehicles for either short or long periods. Located in various parts of the city, these parking facilities contribute significantly to regulating traffic flow, reducing congestion on streets and avenues, and ensuring road safety. The growth in the city's population and the number of vehicles over the past decade has increased the demand for parking spaces. Data regarding the year-by-year increase in population and vehicle numbers, based on official figures from the State Statistical Committee of the Republic of Azerbaijan, is presented in Tables 1 and 2.

Table 1. Population of the city of Sumgayit by year

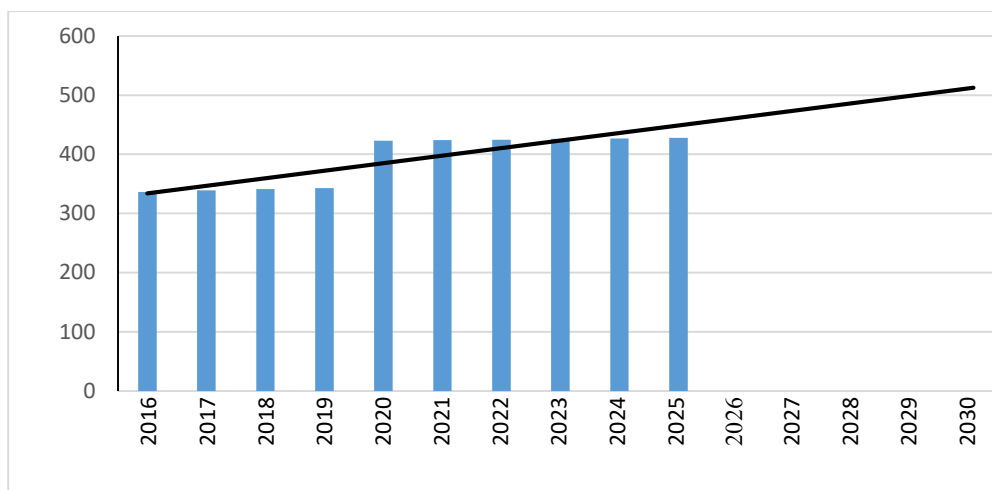
Years	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Change in population size (thousand people)	336.2	339.0	341.2	343.1	423.1	424.2	424.6	426	427	427.6

Table 2. Number of vehicles in the city of Sumgayit by year

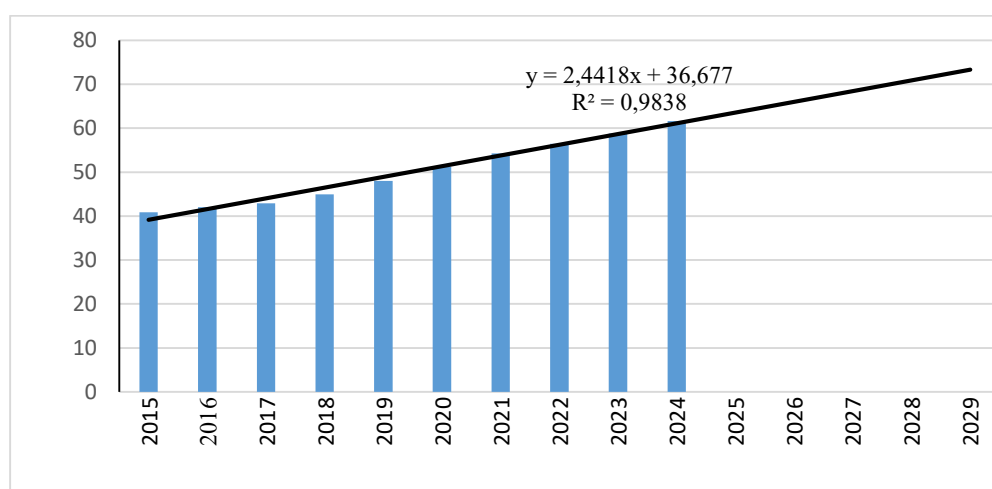
Years	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Number of NVs	40.888	41.997	42.908	44.976	47.993	51.190	54.272	56.436	58.784	61.628

Based on the figures in the table, graphs projecting the growth of the population and the number of vehicles over the next five years have also been created. The growth of the population and the vehicle fleet in the city of Sumgayit can be described with reasonable accuracy by a linear relationship. Projections indicate that the number of vehicles on the streets and roads will increase by approximately 30% over the next five years. This underscores the critical importance of properly managing parking within the city.

Field monitoring and observations. As a result of monitoring in the city of Sumgayit, it was determined that parking places are mostly parallel and perpendicular on the streets. Parking areas are equipped with a parking sign or line. Observational results show that the parking problem around the market causes delays. When drivers pull out of a perpendicular parking space, obstructing the movement of another driver on the road affects the flow of traffic. Figure 1 presents an overview of the parking spaces, which represents a visual representation of the existing infrastructure.



Graph 1. Population growth forecast for the next 5 years



Graph 2. Forecast of vehicle growth over the next 5 years

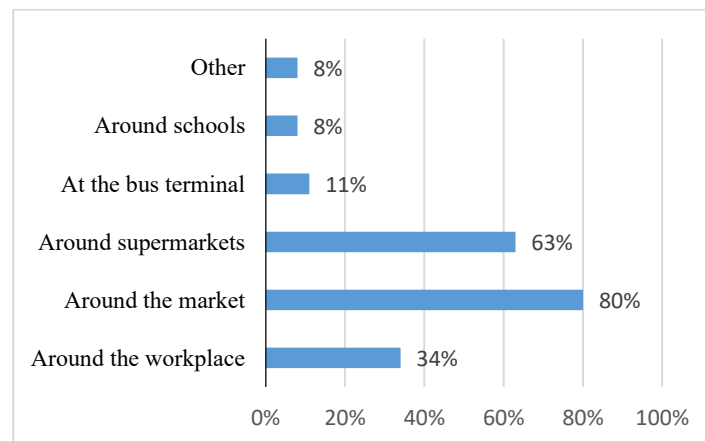


Figure 1. Streets and avenues with parking facilities in the city of Sumgayit.

Questionnaire Survey. In order to solve the parking problems in the current conditions, it is appropriate to determine the distribution of parking spaces on the territory. As an example, the

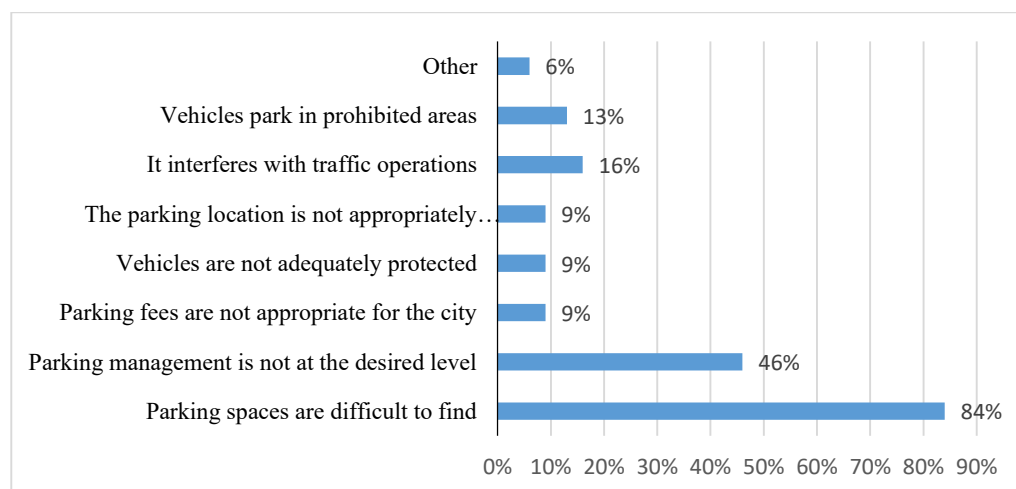
issues of parking distribution in the city of Sumgayit, the second largest city of Azerbaijan in terms of population, were investigated. The analysis of the distribution of parking spaces in the city of Sumgayit was systematically studied on the basis of survey and monitoring. For this reason, the areas where the users of personal vehicles face parking problems in the city of Sumgayit, the existing parking problems in the mentioned areas, the percentage distribution of the easy to find parking places, the hours when the parking problems occur, and the proposals of the population for solving the parking problems were evaluated based on surveys.

Graph 3 and 4 illustrate the areas in the city of Sumgayit where parking issues exist, as well as the specific nature of those problems. As shown in Graph 3, 80% of residents identified the area around the market as a location where they struggle to park their vehicles. Additionally, 63% of residents reported difficulties parking near supermarkets, while 34% cited similar issues near their workplaces. Finally, 11% of the population noted encountering parking problems at the bus terminal.



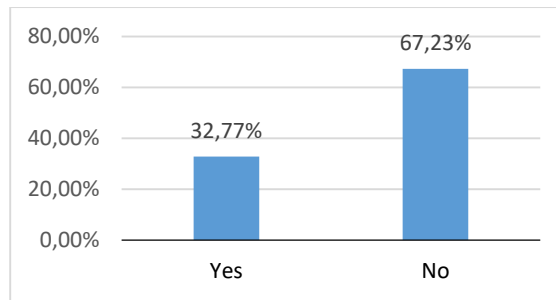
Graph 3. Areas where private vehicle users encounter parking problems

Regarding existing parking issues in the areas shown in Graph 4, 84% of the population experience difficulty finding a parking space. 46% of respondents believe that regulation is not at a satisfactory level, while 9% feel that vehicles are not adequately protected. The survey revealed that 16% of the population considers vehicle parking to be an impediment to traffic flow. 9% of respondents state that parking locations have been poorly chosen and that parking rates are not appropriate for the city.



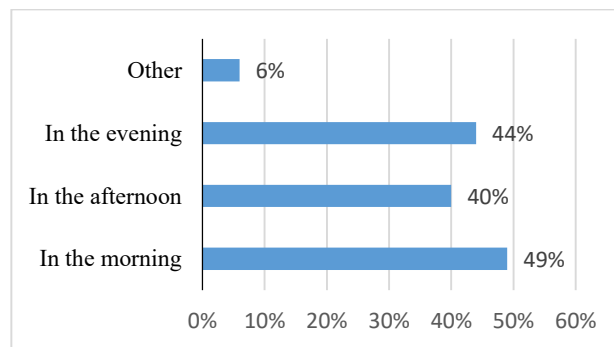
Graph 4. Existing parking problems in the specified areas (around markets and supermarkets)

The results of surveys regarding the ease of finding parking spaces and the times when problems arise are presented in Graphs 5 and 6. Specifically, 67.23% of the population considers parking options inaccessible, while 32.77% believes that parking spaces are easy to find.



Graph 5. Percentage distribution of the ease of finding parking spaces

It has been determined that parking problems arise during the morning and evening hours. Although parking issues do occur in the afternoon, the majority of problems arise during the morning hours.



Graph 6. Hours when parking problems occur

4. Conclusion

To present the data obtained from field surveys more clearly and systematically, the current spatial distribution of parking facilities has also been illustrated through visual materials. These visualizations allow for a comparative analysis of the spatial distribution characteristics of parking spaces and problem areas, using the city of Sumgayit as a case study. Survey and monitoring results indicate that the primary parking issue in Sumgayit is the inability of drivers to find spaces in the vicinity of markets and supermarkets

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