

# A Project Structure for Parking Policy and Plan for Better Mobility in Vijayawada City

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**ABSTRACT:** Parking is the one of the major problems that is created by increasing road traffic. It is an impact on transport development. The availability of less space in urban areas has increased the demand of parking space especially in areas like central business district and affects the mode choice. This has a great economic impact system. Solution is not simple; parking studies are used to determine the demand for the supply of parking facilities. To maintain the sufficient regular parking system in crowded areas the suitable parking zones are provided. Introduction to traffic engineering and related topics were useful for parking policy. Defining of parking and types of parking in India. Observations from central business district areas like Benz circle, ramavarapadu ring road, Sitara centre, police control room. Literature review, methodology stages like parking policy, future forecasting parking demand, parking supply gap analysis and future forecasting demand. Data from reconnaissance survey, Observations regarding core values are discussed in it. Study area zone is taken a pictorial representation. Although strategic intent and objectives are concluded. Finally, parking prices from different locations are collected and so that newly existing parking prices are concluded. Parking performance is computed based on data available from ticket vending machines calibrated using floating car films. The survey method allows comparing parking occupancy including its temporal variations, allowing the analysis of the accumulated utilization pattern. Average and maximum parking occupancy levels, throughout, parking duration and total fare collection are compared prior and following introduction of a new parking scheme for visitors. The results indicate that the policy fulfilled its objective to increase the ease of finding a vacant parking place in the central areas and even resulted with underutilized parking spaces.

Key Words: *Statements of Parking, Solutions, Parking System, Transportation System, Vijayawada*

## INTRODUCTION

Traffic engineering is the branch of civil engineering that uses engineering techniques to achieve safe and efficient movement of people and goods on road ways. Parking policy and plan for better mobility in Vijayawada city is part to traffic engineering that needs to study the parking policies. Parking means bringing (a vehicle that one is driving) to a halt and leaves it temporarily typically in a car park or by the side of the road.

**On-street parking:** It means parking your vehicle on the street, anywhere on or along the curb of the streets, in contrast to parking it in a garage. It is usually controlled by government agencies itself. As per IRC 35-1997 the standard dimensions of car parking are taken 5\*2.5 mts and for the truck 3.75\*7.5 mts. common types of on street parking are listed below.

**Off-street parking:** In many urban centres, some areas are exclusively allotted for parking which will be at some distance away from the main stream of traffic. Such parking is referred as off-street parking. They may be operated by public agencies or private firms. A typical layout of an off-street parking is down in figure 7. Off-street parking can be both indoors and outdoors.

**Provisions and activities in city:** Any vehicle will at one time to be parked short time and long time. Provision of parking facilities is essential. Need for parking spaces is usually very great in areas of business, residential or commercial activities. Park and ride. Providing adequate parking space to meet the demand of parking in central business district. In future traffic congestion increases rapidly. To reduce the parking in CBD areas, to provide adequate parking system with suitable fares in areas like Benz circle, ramavarapadu ring road, police

control room, Sitara centre. But also, time saved for better mobility in Vijayawada city.

### **BACKGROUND**

#### **Road network & location of Vijayawada city**

1. Fastest development metro cities in south India.
2. Newly attractive city for tourism and most economical city.
3. Area of 61.88 km<sup>2</sup> and having population of 1.048 million according to 2011 survey records in India.
4. Road network of 888km.
5. Over 3144km country's national highway located in Andhra Pradesh.
6. Location: south of India having only one corridor southern corridor.
7. Proposed international airport provides connectivity with various parts in the world.
8. Vijayawada is one of the cities to be covered under the solar/green cities schemes launched by the ministry of new and renewable energy.
9. The city of Vijayawada has old and new own areas.
10. The e primary modes of intra- city public transport are city busses and auto rickshaws.
11. The two major national highways of NH 16 (old NH 5) connecting Kolkata Chennai and NH 65(old NH 9) connecting pune-hyderabad-suryapet-machilipatnam provides access to other states.
12. The ring road connects NH 16 and 65 to serve the main purpose of easing traffic congestion.

### **NEED FOR THE STUDY**

The rising standard of living and affordable pricing strategy study of car manufactures led to an unpredicted increase in private vehicle, increase in population since 2011 to 2014 is 5% whereas the increase in vehicle population in the same period is 19%. High demand of parking, parking management is valuable tool for encouraging more efficient use of road space. Current DCR is having uniform off street parking requirements needs change i.e. less parking in properties in influence zone of public transport corridors. all the above are indicative reasons to study. To identify the sufficient parking areas should be in the city and unregulated parking spaces, especially on the roads should be eliminated. As per the data available with the road transport officials , the city itself has 7,10,000 vehicles including transport and non- transport and 9,80,000 vehicles in the district.

Implement several alterative plans in the offing to reduce the traffic chaos like constructing more fly over's and active usage of bypass transport system.

#### **Proposed parking strategy based on zones:**

**Mobility corridor** This region includes all the parking areas falling under the mobility corridors. The proposed metro alignment, the state & national highways running in the Vijayawada fall under this zone.

**Core area** The core area is the central business district(CBD) of the city. Regions like K R market & Besant road and other commercial areas are categorized under this region.

**Mixed zone** Area not categorized under the above zones fall under the mixed zones. Residential and other institutional or public areas are considered under this region.

Table 1 need for parking policy and master plan

scenario	Private vehicle share	IPT share	PT share
Do nothing- 2032	86%	9%	5%
Bus augmentation +route rationalization + rapid transit system +TOD	64%	6%	30%

Drastic change in PT share and increase in private vehicle share!!!

### **OBSERVATIONS**

#### **1. Benz circle: Statement**

1. Benz circle is one of the busiest junctions in the city, is fast turning into major traffic bottleneck, to significant rise in the number of vehicles coming from all directions.
2. Traffic snarls are a perennial problem.
3. Every motorist takes at least 2-3 min to cross the road, due to off-street parking.
4. Pedestrians too are facing the problems while crossing the road. many motorists stop their vehicles at zebra- crossing signage earmarked for pedestrians.
5. Citizens are wary of heading considering the jam-packed roads in peak hours.
6. With the disarray festival on the horizons, citizens are getting increasingly worried due to city roads are becoming congested with increasing city traffic.
7. Traffic diversions for special events like political rallies and special tours add to our problems.
8. Taking free left turn from parameter to varadhi is a bone breaking experience.



Fig 1 illustrates off-street parking.

#### **solution:**

- Introduce no parking zone at distance of 75 mats from the junction.
- Provide electric guidance sign at junctions.
- Regularize on-street parking introducing pay-park facility.
- Strict enforcement to be taken up by the traffic police to regularize the parking.
- Use of remote controllers to control traffic signals when needed



Fig 2 illustrates parking spaces availability.



Fig 4 illustrates automatic parking system.

## 2. Ramavarapadu ring road Statement:

- Ramavarapadu junction is one of the busiest chows (round about/traffic signal) and a prominent landmark located on national highway 16 in the Indian city of Vijayawada, Andhra Pradesh.
- But traffic congestion leads to interpretation to transport within the city limits.
- The street lies along a major commercial and a public area.
- Long term auto parking is observed that creates congestion for city public busses.
- The place is major commercial area, off-street parking is major problem.



Fig 3 illustrates long term traffic congestion.

### solution:

- Metro rail station, gondola satellite station will change the outlook while we are providing a good parking system.
- Introduce no parking zone at 75 mats from the junction.
- Remove encroachment of the parking space by hawkers and strict law enforcement.
- Use of remote controllers to control traffic signals when needed

## 3. Sitar centre Statement:

- Unregulated off-street parking on both sides of north, and west sides of the park.
- 2-lane road to the west side of park is reduced to a single lane road due to the presence of parked vehicles.
- The bus stop presents at the west side of the 'cave' is hidden by the parked vehicles.
- The presence of off-street parking is unable to cater to the existing demand.
- The city lies in a major commercial area and semi-public area.
- Short term auto parking is observed that creates congestion for city public busses.
- Citizens are wary of heading considering the jam-packed roads in peak hours.



Fig 5 illustrates congestion at intersections points

### Solution:

- Introduce odd even parking along the side of the park (due to constrained road width).
- Regularize on-street parking introducing park-pay facility.
- Strict enforcement to be taken by the traffic police to regularize the parking.
- Use of remote controllers to control traffic signals when needed.
- Parking signs should be invisibly implemented to take decision of the pedestrian and road user.



Fig 6 illustrates vender machines to give tokens.

- Avoid long term parking by students from educational institution but also reduce commercial (city busses) problems.



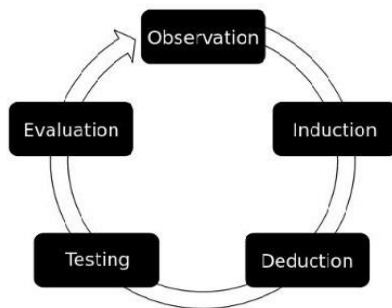
Fig 8 illustrates strict enforcement.

**4. Police control room Statement:**

- The place is major commercial and public /semi-public area.
- Off-street parking is major problem observed at the edges of roads.
- The presence of junction nearby this location coupled with short term parking characteristics creates frequent traffic chaos.
- The effective ROW of the 4-way junction road is further reduced to intermediate lane because of a parked vehicle manurable.
- Short term auto parking is observed that creates congestion for city public busses.
- Citizens are wary of heading considering the jam-packed roads in peak hours.



Fig7 illustrates no signal for pedestrians.



**Solution:**

- Introduce no parking.
- Introduce on-street pay-park facility along with telescopic rates to ease out the congestion and avoid long term.
- Introduce no parking zone at 75 mats from the junction.
- Remove encroachment of the parking space by hawkers and strict law enforcement.

**METHODOLOGY**

**APPROACH TYPES:**

There are different methodologies for the preparation of parking master plan mainly there are two types they are,

1. Empirical methodology.
2. Ideal methodology.

**Empirical research:**

Empirical research is using empirical evidence. It is a way of gaining the knowledge by means of direct and indirect observation or experience. empirical values such research more than offer kinds.

Fig 9 illustrates methodology.

**Ideal methodology:**

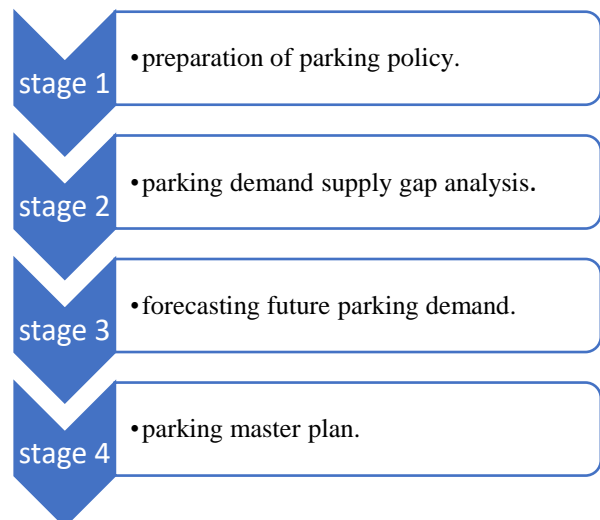


Fig 10 illustrates methodology.

Methodology is the systematic theoretical analysis of the methods applied to a field of study. Instead, a methodology offers the theoretical under pinning for understanding which method, set of method or (best particles) can be applied to a specific case, for example to calculate a specific result.

**IDEAL METHODOLOGY:**

The ideal methodology for the preparation of parking master plan for the complete city must contain the following

### Stage 1 preparation of parking policy

It is the key for preferred strategy for reducing pollution and congestion globally. Parking policy is also included in the transportation reformed in Indian cities and is especially mandated under the JNNURM programme. many Indian cities are in the process of designing this parking policy. But it also demands deeper policy as well as public understanding of what parking policy is expected to do? But this is possible only if additional measures are taken to encourage people to shift from personal mode to public transport and non-motorized transport and reduce their dependence on cars. Traffic management offers that opportunity as well as to reduce traffic chaos.

1. Reasons to rethink parking policy.
2. Emerging policies reefing the scope of parking policy.
3. Well managed parking and parking restrains have many benefits.
4. Key elements of parking policy.

### Purpose:

Through on-street parking is one of the major causes for congestion on the roads, it cannot be eliminated. But its negative effects can be reduced with proper planning. To reduce congestion and improve the traffic movement this parking policy is expected to.

- Provide a guideline for working out strategies to handle the increasing demand for parking spaces.
- Provide guidelines for appropriate level of expenditures and cost recovery for provision of parking facilities.
- Provide a framework within which parking infrastructure and services can be provided and used efficiently with the support of the government, corporate and private sector.
- Provide a framework within which appropriate institutional arrangements can be created or strengthened to facilitate effective provision and management of facilities.
- Indicate the legal and administrative arrangements needed in support of this policy.

### Stage 2 parking supply gap analysis

Where is “local parking supply is greater than demand, and where is local demand greater than supply” and at what prices does it hold? Does this systematically by type of place or other criteria?

Huge parking space on-street parking is now creating severe problem in major roads of Vijayawada city like Benz circle, ramavarapadu ring road, sitar centre, police control room. Which number of offices, commercial spaces and shopping centres.

- These are different activities in this methodology they are parking prices & subsidies socioeconomics, alternative transportation.
- In addition to information technology safety and cultural activities are regularly taken place.

- The amount and availability of parking should be based on development patterns, parking requirements and market based private parking’s.
- By these activities and parking supply gives a gap for sharing and pricing policies that extent use of supply of parking.
- Based on this gap analysis the parking market demand of different locations having commercial residential areas is to be selected.
- Finally parking occupancy for different vehicles for different time are regulated.

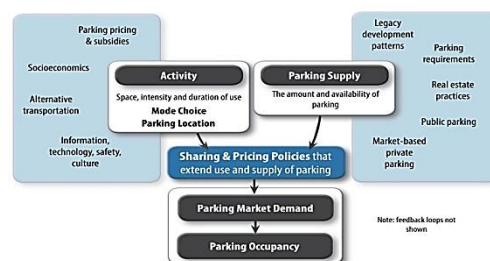


Fig 11 illustrates activities and supply of parking.

### stage 3 forecasting future parking demand

- Hybrid smart parking platform market should be plan for the better mobility in Vijayawada city.
- Smart parking solutions prone a necessity for the present scenario a rising vehicle population and parking space.
- In January 2018, autonomous technology, development of smart cities dominates CES.
- Clarion and Hitachi demonstrated an autonomous voice activated, in-car parking reservations via the Google assistant in android auto.

### Tools to influence parking demand and TDM:

- Marking and signage.
- Regulating parking duration.
- Transport demand facility.
- Parking guidance system.

### Increasing of parking space for every 30-minute interval:

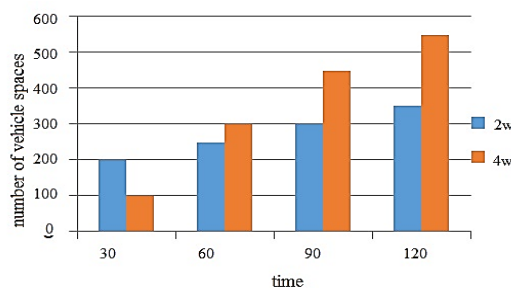


Fig 12 illustrates parking specs for 30 min time.

### stage 4 parking master plan:

Parking means bringing a vehicle that one is driving to a halt and leaves it temporarily typically in a car park or by the side of the road Dimensions

Parking stalls as per provisions

**Width: -**

A minimum width of 2.5 m shall be provided for each parking stall.

**Exceptions:**

1. The width of a parking stall shall be increased 26 cm for obstructions located on either side of the stall within 4.3 m of the access aisle.

**Length: -**

A minimum length of 5 m shall be provided for each parking stall.

**Exceptions:**

1. Compact parking stalls shall be permitted to be 5.5 m in length.  
2. Parallel parking stalls shall be a minimum 6 m in length.

**Minimum dimensions:** The following are the minimum dimension for parking:

**Table 2 minimum parking dimensions.**

Type of vehicular parking	Width(m)	Depth(m)
Car Parking	2.5	5
Disabled car parking	4.85	5.5
Lorry Parking	3.5	10
Heavy Vehicle Parking	3.75	10
Ambulance parking	3	9

**Driveway width:**

Every parking facility shall be provided with one or more access driveways, the width of which shall be the following:

1. Private driveways at least 2.8 m.
2. Commercial driveways:
  - 3.6 m for one-way enter/exit.
  - 5.4 m for two-way enter/ exit.

**Requirements:** Some minimum parking requirements for different type of buildings

For residential buildings plot area

1. less than 300sq.m require only community parking space i.e., 2.5m×5m
2. 500-1000sq.m, minimum one fourth of the open area should be reserved

For offices may requires at least one space for every 70 square meters as parking area

For restaurants one parking space is enough for 10 seats

For cinema hall 1 parking space is required for 20 seats.

**Multi-level car parking system:**

It is a building (or part there here of) which is designed specifically to be for Automobile Parking and where there are several floors or levels on which parking takes place.

Is essentially a Stacked Car Park.

“Multilevel Car Park” – Term Originated in UK, in US it is called a “Parking Structure” Types

**1.MANUALLY OPERATED** (non-mechanized-with ramps)

**2. MECHANIZED** (Classified in different type based on technology)

- Mini
- Puzzle
- Tower

**3. ROBOTIC**

To accommodate the large volume of vehicles, small cities and towns must develop their infrastructure. One solution may be a multi-level car parking system to maximize car parking capacity by utilizing vertical space, rather than expand horizontally. With land in metros and ‘a’ grade cities becoming scarce and dearer, and plots getting smaller, conventional parking is proving infeasible.

**ROBOTIC PARKING SYSTEM**

An **automated (car) parking system (APS)** is a mechanical system designed to minimize the area and/or volume required for parking cars. an APS provides parking for cars on multiple levels stacked vertically to maximize the number of while minimizing land usage. The APS, however, utilizes a mechanical system to transport cars to and from parking spaces (rather than the driver) to eliminate much of the space wasted in a multi-story parking garage. While a multi-story parking garage is like multiple stacked vertically, an APS is more like for cars. (shown animated at the right) is an example of one of the earliest and most common types of APS.

APS is also generically known by a variety of other names, including: automated parking facility (APF), automated vehicle storage and retrieval system (AVSRS), car parking system, mechanical parking, and robotic parking garage.



Fig 13 Entrance for robotic parking system

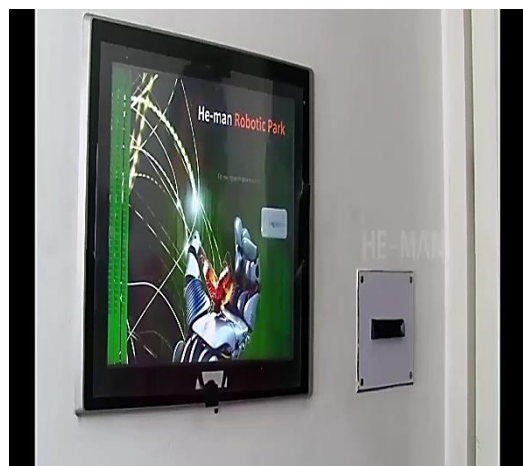


Fig 14 APS unit for collecting parking token



Fig 15 the entire automated parking unit.

Fig 16 illustrates parking spaces.

**DATA COLLECTION AND ANALYSIS**

**Data collection:**

- Reconnaissance survey findings.
- Parking facilities in Vijayawada is adequate.
- Encroachments due to parked vehicles reduces the ROW (sitar centre).
- City roads are clogged with parked vehicles.
- Currently the city busses are also face shortage of running vehicles at the traffic congestion areas.
- Designated parking lots under flyovers for 2-wheelers from Benz circle to ramavarapadu ring road.
- Maximum on-street parking slots are free hence, attracting commuters to park on street.
- 2-wheeler charges are 5-10 rest and 4-wheeler charges are 15-20 rest for 6-8 hours.
- Average parking charges per hour is far less in Vijayawada.
- Parking charges for public places like railway stations and airports is also very less.
- Lower parking charges resulting in increase in private vehicle share compared to public transport.
- A total of 20 different locations in the city on a pilot basis having an area of 12 hectares.

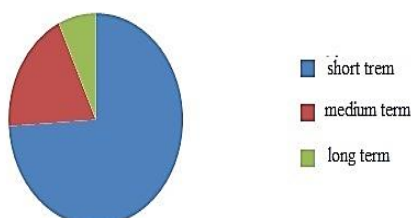
**Data accumulation and duration:**

- Peak parking demand and parking duration at different locations have been analysed.
- The significant parking locations with high parking demand are Kaneswaran market, BRP road, canal road, railway station west booking, NTR complex on Prakash am road and cross roads from euro road to MG road.

**The salient finding of the parking study is:**

- The maximum parking demand is around kales war road market and it is in the range of 5770 vehicles during the peak period from 10:00 am to 12:00 noon, inclusive of off-street parking lots.
- The average share of short(1hr), medium (1-4 hrs) and long (more than 4 hours) teem parking demands at all the on- street parking locations are 74,19 and 7 percent respectively.

parking space



**EXISTING PARKING FARES WITHIN THE CITY LIMITS:**

Table3 different locations with parking fares are collected

n location	type	Ownership	Mode	fare	period
Railway Station	On-street	----- all--	2W,4W	20 rupees	24hrs
Bandar Road	On-street	-----	2W,4W	Free	NO Limits
Bus Stand	On-Street	-----	2W,4W	20rupees	24hrs
Besant Road	On-Street	-----	2W	5rupees	24hrs
Benz circle	On-street	-----	2W,4W	Free	NO limits
NTR complex	On-street	Private	2W	10rupees	2hrs
NTR complex	Off-street	Private	4W	20rupees	2hrs

**Parking statistics:**

1. Parking accumulation It is defined as the number of vehicles parked at a given instant of time. Normally this is expressed by accumulation curve. Accumulation curve is the graph obtained by plotting the number of bays occupied with respect to time.
2. Parking volume Parking volume is the total number of vehicles parked at a given duration of time. This does not account for repetition of vehicles.
3. Parking load Parking load gives the area under the accumulation curve. It can also be obtained by simply multiplying the number of vehicles occupying the parking area at each time interval with the time interval. It is expressed as vehicle hours.
4. Average parking duration It is the ratio of total vehicle hours to the number of vehicles parked.
5. Parking turnover It is the ratio of number of vehicles parked in duration to the number of parking bays. This can be expressed as number of vehicles per bay per time duration.
6. Parking index is also called occupancy or efficiency. It is defined as the ratio of number of bays occupied in time duration to the total space available. It gives an aggregate

measure of how effectively the parking space is utilized. Parking index can be found out as follows

Parking index = parking load/parking capacity × 100

IN-OUT parking Surveys at different zones

60	6	2	34	68	170
Total					1925

Total parking load be 1925 vehicles. In or 32vehicles.hour

**3. BENZ CIRCLE** Parking area consisting of 40 bays  
Initial vehicles be 15

**1. KR MARKET Parking** area consisting of 25bays  
Initial vehicles be 15

Table 4

TIME	In	Out	Accumulation	Occupancy (%)	Parking load
5	4	2	17	68	85
10	2	4	13	52	65
15	6	3	18	72	90
20	5	2	18	72	90
25	2	3	14	56	70
30	2	4	13	52	65
35	7	5	17	68	85
40	2	3	14	56	70
45	5	3	17	68	85
50	6	3	18	72	90
55	2	5	12	48	60
60	7	3	19	76	95
Total					950

Total parking load be 950 vehicles. In or 16 vehicles. hour

**2. BESANT ROAD and NTR complex:**

Parking area consisting of 50bays  
Initial vehicles be 30

table 5

TIME	In	Out	Accumulation	Occupancy (%)	Parking load
5	5	2	33	66	165
10	4	3	31	62	155
15	6	4	32	64	160
20	4	7	28	56	140
25	3	2	31	62	155
30	5	4	31	62	155
35	6	2	34	68	170
40	5	3	32	64	160
45	7	4	33	66	165
50	6	2	34	68	170
55	5	3	32	64	160

Table 6

TIME	In	Out	Accumulation	Occupancy (%)	Parking load
5	5	2	18	45	90
10	4	6	13	32.5	65
15	6	4	17	42.5	85
20	8	2	21	52.5	105
25	7	5	17	42.5	85
30	5	6	14	35	70
35	2	4	13	32.5	65
40	6	8	13	32.5	65
45	4	7	12	30	60
50	3	4	14	35	70
55	5	2	18	45	90
60	7	2	20	50	100
Total					950

Total parking load be 950 vehicles. In or 16 vehicles. hour

**4. RAMAVARAPADU RING ROAD:** Parking area consisting of 20bays  
Initial vehicles be 15

Table 7

TIME	In	Out	Accumulation	Occupancy (%)	Parking load
5	5	2	18	90	90
10	4	5	14	70	70
15	6	3	18	90	90
20	8	4	19	95	95
25	2	7	10	50	50
30	5	2	18	90	90
35	4	3	11	55	55
40	5	2	18	90	90
45	6	3	18	90	90



50	7	4	18	90	90
55	5	2	18	90	90
60	2	3	14	70	70
Total					970

Total parking load be 970 vehicles. In or 17vehicles.hour

### **THE IMPACTS OF PARKING**

The impacts of parking about various planning objectives, include.

- Parking supply (how much parking is provided in an area).
  - Parking prices (whether users are charged directly for parking, and the price structure used).
  - Travel patterns (the amount of vehicle traffic generated and use of alternative modes) and
  - Equity impacts (how costs are distributed).
  - The main area of interest for the impact of parking policy upon the following factors:
    - Congestion.
    - Carbon emissions and pollutants.
    - Sustainable transport.
    - Business activity and town centre viability.
    - Urban design.
1. Providing a generous parking supply is costly ranging from about 250 rest to 2250 per space.
  2. Our development patterns have created a landscape that is often dominated by the car.
  3. In many cases, residence of auto oriented communities would like to have more transportation options, but low density associated with a generous parking supply makes this unfeasible.
  4. Also, residents who are opposed to new developments with increased density often cite fears of increased traffic and parking difficulties.
  5. If the provisions of parking spaces were left entirely up to the market, we would live in a very different society today.
  6. Parking management strategies particularly pricing, will have the effect of forcing users to 'economize' when it comes to parking.
  7. There are very few land uses that generates less revenue than surface parking lot in fact they are more likely to reduce the economic success of a downtown than to improve it.
  8. The market would only supply parking where it is profitable, and there would be fewer spaces people would favourably live closer together, walk more and drive less.

### **OVER REVIEW OF RESULTS**

Many research papers have been published that relates to parking. In many, there is a little detailed consideration of the issues in which particularly interested. Nevertheless, potential topics for future research are generated from such papers. Furthermore, the papers reviewed have enabled to build up a broad evidence base of useful information.

Much guidance and advice on parking operations is provided to car park operators, developers and local authorities. these reports often cover a range of operational issues including legislation, design and under taking surveys. others set out the main policy considerations that should guide local authority decisions including designers and local authorities approach to residential street design to help change it to better.

Studies are almost exclusively concerned with city and centres, with little consideration given to rural areas. However, many studies are concerned with how access to centre is affected by parking policies with clearly impacts upon rural communities.

Several papers address parking matters at the national scale, for example policy measures. However, some studies cover relatively small geographic areas. Sometimes only being concerned with the situation in a few streets, others are concerned with a single town. As a result, the replicability of their results and interpretation elsewhere may be limited.

Two types of information source are commonly applied.

- Cross sectional - comparing the travel responses of different individuals or groups at a single point in time to make interferences about behaviour, and
- Time series – using direct observations of such behaviour over a period.

Most studies have focused on cross-sectional studies and the picture of behavioural change over time with respect to parking policy is unclear.

### **FINDING FOR COSTING**

From the NOIDA Indian researchers, the specific rate for specific parking systems are given they are. <https://dir.indiamart.com/search.mp?ss=robotic+parking+systems&src=as-rcnt>

- For automated or robotic car parking system the cost per piece is 2.80 laths.
- That is economical and more suitable for less space and time saving parking. Nowadays, smart parking system is more efficient and capable for citizens.

### **IN VIJAYAWADA CITY: K.R MARKET:**

- The no of vehicles is to be parked =970
- Automatic (or) robotic parking for 1unit cost =2.5lakhs
- Building cost =1000\*2.5  
=2425 laths/building

### **BEASENT ROAD:**

- The number of vehicles is to be parked are =1925
- Automatic (or) robotic parking for 1unit cost=2.5lakhs
- Building cost =1950\*2.5  
=4875 laths/building

### **BENZ CIRCLE:**

- The number of vehicles is to be parked are =950
- Automatic (or) robotic parking for 1unit cost =2.5lakhs
- Building cost =1000\*2.5  
=2425 r laths/building

**RAMAVARAPADU RING ROAD:**

- The no of vehicles is to be parked =950
- Automatic (or) robotic parking for 1unit cost =2.5lakhs
- Building cost =1000×2.5 =2425 laths/building.

**Total costing estimation: Table no 7**

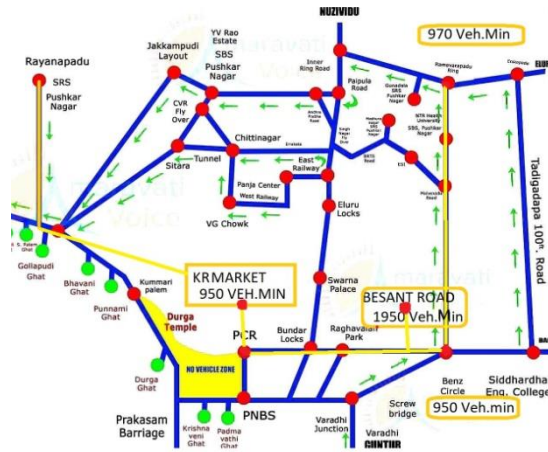


Fig 17 different vehicle parking spaces.

Hence, we provide automatic parking system for all this mobility corridors

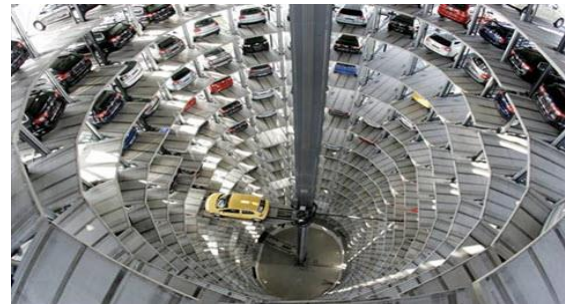


fig 18

illustrates automated parking system.

**Zone wise parking charges for automatic parking system.**

**CONCLUSION**

we provide solutions for the parking problems at different areas in Vijayawada city.

Described the methodologies briefly and data collection from the Vijayawada study area zoning.

We described the forecasting future parking demand

We found the parking load by in and out survey of parking statistics due to that increasing of vehicle count and utility of parking space be less, so automatic parking system in multi-storey building will be more convenient.

analysis of existing parking facilities to give a new parking charges for parking space for this automatic parking system (robotic parking system).

By increasing the parking space rates leads to reduce the private vehicle count.

Lack of insufficient parking area leads to waste of time in finding parking space causes traffic congestion and sultrily push up from the parking space also delay.

So, we have concluded that robotic parking system will be apt for the current positional areas in Vijayawada city.

Area	Type	Parking spaces	Building cost	Cost per space
K.R market	Robotic or automatic	970	2425	2.5lakhs/unit
Besant road	Robotic or automatic	1970	4875	2.5lakhs/unit
Benz circle	Robotic or automatic	970	2425	2.5 laths/unit

Duration/mode wise parking multiplication factor.	Robotic or automatic	Two wheel car	950 V	Auto rickshaw	2425 Min i bus	22.5 axles trucks	Private bus
Up to an hour	10	20	30	20	25	40	35
Up to two hours	15	25	35	25	30	45	40
Two to four hours	20	30	40	30	35	50	50
Four to eight hours	25	35	45	35	40	55	55
Eight to 12 hours	30	40	50	40	45	60	60
12 to 16 hours	35	45	55	45	50	65	70
16 to 24 hours	50	50	60	50	55	70	75

Table 8

Zone no	Zone description	On-street parking	Off-street parking
A	City core area/ business district.	3.55X	2X
B	Area along the mobility corridors.	2.5X	1.5X
C	Area near mobility corridors	1.75X	1.25X
D	Residential streets.	1.5X	1X
E	Sensitive areas.	N. A	1X

Table 9

Total 12150 laths/building

Overall cost with convenient charges are = total building cost× factor of safety.

=12,150×1.5

=18,225 laths/building.

**RESULTS**

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