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SELF-SUSTAINING AND SMART PARKING MANAGEMENT SYSTEM

A CASE STUDY OF PIMPRI, PUNE.

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Abstract

In India, the number of cars is increasing day by day with increasing traffic jams and parking difficulties which is an inconvenience for urban development. For the rapid development of cities, the balanced development of automobile resources shall be created, and it can be also convenient for people to travel by bus or car. Smart parking systems may be developed and put into place to decrease time, fuel, and environmental pollution. In many parts of the world, several types of smart parking systems have been implemented. Furthermore, efficient parking management has shown to be helpful in delivering sustainable urban mobility in Indian cities, but it is also one of the least developed aspects of sustainable policies.

Additionally, it is well known that effective parking management can help free up valuable public space, improve the appearance of our cities, boost the local economy, minimise vehicle congestion and traffic, strengthen roadway security and quality of air, and produce revenue for expenditures in sustainable transportation and urban improvements. The current issues with urban parking and management are covered in this study, along with possible solutions. As rapidly increase in ownership of vehicles in Pimpri Chinchwad Municipal Corporation, This Study first analyses the existing problems in Pimpri-Chinchwad parking management from aspects, such as the serious shortage of parking lots, the lack of a clear management body, the inefficient car parks in some areas and the lack of mechanisms and solutions to the problems from different aspects.

Keywords: *Smart Parking System, Sustainable policies, Urban Parking, Parking Lots, Inefficient.*

1. Introduction

Parking is defined as an area or facility set aside for the parking of automobiles, which includes any associated roadways and lanes, or parking spots but excludes any portion of a street. Parking is supposed to be built for reducing on-street traffic and related on-street infrastructures. If not, it can cause traffic congestion, which is a common problem in many cities, needs to be dealt with alongside time, fuel which is required to search for parking and pollution caused by it can be reduced if smart parking systems are designed. Parking facilities are a major social cost, and parking conflicts are among the issues that designers, operators, planners, and other officials face most regularly. These problems can be often defined either in terms of management or in terms of supply. The smart and self-sustaining parking is the ability to check available parking spaces and reserve a parking spot using smart phones and sensors in real-time. This service is useful to several parking organization systems to decrease such traffic issues and improve the comfort of car users. In Metropolitan cities like Mumbai

there are smart parking available in many areas, but due to increased traffic volumes, increase in parking rent, lack of space and accuracy in self-management also political issues led to quantitative expansion, which results in a situation where these self-sustaining parking failed to function properly, despite their quantities. The situation in Pimpri-Chinchwad is far worse than in Mumbai because of the lack of parking space itself.

1.1 Aim

To develop Self-Sustaining and Smart Parking Management System in Pimpri-Chinchwad, Pune.

1.2 Objectives

i. To assess the existing condition of parking areas in Study Area.
ii. Gap identification by comparing the Existing parking condition with Standards.
iii. To analyse the need of smart parking within the city.
iv. Recommending the Proposal of parking infrastructure facilities wherever available in region for management of parking

2. Need of Study

Most urban areas are lively, congested, and full of traffic and excessive population and no parking! So, parking in urban areas is nearly impossible to find if you are unfamiliar with the area. In urban areas, municipal authorities are responsible for public parking provisions & parking management. As it is a dynamic phenomenon with multiple nonlinear characteristics so in many cases the demand for parking cannot be fulfilled because of many reasons, as it is critical to manage parking supply as per the demand so the demand and supply management needs infrastructure as well as an operational system. Talking about the context, during & after pandemic people intended to use their vehicles for solo purpose rather than using a public transport. This has significantly impacted on traffic as well as parking across the globe where India & Maharashtra aren't different to count. The demand of urbanization trends leans towards smart parking systems, which can assess finances of a city by managing depressed open spaces for parking.

3. Study Area

Pimpri-Chinchwad Municipal Corporation is Governing body of Pimpri-Chinchwad city in India state of Maharashtra. The Municipal Corporation consisting of democratically elected members is headed by a mayor and administers the city's infrastructure, public services and transport. PCMC has Jurisdiction over the area of 181 sq.km. In which our Study area is around 11 sq.km. Ward no.19, 20, 21 is considered as the Study area from election ward of PCMC.

3.1 History

Pimpri-Chinchwad, located in the Pune Metropolitan Region of Maharashtra, India, has a rich history that spans several centuries. Originally two separate villages, Pimpri and Chinchwad, they have gradually grown and merged over time to form a significant industrial and residential hub. The history of Chinchwad can be traced back to ancient times. It is believed that Chinchwad was established during the reign of the Mauryan Empire in the 3rd century BCE. The area witnessed the rule of various dynasties, including the Satavahanas, Rashtrakutas, Yadavas, and the Marathas. Pimpri, on the other hand, has a history that can be traced back to the Yadava dynasty, who ruled the region in the 13th century CE. During the 18th century, the Maratha Empire gained prominence in the region. Under the leadership of the Peshwas, Pune became the political and administrative center. In the late 19th century, the industrial revolution in India led to the establishment of several industrial units in Pimpri-Chinchwad. The region became known for its manufacturing and engineering industries, attracting people from various parts of the country in search of employment opportunities.

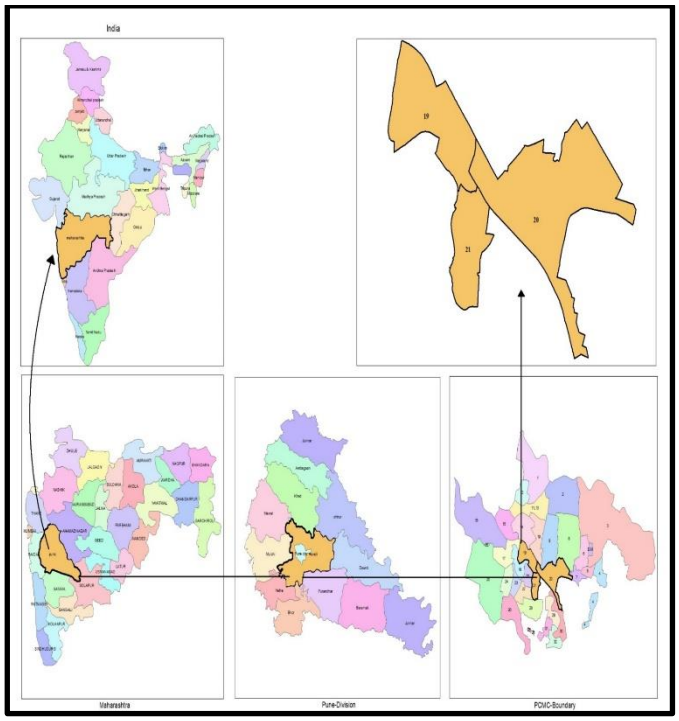


Figure 1.Location Map-Study Area

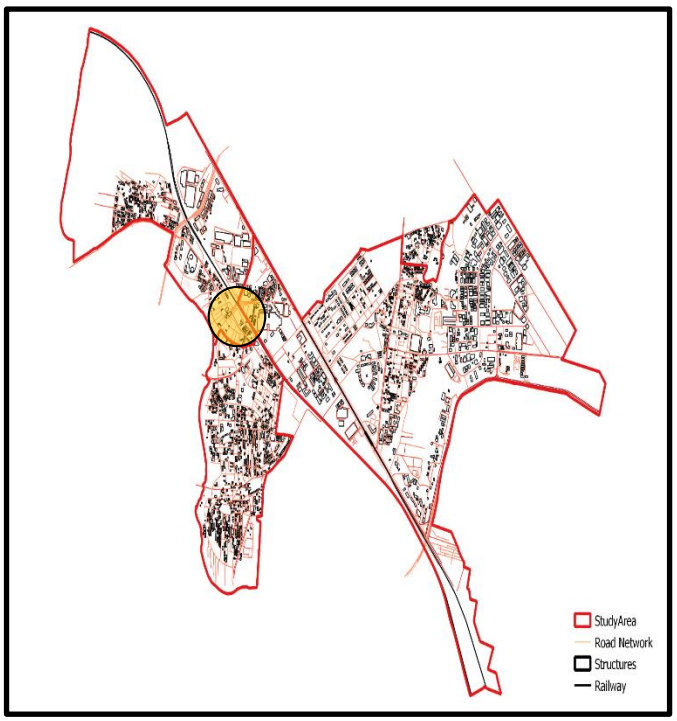


Figure 2.Location of Survey Sample-1

3.2 Population Projection

The Population Growth rate shows an increasing as well as decreasing value. The fact is the sudden industrial, residential, commercial and IT sector growth in PCMC area. The Population projection is done using Arithmetic Mean method.

SR.NO	YEAR	POPULATION
1	1991	520639
2	2001	1006417
3	2011	1727692
4	2021	2245000
5	2031	3012200
6	2041	3635090

Table 1. Projected Population

Around 30lakhs Population is projected for 10 years from 2021 and 36lakhs in 20 years. The formula used in Arithmetic mean method is [Pn=P+ (n*I)].

4. Primary Survey Methodology

Survey is a study to identify the area and relate the problem facing in that area. Survey techniques used in this study are,

1. Observation survey: - In this technique the area is observed where most issues arises then the area is fixed for survey. Observation itself is to just observe the behaviour of happenings. In this we observed the area where parking issues arise.

2. One-to-one survey: - In this the survey for particular area was done by having direct contact with the peoples around that area. In this the one is manager and other is user, where the questions were asked by manager to user.

3. Questionnaire survey: - In this survey technique one page consisting of 12-13 open ended questions are given to the user i.e., the people in that area. They have to select particular answers for those questions. This method gives particular survey directly from the peoples.

4.1 Parking Survey Methods

To get the accurate values Standard parking survey methods are used in this study they are as follows:

1. In-Out Survey

2. Fixed Period Sampling

3. License plate method of survey

The survey for the study area was performed in month of March 2023.On 23, 24, 25,26th of march the parking survey was done in which 2 weekdays and 2 weekends were concluded. For Off-Street parking In-Out Survey method and fixed period sampling methods were used to find accurate values. In-Out method was a recording of all the vehicles within the parking following that counting at the entry point within a fixed period was done, the count was recorded for 1 hr of time interval. For On-Street parking License plate method was used recording the plate number within specific time interval. This recording gave sufficient values for preparing parking statistics. By using these survey methods need for parking and its efficiency can be calculated. Parking charges are also be decided using these values.

4.2 Vehicular Population and Projection

As rapidly increase in population the vehicular growth is also increasing. Total count of vehicles in PCMC according to RTO-Pimpri Chinchwad is around 19lakhs till 2023.As guidelines delivered by Motor Vehicle Department-RTO, Maharashtra, that the vehicles above 15 years registration are used to be scrap and is illegal to use those old cars in city to avoid pollution growth. Around 38.47% Growth is seen in vehicle growth according to (Vahan.Parivahan) RTO-PCMC.

As daily increase in population and vehicular growth the traffic in city is arising day by day, congested roads, traffic jams, increase in air pollution, noise pollution and lack of public transport is seen in the city.

As problem arises with parking issues some projections should be done to fulfil the future demand and mobility to the vehicle users. Projections are done using the current values with arithmetic mean method.

SR.NO.	YEAR	VEHICLE POPULATION
1	2022	1851415
2	2023	1978327
3	2024	2105239
4	2025	2232151
5	2026	2359063
6	2027	2485975

Table 2. Vehicular Projections

Projections for next 5 years is give in the Table 2.

5. Survey Sample Analysis- Pimpri Part

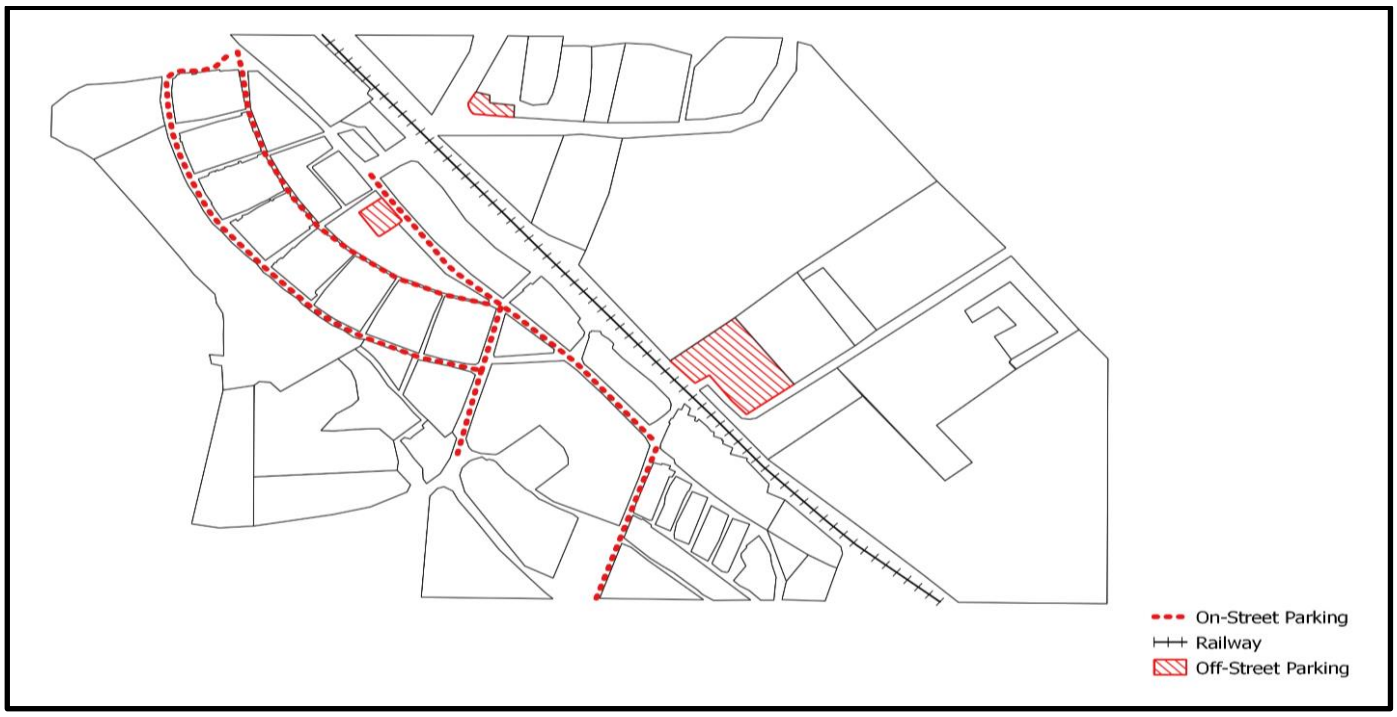


Figure 3. On&Off-Street Parking Locations-Survey Sample Pimpri

In this survey sample the traffic congestion is more in weekdays as well as weekends. From Shagun chowk to Sai chowk the main 2 junctions are always crowded, due to illegal parking of vehicles. These junctions have maximum number of traffic flow which leads to noise, air pollution. Due to these behaviours a special parking management shall be focused to avoid these conditions.

This map shows the total On-street parking area and Off-street parking area. In this Area On-Street parking does not have particular parking angles, due to this in peak hours the traffic congestion is more. To avoid this particular policy for parking should be needed which can avoid the traffic congestion and easily provide parking spot to the vehicles. Off-Street parking in this area has rates i.e., 20rs for 2W, 30rs for 4W and 20rs for Auto Rickshaw. This rate is for 2hours which means for 1 hour the half rates are applicable. But the main reason in this Off-Street parking is the poor management system, which should be changed into a self-sustaining smart parking management. The total area for On-street Parking is around a stretch of 2200m. Where for Off-Street parking is around 13700sq.m. Despite of having the area for parking the area has traffic as well as parking issues.

SR.NO.	AREA	LOCATION	TYPE	LENGTH/AREA
1	Pimpri-Market	Shagun chowk to Sai chowk	On-Street(12m)	550m
2	Pimpri-Market	Sai chowk to Ashok theatre	On-Street(12m)	370m
3	Pimpri-Market	Shagun chowk to Market	On-Street(9,6m)	500m
4	Pimpri-Market	Vardhaman to Bhatnagar chowk	On-Street(12m)	550m
5	Pimpri-Market	Deluxe chowk to Vardhaman	On-Street(18m)	120m
6	Pimpri-Market	Pay and Park (1) Sai chowk	Off-Street	10,716sq.m.
7	Pimpri-Market	Pay and Park (2) Mandai	Off-Street	1,690sq.m.
8	Pimpri-Market	Pay and Park (3) near Croma	Off-Street	1,320sq.m.

Table 3.Survey Sample Locations- Pimpri

According to above table, Analysis is given as follows:

1. Shagun chowk to Sai chowk

The Red dotted line indicates the Stretch of the On-Street Parking of around 550m. This Includes the Market for mobile shops and electronic market. The shops in this area are totally crowded by the public, as there

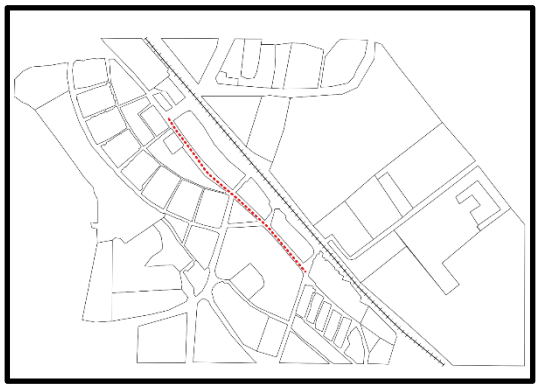


Figure 4. On-Street Parking- (Shagun ch to Sai ch)

are no private parking's for shops, illegal parking's on roads are present on this road. There is heavy traffic seen every time of the day i.e., from morning 9 am to night 10 pm. In peak hours like in morning 9am to 11 am and in evening 4pm to 9pm the parking issues are more complicated in this area. The parking method is Perpendicular on 12m wide road on both sides which obstructs the other vehicles for ease of mobility. Also, illegal parking's of 4 wheelers are seen on this stretch. There is no 4 wheelers parking on this stretch.

Hourly ECS accumulation for the stretch shows that maximum ECS accumulation occurs between 11am to 1pm in Morning and from 4pm to 8pm in Evening for the weekdays, and for weekends 5pm to 8pm.

Where Parking Slot Dimensions i.e., for 2W- 2m x 1m The ECS is 0.2, for 4W – 5m x 2m The ECS is 1.0

For Auto rickshaws (3W) – 3m x 1.5-2m The ECS is 0.6, and for LVC ECS is 1 respectively.

According to the survey, using survey methods the calculations for Demand and Supply are given below,

1. Total Length of Stretch – 550m
2. Total 3 Small Junctions (according to IRC there should be Parking after 50m from Junctions)
3. Total Stretch available for Parking – 400m.
4. Parking on Both sides of road (two wheelers).
   At Peak Hours 4pm-9pm.

LOCATION	DEMAND	SUPPLY
Shagun chowk to Sai chowk	830	400

(In Weekdays)

Table 4. Demand& Supply-Shagun ch to Sai ch Road

LOCATION	DEMAND	SUPPLY
Shagun chowk to Sai chowk	1106	400

(In Weekends)

In this Stretch it is seen that in Peak Hours the Legal parking explodes to be illegal parking because of less Parking area available in the Stretch. Due to this kind of parking traffic congestions are seen in peak hours.

2. Sai chowk to Ashok theatre (On-Street)

The Red dotted line indicates the Stretch of the On-Street Parking of around 370m. This includes the cloth market and variety shops. The stretch is of 12m wide and parking in this stretch is on both side. As PCMC has created norms for alternate day one side parking but it is not managed properly because high illegal parking, Hence in Peak hours the traffic congestion seems to be more in this stretch

Figure 5. On-Street Parking-(Sai ch to Ashok Theatre)

Hourly ECS accumulation of the stretch shows that maximum ECS accumulation occurs between 4pm to 7pm in Evening for the weekdays, and for weekends from morning to 9pm.

According to the survey, using survey methods the calculations for Demand and Supply are given below,

1. Total Length of Stretch – 370m. (100m for car Parking)
2. Alternate day parking applied. (Unfollowed by the Public).
   At Peak Hours 4pm-7pm.for weekdays and 1pm-9pm in weekends.

LOCATION	DEMAND	SUPPLY
Sai chowk to Ashok theatre	626	310

(In Weekdays)

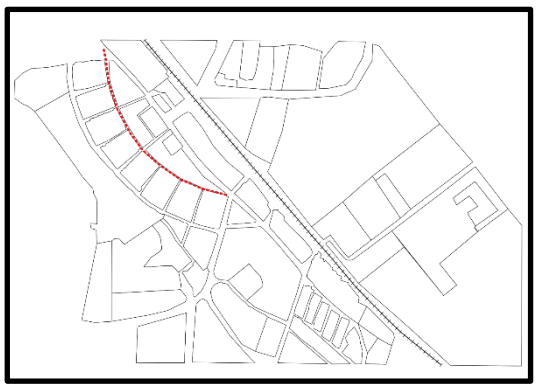
Table 5. Demand& Supply-Sai ch to Ashok Theatre Road

LOCATION	DEMAND	SUPPLY
Sai chowk to Ashok theatre	748	310

(In Weekends)

Alternate days parking norm has been provided by PCMC then too the demand is high.

3. Shagun chowk to Market (On-Street)



The Red dotted line indicates the Stretch of the On-Street Parking of 500m on inner road. The width of 9m and 6m is existing with huge nom of parking's which obstructs the public walking on this street also if some vehicle wants to pass through this stretch the traffic congestion arises due to low width of road and high nom of illegal parking's. The stretch has the famous glossary market in Maharashtra.

Figure 6. On-Street Parking-(Market Road)

As from Morning to Night the stretch is crowded all the time. Parking on this stretch is perpendicular on both sides of road which causes traffic if any vehicle passes through the stretch.

According to the survey, using survey methods the calculations for Demand and Supply are given below,

1. Total Length of Stretch – 500m.
2. Alternate day parking applied. (Unfollowed by the Public).
   At Peak Hours 4pm-7pm.for weekdays and 1pm-9pm in weekends.

LOCATION	DEMAND	SUPPLY
Shagun chowk to Market	252	200

(In Weekdays)

Table 6. Demand& Supply-Shagun ch to Market road

LOCATION	DEMAND	SUPPLY
Shagun chowk to Market	312	200

(In Weekends)

4. Vardhaman to Bhatnagar chowk (On-Street)

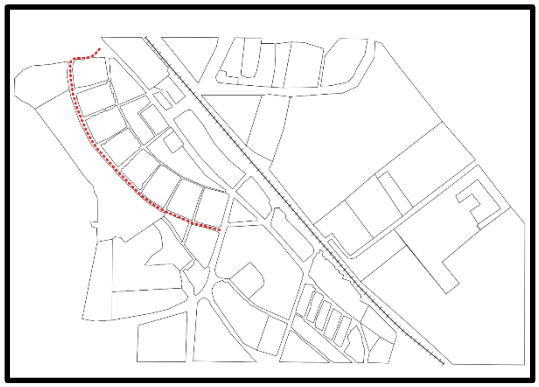


Figure 7. On-Street Parking-(Bhatnagar Road)

The Red dotted line indicates the survey stretch of 550m which includes 2-wheeler 3-wheeler 4-wheeler as well as LCV. The supply is calculated by dividing the vehicular area into the length of the stretch.

According to the survey, using survey methods the calculations for Demand and Supply are given below,

1. Total Length of Stretch – 550m
   Total 7 Small Junctions (according to IRC there should be Parking after 50m from Junctions)
   Total Stretch available for Parking – 200m.
   Parking on Both sides of road (two wheelers).
   At Peak Hours in morning 9am-11am, in evening 4pm to 7 in weekdays and in weekends 5pm-9pm.

LOCATION	DEMAND	SUPPLY
Vardhaman to Bhatnagar chowk	444	200

(In Weekdays)

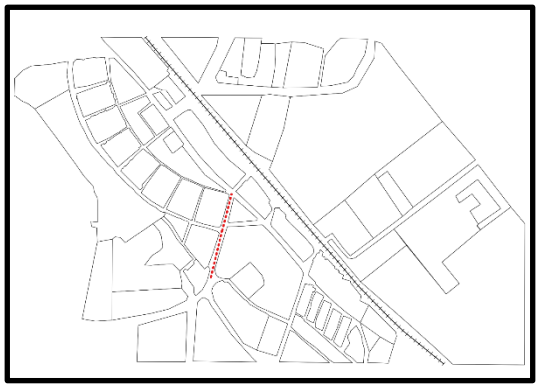
Table 7. Demand& Supply-Vardhaman to Bhatnagar

LOCATION	DEMAND	SUPPLY
Vardhaman to Bhatnagar chowk	456	200

(In Weekends)

As the demand is high in every stretch due to illegal parking's and no special parking spots allocated and its free for use, there should be some charges applied to the parking so that there will be no illegal parking's.

5. Deluxe chowk to Vardhaman (On-Street)



The Red dotted line indicates the survey stretch of 120m, 18m wide road with median. This stretch includes the jewellery shops and other hardware shops on a small stretch.

Figure 8. On-Street Parking- Deluxe Road

According to the survey, using survey methods the calculations for Demand and Supply are given below,

1. Total Length of Stretch – 120m
   Parking on Both sides of road
   At Peak Hours in evening 4pm-7pm in weekdays and 1pm to 9pm in weekends.

LOCATION	DEMAND	SUPPLY
Deluxe chowk to Vardhaman	92	60

(In Weekdays)

Table 8. Demand& Supply-Deluxe to Vardhaman Road

LOCATION	DEMAND	SUPPLY
Deluxe chowk to Vardhaman	120	60

(In Weekends)

There is parking on this 18m but because of auto rickshaws the stretch faces traffic problems. No specific spot for the auto rickshaws is made as the stretch has the main junction.

6. Pay and Park (1) – Sai Chowk (Off-Street)

The Red dot indicates the pay and parking area. This is located near to Sai chowk. On 200m-500m there is the main Pimpri market, the mobile market, the Gurudwara, and service road to Ola Mumbai-Pune Highway on 700m.

Figure 9. Off-Street Parking-1 (Sai chowk)

As parking lot has all types of vehicles i.e., 2W, 3W, 4W, and LCV. The parking capacity is for 300 vehicles. And this Parking lot is recently started, hence less use by the public.

According to the survey, using survey methods the calculations for Demand and Supply are given below,

1. Total Area of Parking lot – 10,716 Sq.m.
2. Parking Lot is under the Municipal Corporation and managed by PPP model.
3. Parking Capacity – 500.
4. Parking Fee – 2W (10rs), 4W (15rs), 3W (10rs) Per Hour.

   This includes the Bikes, Auto, cars, trucks, LCV, etc. too.

   Peak Hours for parking lot in morning is between 9am-12pm. And in evening 6pm-9pm. For weekdays and for weekends 4pm-9pm.

LOCATION	AREA	DEMAND	SUPPLY
Pay and Park (1) Sai chowk	10,716sq.m.	401	550

(In Weekdays)

Table 9. Demand& Supply-Pay and Parking

LOCATION	AREA	DEMAND	SUPPLY
Pay and Park (1) Sai chowk	10,716sq.m.	511	550

(In Weekends)

In this Case the Demand is low, compare to supply but in few years the parking lot will be fully filled and it will become impossible to manage. If the parking lot if totally full then it can generate approx.8000 Rs. per Hour which will increase the revenue.

7. Pay and Park (2) - Pimpri Mandai (Off-Street)

The Red dot indicates the pay and parking area. This is located in the Mandai area which is the vegetable market and glossary market. Most of the public use this parking lot as it is nearer to market.

Figure 10. Off-Street Parking-2 (Mandai)

According to the survey, using survey methods the calculations for Demand and Supply are given below,

1. Total area of parking lot is around 1690sq.m.
2. Parking Lot is under the Municipal Corporation and managed by PPP model.
3. Parking Capacity – 170(includes for cars and bikes (i.e., 2W, 4W).
4. Parking Fee – 2W (10rs), 3W (10rs), 4W (20rs) For Whole day.

   Peak Hours for parking lot is between 4pm -9pm in Weekends.

LOCATION	AREA	DEMAND	SUPPLY
Pay and Park (2) Mandai	1,690sq.m.	196	170

(In Weekdays)

Table 10. Demand& Supply-Mandai Parking

LOCATION	AREA	DEMAND	SUPPLY
Pay and Park (2) Mandai	1,690sq.m.	219	170

(In Weekends)

As the demand in higher and capacity does not get increase due to the availability of land in this area, the parking issues are more even though it's an Off-Street parking. In peak hours the parking lot gets overflow and the parking of cars are done on road side.

8. Pay and Park (3) – Near Croma Pimpri (Off-Street)

Figure 11. Off-Street Parking-3 (Near Croma)

The Red dot indicates the pay and parking area. This parking lot is located near to Pimpri Mandai market, and besides commercial building of Croma and PNG jewellers. The parking lot is nearer to Mumbai-Pune Highway.

According to the survey, using survey methods the calculations for Demand and Supply are given below,

1. Total Area of Parking lot – 1,320sq.m.
2. Parking Lot is under the Municipal Corporation and managed by PPP model.
3. Parking Capacity – 150 (includes for cars and bikes (i.e., 2W, 4W).
   Parking Fee – 2W (10rs), 3W (10rs), 4W (20rs) For Whole day.

Peak Hours for parking lot in morning is between 9am-12pm. And in evening 6pm-9pm. For weekdays and for weekends 4pm-9pm.

LOCATION	AREA	DEMAND	SUPPLY
Pay and Park (3) Near Croma	1,320sq.m.	152	150

(In Weekdays)

Table 11. Demand& Supply-Near Croma Parking

LOCATION	AREA	DEMAND	SUPPLY
Pay and Park (3) Near Croma	1,320sq.m.	213	150

(In Weekends)

As the demand in higher and capacity does not get increase due to the availability of land in this area, the parking issues are more even though it's an Off-Street parking.

5.1 Future Parking Demand Projections.

. For the year 2023 the present demand is given by using Survey methods. The future predictions are done using the Arithmetic mean method.

LOCATION	TOTAL DEMAND	TOTAL SUPPLY
Pimpri- Market	3685	2040

(Till March 2023)

Table 12. Total Demand and Supply-Sample Survey 1 Pimpri

For 2w- 2690 (Units)

For 4w- 737 (Units)

For 3w- 221 (Units)

For LCV- 37 (Units) (Also Includes HCV)

SR.NO	LOCATION	PROJECTED DEMAND	YEAR
1.	Pimpri- Market	4245	2024
2.	Pimpri- Market	4805	2025
3.	Pimpri- Market	5365	2026
4.	Pimpri- Market	5925	2027

Table 13. Future Demand Projections for next 5 Years

Demand Calculation gives the no of units demand in future because of increase in population and vehicle population. According to survey the future demand for 2w will be 73% 4w will be 20%, Auto rickshaws, LCV and HCV will be 7% overall.

5.2 Findings from Questionnaire Survey

1. Pimpri Market Survey was done on daytime on 25th march 2023 Sat (Weekend).

2. Pimpri market land use is almost commercial zone and one of famous market in Pune.

3. The sample survey was done and according to the peoples the data was collected.

4. The findings were as follows:

- The type of vehicles in the area were two wheelers around 73%, which was the mean of transport by the peoples, and the parking of around 78%was on street parking.
- 89% Purpose was to visit the commercial shops for shopping and parking of duration 30mins to 1hour and more than 1 hour was observed in survey.
- 90% People were unable to find a parking spot to park their vehicle, and in survey the time taken to find the spot were between 5 to 10 minutes for 2 and 4-whellers.
- The 88% was demand for two-wheeler parking that should be free in future too, rest for safety and security purpose people are willing to pay 0-5rs per hr.
- As security comes first for four-wheeler 48% and 39% Peoples are demanding for parking and can pay 10-20rs per hr.
- From parking to their destination almost walkable distance is been observed.
- Using of advance technologies and Applications 96% in Pimpri Market area people will likely to use the Parking application which will find a spot for parking easily.

5.3 Proposals and Suggestions

Creating an effective parking policy in PCMC limits is opportunity towards betterment of city and environment. It will not only solve the parking problems but also will make a Self-Sustaining Parking in the Municipal corporation limit. Which will reduce the time consumption for traveller to find a spot.

1. Permits for Parking

A parking permit allows the user to priorities parking for people at local addresses. Permits are given for users which can be used only for parking purposes. Permits can be used in private sector as well as government sector. As the private owner has the front premises for car parking of his residential building one cannot park directly, so for this purpose permits should be introduced.
Here are some types of parking permits according to needs.

- Permits for Visitors
- Permits for Overnight
- Permits for Guest
- Permits for Residents

The operating authority shall create a system which will be accessible to user. First thing the private sector should register their space into parking permit, in the operating organization. Then from the policy or website of operating organization user can get the parking permits according to their needs. That can be for a week, month and yearly permits. This would help in revenue generating through permits for parking.

2. Sensor-based Parking Management:

Implement a network of sensors installed in parking spaces that can detect vehicle presence. These sensors can relay information in real-time to a central management system, which can then direct drivers to available parking spots via mobile apps or electronic signage. By help of Smart Navigation and Guidance system which will guide the drivers to the nearest available parking spots using Real-time data this will not only reduce the traffic congestion caused by drivers in search of parking spot but also overall flow of vehicles. By using Mobile apps reservation system can be used.

Reservation system which will allow the drivers to reserve parking spaces in advance. This can be particularly useful for events, shopping centres, and popular destinations, reducing the time spent searching for parking and improving overall efficiency.

3. Integration with Public Transportation

By Connecting smart parking systems with public transportation networks to provide seamless multi-modal transportation options. This integration will encourage the use of public transportation and reduce the reliance on private vehicles, thereby alleviating parking congestion.

5.3.1 Parking Infrastructure development and Upgradation

1. Pimpri Mandai Area.
Considering area restrictions the parking lot is best suitable for Multi levelled Automated Parking System which would save space by creating parking for different types of vehicles. Installing digital sign boards which shall also exhibit details like capacity, parking availability, etc. The installation of digital sign boards shall be done by the adjacent main road as well as outside the parking stretch, showing the available capacity. The cost of building a digital sign board shall not exceed than Rs.9000.

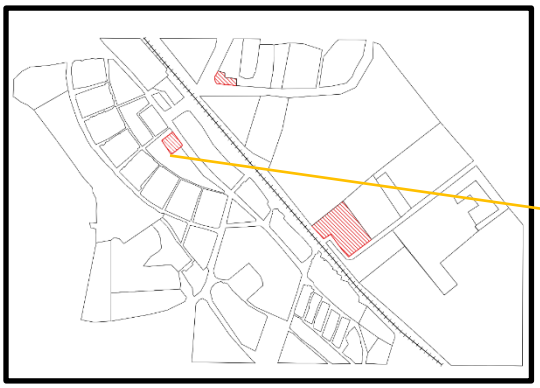


Figure 12. New Plot for Multi levelled automated parking-Near Mandai

Image 1. Total area of 575 Sq.m. near Pay and Park Lot in Pimpri Mandai

2. Pimpri Market Area.

The Commercial shops in this area are more and people visit the shops certain times in a day. As the road 12M wide and Traffic arises the proposal made is One-Way Road and One Side Parking on Alternate days. This will be economically better for the Pay and Park Lot Present in this area. In Search of Parking space people will make use of Pay and park. It will not only reduce the Traffic but also will be better for the Public to walk on sideways of roads.

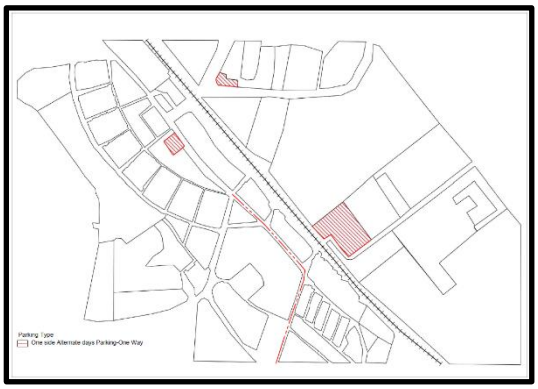


Figure 13.*One side alternate day parking proposal*

The Red Line indicates the One-Side Alternate Day Parking, and this should be taken care under the RTO department for making strict fines on Illegal Parking's in this Area.

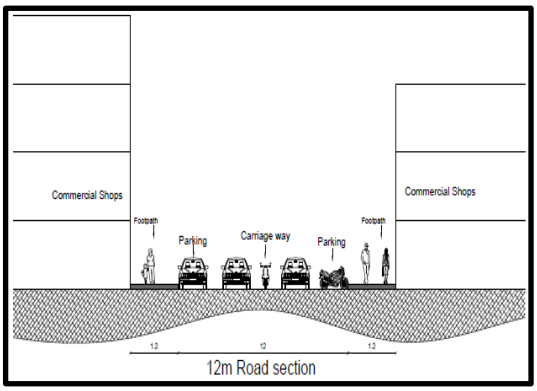


Figure 14. Existing Section of 12m road

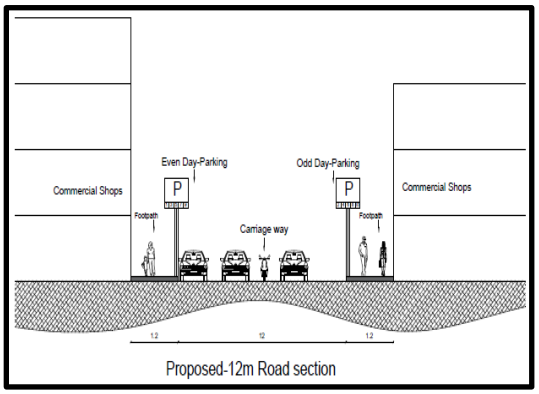


Figure 16. Proposed Section of 12m road

6. Conclusion

The implementation of smart and sustainable parking management system presents a promising solution to challenges faced by modern cities. In need for parking space there are many conflicts and issues which causes traffic congestion and many other issues. This article gives an idea for and proposals in which the parking layouts, Available parking spaces can be improved and policies can be implemented by government for future demand and supply for parking. The primary, secondary data collection, gives the future demand for this study area. Smart and sustainable parking management can be achieved by these goals.

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