CHANGING URBAN LANDUSE AND UTILITY SERVICES IN PUNE MUNICIPAL CORPORATION, PUNE, MAHARASHTRA (1981 - 2014)

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DECLARATION

I hereby declare that the thesis entitled ***"Changing Urban Landuse And Utility Services In Pune Municipal Corporation, Pune, Maharashtra (1981 - 2014)"*** *completed and written by me has not previously been formed as the basis for the award of any Degree or other similar title upon me of this or any other Vidyapeeth or examining body. I understand that if my Ph.D Thesis (or part of it) is found duplicate at any point of time my research degree will be withdrawn.*

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Place :
Date :

CERTIFICATE

This is to certify that thesis entitled ***"Changing Urban Landuse and Utility Services in Pune Municipal Corporation, Pune, Maharashtra (1981 - 2014)"*** *which is being submitted herewith for the award of the Degree of Vidyavachaspati (Ph.D) in* ***Geography*** *of Tilak Maharashtra Vidyapeeth, Pune is the result of original research work completed by* ***Smt. Anuradha Suresh Ohal*** *under my supervision and guidance. To the best of my knowledge and belief the work incorporated in this thesis has not formed the basis for the award of any Degree or similar title of this or any other University or examining body.*

Dr. Virendra R. Nagarale
Research Guide

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Abbreviations

CDP	City Development Plan
DB	Data Base
DP	Development Plan
E	East
ERDAS	Earth Resource Data Analysis System
ETM+	Enhanced Thematic Mapper
GIS	Geographical Information System
IRS	Indian Remote Sensing
JNNRUM	Jawaharlal Nehru National Urban Renewal Mission
Km	Kilometer
LANDSAT	Land Remote Sensing Satellite
LISS	Linear Imaging Self Scanner
LULC	Land Use Land Cover
MSS	Multi Spectral Scanner
N	North
NRSC	National Remote Sensing Agency
PMC	Pune Municipal Corporation
S	South
SOI	Survey of India
sq.Km	Square Kilometer
TGA	Total Geographical Area
W	West
WIS	Ward Information System

CHANGING URBAN LANDUSE AND UTILITY SERVICES IN PUNE MUNICIPAL CORPORATION, PUNE, MAHARASHTRA (1981 - 2014)

Abstract

Urbanization is the progression in which rural area adapt into urban area. Urban area is differing from rural area due to its service providing nature, which is superior than the rural area. Health services, educational services, entertainment services, electricity supply, water supply, excellent road network, security this are the examples of services which all are including in one title as 'Utility'. Day by day population of urban area increases hence, availability of utilities in present time is become shorter as campier to its present need. But, there is a trouble seen in urban area that these utilities are not evenly distributed. One portion or zone has high amenities where, another zone shows lack of amenities.

In Maharashtra Pune is an important town from historical period. Pune is the 8th largest city in India and the 2nd largest in the state of Maharashtra. Pune is play an important role in politics, education and social changes. Pune Municipal Corporation is located in Pune District in western region in Maharashtra state between 17^{0}50' North to 19^{0}24' North latitude and 73^{0}19' East to 75^{0}10' East longitudes. The city is located to the South-East of Mumbai at an elevation of 560 m above mean sea level. The total area of PMC is 243.96 sq.km. Due to the uncontrolled urbanization in PMC, environmental degradation has been occurring very rapidly. Land use planning and the pattern of development, relationship between residential areas and industrial areas, commercial and office complex have a considerable impact on the environment.Pune Municipal Corporation has shows the lots of change in land use from 1981 to 2013. In 1981 PMC has 24.92 sq.km area under built up. i.e. 10.24 % area was under built up in 1981 and in 2013, PMC has 192.53 sq.km area under built up. i.e.81.48 %.

To find out the land use change of PMC, distribution of various utility services and to create information sytem following aims and objectives are preset:

1. To studying the Urban Land use changes in PMC.
2. To prepare ward information system (WIS) for administrative wards in PMC.
3. To asses Utility Services and their correlation, distribution in study area.
4. To apply RS and GIS techniques for the mapping of utility services and planning strategies.

Methodology is a way to systematically solve the research problem. Result and analysis of research are totally depends on methodology. To find out land use change of PMC and distribution of utilities following methodology was adopted:

1. Library Work : Library Work was includes with intensive and extensive search of literature, references, manuals, bulletins focusing on the topic, reference books, institutes, government departments, internet etc.

2. Prefield Work Phase: This phase deals with the collection of various maps like topographical map, satellite images as well as utility services data. Topographical Map (47 F/ 14/2, 47 F/ 14/3, 47 F/ 14/6, 47 F/15 / NE, 47 F /15 /NW) was collected from Survey of India. Satellite Imagery – LIIS III (2005,2011) was obtained from Bhuvan. (National Remote Sensing Center, Hyderabad)

3. Field Visits : The study was supported by the primary sources of data generated through the extensive field verification survey as well as the literature survey of the records. Collect the data of utility services of the study are like Public Gardens, Public Water Tanks, Fire Stations, Blood Bank, Barbers, Flour Mills, Gyms, Under Graduate and Post Graduate Colleges.

4. Laboratory Work : This phase was included the digitization of various layers, preparation of various thematic maps using GIS techniques. i.e. Georeferencing, Digitization, Attribution, Data attachment, Final layout of different maps was analyzed.

The Approach :

To attain actual result and solution, to fulfil the need of research's aim and objectives, research is ramble through various stages. The present research work is divided into six chapters. The chapter scheme and its details are as follow :

First Chapter, the major component of this chapter is devoted to the introduction of Urbanization, Land use, Utility Services and its various definitions. This chapter also deals with aims and objective of the present study, Methodology which is important to

achieve the aims and objective and limitation of the study, To achieve aims of the study review of literature is guided; hence 'Review of Literature' is essential part of this chapter.

The Second Chapter is primarily paying attention on uniqueness of study area. This chapter explains a detailed account of location and extent of study area. Introduction of Study Area, Historical Back Ground of Pune Municipal Corporation (PMC), Location and Extent this content are describe with Physiography, Drainage, Climate. This all content provides the proper delineate about the study area. Demography, Literacy and Transportation this content explains the socio - economic condition of the study area.

The Third Chapter is straightly associated to research's aims and objectives. This chapter utters the land use change of PMC from 1981 to 2011 and explains the characteristics of those changes as well as the reasons, which are responsible for those changes.

The Fourth Chapter is focused on utility services importance of such services and ward wise distribution in PMC these points are discussed. This chapter also focused on Information System and its impotence. It deals with the utility's ward wise distribution and generates Ward Information System for those utility services. This Ward Information System is helpful to common people. Due to operate this Ward Information System people get the information within one click. The planning strategies are also converse here to face the upcoming challenges.

The Fifth Chapter is deal with data analysis.' Data that was collected by various sources for various purposes are analyzed in this chapter to justify the problems and their reasons. This chapter is a back bone of research work, which is actually argue the problems and give assurance to resolve the problems.

The Sixth Chapter is chapter deals with the summery, conclusions and suggestions. The role of this chapter is very essential because it act as a formal announcing of various reasons, results and suggestions, which are discussed in last five chapters.

Conclusions :

Educational Center, Research Center, Hospitals, IT sectors, Business Hub, Industries, Residential areas, Transportation facilities, recreational centers this all facilities are easily available in PMC. This all are become pull factors of migration. Number of peoples

migrates and stables in this city. To fulfill all those people's housings needs barren land, agricultural lands are captured and that land was permanently convert into built up land.

In 1981 PMC has 24.92 sq.km area under built up. i.e. 10.24 % area was under built up in 1981. In 2005, built up area were increases and 143.80 sq.km area of PMC was under built up i.e. 58.97%. The rate of change of built up was 43.8% from 1981 to 2005. In 2011, built up area capture maximum area of the city and in 2011, PMC has 192.53 sq.km area under built up, i.e. 78.92% , the rate of change of built up area was 92.53% from 2005 to 2011. In 2013, PMC has 192.53 sq.km area under built up. i.e.81.48 %, the rate of change of built up 98.79 % from 2011 to 2013.

The agricultural area decreases rapidly, barren land occupied by built up, hilltop and hill slopes are captured by built up. Hence, productive land cover by built up and the quality of such land set out permanently. In 1981 PMC has 39.17 % area under the agriculture which was decreasses and in 2013, 9.97 % area was under agricultural area.

In 1981, PMC has 95.26 sq.km area under agriculture and in 2005 it was reach at 59.66 sq.km , i.e. from 1981 to 2005 the rate of decrees of agricultural land was 40.34 % and from 2005 to 2011 this rate of change increases i.e. from 2005 to 2011 agricultural land decreases and the rate of decreases of agricultural land was 75.22%. From 2011 to 2013 rate of agricultural land change is again increases and from 2011 to 2013 in this span the rate of change is 75.67 %.

When focused on rate of change of forest it is observed that from 1981 to 2005 the rate of decreases of forest was 86.08 % and from 2005 to 2011 the rate of decreases of forest was 88.81 %. From 2011 to 2013 the rate of change of forest area is 88.92 %.

Pune Municipal Corporation has 14 administrative wards. Core region of the PMC has cover maximum area under built up. Core region includes 5 administrative wards i.e. B.S. Dhole Patil Road, Bhavani Peth, Ghole Road, Kasba Vishrambagh and Sahakarnagar. From 1981 to 2013 agricultural area of the city decreasses and this agricultureal area is found far from the core region.

From 1981 to 2013, if focused on the characteristics of land use of PMC, it is observe that built up area increases and other categories of land was decreases. It means built up area capture the other land categories. Built up area consist of settlement, hospitals, research centers, IT, MNC and Business Hub, rode network. Hence, it is conclude

directly that the city skip the primary sector, secondary sector and most of the people busy in tertiary, quaternary sector and quinary sector.

The information System is created in terms of ward's Utility Services. Basic information about the PMC and its 14 administrative ward is generated for recognize various Utilities like Barbers, Blood Bank, Flour Mill, e - Suvidha Center, Gym, Fire Station, Property Tax Pay Office, Public Gardens, Swimming Tanks etc. This information system is developed to assist the planners for city planning. Ward Information System of Utility Service of PMC helps to tress out the exact location of utility.

All types of Utility Services are provide in Pune Municipal Corporation. When focused on Administrative Ward Wise distribution of utility services it is noticed that the distribution of utility is uneven. When this utility services are compare with each ward's population it is found that some ward experience lack of some utility or the number of population and availability of utility is not in proper manner. All types utility services are concentrated in core area of the city. Utility services of slum area are in poor condition and old. While in commercial area this services are in good condition.

Most of the blood banks are concentrated near the hospital and these hospitals are concentrated core part of the city. In PMC, Sahakarnagr ward has maximum numbers of Blood Bank. i.e. 6 where Sangamwadi, Tilak Road, Yerawada this ward has minimum number of Blood Bank i.e. 1.

Out of 14 administrative wards 11 administrative ward has PMC Fire Station and each ward has only 1 Fire Station. Bibvewadi, Ghole Road and Sahakarnagar this three administrative ward has no Fire Brigade Station.

Pune Municipal Corporation is well connected by road, rail and air network with almost all the important cities within Maharashtra and India. Therefore, migration rate is increases year by year. Hence demand of residential, commercial land is increases. Due to increasing population, various troubles are created like traffic congestion, waste disposal, decrease in forest or green cover, encroachment on the hill slopes, and unequal distribution of public utility services. These troubles are challenges to make this city as a 'Smart City'.

CHAPTER ONE
INTRODUCTION

1.1 Introduction

Urbanization is a tool in which rural population transform in urban population. Rural population always faces the lack of Job opportunities and various basic facilities like education, road, medical services, and entertainment services. Large numbers of job opportunities, changing life style, growing living standard, well developed industrial areas, good infrastructures, transport / road accessibility, easily available utilities services this are the gear / factors on which urbanization process attain its speed. When these factors attain their higher and good quality, urbanization level also going to its higher stage and this procedure is responsible for increasing population in city. When urban population increases, it has put heavy pressure on public utilities like housing, sanitation, transport, water, electricity and so on. Due to this urbanization process, land use of that particular area will change.

India is one among the country of low level of urbanization. In 2001, 306.9 million Indians were living in nearly 3700 towns and cities spread across the country, and it is expected to increase to over 533 million by 2021 respectively. In India, urbanization has been relatively slow compared to many developing countries. Only 28 % of population was living in urban areas as per 2001 census. Number of population residing in urban areas has increased from 2.58 crores in 1901 to 28.53 crores in 2001. ***(Datta Pranati, 2006)***

The state of Maharashtra is the third largest state in the country with an area of about 3 million sq.km. People from different parts of India over the years have shifted to Maharashtra. In Maharashtra, Mumbai, Pune, Nashik and Nagpur are more densely populated cities.

Pune is Maharashtra's cultural, industrial and educational capital. Now a day's Pune city is known as a Metropolitan city. It is already known as Oxford of the East, IT city hence, population of this city both naturally and through migration increases day by day. In 1991, total population of Pune city was 15,66,651 as per 1991 census, where in 2001 it reach at 23,74,013. Now in 2011, it reach at 31,24,458. The rapid growth of population

observe in city from 1991 to 2011.This rapid growth of population in Pune city is mounting serious problem to ahead of city planners, because this population put heavy pressure on land use and available utility services. Hence, to facing the challenges related to land use, degradation of environment, growing population, it is necessary to learn about urbanization procedure, land use change and advanced techniques, which are helps to find out the intensity of problems and also helps to focused on the way which gives proper direction to solve the problem at ground level.

1.1.1 Urbanization : Meaning and Definitions

Urbanization is the procedure by which huge numbers of people become permanently concentrated in relatively small areas, forming cities. Internal rural to urban migration means that people move from rural areas to urban areas. In this process the number of people living in cities are increases as compared with the number of people living in rural areas. An urban area is spatial concentration of people who are working in non-agricultural activities. ***(Long, 1998)***

Urbanization has been an instrument of economical, social, and political progress; it has led to serious socio-economic problems. An urban area expands, prime agricultural land, costal habitats and forests are transformed into land for housing, road, industry etc.

Urbanization is broadly defined as a growth of towns and increasing ratio of rural to urban population of a country. The sheer magnitude of the urban population, haphazard and unplanned growth of urban areas and a desperate lack of infrastructure are the main causes of such a situation. The rapid growth of urban population both natural and through migration has put heavy pressure on public utilities like housing, sanitation, transport, water, electricity, education, health and so on.

"Urbanization is the proportion of living in urban settlement to total population."

"An Index of transformation in which traditional rural economies convert into modern industrial economies is known as Urbanization."

"Places having a minimum population of 5000 with at least 75 present of male workers being engaged in non-agricultural activities and the density of population should be 400 people per square kilometer." – ***Census of India (1961)***

"The level of Urbanization is defined as the proportion of urban population to total population residing in urban places by shifting population from village to city and the process of transformation of village into city is called Urbanization."- ***Triwartha***

1.1.2. Land Use : Meaning and Definitions

The term 'Land Use' and 'Land Cover' are often used simultaneously to describe maps that provide information about the types of features found on the earth's surface (Land Cover) and the human activity that is associated with them (Land Use). Land cover is an important input parameter for a number of agricultural, hydrological and ecological models, which constitute necessary tools for development, planning and management of natural resources in the territory ***(Shetty Amba,et.al.2005)***.

The United Nation's Food and Agriculture Organization Water Development Division explains that, *"Land use concerns the products and /or benefits obtained from use of the land as well as the land management actions (activities) carried out by humans to produce those products and benefits."*

Land Use is a dynamic phenomenon, its value and pattern changes from one particular point of time to another and also from one geographical unit to another, with varying efficiencies, abilities, priorities and needs ***(Bisht and Tiwari, 1996)***.

"Land use is also related to conservation of land from one major use to another general use." ***(R. B. Mundel)***

"Land use means surface utilization of all development and vacant land for a specific point at a given time and space." ***(M.B. Nanavati ,1957)***

"Land use is a key term in the language of city planning." ***(Albert Guttenberg ,1959)***

Land Use pattern reflects the character of the interaction between people and environment, and the influence of distance and resource base upon basic economic activities. The term Land Use is used to describe the function or use of an area of land is put to ***(Shekhar Sulochana, 2015)***.

Land use is a dynamic phenomenon that changes with time and space due to anthropogenic pressure and development. Evaluating the existing land use and its periodic change is useful for urban planners, policy makers and natural resource managers ***(Mary Tahir et.al. 2013)***.

Land use and Land Management practices have a major impact on natural resources including water, soil nutrients, plants and animals. Land use information can be used to develop solutions for natural resource management issues.

"Land use refers to man's activities and the various use which are carried on land."

"Land use involves the management and modification of natural environment or wilderness into the built environment such as settlements and semi- natural habitats such as arable fields, pastures."

"Land use is the function of land- what it is used for land use varies from area to area."

"Land use refers how the earth's surface is used, including to the location, type and design of human development."

1.1.3.Global Information System (GIS) and Remote Sensing (RS)

Geographic Information System (GIS) is a powerful set of tools for collecting, storing, retrieving, transforming and displaying spatial data from the real world. It has an ability to assimilate divergent sources of data spatial and non-spatial. GIS allows the user to integrate database generated from various sources on signal platform and analyze them in spatiotemporal domin. GIS provides support in resource management and decision making ***(Burrough, 1986).***

"An information technology which stores, analysis, and displays both spatial and non-spatial data. GIS is actually a technology and is not necessarily limited to the confines of a single, well defined software system." ***(Parke, 1988).***

"A computer system that can hold and use data describing places on the earth surface." ***(Rhind,1989).***

"Geographical Information System (GIS) is one of the most efficient ways to get the hypothetical view of any object or phenomena on the earth's surface similar to the actual situation. Remote Sensing (RS) technique an effective tool for identifying the urban growth pattern from the spatial and temporal data." ***(Mali Sagar,et.al. 2013)***

" A Geographic Information System (GIS) is a collection of computer hardware, software and geographic data used to analyze and display geographically referenced information."

"A Geographic Information Systems (GIS) lets us visualize, question, analyze and interpret data to understand relationships, patterns and trends."

"Geographic Information System is a computer based tool that analyzes, stores, manipulates and visualizes geographic information on a map."

"GIS is a broad term that can refer to a number of different technologies, processes and methods."

1.1.4. Utility Services : Meaning and Definitions

Urban area is differing from rural area due to its service providing nature. Good quality road network, electricity, water supply, proper urban land use and sanitation planning are major urban service and School, Banks, Hospital, Fire and Police Station, Market and Entertainment are major utility service which indication of the quality of city ***(Gade Adinath D. et.al. 2013)***.

Utility is similar to the word Utilize.

Utility means of *'practical use.'*

‘Utility is a subjective concept on the basis of a which people demand a commodity’ – ***(Carl Mengerand Leon Walras)***

“Utility is an economic term referring to the total satisfaction received from consuming a good or services.”

1.2 Aims and Objectives

1 To studying the Urban Land use changes in PMC.

2 To prepare ward information system (WIS) for administrative wards in PMC.

3 To asses Utility Services and their correlation, distribution in study area.

4 To apply RS and GIS techniques for the mapping of utility services and planning strategies.

1.3 Limitation of the Study

Despite the fair proceeding and accomplishment of the research, a number of challenges were encountered in the process and hence there is some limitations are stands against in front of research. Some of them are as follows

1. The first limitation is related to study area and time or duration of the study. Pune Municipal Corporation is selected as a study area and 1981 to 2014 this is desire time span for the study.
2. The second limitation of the study is directly related to aims and objectives. The General Land Use of the study area is studied for the years 1981 to 2014. Many types of utility services are available in study area, some utility services are directly provided by the Pune Municipal Corporation and some utility services are provided by the private sector. Public Gardens, Public Water Tanks, Fire station this services consider for study which are provide by PMC and few utilities like Blood Bank, Barbers, Flour Mills, Gyms which are provided by both PMC and private sectors are consider for the study.
3. The major limitation of the study is related to satellite images and their resolution. All of the images is not the same it means limitation as a result of resolution difference. For 1981, toposheets are used, where 2005-2006, and for 2011-2012 BHUVAN's classified data was used.

1.4 Classification of Land Use

1. **Urban Built Up Land**

a. A place with a municipality, corporation or cantonment or, notified town area.

b. A place satisfying all the following :

i. Minimum population of 5,000

ii. 75 percent male working population as non-agricultural

iii. Density of at least 1,000 person per square mile.

Residential, industrial, transportation, recreational areas, public and semi-public areas are included in this class.

2. **Agricultural Land**

Agricultural land is typically land devoted to agriculture, the systematic and controlled use of other forms of life- particularly the rearing of livestock and production of crops- to produce food for humans. It is thus generally synonymous with farmland or cropland. This includes cropped areas, fallow lands and plantation areas (https://en.m.wikipedia.org.)

3. **Forest Land**

Forestland means any woodland, brush land, timberland, grazing land. A forest is a large area of land covered with trees or other woody vegetation.(https://en.m.wikipedia.org.)

4. **Water Bodies**

A body of water any significant accumulation of water, generally on a planet's surface. A body of water does not have to be still or contained rivers, streams, canals, and other geographical features where water moves from one place to another are also considered bodies of water. (https://en.m.wikipedia.org.)

5. **Barren Land**

Barren land includes the areas with no vegetation cover, stock quarry, stony areas and uncultivated agricultural lands.

1.5 Introduction of Study Area

In Maharashtra , Pune is an important town from historical period. Pune is the 8th largest city in India and the 2nd largest Metropolitan City in the state of Maharashtra after Mumbai. Pune is play an important role in politics, education and social changes. Looking into history of Pune it was initiate that Pune was originally a small agriculture settlement which was known by ***'Punnakka'.*** Later the settlement had grown to a small village called as ***'Kasba Peth','Punavadi',*** which is situated a raised plateau, slightly away from the Mutha River. Pune city is second largest metropolitan city in the state, is changing its character from ***'Pensioner's Pune', to'Oxford of the East'.*** There is six Universities, which includes 600 functional colleges and PG departments in their folds like Savitribai Phule Pune University, SNDT Women's University Bhatia Vidyapeeth, Agriculture Vidyapeeth, Tilak Maharashtra Vidyapeeth, D. Y. Patil Deem University, Deccan College, Agriculture College and Engineering College were the initial hallmark of this development. Kirloskar Oil Engine Ltd. becomes as remarkable landmark in the industrial history which was founder to create one another new image of this city as ***'Auto – Hub Pune'.*** Following to the above, Horticulture and Floriculture industries mark Pune city as an ***'Agro Business Centre'***.Given the distinctive characteristics of these industries, many value – added industries like food processing have flourished in and around the city. Chitale Bandhu, Gits Food Products, Weikield Products this are the some examples, which are established in last several years in Pune city. Now fast growing Pune generates its new image as ***'IT - BT Pune'.***

1.5.1 Historical Back Ground of Pune Municipal Corporation (PMC)

Previous to 1950, the Pune city Municipality and Pune Sub Urban Municipality this two Municipality was governed the city of Pune. Since the population of the both these Municipalities reached a considerable number, the State Government constituted the Pune Municipal Corporation (PMC) on 15th February 1950. The Bombay Provincial Municipal Corporations Act, 1949, governs it. Now, the administrative wing of PMC is divided into 14 administrative wards and those wards are maintaining the some prime functional departments.

Table No 1.1 Administrative Wards of PMC

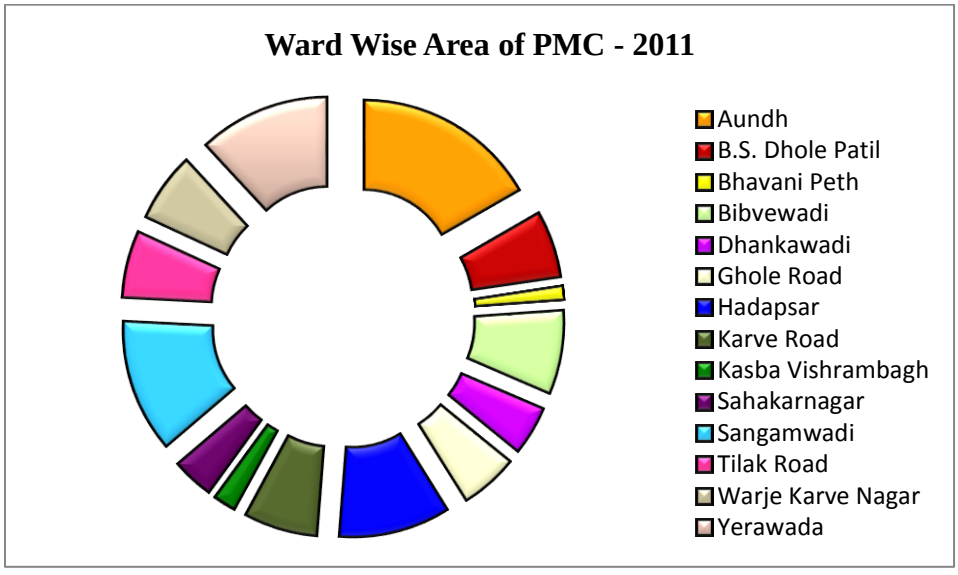
Sr.No.	Ward Name	Sr.No.	Ward Name
1	Aundh	8	Kasba Vishrambaghwada
2	Bhavanipeth	9	Karve Road
3	Bibvewadi	10	Sahakarnagar
4	Dhankawadi	11	Sangamwadi
5	Dhole Patil	12	Tilak Road
6	Ghole Road	13	Warje Karvenagar
7	Hadapsar	14	Yerawada

(Source : City Development Plan 2006-2012)

Table No 1.2 Administrative Wards Wise Area of PMC

Ward No.	Ward Name	TGA in 2011 sq.km.
1	Aundh	40.75
2	B.S. Dhole Patil	14.64
3	Bhavani Peth	2.90
4	Bibvewadi	18.35
5	Dhankawadi	10.84
6	Ghole Road	12.76
7	Hadapsar	24.78
8	Karve Road	16.26
9	Kasba Vishrambagh	5.00
10	Sahakarnagar	9.20
11	Sangamwadi	29.44
12	Tilak Road	14.71
13	Warje Karve Nagar	15.23
14	Yerawada	29.10
	TOTAL AREA OF PMC	243.96

(Source : Compiled by Researcher)



(Source : City Development Plan 2006-2012)

Fig. No. : 1.1

Table No. 1.2 and Fig. No. 1.1 is show the Ward - Wise geographical area of Pune Municipal Corporation for 2011. Total geographical area of Pune Municipal Corporation is 243.96 sq.km. Aundh administrative ward has cover maximum area of PMC i.e. 40.75 sq.km and Bhavani Peth administrative ward has cover minimum area of PMC i.e. 2.90 sq.km.

1.5.2 Location and Extent

Pune Municipal Corporation is located in Pune District in western region in Maharashtra state between $17^0$50' North to $19^0$24' North latitude and $73^0$19' East to $75^0$10' East longitudes. The city is located to the South-East of Mumbai at an elevation of 560 m above mean sea level. The total area of PMC is 243.96 sq.km.

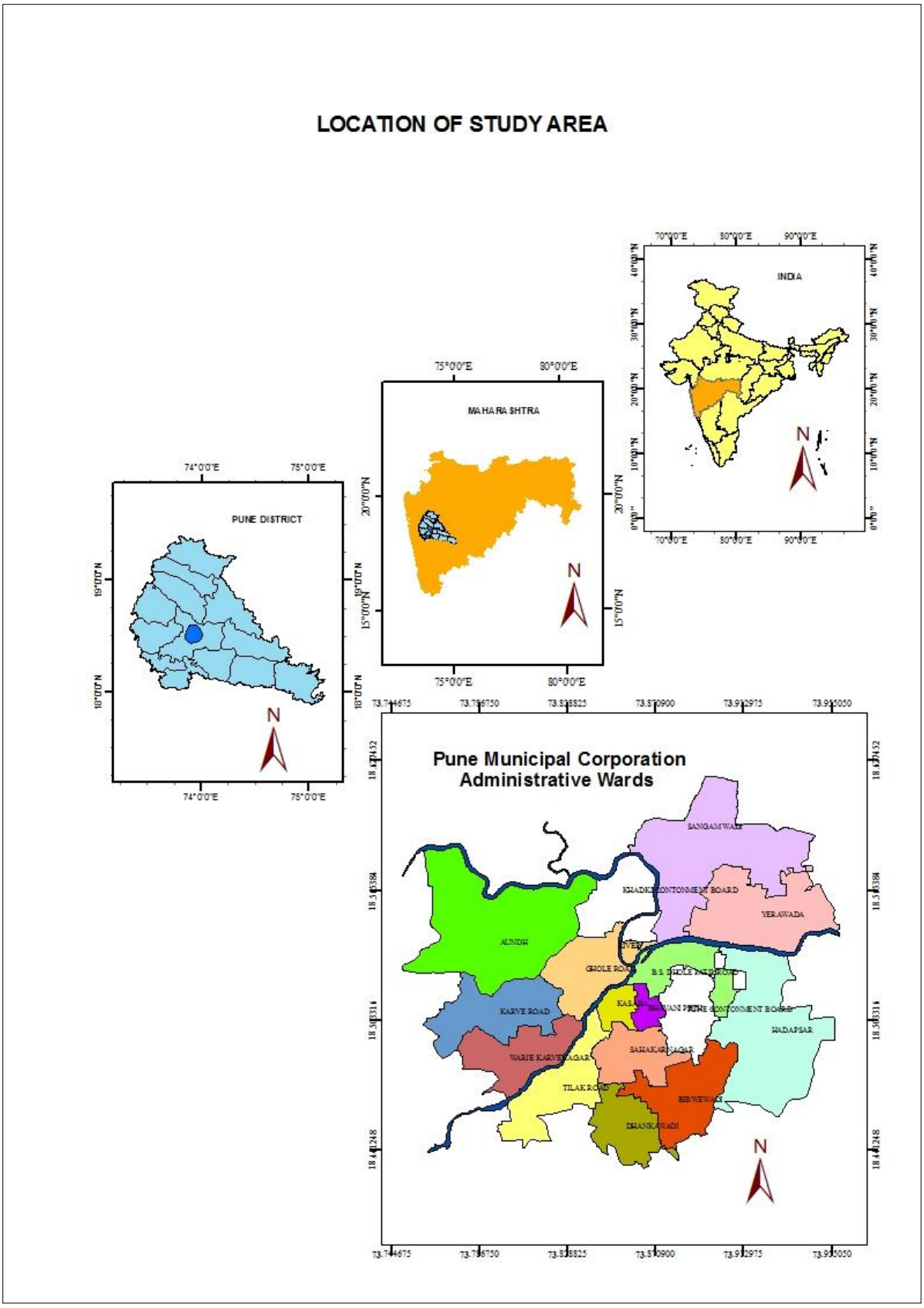
1.5.3 Physiography

Pune city is situated on the leeward side of the Sahyadri ranges – Western Ghats, and the western of the Deccan Plateau at the confluence of the river Mula and Mutha. The Mula and Mutha, Pavana, Indrayani this rivers latter drain into Bahia river. Thus, the city is located at upper Bhima basin. Parana and Indrayani are two rivers, which are traverse the northwestern outer edge of the urban area where, the Sinhagad -Katraj -Dive Ghats ranges from the southern boundary of the urban area. Sinhagad Fort, which is at 1300 m above mean sea level, is the highest point just outside the urban area and Vital hill which is at 800 m above mean sea level is within the urban area. In general, city has slope towards east with hill and rugged topography at its extreme west, south west and south. The city has approximately 12% land under hilltop and slope. There are 11 natural hills in study area.

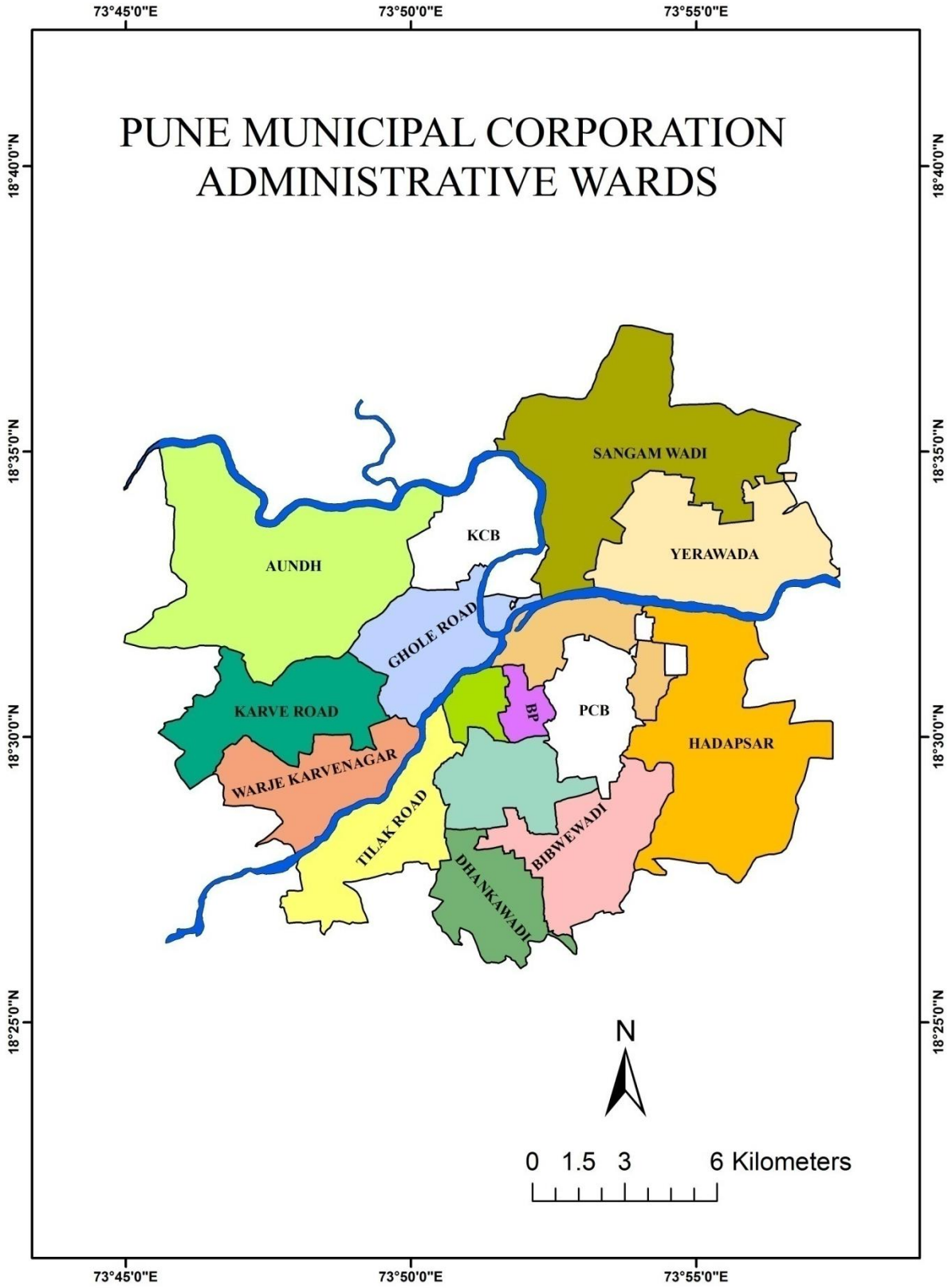
Table No 1.3 Hillsin PMC

Sr.No.	Name of Hill	Sr.No.	Name of Hill
1	Parvati Hill	7	Taljai Hill
2	Arai and Malwadi Hill	8	Chaturshrungi Hill
3	Fergusson College Hill	9	Law College Hill
4	Vetal Hill	10	Katraj Hill
5	Baner Hill	11	Kirkitwadi Hill
6	Ram Hill		

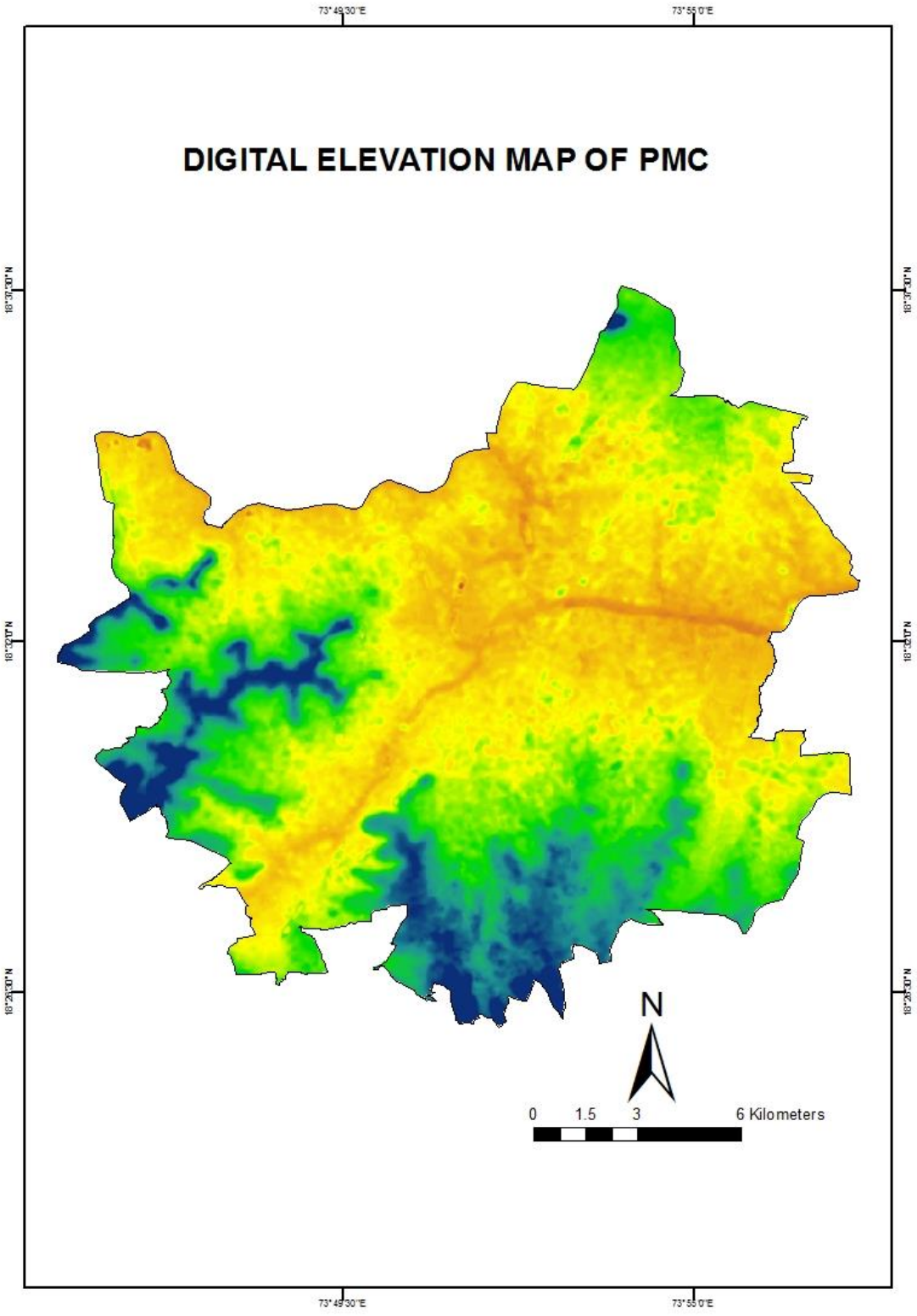
(Source : City Development Plan 2006-2012)


LOCATION OF STUDY AREA
INDIA
MAHARASHTRA
PUNE DISTRICT
Pune Municipal Corporation
Administrative Wards
SANGAMWADI
KHADKI CONTONMENT BOARD
YERAWADA
KOTHRUD
KARVE ROAD
PUNE CONTONMENT BOARD
HADAPSAR
SAHAKARNAGAR
TILAK ROAD
BIBWEWADI
DHANKAWADI
N

Map 1.1


PUNE MUNICIPAL CORPORATION
ADMINISTRATIVE WARDS
73°45'0"E
73°50'0"E
73°55'0"E
18°40'0"N
18°35'0"N
18°30'0"N
18°25'0"N
SANGAM WADI
KCB
YERAWADA
AUNDH
GHOLE ROAD
KARVE ROAD
BP
PCB
HADAPSAR
WARJE KARVENAGAR
TILAK ROAD
BIBWEWADI
DHANKAWADI
N
0 1.5 3 6 Kilometers

Map 1.2


DIGITAL ELEVATION MAP OF PMC
73° 49'30"E
73° 55'0"E
18° 32'30"N
18° 27'0"N
N
0 1.5 3 6 Kilometers

Map 1.3

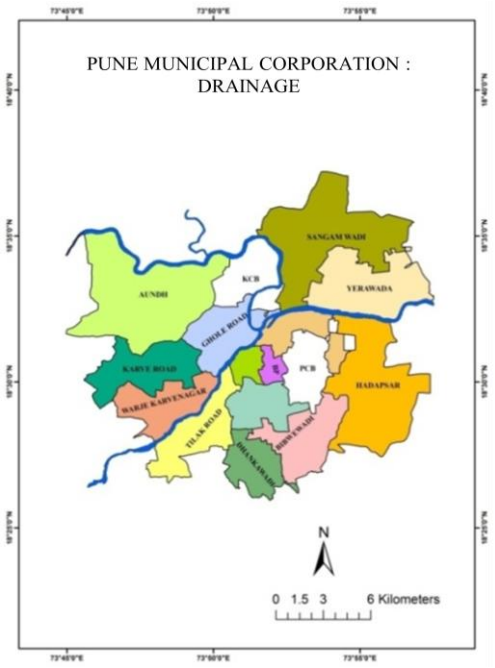
1.5.4 Drainage

Mula, Muhta, Pavna and Indrayani this are the four rivers which are highly notable in Pune city. This four rivers are finally drain into Bhima River. The Mulshi dam is located on Mula river and the Pavana dam is built on Pavana river. Khadakwasala dam is located on Mutha river, having 86 million cubic meter water storage capacity. The river Ambi and Mose this are the tributaries of Mutha river. Tanaji Sagar dam is located on Ambi river has an yield of 304 million cubic meters of water annually where, Veer Baji Pasalkar dam is located on Mose river has an yield of 397 million cubic meters of water annually. The overflow from The Tanaji Sager and Veer Baji Pasalkar dam flow into the Khadakwasala dam. Water from Khadakwasala dam runs through Mutha right bank canal, running within 6.4 km parallel to the river which is the main source of water to people of Pune city. Mula and Mutha river has confluence at the center of the city.

Table No. 1.4 : Rivers in PMC

Sr. No.	Name of the River	Description	Length in kms
1	Mutha River	Dhayri to Sangamwadi	10.4
2	Mula River	Balewadi to Sangamwadi	22.37
3	Mula - Mutha River	Sangamwadi to Kharadi	11.75

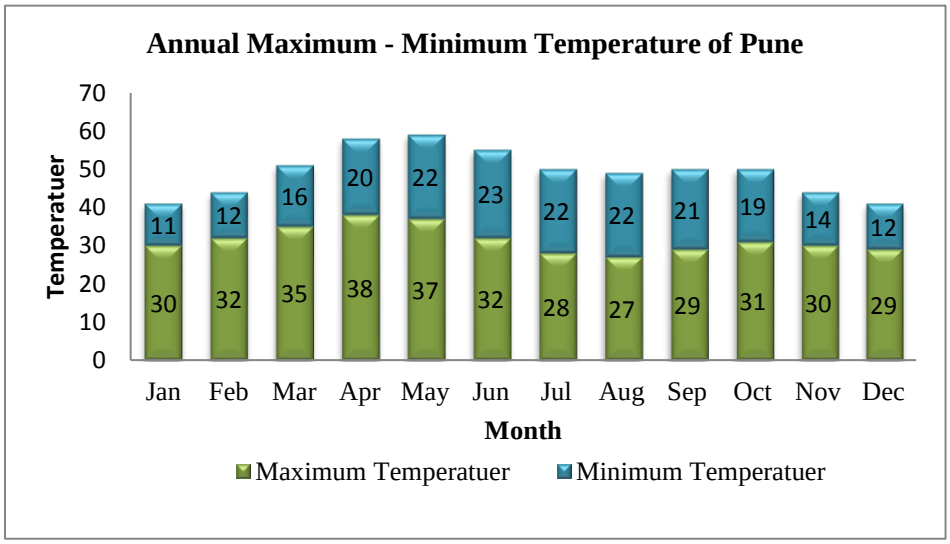
(Source : Pune City Sanitation Plan 2011)



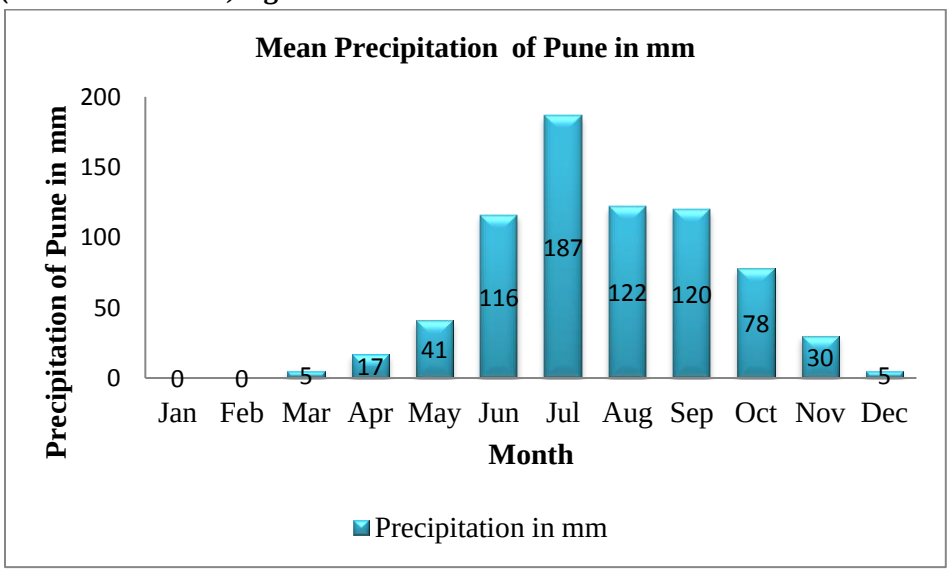
Map 1.4

1.5.5 Climate

Pune city shows typical monsoonal climate with three distinct seasons i.e. summer, rains and winter as elsewhere in India. Western Ghats play an important role to fix out climate of this city. Pune city experience summer season from March to May with maximum temperatures ranging from 35^0C to 39^0C. The city often receives locally developed heavy thundershowers with sharp downpours in the month of May. Pune receives moderate rainfall between June to September as a result of the southwest monsoon. It receives 722 mm annual rainfall, which is minimum as compared to that receive at the adjoining Western Ghats. Winter season feels enjoyable time of the year.



*(Source: IMD-Pune)***Fig .No. : 1.2**



(Source: IMD-Pune) **Fig. No. : 1.3**

1.5.6 Demography

Population is very dynamic phenomena which change according to time. Population of the country is the ultimate resource to improve country's Socio-Economic condition. Demographic structure of the region is responsible for regional disparities and it explains relationship between population and economic development of such region. Hence it is necessary to analyze the present demographic structure of such region to achieve goals of nation and to attain balance in regional development in future.***(Leonard Nadler, 1970)***

1.5.6.1 Population Growth

Pune Municipal Corporation is very progressive and rapid urbanized area which is the part of Pune District. If focused on the population growth in Pune District, it is observed that the Pune City shows the increasing grid of population growth with compare to other tahsils of Pune District. Table No. 2.5 is show the Tahsil - Wise Population Growth of Pune District. In 1991 to 2001, Total population of Pune City was 2695911 and in 2001 to 2011 it becomes 3124458.

Table No. 1.5 : Tahsil Wise Population Growth in Pune District

Sr.No.	Name of Tahsils	Tahsil Wise Population Growth	
		1991 to 2001	2001 to 2011
1	Junnar	369806	400665
2	Ambegaon	213842	237290
3	Shirur	310590	385466
4	Khed	343214	447373
5	Maval	305083	377935
6	Mulsi	127385	172388
7	Haveli	1353050	2437849
8	**Pune City**	**2695911**	**3124458**
9	Daund	341388	382535
10	Purandar	223428	236152
11	Velhe	55874	54497
12	Bhor	171719	185826
13	Baramati	372852	430010
14	Indapur	348413	383100

(Source : Census of India 2011, Tahsil Profile, UNICEF)

1.5.6.2 Decadal Change of Total Population in Pune City : 1911 to 2011

Decadal change of Total Population in Pune City from 1911 to 2011 is show in Table. No. 2.6 and Fig No. 2.4. From 1911 to 1941 population size did not show a significant increase. In the year 1941 the population reached on 2.57 lakhs. In 1951 Pune Municipal Corporation was established.

Table No. 1.6 : Decadal Change of Population in Pune City : 1911 to 2011

Year	Total Population	Decadal Change in Population
1911	158,856	-
1921	198,523	39667
1931	198,078	- 445
1941	257,554	59476
1951	488,419	230865
1961	606,777	118,358
1971	856,105	249,328
1981	1,203,363	347,258
1991	1,691,460	488,097
2001	2,538,473	847,013
2011	3,124,458	585985

(Source :Socio - Economic Survey of Pune City, 2008 -2009)

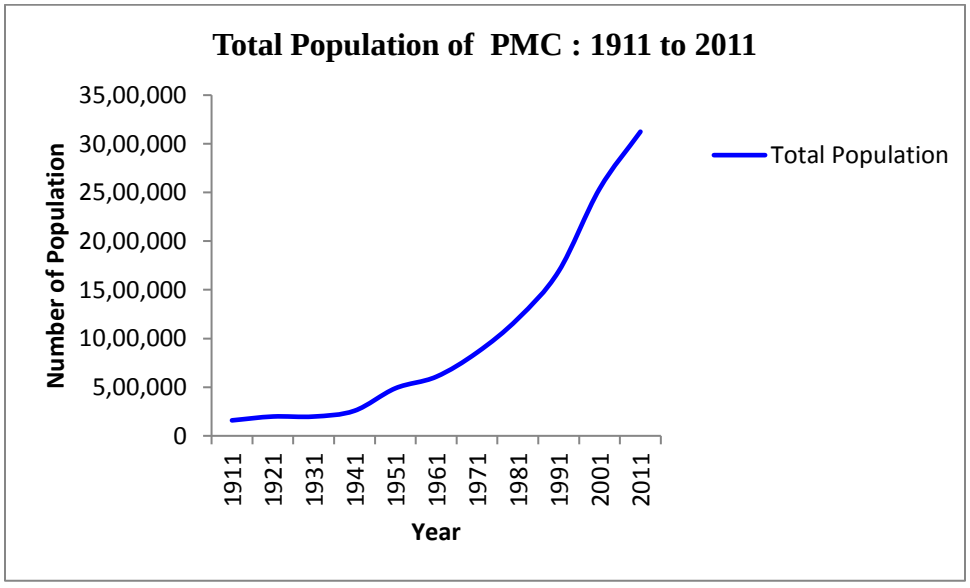


Fig.No. : 1.4

When the Pune Municipal Corporation set up in 1951 it catered to a total population of 4.85 lakhs. The main reasons for a significant change in the population size from 1920 to

1950 were increase in employment and business opportunities after the World War II, large-scale migration from Pakistan after partition and from other neighboring countries.

Total population of PMC is increases from 1951 to 2011, in 1951 it was 488,419 and in next six decades it is observed that the population increases in every decade. In 2011, total population of PMCis 3124458. From 1951 to 2011 various changes are occur in PMC and this quick changes plays vital role to make over the cities old identity 'Pensioners Pune' to 'IT Pune'.

Now a day's PMC has excellent road, rail and air connectivity with almost all important cities in India. It is well-known for its education facility, healthcare facility and job opportunity. With compare to other cities of Maharashtra or India, Pune's citizen enjoys quality of life. In PMC, cultural program, music, drama, dance, seminars this activities are found in each and every day. India's famous Film Institute is in Pune city and many artists are settle in this city. Various types of educational institutes, Universities are available in PMC. Medical Colleges, Engineering Colleges, Low Colleges, Commerce Colleges, School of dram, Art and Painting school, Dance and Music academies are located here. With all this reason, IT Industry, number of Multi National Companies, BPO, variety of NGOs are available for job opportunity. This all are the pull factors to attract the population from out of the city. This are all the reasons that's why the population increases day by day.

1.5.6.3 Population Growth Trend of PMC : 1951 to 2011

The Population Growth Trend is show in Table No. 1.7 and Fig. No. 2.5. From 1951 to 1961 decadal growth rate of PMC was 24.23 % which was suddenly increases in next decade from 1961 to 1971 and reach on 41.09%. New infrastructure was established in PMC. Various services of the city like transportation service, medical services, education services this are get makeover itself to attuned new upcoming challenges of new decades. Various industries are subsisting here; hence from 1961 to 1971 growth rate of PMC increases. Population Growth rate was observes constant during 1971 to 1981 and 1981 to 1991. This two decades show 40.56 % population growth rate. In 1991 to 2001 growth rate was increased. Expansion of Information Technology (IT) industry is the main motivation, hence growth rate was increases from 40.56% (in 1991) to 50.08% (in 2001).

The population growth rate of the city is decline from 50.08% to 22.73% from 2001 to 2011.

Table No. 1.7 : Population Growth Trend of PMC : 1951 to 2011

Year	Total Population	Decadal Growth Rate
1951	488,419	
1961	606,777	24.23%
1971	856,105	41.09%
1981	1,203,363	40.56%
1991	1,691,460	40.56%
2001	2,538,473	50.08%
2011	3,124,458	22.73%

(Source : Pune Census Report, 2011)

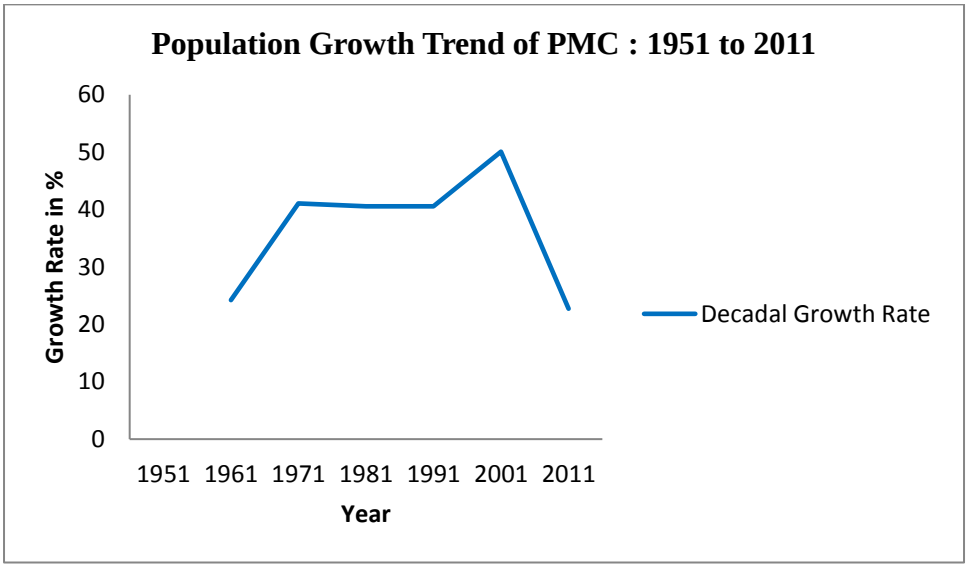


Fig.No. : 1.5

1.5.6.4 Ward Wise Population of PMC : 2011

Ward-wise Population Distribution in PMC is show in Table. No. 1.8 and Fig. No. 1.6. Ward Wise Population's study is important for planning strategies of Pune Municipal Corporation. Hadapsar ward shows maximum number of population i.e. 324751 and Bibvewadi ward is on second position who has 291446 population. Hadapsar and Bibvewadi are situated in Southeast part of the city. IT townships are established in this

area, hence number of populationfound high in these wards. B. S. Dhole Patil ward has minimum number of population, this ward has 155413 populations.

Table No. 1.8 : Ward Wise Population of PMC : 2011

Sr. No	Ward Name	Area in sq.km	Population: 2011
1	Aundh	40.75	181124
2	B.S.Dhole Patil	14.64	155413
3	Bhavani Peth	2.90	192932
4	Bibvewadi	18.35	291446
5	Dhankawadi	10.84	236648
6	Ghole Road	12.76	171678
7	Hadapsar	24.78	324751
8	Karve Road	16.26	209331
9	Kasba Vishrambagh	5.00	178484
10	Sahakarnagar	9.20	205441
11	Sangamwadi	29.44	261957
12	Tilak Road	14.71	242290
13	Warje Karvenagar	15.23	233399
14	Yerawada	29.10	239564
	Total	243.96	3124458

(Source: Pune Census Report, 2011)

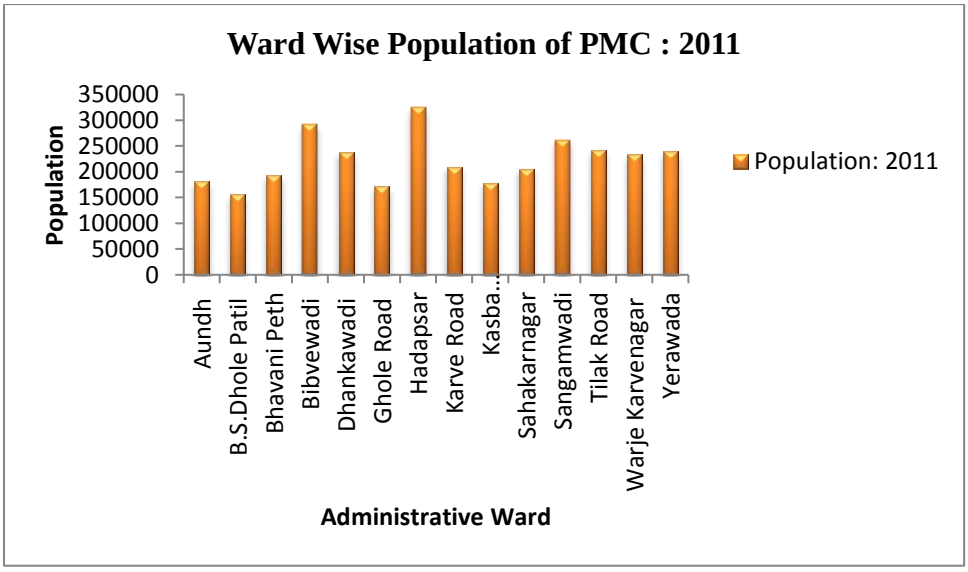


Fig.No. : 1.6

1.5.6.5 Ward Wise Slum Population of PMC : 2011

Day by day population of Pune city is increases. Rapid urbanization, population and growing economy and industry of the region have placed an enormous strain on the city's infrastructure. The growth of the city has given rise to problem of slum which impact on cities plan, layout and morphology. Urbanization and slums this two things are depended on each other, if urbanization increases then, the number of people living in slum area are also increases . Pune Municipal Corporation provides various facility like water and electricity supply, educational facilities, health facilities, security, communications facilities, but due to increasing slum area this facilities are fall down and useless. As per Pune City Sanitation Plan- 2011, in PMC the total numbers of slum are 564 and out of this 353 slums are declared, where 211 slums are undeclared. Slum has been declared or it has been officially recognized by the local government that means, declared slum is eligible for basic service provision.Undeclared slums are not considered for basic provision and its mean those slums are excess but they use all facility which are provided by Pune Municipal Corporation. Due to undeclared slum that facility are fall down.

Table No. 1.9 : Ward Wise Slum Population of PMC : 2011

Sr. No	Ward Name	Total Population : 2011	Slum Population :2011
1	Aundh	181124	41475
2	B.S.Dhole Patil	155413	72040
3	Bhavani Peth	192932	60615
4	Bibvewadi	291446	15725
5	Dhankawadi	236648	5260
6	Ghole Road	171678	84405
7	Hadapsar	324751	84465
8	Karve Road	209331	141742
9	Kasba Vishrambagh	178484	8880
10	Sahakarnagar	205441	70900
11	Sangamwadi	261957	116390
12	Tilak Road	242290	83595
13	Warje Karvenagar	233399	52245
14	Yerawada	239564	29775
Total		3124458	867512

(Source : Revised City Development Plan for Pune -2041 and MARSHAL, Pune Slum Atlas)

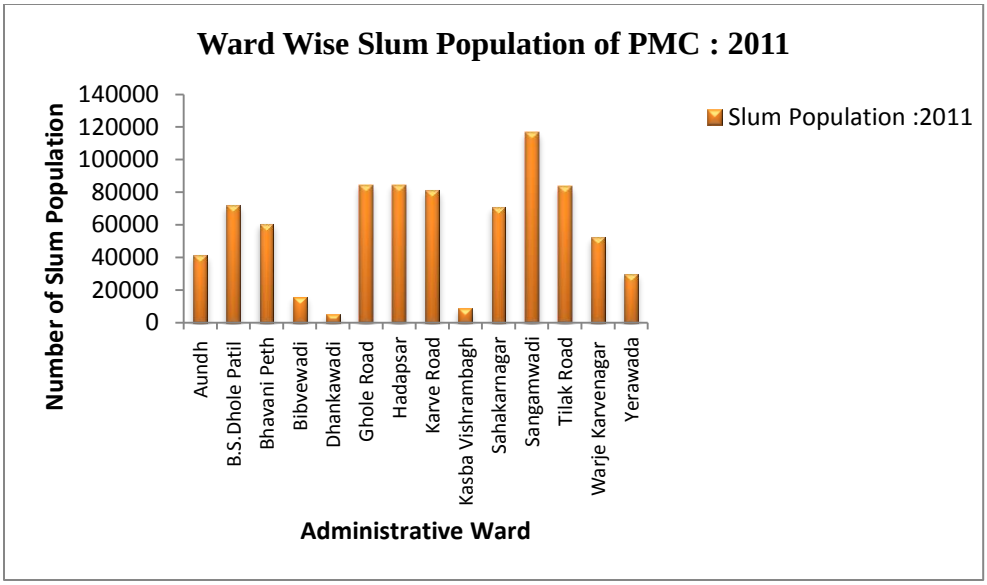


Fig. No. : 1.7

Ward Wise Slum Population of PMC for 2011 is show in Table No. 1.9 and Fig. No. 1.7. In 2011, Sangamwadi ward shows maximum number of slum population. Sangamwadi ward is joining to Pimpari Chinchwad Municipal Corporation. Pimpari Chinchwad Municipal Corporation is one of the most important and biggest Municipal Corporation in Pune District. Pimpari Chinchwad Municipal Corporation is well known for its industrialization. People who are subsisting in Sangamwadi ward may be brought job from both sides from PMC and PCMC. Hence, there is reason to develop slum population in Sangamwadi. Total population of Sangamwadi Ward is 261957 and out of this 116390 population is subsist in slum. Aundh Administrative ward also has nearness to PCMC and this ward's north side bordered by Mula River. But this ward shows minimum slum population with compare to Sangamwadi. Total population of Aundh Ward is 181124 and out of this 41475 population lives in slum area. Aundh Ward is so far from the core area, and may be due to inconvenience people reject to subsist in this ward. Kasba Vishrambagh, Ghole Road, B.S. Dhole Patil Road, Bhavani Peth, Tilak Road these wards are jointly form a core area of PMC. Kasba Vishrambagh and Dhankawadi this two administrative ward shows minimum slum population in PMC.

1.5.7 Literacy

Pt. Jawaharlal Nehru termed Pune as the ***'Oxford of the East'.*** Social Reformer like Maharshi Karve, Mahatma Phule, Lokmanya Tilak, G.G. Agarkar, Gopalkrishna Gokhale, Vishnu Shastri Chiplunkar this are those persons who know the importance of education, they also well known that to generate social change in our society each and every person should get the education. In 1848, First school for girls was founded in bhide wada and founder was Mahatma Phule. The first college found in the city was the Deccan College in 1821 and founder was Lokmanya Tilak, and the Deccan Education Society was established in 1880.

In 1860, The Poona Native Institution was established under the guidance of Shri Vaman P.Bhave. He worked towards bringing education to the benefit of the backward class. This society was named the Maharashtra Education Society in the year 1922 and the reins of which were taken over by eminent persons such as Shri. Gopalkrishna Gokhale. This institute was instrumental in establishing various primary and secondary schools in the city like Bhave School, Garware High School, Bal Shikshan Mandal School.

In 1916, the first Women's University was found in Pune city and the founder was Maharshi Karve. This basic platform of education was established in Pune city and due to this many institutes, education organizations, schools are originate in this city. Pune City is known as 'Education Center.' In PMC, various education and research institutes are found like BARTI, Gokhale Institute, Bhandarkar Institute, Jayant Naralikar Institute, Ranade Institute. Savitribai Phule University, SNDT Women's University, Tilak Maharashtra Vidyapeeth, Bharti Vidyapeeth this are the some famous university found in Pune City. Fergusson College, Garvare College, S.P.College this are some colleges found in Pune City. The Literacy rate demonstrates the socio-economic development. Pune city has highest literacy rate in Pune District.

Table No. 1.10 : Ward Wise Literate Population in PMC : 2011

Sr. No	Ward Name	Population: 2011	Literate	Literacy in %
1	Aundh	181124	145896	81
2	B.S.Dhole Patil	155413	122003	79
3	Bhavani Peth	192932	152394	79
4	Bibvewadi	291446	224612	77
5	Dhankawadi	236648	192523	81
6	Ghole Road	171678	122003	81
7	Hadapsar	324751	257959	78
8	Karve Road	209331	170681	82
9	Kasba Vishrambagh	178484	154533	87
10	Sahakarnagar	205441	164372	80
11	Sangamwadi	261957	203254	78
12	Tilak Road	242290	192775	80
13	Warje Karvenagar	233399	188871	81
14	Yerawada	239564	192482	80

(Source: Pune Census Report, 2011)

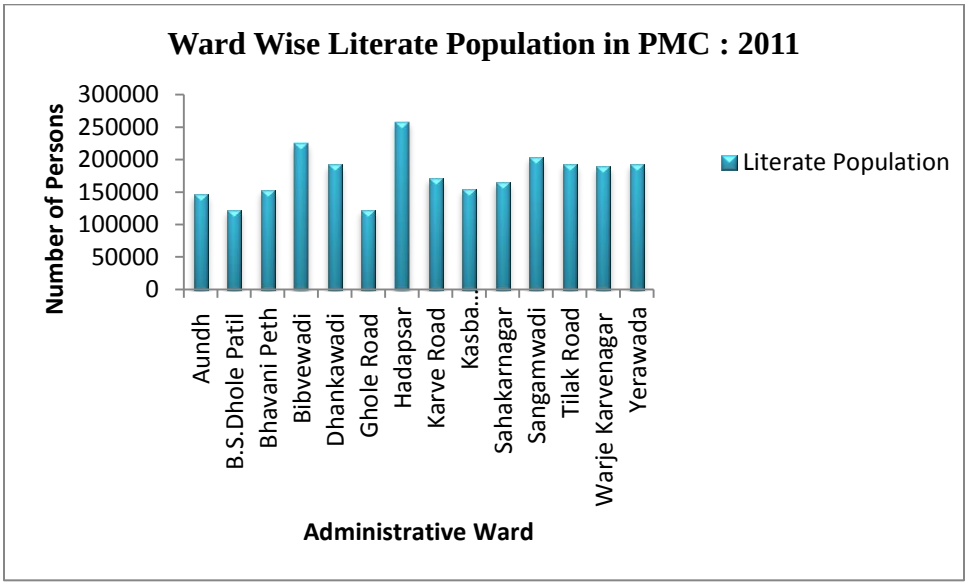


Fig. No. : 1.8

Ward -Wise Literate Population in PMC for 2011 is show in Table No. 1.10 and Fig. No. 1.8. To find out literacy level of each ward of PMC, total population of ward and number of literate people of same ward are considered and it is observed that all administrative wards has well condition of education and every ward show the above 70 % literate population. Kasba Vishrambagh administrative ward is at first position that has 87 % literate population. Karve Road administrative ward has 82% literate population. Maximum number of the education centers are found in those both administrative ward.

Aundh, Dhankawadi, Ghole Road, Warje Karvenagar this wards has 81% literate population. Sahakarnagar, Tilak Road, Yerawada this wards has 80% literate population. B.S.Dhole Patil and Bhavani Peth administrative ward has 79 % literate population where, Hadapsar and Sangamwadi ward has 78% literate population. Bibvewadi ward has 77% literate population. When compare and give the rank to all wards to find the literate level of each ward it is recognize that the Kasba Vishrambagh administrative ward has first position with 87 % literate population and Bibvewadi administrative ward has last position with 77% literate population.

1.5.8 Transportation

Transportation has contributed much to the development of economic, social, political and cultural fields and uplifting the condition of Pune City. Due to good transportation service, many industries are situated or establish in the city. PMC has excellent road, rail and air connectivity with almost all important cities in India like Mumbai, Delhi, Hyderabad, Bangalore, Chennai and Kolkata.

1.5.8.1 Road Communications

The road network consists of Express Highway, National Highway, State Highway and Major District Roads. Pune Municipal Corporation is located along the intersections of the following roads and all of them experiencing a very highway commercial and domestic traffic.

Table No. 1.11 : Highways of PMC

Sr.No.	Name of the Road	Type of the Road	Number
1	Mumbai - Pune - Bangalore	National Highway	NH 4
2	Pune - Solapure - Hyderabad	National Highway	NH 9
3	Pune - Ahemadnagar - Aurangabad	State Highway	SH 60

(Source: Integrated Ward Level Disaster Management Plan, PMC 2012)

In Pune city, the traffic density is high. The road length of PMC is 1872 km with additional national and state highway of 50 km length passing through the city. PMC is internally well connected through an extensive road network. The city boasts of

maximum number of two -wheeled vehicles. To solve the traffic problem of PMC, BRT system was applied.

Table No. 1.12 : City Roads of PMC

Sr.No.	Intercity Roads of PMC	Sr.No.	Intercity Roads of PMC
1	Laxmi Road	7	Senapati Bapat Road
2	Tilak Road	8	Fergusson Road
3	Bhandarkar Road	9	Kumthekar Road
4	Jangali Maharaj Road	10	Prabhat Road
5	Karve Road	11	Shastri Road
6	Bajirao Road	12	Apte Road

(Source : Compiled by Researcher)

1.5.8.2 Rail Communications

Pune Municipal Corporation has two railway junction 'Pune Junction' and 'Shivajinagar Railway Station'. Pune Junction is a major hub that connects to Mumbai, Bangalore, Hydarabad, Chennai and New Delhi. The rail network consists of both broad gauge (electrified and non - electrified) double track as well as single track lines. Local trains run between Pune - Daund, Pune -Lonavala. Deccan Queen is one of the most fastest train of India which run between Pune - Mumbai. Averagely there are 134 passenger trains that pass through Pune Junction daily. Shivajinagar Railway Station is one of the additional suburban railway station that is being used by the commuters, but this station does not have any siding and thus there are no trains originating or terminating here.

1.5.8.3 Airways Communications

The district headquarter has connectivity through airways for transport and trade to major airports within the country and to select international destinations. Pune International airport at Lohagaon, operate by the Airports Authority of India. It shares its runway with the neighboring Indian Air Force base. In addition to domestic flights to all major Indian cities i.e. Pune to Delhi, Mumbai, Bangalore, Hyderabad and Goa.

This airport serves international direct flights to Dubai and to Frankfurt. Indian Airlines, Sahara, Jet Air wage this are the companies who provide air transport service in city.

CHAPTER TWO
REVIEW OF LITERATURE

2.1 Introduction

A literature review surveys books, scholarly articles and any other sources relevent to a particular issue, area of research, or theory, andby so doing, provides a description, summary, and critical evaluation of these works in relation to the research problem being investigated. Literature reviews are designed to provide an overview of sources to explored researching a particular topic and to demonstrate to researcher***(Fink Arlene 2014).***

Literature which refers toipc concerning to urbanization, land use, land use changes, city growth, advanced techniques likes GIS and RS, utility services are used for review. Various Thesis, Dissertations, Journals, Research Papers, Scholary Articles, Published and UnpublishedProjects, Reports, Goverment's City Development Plan, Census and Books are use to clarify concepts and update knowledge about the research problem.

2.2 Review of Thesis and Dissertations

Laura Vang Rasmussen (2013) investigate theExploring Land Use Change in the Sahel: Complementary Perspectives on Coupled Human-Environment Systems. The present study was attentive the influence of seasonal rainfall upon Sahel vegetation and Land use rationales in desert fringe agriculture. The population growth in Sahelian region was also responsible for land degradation. Whole aim of farming is to increase the food production for rapidly growing population. Resilience theory was used to analyze village level Sahelian land use changes. Farmers in adjusting their land use decisions used system Dynamics Model to demonstrate factors, which are responding.

Yikang Rui (2013) was emphasized onUrban Growth Modeling Based on Land-Use Changes and Road Network Expansion. Population growth and transportation this are two main driving force which are responsible for urban growth. As per this study

commercial areas are located around city center. When cities are grow some factories move to urban fringe. High-density residential areas principally demonstrate better centrality accessibility. Land use types and street centralities are reflects the influence of human activities on land. It also explains characteristics of urban growth and sprawl, relationship between road network and land use. Multi Agent Systems (MAS) model, The Hybrid Urban Growth Model,Weighted Network Modelthese models are used to examine urban growth of Toranto and Stockholm. Landsat TM images, population data, transportation network and DEM data was used.

Kadam Anushri (2013) studied the land use changes in Pimpri Chinchwad Municipal Corporation. Land Use change was analyzed by using RS data, which applied to discover the trends of urban development in PCMC. GIS techniques used to identify the change in land use pattern and it also used to prepare Database Management System for utility services in PCMC. It analyzes land use changed for 2001, 2009, 2011 and explained the spatial relationship between land use change and utility services in PCMC. According to this study, as a built up area increases vegetation, wasteland and agricultural land decreases. Open land came under the built up area. In PCMC, transport facility is well developed but it reduced agricultural land. Transport services, Industrial services, educational services are rapidly developed and thus built up area increasesin PCMC.

Praveen Jha (2012) scrutinizeManagement of Land Use Land Cover through the Application of Remote Sensing, Geographic Information Systems and Simulation. The Manas Tiger Reserve a part of the Eastern Himalaya Biodiversity that is an UNESCO World Biodiversity Heritage Site and Rajaji National Park, Uttarakhand was selected as study areas. The study was concluding that the 28 Tiger Reserves decreased by 94 sq. km during 1997 to 2002. The deforestation rate was 1.20 % during 1990 to 2004, which was highest in India. Human inhabitation encroach the green areas i.e. forests are decreasing at a rapid pace. Hence there is urgent need for a monitoring regime for rapid assessment of LULC. Multi-spectral LANDSAT,Thematic Mapper (TM) satellite data was used for LULC classification. Multi-Algorithm Automation Program (MAAP), Data Automatic

Modification Program (DAMP), Multi-Stage Simulation Program (MUSSIP), the new tools and Methodologies was used to accurate and rapid assessments.

Jonathan W. Malette (2012) examine Assessing Land Use And Land Cover Change In Tropical Dry Forest Of Northern Chinandega, Nicaragua From 1985 To 2011. Present Study pay an attention on problem of deforestation due to agricultural expansion, fuel wood extraction and other land uses. The author analyzes Landsat 5 Thematic Mapper (TM) images for support to find out conclusions. From 1985 to 2011, tropical dry forest area decrease from 1434.2 ha to 1223.64 ha. The study also forecast that, if that current rate of tropical deforestation was continue then the Nicaraguan Municipality face the problem of losing forest cover in upcoming next few decades.

Christopher Ifechukwude Chima (2012)concludedMonitoring And Modeling of Urban Land Use In Abuja Nigeria, Using Geospatial Information Technologies. The change between 2001 and 2006 was detected. In 2001, residential / commercial land use was 161.43 km^2 where in 2006 it was found 251.85 km^2 , this gradual raise in this land use type reflects the raise in population. According to this study, annual urban growth was 4.43 %. Present study was used 'Object Based Image Analysis' (OBIA) method, Shannon's Entropy Index for urban Land Use and Land Cover analysis in Nigeria. Remotely sensed data was used to validate an Urban Growth Model (UGM). Cellular Automata /Markov analysis was used to predict urban growth trend.

Bhailume S.A. (2011) focused on An assessment of urban sprawl using GIS and Remote Sensing Techniques : A case study of Pune - Pimpri Chinchwad Area.focused on urban sprawl and ward wise utility services with Remote Sensing Techniques and GIS of PMC and PCMC. Shannon's entropy was used as a tool to measure and distinguish types of sprawl.

Effah Kwabena Antwi (2009) Integrating GIS and Remote Sensing for Assessing the Impact of Disturbance on Habitat Diversity and Land Cover change in a Post mining Landscape. The entire study was assessed on Land Cover Change and tries to find some

remedy to restore the damaged ecosystem. Change detection extension was used and finds the results with 'positive change' i.e. the area of pine, deciduous tree, lake and mixed grasslands was increased. It was also paying attention on causes of Land Cover changes in Schlabendorf, Habitat Diversity and Species Diversity in Schlabendorf.

Netsanet Deneke Morie (2007) focused onLand Use And Land Cover Changes In Harenna Forest And Surounding Area, Bale Mountains National Park, Oromia National Regional State, Ethiopia. The study was including seven land use land cover categories. Harenna Forest or study area face land scarcity which was forced to farming families to expands agricultural land area on to natural forests; hence it was conclude that the agricultural land was increase from 22,956 ha to 49,312 ha due to rapid growth of population from 1986 to 2000.

Zubair Ayodeji Opeyemi (2006) indicates the Change Detection in Land Use and Land Cover Using Remote Sensing Data and GIS: A case study Of Ilorin and its environs in Kwara State. The present study was expressing the Land Use Land Cover Distribution of the years like 1972, 1986, 2001. Land Consumption Rate and Land Absorption Coefficient were initiate to find out quantitative assessment of Land Use Land Cover Change. It concludes that, from 1972 to 1986 there was rapid growth in built-up land, but period between 1986 to 2001 there was reduction in built-up land.

Kahsay Berhe Gebrehiwet (2004)shows Land Use And Land Cover Changes In The Central Highlands Of Ethiopia: The Case of Yerer Mountain and its Surroundings. Present study emphasizes that biophysical aspects and socio-economic factors, both are responsible for degradation of land. This study concludes that the present area was not sustainable due to shortfalls of food, feed and fuel wood. In study area, more than 50% of children are not going to school and these children who become illiterate farmers in future and hence they will be responsible for damage to natural resource. In study area cultivated land increased from 25% to 56.4% but grasslands decreased from 65.35% to 32.7% from 1971/72 to 2000. For analyzed conclusions Biophysical data, socio-economic characteristics of households was used to interpret thirty years' time span with

the help of remotely sensed data, aerial photograph for 1971/72 and Landsat ETM+ imagery of 2000.

Morshed Anwar (2002) focused on Land Use Change Dynamics: A Dynamic Spatial Simulation. Dynamic Simulation Model of Land Use change was created for Nong Chok area. This model was derived based on selected biophysical and human driving forces and model was run for 19 years, from 1981- 2000. To derived Simulation Model Demographic and Socio-economic, data was collected from farmers like distance to canal, age, religion, area of land, land ownership, area of rice and fish farms, comparative income between rice and fish year and land use map as a model's inputs.

Jung-Hoon kim (2001)documented on An Analysis Of Land Use Chang using GIS and Spatial Analysis: A Case Study of the Seoul Metropolitan Region Perimeter. Seoul Metropolitan Region Perimeter was taking as a case study to analyze land use change from 1994 to 1998. GIS and Spatial Analysis was support to local government to forecast future land use changes. The study illustrate the significant pattern of land use change and demonstrate the relationship between neighboring land use and the pattern of land use change.

Ming Zhang (2000)addressed Modeling Land Use Change in the Boston Metropolitan Region. This was a descriptive study of land use data set for the Boston Metropolitan Region. The data set has distribution of lands of 153 cities for specific or selected year i.e. 1971, 1985 and 1991. Land use change of this region was correlated with some variables, which are access to CBD.

2.3 Review of Research Papers and Articles

Alison Rothwell, Brad Ridoutt and et.al. (2015)contributed onFeeding and housing the urban population: Environmental impacts at the peri-urban interface under different landuse scenarios. This paper mainly focus on peri-urban landscapes and food provision, environmental impacts due to urbanizing horticultural land, five food and housing land use scenarios in a peri-urban (PU) context are compared. Multifunctional combinations of

land uses in PU regions will generate different environmental impacts on monofunctional housing use. This paper also highlight that Greenfield housing with remote food production increased impact 25-43 present.

Kale Nilesh Ashok and Karlekar S. N. (2015)concluded on Village Information System Using GIS Techniques: A Case Study of Nimone Village, Taluka- Shirur, Dist-Pune (Maharashtra). Village Information System techniques was created for Nimone village. According to this research, 70% Pakka house are found Nimone village and water facility is located outside the each house. Eastern part of the village is barren and has high relief therefore, water supply to this land is difficult that's why this part has large number of wells. The cadastral map of the village used and create various thematic maps like land use map, road map, water facility and Accessibility for the Nimone village.

Syed Aasif Farooqi, sohieb Gazali (2014) studied Application of Geographical Information System in Urban Management and Planning: A Case Study of kulgaon-Badlapur, Dist.- Thane, Maharashtra. Present paper emphasis about e-GIS plat forum. The main aim was this paper to develop preliminary e-GIS plat forum that will showcase the ability of e-geographical information system for optimization of resources in a most excellent form. This paper also recommend that e-GIS plat forum will become a conceptual model for achieving better planning, good urban governance and management to the whole areas of city which may require further working.

Sankhala Sunil and Singh B.K. (2014) concluded onEvaluation of Urban Sprawl and Land Use Land Cover Change Using Remote Sensing and GIS. According to this paper specially mark in simple sentence that “as population increases in an area, the boundary of the city expands to accommodate the growth, and this expansion is deemed as Sprawl.” For the study of Urban land use/land cover change of Jaipur city of different time period, land use/land cover maps are used.

Mohd Talha Anees, Akram Javed, Mohd Yousuf Khanday (2014) focused onSpatio-Temporal Land Cover Analysis in Makhawan Watershed (M.P.), India through Remote

Sensing and GIS Techniques. Land Use and Land Cover changes in Makhawan Watershed are the unite effects of decline in average rainfall, more urbanization, sustainable agriculture activities and successful wasteland reclamation programs.

Mundhe Nitin N., Jaybhaye Ravindra G. (2014) highlights the Impact of urbanization on land use/land covers change using Geo-spatial technique. The main aim of the study that to assess land use/land cover changes in pune city for four decades. I. e. 1973 to 2011. It investigate that the rapid growth of the city is mainly attributed to industrialization of PMC/PCMC after 1960 and growth of information technology (IT) industry and service sector in the last decade. Satellite imagery of four decades was used to evaluate urban growth of Pune city. This study conclude that in 1973, 20.54 percent area was under built up where in 2011, 63.97 percent area was occupied by built up area.

M. S. Aduah, P.E. Baffoe (2013) studied on Remote Sensing for Mapping Land-Use/Cover Changes and Urban Sprawl in Sekondi-Takoradi, Western Region Of Ghana. This paper explains the land cover and land cover change of the Sekondi-Takoradi Metropolis by using remote sensing techniques. The urban area was doubled and the forest area decreased by 10% from 1988 to 2001. Shannon entropy index was used to evaluate Urban Sprawl.

Mali Sagar, Bhailume Santosh and Das Sandipan (2013) call attention on Geoinformatics Application for Urban Utilities Information System: A Case Study of Pune City,Maharashtra, India. The study was find out the pattern of utilities and also find the areas which was face lack of that utilities with help of advanced tools like Remote Sensing, GPS and GIS. Ward wise population data, Blood bank, Hospital, Education Sector were collected to support this study.

Mary Tahir, Ekwal Iman and Tahir Hussain (2013) emphasized on Evaluation of land use/land cover changes in Mekelle City, Ethopia using Remote Sensing and GIS. It express the Land Use/Land Cover changes in Mekelle City, Ethopia over a period of 25 years. Multi-Temporal Satellite Data of Landsat was used for present Bare land and Farm

Land this categories shows negative changes where Urban features and Grass land this categories show positive changes during 1985 to 2010. Farm lands was reduced three Km^2 to zero Km^2 where Bare land was reduced 14 Km^2 to 1 Km^2 during 1985 to 2010.

M. Nagarajan and Chandan Ashis Gupta (2013) call attention onA GPS and GIS based model for an Empirical study of Village Information System. This paper was illustrate about GPS and GIS based information model which was generate for the village Potheri, Tamil Nadu, India. Some features like houses, water taps, tube wells, streetlights and linear features of roads and streets has been collected and converted into shape files and accessed in GIS to create VIS. The help of this system can easily do the modification like updating and deleting of data.

Sreedhar Ganapuram, R. Nagarajan and et.al. (2013) call attention on village-level Drought Vulnerability Assessment Using Geographic Information System (GIS). This article express the village level drought vulnerability assessment with the help of GIS techniques. Water Estimation created for the Peddavagu watershed and total water use for domestic, livestock and agriculture were calculated. The drought vulnerability maps were developed.

Farzana Raihan, Nowrine Kaiser (2012) studied onLand Use Changing Scenario at Kerniganj Thana of Dhaka District Using Remote Sensing and GIS. Land use was change in Keraniganj Thana due to industrialization and urbanization. Built up area was increased 3487.73 acres to 4137.05 acres from 1997 to 2006. Irregular and unplanned urbanization was responsible for land pollution,water pollution, air pollution and noise pollution.

Sandipan Das, Sagar P. Mali and Ankita Misra (2012) examined onUrban Landuse/Landcover Change Detection Analysis of Aurangabad City Using Geoinformatics Techniques. This paper was illustrates that the high rate of urban population growth has led to serious land use problems such as loss of agricultural land, unauthorized urban sprawl, high land values, pollution, poverty and so on. This paper

also highlights the essentialness and significance of Remote Sensing and GIS to have up to date information in existing land use and detection of urban land use changes.

Aher, S.P. (2012) bring to light onVillage Information System: A Role Model for Sangamner Tahsil Villages in Ahemadnagar District of Maharashtra. The whole study highlights the importance of Village Information System. Current paper expresses the importance of micro level information of village which is help to development of village and as well as State and Nation and also states the importance of Geographical Information System and Remote Sensing technology who plays an vital role to create VIS. Village Information System Role Model created for Sangamner.

Sitedar, Satish Kumar and et.al. (2012) highlight Village Information System – A Case Study of Muklan Village, Hisar, Haryana, India. Present paper explains Village Information System for Mulkan Village, Hissar. To create VIS for Mulkan village the household level information related to population and household was collected by field survey using questionnaire and LISS III image was used. Database developed in GIS environment with the help of high spatial resolution image shows the great potential to investigate the exiting scenario at village level.

Bhagawat Rimal (2011) call attention toApplication of Remote Sensing and GIS, Land Use/Land Cover Change In Kathmandu Metropolitan City, Nepal. Present paper express that the land use and land cover pattern of a region is an outcome of natural and socio-economic factors and their utilization by man in time and space. Kathmandu, the capital city of Nepal, has been experiencing a lot of land use and land cover changes due to both socioeconomic and natural factors. Markov chain model has been applied to predict future changes which are based on the rates of past change using IDRISI GIS.

Njike Chigbu et.al. (2011) emphasize on Analysis of Landuse and Landcover Changes of Aba Urban Using Medium Resolution Satellite Imageries. The study was carrying comparative study/analysis of the Land use and Land cover changes of Aba main Town using RS and GIS tools. To study analyzed and discussed about Landuse changes in Aba,

14 years time span was selected. It emphasize that there was three main categories of industries – public, partnership and private are found in Aba and all of thse are responsible for the observed land use pattern of Aba.

Manish Kumar and Uma Gole (2011) accentuate on Development of Village Information System for Resource Planning Using Remote Sensing and GIS Techniques. A case study of Raikholi village, District Almora, Uttarakhand. This paper examines the land cover of Raikholi village for the year 2001 and 2010 in Almora district of Uttarakhand with the help of remote sensing and GIS. Google imageries, elevation data of SRTM, Census of India 2001 data and field survey all of this used for prepare resource map to do perfect planning of study area.

Ashraf M. Dewan & Yasushi Yamaguchi (2009)underscore on Using remote sensing and GIS to detect and monitor land use and cover change in Dhaka Metropolitan of Bangladesh during 1960-2005. This paper quantified the patterns of land use land cover change for the last 45 years for Dhaka Metropolitan. Topographical maps and remote sensing was used to describe Multi-temporal land use/ land cover classification of Dhaka. This study explains that rapid urban growth in Dhaka leading to the quick loss of rural and arable lands.

Sigh Harpinder, Kewal Krishnan, Litoria, P.K. (2009) draw attention to Creation of Village Information System of Moga District in Punjab using Geoinformatics. This paper states that to enrich rural lives and bring revolutionary changes Geoinformatics technology is most important.' In this study spatial data regarding the Land use of Moga district has been extracted from IRS LISS III Satellite image. Village Directory from the planning department was also used to create attributes about Moga district.

Khagendra Raj Poudel (2008) show up on Urban Growth and Land Use Change in The Himalayan Region: A Case Study of Pokhara Sub-Metropolitan City, Nepal. The study of urban land use pattern of Pokhara Sub Metropolis is based on aerial photographs of 1996 and field observation of 2000. According to this paper, private residential and

commercial-cum-residential areas occupied more urban area that industrial area in Pokhara. GIS software ARC/INFO has been applied to analyze the data and 8 catagories are classified for analysis.

Hugh Wenban-Smith (2006)highlight on Production and cost functions for utilities in an urban context: problems of specification and estimation. This paper express that utilities like electricity, water supply, telecoms are constitute an important part of the urban infrastructure. This article focused on Nerlove, Roberts and Thompson's assumptions for cost functions in analysis of electricity supply. It gives suggestive results for urban water supply using a simplistic approach based on Wenban – Smith's unit costs assumption.Entire study draw attention on some methodologies which are well – established in the utility regulation literature which are so simple to adapt them to analyze urban infrastructure.

S. Savas Durduran, Ali Erdi (2006) emphasized on Activities and Problems of Urban Information System (UIS) in Turkey. This paper presents Urban Information System (UIS) in Turkey. Research was applied on all the municipalities in Turkey during May 2005 – August 2005 time period. Conclusion after all study was that, 543 municipalities have numbering unit and out of 543 municipalities only 104 municipalities have updated numbering information, however only 17 of 104 have numbering information recorded in the computers. The paper tags the importance or benefits of several spatial and non spatial databases.

Shahab Fazal (2000)give detailed account on Urban expansion and loss of agricultural land – a GIS based study of Saharanpur City, India. It examines the loss of agricultural land and urban expansion in Saharanpur. This paper extremely focuses on the loss of agricultural land which was converting into human settlement. It emphasize that 1.5 million hectares of land (mostly agricultural) went to urban growth between 1955 -1985. It also analyzed that the Saharanpur has recorded a significant increase in the built – up area due to population growth but this urban expansion was unlanned. The northward urban expansion has caused losses to exiting plantations. Entire study was done in a GIS environment.

2.4 Review of Books

Tim Hall, Heather Barrett (2012) description onUrban Geography. This book helps to examine the new geographical patterns forming within and between cities. This book structured into three sections viz. 'Contexts', 'Themes', and 'Issues' which helps to understand the internal nature of cities, Urban form and structure, Global urban diversity. This book also discusses various topics like urban world and politics, housing and residential segregation, transport and mobility in cities, sustainability and the city.

Rao Pratap M. (2012) narrate Urban Planning Theory and Practice. Present book give a way to research to understand the importance of urban planning. This book covers the essential aspects of Urban Planning with case studies, specially with reference to Indian conditions. The book deals with various chapters like Ancient and Modern Urban Planning, Planning Legislation, preparation of development plan, housing, landscape design.etc.

Singh A. K. (2010) description on Urban Geography. This book explains pattern and processes of urban development with special case study of Ranchi. This book also shares the problems which are facing by small and medium towns when basic services are provide to their resident. The study of processes of urbanization in Ranchi gives blue print for future urban planning.

Oats Briony J. (2006)account on Researching Information Systems and Computing. The present book discusses the nature of research and the process and explains how to do a literature review, the starting point for most research projects. It gives proper overview of the range of approaches used in Information System and Computing which most appropriate to researcher's needs and interests.

Mandal R.B. (2000) narrate various concepts and theory about urban population, urban transport, urban land use and industrial development. This book mainly discussed about city's origin, city's growth and rate of growth, city's function and distribution.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

The method section describes action to be taken to invistigate a research problem and the rationale for the application of specific procedures or techniques used to identify, select, process and analyze information applied to understanding the problem, thereby, allowing the researcher to critically evaluate a study;s overall validity and reliability. The methodology section of a research paper answers two main question: How was the data collected or generated and how was it analyzed. ***(Kallet Richard H., 2004)***

3.2 Methodology

Methodology is a way to systematically solve the research problem. Result and analysis of research are totally depends on methodology. To find out aims and objective of the study the methodology was follow following steps:

3.2.1 Library Work

Library Work was includes with intensive and extensive search of literature, references, manuals, bulletins focusing on the topic, reference books, institutes, government departments, internet etc.

3.2.2 Pre – field Work Phase

This phase deals with the collection of various maps like topographical map, satellite images as well as utility services data. Topographical Map (47 F/ 14/2, 47 F/ 14/3, 47 F/ 14/6, 47 F/15 / NE, 47 F /15 /NW) was collected from Survey of India. Satellite Imagery – LIIS III (2005,2011) was obtained from Bhuvan. (National Remote Sensing Center, Hyderabad)

3.2.3 Field Visits

The study was supported by the primary sources of data generated through the extensive field verification survey as well as the literature survey of the records. Collect the ward

wise data of utility services of the study are like Property Tax Pay Offices, Maha e - Suvidha Centers,Public Gardens,24 Hours Open Medical Stores, Fire Stations, Blood Bank, Barbers, Flour Mills, Gyms, Swimming Tanks.

3.2.4 Laboratory Work

This phase was included the digitization of various layers, preparation of various thematic maps using GIS techniques. i.e. Georeferencing, Digitization, Attribution, Data attachment, Final layout of different maps was analyzed.

3.2.5 Software use

Basically, five software were used for this project viz :

(a) ArcGIS : It was used to compliment the display and processing of the data

(b) Idrise32 : It was used for the development of land use land cover classes and subsequently for change detection analysis of the study area.

(c) Global Mapper :

(d) Microsoft Word (MS-Office 2007) : It was used basically for the presentation of the research.

(e) Microsoft Excel : It was used in producing the bar graph .

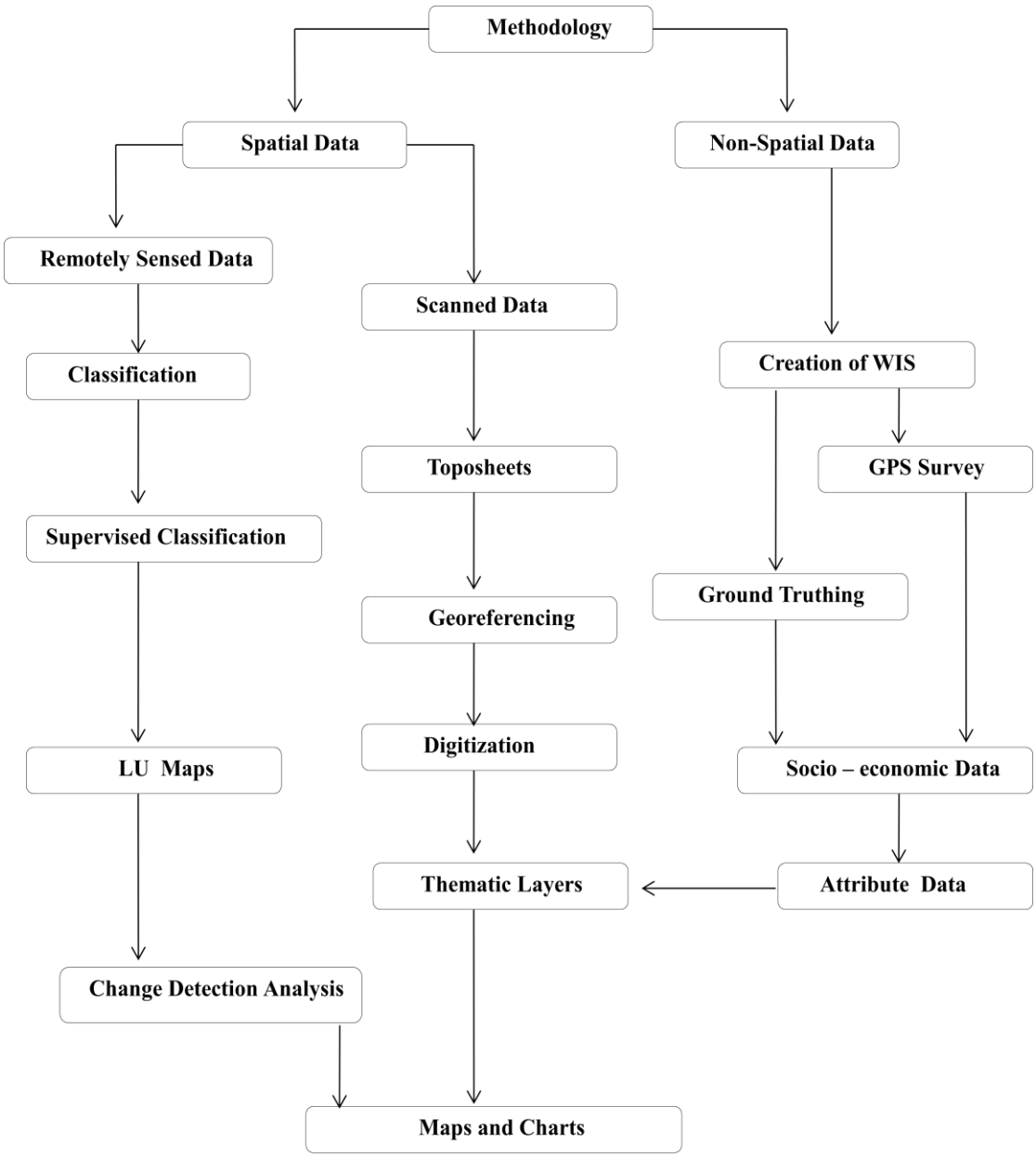


Chart No: 3.1 Methodology

3.3Urbanization and General Land Use of PMC : 1981 - 2013

Urbanization, which may be broadly defined as the process of expanding urban influence, has been taking place for more than 6000 years, has increased markedly since the beginning of this century. The process of urbanization in India has been slow but steady. Urban expansion is a world occurrence. Growing cities are creating an alarming situation in all countries of the world. It has led to serious land use problems such as loss of agricultural land, unauthorized urban sprawl, high land values, speculation in land and other related problems. In the emerging scenario, it is essential to have updated information on urban growth patterns and its impact on the living environment. **(Shekhar Sulochana, 2015)**

Urbanization is the method of urban areas growth, which result in population growth, increase of built up area, high density of population and it also psychological stage of urban way of life. Uncontrolled momentum of urbanization and land use change raises many issues which might have both positive and negative impacts.**(Mundhe Nitin,2014).**

Rapid urbanization marked by population explosion in the Indian cities can be largely attributed to the large scale rural to urban migration.Due to the uncontrolled urbanization in PMC, environmental degradation has been occurring very rapidly. Land use planning and the pattern of development, relationship between residential areas and industrial areas, commercial and office complex have a considerable impact on the environment.

Pune City is the second largest metropolitan city in the state. This city is changing its character from Pensioner's City to Educational Center, Administrative Center, Industrial Hub and nowadays it is known as IT Center. The city also reflects the change in its ethos from highest number of bicycle users to a large number of automobiles, from Wada culture to large multiplexes and high risers and the growth of slums. The land use and their consequential results such as population density, congestion on roads, fast deteriorating level of services etc. are becoming more and more complex day by day. **(Socio Economic Survey of Pune City : 2008 - 2009)**

3.4 General Land Use of PMC: 1981

In 1981, total population of Pune Municipal Corporation was 1,203,363. The city was known as Pensioners City, Educational Center and Bicycle's City. Maximum area of the city covers by agricultural land and barren land where built up area covers minimum area. This characteristic represents that the progress of Pune Municipal Corporation city was slow and steady as like as a small village.

Table No. 3.1 : General Land Use of PMC : 1981

Sr.No.	General Land Use	1981(sq.km)	in %
1	Agricultural Land	95.29	39.17
2	Barren Land	101.61	41.76
3	Built Up Area	24.92	10.24
4	Forest	20.72	8.52
5	Water Bodies	0.76	0.31
	Total	243.30	100

(Source : Compiled by Researcher)

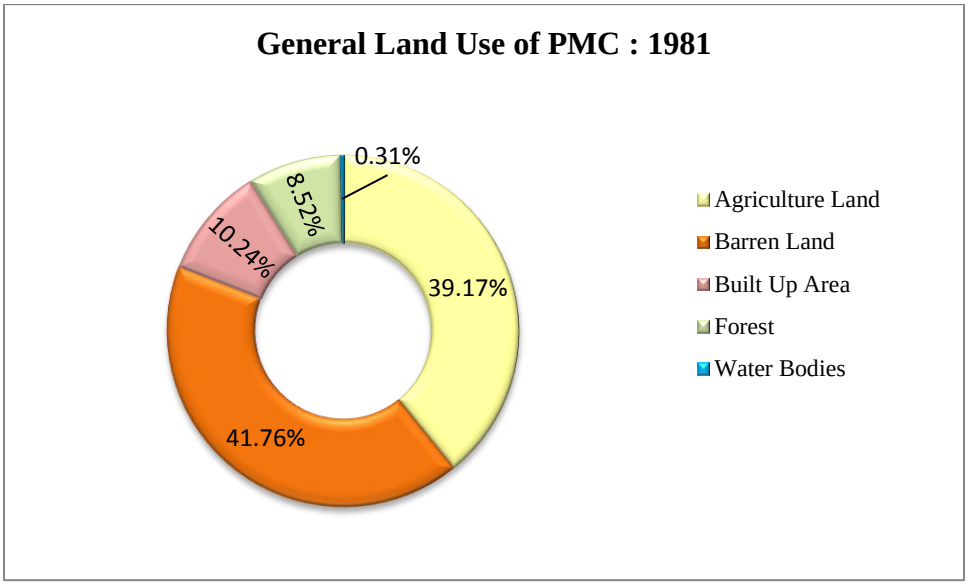
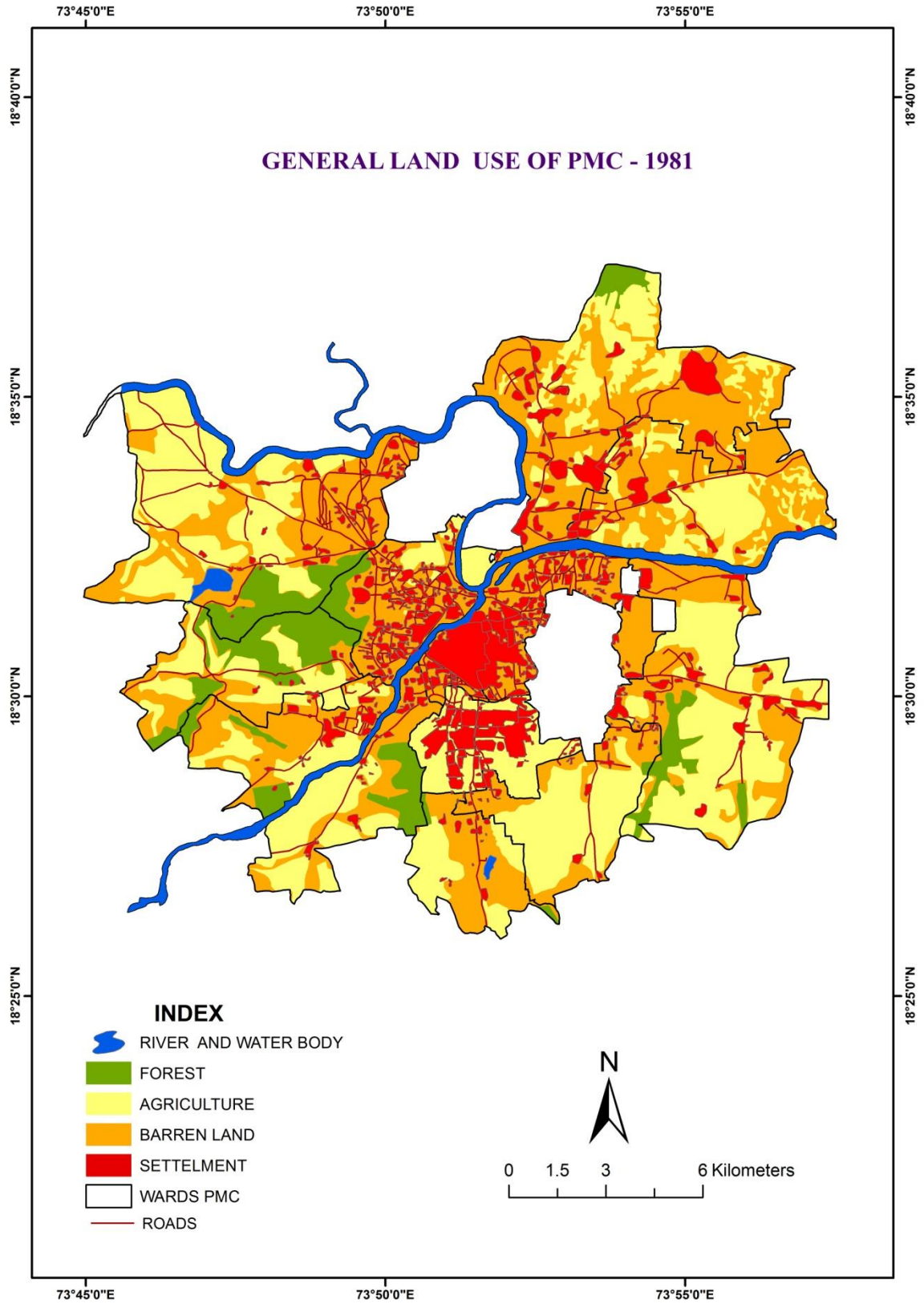


Fig. No. : 3.1

Table No 3.1, Fig. No. 3.1 and Map No. 3.1 signify the General Land Use of PMC for the year 1981. Total geographical area of PMC in 1981 was 243.30 sq.km. Maximum area of the PMC is covered by barren land, it covers 101.61 sq. km area i.e. 41.76 %. Agricultural land covers 95.29sq.km area. In 1981, built up area was covers 24.92 sq.km area, i.e. 10.24 % only. Area under the forest was covered 20.72 sq. km area. Water body covers 0.76 sq.km area.



MAP NO . 3.1 : GENERAL LAND USE OF PMC - 1981

3.4.1 Agricultural Land: 1981

In 1981, PMC has 95.29 sq.km. area under the agriculture. When focused on the distribution of agricultureal area in PMC it is observe that the agricultureal area was found far from the core region of the city where the southeast region, south, southwest region, west, northwest region and northeast region of the PMC cover the agricultureal area. It is also found that the agriculture region was surrounded by the barren land exept west sides argicultureal area.West side's agriculture area was surrounded by forest area.The core area of the city where the mula and mutha river are join together,that confluence area has agricultural area. In 1981 PMC has 39.17 % area under the agriculture that means the people of the city was also busy in primaery sector.The production of crops or vegitabels are gain by this agriculture area.

Table No. 3.2 : Distribution of Agricultural Area of PMC : 1981

Sr. No.	Region of PMC	Administrative Ward	Agricultural Area in %
1	Core Region	B.S.Dhole Patil Road	2.27
		Bhavani Peth	
		Ghole Road	
		Kasba Vishrambagh	
		Sahakarnagar	
2	North West	Aundh	18.65
3	North East	Sangamwadi	27.35
		Yerawada	
4	South	Dhankawadi	4.34
5	South East	Bibvewadi	29.06
		Hadapsar	
6	West	Karve Road	6.51
7	South West	Tilak Road	11.82
		Warje Karvenagar	
		Total	100

(Source : Compiled by Researcher)

Table No. 3.2 shows the distribution of agricultural area of PMC for 1981. According to this table it is find out that there are three regions who has maximum area under agriculture in Pune Municipal Corporation. Southeast region of the city has maximum agricultural area i.e. 29.06%. Northeast region of the city has 27.35 % agriculture area

where northwest region has 18.65 % agriclture aera. The core region of the city has minimum agriculture area i.e. 2.27%.

3.4.2 Barren Land : 1981

Waste land, fallow land and quarries, stony area, unproductive area which has no vegitation are considered as barren land. In 1981, maximum area of PMC has capture by barren land i.e. 41.76 %.The barren land of core region of the city covers by settelment rather than every settelment or built up area of the city was found on barren land in 1981.When move from core region the northeast region of the city has maximum barren land and west region of the city has minimum barren land.

Table No. 3.3 : Distribution of Barren Land of PMC : 1981

Sr. No.	Region of PMC	Administrative Ward	Barren Land in %
1	Core Region	B.S.Dhole Patil Road	25.72
		Bhavani Peth	
		Ghole Road	
		Kasba Vishrambagh	
		Sahakarnagar	
2	North West	Aundh	14.51
3	North East	Sangamwadi	26.13
		Yerawada	
4	South	Dhankawadi	3.66
5	South East	Bibvewadi	15.5
		Hadapsar	
6	West	Karve Road	2.78
7	South West	Tilak Road	11.7
		Warje Karvenagar	
		Total	100

(Source : Compiled by Researcher)

Table No. 3.3 shows the distribution of barren land of PMC for 1981. Maximum area of northeast region of the city has cover by barren land i.e. 26.13 % where the core region of the city has 25.72 % barren land. Southeast region of the city has 15.5% barren land. Minimum area of the west region of the city has covered by barren land i.e. 2.78 % only.

3.4.3 Built Up Area : 1981

In 1981, Pune Municipal Corporation has 10.24 % built up area. Built up area is consist of all types of manmade constructions of Residential buildings, Commercial and services provide buildings, Industrial area, Transportation, Communication and Utilities. Built up area is the area, which was considered as non - agricultural area.

Table No. 3.4 : Distribution of Built Up Area of PMC : 1981

Sr. No.	Region of PMC	Administrative Ward	Built Up Area in %
1	Core Region	B.S.Dhole Patil Road	52.64
		Bhavani Peth	
		Ghole Road	
		Kasba Vishrambagh	
		Sahakarnagar	
2	North West	Aundh	5.84
3	North East	Sangamwadi	23.52
		Yerawada	
4	South	Dhankawadi	1.16
5	South East	Bibvewadi	9.35
		Hadapsar	
6	West	Karve Road	0.75
7	South West	Tilak Road	6.74
		Warje Karvenagar	
		Total	100

(Source : Compiled by Researcher)

Table No. 3.4 despite the distribution of Built Up area of PMC for 1981. Core Region of the city has capture maximum area under built up. From ancient time, this region has settlement with some commercial shops. In fact, origin of the city starts from those small settlements. Core region of the city has 52.64% area under built up. Nearness of Mula - Mutha river and availability of all types of markets (vegetable market, cloth market, gold ornament market, stationary market), government offices, education facilities are centralized here hence this area has maximum built up area. Northeast region of the city has 23.52 % built up area. West region of the city has minimum built up area i.e. 0.75%. Farness from core region, absence of utility services, lack of transport mode and dense forest area this are the reason responsible for the less built up complete in this region in 1981.

3.4.4 Forest : 1981

Pune Municipal Corporation has 8.52 % area under forest in 1981. A forest is a large area of land covered with tress or other woody vegetation. Hill regions, hill top, hill slopes of PMC has cover by forest. Parvati hill, Katraj hill, Chatrushrungi hill this are the some examples which has forest.

Table No. 3.5 : Distribution of Forest Area of PMC : 1981

Sr. No.	Region of PMC	Administrative Ward	Forest area in %
1	Core Region	B.S.Dhole Patil Road	8.04
		Bhavani Peth	
		Ghole Road	
		Kasba Vishrambagh	
		Sahakarnagar	
2	North West	Aundh	20
3	North East	Sangamwadi	5.56
		Yerawada	
4	South	Dhankawadi	1.3
5	South East	Bibvewadi	15.49
		Hadapsar	
6	West	Karve Road	30.16
7	South West	Tilak Road	19.45
		Warje Karvenagar	
		Total	100

(Source : Compiled by Researcher)

Table No. 3.5 shows the distribution of forest area of PMC in 1981. West region of the city has maximum forest area. This region covers 30.16 % area under forest. This was more sufficient forest area cover by this region in 1981, which was necessary for environmental wellness. Northwest region of the city has 20% forest area where southwest region of the city cover 19.45 % area under forest. South region of the city has cover minimum forest area i.e. 1.3 % only.

3.4.5 Water Bodies : 1981

Mula - Mutha these two rivers are found in PMC and both has confluence at the center of the city. Mutha River enters in PMC from southwest side and Mula River enters in city from northwest side. Before both river confluence with each other length of Mula River is 22.37 km and length of Mutha River 10.4 km and after confluence at Sangamwadi the length of Mula-Mutha River is 11.75 km.

For the discussion of water bodies of PMC in 1981, here in these category ponds, lakes and manmade tanks are considered which was distributed over all the study area. In PMC, 0.76 sq.km area under water bodies. Northwest region and South region of the city has water bodies other than river.

3.5 General Land Use of PMC : 2005

The old identity of city's like Pensioners City, Educational Center and Bicycle's City was moved out and new identity like International levels Educational Center, Auto-Hub Pune, Health facility provider Pune was overcome. Maximum area of the city covers by built up area. This characteristic represents the rapid progress of Pune Municipal Corporation from 1981 to 2005.

Table No. 3.6 : General Land Use of PMC : 2005

Sr.No.	General Land Use	2005 (sq.km)	in %
1	Agricultural Land	59.66	24.47
2	Barren Land	26.02	10.67
3	Built Up Area	143.80	58.97
4	Forest	13.92	5.71
5	Water Bodies	0.45	0.18
	Total	243.84	100

(Source : Compiled by Researcher)

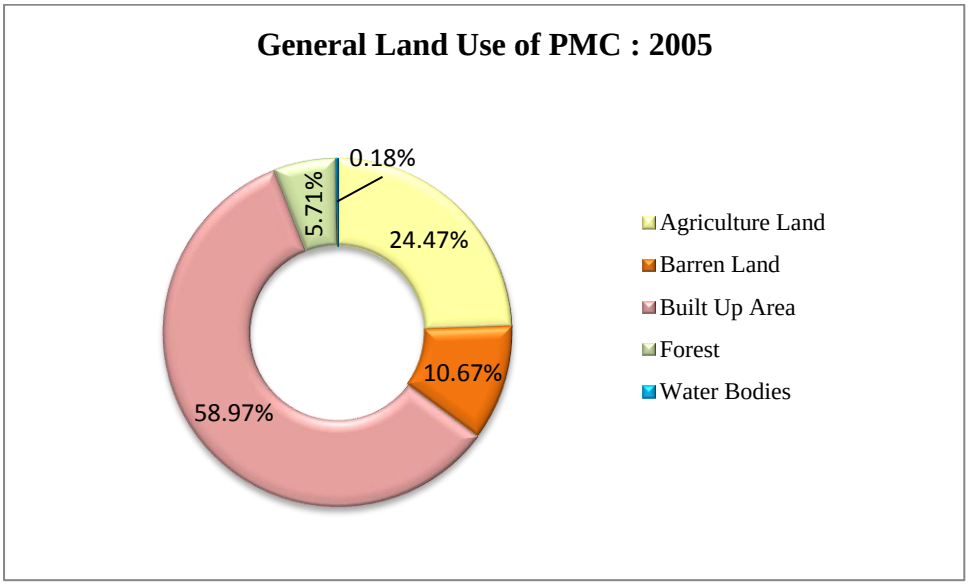
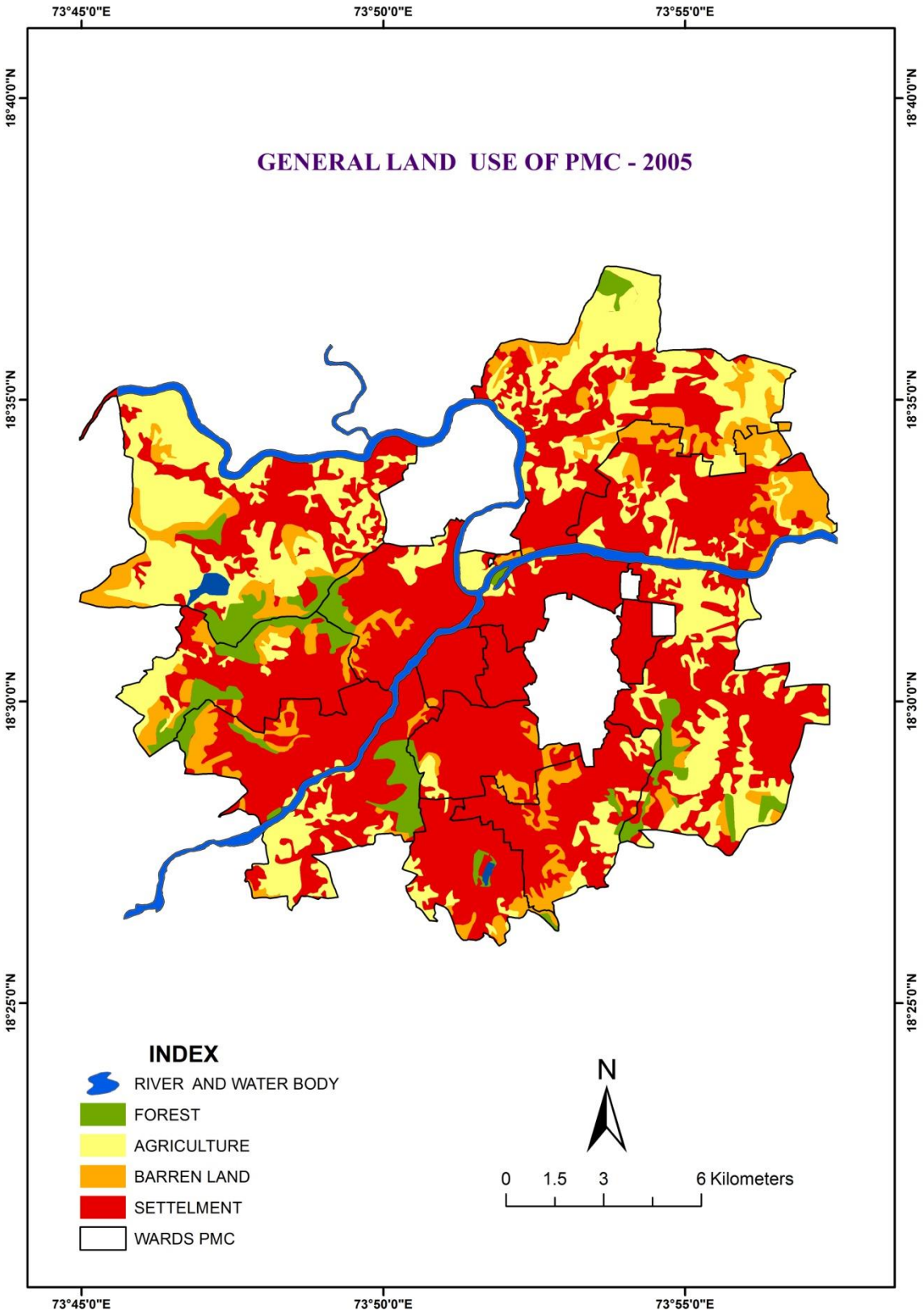


Fig. No. : 3.2

Table No. 3.6, Fig. No. 3.2 and Map No. 3.2 show the General Land Use of PMC for 2005. In 2005, total geographical area of PMC was 243.84 sq.km. Maximum area of city captured by built up. This category covers 143.80 sq.km area i.e. 58.97%. Agricultural area covers 24.47 % area of the city where 10.67 % area cavers by barren land. Area under the forest was 5.71% and minimum area of the city covers by water bodies.



MAP NO. 3.2 : GENERAL LAND USE OF PMC - 2005

3.5.1 Agricultural Land: 2005

Pune Municipal Corporation has 24.47 % area under agriculture in 2005. Pune Municipal Corporation is the city, where the most of the peoples were engaged in secondary sector, tertiary sector and quaternary sector, quinary sector. Hence the land under the agriculture was neglected or dominated. Due to this reason productive land was treated as unproductive and such land use for built up.

Table No. 3.7 : Distribution of Agricultural Area of PMC : 2005

Sr. No.	Region of PMC	Administrative Ward	Agricultural Area in %
1	Core Region	B.S.Dhole Patil Road	4.95
		Bhavani Peth	
		Ghole Road	
		Kasba Vishrambagh	
		Sahakarnagar	
2	North West	Aundh	32.95
3	North East	Sangamwadi	24.58
		Yerawada	
4	South	Dhankawadi	1.49
5	South East	Bibvewadi	24.12
		Hadapsar	
6	West	Karve Road	4.36
7	South West	Tilak Road	7.55
		Warje Karvenagar	
		Total	100

(Source : Compiled by Researcher)

Table No. 3.7 show the distribution of agricultural area of PMC for 2005. Northwest region, northeast region and southeast region of the city has preserved remarkable agricultural area. Northwest region has cover maximum agricultural area i.e. 32.95%. Northeast region of the city has cover 24.58% agricultural area where southeast region of the city cover 24.12% agricultural area. If excluding this three region from PMC, there was no another region was found which cover at least 10% agricultural area. These three regions have some common fact, which combine them in same criteria. This three regions are far from the core region of the city and lack of facilities which was easily available in core part of the city, inadvertence or inattentive by people and planner of the city which

was actually good one for this three region. Hence, this region still maintains its agricultural culture. In 2005, some people of these regions are busy in agricultural sector.

3.5.2 Barren Land : 2005

Barren land was the west land which was never use for agricultureal purpose.Hence any city, place which has such type of barren land, that was convert into built up area. In 2005, barren lands area of PMC was decreases and it was found 10.67 % only.

Table No. 3.8: Distribution of Barren Land of PMC : 2005

Sr. No.	Region of PMC	Administrative Ward	Barren Land in %
1	Core Region	B.S.Dhole Patil Road	5.71
		Bhavani Peth	
		Ghole Road	
		Kasba Vishrambagh	
		Sahakarnagar	
2	North West	Aundh	20.44
3	North East	Sangamwadi	34.84
		Yerawada	
4	South	Dhankawadi	3.56
5	South East	Bibvewadi	14.11
		Hadapsar	
6	West	Karve Road	10.18
7	South West	Tilak Road	11.16
		Warje Karvenagar	
		Total	100

(Source : Compiled by Researcher)

Table No. 3.8 show the distribution of barren land of PMC for 2005. Northeast region of the city has covers maximum area under barren land. This region has 34.84 % barren land. Northwest region of the city cover 20.44 % barren land. This two regions has maximum area under barren category, it means human interfere was less in land utilization of this region. These two regions were far from city, developing process of this region was in progress. Hence this two regions has maximum barren land with compare to reaming regions of the city. Southeast region has 14.11 % barren land where southwest region has 11.16% barren land. IT sectors development, increasing number of research and educational centers, Mumbai - Pune - Bangalore National highway these are the

reason are responsible for the declining the barren land of this both region. South region of the city has minimum area under barren land. This region has 3.56% barren land.

3.5.3 Built Up Area: 2005

In 2005, it was observed that IT -BT sectors are well established in the city, Multiplex Cinema hall, Mall culture was newly appointed in the city. Hence, Pune Municipal Corporation has 58.97 % area under built up in 2005. Number of constructions sites was found beginning and in progress condition in such a period. Various Malls, Multiplex hall, Business Hub centers were construct in this period. Hence in 2005, area under built up was increases and other categories of land like agricultural land, barren land and forest are decreases.

Table No. 3.9 : Distribution of Built Up Area of PMC : 2005

Sr.No.	Region of PMC	Administrative Ward	Built Up Area in %
1	Core Region	B.S.Dhole Patil Road	27.06
		Bhavani Peth	
		Ghole Road	
		Kasba Vishrambagh	
		Sahakarnagar	
2	North West	Aundh	8.84
3	North East	Sangamwadi	23.7
		Yerawada	
4	South	Dhankawadi	5.83
5	South East	Bibvewadi	15.55
		Hadapsar	
6	West	Karve Road	5.52
7	South West	Tilak Road	13.5
		Warje Karvenagar	
		Total	100

(Source: Compiled by Researcher)

Table No. 3.9 show the distribution of built up area of PMC for 2005. Core region of the city has maximum area under the built up. Core region has 27.06% area under built up. This region has large density of settlement and commercial sectors. Northeast region has 23.7% area under the built up. Such region has nearness to Pimpri - Chinchwad Municipal Corporation (PCMC) and farness from central area of the city. Due to low

price of land and low rent of houses, people who not afforded high rent to pay they were migrate and subsist in this region. Maximum number of slums is also finding in this region. Hence, area under built up was high in this region. Southeast region has 15.55% area under built up. This region was under in progressive condition. Hence built up area was increased in this region. Southwest region of the city has 13.5% area under built up. South region and west region of the city show the minimum area under the built up. South region has 5.83% area under built up where west region has 5.52 % area under built up.

3.5.4 Forest : 2005

In 2005, 5.71% area was under the forest. Most of the forest areas of the city were on hill slope and hilltop. When city grows up, settlement spread out from center to outer side of the city and those settlements take shelter on hill slope and hilltop. Hence, area under forest of the city was decline day by day.

Table No. 3. 10 : Distribution of Forest Area of PMC : 2005

Sr.No.	Region of PMC	Administrative Ward	Forest area in %
1	Core Region	B.S.Dhole Patil Road	8.21
		Bhavani Peth	
		Ghole Road	
		Kasba Vishrambagh	
		Sahakarnagar	
2	North West	Aundh	19.78
3	North East	Sangamwadi	4.45
		Yerawada	
4	South	Dhankawadi	3.59
5	South East	Bibvewadi	19.54
		Hadapsar	
6	West	Karve Road	22.1
7	South West	Tilak Road	22.33
		Warje Karvenagar	
		Total	100

(Source : Compiled by Researcher)

Table no 3.10 despite the distribution of forest area of PMC for 2005. Core region, Northeast region and south region of the city has minimum forest area. While Southwest region, west region, southeast region and northwest region has large area under forest.

Southwest region and west region has cover maximum area under forest i.e. 22.33 % and 22.1 %. Northwest and southeast region has 19.78 % and 19.54 % forest area. South region has 3.59 % forest area.

3.5.5 Water Bodies : 2005

In 2005, PMC has 0.18 % water bodies other than river. This indicates that the area of natural water bodies like ponds, lake is decreases. Mula - Mutha Rivers this are only source of natural flowing water and there was no other source of water. Total population of the city was depending on dam's water, which comes through pipeline. Hence people of the city face the water problems in summer and also crisis about water distribution.

3.6 General Land Use of PMC : 2011

In 2011, total population of Pune Municipal Corporation was 3,124,458. Now the city was known for its Multi Specialty Medical Services, Multi National Companies, well developed IT sectors, Cultural hub, MPSC - UPSC study center, well connected to other city by transport mode. Due to this city developed rapidly. Every person wants to be a part of this city. In 2011, total geographical area of the city was 243.96 sq.km.

Table No. 3.11 : General Land Use of PMC : 2011

Sr. No.	General Land Use	2011 (sq.km)	in %
1	Agricultural Land	24.78	10.16
2	Barren Land	14.78	6.06
3	Built Up Area	192.53	78.92
4	Forest	11.19	4.59
5	Water Bodies	0.68	0.28
	Total	243.96	100

(Source : Compiled by Researcher)

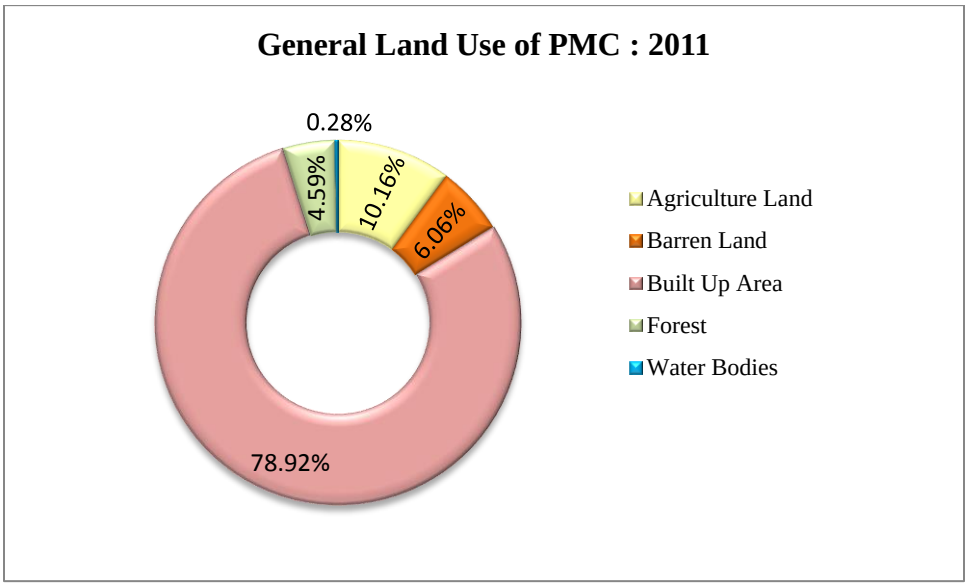
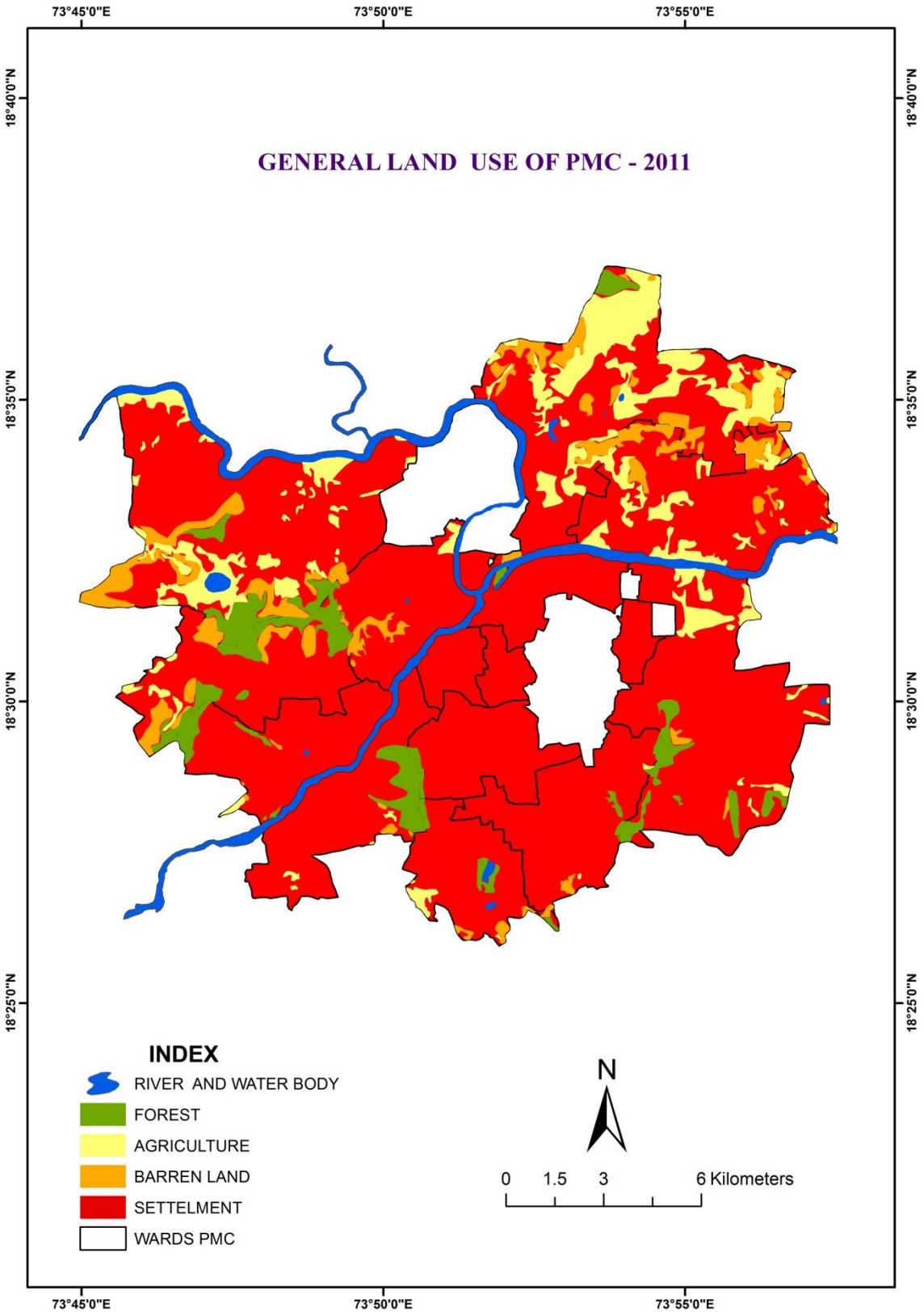


Fig. No. : 3.3

Table No. 3.11, Fig. No. 3.3 and Map No. 3.3 shows the general land use of PMC for 2011. Built up area capture maximum area of the city.PMC has 78.92% built up area. Agricultural area of the city was 10.16 % only where barren land has cover 6.06 % area of the city. PMC has less forest area in 2011 i.e. 4.59% only.



MAP NO. 3.3 : GENERAL LAND USE OF PMC - 2011

3.6.1 Agricultural Land: 2011

Pune city was become a metro city of the India. When city was grown up, then functions of the city also changes. When focused on Pune Municipal Corporation's land utilization, it is observed that the city was engaged in other than agricultural field. Hence, agricultural area has less importance and due to this negligence agricultural area decreases and productive land goes under the built up field. In 2011, PMC has only 10.16 % agricultural area.

Table No. 3. 12 : Distribution of Agricultural Area of PMC : 2011

Sr.No.	Region of PMC	Administrative Ward	Agricultural Area in %
1	Core Region	B.S.Dhole Patil Road	1.28
		Bhavani Peth	
		Ghole Road	
		Kasba Vishrambagh	
		Sahakarnagar	
2	North West	Aundh	24.26
3	North East	Sangamwadi	60.24
		Yerawada	
4	South	Dhankawadi	1.65
5	South East	Bibvewadi	9.28
		Hadapsar	
6	West	Karve Road	2.1
7	South West	Tilak Road	1.19
		Warje Karvenagar	
		Total	100

(Source : Compiled by Researcher)

Table No. 3.12 show the distribution of agricultural area of PMC for 2011. Northeast region of the city has 60.24% agricultural area. Northwest region of the city has 24.26% agricultural area. Other regions of the city have very little area under agricultural activity. Core region of the city has 1.28 % agricultural area, South region has 1.65 % area under agricultural activity, West region of the city has 2.1 % area under agriculture. While southwest region of the city has 1.19 % area under agricultural activity. These all regions agricultural area decline due to good road network, availability of various utility services, increasing population, increases the number of slum area.

3.6.2 Barren Land : 2011

In 2011, total geographical area of PMC was 243.96 sq km. and out of this it has 6.06% area under the barren land. Area under construction was incresases during this period hence barren land was a good option for the developed cities infrastructure. To develope settelment area, to built roads, over bridge, hospitals, institutes, company sectors, shoping mall, to produce entertainment facilities barren lands was used. Hence when area under builtup increases the area under barren decreasess.

Table No. 3.13 : Distribution of Barren Land of PMC : 2011

Sr.No.	Region of PMC	Administrative Ward	Barren Land in %
1	Core Region	B.S.Dhole Patil Road	6.13
		Bhavani Peth	
		Ghole Road	
		Kasba Vishrambagh	
		Sahakarnagar	
2	North West	Aundh	29.14
3	North East	Sangamwadi	43.33
		Yerawada	
4	South	Dhankawadi	2.5
5	South East	Bibvewadi	2.93
		Hadapsar	
6	West	Karve Road	14.46
7	South West	Tilak Road	1.51
		Warje Karvenagar	
		Total	100

(Source : Compiled by Researcher)

Table No. 3.13 show the distribution of barren land of PMC for 2011. Northeast region of the city has maximum area under barren land. It has 43.33% area under barren land. Northwest region of the city has 29.14 % area under barren land and west region of the city has 14.46% barren land. Other regions of the city have minimum area under barren land. Core region has 6.13% , south region has 2.5%, southeast region has 2.93% and southwest region of the city has 1.51% barren land. These regions has large number of built up, hence it was concluded that the barren land capture by built up.

3.6.3 Built Up : 2011

In 2011, Pune Municipal Corporation has 192.53 sq.km area under the built up. Various types of Multinational companies are well established here from last decades, IT - BT Hub's are well developed hence the number of people who works in those companies are increases. Living standard of such people has changed and they need some advanced and modern facilities like Malls, Multiplex Cinema Hall, Luxurious flats with all modern amenities, Row houses. Hence, to full fill this need area under built up was increases and due to this built up area of PMC covers 78.92% area in 2011.

Table No. 3.14 : Distribution of Built Up Area of PMC : 2011

Sr.No.	Region of PMC	Administrative Ward	Built Up Area in %
1	Core Region	B.S.Dhole Patil Road	22.03
		Bhavani Peth	
		Ghole Road	
		Kasba Vishrambagh	
		Sahakarnagar	
2	North West	Aundh	14.52
3	North East	Sangamwadi	18.95
		Yerawada	
4	South	Dhankawadi	4.92
5	South East	Bibvewadi	19.72
		Hadapsar	
6	West	Karve Road	5.69
7	South West	Tilak Road	14.17
		Warje Karvenagar	
		Total	100

(Source : Compiled by Researcher)

Table No. 3.14 show the distribution of built up area of PMC for 2011. Core region of the city has maximum area under built up i.e. 22.03%. Southeast region has 19.72% built up area, northeast region has 18.95% built up area where northwest region has 14.52% built up area and southwest region has 14.17% built up area. South region of the city has minimum area under built up category. It has 4.92% area under built up. West region of the city also has minimum built up i.e. 5.69%.

3.6.4 Forest : 2011

The city has approximately 12% land under hilltop and hill slope and this hilltop and hill slopes are cover by forest. In 2011, PMC has 4.59 % forest area. Rapid urbanization, increasing population and increasing number of slum area this are the main reasons to declining the forest area of the city. All the educational centers, hospitals and residential area captures the land under the forest.

Table No. 3.15 : Distribution of Forest Area of PMC : 2011

Sr. No.	Region of PMC	Administrative Ward	Forest Area in %
1	Core Region	B.S.Dhole Patil Road	7.56
		Bhavani Peth	
		Ghole Road	
		Kasba Vishrambagh	
		Sahakarnagar	
2	North West	Aundh	19.36
3	North East	Sangamwadi	5.12
		Yerawada	
4	South	Dhankawadi	3.57
5	South East	Bibvewadi	21.75
		Hadapsar	
6	West	Karve Road	23.73
7	South West	Tilak Road	18.91
		Warje Karvenagar	
		Total	100

(Source : Compiled by Researcher)

Table No. 3.15 shows the distribution of forest area of PMC for 2011. In 2011, total area of PMC was 243.96 sq km and out of this total area only 12% area was covered by forest. According to this table it is highlighted that the west region, southeast region, northwest region and southwest region of the city has forest area which was greater than at least 15%. West region of the city has maximum forest area, which is 23.73 %. Southeast region of the city has 21.75% forest area. Northwest region of the city has 19.36 % forest while southwest region has 18.91 % forest. South region of the city has minimum forest area i.e. 3.57% only.

3.6.5 Water Bodies : 2011

In 2011, PMC has 0.28 % water bodies other than river. Water bodies other than river like lakes, ponds are protected and developed by PMC. Hence, the area under water bodies is increases. This lakes are become tourist point and number of people are visit to this point. Hence from last few years PMC actively involve to protect and develop the condition of this natural water bodies.

3.7General Land Use of PMC : 2013

Pune Municipal Corporation's huge development is seen in 2013.Now the outer boundary of PMC is described from Gahunje. The village Gahunje now familiar to whole world because of its Gahunje CricketStadium. Like this village, all villages of outer side of PMC now include in PMC. This is sign of horizontal growth of the city.

Table No. 3.16 : General Land Use of PMC : 2013

Sr. No.	General Land Use	2013 (sq.km)	in %
1	Agricultural Land	24.33	9.97
2	Barren Land	8.92	3.66
3	Built Up Area	198.78	81.48
4	Forest	11.08	4.54
5	Water Bodies	0.84	0.34
	Total	243.96	100

(Source : Compiled by Researcher)

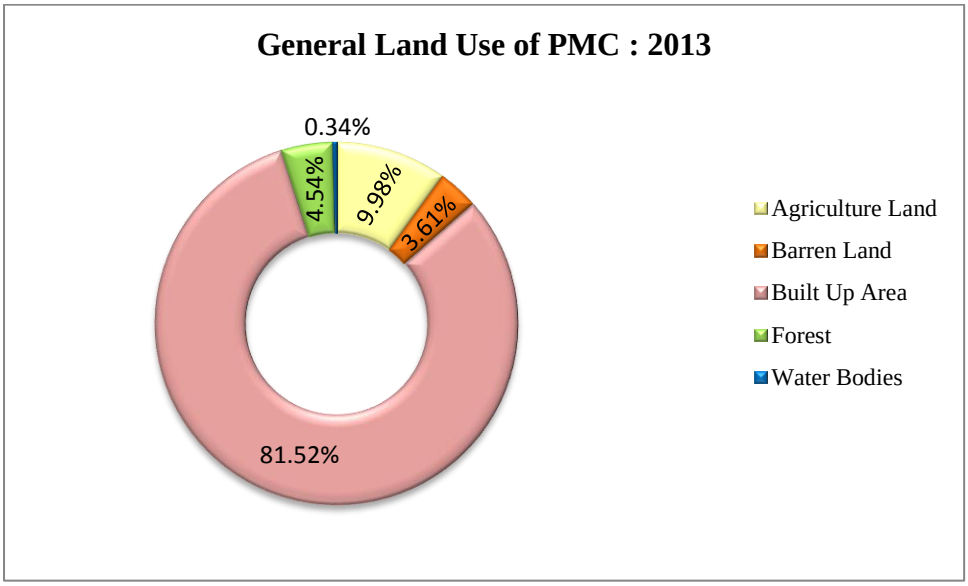
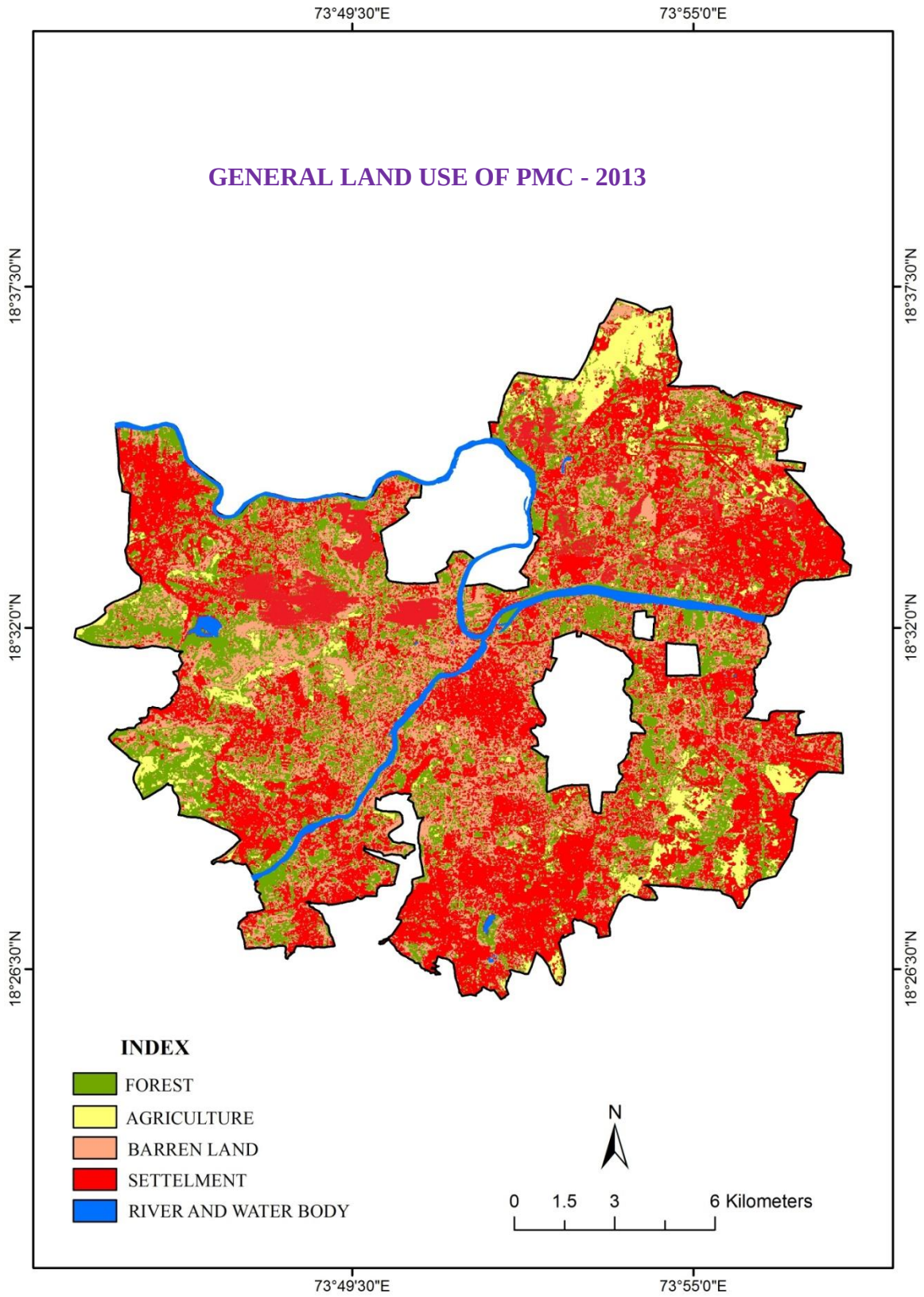


Fig. No. : 3.4

Table No. 3.16, Fig. No. 3.4 and Map No. 3.4 shows the general land use of PMC for 2013.In 2013, Built up area capture maximum area of the city.PMC has 81.48% built up area. Agricultural area of the city is 9.97 % only where barren land has cover 3.66% area of the city. PMC has less forest area in 2013 i.e. 4.54% only.



MAP NO. 3.4: GENERAL LAND USE OF PMC - 2013

3.7.1 Agricultural Land: 2013

Now Pune city is International City,which have huge industries in Software, number of IT companies, International Level's Sports Stadium. If focused on city by its functional variation, it is find that city is busy in tertiary, quaternary sector and quandary sector. Now the land under agriculture is found far from core region of the city and outside or on the boundary of the city.In 2013 PMC has 24.33 sq.km area under agriculture.

Table No. 3. 17 : Distribution of Agricultural Area of PMC : 2013

Sr.No.	Region of PMC	Administrative Ward	Agricultural Area in %
1	Core Region	B.S.Dhole Patil Road	0.49
		Bhavani Peth	
		Ghole Road	
		Kasba Vishrambagh	
		Sahakarnagar	
2	North West	Aundh	24.25
3	North East	Sangamwadi	59.88
		Yerawada	
4	South	Dhankawadi	1.19
5	South East	Bibvewadi	8.55
		Hadapsar	
6	West	Karve Road	2.01
7	South West	Tilak Road	3.62
		Warje Karvenagar	
		Total	100

(Source : Compiled by Researcher)

Table No. 3.17 shows the distribution of agricultural area of PMC for 2013. North East region of the PMC has maximum area under agriculture. This region has 59.88 % area under agriculture. This region is outlying from core region of the city and far from the influence of core regions economical activities hence, people of this region found busy in primary sector. North West region of the city has 24.25 % area under agriculture. South East region of the city has 8.55% area under agriculture. Bibvewadi and Hadapasr his two administrative wards are includes in this region. Agricultural products of this regions are reach in market in day to day schedule. Hence this region still found in agricultural activities. South West region of the city has 3.62 % area under agriculture. West region of the city has 2.01% area under agriculture where, Core region of the city has 0.49 % area under agriculture.

3.7.2 Barren Land : 2013

In 2013, total geographical area of PMC was 243.96 sq km. and out of this it has 3.66 % area under the barren land. Due to rapid growth of city area under baren consum day by day. Number of Malls, Intertainment Facilities, Sport Stedium are incrises in the city and barren land was mostly used for this utilities. Hence the area under barren decreasess.

Table No. 3.18 : Distribution of Barren Land of PMC : 2013

Sr.No.	Region of PMC	Administrative Ward	Barren Land in %
1	Core Region	B.S.Dhole Patil Road	2.02
		Bhavani Peth	
		Ghole Road	
		Kasba Vishrambagh	
		Sahakarnagar	
2	North West	Aundh	14.01
3	North East	Sangamwadi	55.83
		Yerawada	
4	South	Dhankawadi	2.02
5	South East	Bibvewadi	3.25
		Hadapsar	
6	West	Karve Road	21.64
7	South West	Tilak Road	1.23
		Warje Karvenagar	
		Total	100

(Source : Compiled by Researcher)

Table No. 3.18 shows the distribution of barrenland of PMC for 2013. North East region of the city has maximum barren land. This region has 55.83% barren land of the city. West region of the city has 21.64 % area under barren. North west region of PMC has 14.01 % area under barren. North East region, West region and North West region this are far from core region and some barren area of this three regions are either on hill and hill slop or government / corporations belongings. Core region of the city has 2.02 % where South East region has 3.25 % barren land. South West region of the city has minimum barren land, it has 1.23 % barren land.

3.7.3 Built Up : 2013

In 2013, Pune Municipal Corporation has 198.79 sq.km area under the built up. IT - BT Hub's area increases. Number of companies of software as well as manufacturing is established in the city with Malls, Multiplex Cinema Hall, Luxurious flats and Sports Stadiums. Hence, area under built up is increases and due to this built up area of PMC covers 81.48% area in 2013.

Table No. 3.19 : Distribution of Built Up Area of PMC : 2013

Sr.No.	Region of PMC	Administrative Ward	Built Up Area in %
1	Core Region	B.S.Dhole Patil Road	21.84
		Bhavani Peth	
		Ghole Road	
		Kasba Vishrambagh	
		Sahakarnagar	
2	North West	Aundh	15.10
3	North East	Sangamwadi	19.26
		Yerawada	
4	South	Dhankawadi	4.96
5	South East	Bibvewadi	19.36
		Hadapsar	
6	West	Karve Road	5.63
7	South West	Tilak Road	13.85
		Warje Karvenagar	
		Total	100

(Source : Compiled by Researcher)

Table No. 3.19 show the distribution of built up area of PMC for 2013. Core region of the city has cover maximum area under built up, this area has 21.84 % area under built up.South East region and North East region has approximate same area under the built up. South East region of the PMC has 19.36 % area under built up while North East region has 19.26 % area under built up. This two regions are under the devloping and many construction siets are still busy in construction. Next decaeds this regions may be fully covered by built. North West region of the city has 15.10 % area under built up.South west region of the city has 13.85 % area under the built up. West region of the city has 5.63 % area under built up where South region has 4.96 % area under built up.

3.7.4 Forest : 2013

The Forest area of the city is found only on hilltop and hill slope of the city. In 2013, PMC has 4.54 %forest area. Rapid urbanization, increasing population and increasing number of slum area this are the main reasons to declining the forest area of the city.

Table No. 3.20 : Distribution of Forest Area of PMC : 2013

Sr. No.	Region of PMC	Administrative Ward	Forest Area in %
1	Core Region	B.S.Dhole Patil Road	6.59
		Bhavani Peth	
		Ghole Road	
		Kasba Vishrambagh	
		Sahakarnagar	
2	North West	Aundh	28.16
3	North East	Sangamwadi	5.14
		Yerawada	
4	South	Dhankawadi	3.07
5	South East	Bibvewadi	20.58
		Hadapsar	
6	West	Karve Road	23.83
7	South West	Tilak Road	12.64
		Warje Karvenagar	
		Total	100

(Source : Compiled by Researcher)

Table No. 3.20 shows the distribution of forest area of PMC for 2013. North West region of the city has maximum area under built up. This region has 28.16 % area under forest. West region of the city has 23.83 % area under forest. South East region has 20.58 % area under forest. South West region of the city has 12.64 % forest while Core region of the city has 6.59 % area under forest and North East region of the city has 5.14 % area under forest. South region of the city has 3.07 % area under forest.

3.7.5Water Bodies : 2013

In 201, PMC has 0.34 % water bodies other than river. Water bodies other than river like lakes, ponds are protected and developed by PMC. Hence, the area under water bodies is increases.

3.8General Land Use Trend of PMC : 1981 to 2013

Pune Municipal Corporation shows rapidly changes from 1981 to 2011. In this thirty decades PMC generate its new identity. The journey of the city starts with Pensioners Pune and now it reach and develop its new identity i.e. IT Pune, Oxford of East, excellent Medical Facility provider city. People of SARC countries and all over the worlds are come in this city for job, medical facility and education. Hence nature of land use changes rapidly.

Table No. 3.21 : General Land Use Trend of PMC : 1981 to 2013

Sr.No.	General Land Use	1981 in %	2005 in %	2011 in %	2013 in %
1	Agricultural Land	39.17	24.47	10.16	9.97
2	Barren Land	41.76	10.67	6.06	3.66
3	Built Up Area	10.24	58.97	78.92	81.48
4	Forest	8.52	5.71	4.59	4.54
5	Water Bodies	0.31	0.18	0.28	0.34
	Total	100	100	100	100

(Source : Compiled by Researcher)

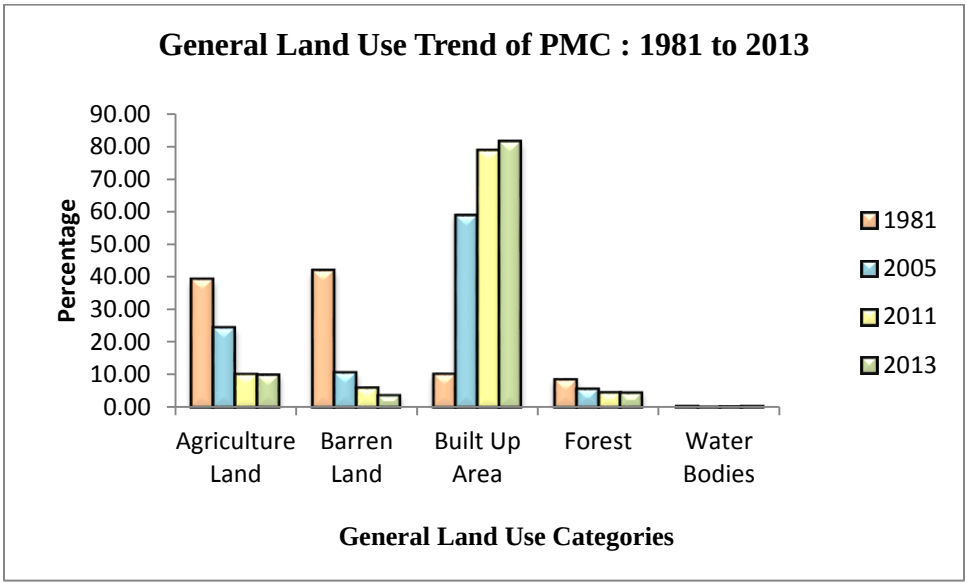


Fig. No. : 3.5

Table No. 3.21 and Fig. No. 3.5 shows the General Land Use Trend of PMC from 1981 to 2013. From 1981 to 2013, major changes are occurred in the city. Built up area increases rapidly with consuming agriculture land, barren land and forest area.

Agriculture area decreases rapidly, in 1981 PMC has 39.17 % agriculture area which was decrees and remain 24.47 % till 2005 and continuously declining the rate and reach at the 10.16 % in 2011. In 2013, PMC has 9.97 % area under agriculture. Likewise, about the barren land of the city, in 1981 barren land cover the maximum area of PMC i.e. 41.76 %, which were decreases and in 2005 it was reach on 10.67 % and in 2011 it was reach on 6.06 % and in 2013 PMC has 3.66% area under barren land. These rapid changes of land are force to decide the things, which are going on, are right or wrong. On one side of coin, the agricultural area decreases rapidly, barren land occupied by built up, hilltop and hill slopes are captured by built up. Hence, productive land cover by built up and the quality of such land set out permanently. But this built up area enclose the number of Educational Center, Research Center, Hospitals, IT sectors, Business Hub, Industries, Residential areas, Sports Stadium, Hotels, Transportation facilities, Recreational centers, Public and semi-public areas. Built up area widen from 1981 to 2013. In 1981, PMC has 10.24 % area under the built up area, which was increase, and this class capture maximum area of the city. In 2005, PMC has 58.97 % area under the built up, in 2011 it was set on 78.92% and in 2013, PMC has 81.48% area under built up.

In Pune Municipal Corporation, from 1981 to 2013 built up area increases rapidly, agricultural area decreases. Barren land capture by built up. This all changes occur only by Built up, but there were number of reasons are available which explains the growth of city or why this city face the condition of increasing built up and decreasing other land categories. Some of them are as follows

1. Educational Center, Research Center, Hospitals, IT sectors, Business Hub, Industries, Residential areas, Transportation facilities, recreational centers this all facilities are easily available in PMC. This all are become pull factors of migration. Number of peoples migrates and stables in this city. To fulfill all those people's housings needs barren land, agricultural lands are captured and that land was permanently convert into built up land.
2. Large numbers of Multinational Companies are established in the city. Expansion of industrial and trading activities by multinational companies leads to creation of employment opportunities and rising the standard of living. The people of those

are works in IT, follow the modern westernize culture. This people are wants some advanced and modern facilities like Malls, Multiplex Cinema Hall, Luxurious flats with all modern amenities, Row houses. Hence, the built up area was increases to provide all those facilities.

3. Water Supply is one of the most important motivations for increasing urbanization in PMC. Water is main source to survive human being. In ancient period, the settlement was situating near the riverbank. From 1981 to 2011, Pune Municipal Corporation always attentive about the water supply to citizens. Pune Municipal Corporation has three main water bodies Khadakwasla, Pashan Lake and Katraj Lake. Khadakwasla dam is the main source of water for Pune City and another three more dams like Panshet, Warasgaon and Temghar have been constructed on the same river, upstream of Khadakwasla. Right bank canal and closed pipeline from Khadakwasla dam are arranged for water supply to city. Forest Department and Pune Municipal Corporation are jointly worked on to conservation and development of catchment of Khadakwasla near the Sinhagad fort and its surrounding area. Pune Municipal Corporation has Parvati water works, Warje water works (old and new), Wagholi water works and approximate 20 pumping stations. Water is supplied to different parts of the city through a network of this pumping stations and pipelines. Total length of those pipelines is approximate 2400 km. Several large water storage tanks have been built in different parts of Pune. Due to regular and good quality water's supply, number of people who migrate in city was situated here. However, this regular water supply creates some social impact. Number of construction sites was increased and agriculture lands, barren lands, forest of the city are occupied for built up. Built up area of the PMC increased rapidly from 1981 to 2013.
4. Road Network of PMC is one of the reason to increases built up in the city. Pune-Mumbai National Highway (NH-4), Pune - Bangalore National Highway (NH-9), Pune - Ahamednagar - Aurangabad State Highway, Pune - Nasik State Highway, Pune - Solapur State Highway, Katraj - Dehu Road Bypass this roads are play an vital role in city. Due to this roads, people of the city move daily city to out of city and back again to city. City bus, Auto, Private Carrier and personal vehicle this

facility is available to move on. Peoples are settle in city for their children's education, city's convenience and availability of utility services and they move daily up down for their city's outsides job. People of the outsides area of the city are also interesting to migrate in city. Hence in city, incoming force of people is maximum than outgoing force. This migration is happen very easily and smoothly.

5. Social wellness and safety this is one of the reasons to increases population and built up of the city. People of different cultures, language and religions are settling here and all of them respect and enjoy each other's culture and involve each other's religious occasions. Hence, people of outside of the city are highly fascinated to live in this city.
6. Pune Municipal Corporation also known for its artistic nature. Dance, Music, Film making, Acting, Books Publishing, various Symposium. The various people who related to such activities are interested to live in city. In PMC, number of academy or classes are founds which are busy to coaching of music and dance. For example, Salil Kulkarnie's Music Academy, Dev Music Academy. Hence people who are interested in such field are settle in PMC. The demand of such academies increases day by day in the city.
7. Pune Municipal Corporation also famous for its sport culture. Deccan Gym Khana, Ganesh Kala Krida Munch, Sanas Ground, Balewadi Stadium and Gahunje Cricket Stadium this are some examples where the sports facilities are available.

3.9Change in General Land Use of PMC : 1981 to 2013

Pune Municipal Corporation is one of the most important Corporation in Maharashtra after Mumbai Corporation. From 1981 to 2013 various changes are occur in PMC. Increasing population of the city is main reason to changes land use of the city. In PMC, 1981 to 2013 general land use change is observe in step by step. Each change in land use category has its own characteristics.

3.9.1 Change in General Land Use of PMC : 1981 to 2005

Table No 3.22 and Fig No.3.6 shows the Change in General Land Use of PMC from 1981 to 2005. Agricultural land decreases from 1981 to 2005. Total area under the agriculture was 39.17% in 1981 which was decreases by 14.7 % and in 2005 it was found 24.47%. Barren land was decreases by 31.09% from 1981 to 2005. Area under the forest also decreases by 2.81% from 1981 to 2005. In 1981, total area under the forest was 8.525 % and in 2005 it was found 5.71%. In 1981, 0.31 % area 2 was under Water Bodies which was decreases by 0.13 % and in 2005 it was found 0.18% only. Area under Built up was only one category which was increases from 1981 to 2005. Built up area increases by 48.73% from 1981 to 2005. In 1981, area under built up was 10.24 % which was increases and found 58.97% in 2005.

Table No.3.22 : Change in General Land Use of PMC : 1981 to 2005

Sr.No.	General Land Use	1981 in %	2005 in %	Change from 1981 to 2005 in %
1	Agricultural Land	39.17	24.47	-14.7
2	Barren Land	41.76	10.67	-31.09
3	Built Up Area	10.24	58.97	48.73
4	Forest	8.52	5.71	-2.81
5	Water Bodies	0.31	0.18	-0.13

(Source : Compiled by Researcher)

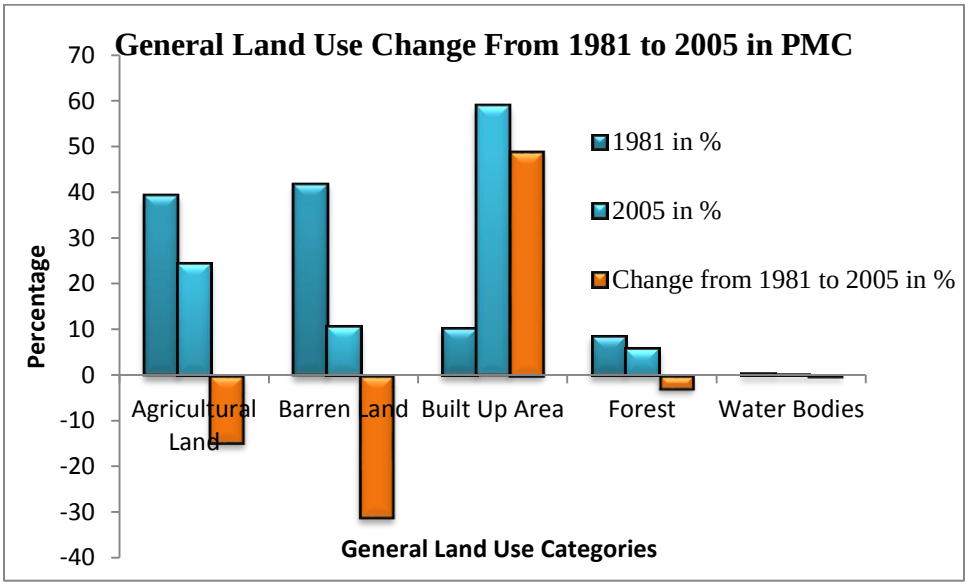


Fig. No. 3.6

3.9.2 Change in General Land Use of PMC : 2005 to 2011

Table No 3.23 and Fig No 3.7 shows the Change in General Land Use of PMC from 2005 to 2011. Area under agriculture activity was decreases by 14.31 % from 2005 to 2011, in 2005, 24.47 % area was under the agriculture and in 2011 it was found 10.16 % . Barren land decreases by 4.61 % from 2005 to 2011. Forest area was decreases from 2005 to 2011 by 1.12%. In 2005 area under forest was 5.71% which was found 4.59 % in 2011. Water bodies increases from 2005 to 2011 by 0.1 %, in 2005 area under water bodies was 0.18 % which was found 0.28 % in 2011. Built up area was an increase by 19.95 %. In 2005, 58.97 % area was under built up which was found 78.92 % in 2011.

Table No. 3.23: Change in General Land Use of PMC : 2005 to 2011

Sr.No.	General Land Use	2005 in %	2011 in %	Change from 2005 to 2011 in %
1	Agricultural Land	24.47	10.16	-14.31
2	Barren Land	10.67	6.06	-4.61
3	Built Up Area	58.97	78.92	19.95
4	Forest	5.71	4.59	-1.12
5	Water Bodies	0.18	0.28	0.1

(Source : Compiled by Researcher)

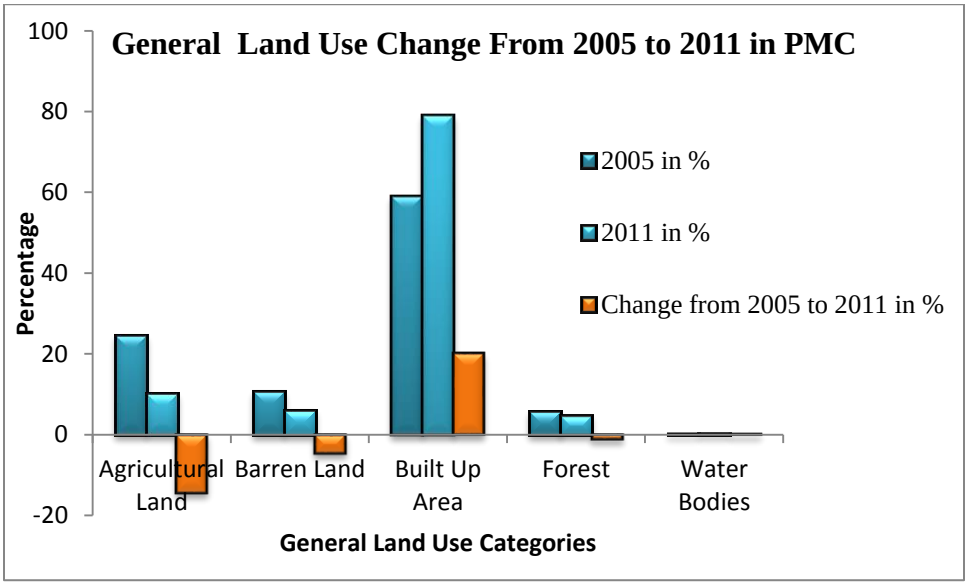


Fig. No. 3.7

3.9.3 Change in General Land Use of PMC : 2011 to 2013

Table No 3.24 and Fig No 3.8 shows the Change in General Land Use of PMC from 2011 to 2013. Area under agriculture activity was decreases by 0.19 % from 2011 to 2013, in 2011, 10.16 % area was under the agriculture and in 2013 it was found 9.91 % . Barren land decreases by 2.4 % from 2011 to 2013. Forest area was decreases from 2011 to 2013 by 0.05 %. In 2011 area under forest was 4.59 % which was found 4.54 % in 2013. Water bodies increases from 2011 to 2013 by 0.06 %, in 2011 area under water bodies was 0.28 % which was found 0.34 % in 2013. Built up area was an increase by 2.56 %. In 2011, 78.92 % area was under built up which was found 81.48 % in 2013.

Table No. 3.24 : Change in General Land Use of PMC : 2011 to 2013

Sr.No.	General Land Use	2011 in %	2013 in %	Change from 2011 to 2013 in %
1	Agricultural Land	10.16	9.97	-0.19
2	Barren Land	6.06	3.66	-2.4
3	Built Up Area	78.92	81.48	2.56
4	Forest	4.59	4.54	-0.05
5	Water Bodies	0.28	0.34	0.06

(Source : Compiled by Researcher)

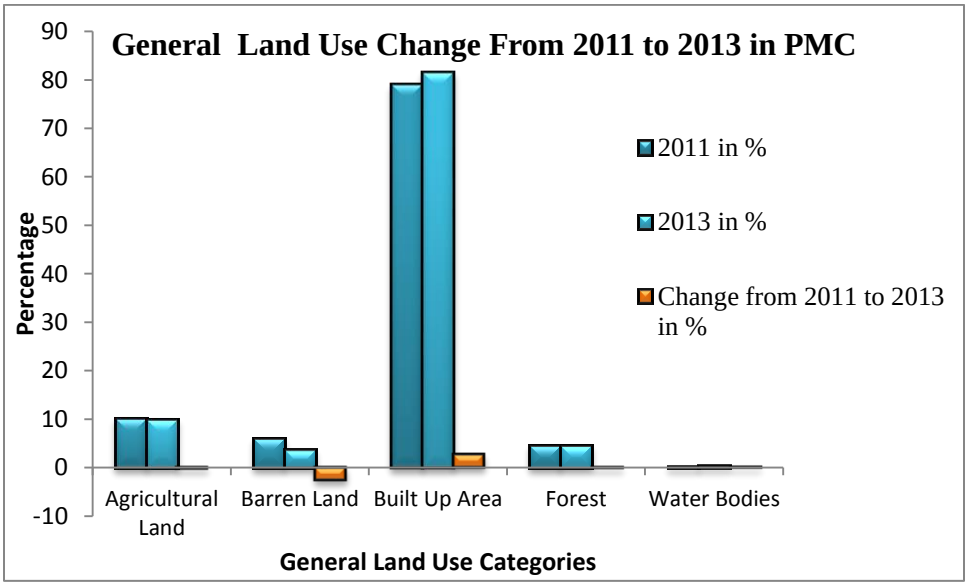


Fig. No. 3.8

3.10 Rate of Change of General Land Use of PMC : 1981 to 2013

The rate of change of general land use of PMC has two results either increasing rate or decreasing rate. Table No 3.25 shows the Rate of Change of General land Use of PMC from 1981 to 2013. In 1981, PMC has 95.26 sq.km area under agriculture and in 2005 it was reach at 59.66 sq.km , i.e. from 1981 to 2005 the rate of decrees of agricultural land was 40.34 % and from 2005 to 2011 this rate of change increases i.e. from 2005 to 2011 agricultural land decreases and the rate of decreases of agricultural land was 75.22%. From 2011 to 2013 rate of agricultural land change is again increases and from 2011 to 2013 in this short span the rate of change is 75.67 %.

Table No.3.25 : Rate of Change of General Land Use of PMC : 1981 to 2013

Year	Agri. Land in sq.km	Rate of Change in %	Barren Land in sq.km	Rate of Change in %	Built Up Area in sq.km	Rate of Change in %	Forest in sq.km	Rate of Change in %	Water Bodies in sq.km	Rate of Change in %
1981	95.26	-	101.61	-	24.92	-	20.72	-	0.76	-
2005	59.66	-40.34	26.02	-73.98	143.80	43.8	13.92	-86.08	0.45	-99.55
2011	24.78	-75.22	14.78	-85.22	192.53	92.53	11.19	-88.81	0.68	-99.32
2013	24.33	-75.67	8.92	-91.08	198.79	98.79	11.08	-88.92	0.84	-99.16

(Source : Compiled by Researcher)

Rate of change of barren land was increases. From 1981 to 2005, rate of decreases of barren land was 73.98% where from 2005 to 2011 it was found 85.22% and from 2011 to 2013 the rate of change of barren land is 91.08%. The total geographical area of PMC was 243.30 sq.km in 1981 and out of this 24.92 sq.km area was under built up. In 2005, built up area were increases and 143.80 sq.km area of PMC was under built up. The rate of change of built up was 43.8% from 1981 to 2005. In 2011, built up area capture maximum area of the city and in 2011, PMC has 192.53 sq.km area under built up, i.e. the rate of change of built up area was 92.53% from 2005 to 2011 where in 2011 to 2013 the rate of change of built up area is 98.79 %

When focused on rate of change of forest it is observed that from 1981 to 2005 the rate of decreases of forest was 86.08 % and from 2005 to 2011 the rate of decreases of forest was 88.81 %. From 2011 to 2013 the rate of change of forest area is 88.92 %. Likewise forest area water bodies also has decreasing rate from 1981 to 2011. In PMC, from 1981 to 2005 the rate of decreasing of water bodies was 99.55% where , from 2005 to 2011 the rate of change of water bodies was 99.32% and from 2011 to 2013 the rate of change of water bodies is 99.16%.

3.11 Changing Characteristics of Urban Land Use in PMC : 1981 to 2013

Land Use of Pune Municipal Corporation changes quickly from 1981 to 2013. This change has some unique characteristics. Growth of the city is not depend on any single reasons. Many more reasons are combine together and leave its impact on city's growth. Hence, the changes in urban land use of the PMC has some characteristics. This characteristics are explains the trend of change of the city's infrastructure.

1. From 1981 to 2013, if focused on the characteristics of land use of PMC, it is observe that built up area increases and other categories of land was decreases. It means built up area capture the other land categories. Built up area consist of settlement, hospitals, research centers, IT, MNC and Business Hub, rode network. Hence, it is conclude directly that the city skip the primary sector, secondary sector and most of the people busy in tertiary, quaternary sector and quinary sector.
2. Built up area of the city increases with consuming maximum barren land of the city. Residential Plaza, Shopping Malls, Hospital, Industries, Education institutes, Research Centers are built on barren land and agricultural land. Hospitals of private sectors and PMC's hospitals are built on this barren land. PMC's hospital provide all medical services in minimum price which is really helpful to common people and the people below the poverty line. Hence, in this way, the assessment of that barren land is satisfying. Such land is accessible for every people to use in different way.

3. Center of Police Research, Indian Institute of Science Education and Research (IISER), Center for Climate Change Research / Indian Institute of Tropical Meteorology, Agharkar Research Institute this are few examples which was give the contribution to nations improvement are in Pune City. All those research center was built on huge barren and agriculture land.
4. From 1981 to 2013 it was observe that housing types are changes. Vada, Chawal this type's housing system are fade away with time and 'all amenities are at one resident' types housing systems demand increases. Hence, the area under built up has big resident complex with swimming pool, gym, cultural hall, children's park.
5. The mall culture in the society is created due to shopping, roaming, enjoying movies and entertainment. Mall as a single - point destination for shopping, food and entertainment appeal simultaneously to the browsing, the brand conscious, the quality conscious, the ambience seeking, the discount seeking and the impulsive buyers. International brands of reputed companies are available in mall. These cities are known as IT industrial hubs and the income level of IT people is higher than the level in rural and some urban areas. Such people who works in MNC and IT companies has high living standard hence they choose to visit mall for shopping. Hence when focused on built up tendency of city it was noticed that the built up of the city not only consist of residential area but also consist of shopping plaza and malls, entertainment's spot. In PMC, Phoenix Market City, Season Mall, Central, Amanora Mall, Inorbit Mall, Reliance this malls chains are available over all the city.
6. To improve the infrastructure of the city, roads are get construct wider, to solve traffic problem bridge are constructed, underground walking way facility also available. The rate of built up of PMC is increases due tothis reasons.
7. Area under built up is not only used for settlement but also use for Fire station, blood bank, markets, government offices, and NGO. The category of land changes from 1981 to 2013. Barren land, agriculture land convert into built up but quality and use of such land also improve in those years.

3.12 Ward wise General Land Use of PMC : 1981 - 2013

Urbanization, in conventional terms, refers to the process through which society is transformed from rural to urban areas. It is broadly defined as a growth of towns and increasing ratio of rural to urban population of a country. Urbanization usually brings with it regional prosperity as the provision of infrastructure facilities. It stimulates the development of locally available resources, increasing regional income and the level of employment. Although, it provides new economic opportunities through providing several infrastructural facilities but also responsible to create new problems.

Urbanization is one of the dynamic and serious issues at present because rapid urbanization results the haphazard and unplanned growth of cities. The pressure of an ever-growing population becomes a burden on the limited public facilities, which are virtually collapsing; there is the need to balance present requirements of land with available facilities while considering future needs. Urbanization is a process through which the productive agricultural land, forests and surface water bodies are being irretrievably decreasing. ***(Tali J.A.,2012)***

Land use is the human use of land. Land use involves the management and modification of natural environment or wilderness into built environment. It has also been defined as ' The arrangements, activities and inputs of people undertake in a certain land cover type to produce, change or maintain it.'

Remote Sensing (RS) and Geographic Information System (GIS) has an ability to assimilate divergent source of data spatial and non spatial. It is eventually has helped in analyzing t5he data showing change in land use pattern of Pune Municipal Corporation (PMC) from 1981 to 2011. In last 30 years, Pune has witnessed fast growth. The urban growth of the city has transformed most of the agricultural land, barren land of city into industrial, commercial and residential area. This analysis has helped in understanding and comparing the changes in the land use patterns in these years along with suggesting planning for utility services.

3.12.1 Ward wise General Land Use of PMC : 1981

General land use of PMC in 1981 is shown in Table No. 3.26. In 1981, Total geographical area of the city was 243.30sq.km. Out of this total geographical area 95.29

sq km area was under agriculture, 101.61 sq. km area was under barren land , where 24.92 sq.km area was capture by built up. Forest area covers 20.72 sq,km area while 0.76 sq.km area was under water bodies.

Table No. 3.26 : Ward wise General Land Use of PMC : 1981

Sr. No	Ward Name	General Land Use Categories					1981 TGA (sq. km)
		Agriculture	Barran	Built up	Forest	Water Body	
1	Aundh	17.77	14.74	1.46	4.14	0.62	38.73
2	B.S. Dhole Patil	0.00	10.22	2.42	0.00	0.00	12.64
3	Bhavani Peth	0.00	2.15	0.64	0.00	0.00	2.79
4	Bibvewadi	9.92	11.47	0.36	0.38	0.00	22.13
5	Dhankawadi	4.14	3.72	0.29	0.27	0.14	8.56
6	Ghole Road	2.16	6.92	3.44	1.39	0.00	13.91
7	Hadapsar	17.77	4.29	1.97	2.83	0.00	26.86
8	Karve Road	6.20	2.82	0.19	6.25	0.00	15.46
9	Kasba Vishram.	0.00	1.58	2.68	0.00	0.00	4.26
10	Sahakarnagar	0.00	5.26	3.93	0.28	0.00	9.47
11	Sangamwadi	17.52	7.44	4.28	1.15	0.00	30.39
12	Tilak Road	7.03	3.42	0.73	2.42	0.00	13.60
13	Warje Karve Na.	4.23	8.47	0.95	1.61	0.00	15.26
14	Yerawada	8.55	19.11	1.58	0.00	0.00	29.24
	TOTAL	95.29	101.61	24.92	20.72	0.76	243.30
						TOTAL PMC AREA	

(Source : Compiled by Researcher)

In 1981, 95.29 sq. km area of the city was under the agricultural area. Aundh, Hadapsar and Sangamwadi this wards has maximum agricultural land. Aundh and Hadapsar administrative wards have 17.77 sq.km area under agriculture. While Kasba Vishrambagh administrative wards does not have agricultural area. Barren land of the city was 101.61 sq.km. Yerawada administrative ward has maximum area under the barren land. Total geographical area of the Yerawada ward was 29.24 sq.km and out of this area, 19.11 sq.km area was under the barren land while Kasba Vishrambagh ward has minimum area under the barren category. The total area of this ward was 4.26 sq.km and out of this 1.58 sq.km area under barren land in 1981. When focused on Built up area of the city, it was found that PMC has only 24.92 sq.km built up area and out of this built up area maximum built up area was found in Sangamwadi, 4.28 sq.km built up area found in Sangamwadi.

3.12.2 Ward wise General Land Use of PMC : 2005

General land use of PMC in 2005 is display in Table No. 3.27. In 2005 Total geographical area of the city was 243.84 sq.km. Out of this total geographical area 59.66 sq km area was under agriculture, 26.02 sq. km area was under barren land, where 143.80 sq.km area was capture by built up. Forest area covers 13.92 sq, km area while 0.45 sq.km area was under water bodies.

Table No. 3.27 : Ward wise General Land Use of PMC : 2005

Sr. No.	Ward Name	General Land Use Categories					2005 TGA (sq.km)
		Agriculture	Barran	Built up	Forest	Water Body	
1	Aundh	19.66	5.32	12.71	2.75	0.31	40.75
2	B.S. Dhole Patil	0.41	0.00	14.09	0.14	0.00	14.64
3	Bhavani Peth	0.00	0.00	2.90	0.00	0.00	2.90
4	Bibvewadi	2.32	2.48	13.18	0.37	0.00	18.35
5	Dhankawadi	0.89	0.93	8.39	0.50	0.14	10.84
6	Ghole Road	2.01	0.51	9.38	0.86	0.00	12.75
7	Hadapsar	12.07	1.19	9.17	2.35	0.00	24.78
8	Karve Road	2.60	2.65	7.93	3.08	0.00	16.26
9	Kasba Vishram.	0.00	0.08	4.92	0.00	0.00	5.00
10	Sahakarnagar	0.53	0.90	7.62	0.15	0.00	9.20
11	Sangamwadi	10.00	3.70	15.04	0.62	0.00	29.35
12	Tilak Road	4.30	0.49	7.71	2.20	0.00	14.71
13	Warje Karve Na.	0.20	2.41	11.70	0.91	0.00	15.21
14	Yerawada	4.66	5.37	19.07	0.00	0.00	29.10
	TOTAL	59.66	26.02	143.80	13.92	0.45	243.84
						T0TAL PMC AREA	

(Source : Compiled by Researcher)

PMC has 143.80 sq.km area under built up and out of this area Yerawada administrative ward has covers 19.07 sq km area under built up. Bhavani Peth administrative ward has minimum built up area i.e. 2.90 sq.km. In 2005, agricultural area was 59.66 sq.km and out of this agricultural area 19.66 sq .km area was found in Aundh administrative ward. Forest area of the city covers 13.92 sq.km area of city and out of this forest area 3.08 sq.km area was found in Karve Road administrative ward. Minimum forest area was found in B.S.Dhole Patil ward. This ward has 0.14 sq.km area under forest.

3.12.3 Ward wise General Land Use of PMC : 2011

General land use of PMC in 2011 is presents in Table No. 3.28. In 2011 Total geographical area of the city was 243.96 sq.km. Out of this total geographical area 24.78 sq km area was under agriculture, 14.78 sq. km area was under barren land, where 192.53 sq.km area was capture by built up. Forest area covers 11.19 sq, km area while 0.68 sq.km area was under water bodies.

Table No. 3.28 : Ward wise General Land Use of PMC : 2011

Sr. No.	Ward Name	General Land Use Categories					2011 TGA (sq.km)
		Agriculture	Barran	Built up	Forest	Water Body	
1	Aundh	6.01	4.31	27.96	2.17	0.30	40.75
2	B.S. Dhole Patil	0.00	0.00	14.54	0.10	0.00	14.64
3	Bhavani Peth	0.00	0.00	2.90	0.00	0.00	2.90
4	Bibvewadi	0.05	0.19	17.74	0.37	0.00	18.35
5	Dhankawadi	0.40	0.37	9.47	0.40	0.20	10.84
6	Ghole Road	0.32	0.91	11.02	0.51	0.01	12.76
7	Hadapsar	2.25	0.24	20.23	2.07	0.00	24.78
8	Karve Road	0.52	2.14	10.95	2.66	0.00	16.26
9	Kasba Vishram.	0.00	0.00	5.00	0.00	0.00	5.00
10	Sahakarnagar	0.00	0.00	8.96	0.24	0.00	9.20
11	Sangamwadi	11.83	3.73	13.15	0.57	0.15	29.44
12	Tilak Road	0.17	0.15	12.48	1.91	0.00	14.71
13	Warje Karve Na.	0.12	0.07	14.81	0.21	0.02	15.23
14	Yerawada	3.10	2.67	23.33	0.00	0.00	29.10
TOTAL		24.78	14.78	192.53	11.19	0.68	243.96
TOTAL PMC AREA							

(Source : Compiled by Researcher)

In 2011, PMC has 192.53 sq. km built up area and out of this Aundh administrative ward has maximum area i.e. 27.96 sq.km. Kasba Vishrambagh administrative ward and Bhavani Peth administrative ward, this both wards total geographical area is capture by built up area. City has 24.78 sq. km agricultural area and out of this area Sangamwadi ward has maximum agriculture area i.e. 11.83 sq.km. The city has 14.78 sq.km barren land and out of this area Aundh administrative ward has maximum forest area i.e. 4.31 sq.km. In 2011, PMC has 11.19 sq.km forest area , out of this Karve Road ward has cover maximum forest area i.e. 2.66 sq.km. Bhavani Peth, Kasba Vishrambagh and Yerawada this three administrative wards does not have forest area.

3.12.4 Ward wise General Land Use of PMC : 2013

General land use of PMC in 2013 is present in Table No.3.29.In 2013 the total geographical area of the PMC is 243.93 sq.km. Out of this total geographical area 198.79 sq.km area is under built up.In 2013, area under agriculture is 24.33 sq.km where barren land covers 8.92 sq.km area and area under forest is 11.08 sq.km only. Water body covers minimum area i.e. 0.84 sq.km.

Table No. 3.29 : Ward wise General Land Use of PMC : 2013

Sr. No.	Ward Name	General Land Use Categories					2013 TGA (sq.km)
		Agriculture	Barran	Built up	Forest	Water Body	
1	Aundh	5.90	1.25	30.02	3.12	0.46	40.75
2	B.S. Dhole Patil	0.00	0.00	14.60	0.04	0.00	14.64
3	Bhavani Peth	0.00	0.00	2.90	0.00	0.00	2.90
4	Bibvewadi	0.00	0.11	17.97	0.27	0.00	18.35
5	Dhankawadi	0.29	0.18	9.86	0.34	0.17	10.84
6	Ghole Road	0.12	0.18	11.89	0.51	0.06	12.76
7	Hadapsar	2.08	0.18	20.51	2.01	0.00	24.78
8	Karve Road	0.49	1.93	11.20	2.64	0.00	16.26
9	Kasba Vishram.	0.00	0.00	5.00	0.00	0.00	5.00
10	Sahakarnagar	0.00	0.00	9.02	0.18	0.00	9.20
11	Sangamwadi	11.64	2.98	14.12	0.57	0.13	29.44
12	Tilak Road	0.80	0.05	12.54	1.32	0.00	14.71
13	Warje Karve Na.	0.08	0.06	14.99	0.08	0.02	15.24
14	Yerawada	2.93	2.00	24.17	0.00	0.00	29.10
	TOTAL	24.33	8.92	198.79	11.08	0.84	243.96
						TOTAL PMC AREA	

(Source : Compiled by Researcher)

In 2013, toatal area under agriculture is 24.33 sq.km where out of this agricultural area Sangamwadi ward has maximum agricultureal area. This ward has 11.64 sq.km area under agriculture. When focuse o barren land, PMC has 8.92 sq.km barren area out of this Sangamwadi ward has maximum barren land. Out of total barren land (8.92 sq.km) this ward has 2.98 q.km area under barren. In 2013, PMC has 198.79 sq.km area under built up. Aundh administrative ward covers maximum area of built up. Aundh ward has 30.02 sq.km where Bhavani Peth, Kasba Vishrambagh administrative ward show no change in built up land from 2011 to 2013. Forest area of Aundh administrative ward is

3.12 sq.km which is show growth from 2011 to 2013.Aundh ward also show growth in area under water bodies from 2011 to 2013. Aundh ward has 0.46 sq.km area under water bodies.

3.13Ward wise Built Up change of PMC: 1981 to 2013

Table No. 3.30 presents ward wise built up change of PMC. In 1981, PMC has 24.92 sq.km built up area which was increases in 2005 by 43.8% and in 2005 PMC has 143.80 sq.km area under built up area. In 2011, PMC has 192.53 sq.km built up area where in 2013, PMC has 198.79 sq.km area under built up.

Table No. 3.30 : Ward wise built up change of PMC : 1981 to 2013

Sr. No.	Ward Name	Built up Changes (sq.km)			
		1981	2005	2011	2013
1	Aundh	1.46	12.71	27.96	30.02
2	B.S. Dhole Patil	2.42	14.09	14.54	14.60
3	Bhavani Peth	0.64	2.90	2.90	2.90
4	Bibvewadi	0.36	13.18	17.74	17.97
5	Dhankawadi	0.29	8.39	9.47	9.86
6	Ghole Road	3.44	9.38	11.02	11.89
7	Hadapsar	1.97	9.17	20.23	20.51
8	Karve Road	0.19	7.93	10.95	11.20
9	Kasba Vishrambagh	2.68	4.92	5.00	5.00
10	Sahakarnagar	3.93	7.62	8.96	9.02
11	Sangamwadi	4.28	15.04	13.15	14.12
12	Tilak Road	0.73	7.71	12.48	12.54
13	Warje Karve Nagar	0.95	11.70	14.81	14.99
14	Yerawada	1.58	19.07	23.33	24.17
	TOTAL	24.92	143.80	192.53	198.79

(Source : Compiled by Researcher)

Kasba Vishrambagh and Bhavani Peth this two ward's total geographical area is convert into built up area in 2011. In 1981, Bhavani Peth ward has 0.64 sq.km area under built up and 2011 it is found 2.90 sq.km. Total geographical area of Bhavani Peth in 2011 is 2.90 sq km i.e. total area of the ward is capture by built up. Timber Market, Panch Houd Church, Padamji Park, Doke Talim, Ganesh Peth Fish Market, Nishant Tokies, Alpana Tokies, Sent Vincent High School this all are found in Bhavani Peth which are

responsible to increases built up in this ward. Likewise this Kasba Vishrambagh ward, the city was expands from this ward. This ward has all types market, number of school, various commercial shops, good road network and due this total geographical area of this ward is under in built up in 2011. The growth of this two wards is stable. There is no chance to increases built up area.

Aundh ward has 40.75 sq km total geographical area. In 1981, Aundh ward has 1.46 sq. km built up area, in 2005 it was increases and has 12.71 sq km area under built up while in 2011, 27.96 sq.km area of the ward is under built up. In 2013, area under built up is increases and Aundh ward has 30.02 sq.km area under. Aundh ward has Rajbhavn, Botanical Garden, Savitribai Phule Pune University, Spicer College, Rural Police Head Office, Kasturba Slum, Abhimanshree Society, Yashada, Sakalnagar, Rohan Nilay Society. This all are the main reasons to increases built up of this ward.

The total area of B.S.Dhole Patil ward is 14.64 sq.km. In 1981, B.S.Dhole Patil ward has 2.42 sq.km area under built up while in 2011, this ward has 14.54 sq. km area under built up. Wadia Hospital, Shivaji Maratha High School, Hirabagh this are includes in this ward.

Bibvewadi administrative ward has 17.97 sq.km area under built up in 2013. Total geographical area of this ward is 18.35 sq.km. Kubera garden, Mahesh Housing Society, Chintamani nagar, Bhagyodaynagar, Mount Caramet High School, Gokulnagar, Konarkpuram, Kousarbagh, NIBM, Clover Village this all are includes in this ward. The number of slums is also found here. Hence, population of this ward increases and built up area increases from 0.36 sq km (1981) to 17.97 sq.km (2013).

Total geographical area of Dhankawadi administrative ward is 10.84 sq.km. In 1981, this ward has 0.29 sq.km built up area while in 2005, 8.39 sq km area was capture by built up. In 2011, this ward has 9.47 sq. km area under built up. Katraj Dairy, Rajiv Gandhi Pranisnagrhalay, Katraj Sneak Park, Kadam Plaza, Rajas Society, Balajinagar, Kavadewadi, Sopanbagh, Kalashankarnagar, Bhimnagar, Shelar Ghat, Katraj Lake, Udaybagh this all are included in Dhankawadi ward, hence built up of this area increases and in 2013, 9.86 sq.km area is under built up.

In PMC, Ghole Road ward is known for its commercial area and government offices. The total geographical area of this ward is 12.76 sq.km and out of this 11.89 sq.km area is

under built up in 2013. Balgandharva Rangmandir, Sambhaji Udyan, Deccan Gymkhana, Modern College, Fergusson College, British library, Shivajinagar Court, Sancheti Hospital, Akashwani, Agricultural College this all are includes in this ward. Hence built up area increases of this ward. In 1981, 3.44 sq.km area of this ward was under built up and in 2013 it covers 11.89 sq.km area.

Hadapasr ward has 24.78 sq.km total geographical area. Most of the area of this ward covers by slum area. Sasanenagar, Vaiduvadi, Hadapsar Gaothan, Gosavi Vasti as well as Lohiya Udyan, Kandhenu Estate, Poonawala Stud Farm this all are includes in this ward. This ward has maximum population in 2011. The total population of this ward is 324751. Hence when focused on built up of this ward it is observe that in 1981, 1.97 sq.km area was under the built up, in 2005, 9.17 sq.km area under the built up and in 2011, 20.23 sq.km area is under the built up. In 2013, Hadapsar ward has 20.51 sq.km area is under built up.

Karve Road ward has City's West side gate i.e. Chandani Chouk, Bhusari Colony, Bavdhan, Vedbhavan, Sahajanand Society, Shivtirthnagar, Eklavya Polytechnic, Mahatma Society this all are includes in this ward. Most of educated people are live this ward. The total area of this ward is 16.26 sq.km. The ward has good road network, availability of utility services and hence this ward has 209331 populations. In 1981, this ward has 0.19 sq.km area under built up which was increases up to 7.93 sq.km till 2005 and in 2011 the total built up area of this ward is 10.95 sq.km. In 2013, Karve Road ward has 11.20 sq.km area under built up.

Sahakarnagar ward has 9.20 sq km total area and out of this 9.02 sq.km area is under built up in 2013. Total population of this ward is 205441 in 2011. In 1981, the built up area of this ward was 3.93 sq.km. Sarasbagh, Peshvepark, Jawaharlala Neharu Stedium, Sanas Ground, Mitramandal Colony, Kamal Vihar, Rautbagh, Sambhajinagar, Padmavati, Laxminagar, Yashvantrao Chavan Udyan this all are includes in this ward .Hence area under built up is increases in this ward from 1981 to 2013.

Total geographical area of Sangamwadi ward is 29.44 sq. km in 2013. In 1981, this ward has 4.28 sq.km area under built up. In 2005, this ward has 15.04 sq km area under built up. In 2011, some villages are add in this ward and hence the total area of this ward

increases and built up area is observe 13.15 sq.km. In 2013, this ward show 14.12 sq.km area under built up.

Tilak Road ward has 14.71 sq km total geographical area. In 2013, the ward has 12.54 sq.km area under built up which was 0.73 sq. km in 1981. Warje Karvenagar ward has 15.23 sq.km total area and out of this 14.99 sq. km area is under built up in 2013. This two ward has commercial as well as residential areas. Most of utility services are available in this both ward. Mutha river is become the border in between this two wards. The slum area of both wards develop with river bank.

Total geographical area of Yerawada ward is 29.10 sq.km. In 1981, this ward has 1.58 sq.km area under built up while in 2005, built up area occupied 19.07 sq km area under built up and in 2011 , 23.33 sq. km area is under the built up. In 2013, built up area of this ward is found 24.17 sq.km. Vimannagar, Sanjay Park, Vadgaon Panping Station, Konark Campus, Kharadi InfoTech Park, Lohagaon Vimantal, Aagakhan Palace, Don Bossco High School, Nagpur Chawl this all are includes in this ward and due to this built up area of this ward increases 1.58 sq.km (1981) to 24.17sq.km(2013).

3.14Ward Wise Utility Services of PMC

All types of Utility Services are provide in Pune Municipal Corporation. When focused on Administrative Ward Wise distribution of utility services it is noticed that the distribution of utility is uneven. When this utility services are compare with each ward's population it is found that some ward experience lack of some utility or the number of population and availability of utility is not in proper manner.

Table No. 3.31shows Utility Services of PMC: I. According to this table, Hadapsar Administrative ward has maximum number of population in PMC. In 2011, this ward has 3,24,751 population. This ward has 8% Property Tax Pay Office, 16% Maha e- Suvidha centers, 7% blood bank, 12% medical stores which are 24 hours open. When this available utilities are compare with wards total population it is notice that the ratio of number of population and available utility services are in inversely proportion. When focused on blood banks it is found that there is need to increases number of blood bank. In 2011, Sangamwadi ward has 2,61,957 population, Tilak Road ward has 2,42,290,

population and Yerawada ward has 2,39,564 population and this three ward also show lack of blood bank. These three wards have 2% blood banks.

Warje Karvenagar ward has 2,33,399 population. This ward has 13 % medical stores, which are open for 24 hours. This ward has 7% blood bank, 5% e- Suvidha Center and 3% Property Tax Pay Offices. Total population of Warje Karvenagar ward and the utilities available in this ward are in inversely proportion.

Maha e - Suvidha Center's ward wise distribution is also found uneven. Hadapsar Ward and Tilak Road Ward has highest percentage of e - Suvidha Center in PMC. Hadapsar Ward has 16 % e - Suvidha Center where Tilak Road Ward has 17 % e - Suvidha Centers. But when available e - Suvidha center's percentage are compare with population of such wards, it is observed that the present status of e - Suvidha Centers is not enough.

Table No. 3.31 : Utility Services of PMC : I

Ward No.	Ward Name	Population in 2011	Utility Services of Pune Municipal Corporation									
			Property Tax Pay Offices		Maha e - Suvidha Center		Blood Banks		24 Hours Open Medical Stores		Fire Stations	
			Number	in %	Number	in %	Number	in %	Number	in %	Number	in %
1	Aundh	181124	6	9	3	3	5	12	8	6	1	9
2	B.S. Dhole Patil	155413	3	5	6	7	3	7	4	3	1	9
3	Bhavani Peth	192932	4	6	5	6	3	7	6	5	1	9
4	Bibvewadi	291446	5	8	3	3	2	5	9	7	0	0
5	Dhankawadi	236648	4	6	6	7	2	5	11	9	1	9
6	Ghole Road	171678	12	18	6	7	4	10	6	5	0	0
7	Hadapsar	324751	5	8	14	16	3	7	15	12	1	9
8	Karve Road	209331	4	6	4	5	3	7	13	10	1	9
9	Kasba Vishram.	178484	2	3	5	6	4	10	10	8	1	9
10	Sahakarnagar	205441	5	8	7	8	6	15	4	3	0	0
11	Sangamwadi	261957	4	6	3	3	1	2	5	4	1	9
12	Tilak Road	242290	5	8	15	17	1	2	9	7	1	9
13	Warje Karve Na.	233399	2	3	4	5	3	7	16	13	1	9
14	Yerawada	239564	4	6	7	8	1	2	8	6	1	9
TOTAL		3124458	65	100	88	100	41	100	124	100	11	100

(Source : Compiled by Researcher)

Ghole Road Ward has 1,71,678 population. This ward has 18 % Property Tax Pay Office, 7% Maha e- Suvidha Centers, 10% Blood Bank and 5% medical stores that are 24 hours open. Kasba Vishrambagh Ward has 1,78,484 population. This ward has 3% Property Tax Pay Office, 6% Maha e - Suvidha Center, 10 % Blood Bank and 8 % medical stores which are 4 hours open. Population of these two wards is approximately same. But percentages of available utilities in both wards are vary.

B.S.Dhole Patil Ward has 1,55,413 population. In PMC, this ward has minimum number of population. This ward has 5 % Property Tax Pay Offices, 7 % Maha e - SuvidhaCenters, 7 % Blood Bank and 3 % medical stores that are 24 hours open. Proportion of utility services and total number population is inversely proportion.

In PMC, 11 administrative wards has Fire Station i.e. in PMC only 11 Fire Stations are available. PMC has 31,24,458 population in 2011. Number of total population and Fire Station are inversely proportion. Hence it is need today to increase the number of Fire Station in each ward.

Table No. 3.32 :Utility Services of PMC: II

Ward No.	Ward Name	Population in 2011	Utility Services of Pune Municipal Corporation									
			Public Gardens		Swimming Tanks		Gym		Flour Mills		Barber	
			Number	in %	Number	in %	Number	in %	Number	in %	Number	in %
1	Aundh	181124	12	7	3	8	32	11	60	6	71	7
2	B.S. Dhole Patil	155413	14	9	0	0	25	9	38	4	54	5
3	Bhavani Peth	192932	6	4	4	11	20	7	52	5	40	4
4	Bibvewadi	291446	7	4	1	3	34	12	100	10	74	7
5	Dhankawadi	236648	5	3	3	8	30	10	120	12	81	8
6	Ghole Road	171678	17	11	3	8	20	7	42	4	45	4
7	Hadapsar	324751	11	7	5	13	18	6	83	8	105	10
8	Karve Road	209331	11	7	3	8	27	9	71	7	130	12
9	Kasba Vishram.	178484	9	6	2	5	11	4	77	8	55	5
10	Sahakarnagar	205441	20	12	2	5	11	4	72	7	60	6
11	Sangamwadi	261957	13	8	1	3	10	3	36	4	51	5
12	Tilak Road	242290	9	6	4	11	15	5	77	8	63	6
13	Warje Karve Na.	233399	15	9	2	5	22	8	68	7	132	12
14	Yerawada	239564	12	7	5	13	18	6	98	10	96	9
	TOTAL	3124458	161	100	38	100	293	100	994	100	1057	100

(Source : Compiled by Researcher)

Table No. 3.32 shows the Utility Services of PMC : II. According to this table it is observe that the utilities like Public Garden, Swimming Tank, Gym, Flour Mills and Barber are unevenly distributed in PMC. Hadapsar ward has maximum number of population (3,24,751) but this ward has only 11 Public Gardens i.e. 7%. This ratio shows that the lack of Public Gardens with compare to population of the ward.

Hadapsar ward has 13 % Swimming tank, 6% Gym, 8% Flour Mill and 10 % Barbers. Available utilities and total population of the ward is uneven and in inversely proportion. Sahakarnagar ward has 2,05,441 population. This ward has 12 % Public Gardens while Ghole Road Ward has 11% Public Gardens. Dhankawadi ward has 3 % Public Gardens. When compare to availability of Public Gardens and available population of each ward are inversely proportion.

Hadapsar and Yerawada ward has 13 % Swimming Tanks. B.S. Dhole Patil ward has no Swimming Tank. The increasing population of each ward face the lack of Swimming Tanks. The quantity of swimming tanks and population are inversely proportion. Bibvewadi ward has 2,91,446 population. This ward has 4 % Public Gardens, 3 % Swimming Tank, 12 % Gym, 10 % Flour Mill. and 7 % Barber shops. Available Utilities and increasing population of Bibvewadi are in inversely proportion

Karve Road and Warje Karve Nagar wards has 12 % of Barber Shops. These wards has maximum number of population and all types of Barber shops are available in these both wards. While Hadapsar Ward has 10 % Barber Shops. Likewise Barber shops, focused on Flour Mill it is noticed that, Dhankawadi ward has 12 % Flour Mills while B.S. Dhole Patil, Ghole Road and Sangamwadi these three ward has 4 % Flour Mill.

In PMC, Bibvewadi ward has maximum number of Gym i.e. 34 or 12 % while Sangamwadi ward has only 10 % Gyms. In PMC, it is observe that each wards population and available utility services are in inversely proportion and day by day population of each ward increases and face the lack of utility.

CHAPTER FOUR

ANALYSIS AND FINDINGS

4.1 Introduction

Economic development is happening due to rapid rate of industrialization and urbanization in India. The growth of the urban area largely depend on proper urban planning and provision of urban utility services for urban wellbeing ***(Gade Adinath D., et.al.2013)*** **.** The term utility is used to denote the satisfaction or welfare. Utilities are depend upon human wants as well as its use, hence they are affected by various socio-economic factors like social group, economic structure, cultural or ethnic group and tradition of society. The concept of utility was introduced for the first time by William Stanley Jevons (1834-1882) of Great Britain.

Indian cities are experiencing an increasing use of utilities. As a matter of fact there is wide gap between the utility availability and need for the utilities, which is reportedly due to the perennial influx of rural population to urban center. As a result the existing infrastructure, gets burdened ***(Mali Sagar, et.al. 2013)*.**

Urbanization is the progression in which rural area adapt into urban area. Urban area is differing from rural area due to its service providing nature, which is superior than the rural area. Health services, educational services, entertainment services, electricity supply, water supply, excellent road network, security this are the examples of services which all are including in one title as 'Utility'. Day by day population of urban area increases hence, availability of utilities in present time is become shorter as campier to its present need. But , there is a trouble seen in urban area that these utilities are not evenly distributed. One portion or zone has high amenities where, another zone shows lack of amenities.

Pune Municipal Corporation is one of the fast growing urban area. PMC has fourteen administrative wards, which are face the problem of unevenly distribution of utility. Hence for planning strategy, its need to trace out availability of utility and where is need of set up those utility in PMC. To understand the nature of utility services and to discuss about their distribution in PMC it should be well known about the sector which one

provide that service in PMC. Economically there is three sectors are available Public Sector, Private Sector and Public Private Partnership.

The Public Sector is that portion of an economic system that is controlled by National, State or Provincial and Local Government, For example Post Office.

Private Sector refers to Organizations that are not government owned, the goods and services provided by Organizations outside of the Government.

Public Private Partnership (P3) is a contractual arrangement between Public agency (Federal, State or Local) and Private Sector entity. Through this arrangement the skill and assets of each sector (Public and Private) are shared in delivering a service or facility for the use of the general public.

To discuss the utility services and to recommend the suggestion it is need to classify all services of PMC which are acceptable for the research purpose. The classification is as follows

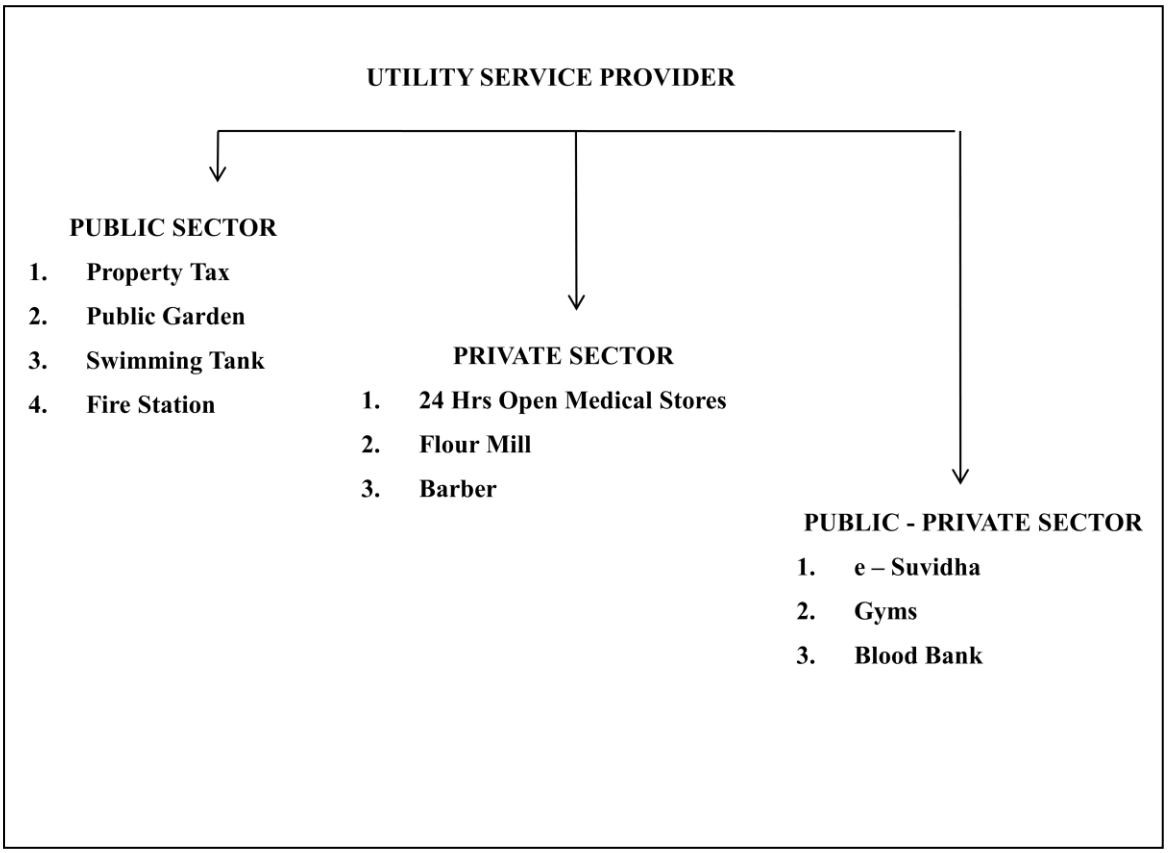


Chart No : 4.1

4.2 Property Tax Pay Offices in PMC

The property tax has a number of strengths. Because it has been in place since the earliest days of settlement. Generally, it is a reliable and stable source of revenue for local governments, relying on commodities (land and buildings) that are geographically fixed within jurisdictional boundaries. Growth in Property Value has boosted property tax revenues, and this helps local governments finance growing costs. One of the advantages of the property tax is that there is a rational nexus between the taxes and the benefits, local revenues are used to fund service and facilities for local residents***. (Brunori David, & et.al ,2006)***

Property Taxes on homes, land, farms and other forms of real estate make up an important and a primary source of revenue Pune Municipal Corporation. Property tax pay for things like public school , community colleges, libraries, parks and recreation , sanitation , sewer , police and fire protection , roads and other local needs.

' Property Tax is the annual amount paid by a land owner to the local government or the Municipal Corporation of the area.'

' The Tax which is usually based on the value of the property is known as Property Tax'.

Table No. 4.1 : Property Tax Pay Offices in PMC

Sr. No	Ward Name	Area in sq.km	Population: 2011	Tax Pay Office
1	Aundh	40.75	181124	6
2	B.S.Dhole Patil	14.64	155413	3
3	Bhavani Peth	2.90	192932	4
4	Bibvewadi	18.35	291446	5
5	Dhankawadi	10.84	236648	4
6	Ghole Road	12.76	171678	12
7	Hadapsar	24.78	324751	5
8	Karve Road	16.26	209331	4
9	Kasba Vishrambagh	5.00	178484	2
10	Sahakarnagar	9.20	205441	5
11	Sangamwadi	29.44	261957	4
12	Tilak Road	14.71	242290	5
13	Warje Karvenagar	15.23	233399	2
14	Yerawada	29.10	239564	4
Total		243.96	3124458	65

(Source : Compiled by Researcher)

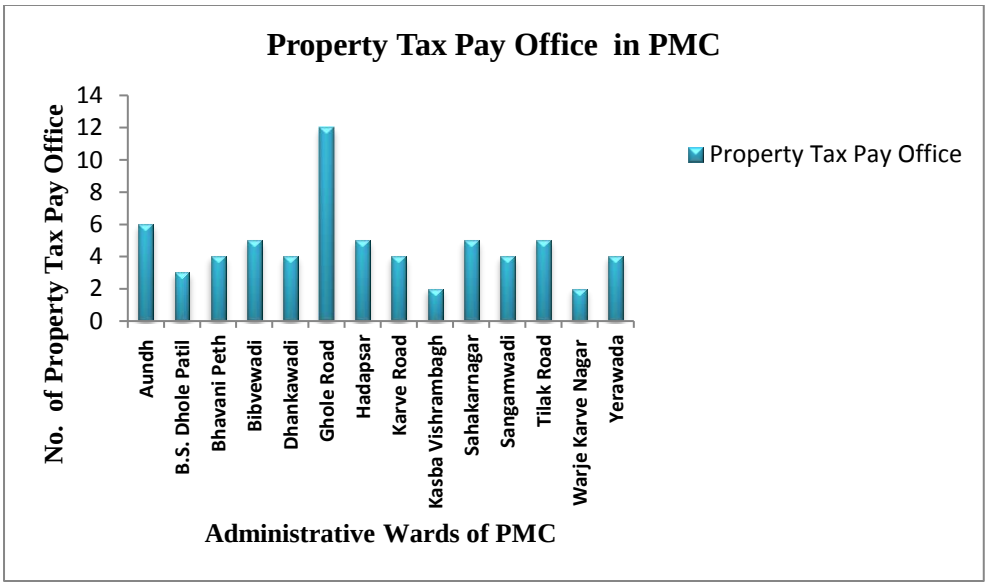
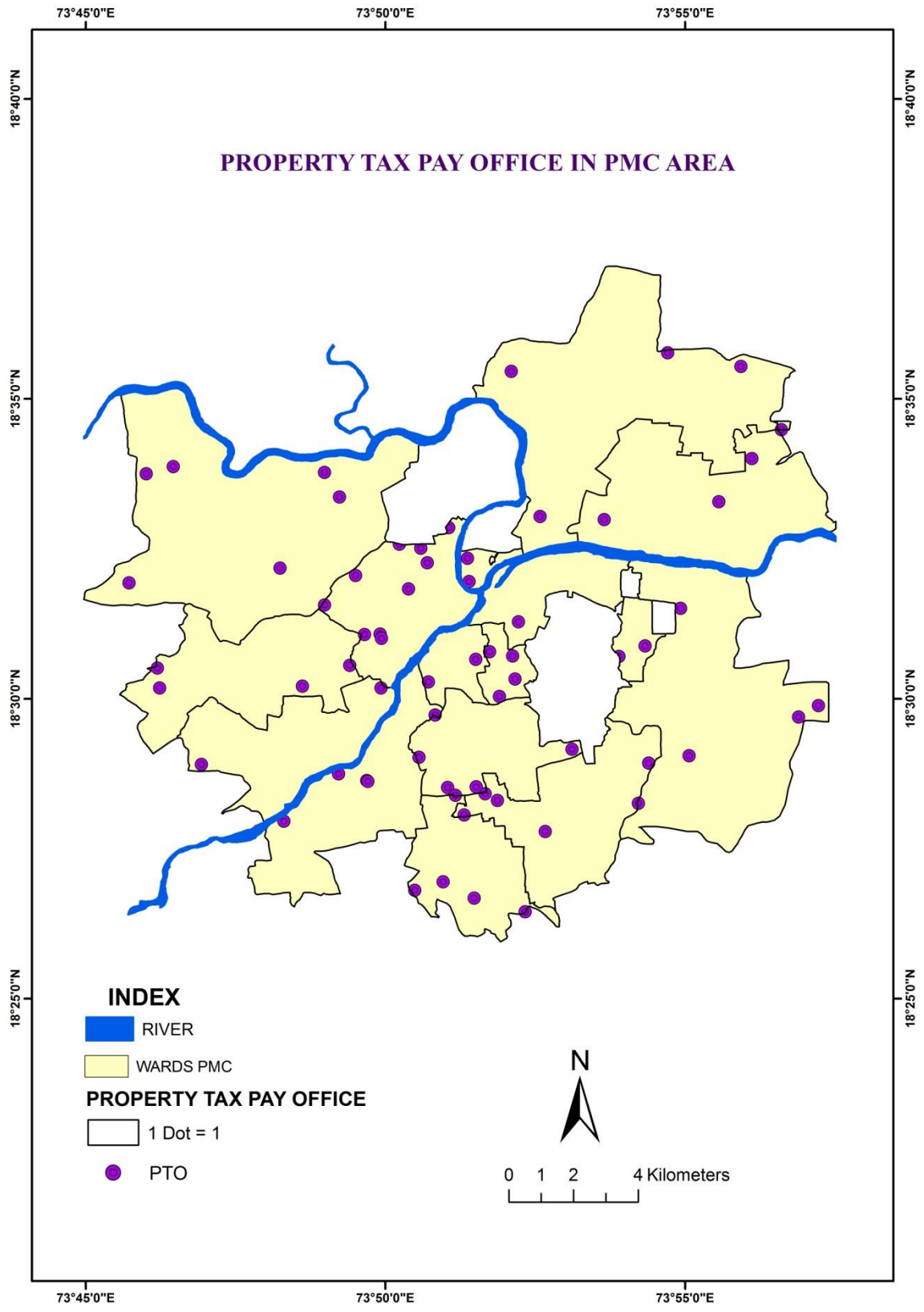


Fig No. : 4.1

Table No. 4.1 and Fig. No. 4.1 shows the ward wise numbers of Property Tax Pay Office in Pune Municipal Corporation. Property tax is pay for one time overall the year. Online pay mode is also available to people, but minimum numbers of people has knowledge about the online transaction. Most of people directly go to the property tax pay office to pay the tax amount. Due to minimum numbers of those offices, peoples face inconvenience in those days. Hence, to take out from this inconvenience, there is need to focused on number of property tax pay office. Ghole Road administrative ward has maximum numbers of Property Tax Pay Office. As compare with other 13 administrative wards, Ghole Road ward has maximum number of government offices like Pune Municipal Corporation Main Building, Akashvani, Shivajinagar Court, as well as Sambhaji Udyan, British Library, International Convention Center, Agriculture College. Due to this influence, this ward has maximum Property Tax Pay office i.e. 12. Total population of this ward as on 2011 is 171678, hence the number of property tax pay offices is not sufficient but agreeable. Kasba Vishrambagh and Warje Karvenagar this administrative ward has only two property tax pay offices. Kasba Vishrambagh ward has total population as on 2011 is 178484 and Warje Karvenagar ward has total population as on 2011 is 233399, hence the number of property tax pay office is not enough in both of this ward.


73°45'0"E
73°50'0"E
73°55'0"E
18°40'0"N
18°35'0"N
18°30'0"N
18°25'0"N
PROPERTY TAX PAY OFFICE IN PMC AREA
INDEX
RIVER
WARDS PMC
PROPERTY TAX PAY OFFICE
1 Dot = 1
PTO
N
0 1 2 4 Kilometers

MAP NO. 4.1

4.3 Maha e -Suvidha Center in PMC

e-Suvidha is an e-governance package, designed for community information centers of states of India. This web-enabled software is developed to automate a number of citizen-centric services being delivered by the district / block administration. This brings in transparency to the process of providing services at the local level and reduces harassment of the citizens. These centers are equipped with computer and communication infrastructure and allow the local population to get connected with the digital world. This opened up new possibilities, hitherto unthinking of providing better government services to the people. e - Suvidha is an attempt in that direction. It attempts to provide a flexible e- governance setup where citizens can submit their requests for services at a single location and monitor its status. ***(Dash Shefali, Ray Dibakar, 2005)***

Government of Maharashtra has implemented a National e - Governance Plan (NeGP) to provide government services to the common people at their doorstep and at an affordable cost. With an aim to bring transparency in the system and establish citizen centric governance. Maha e- Suvidha provides a one-stop interface to citizen to interact with government departments. This center provides several internets /online enables facilities to the urban citizens under one roof.

Table No. 4.2 : e - Suvidha Center in PMC

Sr. No	Ward Name	Area in sq.km	Population: 2011	e-Suvidha Center
1	Aundh	40.75	181124	3
2	B.S.Dhole Patil	14.64	155413	6
3	Bhavani Peth	2.90	192932	5
4	Bibvewadi	18.35	291446	3
5	Dhankawadi	10.84	236648	6
6	Ghole Road	12.76	171678	6
7	Hadapsar	24.78	324751	14
8	Karve Road	16.26	209331	4
9	Kasba Vishrambagh	5.00	178484	5
10	Sahakarnagar	9.20	205441	7
11	Sangamwadi	29.44	261957	3
12	Tilak Road	14.71	242290	15
13	Warje Karvenagar	15.23	233399	4
14	Yerawada	29.10	239564	7
Total		243.96	243.96	88

(Source : Compiled by Researcher)

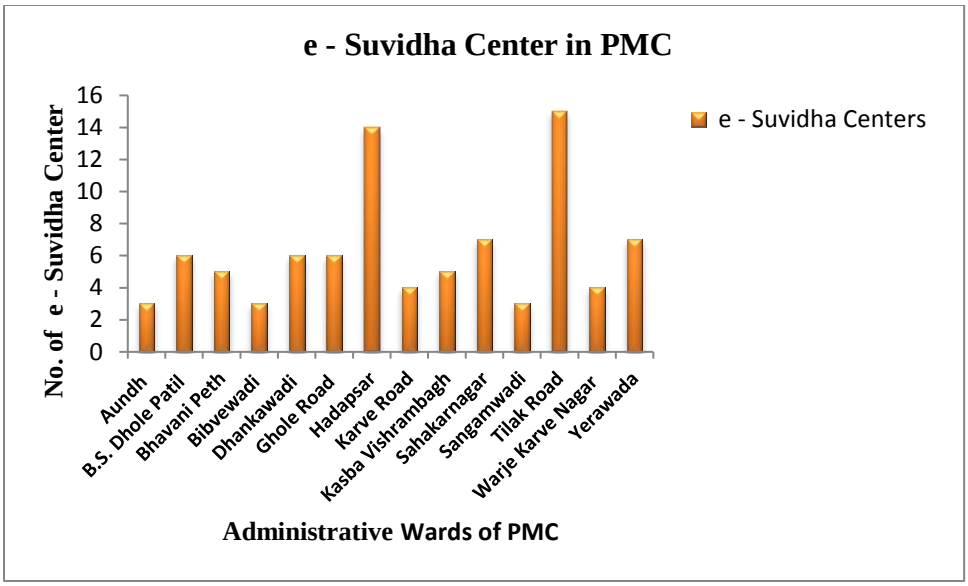
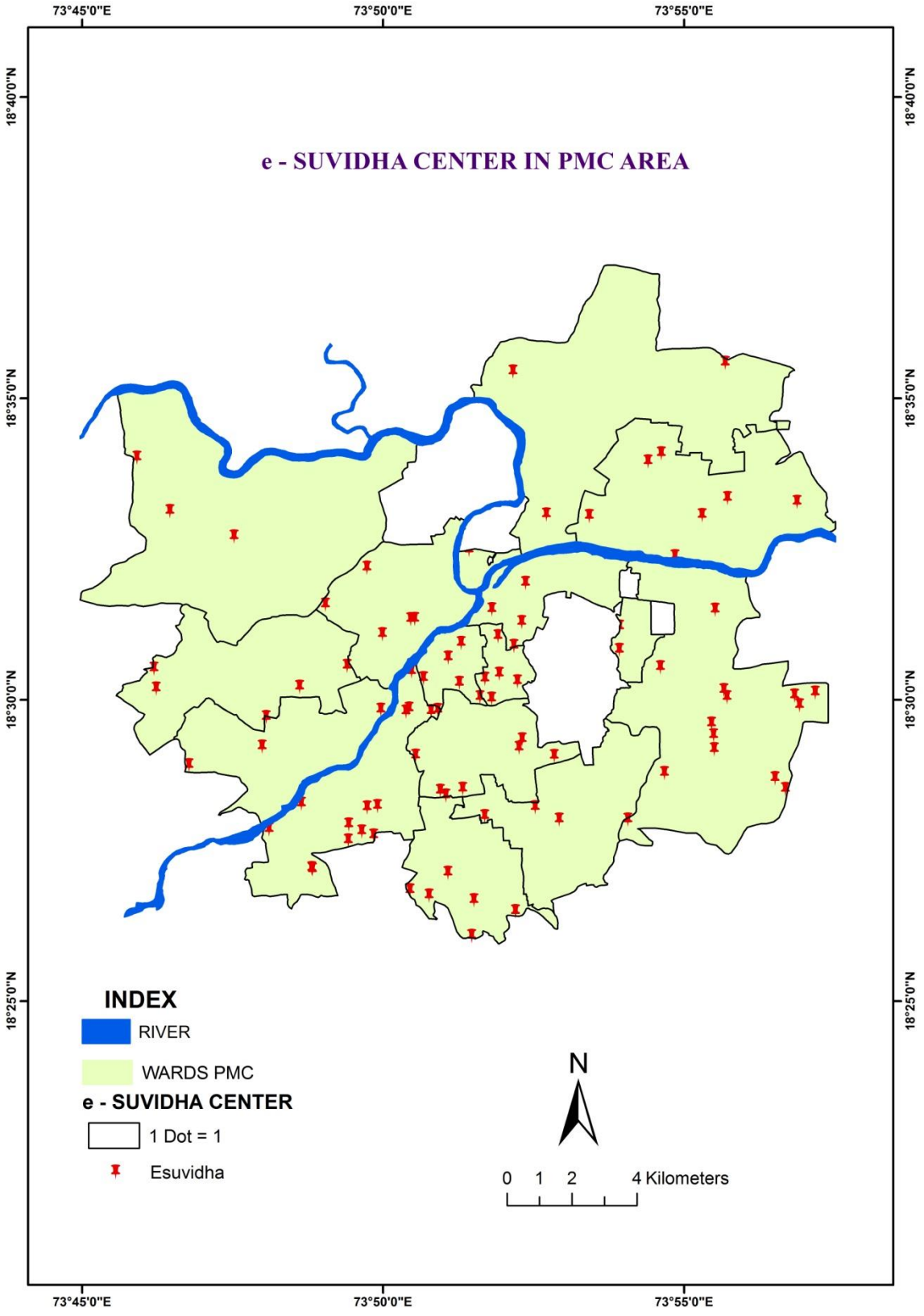


Fig .No. : 4.2

Table No. 4.2 and Fig. No. 4.2 illustrates the ward wise numbers of e - Suvidha Centers in Pune Municipal Corporation. This Maha e - Suvidha centers provide many government recognize services like Pan Card, Reshan Card, Shop Act, Aadhar Card, Smart Card, Gazette, Income Certificate, Domical Certificate, Cast Certificates, Voter Id Card, Gap Certificate, All types of affidavits, Live and Death Certificate , Light Bill , Phone Bill, LIC premium etc. In Pune Municipal Corporation Tilak Road and Hadapsar this two administrative wards has maximum numbers of Maha e - Suvidha Centers. Tilak Road has 15 e- Suvidha Centers where Hadapsar has 14 e - Suvidha Centers. Hadapsar Administrative ward has largest population in PMC i.e. 324751, hence total population of this ward and the number of e - Suvidha Centers ratio is agreeable level. Aundh, Bibvewadi and Sangamwadi this three administrative wards has minimum numbers of e - Suvidha Centers. i.e. 3. In PMC, Bibvewadi administrative ward is known for the migrate people. Many people of this ward are migrate from various parts of Maharashtra and India. This ward has several activities related construction business, hence there is need of skill and non - skill people for those construction business. People from out of this area migrate here for job availability and low rent houses in slum area. Most of this people are illiterate and unknown about government facilities. Hence less demands of governmental documents from such peoples and local politicians ignorance Bibvewadi ward has only 3 e - Suvidha Center.


73°45'0"E
73°50'0"E
73°55'0"E
18°40'0"N
18°35'0"N
18°30'0"N
18°25'0"N
e - SUVIDHA CENTER IN PMC AREA
INDEX
RIVER
WARDS PMC
e - SUVIDHA CENTER
1 Dot = 1
Esuvidha
N
0 1 2 4 Kilometers

MAP NO. 4.2

4.4 Blood Banks in PMC

Blood is universally recognized as the most precious element that sustains life. It saves innumerable lives across the world in a variety of conditions. A blood bank is a place designed especially for the storage of blood and blood products. The term 'blood bank' typically refers to a division of a hospital laboratory where the storage of blood product occurs and where proper testing is performed to reduce the risk of transfusion related events. Blood Bank accepts the donated blood. A person or a hospital can request the blood from the blood bank when they need. Seeker can get the desired blood group from Blood Bank.***(Kulshreshtha Vikas & et.al, 2012)***

Pune City is well known for its medical facilities. Multispecialty Hospitals, 24 hour open hospitals, use of Modern technologies in medical treatment, highly qualified and experienced medical staff this are the significance of Medical Facilities of PMC. Ambulance service, Medical stores, surgical equipment providers, Blood Banks this services are directly involve in medical services. Blood banks are includes in and as an emergency service. Most of the Hospitals in the Pune city have their own blood bank.

Table No. 4.3 : Blood Bank in PMC

Sr. No	Ward Name	Area sq.km	Population : 2011	Blood Bank
1	Aundh	40.75	181124	5
2	B.S.Dhole Patil	14.64	155413	3
3	Bhavani Peth	2.90	192932	3
4	Bibvewadi	18.35	291446	2
5	Dhankawadi	10.84	236648	2
6	Ghole Road	12.76	171678	4
7	Hadapsar	24.78	324751	3
8	Karve Road	16.26	209331	3
9	Kasba Vishrambagh	5.00	178484	4
10	Sahakarnagar	9.20	205441	6
11	Sangamwadi	29.44	261957	1
12	Tilak Road	14.71	242290	1
13	Warje Karvenagar	15.23	233399	3
14	Yerawada	29.10	239564	1
Total		243.96	3124458	41

(Source : Compiled by Researcher)

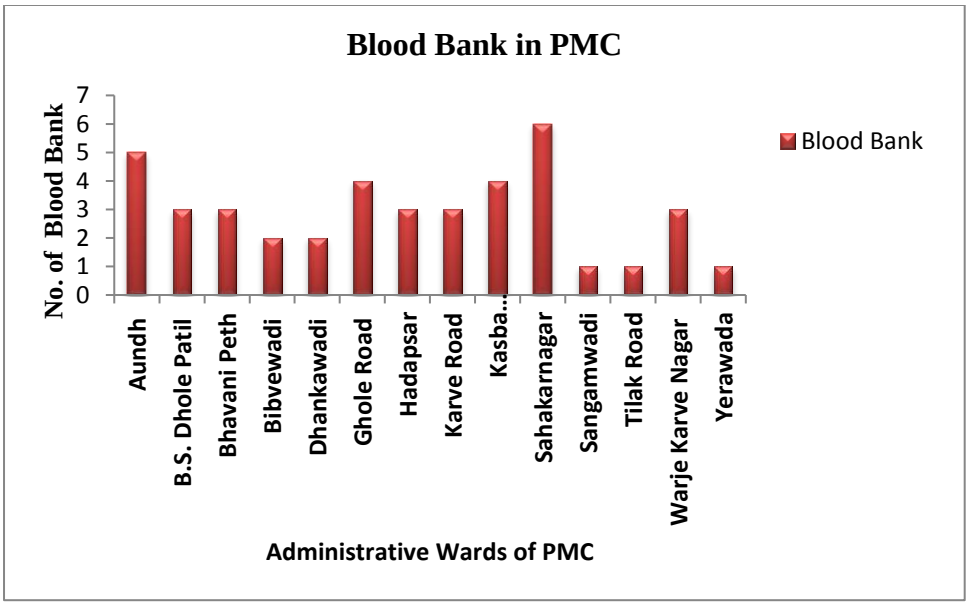
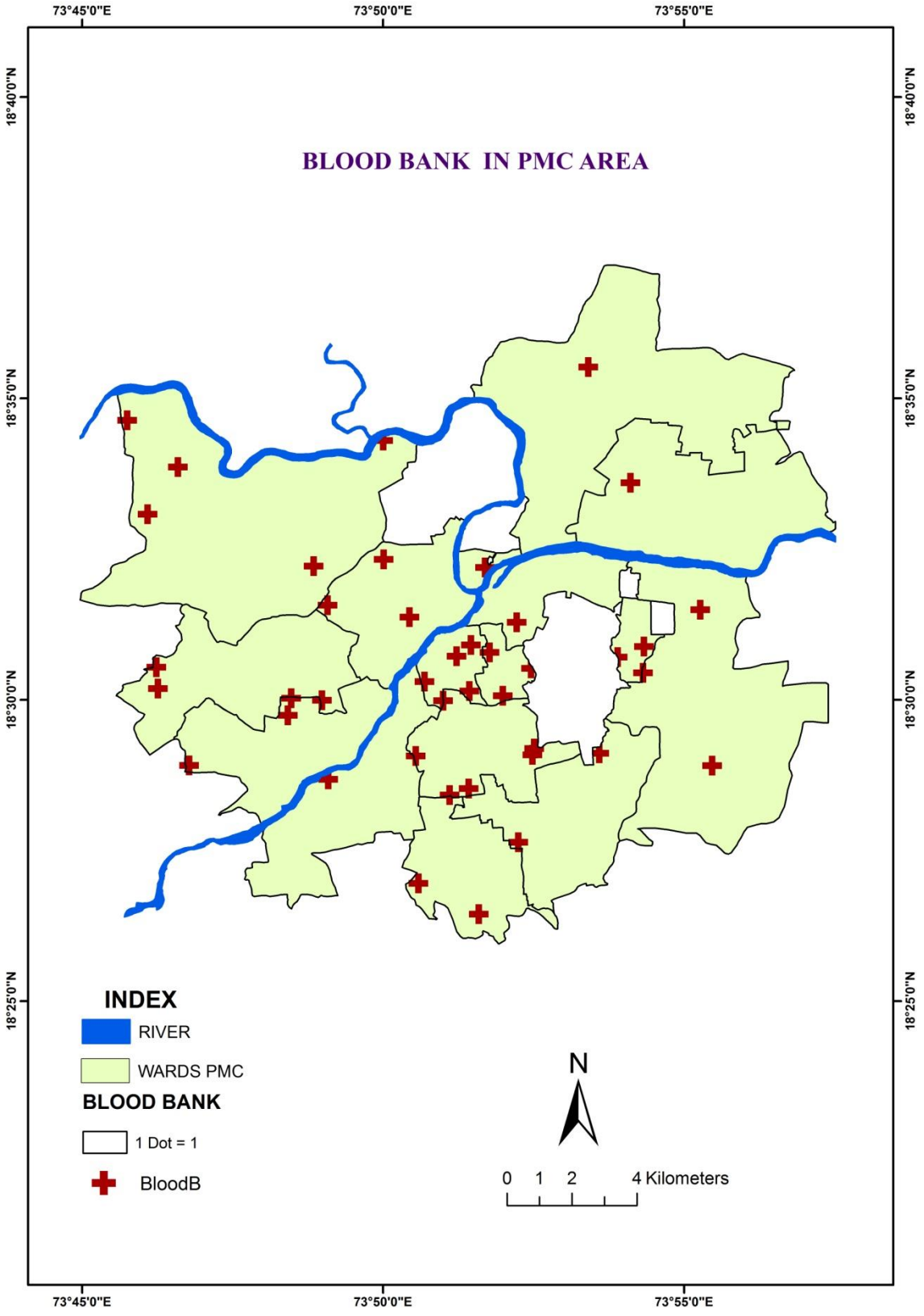


Fig .No. : 4.3

Table No. 4.3 and Fig. No. 4.3 reveals the ward wise numbers of Blood Bank in Pune Municipal Corporation. In PMC, Sahakarnagr ward has maximum numbers of Blood Bank. i.e. 6 where Sangamwadi, Tilak Road, Yerawada this ward has minimum number of Blood Bank i.e. 1.

Multispecialty and big hospitals has their own blood bank. Jahangir Hospital, Ruby Hospital, K.E.M. Hospital, Dinanath Mangeshkar Hospital, Sahyadri Hospital, Shashvat Hospital, Ratna Memorial Hospital, Poona Hospital and Research Center, Navle Hospital, Tarachand Hospital, Sasoon Hospital this are the example of hospital who has their own blood bank.

In PMC total number of blood bank is 41. The number of total blood bank is look like minimum with compare to number of hospitals and patient, but those hospitals has their own blood bank they have sufficient stock of blood. Each hospital has well refrigeration containers system to hold blood products at a constant temperature and are dispersed wherever required. Now a day's people are aware of blood donation. Hospital registers the blood donors information like name, blood group, contact. Hospital sends notification to the person regarding donation camp or emergency donation. These hospitals also have updated list of donors.


BLOOD BANK IN PMC AREA
73°45'0"E
73°50'0"E
73°55'0"E
18°40'0"N
18°35'0"N
18°30'0"N
18°25'0"N
INDEX
RIVER
WARDS PMC
BLOOD BANK
1 Dot = 1
BloodB
N
0 1 2 4 Kilometers

MAP NO. 4.3

4.5 24 Hours Open Medical Stores in PMC

The availability of drugs and medical stores plays a pivotal role in the performance of medical services. In recent years of rapid economic growth, Indian pharmaceutical industry has been at the forefront of progress and has developed world-class expertise in drug manufacturing research and technology.***(Kadzan Arvind , 2010)***

Medical stores are including in emergency and necessitate service, this service known as supportive service of Hospitals and Doctors. Many hospitals has 24 hours open medical stores in their premises. Now a day's some private Medical Stores also provide such services for 24 hours.

Mumbai city is known as 'awake city'. 24 hours open shops, hotels, markets are the need of such lifestyle, hence in Maharashtra 24 hours open medical stores concepts have capture their root first in Mumbai. Mumbai - based 24 hours open medical store concept now launch in Pune city. For example, 'Wellness Forever' this medical stores chain is beginning in PMC last few years.

Table No. 4.4 : 24 Hours Open Medical Stores in PMC

Sr. No	Ward Name	Area sq.km	Population : 2011	Medical Stores
1	Aundh	40.75	181124	8
2	B.S. Dhole Patil	14.64	155413	4
3	Bhavani Peth	2.90	192932	6
4	Bibvewadi	18.35	291446	9
5	Dhankawadi	10.84	236648	11
6	Ghole Road	12.76	171678	6
7	Hadapsar	24.78	324751	15
8	Karve Road	16.26	209331	13
9	Kasba Vishrambagh	5.00	178484	10
10	Sahakarnagar	9.20	205441	4
11	Sangamwadi	29.44	261957	5
12	Tilak Road	14.71	242290	9
13	Warje Karvenagar	15.23	233399	16
14	Yerawada	29.10	239564	8
Total		243.96	3124458	124

(Source : Compiled by Researcher)

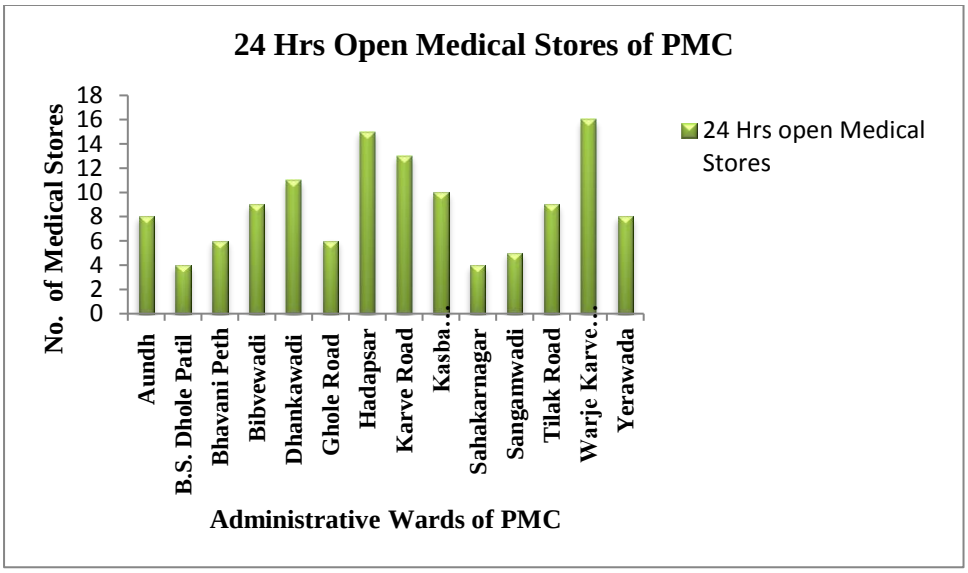
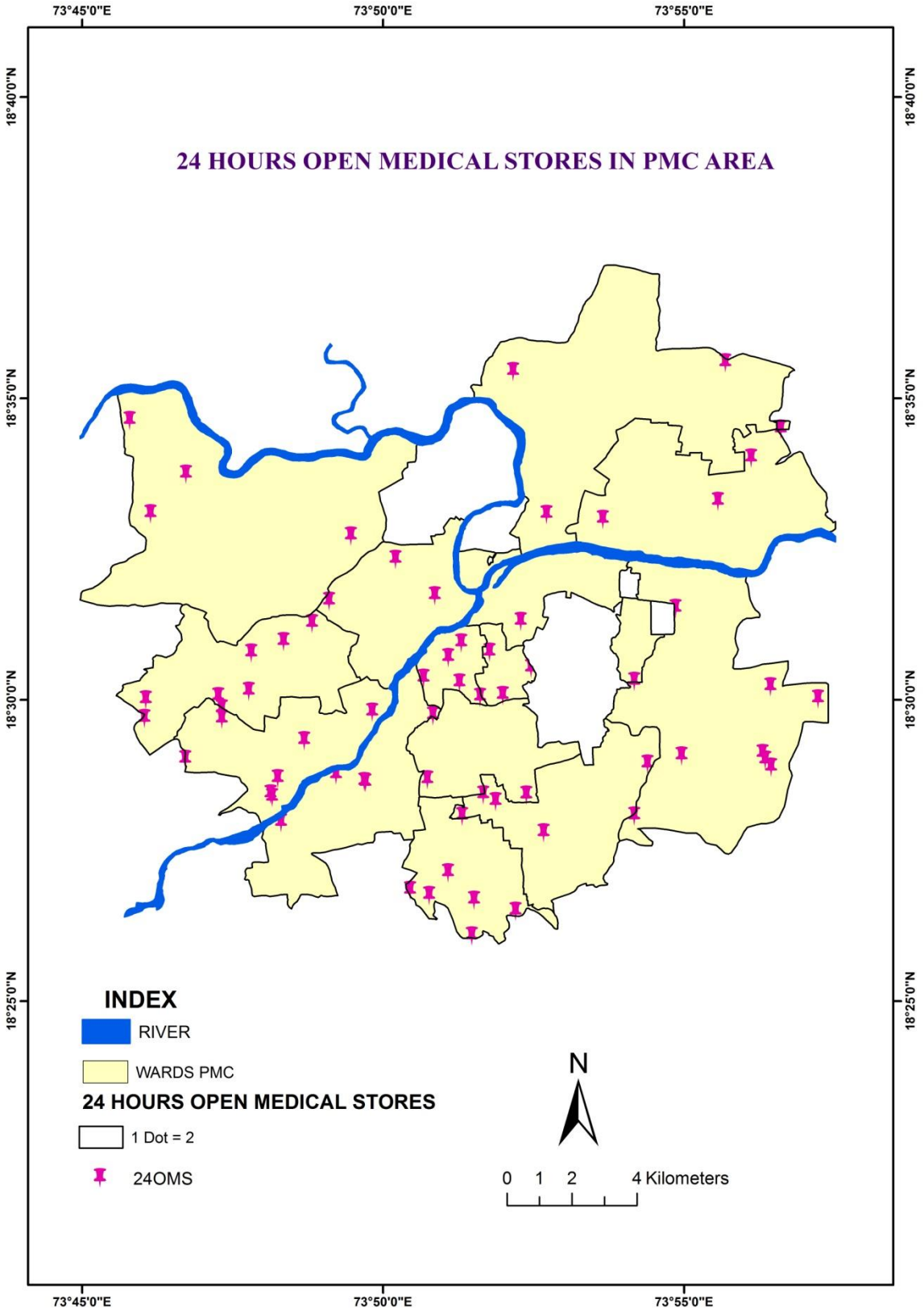


Fig. No. 4.4

Table No. 4.4 and Fig. No. 4.4 shows the ward wise numbers of 24 Hours Open Medical Store in Pune Municipal Corporation. Out of 14 administrative ward some ward has 10 and more than 10 medical stores which are open for 24 hours, such administrative wards are Warje Karvenagar (16), Hadapsar (15), Karve Road (13) , Dhankawadi (11) and Kasba Vishrambagh (10). B.S. Dhole Patil and Sahakarnagar ward has minimum numbers of such medical stores i.e. 4.


73°45'0"E
73°50'0"E
73°55'0"E
18°40'0"N
18°35'0"N
18°30'0"N
18°25'0"N
24 HOURS OPEN MEDICAL STORES IN PMC AREA
INDEX
RIVER
WARDS PMC
24 HOURS OPEN MEDICAL STORES
1 Dot = 2
24OMS
N
0 1 2 4 Kilometers

MAP NO. 4.4

4.6 Fire Stations in PMC

Fire Brigades main purpose is to enhance community safety, quality of life and confidence by minimizing the impact of hazards and emergency incidents on the people, environment and property. Fire Brigade is ever ready to protect the lives and property of the people from fire incidents. The Fire Department of the Pune City comprises of highly skilled firefighters and emergency response teams. The Department's main goal is to provide fire protection and critical public safety services to residents and visitors in every nook and corner of Pune City. The PMC's fire department has continually ensured that the city is safe even after its transformation from a quaint pensioner's paradise to one of the largest IT hubs in the country. 14th to 20th April is celebrates as 'A fire Safety Week'. During this week various rallies, mock drills, health camps and public awareness lectures are conducted. The Department updates and upgrades itself to keep pace with the ever changing infrastructure of this city and seeks to improve its urban organizational infrastructure to ensure effective and timely response each time, every time. The department follows national safety policies and practices.

Table No. 4.5 : Fire Station in PMC

Sr. No	Ward Name	Area sq.km	Population : 2011	Fire Station
1	Aundh	40.75	181124	1
2	B.S.Dhole Patil	14.64	155413	1
3	Bhavani Peth	2.90	192932	1
4	Bibvewadi	18.35	291446	0
5	Dhankawadi	10.84	236648	1
6	Ghole Road	12.76	171678	0
7	Hadapsar	24.78	324751	1
8	Karve Road	16.26	209331	1
9	Kasba Vishrambagh	5.00	178484	1
10	Sahakarnagar	9.20	205441	0
11	Sangamwadi	29.44	261957	1
12	Tilak Road	14.71	242290	1
13	Warje Karvenagar	15.23	233399	1
14	Yerawada	29.10	239564	1
Total		243.96	3124458	11

(Source : Compiled by Researcher)

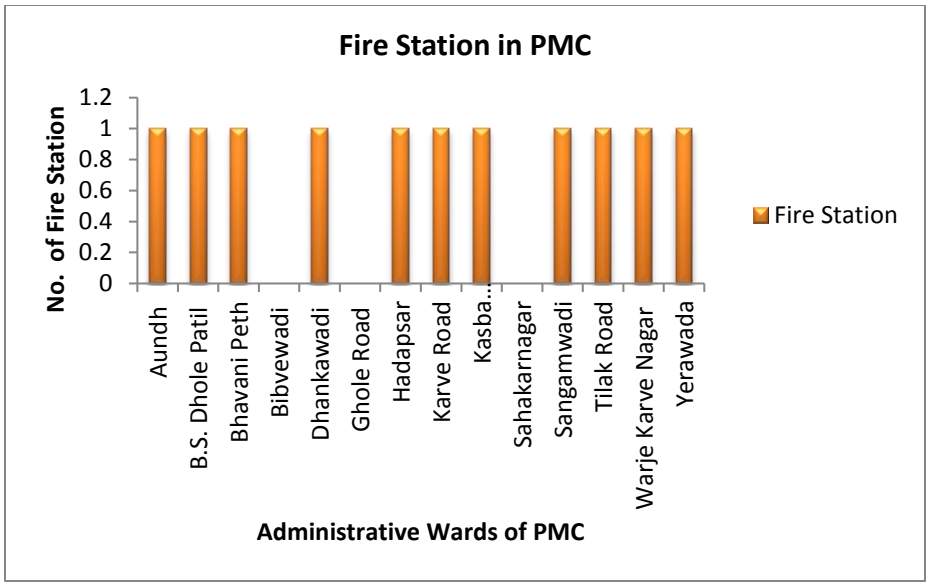
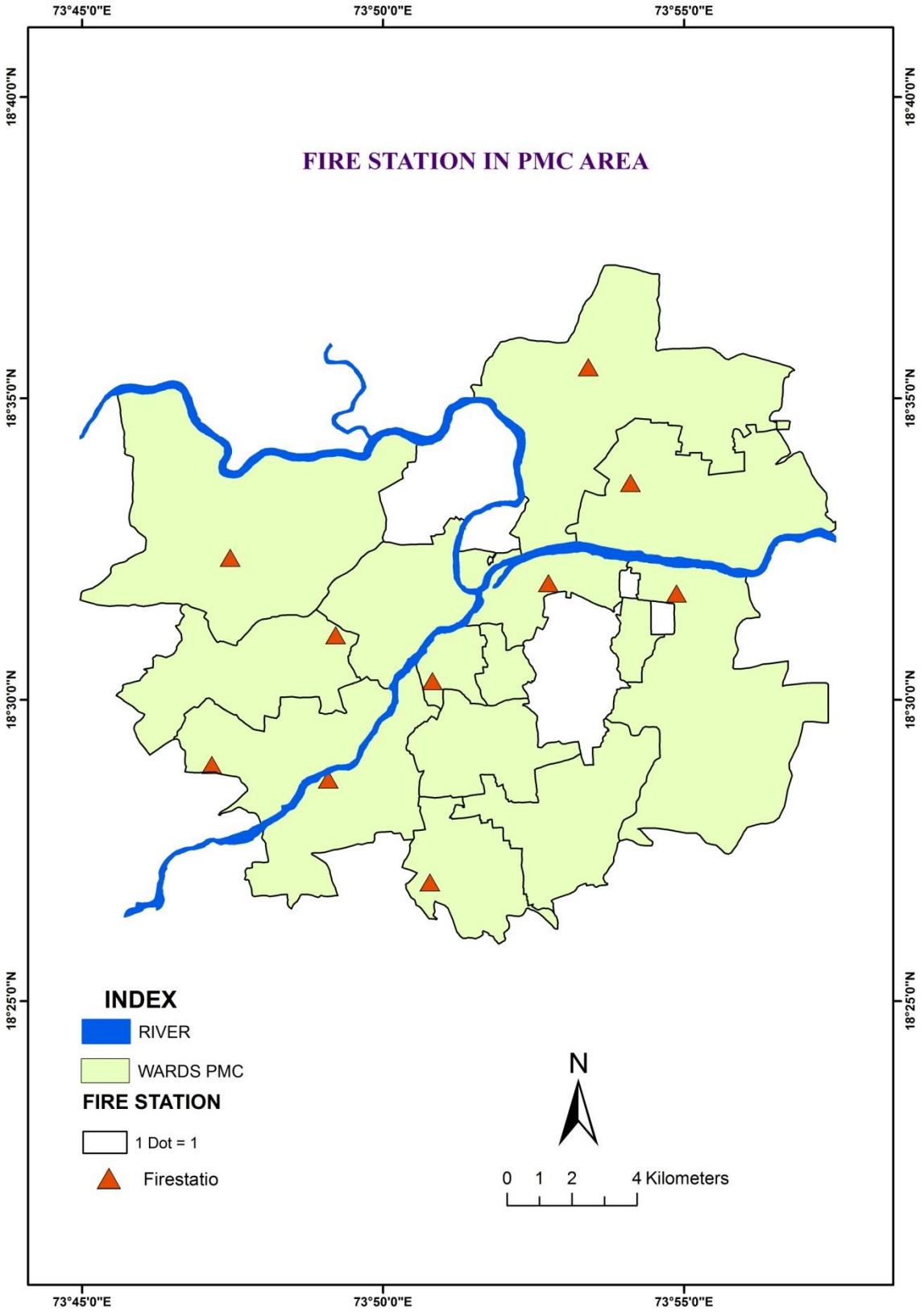


Fig. No. 4.5

Table No. 4.5 and Fig. No. 4.5 shows the ward wise numbers of Fire Stations in Pune Municipal Corporation. Out of 14 administrative wards 11 administrative ward has PMC Fire Station and each ward has only 1 Fire Station. Bibvewadi, Ghole Road and Sahakarnagar this three administrative ward has no fire Brigade Station.

Pune Municipal Corporation is growing city, it's each wards population increases day by day. The fire fighters of Fire Departments of the city are well trained and well skilled persons. There is no doubt on their quality but it is noticed that Fire station, which is, includes in emergency services not well distributed overall the city. In core region of PMC has commercial as well as residential areas. In Kasba Vishrambagh, 100 years old vada / houses also found, many schools also found the core region of PMC, some ward has large numbers of slum population. If some hazard is occurring in any ward there is, only one Fire Station is available to rescue the people from such incident.


73°45'0"E
73°50'0"E
73°55'0"E
18°40'0"N
18°35'0"N
18°30'0"N
18°25'0"N
FIRE STATION IN PMC AREA
INDEX
RIVER
WARDS PMC
FIRE STATION
1 Dot = 1
Firestatio
N
0 1 2 4 Kilometers

MAP NO. 4.5

4.7 Public Gardens in PMC

The quality of cities depends on how the urban green space are designed, managed and protected. Urban green spaces fulfill many functions in urban context that benefits people's quality of life. In order to meet social and psychological needs of citizens satisfactorily, green spaces in the city should be easily accessible and in adequately optimal in quality and quantity. Public gardens are play the important role in city, it keep city's greenery and as well as it keep as a public's entertainment. Strengthening social ties, relation and cohesion, positive impact on human health mental and physical, reducing air pollutant level this are the benefits of Public Gardens

'Public Gardens are defined as delineated open space areas, mostly dominated by vegetation and water, and generally reserved for public use.'

Table No. 4.6 : Public Garden in PMC

Sr. No	Ward Name	Area sq.km	Population: 2011	Public Gardens
1	Aundh	40.75	181124	12
2	B.S.Dhole Patil	14.64	155413	14
3	Bhavani Peth	2.90	192932	6
4	Bibvewadi	18.35	291446	7
5	Dhankawadi	10.84	236648	5
6	Ghole Road	12.76	171678	17
7	Hadapsar	24.78	324751	11
8	Karve Road	16.26	209331	11
9	Kasba Vishrambagh	5.00	178484	9
10	Sahakarnagar	9.20	205441	20
11	Sangamwadi	29.44	261957	13
12	Tilak Road	14.71	242290	9
13	Warje Karvenagar	15.23	233399	15
14	Yerawada	29.10	239564	12
Total		243.96	3124458	161

(Source : Compiled by Researcher)

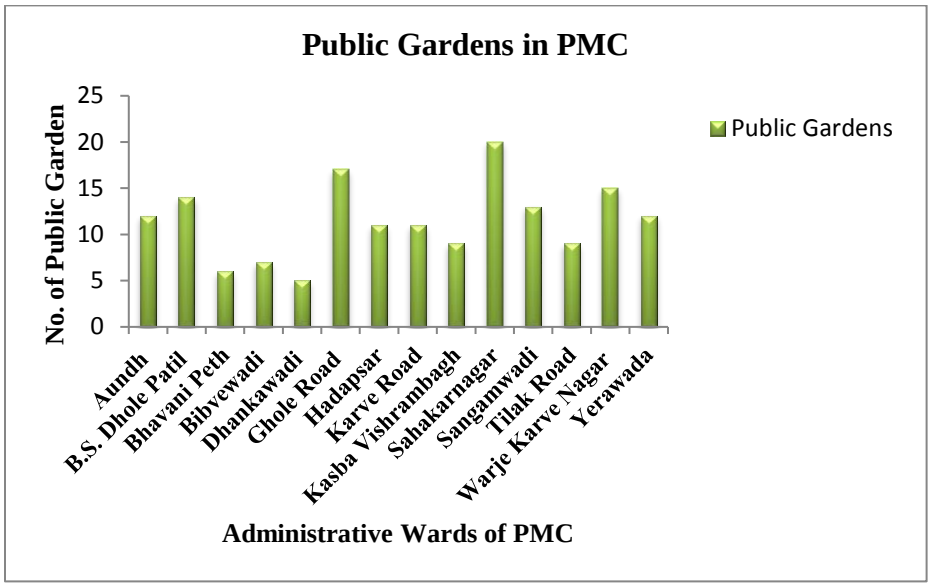
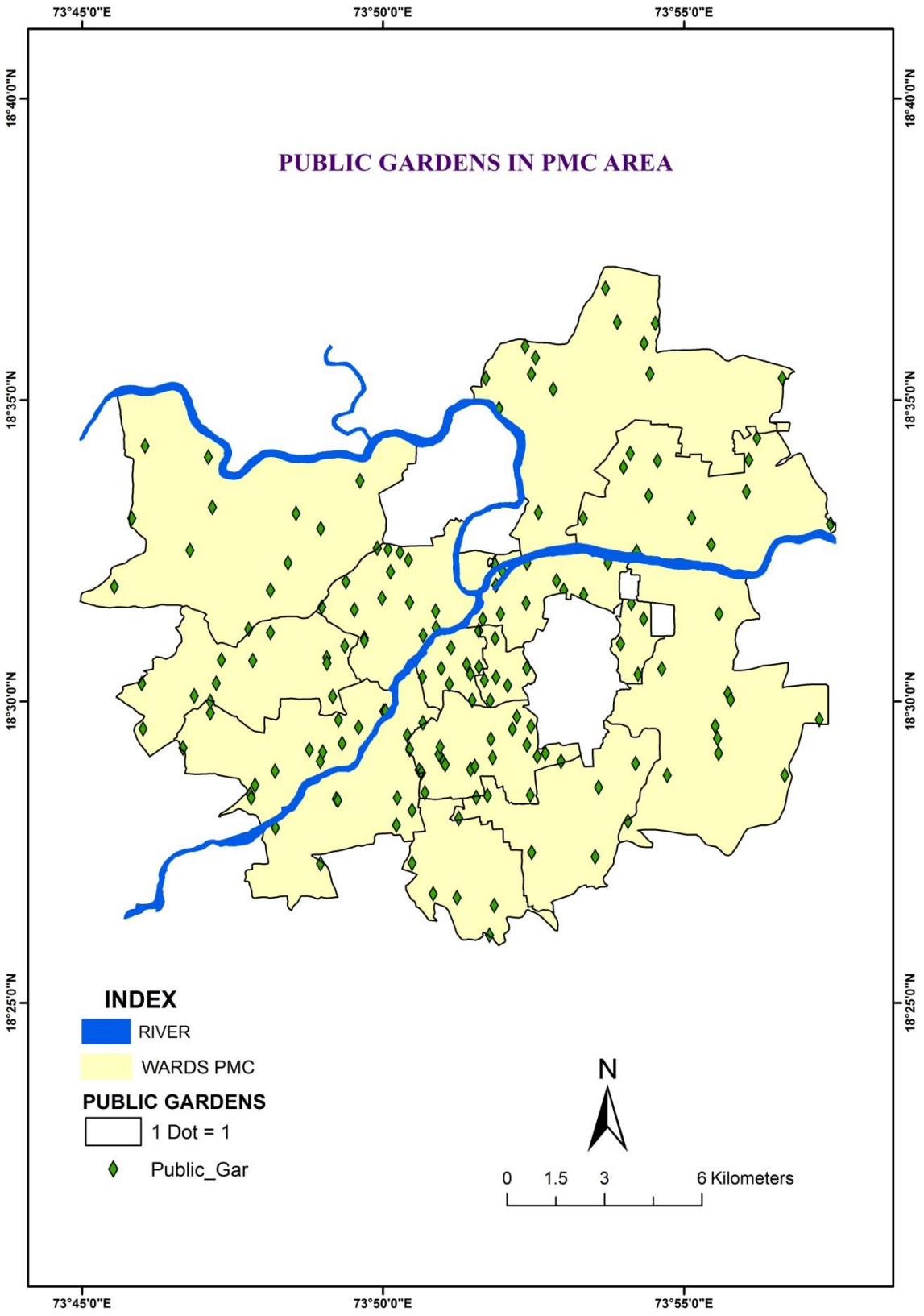


Fig. No. 4.6

Table No. 4.6 and Fig. No. 4.6 shows the ward wise numbers of Public Gardens in Pune Municipal Corporation. In Pune city, 161 public gardens are in under observation of Pune Municipal Corporation. These public gardens are playing various role as they keep city's greenery, to decorative city and entertainment to the common people.

In PMC, Sahakarnagar ward has maximum number of Public gardens i.e. 20, where Bhavani Peth ward has minimum Public gardens i.e. 6. Hadapsar ward has maximum number of population in 2011, i.e. 324751 and it has 11 public gardens it means per 29522 person one public garden. B.S. Dhole Patil has 14 public garden i.e. per 11100 person one public garden.


PUBLIC GARDENS IN PMC AREA
73°45'0"E
73°50'0"E
73°55'0"E
18°40'0"N
18°35'0"N
18°30'0"N
18°25'0"N
INDEX
RIVER
WARDS PMC
PUBLIC GARDENS
1 Dot = 1
Public_Gar
N
0 1.5 3 6 Kilometers

MAP NO. 4.6

4.8 Swimming Tanks in PMC

Swimming polls are mainly fun and positive place. Pune Municipal Corporation provides various services and utility. Swimming tank is one of the utility, which is providing by PMC. Each administrative ward has a swimming tank, which are care and services by Pune Municipal Corporation. These swimming tanks are available all over the year. These Swimming Pools has Head Life guard, Lifeguard for observation and training.

Table No. 4.7 : Swimming Tank in PMC

Sr. No	Ward Name	Area sq.km	Population : 2011	Swimming Tanks
1	Aundh	40.75	181124	3
2	B.S.Dhole Patil	14.64	155413	0
3	Bhavani Peth	2.90	192932	4
4	Bibvewadi	18.35	291446	1
5	Dhankawadi	10.84	236648	3
6	Ghole Road	12.76	171678	3
7	Hadapsar	24.78	324751	5
8	Karve Road	16.26	209331	3
9	Kasba Vishrambagh	5.00	178484	2
10	Sahakarnagar	9.20	205441	2
11	Sangamwadi	29.44	261957	1
12	Tilak Road	14.71	242290	4
13	Warje Karvenagar	15.23	233399	2
14	Yerawada	29.10	239564	5
Total		243.96	3124458	38

(Source : Compiled by Researcher)

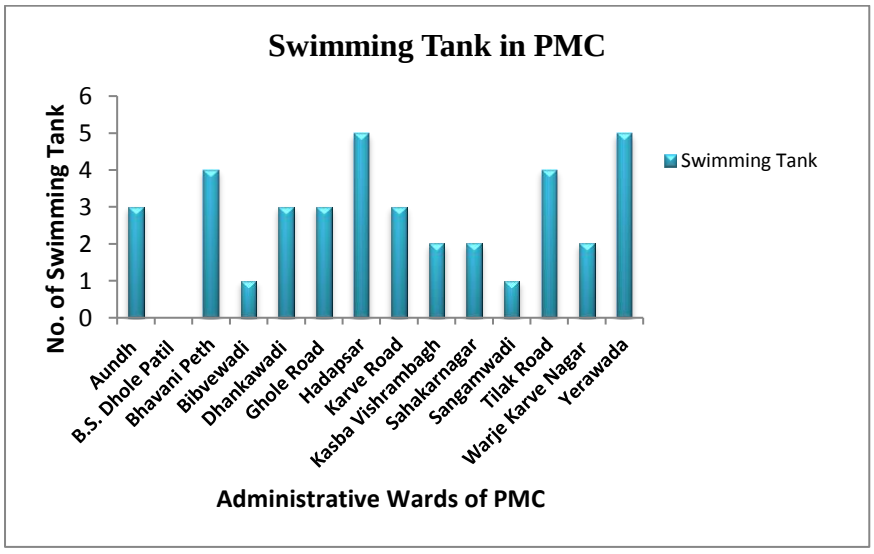
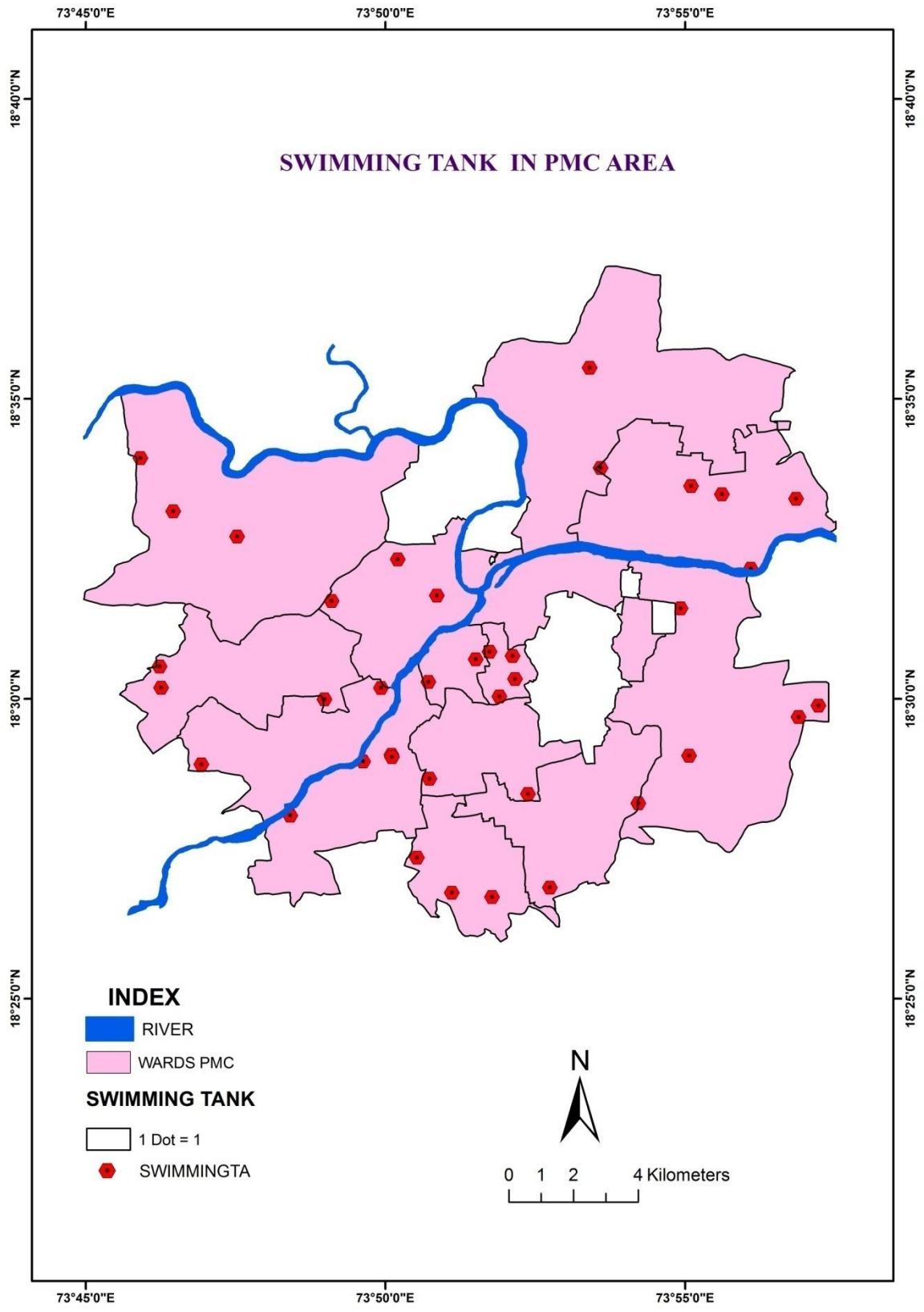


Fig. No. 4.7

Table No. 4.7 and Fig. No. 4.7 shows the ward wise numbers of Swimming Tank in Pune Municipal Corporation. Yerawada and Hadapsar ward has maximum numbers of Swimming Tanks. i.e. 5. Bibvewadi and Sangamwadi ward has only 1 swimming tank. Bhavani Peth ward and Tilak Road ward has 4 swimming tank which are services by PMC. In summer vacation, demand of people for swimming tanks is increased.


73°45'0"E
73°50'0"E
73°55'0"E
18°40'0"N
18°35'0"N
18°30'0"N
18°25'0"N
SWIMMING TANK IN PMC AREA
INDEX
RIVER
WARDS PMC
SWIMMING TANK
1 Dot = 1
SWIMMINGTA
N
0 1 2 4 Kilometers

MAP NO. 4.7

4.9 Gym in PMC

In modern life style, gyms are plays important role to care health of the people. Today's busy schedule, tress of work gives the mental and physical depression. To rescue from daily tress exercise is best solution. Regular exercise can have a profoundly positive impact on depression, anxiety, ADHD and more. Gym is the place where physical exercises and activities performed inside, often-using equipment. The purpose of a gym is not simply to give you access to different machines; it's to increase the likelihood to continue exercise to maintain persons fitness. Gym do this through a combination of equipment, education, training and socialization that keep the person motivated. Gym is slang for 'Fitness Center'.

Table No. 4.8 : Gym in PMC

Sr. No	Ward Name	Area sq.km	Population : 2011	Gym's
1	Aundh	40.75	181124	32
2	B.S. Dhole Patil	14.64	155413	25
3	Bhavani Peth	2.90	192932	20
4	Bibvewadi	18.35	291446	34
5	Dhankawadi	10.84	236648	30
6	Ghole Road	12.76	171678	20
7	Hadapsar	24.78	324751	18
8	Karve Road	16.26	209331	27
9	Kasba Vishrambagh	5.00	178484	11
10	Sahakarnagar	9.20	205441	11
11	Sangamwadi	29.44	261957	10
12	Tilak Road	14.71	242290	15
13	Warje Karvenagar	15.23	233399	22
14	Yerawada	29.10	239564	18
Total		243.96	3124458	293

(Source : Compiled by Researcher)

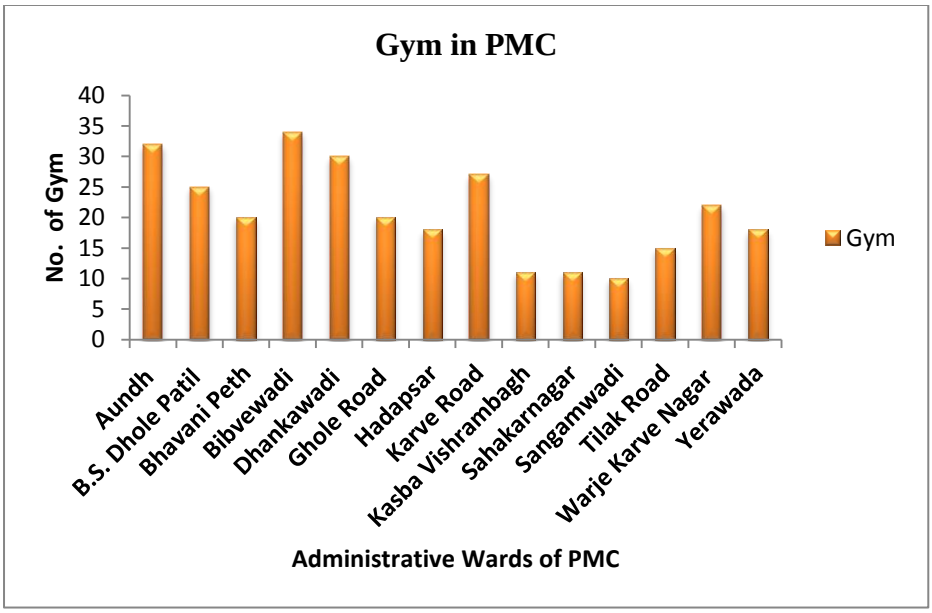
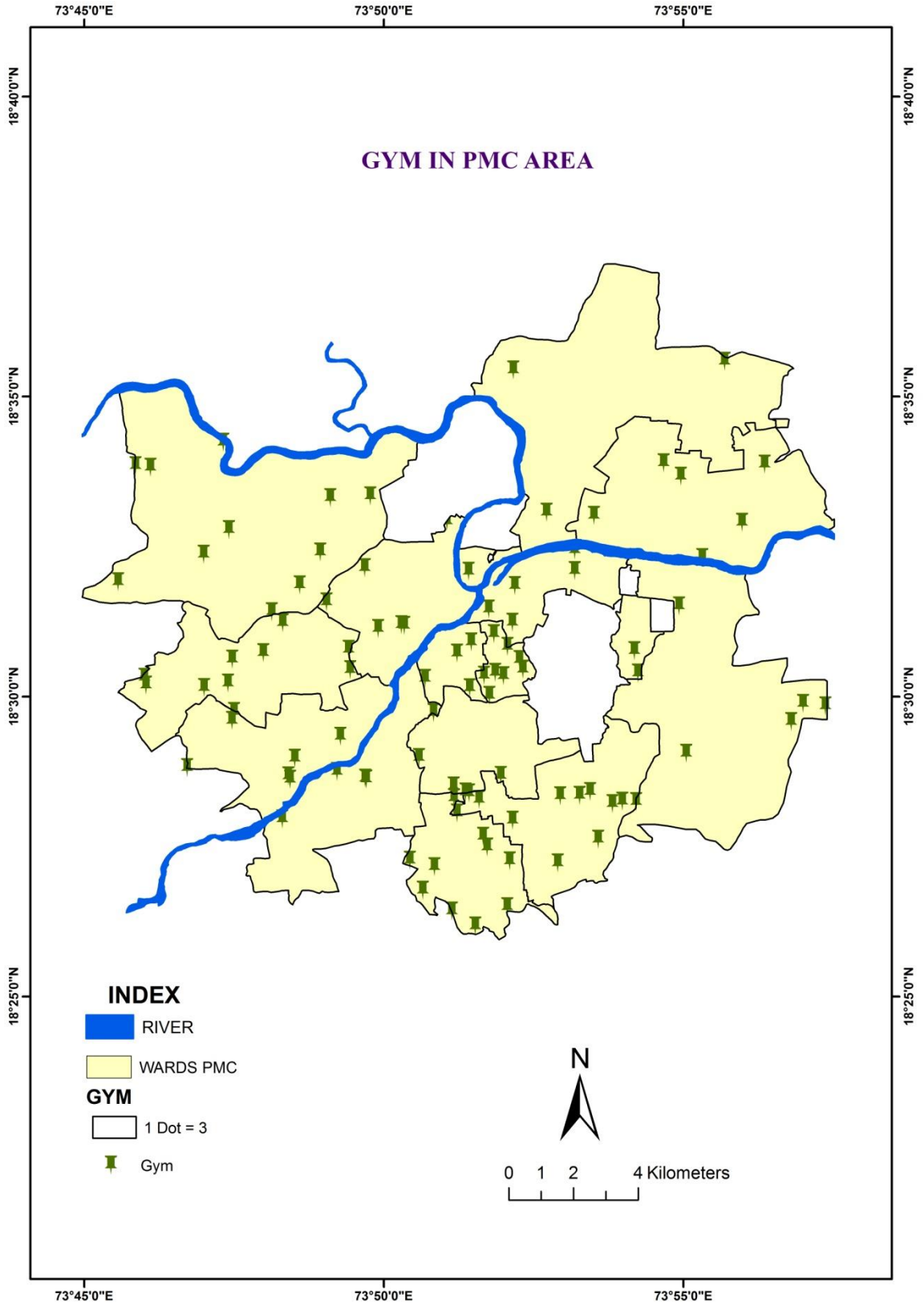


Fig. No. 4.8

Table No. 4.4 and Fig. No. 4.4 shows the ward wise numbers of Gyms in Pune Municipal Corporation. In Pune City, Gym services are provided by PMC as well as by Private sectors. Maximum number of gyms are found in Bibvewadi ward i.e. 34 and minimum number of gyms found in Sangamwadi ward i.e.10. Some Gyms are small, they have minimum instruments and only one instructor can handle such type of Gym but some Gyms are provide costly and high qualified services.


GYM IN PMC AREA
73°45'0"E
73°50'0"E
73°55'0"E
18°40'0"N
18°35'0"N
18°30'0"N
18°25'0"N
INDEX
RIVER
WARDS PMC
GYM
1 Dot = 3
Gym
N
0 1 2 4 Kilometers

MAP NO. 4.8

4.10 Flour Mills in PMC

Flour Mill is the very common but important utility. This utility provide by private sectors. In Social life there is some class are categorized based on their economical condition or level, such as below poor line, middle class, high-middle class and high class. During the field survey it was noticed that the people who belongs to below poor line and middle class are depend on this utility, which was provide by private sectors. High - middle class and high class living people has their own flour mill in their house.

Table No. 4.9 : Flour Mills in PMC

Sr. No	Ward Name	Area sq.km	Population : 2011	Flour Mills
1	Aundh	40.75	181124	60
2	B.S.Dhole Patil	14.64	155413	38
3	Bhavani Peth	2.90	192932	52
4	Bibvewadi	18.35	291446	100
5	Dhankawadi	10.84	236648	120
6	Ghole Road	12.76	171678	42
7	Hadapsar	24.78	324751	83
8	Karve Road	16.26	209331	71
9	Kasba Vishrambagh	5.00	178484	77
10	Sahakarnagar	9.20	205441	72
11	Sangamwadi	29.44	261957	36
12	Tilak Road	14.71	242290	77
13	Warje Karvenagar	15.23	233399	68
14	Yerawada	29.10	239564	98
Total		243.96	3124458	994

(Source : Compiled by Researcher)

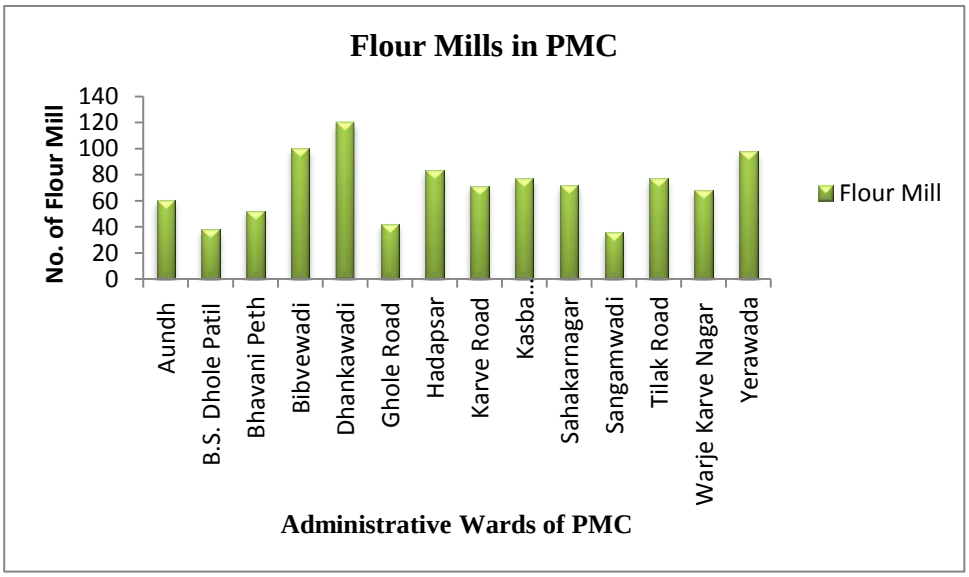
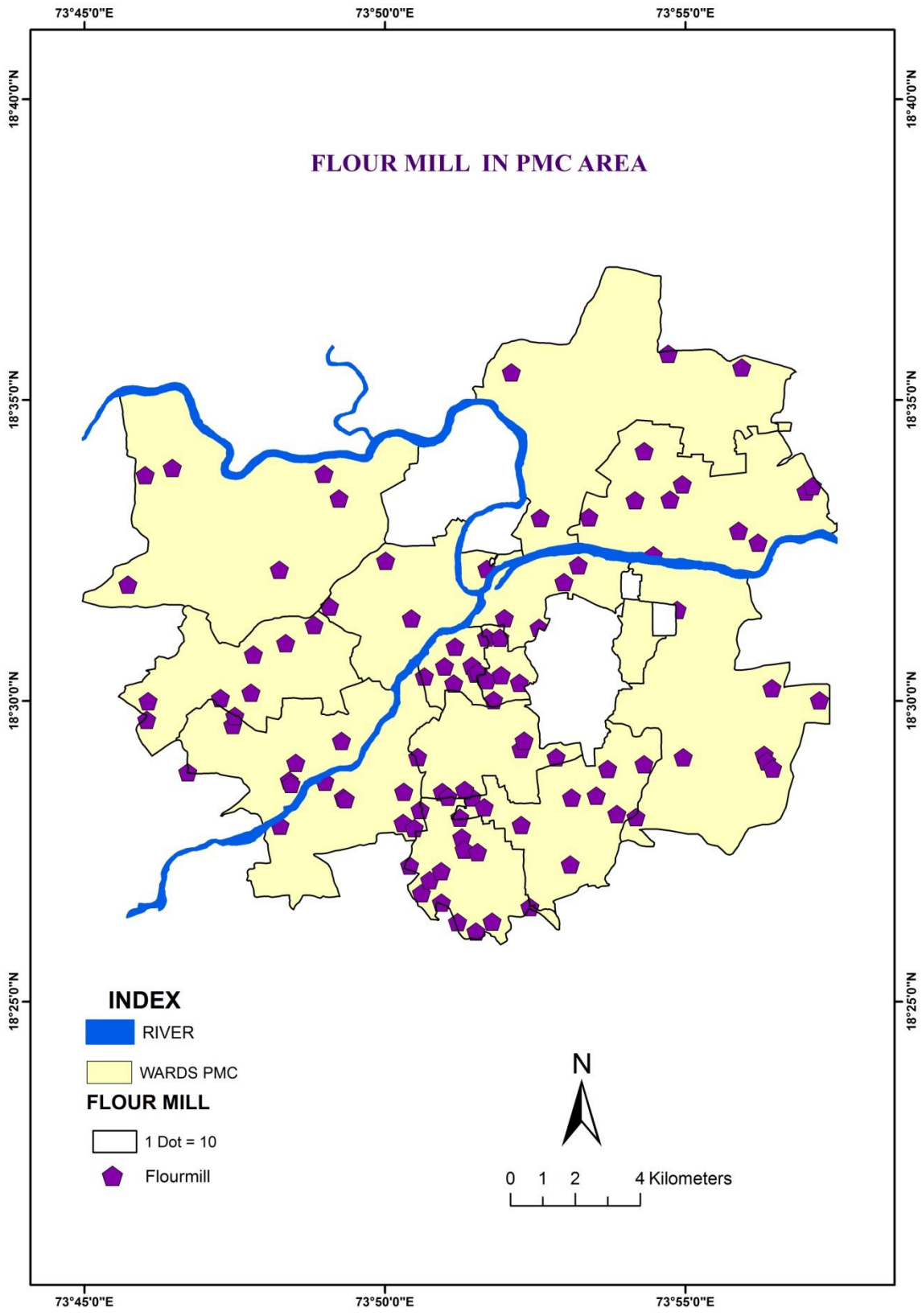


Fig. No. 4.9

Table No. 4.9 and Fig. No. 4.9 shows the ward wise numbers of Flour Mill in Pune Municipal Corporation. In study area, Dhankawadi ward has maximum numbers of Flour Mills i.e. 120. Bibvewadi ward has 100 flour mills and Yerawada ward has 98 flour mills. Sangamvadi Ward shows minimum number of Flour Mills i.e. 36 only.


FLOUR MILL IN PMC AREA
73°45'0"E
73°50'0"E
73°55'0"E
18°40'0"N
18°35'0"N
18°30'0"N
18°25'0"N
INDEX
RIVER
WARDS PMC
FLOUR MILL
1 Dot = 10
Flourmill
N
0 1 2 4 Kilometers

MAP NO. 4.9

4.11 Barber in PMC

This utility also provide by Private sectors. An earliest time in India Barber was a cast and person of this cast involve this profession generation by generation. The skilled of this profession was transfer from one generation to next. Barber has either visit door to door or has a one location near river, in temple or under the tree.

Nowadays time has changed and due to some social changes people from another cast / categories are also prefer the same profession and this profession has well status and value in Fashion World of today. Barber shops provide barbering services such as cutting, trimming, shampooing, and styling hair, shaves. The common people or young generation has follow the trend of hairstyle and look of Heroes / Actors of Hollywood or Bollywood. Now the barbershops are not only for haircut or for hairstyle and shave but also to fraternize and to generate new fashion trend. The hairstylists of India are famous in our country and they giving their services at the international level also. Now in PMC some Barbershop's hairstylist are famous in National or International Fashion World.

Table No. 4.10 : Barber in PMC

Sr. No	Ward Name	Area sq.km	Population: 2011	Barber
1	Aundh	40.75	181124	71
2	B.S. Dhole Patil	14.64	155413	54
3	Bhavani Peth	2.90	192932	40
4	Bibvewadi	18.35	291446	74
5	Dhankawadi	10.84	236648	81
6	Ghole Road	12.76	171678	45
7	Hadapsar	24.78	324751	105
8	Karve Road	16.26	209331	130
9	Kasba Vishrambagh	5.00	178484	55
10	Sahakarnagar	9.20	205441	60
11	Sangamwadi	29.44	261957	51
12	Tilak Road	14.71	242290	63
13	Warje Karvenagar	15.23	233399	132
14	Yerawada	29.10	239564	96
Total		243.96	3124458	1057

(Source : Compiled by Researcher)

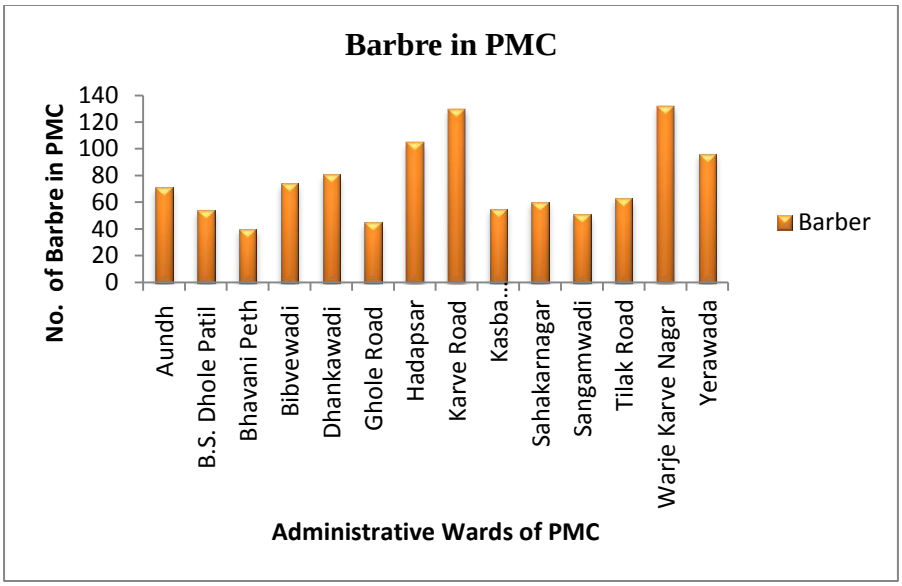
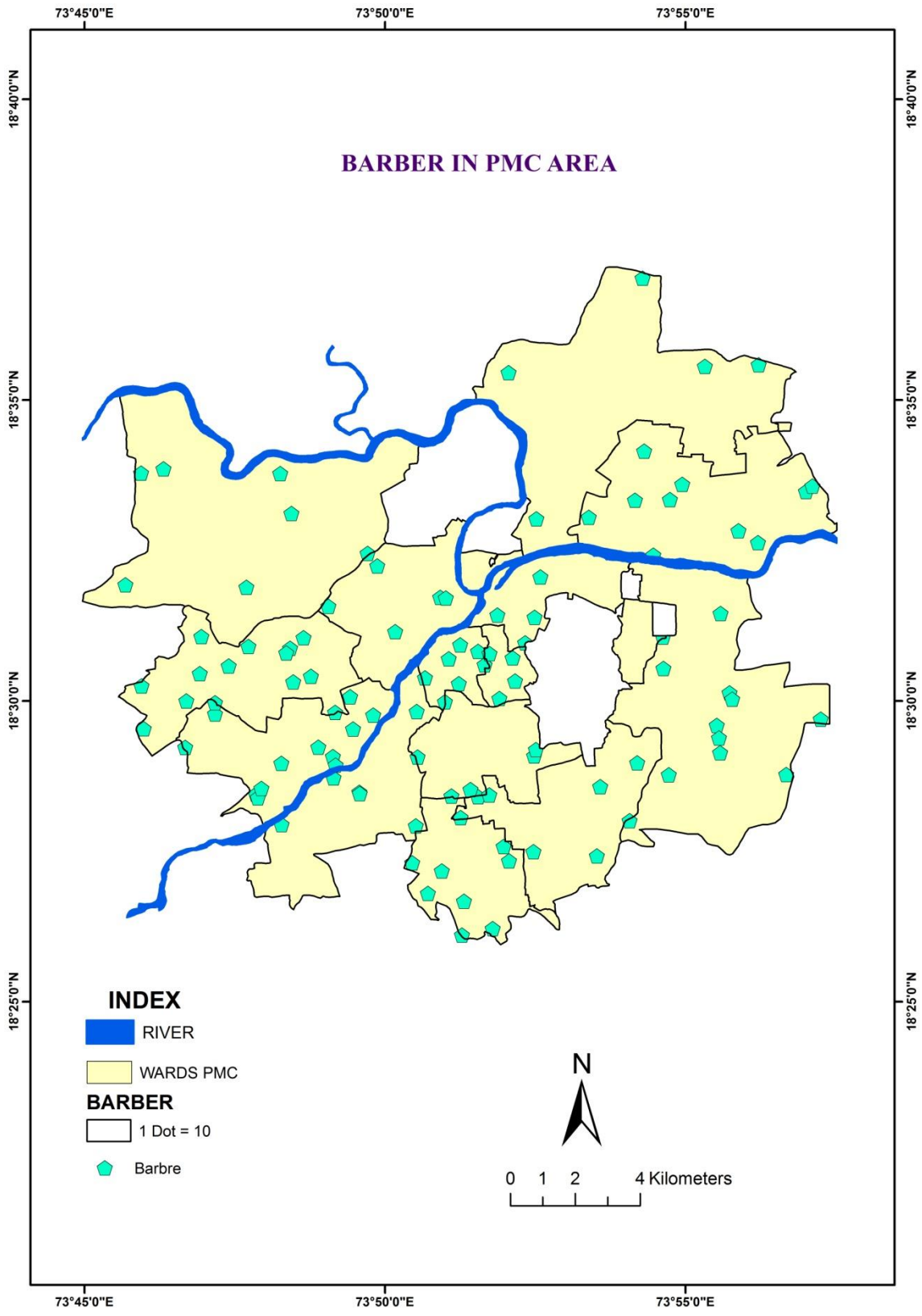


Fig. No 4.10

Table No. 4.10 and Fig. No. 4.10 shows the ward wise numbers of Barber in Pune Municipal Corporation. In slum areas barber shops are in very simple manner i.e they still give traditional single - blade razor shaves but B.S.Dhole Patil, Karve Road this area which is known as well commercial area shows high quality and costly services provider barber shops i.e. luxurious levels. Karve Road ward has maximum number of Barber shops i.e. 130 where Bhavani Peth ward shows minimum number of Barber shops i.e. 40. Some Barber shops are 40 to 45 years old where some new barbershops has their chain over all the city, this new barbershops follow modern trends of fashion.


BARBER IN PMC AREA
73°45'0"E
73°50'0"E
73°55'0"E
18°40'0"N
18°35'0"N
18°30'0"N
18°25'0"N
INDEX
RIVER
WARDS PMC
BARBER
1 Dot = 10
Barbre
N
0 1 2 4 Kilometers

MAP NO. 4.10

4.12 Information System (IS)

Nowadays, society becomes dependent on Information System. An Information System has help many people in their daily life routine. An Information System is a such as one in the opening scenario are combinations of hardware, software and telecommunication network that people build and use to collect , create and distribute useful data especially in organizational settings.

An Information system is computer based systems, designed for the collection, storage and analysis of objects and phenomena where geographical location is an important characteristic or critical to the analysis. Information system integrates common database operations such as query and statistical analysis with the unique visualization.

Design makers and planners are handicapped today due to the lack of authentic, complete and up to date information, hence, it is necessary to create information system to get the information only on one click by user. An Information System focuses on the basic concept of database, data requirements and the mechanism to store, organize, process and analyze.

An Information System as a system, which assembles, stores, processes and delivers information relevant to an organization or to society in such a way that the information is accessible and useful to those who wish to use it. ***(Dale, 1999)***

An Information system designed to collect, process, and store and distribute information, is comprised of four critical components: technology, process, structure and people. Technology and process represent the technical sub - system, while structure and people represents the social sub - system. The technology component includes hardware, software and telecommunication equipment. A process is a set of actions that are designed to carry out a specific activity. The people component include all of the individuals who are directly involved with the information system. Finally, the structure component refers to the relationship among the individuals in the people component. An Information Systems not only improve point to point communication, but also within networks which involves more than two parties. Information systems include data and processes. In information system data plays a central role. Data can be logical values, numbers, words, or strung - together sentences. Actions, known as processes, are required to actively exchange, transform, and move data. For computer to ' compute', processes

actively manipulate data. Components of an information system detail the rules for what processes can do to data, under what circumstances. A systems innovator seeking to improve an information system might look to modify the data an information system contain or collect. Equally, a systems innovator might improve an information system by modifying what processes manipulate data or an innovator might modify the policies of a system to reuse existing processes in new ways on data.***(Richard T. Watson, 2005)***

' An Information System (IS) is an organized system for the collection, organization, storage and communication of information.'

'An Information System (IS) is a group of components that interact to produce information.'

4.13 Ward Information System (WIS) for Utility Services of PMC

Ward Information System is storing the information and contains privilege to add, update and delete the data. It will be useful to many users on a variety of stages like government official, planners, researchers, common person who are interested in such a information. This information system will split the information on one platform, which will, helpful for successful administration.

The information System is created in terms of ward's Utility Services. Basic information about the PMC and its 14 administrative ward is generated for recognize various Utilities like Barbers, Blood Bank, Flour Mill, e - Suvidha Center, Gym, Fire Station, Property Tax Pay Office, Public Gardens, Swimming Tanks etc. This information system is developed to assist the planners for city planning. Ward Information System of Utility Service of PMC helps to tress out the exact location of utility.

To prepare Ward Information System for utilities like Barbers, Blood Bank, Flour Mill, e - Suvidha Center, Gym, Fire Station, Property Tax Pay Office, Public Gardens, Swimming Tanks etc., data regarding to these all utilities like utility name, address, ward wise quantity has been attached in GIS environment with the help of ArcGIS 9.1. In this queries has been fired on the particular data set and got the information by the software.

Ward Information System is creating to visualize ward wise distribution of the particular utilities. Snap No. 1 to Snap No. 10 are give an idea about the distribution of utility overall the Pune Municipal Corporation.

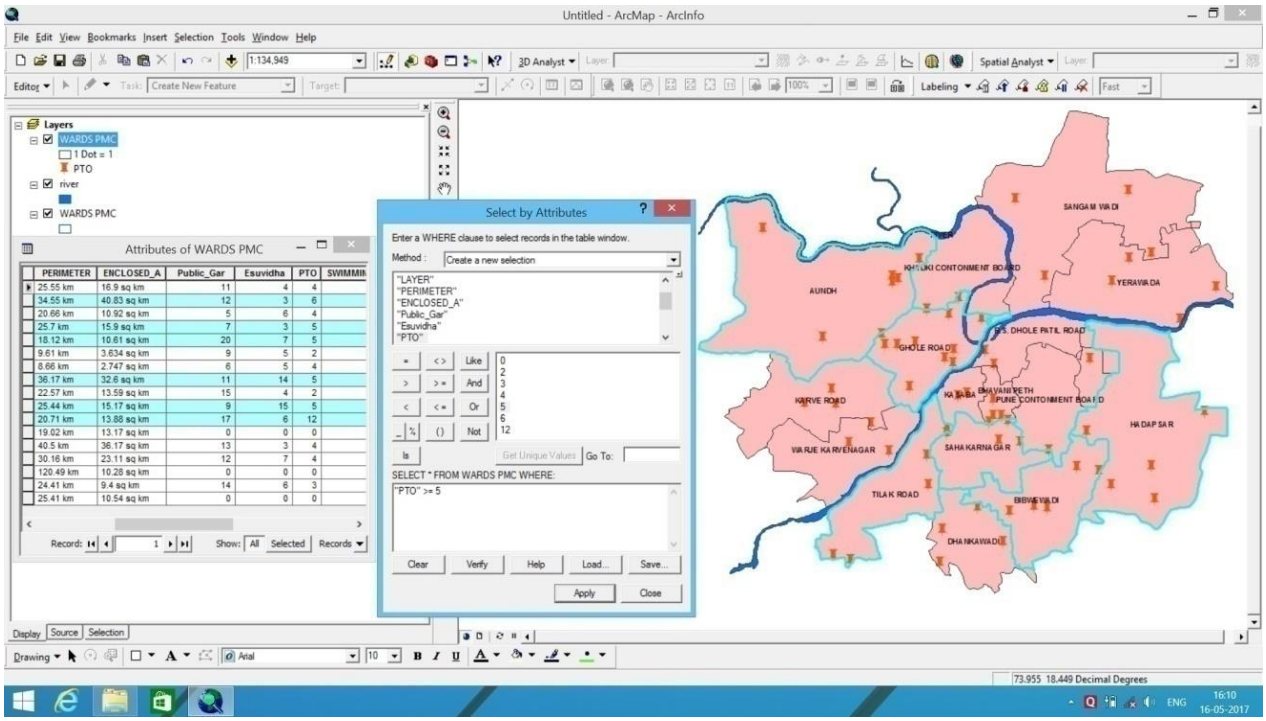


Fig. No. 4.11 : Ward Information System for Property Tax Pay Office

Ward Information System for Property Tax Pay Offices is shown in Snap No. 4.1. This Information System shows the number of property tax office in per administrative ward. For preparation information system for Property Tax Pay Office ward wise data has been attached in GIS environment i.e. Aundh : 6, B.S.Dhole Patil : 3 etc.

For ward information system the queries has been fired, 1 dot = 1 Property Tax Pay Office and here the group of administrative ward call attention to which have more than 5 Property Tax Pay Offices in above snap. There is six administrative wards are found which have more than 5 property tax pay office in above Snap.

People make use of such information to pay tax. Common people who will operate such information system, they will obtain the information within one click i.e. how many Property Tax Pay Offices are obtainable in particular area.

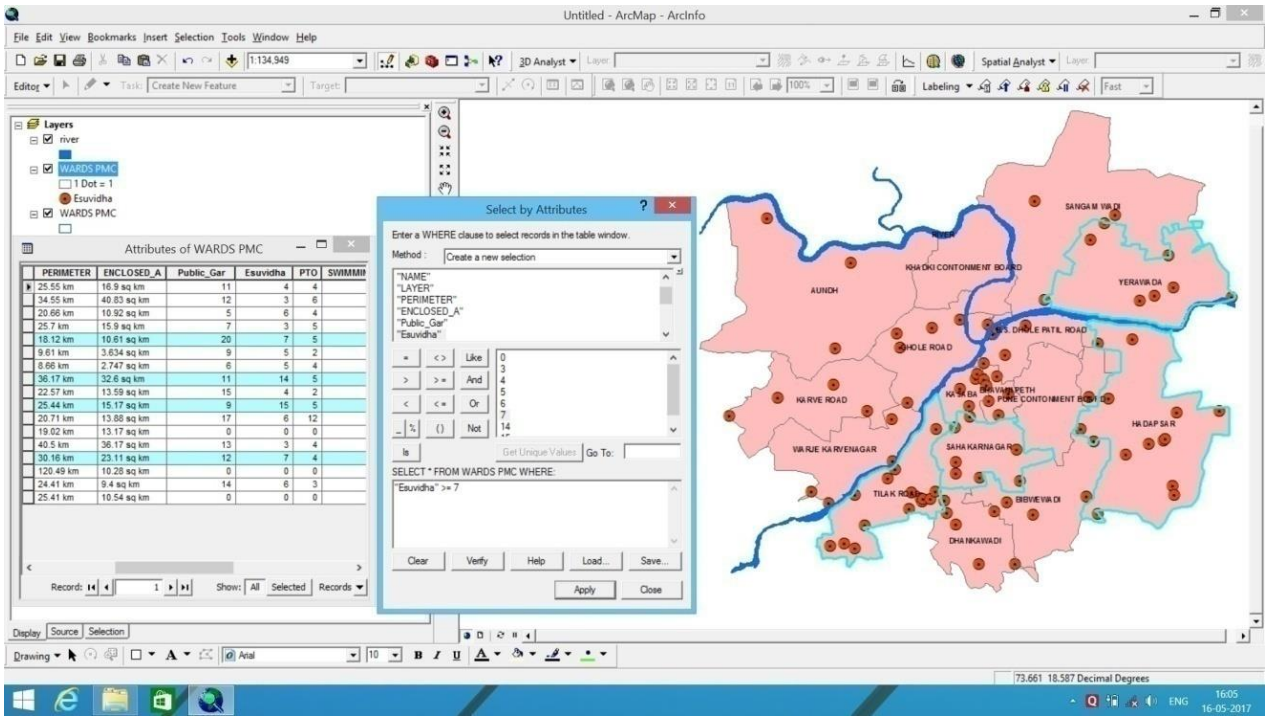


Fig. No. 4.12 : Ward Information Systemfor Maha e - Suvidha Center

Ward Information System for e - Suvidha Center is shown in Snap No. 4.2. This Information System shows the number of e - Suvidha in per administrative ward. To grounding information system for e - Suvidha Center, ward wise data has been attached in GIS environment i.e. Bhavani Peth: 5, Bibvewadi: 3 etc.

The queries has been fired for ward information system , 1 dot = 1 e - Suvidha Center and here the administrative ward which have more than 7 e - Suvidha Centers are shown in above snap. There is four administrative wards are found which have more than 7 e - Suvidha Center. Common people who will make use of such information system, they will obtain the information within one click i.e. how many e - Suvidha Centers are in particular area.

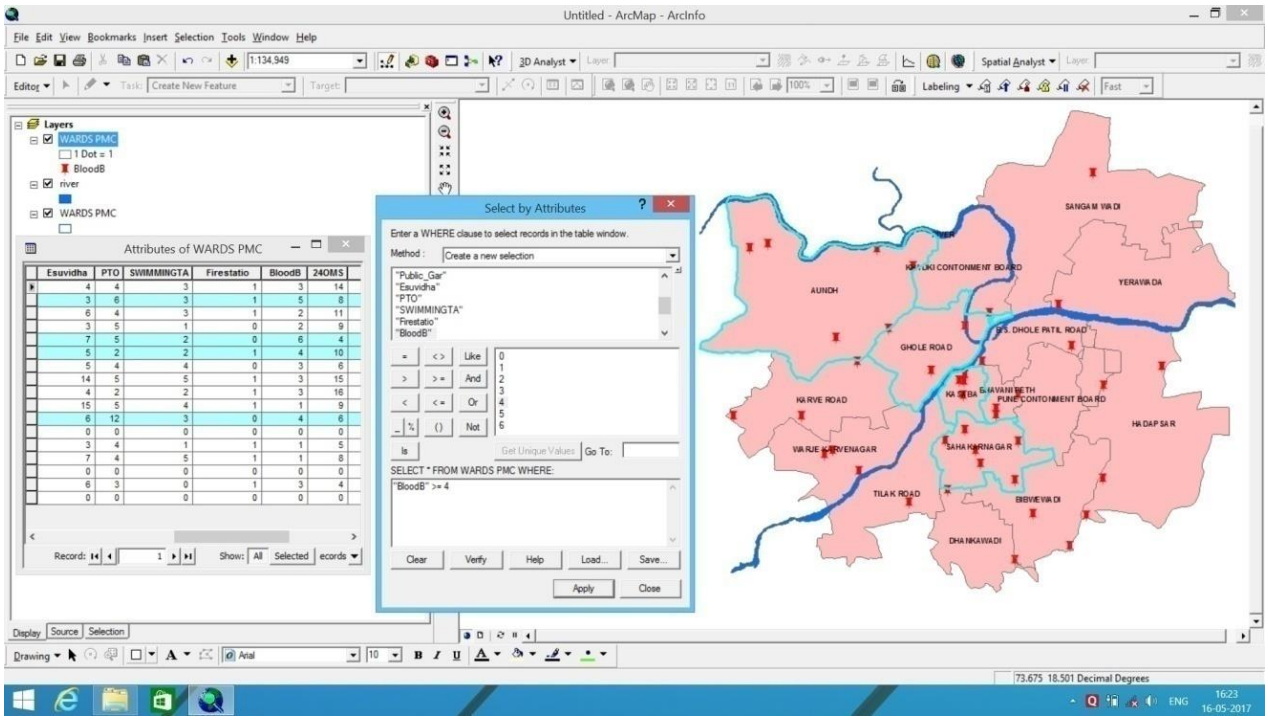


Fig. No. 4.13 : Ward Information Systemfor Blood Bank

Ward Information System for Blood Bank is shown in Snap No. 4. 3. This Information System shows the number of Blood Bank in per administrative ward. To prepare information system for Blood Bank availability, ward wise data has been attached in GIS environment i.e. Dhankawadi: 2, Ghole Road: 4 etc.

The queries has been fired for ward information system, 1 dot = 1 Blood Bank and in above snap it is highlighted that the group of administrative ward which have more than 4 Blood Bank. There is four administrative wards are found which have more than 4 Blood Bank. In emergency, common people who will apply such information system, they will search out the information within one click i.e. how many Blood Banks are available in particular ward, and on its next stage the information regarding the Blood Bank such as address, and contact numbers is highlighted.

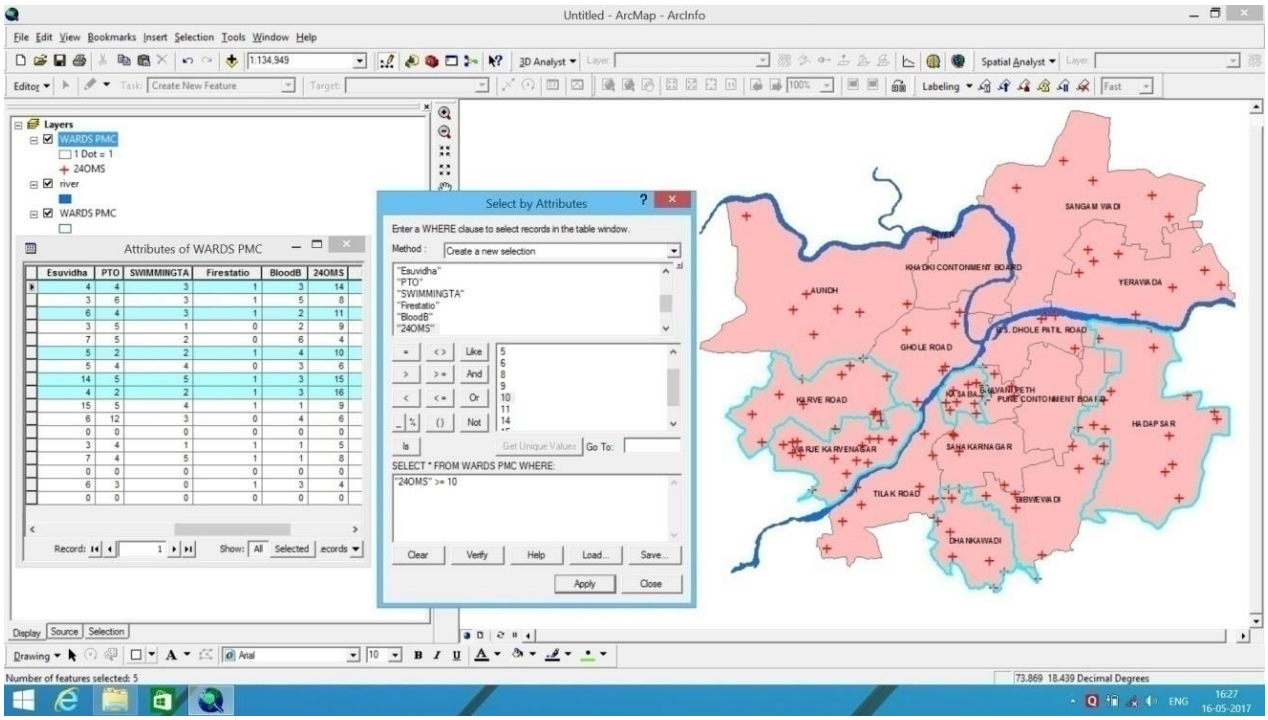


Fig. No. 4.14 : Ward Information Systemfor 24 Hr's Open Medical Stores

Ward Information System for 24 Hrs Open Medical Stores is shown in Snap No. 4. 4. This Information System shows the number of 24 Hrs Open Medical Stores in per administrative ward. To prepare information system for 24 Hrs Open Medical Stores accessibility, ward wise data has been attached in GIS environment i.e. Hadapsar: 15, Karve Road: 13 etc.

The queries has been fired for ward information system, 1 dot = 1 Medical Store which is open for 24 hrs. In above snap it is show up that the group of administrative ward, which have more than 10 Medical Stores of 24 hrs open. There is five administrative wards are found which have more than 10 Medical Stores of 24 hrs open. Common people will get the information within one click, how many Medical Stores are available 24 hrs in particular ward.

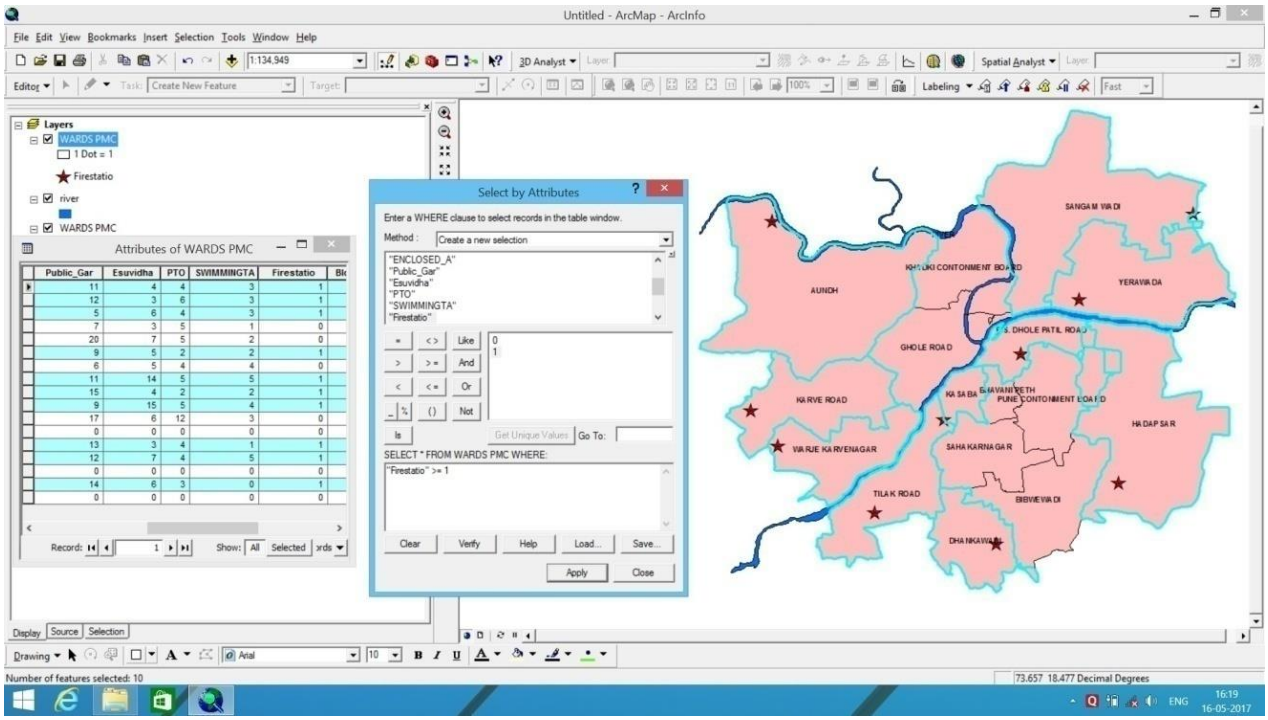


Fig. No. 4.15 : Ward Information Systemfor Fire Station

Ward Information System for Fire Station is shown in Snap No. 4.5. This Information System shows the number of Fire Station in per administrative ward. To prepare information system for Fire Station accessibility in PMC, ward wise data has been attached in GIS environment. The queries has been fired for ward information system, 1 dot = 1 Fire Station of PMC. The people will use this information to find the ward, which has Fire Station, and where lack of Fire Station.

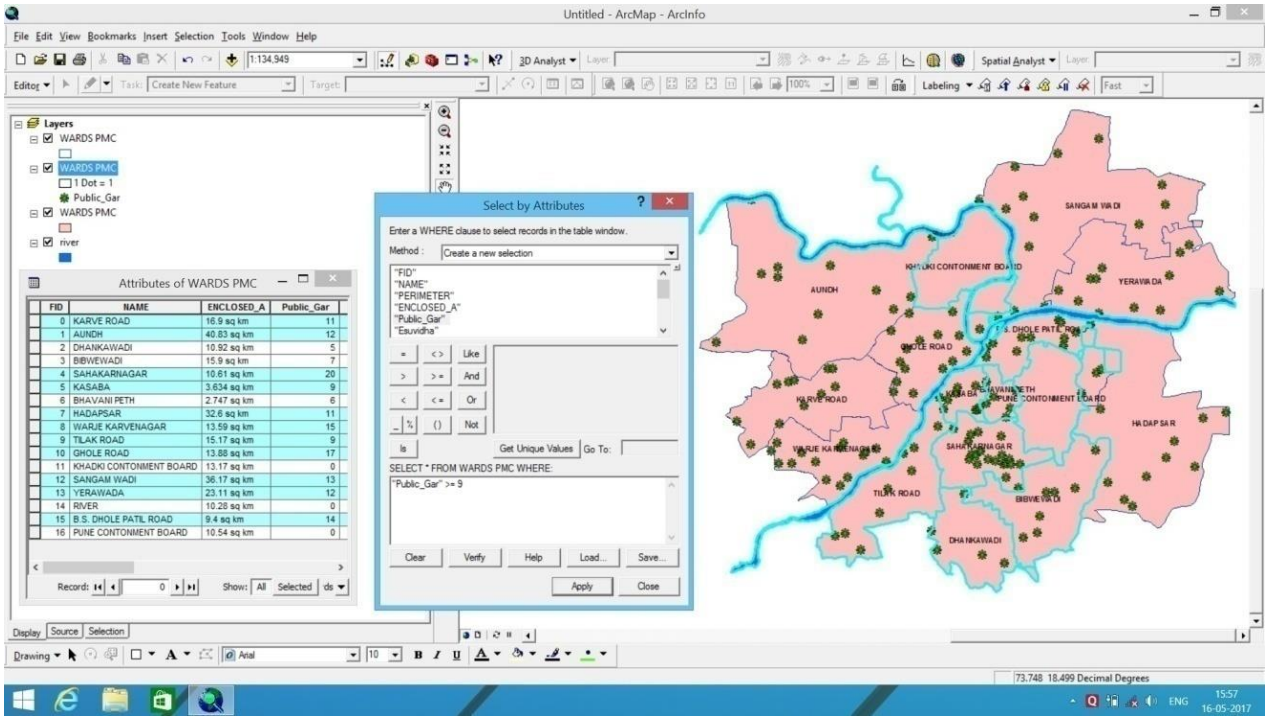


Fig. No. 4.16 : Ward Information Systemfor Public Garden

Ward Information System for Public Garden is shown in Snap No. 4. 6. This Information System shows the number of Public Garden in per administrative ward. To prepare information system for ward wise Public Garden facilities, ward wise data has been attached in GIS environment i.e. Kasba Vishrambagh : 9 , Sahakarnagar : 20 etc.

The queries has been fired for ward information system, 1 dot = 1 Public Garden is consider. In above snap, it is draw attention to the group of administrative wards, which have 9 and more than 9 Public Gardens. There is eleven administrative wards are found which have 9 and more than 9 Public Gardens. Common people who will make use of such information system, they will get the information within one click i.e. how many Public Gardens are accessible in a particular ward.

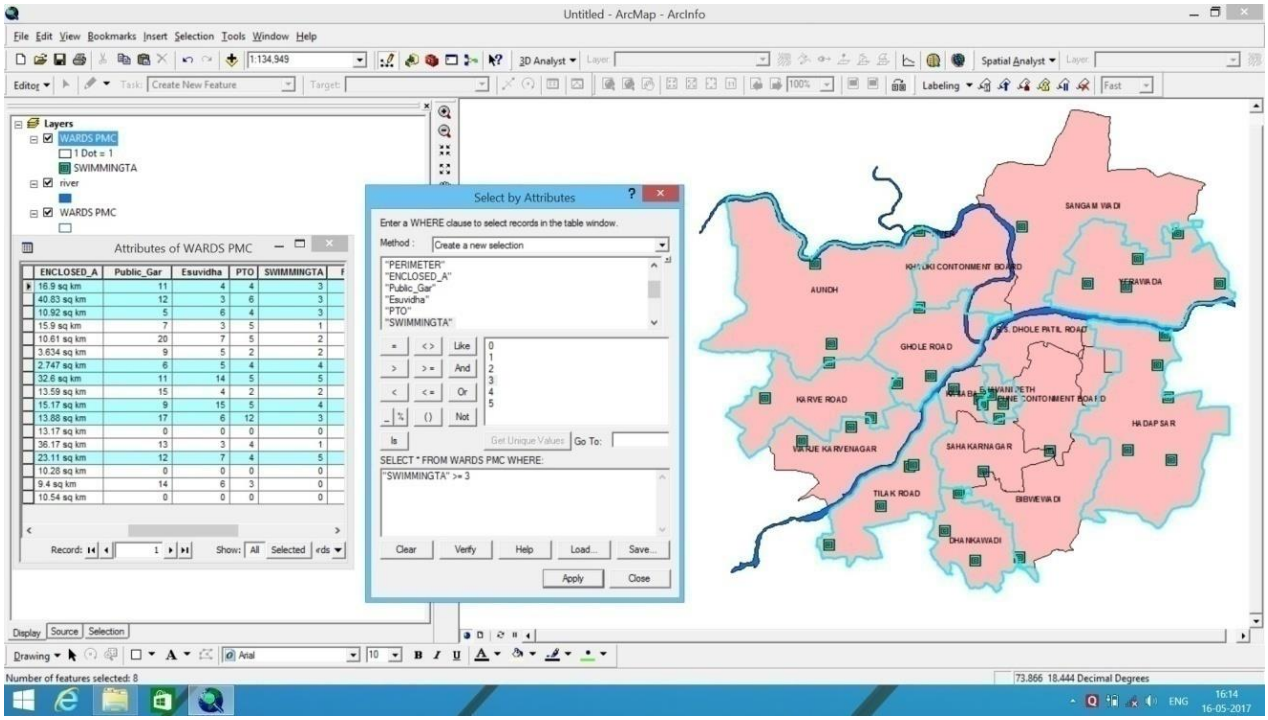


Fig. No. 4.17 : Ward Information Systemfor Swimming Tank

Ward Information System for Swimming Tank is shown in Snap No. 4.7. This Information System shows the number of Swimming Tank in per administrative ward. To prepare information system for ward wise Swimming Tank amenities, ward wise data has been attached in GIS environment i.e. Sangamwadi : 1, Tilak Road: 4 etc.

The queries has been fired for ward information system, 1 dot = 1 Swimming Tank is consider. The above snap give an idea about the group of administrative wards, which have 3 and more than 3 Swimming Tank facility's availability. There is eight administrative wards are found which have 3 and more than 3 Swimming Tank. People who will make use of such information system, they will search out the information within one click i.e. how many Swimming Tanks are easily reached in a particular ward.

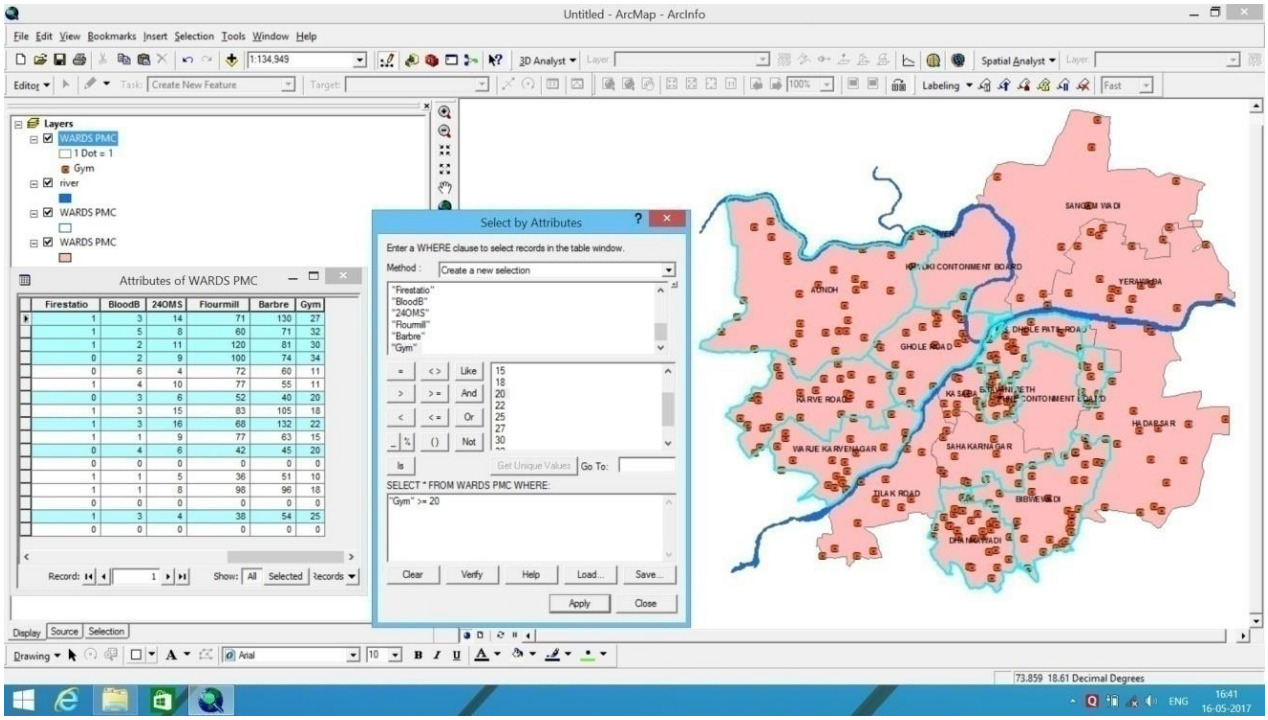


Fig. No. 4.18 : Ward Information Systemfor Gym

Ward Information System for Gym is shown in Snap No. 4.8. This Information System shows the number of Gym in per administrative ward. To prepare information system for ward wise Gym amenities, ward wise data has been attached in GIS environment i.e. Warje Karvenagar : 22, Yerawada: 18 etc.

The queries has been fired for ward information system, 1 dot = 1 Gyms is consider. The above snap give an idea about the group of administrative wards, which have 20 and more than 20 Gym's facility. There is eight administrative wards are found which have 20 and more than 20 Gyms. People who will make use of such information system, they will search out the information within one click i.e. how many Gyms are simply arrive in a particular ward.

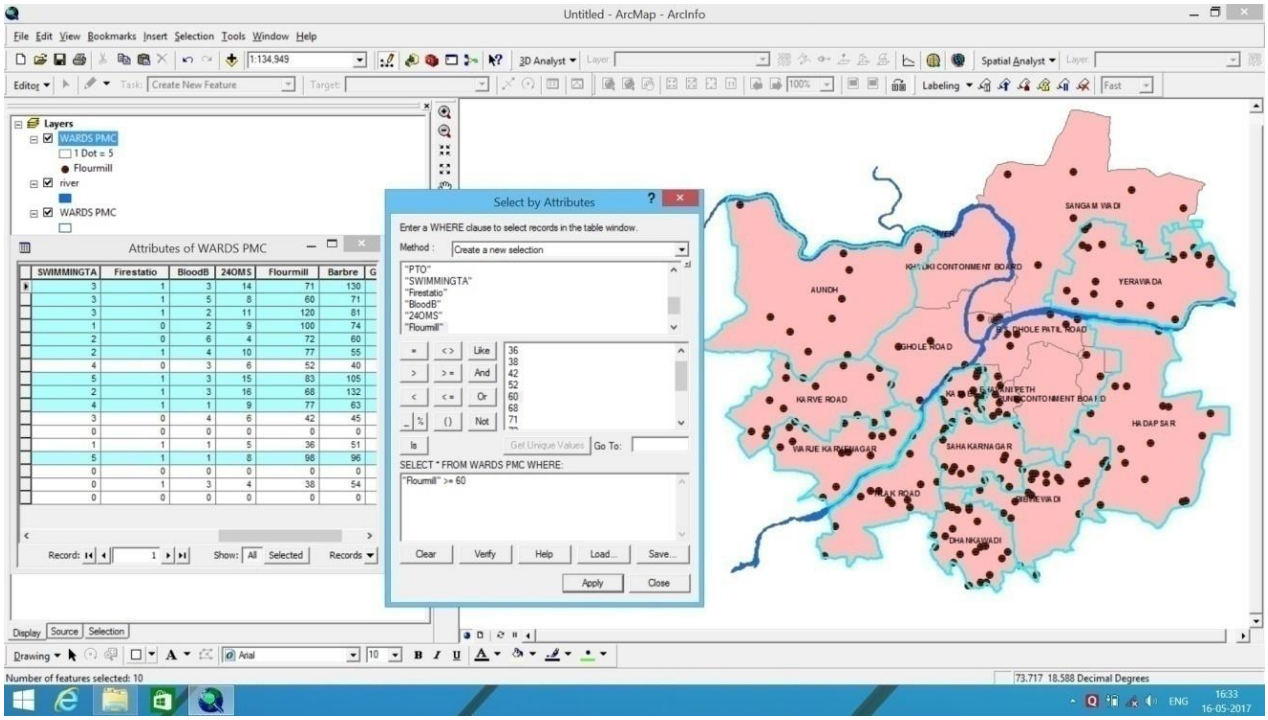


Fig. No. 4.19 : Ward Information Systemfor Flour Mill

Ward Information System for Flour Mill is shown in Snap No. 4.9. This Information System shows the number of Flour Mill in per administrative ward. To prepare information system for ward wise Flour Mill facilities, ward wise data has been attached in GIS environment i.e. Aundh : 60 , B.S. Dhole Patil : 38 etc.

The queries has been fired for ward information system, 1 dot = 5 Flour Mill are consider. In above snap, it is draw attention to the group of administrative wards, which have 60 and more than 60 Flour Mill. There is ten administrative wards are found which have 60 and more than 60 Flour Mill. Common people who will make use of such information system, they will get the information within one click i.e. how many Flour Mill are available in a particular ward.

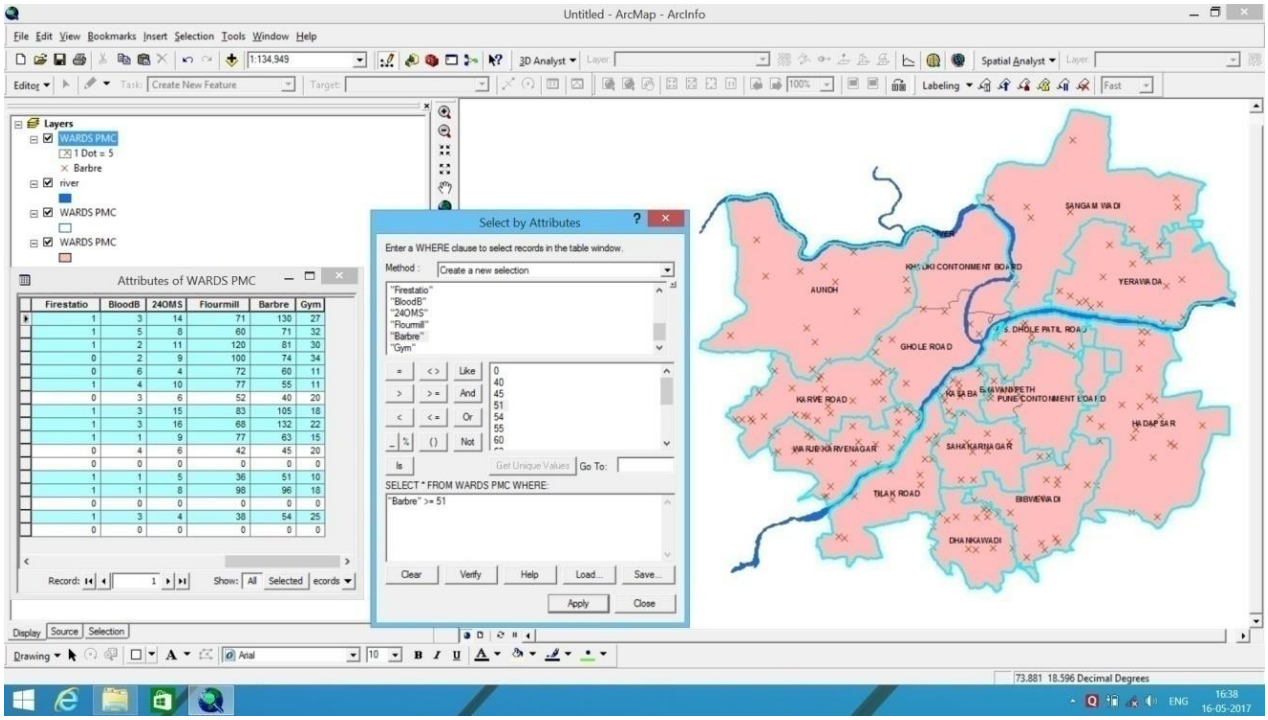


Fig. No. 4.20 : Ward Information Systemfor Barber

Ward Information System for Barber is shown in Snap No. 4.10. This Information System shows the number of Barbers in per administrative ward. To prepare information system for Barber availability, ward wise data has been attached in GIS environment i.e. Dhankawadi : 81, Ghole Road: 45 etc.

The queries has been fired for ward information system, 1 dot = 5 Barbershops are consider and in above snap it is highlighted that the group of administrative ward which have 51 and more than 51 Barber. There is twelve administrative wards are found which have 51 and more than 51 Barber. People who will apply such information system, they will search out the information within one click i.e. how many Barber are available in particular ward.

4.14 Planning Strategies

Planning Strategies means a systematic process of envisioning a desire future and translating this vision into broadly defined goals or objectives and sequence of steps to achieve them. To overcome all the problems encountered in development process, quite a few fields are recognized as follows

1. Property tax is pay for one time overall the year. Online pay mode is also available to people, but minimum numbers of people has knowledge about the online transaction. Most of people directly go to the property tax pay office to pay the tax amount. Due to minimum numbers of those offices, peoples face inconvenience in those days. Hence, communicate with the people and help them to understand and use the online pay mode.

2. In PMC, 88 e - Suvidha Centers are active. This e - Suvidha Centers provide all governmental services like to issue smart card, domicile etc. But people are unknown about the services which are provide by the e - Suvidha Centers. Hence it is need to arrange some program for people's awareness. Information boards are highlighted near the e - Suvidha Centers, use the social media to advertise the services of e - Suvidha Centers. The staff, which is appointed in e - Suvidha Center, should be well knowledgeable, expert and well train to handle online and offline services. If people will use this centers, the difficulties are reduce to get the government documents and e - governance policy will be get success as well as achieve the transparency in every activity.

3. Multispecialty hospitals of PMC have their own blood bank. Nowadays hospitals update the list of blood downer, blood group and contact detail of the downer. When emergency occur the hospital check out the stock of blood bank and if there is lack of such blood group, the hospital contact to those blood group persons which has already register with hospital. But this system only handle by those hospitals who has their own blood bank. However, the other hospital that has emergency need of blood they are depends on blood bank and Hospital's blood

bank. The small hospital contact to various blood bank for inquiry. This procedure is very stressful to small hospital and patient's relative. Now e - blood banking system is useful and time consuming system. This system always updated with the name of blood bank, address and blood group availability. If hospital or even a patient visit to online this e - banking portal they get detailed information and they directly contact to those blood bank. National Health Portal of India is one of the example of e- Blood Banking. If all hospitals are interlinking with each other and use the benefit of e - blood banking is very helpful to all hospital and patient too.

4. 24 Hrs open medical stores is new concept settle in PMC from last few years but maximum numbers of people are unknown about it. This medical stores are available for 24 hrs without taking any extra charge from customer. If the person who fill illness but not necessary to hospitalized then the family doctors are recommended some medicines, that time this medical stores are helpful. Most of the people are unknown about this emergency facility, hence its need to inform the people through the doctors. Generic Medicines are available at low price, if 24 hrs open medical stores are open this facility for people it's too good for everyone.

5. Pune Municipal Corporation has 14 administrative ward but only 11 administrative wards has Fire Station. Each administrative ward has only one fire station. When compare to total population of the ward this is insufficient. When focused on settlement and road types of PMC it is found that Kasba Vishrambagh this administrative ward has number of vada which are 100 years old, residential and commercial zone are mix together, slum areas are increases towards the hill side in Hadapsar, Bibvewadi, Warje Karvenagar, roads are full of traffic and insufficient width of roads this are the condition of PMC's settlement and roads. If any emergency circumstances takes place, it is difficult to reach on time to such position due to roads and traffic , when Fire Brigade reach their they also face difficulty to recue people due to settlements unplanned arrangement. Hence it is need to increase the number of Fire Station per ward. 14th to 20th April is celebrated as ' A Fire Safety Week' and Fire Department conduct various rallies,

mock drills, and public awareness lectures but all this activates are occur in core area of the city. The nature of this programmed is only at celebration level only and not reach to common people.

6. Public Garden is the green spaces where people spend their time for entertainment, relaxations. This area is with full of greenery and has lots of open space. People who were exposed to natural environment, the level of stress decreased rapidly. Public spaces such as public gardens are potentially of importance because they cater the opportunities for high levels of interaction between persons of different social and ethnic background. However, sometime people mistreat with this place. Some people's enjoyment level increases and such enjoyment is painful to other people, and that time there is need of security staff or volunteers to handle such situation. However, it is found that there is a lack of security staff and volunteers. Hence it is need to appoint sufficient security staff for each Public Garden. Another problem is that the population of each ward and number of Public Gardens are insufficient and total area of each garden is not enough to number of visitors hence Public Park are always has the rush of people. Hence, increase the number of Public Gardens to avoid the crowdedness. One more trouble is that the all Public Gardens are road touch hence two wheelers, four wheelers parking problem is common thing and all gardens are surrounded by small shops of food or snacks i.e. Tapari, Hathgadi and a peddler and due to this small shops the area of garden is become full of hustle and bustle and hence the concept of garden which is known for place with full of silence is shattered.

7. In summer vacation, demand of Swimming Tanks is increases. There is 38 swimming tanks are available which are services by the Pune Municipal Corporation. The number of membership is increases during summer camp. Swimming Tank has open in three sessions in summer i.e. morning, afternoon and evening, maximum numbers of people are attend every batch. However, with compare to number of swimmer and the number of instructors, lifeguard is not in proper manner. Some time it is strike that the swimmer can swim in their own

responsibility, lifeguards are not present near the tank. Head of Lifeguard and other staff has no familiar with their work and responsibility. They have no seriousness about upcoming incidents. Another problem is about the cleanness. Some Swimming tanks are in very poor condition. Water tanks are found with moss and sediment. Some time pool slides, pool ladders and pool steps are slippery. The minimum number of diving boards. Hence, it is necessary to takeproper care of swimming pools by the PMC and give the proper training and consciousness to the staff related to swimming tanks.

8. In Pune Municipal Corporation private gyms are found in two class some Gyms are small and some Gyms are with luxurious facility. Common problem is found in this industry is about trainer and equipment. It is realize that anyone can become a trainer but very few trainer have the certification of trainer and have the knowledge about fitness and aware of physical education. Hence, it is necessary to appoint well train Gym trainer or instructor. Some Gyms are with faulty equipment. The Equipment must be in proper working order. Trainers and Staff must also be familiar with the proper operation of the equipment. Charges of luxurious Gyms are not affordable to common people. If Pune Municipal Corporation start the 'Open Gym' concept as like as Mumbai with free of charge number of people will use this facility.

9. Flour Mill is daily used service and this service is directly related to people's health. The workers and owners of such Flour Mills are not take proper care during graining the grain. In Pune Municipal Corporation, some Flour Mills are 40 to 45 years old and the physical condition of such Flour Mills is not so good. Hence, the Flour Mill Associations or Organizations should notice these problems and keep the attention of Flour Mill owners on this problem to solve individually. One committee should be form to check out the conditions of every Flour Mill and those one has not follow the hygiene in their Flour Mill should be disqualified for some time and take some penalty charge from those Flour Mills.

10. When focused on barbering services of Pune Municipal Corporation, The luxurious Barbershops are centralized in some wards only i.e. Karve Road, B.S. Dhole Patil Road, Ghole Road, Tilak Road, Warje Karvenagar. The another problem which draw attention to in review that the many of the people who works at salons are not trained and this problem is found with slum area of ward and small barbershops. Hence, Barbershop owner should take training of such skill or skill person will be appointed for those services. Small barbershops should change themselves and give maximum modern and fashionable barbering service to the people. If this small barbershops overcome and give the service as like as luxurious barbershop then demand and charges of luxurious barbering shops will come in control to people.

CHAPTER FIVE
CONCLUSIONS

5.1 Introduction

Land use is subjective thing which can influenced by economic, cultural, political and land tenure factors. Land use refers as man's activities.The land use pattern of any urban areas is anindication of instant and current space requirements of the population and the growing needs over a period of year. Land is the very most important natural resource. The growing pressure of the population with increasing demands of human needs are made pressure on land.A serious problem for modeling urban land use change has been the lack of spatially detailed data.Geographical Information System is one of the most efficient ways to get the hypothetical view of any object or phenomena on the earth's surface similar to the actual situation. Remote Sensing (RS) technique is an effective tool for identifying the urban growth pattern from the spatial and temporal data.GIS and Remote Sensing have the potential to detect and control abuse of land.

The socio-economic development of any society is depends on infrastructure and availability of utility services. Utility services, which are use by the people, indicate the quality of life. Generally it is observe that there is wide gap between the utility availability and need for the utilities.Pune Municipal Corporation is one of the fast growing urban area. PMC is providing basic utilities. PMC has fourteen administrative wards, which are face the problem of unevenly distribution of utility. In order to prepare a development plan for utility planning of a city, there is a need of good and reliable information regarding the location of existing facilities, their accessibility. The modern technology like GIS and RS helps to trace out real picture of utility distribution. Remote Sensing helps to collects physical data of utility and GIS helps us to analyze the spatial data.

With the help of modern technology Ward Information System generate for PMC and its utility services. This Ward Information System is helpful to common people. Due to operate this Ward Information System people get the information within a one click. The planning strategies are also converse here to face the upcoming challenges. Ward Information System is storing the information and contains privilege to add, update and delete the data. It will be useful to many users on a variety of stages like government

official, planners, researchers, common person who are interested in such a information. This information system will split the information on one platform, which will, helpful for successful administration.

5.2Summary

Summary is the important part to focus on the way, which is helps to achieve the aims and objective of the research. To attain actual result and solution, research is ramble through various stages and those stages are compiled through summarizing. The present research work is divided into fifth chapters. The chapter scheme and its details are as follow :

The First Chapter is ***'Introduction'***. This is important part of present research work, which is clarify all basic concepts related to research work. This chapter is deal with introduction, aims and objectives, methodology, limitations of the study, review of literature and conclusion. The chapter is devoted to introduction of Urbanization, Land Use, Utility Services and its various definition. It help to clear concepts like Urbanization, Land Use and Utility Services and also explain the correlation in between those concepts. Review of literature give the various view to researcher to understand the problem and how to find out reasons and impacts of those problems. This Chapter also contain Introduction of Study Region.This chapter primarily paying attention on uniqueness of study area. It explains historical background of study area, physiography, climate, drainage system and population. This chapter helps researcher to realize uniqueness of the study area and how this uniqueness is responsible for the research problem. The PMC is well connected to other city or state by road, rail and air mode of transport. City has conserve its image like Oxford of East, IT BT hub, Hospital facility provider and other major service providing nature, Cultural Pune and city is ready to consume new challenges. 1981 to 2013 PMC plays various role. The changes and characteristics of changes of PMC are mainly disused in this chapter while reasons of change and problems which are shaped and highlighted during the research period are also discused.

The Chapter Two is ***'Review of Literature'.***This chapter hassummary of Thesis, Dissertation, Research Articles and Various Journals and Books.To achieve aims of the

study review of literature is guided; hence ‘Review of Literature’ is essential part of this chapter.

The Third Chapter is ***' Research Methodology'.***This chapter explains methodology of entire research work. This chapter is straightly associated to research's aims and objectives. This chapter utters the land use change of PMC from 1981 to 2013 and explains the characteristics of those changes as well as the reasons, which are responsible for those changes. This chapter deals with the major changes in land use category. It is observe that, built up area of the city increases and other land category like agriculture, barren, forest and water bodies are decreases. The rate of change of general land use is also discussed inthis chapter.The rate of change of general land use of PMC has two results either increasing rate or decreasing rate. Built up area has increasing rate while other land categories shows decreasing rate of change.Ward wise General land use examine in this chapter. Each ward shows different characteristics in general land use. Built up area of each ward is increases from 1981 to 2013. The reasons of increasing built up are also discussed in brief. In this chapter the ratio of population of each ward and available utility services is also studied. At the end of the chapter it is observed that in PMC, every administrative ward has lack of utility services. People of the city face the problem of lack of utility services and available services are has numerous strain on them.

The Fourth Chapter is ***' Analysis and Findings.'*** This chapter focused on utility services, which are available in study area. Utility like Property Tax Pay Offices, Maha e - Suvidha Centers, Blood Bank, 24 hours Open Medical Stores, Public Gardens, Swimming Tank, Gym,Flour Mill and Barber etc are taking for granted. Each ward's total population and availability of utility is discussed in this chapter. The reasons of results also discussed. Some utility services are centralized in core area. Some wards face the lack of utility. This chapter also discus on Planning Strategies. This chapter give the view to city planning. Decentralization of utility services is prime work to city planner. Boundary of the city increases with increasing population and the problems of the city also increases parallel. Data that was collected by various sources for various purposes are analyzed in this chapter to justify the problems and their reasons. This chapter is a back bone of research work, which is actually argue the problems and give assurance to

resolve the problems.This chapter is devoted to Utility Services in Pune Municipal Corporation. In this chapter Utility services, importance of such services and ward wise distribution in PMC these points are discussed. This chapter also focused on Information System and its impotence. It deals with the utility's ward wise distribution and generates Ward Information System for those utility services. This Ward Information System is helpful to common people. Due to operate this Ward Information System people get the information within one click. The planning strategies are also converse here to face the upcoming challenges.

The Fifth Chapter is ***' Conclusions.'*** This chapter deals with the summary, conclusions and suggestions. The role of this chapter is very essential because it act as a formal announcing of various reasons, results and suggestions, which are discussed in last five chapters. Summary of each chapter give fast highlight to understand background of the study and which is necessary to fix problem and give the perfect solution on research problem.

5.3Conclusion

1. Pune Municipal Corporation has shows the lots of changes in land use from 1981 to 2013. The total geographical area of PMC was 243.30 sq.km and out of this 24.92 sq.km area was under built up. i.e. 10.24 % area was under built up in 1981. In 2005, built up area were increases and 143.80 sq.km area of PMC was under built up i.e. 58.97%. The rate of change of built up was 43.8% from 1981 to 2005. In 2011, built up area capture maximum area of the city and in 2011, PMC has 192.53 sq.km area under built up, i.e. 78.92% , the rate of change of built up area was 92.53% from 2005 to 2011. In 2013, PMC has 198.79 sq. km area under built up. The rate of change of built up area is 98.79 % from 2011 to 2013.
2. The agricultural area of PMC decreases rapidly, barren land occupied by built up, hilltop and hill slopes are captured by built up. Hence, productive land cover by built up and the quality of such land set out permanently. In 1981, PMC has 39.17 % area under the agriculture which was decreasses and in 2013, 9.97 % area was under agricultural area.

3. Most of the utility services of the PMC are concentrated in the core areas of the city. Utility services of slum area are observe in poor condition and too old. While in commercial area this services are in good condition.
4. In Pune Municipal Corporation 88 Maha e - Suvidha Centers are Found.Tilak Road and Hadapsar this two administrative wards has maximum numbers of Maha e - Suvidha Centers. Tilak Road has 15 e- Suvidha Centers where Hadapsar has 14 e - Suvidha Centers. Hadapsar Administrative ward has largest population in PMC i.e. 324751, hence total population of this ward and the number of e - Suvidha Centers ratio is agreeable level.
5. PMC has 41 Blood Banks. Most of the blood banks are concentrated near the hospital and these hospitals are concentrated core part of the city. In PMC, Sahakarnagr ward has maximum numbers of Blood Bank. i.e. 6 where Sangamwadi, Tilak Road, Yerawada this ward has minimum number of Blood Bank i.e. 1.
6. In PMC,161 Public Gardens are in under observation of Pune Municipal Corporation. Sahakarnagar ward has maximum number of Public gardens i.e. 20, where Bhavani Peth ward has minimum Public gardens i.e. 6.
7. PMC has 293 Gym's. Maximum number of gyms are found in Bibvewadi ward i.e. 34 and minimum number of gyms found in Sangamwadi ward i.e.10.
8. In study area, 994 Flour Mills are found. Dhankawadi ward has maximum numbers of Flour Mills i.e. 120. Bibvewadi ward has 100 flour mills and Yerawada ward has 98 flour mills. Sangamvadi Ward shows minimum number of Flour Mills i.e. 36 only.
9. In PMC, 1057 Barber Shops are found. Karve Road ward has maximum number of Barber shops i.e. 130 where Bhavani Peth ward shows minimum number of Barber shops i.e. 40. Some Barber shops are 40 to 45 years old where some new barbershops has their chain over all the city, this new barbershops follow modern trends of fashion.
10. Out of 14 administrative wards 11 administrative ward has PMC Fire Station and each ward has only 1 Fire Station. Bibvewadi, Ghole Road and Sahakarnagar this three administrative ward has no Fire Brigade Station.

11. In PMC 65 Property Tax Pay Offices are Found. Hadapsar Administrative ward has maximum number of population in PMC. In 2011, this ward has 3,24,751 population. This ward has 8% Property Tax Pay Office, 16% Maha e- Suvidha centers, 7% blood bank, 12% medical stores which are 24 hours open.

5.4Suggestion

Pune Municipal Corporation is well connected by road, rail and air network with almost all the important cities within Maharashtra and India. Therefore, migration rate is increases year by year. Due to increasing population, demand of residential and commercial land is increases. Hence, various troubles are observed in PMC, like traffic congestion, waste disposal, decrease in forest or green cover, encroachment on the hill slopes, and unequal distribution of public utility services. These troubles are challenges to make this city as a 'Smart City'. To face the challenges some suggestions are recommending.

1. Some public utility services are concentrated in the core region of study area, hence decentralization of these services are necessary for the future planning.
2. To recognize new challenges of the cities, policy makers should consults with the administrators, social organizations, NGO's , political leaders and as well as the common people who actually facing the problems at ground level.
3. The new techniques likes satellite imageries (spatio - temporal data) can be used for the forthcoming sprawl and resolve the problems arises through the sprawl.
4. Protect open space and environmentally sensitive areas. Hilltops and hill slopes are captured by slum area. Due to this reason environmental degradation was starts in PMC. Hence, to avoid degradation of hill region, proper planning needed. Available forest area should be preserve and available barren land will use to develop forest area on it.
5. Today online bill pay, money transaction this facility is available. But due to less knowledge, people are not agree to do online transaction. Hence, to convenience of people and government, people should get knowledge about it.Communicate with common people and help them to understand and use the online services.

6. Blood banks are usually available near the hospital and concentrated core part of the city. Hence it is need to decentralized this utility. Information system should be developed strongly by hospital and information about availability of blood group in blood bank as well as donor person's name, address. This information will easily achieve to the person who will survive such problems.
7. If Pune Municipal Corporation start the 'Open Gym' concept as like as Mumbai with free of charge then number of people will use this facility. Utilize smarter infrastructure and green buildings.
8. In PMC, there is lack of security staff and volunteers in Public Garden. Hence it is need to appoint sufficient security staff for each Public Garden.The population of each ward and number of Public Gardens are insufficient and total area of each garden is not enough to number of visitors hence Public Park are always has the rush of people. Hence, increase the number of Public Gardens to avoid the crowdedness.
9. Information boards are highlighted near the e - Suvidha Centers, use the social media to advertise the services of e - Suvidha Centers. The staff, which is appointed in e - Suvidha Center, should be well knowledgeable, expert and well train to handle online and offline services.
10. Ward Information System should created with new ways and ideas for facing upcoming challenges and to solve unsolved problems of the city.
11. Agricultural land is available far from core region of the city. Hence remaining agricultural land should be preserve by people and by government. Give some facility to those people who has such agricultural land in the city.Day by day Built up area increases by consuming forest, barren land and agricultural land. Hence, PMC should refuse new upcoming construction projects in city.
12. To stop to increases slum area of the city MHADA should provide housing facility in low price to people. Due to this city planner will keep away the city from developing new slum area in the city. Offer low price houses to the people who are already live in slum.

Appendix I : List of Administrative and General Wards of PMC (as per 2011)

Aundh Administrative Ward		
Sr. No.	Name of General Ward	General Ward No.
1	Sanjay Gandhi Hospital	24
2	Bopodi	25
3	Pune University	26
4	Aundh Gano	27
5	Baner Balewadi	28
6	Sutarwadi	29
7	Pashan	30
8	Aundh I.T.I	31
9	Rajbhavan	32

Bhavani Peth Administrative Ward		
Sr. No.	Name of General Ward	General Ward No.
1	Kamala Neharu Hospital	48
2	Tilak Ayurved Mahavidyalaya	73
3	Rajewadi	74
4	Harkanagar	75
5	General Arunkumar Vaidya Stadium	76
6	Doke Talim	77
7	Swami Samrth Mandir , Ganeshpeth	78
8	Ghorpade Udyan	83
9	Mahatma Phule Smarak , Samtabhumi	85
10	Lohiyanagar	86
11	Ekbote Colony	87
12	Gurunanaknagar	88

Bibwewadi Administrative Ward		
Sr. No.	Name of General Ward	General Ward No.
1	Mahadji Shinde Chatri	97
2	Kondhava Khurd	120
3	N.I.B.M.	121
4	Mithanagar	122
5	Bibwewadi Gaon	123
6	Sukhsagarnagar	137
7	Vishwakarma Institute	138
8	Upper Indiranagar	139
9	Kondhawa Budruk	140

Dhankawadi Administrative Ward		
Sr. No.	Name of General Ward	General Ward No.
1	Chavan Nagar	132
2	Dhankawadi Ambegaon Pathar	133
3	Dhankawadi Gaon	134
4	Chitanyanagar	135
5	Balajinagar	136
6	Katraj Gaon	141
7	Rajiv Gandhi Prani Sangrahalaya	142
8	Bharti Vidyapeeth	143
9	Agam Mandir Katraj	144

B.S. Dhole Patil Road Administrative Ward		
Sr. No.	Name of General Ward	General Ward No.
1	Dr.Naidu Hospital	37
2	Bundgardan	38
3	Wadia College	39
4	Koregaon Park	40
5	Mundhava Gaon	41
6	Vikasnagar Ghorpadi	45
7	Dr.Babasaheb Ambedkar Udyan	46
8	Sasun Hospital	47
9	Juna Bazar	49

Ghole Road Administrative Ward		
Sr. No.	Name of General Ward	General Ward No.
1	Kamal Nayan Bajaj Udyan	22
2	Shetaki Mahavidyalay	23
3	Chatrushrungi Mandir	33
4	Model Colony	34
5	Morden College	35
6	Pune Mahanagarpaalika Bhavan	36
7	Fergusan College	53
8	Dr. Homi Bhaba Hospital	54
9	Gokhale Nagar	55
10	Vidhi Mahavidyalaya	56
11	Deccan Gymkhana	67

Hadapsar Administrative Ward		
Sr. No.	Name of General Ward	General Ward No.
1	Magarpatta Hadapsar	42
2	Hadapsar Oudyogik Vasahat	43
3	Sent Petric Town	44
4	Wanavadi Gaon	89
5	Ramtekadi	90
6	Hadapsar Gaon	91
7	Gliding Center	92
8	Sadhana Vidyalaya	93
9	Satavwadi	94
10	Kaleborate Nagar	95
11	Mahamadwadi	96

Kasba Vishrambagh Administrative Ward		
Sr. No.	Name of General Ward	General Ward No.
1	Kasba Ganpati	50
2	Shaniwarwada	51
3	New English School , Ramanbagh	52
4	Rajendranagar	68
5	Vishrambaghwada	69
6	Mahatma Phule Mandai	70
7	City Post	71
8	Ganeshpeth- Gurudwara	72
9	Dr. Kotnis Davakhana	79
10	Renuka Swarup Prashala	80
11	S.P. College	81
12	Subhashnagar	82
13	Panch Houd Mishan	84

Kothrud Administrative Ward		
Sr. No.	Name of General Ward	General Ward No.
1	Shankarrao More Vidyalaya	57
2	Rambagh Colony	58
3	Kishkindhanagar	59
4	Ramkrishna Paramhans Nagar	60
5	Vedbhavan	61
6	Mahatma Society	62
7	Vanaj Company	63
8	Yashwantrao Chavhan Natyagruh	64
9	Ideal Colony	65

Sahakarnagar Administrative Ward		
Sr. No.	Name of General Ward	General Ward No.
1	Salisburey Park	98
2	Tilak Maharashtra Vidyapeeth	99
3	Parvati Darshsn	100
4	Shahu College	115
5	Parvati Industrial Estate	116
6	Maharshinagar	117
7	Chatrapati Shivaji Market Yard	118
8	DAD Colony	119
9	Shankar Maharaj Math	124
10	Padmavati - Aranyeshwar	125
11	Taljai Mandir	126

Sangamwadi Administrative Ward		
Sr. No.	Name of General Ward	General Ward No.
1	Dhanori	1
2	Vidyanagar Lohagaon	2
3	Tingarenager Pamping Station	3
4	Kalas Vishrantwadi	4
5	Nanasaheb Parulekar Vidyalaya	5
6	Yerawada Prisan Press	6
7	Phulenagar Yerawada	16
8	Netaji Subhashchandra Bose Vidyalaya	17
9	Yerawada Gaon	18
10	Parnkuti	19
11	Yerawada Hotmix Plot	20
12	Deccan College	21

Tilak Road Administrative Ward		
Sr. No.	Name of General Ward	General Ward No.
1	Parvati Gaon	101
2	Parvati Jalkendra	102
3	Dandekar Pul - Dattawadi	103
4	P.L. Deshpande Udyan	104
5	Janta Vasahat	114
6	Anandnagar - Hingane Khurd	127
7	Vithalwadi	128
8	Vadgaon - Dhayri	129
9	Vadgaon Budruk	130
10	Manikbagh	131

Warje Karvenagar Administrative Ward		
Sr. No.	Name of General Ward	General Ward No.
1	Dinanath Mangeshkar Rugnalaya	66
2	Major Tathawade Udyan	105
3	Kothrud Gaon	106
4	Happy Colony	107
5	Dahanukar Colony	108
6	Warje Jalshudhikaran Prakalp	109
7	Popular Nagar	110
8	Warje Malwadi	111
9	Maharshi Karvenagar	112
10	Hingane Stree Sikshan Sanstha	113

Yerawada Administrative Ward		
Sr. No.	Name of General Ward	General Ward No.
1	Lohagaon Vimantal	7
2	Kharadi Gaon	8
3	Kharadi Infotech Park	9
4	Sundarabai Marathe Vidyalaya	10
5	Vadgaon Sheri	11
6	Ramwadi	12
7	Aagakhan Palace	13
8	Don Bossco Highschool	14
9	Nagpur Chawl	15

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