PARKING SYSTEM CREATION AND SUPPLY AT URBAN AREA

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ABSTRACT

Initially, the article discusses the problems caused by parking and the importance of proper parking management. The meetings of some researchers on this issue were analyzed and the methods used were adopted. The article mentions the positive aspects of multi-level parking and vollective parking in the direction of traffic jam elimination.

Keywords: management, parking, methods

INTRODUCTION

Parking can be one of the most important revenue-generating assets for an urban area with proper land use. The increase in the city's population has a serious impact on the number of parking spaces. An economic expert said that 30% of traffic jams are caused by vehicles that cannot park their cars. One of the reasons for this is the lack of cheap or free parking.French municipal statistics have shown that the wasted hours on parking search are at least 400 hours per day in city commerce district. If we convert those hours into fuel consumption, CO2 emission and the economical effect, the parking is very expensive whatever from the personal, public or environmental viewpoints.[1]

Urban space allocated for stationary car traffic tend to be in disproportion to its share in use. In the City of Graz, despite the fact that car accounts for only 47% of the mode share, it takes up 92% of the urban space used for stationary traffic. Meanwhile cyclists and pedestrians accounting for 33% of the mode share but only receive 5% of the urban space for stationary traffic.

In every city as vehicle traffic increases, so does the demand for parking. Motorists tend to park illegally when they cannot find a parking space nearby. This indicator may be one of the causes of traffic congestion. “Parking and loading spaces should be plenty, close to the destination, high quality and preferably free of charge” is often the wish of those residents, businesses and visitors who speak up. When businesses and retailers are faced with the introduction of controlled and paid parking, they often fear loss of business and revenue. Parking management is a very important issue and should be given special attention.

For these reasons, parking management has often remained a domain untouched by decision makers,unless parking problems have spiralled out of control and/or the city wants to gain financial revenue. This has led to a merely reactive and operational way of dealingwith parking, mainly only responding when a specific problem pops up (at a certain location), and/or using an isolated approach, further facilitating car use. Thus a predict and provide

mechanism – often focussing on infrastructure – has dominated parking policy in many cities for many years.
Meanwhile we can see the results of such policies: car-oriented developments and cluttered urban space dominate cities, while at the same time increased motorised traffic further and negatively affects the liveability of cities.
Politicians and city administrations who want to fully implement parking management in their cities using a strategic and integrated approach may encounter some obstacles in installing a SUMP system. Some of these barriers are mentioned below:
• Lack of (general) awareness about parking management and its benefits
• Lack of understanding of the parking management concept, its process or how it fits into a SUMP
• Lack of support (either institutional at a higher level, or lack of resources)
• Lack of institutional cooperation (both horizontal as vertical)
• Legislation or restrictions that prevent a comprehensive approach to parking management
• Lack of public participation when developing parking policies.
As a result of increasing intensities, cities need to change. Since the 90s, step by step, sometimes by trial and error, cities have been showcasing the substantial advantages of (more) sustainable parking policies and practices.Parking becomes an integrated part of transport demand management practices and gets a higher rank on the urban political agenda and in the planning process. The EU PUSH & PULL project identified the following "15 good reasons for parking management". These arguments are all based on the central tenet that Parking Management is key to managing urban mobility:
1. Public space has a high value and therefore should be paid for if used for parking.
2. Parking management should contribute to quality of life.
3. Parking Management leads to less park search traffic.
4. Parking management has a good impact – acceptance – ratio compared to other demand management measures like road pricing.
5. People usually moan before new parking management is introduced but initial opposition turns to support when they realize its positive impacts.
6. Parking management protects European historic cities from an “invasion” of parked cars.
7. Parking Management ensures high speed of movement.
8. User-friendly parking areas within walking distance of key locations are acceptable.
9. Parking Management will not stop companies investing in your city.
10. Guaranteed parking spaces at workplaces influence modal choice significantly.
11. Parking management contributes to road safety
12. The introduction of fines for parking violations is necessary.
13. Carefully chosen parking standards can have a positive impact on housing and other real estate projects.
14. Correct rates, prices and appropriate fines are key to the success of parking management.
15. Parking Management can raise municipal revenue that can be used to encourage sustainable mobility
Parking management activities can be developed and implemented under – logical related - topic areas. The following 6 clusters have been selected in Park SUMP due to their fundamental importance to parking management as an effective tool of sustainable urban mobility planning.
1. Expanding parking management is essential if time- and space-constrained parking is to affect more car travelers.
2. Earmarking revenues from paid parking to sustainable mobility measures should become a logical cost-benefit element for integration into SUMP, while solving many financial SUMP support problems.

3. Standards for parking in new developments can have a big influence on mobility behaviour and car ownership.
4. Enforcement is vital for parking management to function effectively.
5. Parking management – including data collection, exchange and smart interoperational use - has to become a backbone of the SUMP as it is the main push activity to tame steadily increasing car use.
6. Technological and institutional/societal innovations empower effective parking management at lower cost and more efficient enforcement, whilst safeguarding equitable access. [2]

LİTERATURE ANALYSİS

The coordination between parking policies and traffic management revealed how parking is becoming a barrier to the through-traffic operation. Hence, it is necessary to understand the parking choice behaviour and actual demand of parking space. In the last three decades, ample studies have been done to evaluate parking characteristics, to estimate the demand for parking and on driver's behaviour while choosing the parking space. As the accelerated industrialization throughout the world led to higher growth rates of urban economy, income as well as the living standard of the inhabitants in addition to the high growth of population, there is continuous growth in the private vehicle ownership. Research indicates that the average volume of traffic related to parking during peak time can reach 30%e50% of total traffic (Shoup, 2006). Hence, it is necessary to carry out the demand assessment for parking in influenced areas of the city to frame appropriate parking policies. Voluminous studies have been done on parking demand models for different conditions and various scenarios of different cities in the world having diverse parking behavioural characteristics. In India, the number of cars increased by 400 percent between 2001 and 2015. It has surprisingly been noted that in National Capital Territory (NCT) of Delhi, the growth rate of population is about 1%, but the increasing rate of motor vehicles is around 7%. One of the earlier researches on parking shows that the parking problem arises mainly due to people want to park exactly in front of the door of their destination. It is necessary at the initial stage of study to have data regarding the availability of parking space, up to what extent it is being used, how much is the duration of parking, assessment of parking demand, etc., for taking any effective actions for the furtherance of parking conditions. In certain conditions, the time spent for searching parking space adds significant proportion in the total travel time, which is why the time factor plays an important role in the choice behaviour of drivers for parking space. About 69 different land use classifications are available as indicated by the Institute of Transportation Engineers (ITE) (2010). Each statistics of land use characters more or less influence the parking generation for the particular building/area. It is required to study different aspects of parking facility and to develop a methodology which can comprehensively evaluate the parking facilities with consideration of all aspects of parking lot, parking operation as well as user's perception.[3]

Nowdays parking problems increase with repaid growth of car ownership. Abdulkareem N. Abbood observed certain problems related to the increased demand for parking at Babylon University:

1. The lack of an efficient and adequate program that adopts the process of defining and distributing the parking areas, according to the different objectives of the vehicle users on and off campus.
2. Increase in random and illegal parking of motor vehicles and their failure to stop in designated places

Abdulkareem N. Abbood assessed the current situation with the help of questionnaires and interviews using the video technique method and then put forward a suitable development proposal.He selected the stops within the master plan of Babylon University and determined

the peak hours through video recording. Peak hours include 11:30 a.m., 10:15 a.m. to 11:15 a.m., 1:45 p.m. to 2:45 p.m., 12:15 p.m. to 1:15 p.m. The percentage of parked vehicles is higher in (1-4 hours) and (<4 hours). This shows that it has a significant impact on the demand for parking in the studied area.

Walking distance one of the indicative indicators of the parking efficiency, in addition, it contributes to reduce illegally parking, which causes conflict points in movements between vehicles and pedestrians. The average walking distance for the study parking was (189) m, which is considered as average shortest distance between pedestrian parking exit and the entrance of nearest building in study parking facilities.[4]

In the article, John A. talked about the intelligent parking system. This system is based on wireless networks of photoelectric sensors placed on access roads entering and exiting these areas. Sensors detect the passage of vehicles on these roads and transmit this information to the data center, thus allowing to know the number of vehicles and the level of occupancy in the controlled zone in real time. This information helps drivers find a parking spot easier.

One of the causes of this excessive amount of time spent on the road in private road transport is the need to spend time looking for free parking spaces. Pineda studied the costs generated by the extra distance vehicles have to travel to find a parking space in the cities of Madrid and Barcelona. The costs in consumption for the extra distance and time spent on the road are approximately 347 million and 268 million euros per year, respectively. Public transport authorities and the operators of parking spaces are evaluating various solutions to improve parking space management.[5]

Private transport represents more than a third of all the journeys carried out in large cities urban areas. The trips made by private vehicles carried out through the city represent around 30% and a 50% of all trips are done in the metropolitan area; however, important variations are registered depending on the city (for example referred only to the tips made through the city, private vehicles represents almost 60% in Brussels but nearly 15% in Barcelona).[6]

Parking problem becomes one of major issues in fast growing cities like Novi Sad. Based on the transport demand forecast for 2009, it is estimated that in 2029, the number of cars will increase in Novi Sad by 64 % compared to the current level, which corresponds to 2.5 % annual growth. A 2004 study in Serbia showed that the average demand for parking is about 10,000 cars per day.[7]

Many factors influence parking demand, such as land development type and density, block layout and road network planning, motor vehicle ownership and travel level, parking management policies and strategies, and public transportation service level. However, TOD(transit-oriented development), as a new type of land-use mode, has a more profound impact on parking demand. Different from the influencing factors of parking demand considered in the general parking demand analysis, the parking demand of TOD in new urban areas mainly focuses on some TOD function outputs, such as reducing the number of motor vehicles, reducing the share of car travel, shortening the travel distance per capita and travel time per capita of residents, and ultimately achieving low-carbon transportation and green travel.

In traditional travel demand forecasting, the travel production is divided into travel generation and travel attraction. The resident's travel purpose is divided into four types as follows: going to work, going to school, returning home, and flexible purposes. Then, the factors related to the travel production that affect the four travel purposes according to the property of land use in the community are determined. However, urban land use is the source of urban transportation demand. Different land-use layouts, land-use properties, and land-use intensities correspond to different transportation demands. Moreover, travel production includes travel generation and travel attraction. The former is based on the socioeconomic characteristics of urban residents, and the latter is based on the form of land use. Then, the

travel production is converted into travel distribution through the gravity model, and the travel demand (TOD) can be obtained.[8]

DATA AND METHODOLOGY

In big cities, many problems arise because the number of parking spaces is much smaller than the number of cars. It is a universally accepted fact that people want to go to their desired destination by car. People want to reach their destinations on time and manage their time efficiently. The number of vehicles in the cities of the Republic of Azerbaijan continues to increase every year. Figure 1. The large number of cars causes air pollution in the city. According to statistics, 64.6% of air pollution in Baku in 1990, and 77.6% in 2011 is related to transport. According to research, a car that drives 15,000 km in a year consumes 4.35 tons of oxygen and emits about 3.25 tons of carbon dioxide, nitrogen gases, and unsaturated hydrocarbons to the environment. [9]

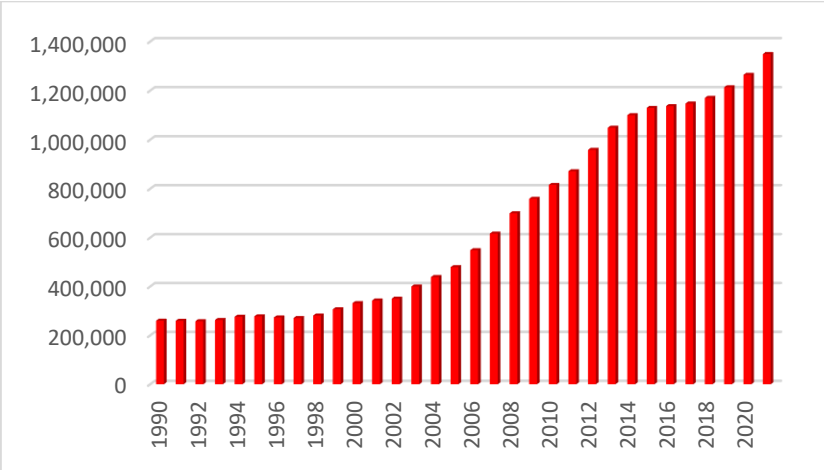

Figure 1. Number of vehicles in 1990-2020

90% of the current number of passenger cars are gasoline, 8% diesel and 1% gas engine cars Figure 2. 95% of the energy consumed by transport is obtained due to oil products. Energy is consumed during production, use of transport, as well as construction of transport infrastructure - highways, bridges, railways. [10]

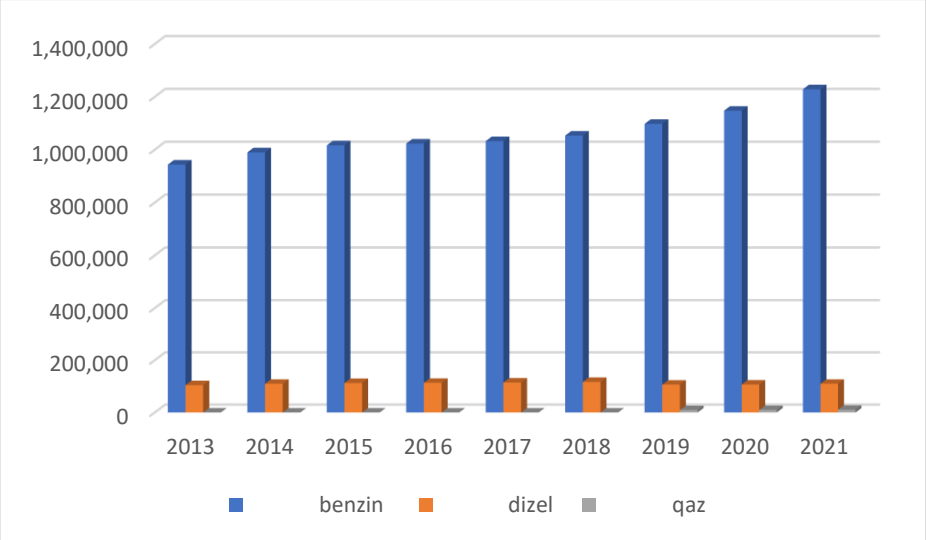

Figure 2. Number of vehicles by types of fuel used

The high number of vehicles increases the demand for parking. About 60-70 percent of passenger cars are in Baku. In the city, people look for places to park their cars, which leads to waste of time, pollution and traffic jams. Many cities are offering alternative options to overcome the inefficiencies of the parking system. The studied place is the city of Baku. Due to the location of attraction centers in the city center of Baku, the problem of parking in the city is urgent and effective planning is important. Lack of parking spaces and improper planning, drivers park their vehicles near shopping malls, residential buildings, etc. causing them to park in front of it. Buda, in turn, causes the problems mentioned below.

- Fuel consumption of cars stuck in traffic increases
- The amount of harmful gases released into the environment increases
- The noise level increases
- The probability of accidents and the degree of pain increases
- Deterioration of the technical condition of vehicles increases the probability of rejection and failure
- The current situation has a negative impact on the work of other infrastructure enterprises

RESULTS AND DISCUSSION

In order to solve the parking problem, the multi-storey parking method of the areas and the collector parking method are proposed. With the creation of multi-storey parking spaces in the city, it is possible to reduce congestion to a certain extent and reduce toxic gases affecting the environment.

Multi-level parking ensures that a large number of cars can park in safe parking spaces. Parking ideas with elevators instead of long ramps and parking sensors to help cars line up slots help reduce the burden on drivers.

Multi-level surface parking spaces are the best way to solve the problem of parking a large number of cars in the area. Multi-storey parking system requires minimum time and space. The operation of parking a car in an automated parking lot does not take more than a minute and a half. [11]

Figure 3. Multi-level Parking method

Collective parking lots are parking lots located on the main highways leading from the outskirts of the city to the city and allowing people driving their private vehicles to park their cars and travel by public transport. As a rule, such parking lots are placed at the entrance gates of the city or at the entrance gates of the roads leading to the city center. The goal is to reduce the number of private vehicles in the city and its center. As a rule, such parking spaces are placed in the parking lots of railway and metro stations and other means of transport. In some countries, parking in such parking lots is either free or at a very low price, and it also provides

an opportunity to save on parking costs spent on movement and storage within the city. The main entrances to the city should be analyzed in the parking lots and fast buses should be provided to the people using the parking lot.

Other parking methods exist and are used: Parallel and conventional parking. Parallel parking after peak hours it can be used during the specified time within the coverage of specially installed toll boxes on the streets of the city. Parallel parking is the regulated parking of cars parallel to the road. In world practice, this is usually done from 19:00 to 08:00, and in central streets from 20:00 to 07:00. In addition, parallel parking can be created during the day on streets with no intensive traffic. In addition to the parking prohibition sign on the city streets, cars can be parked parallel to the road at certain hours of the day, under conditions that do not interfere with the intensity of traffic. For this, first of all, appropriate traffic signs should be prepared and placed on the roads.

Conventional parking lots must be available or under contract for use by all government and business organizations. All residential buildings built in the city must have at least one parking space for each apartment. Parking lot construction and operation should be exempted from value added tax for at least 5 years to stimulate the construction of parking lots. [10]

CONCLUSIONS

Parking problems lead to traffic jams. As a result, fuel has a negative impact on energy and human health. Proper use of the area can contribute to solving these problems. Multi-level parking is considered the most ideal option.

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