

# Residential Development Trend Analysis in a Fast Growing Indian City

Arati Siddharth Petkar  
Department of Civil Engineering  
College of Engineering Pune,  
Maharashtra, India

Dr. J. E. M. Macwan  
Department of Civil Engineering  
S. V. National Institute of  
Technology, Surat, Gujarat, India

Dhiraj L. Takkekar  
Department of Civil Engineering  
College of Engineering, Pune,  
Maharashtra, India

**Abstract**—Residential land use is predominant in any urban area. Residential areas are divided into various zones depending upon various characteristics such as connectivity, surroundings, availability of facilities and amenities, proximity to work place, community, infrastructure to name a few. Depending upon these characteristics different zones in residential land use observes different scale and pace of development. The objective of the study is identification and delineation of different Study Zones based on inventory and reconnaissance survey creating a base to carry out further research and field work. For analysis, recorded data from building permission department for last twelve year is used which consists of details like total number of projects sanctioned in each zone along with area and land uses. The study is limited to residential land use only.

**Keywords**— *Development Trends; Residential Location Preferences; Localities; Housing Location; Zone; Inventory Survey*

## I. INTRODUCTION

A particular residential area often has a particular housing typology and spatial arrangement arising out of it. It becomes important to understand the relationship between various factors affecting the preferences of a family and character of a particular locality in an urban area. It will help in analyzing the various zones, zone wise development trend and type of development in each zone since last twelve years. This study will help in formulating a methodology which will project residential areas likely to be developed in recent future and type of development that will be observed by them on preferences of urban dweller, which will have immense bearing while projecting residential areas in development plan proposals. This study aims at analyzing past residential development trend in the study area forecasting future trends in terms of projecting areas likely to be developed in recent future and type of development they will observe. The study area selected is Pimpri Chinchwad Municipal Corporation (PCMC). Inventory survey includes the current housing scenario, number of projects sanctioned in study area in last twelve years from year 2000 to 2012.

There are many parameters by which any family gauges the buying or renting a house. The most important of all is affordability. Along with this many social, socio-cultural, socio-economic, demographic factors are responsible in deciding location for housing. The commute from the work place and availability of amenities and facilities also affects the location of housing. A preference to the location of house varies for people with different income groups and social background. Many a times certain area is occupied by the

people of equal income group and various zones are formed accordingly. So it becomes important to understand the relationship between various factors affecting the preferences of a particular family and character of a particular locality in the city or town.

## II. STUDY AREA

PCMC, one of the fastest growing cities from Maharashtra state of India is selected for study purpose. It is situated near the western margin of the Deccan Plateau on the leeward side of the Sahyadri ranges and Western Ghats, 560 m above sea level. The rivers Mula, Pawana and Indrayani form boundaries on three sides of the city. The city lies in the seismically active zone of Koyna Region, which is about 100 km. south of Pune. City is well connected by road, rail and air to almost all important cities in India. Pimpri-Chinchwad is along the National Highway no. 4 leading to Mumbai, the capital city of Maharashtra [1].

In PCMC more and more area is getting under development in its limits to cater for increasing population. It has become difficult to provide infrastructure and other facilities to these areas and also it is difficult to control or regulate the development in any particular direction. Hence it becomes necessary to understand the current housing trends and project future housing trends in order to prioritize the infrastructure development in any particular area. The study area will be confined to the municipal limits of Pimpri-Chinchwad. Various areas within Pimpri-Chinchwad have observed different pace of development however, Study will be focused on the Residential areas developed in last ten years, areas recently under development and vacant residential land available. Fig. 1 indicates the location of PCMC with respect to India, Maharashtra and Pune District.

### A. Historical Development

Pimpri was basically established as a center for refugees from Pakistan. Industrialization in Pimpri area commenced with the establishment of Hindustan Antibiotics Limited in 1956. The establishment of the Maharashtra Industrial Development Corporation (MIDC) in 1961-62 considerably facilitated industrial development in the area. The establishment of large-scale core industries has led to the growth of ancillary and small-scale industries in and around this industrial belt. The landscape in the region has seen significant changes over the years with agricultural land giving way to enclosed factory campuses. Today, Pimpri-Chinchwad is a major industrial centre of the Pune region and of the entire country [2].

### B. Demographic Profile

Development of the PCMC dates back to the establishment of industries such as Bajaj Auto and Telco, in the middle of the 20th century. The establishment of the Pimpri-Chinchwad New Town Development Authority (PCNTDA) in the 1980s helped the development of residential colonies in the 1990s to an extent. With the booming IT and ITeS sector in neighboring Pune in the 1990's, Pimpri-Chinchwad has seen large scale development of residential areas. PCMC has a literacy rate of 90 % as per 2011 provisional census. Pimpri-Chinchwad has a sex ratio of 828 females for every 1000 males as per Census 2011. More than 60% of the population growth in Pimpri-Chinchwad has been on account of migration largely due to the employment opportunities prevailing in the region [2]. 1991-2001 was an era of manufacturing industries which led to population growth in PCMC due to Auto and Auto ancillary industries. 2001- 2011 was an era of IT industries which led to rapid growth in population of PCMC irrespective of relocation of some of the manufacturing companies outside PCMC boundaries. The demographic profile of PCMC saw a gradual shift towards higher proportion of service professionals with higher income range groups compared to working class profile of 1990's. Fig. 2 gives the population trend in PCMC in last four decades.

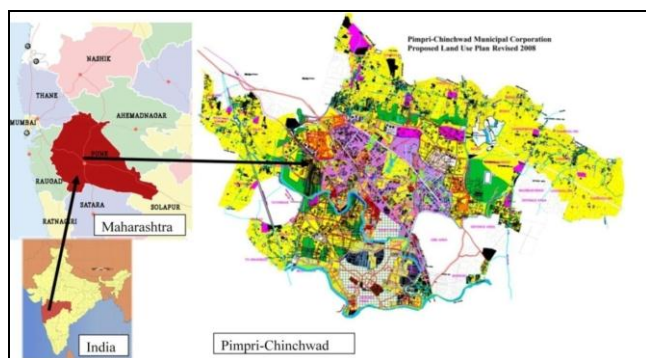


Fig. 1. Location of Study Area

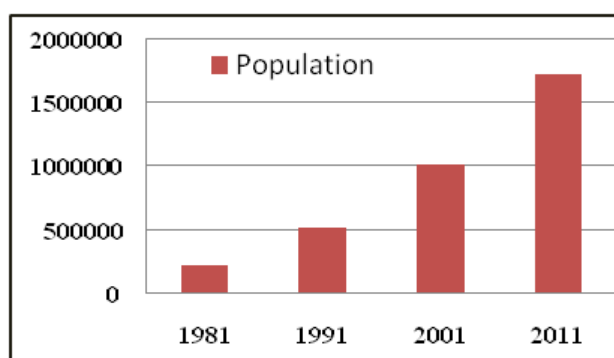


Fig. 2. Decadal Growth of Population in PCMC [3]

### III. SURVEY AND ANALYSIS

PCMC is formed by merging adjoining villages from time to time. The reconnaissance survey was carried out and based on survey analysis study zones are delineated. It is observed from the analysis of development trend that a particular area has a typical type of development dominance over the other. Availability of various amenities and facilities, connectivity with workplace and city center, environmental and community factors differ from area to area. All these factors lead to formation of particular character to an area which will then attract the suitable future development. There are various factors which contribute for having a particular characteristic for an area. These factors can be categorized into two parts Qualitative and Quantitative Aspects. While defining the study zones following Quantitative and Qualitative aspects were considered.

Quantitative aspects includes a) Location of zone with respect to major work places and city centre, b) Connectivity by public transport like bus and rail, c) Availability of facilities like education, health and recreational within zone and d) Availability of Services like water supply, drainage and security.

Qualitative aspects includes a) Environmental aspects like congestion and pollution level in that zone, b) Social aspects includes if the zone is having historical background, type of community and socio-economic characters etc.

#### A. Delineation of Study Zone

Delineation takes into consideration the existing village boundaries. A reconnaissance survey was carried out. It included observations made in the survey, development control regulations, availability of various facilities and amenities and also included opinions of the people, taken during housing survey. All areas are analyzed depending upon various Qualitative and Quantitative aspects mentioned above. It is observed that some of the adjoining areas share same characteristics. These areas are identified and grouped together to forms zones to create base for further research and field work. Nine such zones are identified and listed in Table 1. The Fig. 4 shows delineation of nine study zones.

TABLE 1. DELINEATION OF STUDY ZONES

S. No.	Zone Name	Designation	Name of Village
1	Zone 1	Central	Pimpri, Chinchwad, Akurdi, Bhosari, Nigdi, Kasarwadi
2	Zone 2	South west	Waked-Rahatani-Pimple Gurav, Nilakh, Saudagar
3	Zone 3	North west	Punavale-Ravet-Kiwale- Mamurdi
4	Zone 4	West	Tathwade-Thergaon
5	Zone 5	South	Sangavi-Dapodi
6	Zone 6	South east	Bopkhel-Dighi
7	Zone 7	North east	Chikhali-Moshi
8	Zone 8	North	Talawade
9	Zone 9	East	Charohli-Wadmukhwadi-Choviswadi-Dudulgaon

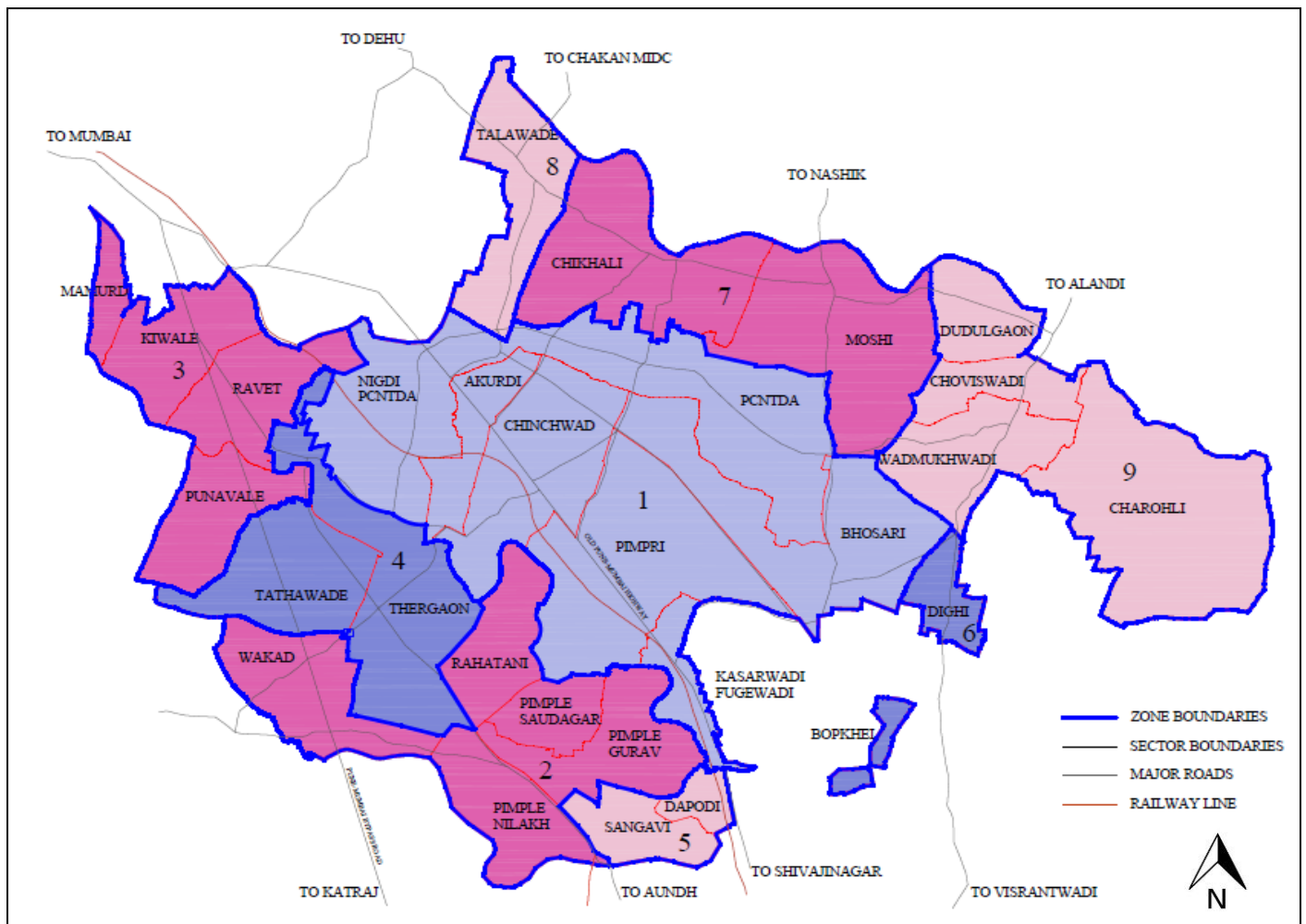


Fig. 4. Map showing Study Zones

### B. Observations from Survey

**Zone 1 - Central:** The areas under this zone have good connectivity by railway as well as bus service. All major facilities like Hospital, Colleges and Market are available in these areas. PCNTDA shares highest land percentage in PCMC limit which is planned development. Akurdi is surrounded by industrial area and planned development of PCNTDA. Of all the core sectors or sectors falling in old PCMC development, Akurdi has observed maximum development in last 12 years. It also has 'Gaothan' area which is now getting redeveloped. Chinchwad is one the Old Core areas of PCMC. In recent years new development along Mumbai-Pune Highway is observed, also redevelopment in core areas is observed. Pimpri consists of Pimpri gaon, Pimpri Nagar and Pimpri Waghere. It is also core area of PCMC. It is dominated by congested areas and unauthorized development. It is surrounded by industrial area. Bhosari has Good connectivity to Chakan MIDC, PCMC and Pune. 'Gaothan' area of Bhosari is dominated by large scale unauthorized development. New large scale projects are coming up in outer areas of Bhosari.

In the Central zone the development potential is fully utilized. The projects which are coming up are mainly redevelopment projects.

**Zone 2 – South west:** This zone is well connected by road network to core areas of PCMC and Pune as well. No local rail connectivity to these sectors. All basic facilities are available along with hospitals and large recreational areas. In Waked due to Hinjewadi IT Park, maximum development has been observed in last 12 years (See Fig. 7). It is dominated by 2BHK and 3BHK apartment buildings and large scale projects with amenities and facilities within the project. In Rahatani, Pimple Gurav, Nilakh, Saudagar, impact of Hinjewadi IT Park is observed. These areas have observed large scale development in recent years along with well developed infrastructural facilities.

**Zone 3 - North West:** The areas from this zone are along Mumbai – Pune by-pass road. Good connectivity to Hinjewadi IT Park is observed. Many new large scale projects are coming up in these sectors. Large amount of vacant land is available in these sectors.

**Zone 4 – West:** These sectors are well connected with city center. Facilities such as hospitals, colleges, recreational facilities are available in these sectors. These sectors have congested areas. Small scale development is observed. Draft



Development plan of Tathwade is published and major part of residential zoned land is for economically weaker section.

**Zone 5 – South:** These sectors are well connected by rail as well as bus to both Pimpri-Chinchwad and Pune city. All basic infrastructure facilities are available. It is dominated by core or ‘Gaothan’ area. Large scale unauthorized development and congested areas. Smaller land holdings. It has very less vacant land available.

**Zone 6 – South East:** It is surrounded by defense land. Due to various development restrictions, no large scale development is observed in Bopkhel and Dighi. Small plotted development is observed. It has good connectivity to Pune city. Basic infrastructure facilities are available. No major recreational places are available in these sectors.

**Zone 7 – North East:** Good connectivity to Chakan MIDC and Talawade IT Park. These sectors are lacking in terms of facilities such as hospitals, colleges and recreational facilities. Many large-scale projects are coming up in these two sectors along Dehu-Alandi BRTS rout.

**Zone 8 - North:** It has an IT Park. Good connectivity to Chakan MIDC. Very less development is observed due to restrictions on development by defense. Basic facilities such as school, hospital and recreational facilities are absent in this sector.

**Zone 9 – East:** It possesses a rural character. These lack in terms of basic urban facilities. No regular and convenient bus services or other means of transport are available to connect these sectors to city centre. Land use is dominated by agriculture. Very less development is observed in this area.

### C. Development Capacity

Development capacity is the ability of land to accommodate greater development. According to Edward J. Kaiser, “In its simplest meaning, developable land is vacant or underused land, without severe physical constraints, which is planned or zoned for more intense use and has access to the urban services necessary to support development.” Development Capacity of various Sectors in terms of availability of land needs to be given a due consideration. Availability of vacant land will have effect on property values, type of development and pace of development of an area. Proposed land uses and development control regulations in various areas also affect the type of development. Here, development capacity is analyzed based on reconnaissance survey and Development plan land uses.

**Zone 1 -** As these are old core sectors there is limitation in terms of plot sizes and availability.

**Zone 2 -** These sectors have observed maximum development in last 5 years with moderate availability of land for future development.

**Zone 3 -** These are newly added villages along the outer periphery of PCMC with large amount of vacant land available.

**Zone 4 -** Limitations in terms of plot sizes and availability.

**Zone 5 -** Limitations in terms of plot sizes and availability.

**Zone 6 -** Smaller Land holdings and restrictions on development by defense.

**Zone 7 -** Large amount of vacant land available.

**Zone 8 -** Vacant Land available but restrictions on development by defense.

**Zone 9 -** Large amount of vacant land available.

### D. Zone Wise Analysis for Type of Development

Type of development refers to whether they are Individual Bungalow, Row houses, Single Building/Apartment, Cluster of Buildings, Townships, Layouts etc. It is seen that a particular area observes a particular type of development dominant over the other. With change in life style of people and changing family structure, people’s preference to housing typology has changed. Impact of this can be seen on overall city structure. Along with people’s preferences, type of development is also governed by the availability of land, sizes of land parcels available, permissible Floor Space Index (FSI) and development control regulations.



Fig. 5. Type of Development

Type of development is gauged on the basis of three parameters viz. plot area of the projects, Maximum Permissible FSI, Mandatory Open Spaces or Amenity spaces to be kept within the project and accordingly data is analyzed classifying into five categories as mentioned below. Fig. 5 is representation of these five types.

- Type 1: Project having area Up to 250 Sq.M. (Bungalows, Row Houses, Semi-detached houses), FSI 0.75, Less Side open spaces and small habitable room sizes allowed.
- Type 2: Project having area 251 Sq.M. to 2000 Sq.M.(Single Apartment / two apartments), FSI 0.75
- Type 3: Project having area 2001 Sq.M. to 3600 Sq.M. (Cluster of Buildings), FSI 1.00, 10% of open space is mandatory.
- Type 4: project having area 3601 Sq.M. to 10000 Sq.M. (Large Cluster of Buildings), FSI 0.85, 15% Amenity space mandatory, club house is allowed in open space.
- Type 5: Project having area 10001 Sq.M and above ( Large Township Projects, or layouts)

The data of sanctioned projects from year 2001 to October 2012 is obtained from PCMC building permission department. The data is available with information of number of projects along with built up area of each project ( more details refer Annexure 1) and analyzed for type of development in each study zone. Fig. 6 summarizes the built up areas under each type of development sanctioned. (For detail refer Annexure 2)

From Fig. 6 it is observed that, large Scale projects within house amenities and facilities that Type-5 form the major part of residential development in last twelve years. Trend of individual plotted development is reducing and people are opting for large projects. Small cluster of buildings also share higher percentage of development compared to the overall development after Type-5. The trend in type of development is not uniform throughout the study area. Each zone has its own characteristics in terms of availability of vacant land, size of land holdings, development control regulations, etc. Fig. 7 shows total built up area sanctioned in each zone in last twelve years. It analyzed that maximum built up area is sanctioned in Zone 2.

Core sectors are developing with small scale projects in pockets as land available for development is less and mostly redevelopment projects. Newly added villages are developing very fast with projects with large plot areas preferable having in-house facilities and amenities like club house, open spaces etc. Impact of higher income range group and changing life style of people can be clearly seen on the development as projects with facilities and amenities are increasing compared to individual plotted development. Zone wise analysis for type of development is shown in Fig. 8 to Fig. 12. It is observed from Fig. 8 that Type 1 is dominant in Zone 1 and Zone 2. Fig. 9 says about Type 2 which is dominant in Zone 1 followed by Zone 2. Fig. 10 identifies that Type 3 is dominant in Zone 2. Type 4 and Type 5 is mainly observed in Zone 2 as shown in Fig. 11 and Fig. 12. Zone 2 is developing at a faster rate compared to all other zones due direct to connectivity to major roads. All the data for Type of Development zone wise is summarized in Fig. 13.

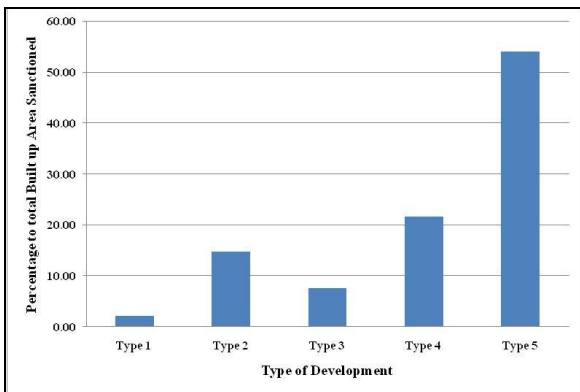


Fig. 6. Area sanctioned under each type of development

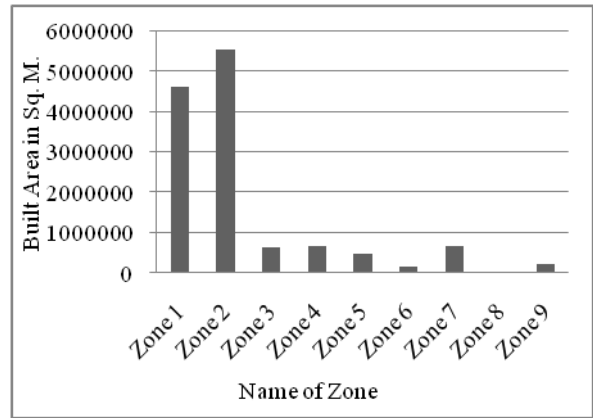


Fig. 7. Zone wise Sanctioned built up area in Sq. M.

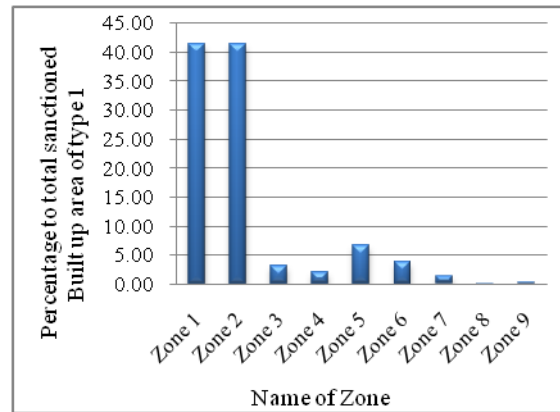


Fig. 8. Zone wise Sanctioned built up area in Sq. M. of Type 1

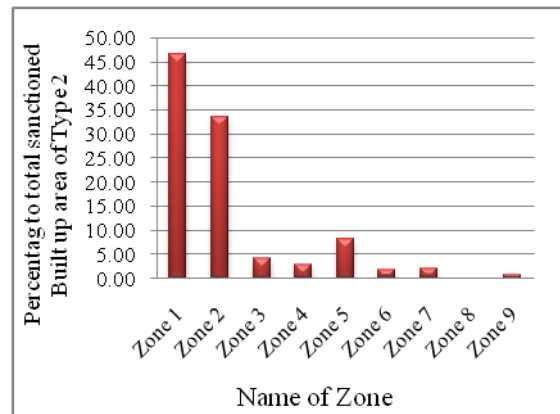


Fig. 9. Zone wise Sanctioned built up area in Sq. M. of Type 2

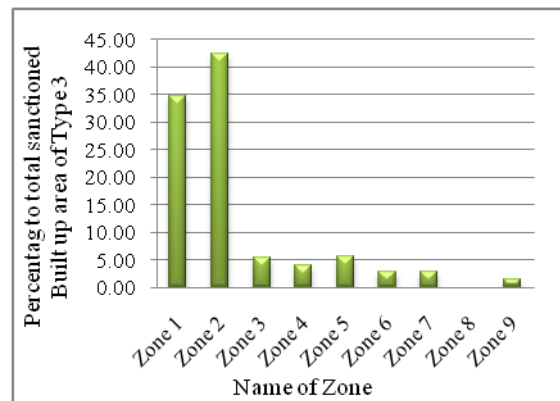


Fig. 10. Zone wise Sanctioned built up area in Sq. M. of Type 3

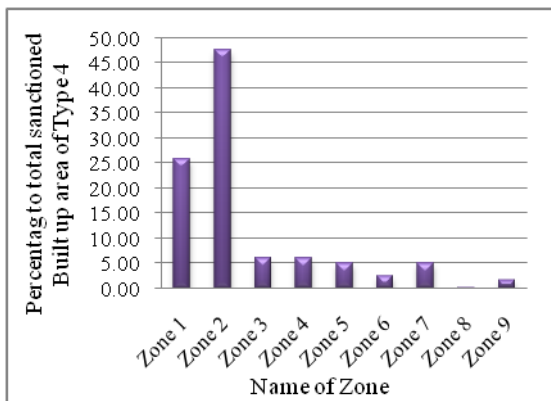


Fig. 11. Zone wise Sanctioned built up area in Sq. M. of Type 4

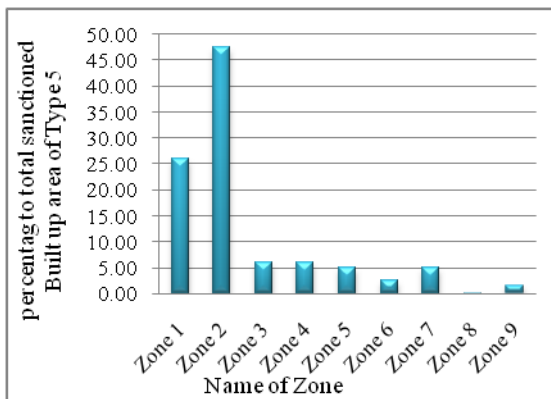


Fig. 12. Zone wise Sanctioned built up area in Sq. M. of Type 5

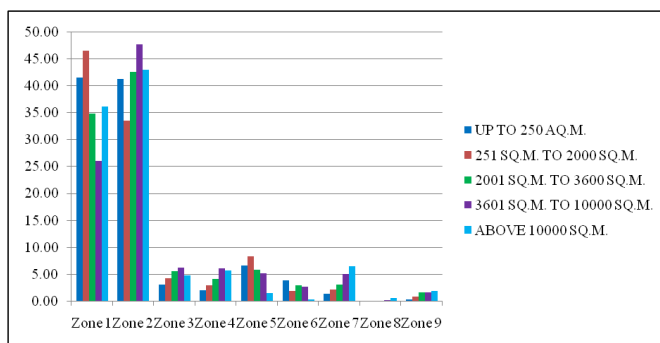


Fig. 13. Graph showing Zone wise Analysis for all Type of Development

#### IV. CONCLUSION

This study gives an understanding of the overall development of Residential area which is most dominant land use in case of any city and which eventually determines the city structure. This study has laid down the methodology to analyze the past development trends in an urban area. The zone wise analysis provides understanding of the development trend, development capacity as well as future development potential of individual zones in relation with entire city.

Pimpri-Chinchwad city has observed growth in terms of residential development due to impact of IT industries irrespective of shifting of some of the manufacturing industries outside PCMC limits. This has also resulted in change in income levels of the people. People with higher income level are increasing. This has impact on the residential development in terms of choice of housing

typology and projects with higher amenities and facilities, available within the project. The development potential of core areas is fully utilized and as land available is very less, higher property values and congested living environment is observed. Newly added villages in PCMC will observe more residential development. These sectors will decide the city structure of PCMC in next decade.

On the basis of this inventory survey study area is analyzed, Study Zones are formulated which has created base to carry out further research and field work. This work has created a platform to build the research further.

#### REFERENCES

- [1] Pimpri-Chinchwad City Development Plan 2006-2012 (2006), Volume I, Technical Assistance by CRISIL under Jawaharlal Nehru National Urban Renewal Mission (JNNURM) available on [http://www.pcmcindia.gov.in/jnnurm\\_info/cdpvol1.pdf](http://www.pcmcindia.gov.in/jnnurm_info/cdpvol1.pdf) accessed on July 2012.
- [2] Pimpri-Chinchwad Municipal Corporation, (2008). Comprehensive Mobility Plan (CMP) for PCMC, available on website [http://www.pcmcindia.gov.in/jnnurm\\_info/CMP.pdf](http://www.pcmcindia.gov.in/jnnurm_info/CMP.pdf) accessed on July 2012.
- [3] Census of India, (2011). Government of India, office of the Registrar General and Census Commission, India available on website <http://www.census2011.co.in/census/city/376-pimpri-and-chinchwad.html>
- [4] Kaiser, Edward J. David R. Godschalk, and S. Stuart Chapin, 1995. Urban Land Use Planning. Urbana and Chicago: University of Illinois Press. Adapted from "Estimating Residential Development Capacity, A Guidebook for Analysis and Implementation in Maryland" accessed from <http://dnr.maryland.gov/watersheds/pubs/planninguserguide/tools/Tool10DevelopmentCapacityAnalysis.pdf>
- [5] Pimpri-Chinchwad City Development Plan 2006-2012 (2006), Volume II, Technical Assistance by CRISIL under Jawaharlal Nehru National Urban Renewal Mission (JNNURM) available on [http://www.pcmcindia.gov.in/jnnurm\\_info/cdpvol2.pdf](http://www.pcmcindia.gov.in/jnnurm_info/cdpvol2.pdf) accessed on July 2012.
- [6] Pune Residential Real Estate Development report (2011) by ASK, Property Investment Advisor available on [http://askfinancials.com/downloads/PUNE\\_REALESTATE\\_REPORT.pdf](http://askfinancials.com/downloads/PUNE_REALESTATE_REPORT.pdf) accessed on Sep 2012
- [7] Pimpri-Chinchwad Municipal Corporation, (2009). Environmental Impact Assessment (EIA) for Proposed Bus – Based Rapid Transit System (BRTs) For PCMC.
- [8] Web site <http://www.pcmcindia.gov.in/index.php#>
- [9] Pimpri-Chinchwad Municipal Corporation, Building permission department, Approved building permission available on [http://www.pcmcindia.gov.in/blpd\\_info.php](http://www.pcmcindia.gov.in/blpd_info.php)

## ANNEXURE 1

From PCMC building permission department the data of sanctioned projects from year 2001 to October 2012 is obtained. The data is in soft copy format (microsoft excel) with information under following heads and available on website - [http://www.pcmcindia.gov.in/bldp\\_info.php](http://www.pcmcindia.gov.in/bldp_info.php)

- Village Name-Name of Sector
- Survey No./ Gat No
- C T S NO.
- Inward No.
- Owner /Developer Name
- Architect Name
- Plot Area -Plot Area(Sq.mtrs), Road Widening Area, TDR Area, Total Area
- Built up Area (Sq.M)
- Name of Buildings
- No. of Floors
- No of Flats
- No of Shops
- First Commencement Certificate
- Latest Commencement Certificate
- Completion Certificate (Part/Full)
- Remarks

## ANNEXURE 2

Table showing number of projects along with total built up area sanctioned in each village during year 2000 to October 2012.

Sr. No	Village Name	Total projects	Total built up area (Sq.M.)	% to total
1	Akurdi	543	1348297	10.3
2	Bhosari	393	585491	4.47
3	Fugewadi-Kasarwadi	2	3305	0.03
4	Bopkhel	11	11600	0.09
5	Charholi	12	96973	0.74
6	Chikhali	52	282254	2.16
7	Chinchwad	962	1431654	10.94
8	Chovisawadi	7	26441	0.2
9	Dapodi	60	145658	1.11
10	Dighi	149	156966	1.2
11	Dudulgaon	9	13749	0.11
12	Kivale	135	192767	1.47
13	Mamurdi	8	37221	0.28
14	Moshi	67	387555	2.96
15	Nigdi	21	197833	1.51
16	Pimple Gurav	477	820915	6.27
17	Pimple Nilakh	549	528832	4.04
18	Pimple Saudagar	250	1190971	9.1
19	Pimpri	611	1074897	8.21
20	Punavale	15	57114	0.44
21	Rahatani	352	768460	5.87
22	Ravet	81	365691	2.79
23	Sangavi	382	335361	2.56
24	Talawade	5	37801	0.29
25	Tathawade	19	241523	1.85
26	Thergaon	152	425826	3.25
27	Wadmukhwadi	83	71056	0.54
28	Wakad	544	2253584	17.22
	TOTAL	5951	13089795	100

(Source: PCMC, Building Permission Department and analyzed by Author)