

Problem of Parking and their Possible Solutions with Special Reference to Kota City

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ABSTRACT: Today we are facing so many problems. Two of those acute problems is parking problem and traffic congestion. It has spread its branches like a banyan tree in all directions. We do not have an accurate parking management in our metro cities and mainly for our developing cities. Managing vehicles in a tactful manner is known as parking management. This paper focuses on such problems contextual to Kota city. Kota is an emerging city; it is third largest city of Rajasthan. It also comes under the 'smart city' project. There are lots of industries and coaching centres situated in the city that contributes to its economy. Due to this there is an increment in population and number of vehicles that has resulted in the traffic congestion and parking problems in this city. Our street space hasn't increased so far, but population of this city is in seven digit number. Especially, in our congested markets, good parking spaces for 2 wheeler as well as 4 wheeled vehicles in the core area of our city is required and still the government not able to resolve our traffic issues and improve parking spaces.

Keywords: Parking problem; Kota city; Traffic congestion; Parking Management.

INTRODUCTION: Kota is considered to be the educational hub of the country and also an industrial city. A vast number of students come to this place every year to prepare for various entrance exams. There are various industries like DSCL Kota, Multimetals etc. and various coaching centres in Kota. This raises the economy of this city year by year and is the reason people eligible to buy assets to make their life luxurious. On the other hand, demand for parking spaces, maintenance of traffic signals and roads and transportation facility has increased with the increase in public and private mode of transportation. It has disturbed the whole part of traffic management or road infrastructure of the city, because these were designed according to the past scenario of traffic in Kota. Now, the amendments or implementations of creative or technical solutions of parking related problems like parking complexes, multi-level hydraulic parking system, metered parking, green parking etc. at the core places of the Kota are required. Besides the increase in number of vehicles and institutional activities in the city temporary/permanent encroachment on roads and authorized parking has become a major problem. In this present paper, we have discussed about the possible solutions for traffic congestion and parking crisis in Kota or other developing cities.

Thus, the solutions lies not in installation of traffic signals and increase in number of traffic police, but in constructing more parking lots with technical or innovative solutions like solar meter installation on parking places and start projects like multi-level hydraulic parking system for providing better facilities and reduced the traffic congestion.

In Kota, however the problem of parking has not been given due importance. Mass transportation systems are generally ignored or do not provide regular, frequent, safe and adequate quality of services. There-by people are relying on the private vehicles, which in turn leads to the extreme traffic congestion and shortage in parking areas. With the preparation of a comprehensive traffic and transportation plan for the city along with the appropriate locating of land uses on the master plan, these problems can be addressed. This system is called "Parking Management".

Parking management can be defined in a broad sense that it is an effective tool for the local government which helps in reduction of single occupant vehicles and encourages the mass transportation facilities to influence the other aspects of parking supply and demand. We have to develop those places which are under authentic parking zones for the better parking supply and provide the possible way of parking for

those places too which are under the tag of non-parking zones.

Kota is the fastest growing city. In 2001, population of the city was 6, 94,316 that later became 1,001,365 as per 2011 census report. As per master plan projected, population will be 15 lakh in 2023. The population of Kota has exorbitantly increased in last two decades. The growth rate of city's population was 50% in 2001, which came to 44.22 % in 2011. Reason of this growth is increase in number of coaching institutes, new small scale or large scale industries, and increase in housing stocks, provided by government/UIT on large scale through housing board. 19% of the land in the city was used for transformation in 2001 and it will be reduced to 14% in 2031. After two decades, the expected scenario of Kota shows the declination in parking and transportation land. We should have to creative and innovative ways of parking instead of constructing horizontal parking lots we have to construct vertical slots or complexes which save our land and give maximum space for vehicles. In Kota, we have some densely crowded areas where we have found some problematic situations which are given as follow. In this research we have proposed our ideas of effective parking system in densely populated areas of city.

PROBLEM AND SOLUTION AS PER AREA OF CITY:

1. Bajariya market (Market nearby the railway station): Fruit vendors and shopkeepers keep their goods and items in front of their shops which cover maximum portion of the roads and leave less space for driving vehicles which results in increased rate of parking problems like shortage of parking space and traffic jams.

Solution: All the fruit vendors should be transferred to the new fruit market made by UIT, Kota and impound the encroachments done by shopkeepers from the roads.

2. Nayapura: Two issues were found at this place. There is no space of parking for the shopkeepers as well as for the commuters, it arises the issue of shortage of parking. Secondly, NH12 and NH76 are passing through this places because of which it comes under accident prone areas of the Kota city.

Solution: Construct parking lot or complex in front of the Brij talkies for the shopkeepers and consumers, and the appropriate place for the mass transportation vehicles should be defined.

3. Arya samaj road near Rampura: It is called to be the rampart area of the Kota which was established in

early days of Kota history. This is most visited place for the consumers and known as the main market of the city. Still it suffers from the acute shortage of parking and there is no space of parking for shopkeepers as well as consumers. Due to which, people park their vehicles in front of the shops.

Solution: We need appropriate space for parking complex in this locality, which can be created in area called Motor Market (Gaadi Khaana), where we have proposed space to construct a parking lot.

4. Gandhi Chowk: Because of exuberant activities of business, frequencies of private vehicles create more traffic at this place. This place has narrow roads and shortage of parking space which generally results in traffic jams.

Solution: Develop parking lot or complex on the nearby place where a school established by the Nagar Nigam, Kota which helps us in providing space for parking vehicles for shopkeepers and commuters.

5. Chaar Khamba and Agrasen Market: Similar situation as that of Gandhi Chowk occurs in Rampura.

Solution: Develop parking complex at the place occupied by old unused building of old police quarters which will help in solving the problem of parking at this place.

6. Old Vegetable market (Sabzimandi): Similar problems as that of at Agrasen Market and Gandhi Chowk is faced at this place. Roads are narrow because of encroachment done by shopkeepers.

Solution: Shift this market to a new place and develop the parking lot in place of this market, which will provide space of parking for the residents, shopkeepers and consumers.

7. Shripura Market: There is no space of parking in this busy market.

Solution: Give the proper shape to the circle (Subhash Circle) located at this place which will help us in providing the space for parking.

8. Gumanpura Market: It is the core area of Kota city or it can be said that it is the place where you can find all branded showrooms.

Solution: Provide space for parking in the arena of Multipurpose School. It will solve the problem of parking and flow of traffic in the Gumanpura market.

9. Chhawani (under the over bridge): A lot of public and private vehicles cross by this place and which creates the situation of traffic jam.

Solution: Remove the encroachment in front of the LIC building and provide the space for constructing a parking lot at that place. Charge public for the vehicles parking under the Flyover.

10. Aerodrome Circle: It is very busy and crowded circle in the city having lots of vehicle pressure. No space for appropriate parking for shopkeepers, commuters and other mode of transportation vehicles which create the situation of traffic congestion.

Solution: Make parking zone with support of airport's wall, it will solve the problem of parking at this place.

11. Commerce College Road (at Maitri hospital): It is the one way road and it has a lot of big private hospitals, but there is no an appropriate place for the parking because of this commuters face the parking problem and the patients in hospitals face the environmental problems like noise and air pollution.

Solution: The sewer channels in front of Maitri and Sudha hospital can be covered to solve the parking problem at this place.

In this research we proposed our ideas of effective parking problem in core areas of city.

Table 1: Accident prone areas according to survey (police station wise) - Source: Traffic Police Department, Kota (Raj.).

Location	No. of Accidents
Railway Colony	6
Nayapura	22
Kunahadi	10
Dadabari	9
Kishorepura	22
Kethunipole	5
Jawahar Nagar	9
Mahaveer Nagar	18
Ram Krishna Puram	2
Gumanpura	7
Borkheda	2
Vigyan Nagar	8
Anantpura	7

Table 2: Registration of vehicles per year - Source: RTO Office Kota (Raj.).

S.No.	MODE OF TRANSPORTATION	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	TOTAL REGISTERED VEHICLES
1	2-WHEELER VEHICLE	17219	21616	20124	11525	24415	26449	25114	26802	31288	33272	40368	278192
2	CAR/JEEP	1579	1978	2286	934	2729	3467	4537	4661	4960	5441	4979	37551
3	TRACTOR	521	636	528	343	935	1498	523	637	1008	1192	1224	9045
4	TRALOR	115	51	98	95	137	70	30	0	0	0	0	596
5	AUTO RICKSHAW	262	210	33	99	362	310	430	837	802	369	558	4272
6	BUSES /MINI BUSES	81	48	36	21	61	88	77	47	151	288	175	1073
7	TAXI	72	122	65	70	66	100	187	194	288	569	324	2057
8	3-WHEELER VEHICLE	117	0	0	0	40	61	167	219	202	176	163	1145
9	TRUCK	462	818	728	455	681	629	402	519	802	950	763	7209
10	CRANE AND OTHER VEHICLE	1	34	0	14	37	57	129	73	134	192	131	802
11	PRIVATE CARRIER	0	0	0	0	0	1	0	0	0	0	0	1
12	TEMPO PUBLIC VEHICLE	40	189	204	136	69	52	94	34	0	0	0	818
	TOTAL	20469	25702	24102	13692	29532	32782	31690	34023	39635	42449	48685	342761

There are three specific spots where the number of accidents exceeds 62 accidents in last year those places are written as follows:

- Nayapura
- Kishorepura
- Mahaveer Nagar

In this research we suggested some solutions to make our city free from traffic congestion and acute shortage of parking. These will provide the quick, smarter as well as better mode of transportation.

LITERATURE REVIEW: According to the Zeenab Aneez¹, It has been observed that a private vehicle spend its 96% of lifetime as an immobile. And the key issues considered for urban transport planning are

traffic congestion, road connectivity and road quality. The issues in parking problem and traffic congestion are caused due to insignificant factors of urban infrastructure planning. More and more people flock towards the urban city because of seeking employment and higher standards of living. The same situation is in Kota where there has been an increase in employment opportunities in this city reasons being establishment of new coaching centres, small and large scale industries. Fundamentally, according to this journal it can be observed that the parking is a problem of space with the growing culture of automobile dependency in urban cities, demand for parking spaces has sky rocketed. We have to established successful parking management in our cities to reduce the parking problem by reducing travel by single occupant

vehicle, provide public transit vehicles at every possible place, applying appropriate charges on parking, restricting parking in areas where we led to shift our mode of transport from private to public.

According to Michael Manville and Donald Shoup², parking is ubiquitous and it is unavailable on those places where its demand is even more. It is ubiquitous because cities require parking spaces everywhere. Most of the cars are parked most of the times and it can be reliably and cheaply stored when it is not being driven. When people start travelling they generally think of the act of travelling and the iconography of the car is more associated with the street and freeways rather than the parking complex or structures. They proposed that the automobile consumed close to half of the land area of cities and they took an example of Los Angeles the Tableure approaches two-thirds un Los Angeles around 62% of the land is covered under the cars parking space not even country side be left from this situation the same condition is occur on those areas. It is difficult for us to know that how much land we should devote to the automobile and they have taken land composition of the US to find out the possible solutions of all the questions. They proposed the graphical analysis of land used for the automobiles in US and ranked them according to their need of parking space and after that research they found interesting facts about it.

Banerjee et.al.³ has shown their study that by improving parking lots with the technical innovations in which we can make our approach simpler for finding the parking space in parking lots as for our cars we don't need any kind of camera and there is no involvement of image processing. We don't want database which ruins or makes our designs more complicated even though we can achieve these tasks without using those things. We need good designs for our car park we got the idea of car-park occupancy information system. It is an innovative technique to solve this problem which is called as WSN (Wireless Sensor Network) based intelligent car parking system in which we deployed wireless sensors in the car parking fields and each parking lot is equipped with one sensor node which helps us to detect and monitors the vacant spaces in parking options in the parking field.

Hitesh J. Lad and Dr. Vibhuti G Joshi⁴ they recommended an immediate action plan and a long term to improve our parking lots by proposing embedded system in our parking lots; the two main embedded system are RC-5 Protocol and CAN Bus protocol. These two embedded system provided, are cost effective, quality efficient and it is the solution to manage

multi story parking system in which we require boom barrier, direction indicator, webcam etc. All these devices are connected to the micro controller based embedded system and control in the perfect manner. This embedded system works on different electrical signal level in fact (IR) based communication system is best solution for this. We can make partial solution for multi storey based parking building with the help of real time embedded controlled parking system. In which we included the RC-5(IR), CAN Bus protocol these two embedded systems played crucial role to share information between central control and parking area or the proposed system can be used to manage vehicles entry-exit database, driving path guidance, building accounting, security issues etc.

Zsolt Peter Sandor and Csaba Csiszar⁵ gave their reviews on the intelligent parking information systems for trucks. They discussed about the advanced parking management for trucks in which they provided real time information and central (system optimum based) navigation with automatic parking place booking. In this way, capacity utilization of parking facilities can be maximized. Modern information and communication technology offer new opportunities in transportation applications. In future time, our parking demands can be affected or influenced by the real time and interactive information management. They proposed individual route plan for drivers and it takes working hours, actual traffic conditions and personal preferences into consideration.

K. Mahmud, K. Gope, S. Mustafizur & R. Chowdhury⁶ studied Possible Causes & Solutions of Traffic Jam and their Impact on the Economy of Dhaka City.

RESULT AND DISCUSSION: In this research article we thoroughly studied all problematic areas of Kota city and studied all possible parking solutions use worldwide and after that we recommended possible solutions best suited for Kota city as per city, population, number of vehicles, parking space available, lifestyle of city, Economy of city and similar points.

For the better mobility and economic strength, we need to make amendments and improvise to provide adequate amount of parking to meet the public need or by the use of other modes of transport. Here, we got so many solutions and recommendations in order to create a parking management system and will make us capable of solving the existing problems. Whatever the plan we have it is related to the existing condition, it shows the development of the particular areas and suggests that it should be implemented for long term

like construction of parking arenas or long surface lots for two-wheeler as well as four-wheeler also. The frequency of public modes of transport rather than using self occupant vehicles should be increased. It should be made more comfortable easier and approachable to the commuters through providing the availability & accessibility of Mass transportation system.

VARIOUS POLICIES REGARDING PARKING:

Proposed Policy of Centralized Parking: We have to introduce a system in which large number of people gathers at one place which we call a center for the parking and then travel by the help of other modes of transportation such as like E-rickshaw etc. And reach destinations in a bunch or a group.

Validation of parking for the specific time: Generally, our communities are attracted towards those places or lots where we have lower rates or free parking spaces. We need to charge high amount for parking vehicles at such places and put the validation of parking for a specific time.

Banned vehicles to park on the street: We have to manage our residential on-street parking. This can be done by setting the permit prices to reflect demand and making space available for parking. Introduce a system with the restrictions for the parking vehicles on street not even residents should be allowed to park on the street.

Introduce a particular firm or an organization for the traffic management, which can be called Traffic Management Association. This will help us in offering parking brokerage services so that we can seek the excess amount of parking in core areas of our city.

Just make compulsory for all the builders who construct residential flats, shops, and commercial buildings for private company and firm's office to create or make a space for the vehicles of residents, employees and workers etc.

Apply the advance parking system in our parking management: It helps drivers to find out the nearest space for parking by means of using signs or informatory boards. It helps drivers to reach the empty parking voids. Subsidies given by the government to the commuters on parking lots and complex should be increased to encourage the public transport system.

Implement the method of mixed use parking: In the period of peak demand, we generally require shared parking in mixed use areas, these demands occurs at different times. Such as temples, mosques, churches etc.should share their parking with the near-

by residential parking lots and commercial establishments on the occasions of festivals or religious functions, this works effectively and they get a lot of parking on peak time.

Shuttle services should be promoted: It means to implement the shuttle buses to reach our specific destination. In this, people use centralized parking to park their vehicles and then with the help of shuttle bus service commuters may reach their destinations.

By implementing green parking system: It is a type of parking in which we can save 80% energy of the parking complex by using LED Manufacturer Companies introduce the special LED lights for the parking zones which save 80% of energy. In this system, we use LED green parking system instead of using tube lights and other LEDs. These LEDs are specifically made for this system and can be controlled by remote control. It returns the construction cost within three years after use.

Comparison of parking spaces: There should be implementation of small-small parking spaces in a large number instead of constructing small amount of large parking lots which shows the wastage of land, economy and man power.

Make Provisions of Parking for Handicapped to meet there needs: Ensure that there should be a provision of handicapped parking. We can accommodate specific facilities for the physical disabled or challenged persons and circulation paths designed for wheel chair can make it better to accommodate physically challenged persons.

Using Meters in Parking lots: Using meters in parking will help us to optimize turnover of spaces for priority users. As we use parking meters its price deflects according to the market demand in which they raise charges of curb in peak hours.

Load-Unload zones: The loaded zones usually have a 30-minute time limit, they are highly congested because of business or commercialization with quick turnaround (banks, drycleaners etc) and delivery needs.

Implementation of Solar Powered Parking Meter in the Parking lots: We have to improve our district's parking meters by installing new solar powered meters and single space meters that accept credit cards as well as coins. These new meters are also a piece of comprehensive intelligent transportation. The new single solar powered meters should have to be installed in a number of areas which depends on locations and high demand of revenue/turnover. Latest technology is that the parking meters also allow us a

variety of other functions. Solar powered parking meters will be installed to facilitate the collection of parking fees and regulation of duration. Maintenance cost is relatively low with the other modes. The meter is powered by solar panels. Payment can be made using coins, Debit cards, Credit Cards, Smart cards (in the case of regular users), One parking meter can service various parking spaces. Remote supervision using parking software management systems.

Periodic Evaluation: We have to make an annual review of parking related ordinance. This evaluation should occur to align current parking practices and enforcement with city police. It helps to coordinate parking enforcement activities among all the city departments including transportation, police and public works.

Encouraging short term parking and loading – unloading parking areas. On-street parking areas include useful resources in business district or an adjacent street in residential areas where we have an adequate amount of parking exists.

Metered parking is generally used on commercial areas with support of local business or private property owners. They can help us turnover the business value and encourage the short term parking access.

Multi-level (hydraulic) parking system: Multi-level hydraulic parking system has provided a number of advantages such as- optimal utilization of space, lower in maintenance and operational cost, Eco friendly in nature, comfortable for the drivers and saves cost for the builders by saving height or depth.

DIFFERENT MODES OF PARKING: Given are the three modes of parking based on the positioning of the vehicle in the space – Parallel Parking, Perpendicular Parking and Angular Parking.

Parallel Parking: It is very difficult to access space in parallel mode of parking. In this vehicles are arranged in a line with the front of one vehicle facing the rear side of the other vehicle. Dimensions of parallel parking are 2.4 x 6.1m. Total area in square metres is 14.85 m². This space required is only for one car only.

Perpendicular Parking: In this kind of parking, vehicles are parked alongside each other which are perpendicular to the curb or a wall. Generally, vehicles are parked in this way that they are facing towards the shops and buildings that provide enough space for it. Dimensions of perpendicular parking are 5.5 x 2.7m. Total area in square meters is 15.125 m² which is required space for single car.

Angular Parking: This type of parking is generally used in a common parking lot. The reason behind using this mode of parking is that it takes up low space than the other modes and it is easier to access. In this, cars are parked alongside as in perpendicular parking but at an angle-normally of 60⁰ to the curb. It is used in hotels, stadiums etc. It can also be used on streets where space is adequate. Dimensions of angular parking are 4.9 x 2.4m. Total area in square meters is 11.76m².

Hence, we conclude that angular parking is the best suitable mode for the parking because it requires least space and it can be used at most of the places where we find the lack of availability of parking space.

We also prefer angular parking management because it compresses less space for parking a vehicle or it can increase the overall supply of On-street parking if street is wide enough.

CONCLUSION: Our focus should be the solution of parking problem, strong economy and healthy environment of the city. In Kota, special authority called as Traffic and Transportation authority is required at city level Kota. There are lots of solutions, some are short term and some are long term basis but we need to work on the basis of long term plan and at the same time take care of discomforts or problems. We need the authority that can look after the construction and development of roads, flyovers, intersections, pedestrian facilities etc. The authority should make master plans for inner, middle and outer roads which will help us in reducing the traffic congestion and accidents in the central areas. Promoting the use of bicycles in the city, we can comfortably use the bicycle in travelling. So this mode needs to be promoted in the city among the coaching students. We need to improve our road maps, zebra crossings, Parking lots, directions, road markings etc.

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