

## STUDY OF URBANIZATION OF VIJAYAWADA CITY USING GIS

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**Abstract:** *Urbanization (or urbanization) refers to the population shift from rural to urban areas, the decrease in the proportion of people living in rural areas, and the ways in which societies adapt to this change. It is predominantly the process by which towns and cities are formed and become larger as more people begin living and working in central areas. Rapid urbanization has led to increased mortality from non-communicable diseases associated with lifestyle, including cancer and heart disease mainly due to pollution and busy life. Increase of Commercial establishments in rural areas, towns and villages leads to urbanization in the society. This paper deals with study of urbanization in Vijayawada city. For this map of Vijayawada city, as well as data regarding various establishments like Govt. offices, schools, hotels etc along with their locations were collected. Population data of the years 2001 and 2011 were collected. Future population for the years 2021 and 2031 has been estimated by using geometric progression method. Densities of population for all the years were also estimated. This data is used in GIS to develop thematic maps showing the spatial distribution of population and densities in different years. Data regarding the commercial establishments, Govt. offices etc, were collected and their spatial distribution maps were also prepared and presented. The outcome of this work may be very useful for the urban planners for their activities as well as entrepreneurs for their business activities. These maps can help them to take better decision for establishing a business/school/office etc.*

**Key Words:** *Population data, Population density, Spatial distribution, GIS, Thematic maps*

### I. INTRODUCTION

Urbanization describes both the increasing footprint of urban areas and the increasing percentage of the urban population. It's a symbol of development because people get more labour or job in urban areas and earn money and increase national income, which will lead to development of a country. It is predominantly the process by which towns and cities are formed and become larger as more people begin living and working in central areas. It refers to the increment of population and the size of the city regarding it. As popular urbanization unfolds in diverse ways dependent upon the wider urban context, specific political constellations and actions, it results in a variety of spatial outcomes and temporal trajectories. This is therefore a revisable and open concept. In proposing the concept of popular urbanization for further examination, we seek to contribute to the collective development of a de-centered vocabulary of urbanization. A geographic information system (GIS) is a conceptualized framework that provides the ability to capture and analyse

spatial and geographic data. GIS applications (or GIS apps) are computer-based tools that allow the user to create interactive queries (user-created searches), store and edit spatial and non-spatial data, analyse spatial information output, and visually share the results of these operations by presenting them as maps. The field of GIS had a critical role to play in the use of geo-spatial data and information in national developmental issues, like population and demography, resource management, environmental monitoring and control, regional integration and international cooperation. However, when integrating GIS technology in the development stage in any country, positive steps have to be taken by government and other stakeholders involved in the development and promotion of GIS use for research, training and production of empirical data for policy formulation at the local, regional and national towards environmental monitoring and management, resource management and developmental planning.

Geographic information system is a powerful tool to manage spatial data and database, widely using in different fields. Both geographic information and population information are basic information although they can be used lonely. The integration of them will gain more important effects. GIS has abilities to create, store, edit, visualize, analyse and present the data, which is needed for carrying out the urban growth of the city.

### OBJECTIVES:

- To collect population data and map of study area Vijayawada
- To estimate the future population of different wards in Vijayawada city
- To digitize the wards of Vijayawada by using ARC GIS
- To create the spatial distribution maps of population statistics of Vijayawada city
- To develop the location maps of commercial establishments map of Vijayawada city

### II. STUDY AREA

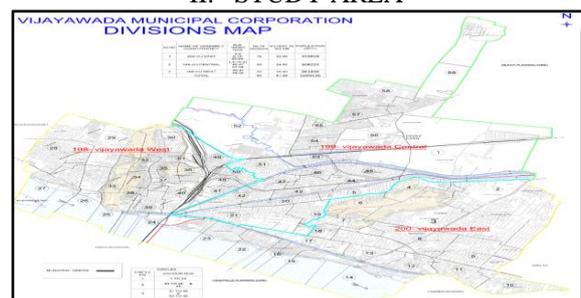


Fig.1. Study area map

### III. METHODOLOGY

As a first step, study area h selected and then data regarding the study area were collected like maps and population data. The next step is to estimate the population for further decade and also estimate the densities of Vijayawada ward wise through their ward areas. After that software work started with Digitization of GIS and thereafter development of Spatial distribution maps and thematic maps. The process of Digitization of GIS and development of thematic maps have explained briefly in the following section.

#### DIGITIZATION OF MAP

Digitizing in GIS is the process of converting geographic data either from a hardcopy or a scanned image into vector data by tracing the features. During the digitizing process, features from the traced map or image are captured as coordinates in either point, line, or polygon format.

#### STEPS OF DATA DIGITISATION PROCESS:

Ready with Data: Data in their any form should be there for digital transformation. Then, follow these steps: Segment data in different categories, as these: Text Data, Numeric Data, Alphanumeric Data, Audio and Visuals/Images

Download the contextual app or software.

Preparing Data: You cannot start with this transformation unless several objects like paper clip, sticky notes or spiral bands are there interfering with data.

Remove such objects.

Make them prepared for scanning or capturing.

Data Capturing: The downloaded software will prepare a ground for capturing data. An optimal clubbing of experts and technology gives digitisation a flying start.

Bring scanning devices, like digital camera, scanner, in place to take care of data capturing.

Make sure that computers are integrated with the scanning hardware through software.

Give command to hardware to extract, store and manipulate data into digital form.

Transition via Automatic Identification and Data Capture (AIDC): This term identifies various methods of data identification, collection and entering into the computer application. It teams up all the tools and techniques to obtain external data. So, you should:

Store data as a digital document, such as JPEG or PDF files. Select the option that takes fast turnaround time and is feasible, such as digital click of a hard copy.

#### Thematic Maps:

Thematic maps are sometimes referred to as graphic essays that portray spatial variations and interrelationships of geographical distributions. Location, of course, is important to provide a reference base of the location of the featured information.

Population data of the years 2001 and 2011 were collected. Future population for the years 2021 and 2031 has been estimated by using geometric progression method. Densities

of population for all the years were also estimated. This data is used in GIS to develop thematic maps showing the spatial distribution of population and densities in different years. Data regarding the commercial establishments, govt offices etc, were collected and their spatial distribution maps were also prepared and presented.

Method adopted in the entire work is shown in the following flow chart. The ward wise population data collected is given in the following table.

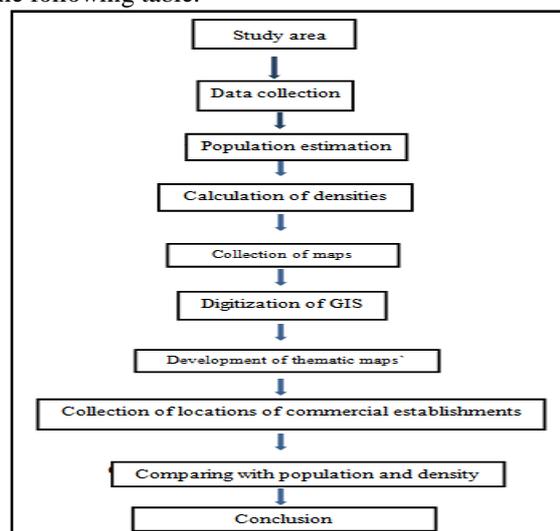


Fig.2. Flow chart showing the methodology

Table 1. Sample Population data of 2001 and 2011 collected

WARD NO	AREA in sq.km	POPULATION 2001	POPULATION 2011
1	5.93	14029	17698
2	4.36	13943	26763
3	1.91	13055	25794
4	0.47	14736	14049
5	0.54	14476	15328
6	0.57	15223	15030
7	0.62	17442	19388
8	1.14	15570	19188
9	1.4	14337	15399
10	0.88	13046	18995
11	0.63	14030	16895
12	0.58	13141	16021
13	1.3	15319	23701
14	2.81	15814	28145
15	0.65	14798	13776
16	0.5	14608	14771
17	0.68	14064	12543
18	0.55	14392	16096
19	0.63	12907	15168
20	0.36	13790	12769

IV. RESULTS

With available population of the years 2001 and 2011, future population of the years 2021 and 2031 were estimated using geometric progression method. Using areas of each ward, the population densities of the wards has been calculated and presented .Using the future population of 2021 and 2031, population densities were also calculated and presented. Using GIS thematic maps of population ward wise and densities ward wise were created and presented.

Table 2 Sample Projected Population

WARD NO	POPULATION 2021	POPULATION 2031
1	22326	28164
2	51370	98556
3	50963	100612
4	13395	12759
5	16230	17157
6	14839	40622
7	21551	23931
8	23646	29124
9	16539	17762
10	27656	40268
11	20345	24491
12	19532	23806
13	36669	56721
14	50091	89074
15	12824	11914
16	14935	15097
17	11186	9957
18	18001	20118
19	17825	20941
20	11823	10925

Table 3 Sample Densities of Population for 2021 and 2031

WARD NUM	AR EA	DENSITY 2011	DENSITY 2021	DENSITY 2031
1	5.93	2984.48	3765.03	4749.41
2	4.36	6138.30	11782.20	22604.59
3	1.91	13504.71	26682.51	52676.44
4	0.47	29891.48	28500.43	27146.81
5	0.54	28385.18	30055.74	31772.22
6	0.57	26368.42	26034.04	71266.67
7	0.62	31270.96	34759.84	38598.39
8	1.14	16831.57	20742.72	25547.37
9	1.4	10999.28	11814.07	12687.14
10	0.88	21585.22	31428.18	45759.09
11	0.63	26817.46	32293.65	38874.60
12	0.58	27622.41	33676.21	41044.83
13	1.3	18231.53	28207.15	43631.54
14	2.81	10016.01	17826.01	31698.93
15	0.65	21193.84	19730.15	18329.23
16	0.5	29542.25	29871.60	30194.00
17	0.68	18445.58	16450.74	14642.65
18	0.55	29265.45	32730.55	36578.18
19	0.63	24076.19	28293.81	33239.68
20	0.36	35469.44	32843.33	30347.22

Spatial distribution of population of population for years 2001, 2011, 2021,2031 were shown in Fig. 3 to 6. Population

density maps were shown in Fig. 7 to 10.

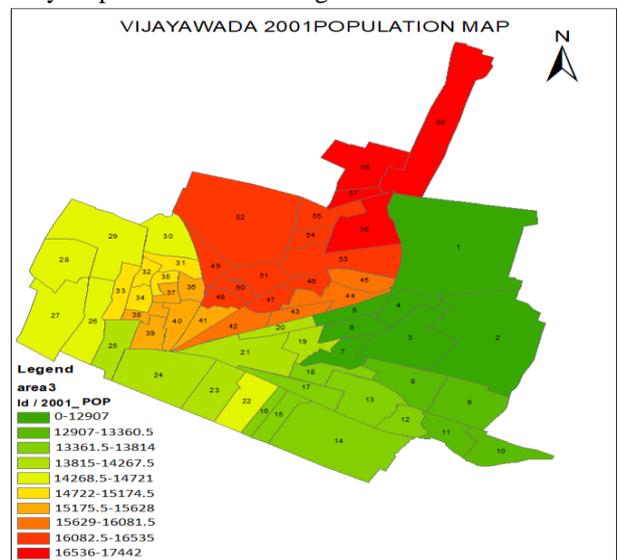


Fig.3. Thematic map showing population in 2001

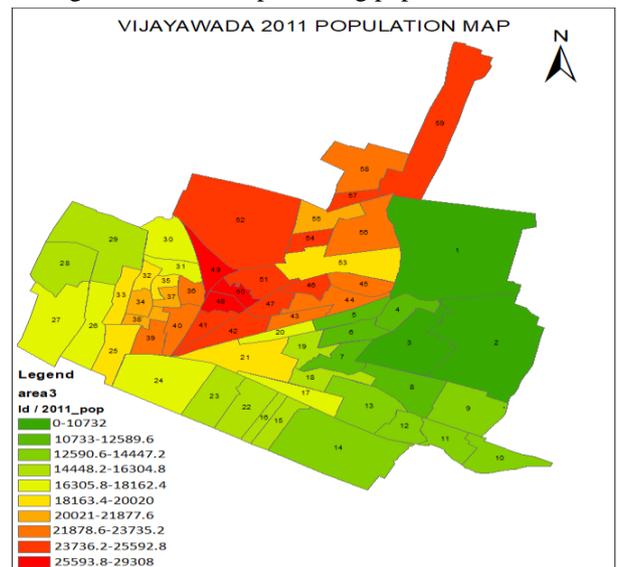


Fig.4. Thematic map showing population in 2011

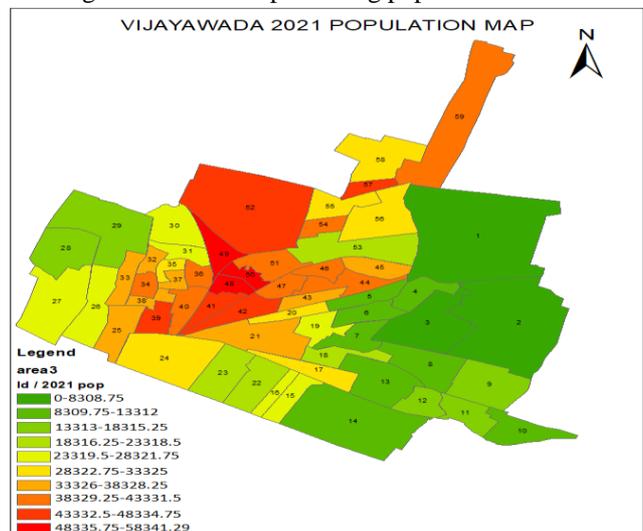


Fig.5. Thematic map showing population in 2021

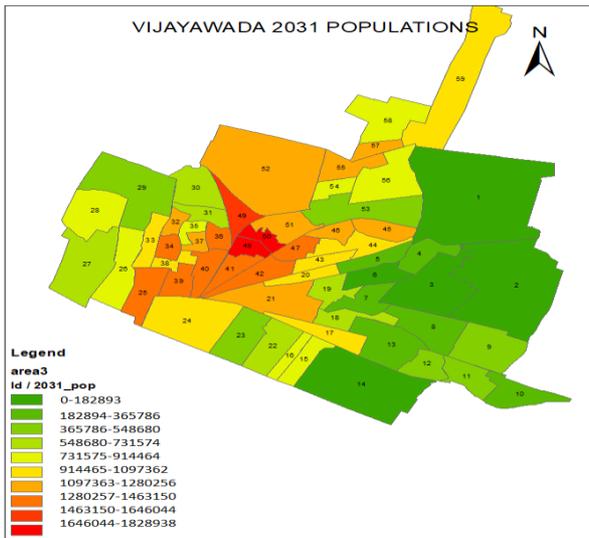


Fig.6. Thematic map showing population in 2001

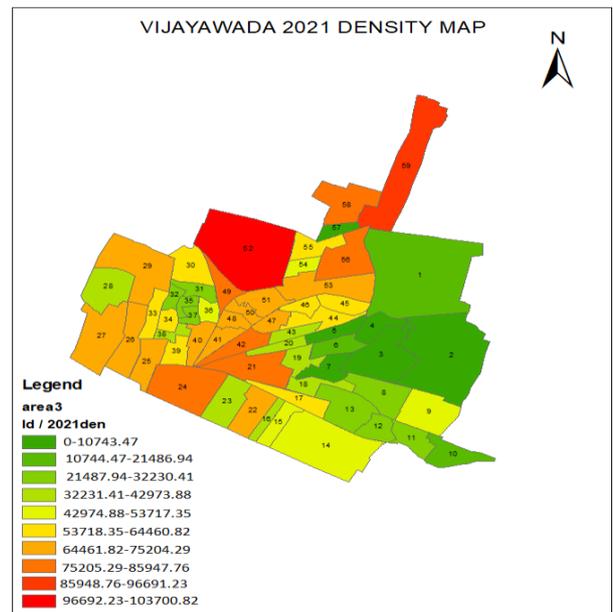


Fig.9. Thematic map showing population density in 2021

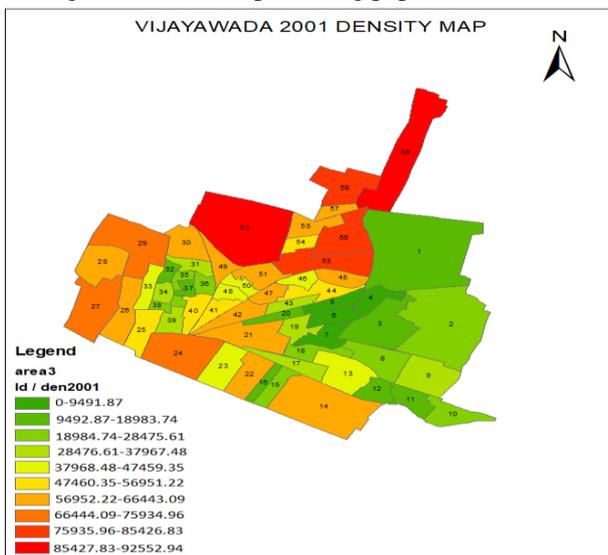


Fig.7. Thematic map showing population density in 2001

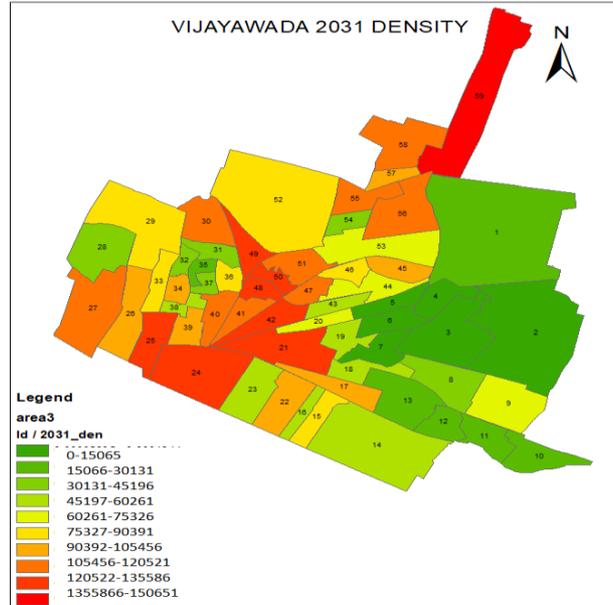


Fig.10. Thematic map showing population density in 2031

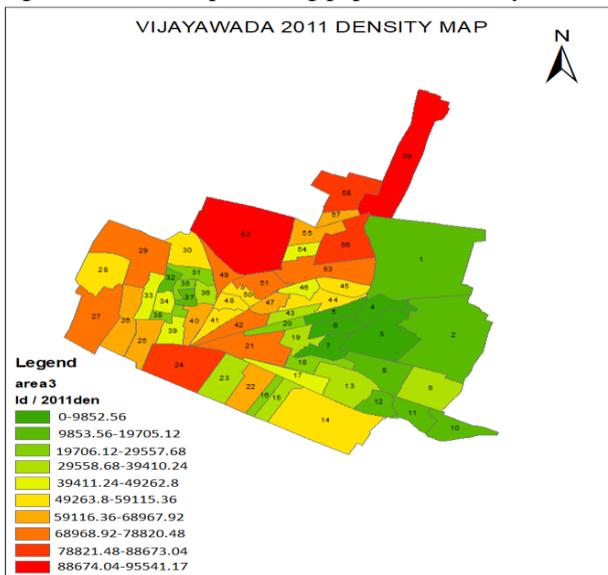


Fig.8. Thematic map showing population density in 2011

**SPATIAL DISTRIBUTION OF OFFICES/ COMMERCIAL ESTABLISHMENTS, ETC:**

Using the collected data, spatial distribution maps of the Vijayawada city for different themes like parks, school, offices, hospitals etc were created and presented in Fig. 11 to 22 below. Brief description of the selected themes were discussed below.

Any income-producing establishment, for profit or nonprofit, including, but not for retail, wholesale, industrial, manufacturing, dining, professional services, automobile services, hotels, motels and restaurants, amusement parks, worship places, hospitals are called to be Commercial establishment

Commercial establishment means an establishment engaged in non-manufacturing or non-processing business, including, but not limited to, stores, markets, shopping centers and

theaters.

Some theatres are within the shopping malls known as multiplexes which 3+ screens and population will be more than 250. However it's the crucial commercial establishment. That's the reason to have theatres in the project.

Colleges are the places which locate all around the city and in and out of the city which consists 500+ population per institute on an average. Its important Commercial establishment. So we've shortlisted Colleges in our project.

These offices works like a clock to serve public all the time in their working hours. Public will come and register their needs, complaints anything else and go every time. So we've inculcated public offices in our project.

Some of the worship places run by funds and some by their own organizations or any foundations and some run by government funds. Police Stations which serve public and controls the traffic of the city by surveillance. And it takes the responsibility of law and order in the city.

A shopping mall (or simply mall) is a North American term for a large indoor shopping center, usually anchored by department stores. The term originally meaning a pedestrian promenade with shops along it, but in the late 1960s began to be used as a generic term for the large enclosed shopping centers becoming common at that time. In the Vijayawada such complexes are considered shopping centers and they huge part in development of city

Some of the worship places run by funds and some by their own organizations or any foundations and some run by government funds.

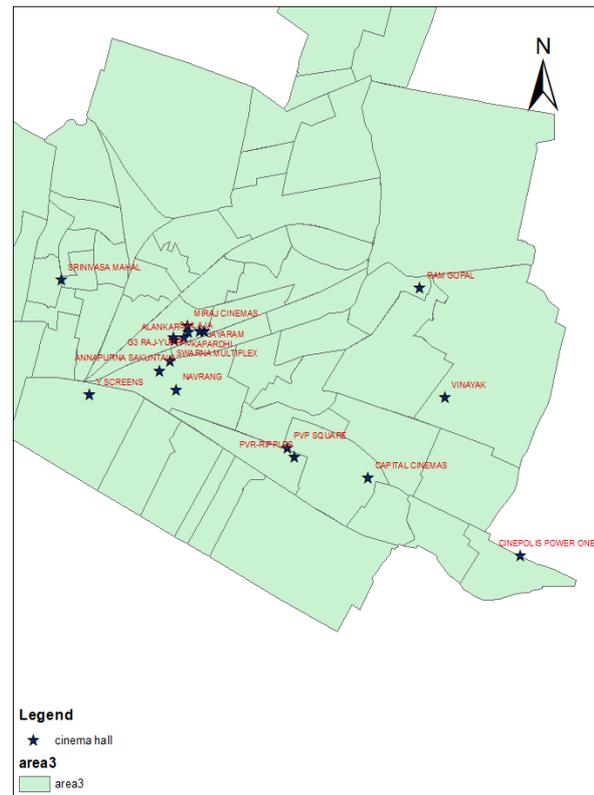


Fig.12.Spatial distribution of Movie theaters

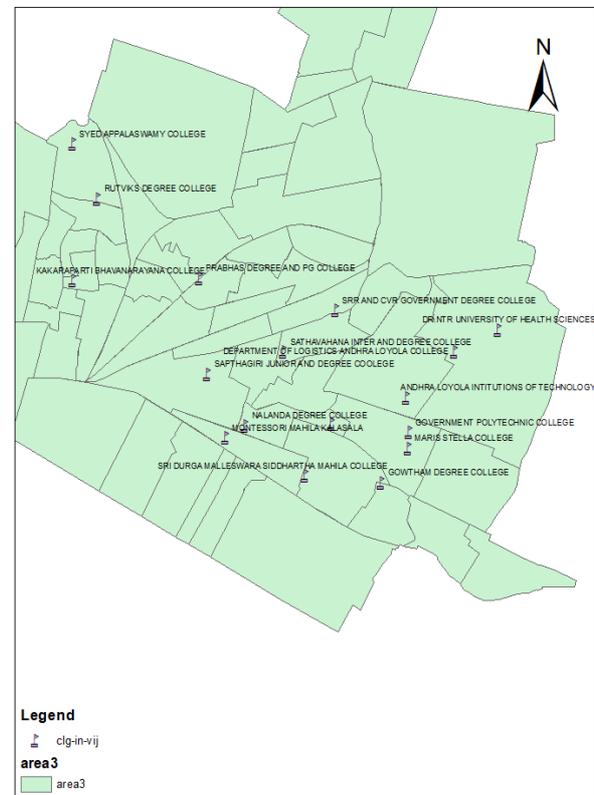


Fig.13.Spatial distribution of Colleges

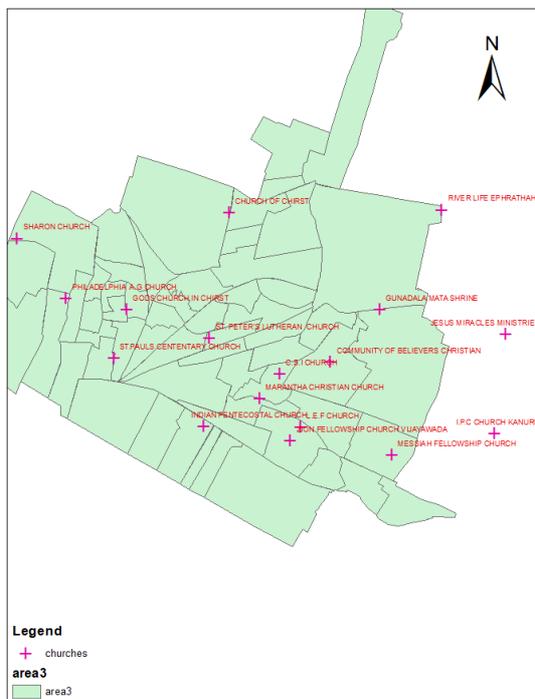


Fig.11.Spatial distribution of religious places

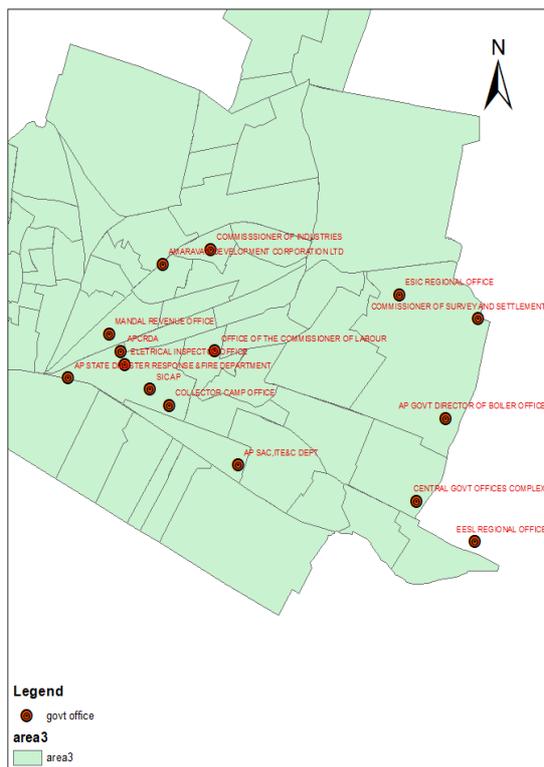


Fig.14.Spatial distribution of Govt.offices

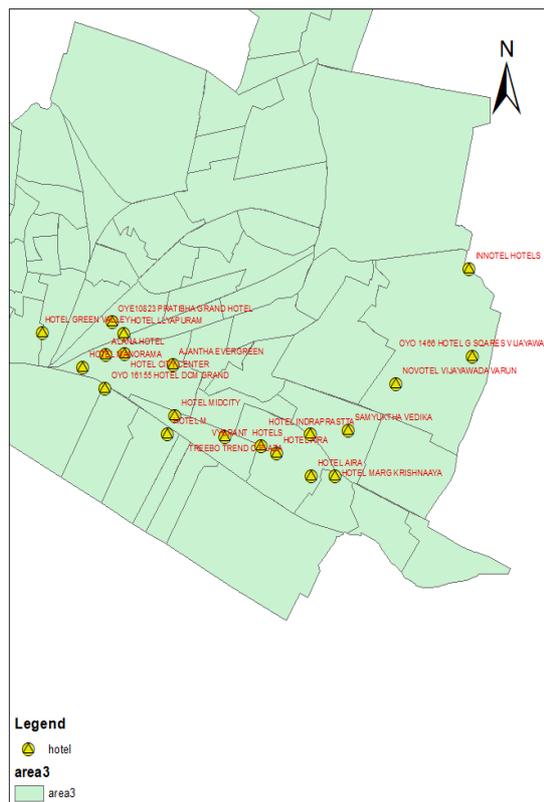


Fig.16.Spatial distribution of Hotels

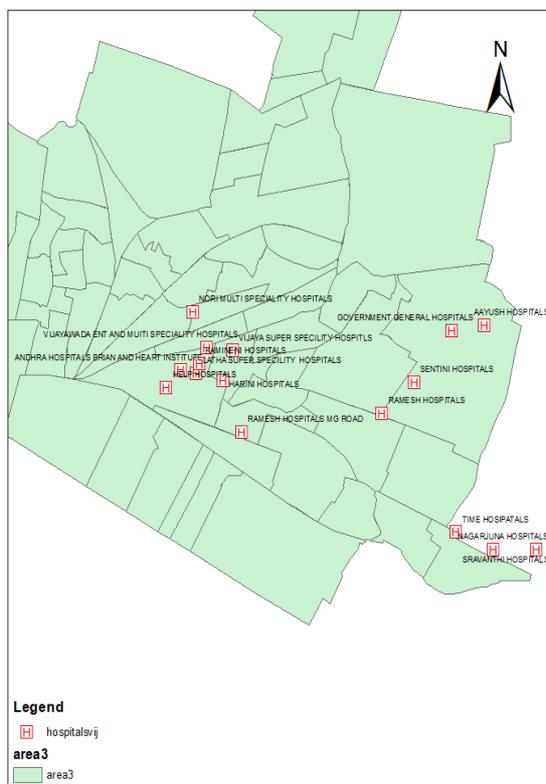


Fig.15.Spatial distribution of Hospitals

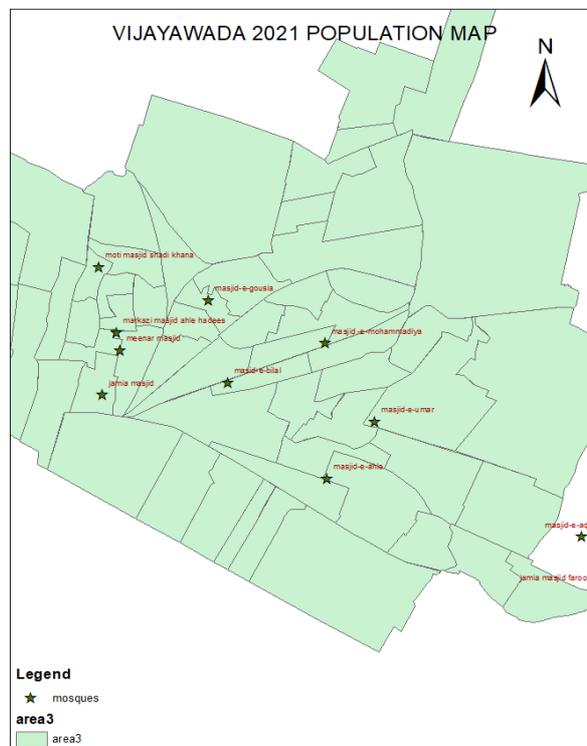


Fig.17.Spatial distribution of Mosques

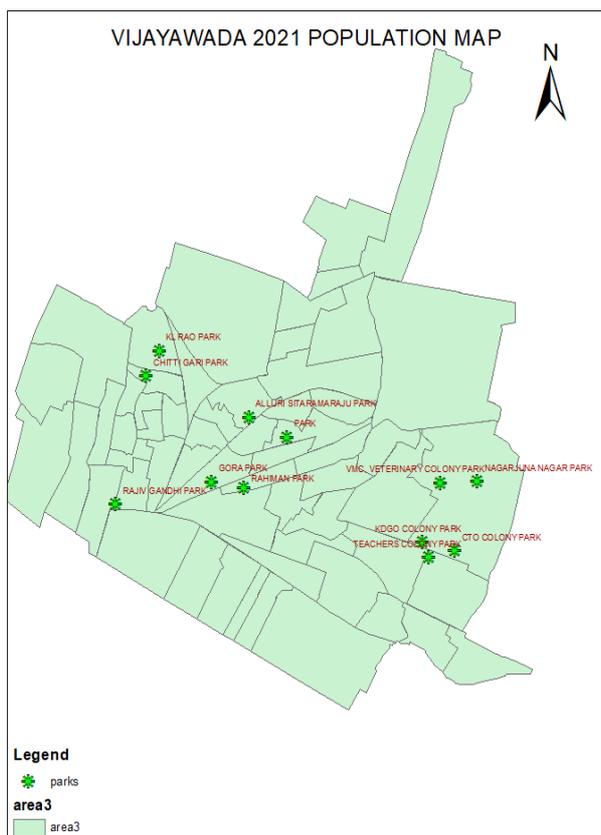


Fig.18.Spatial distribution of Parks

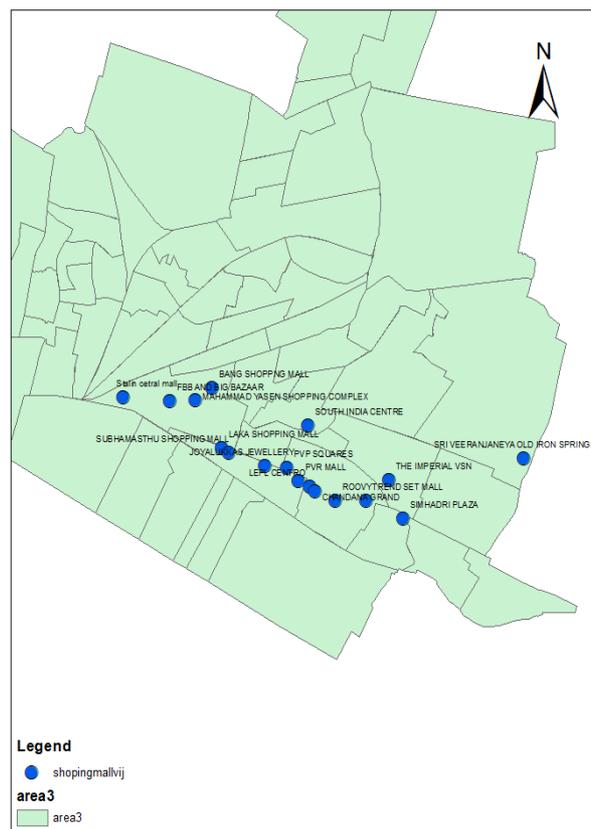


Fig.20.Spatial distribution of Shopping Malls

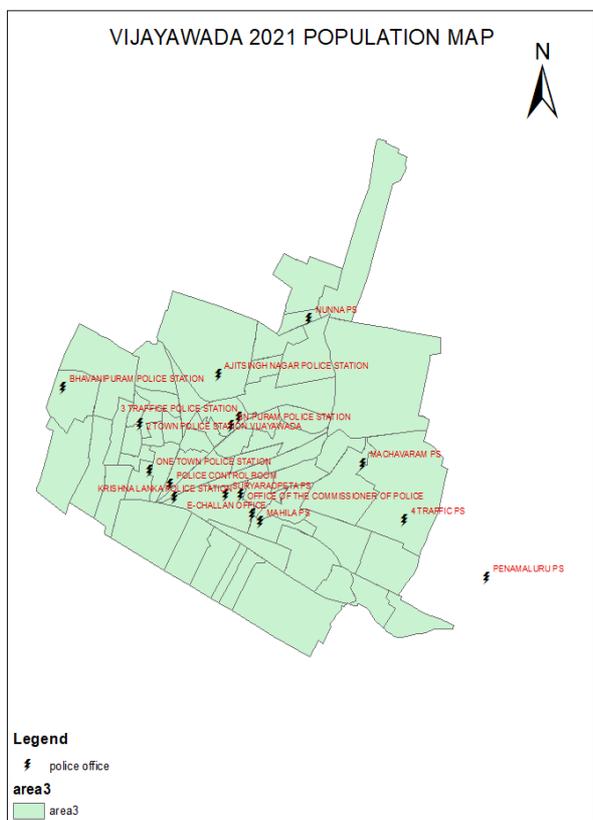


Fig.19.Spatial distribution of Police Stations

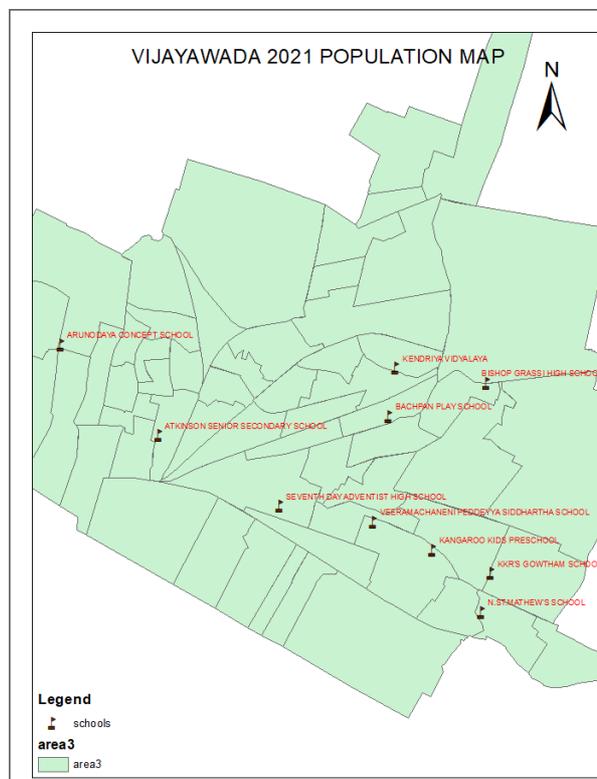


Fig.21.Spatial distribution of Schools

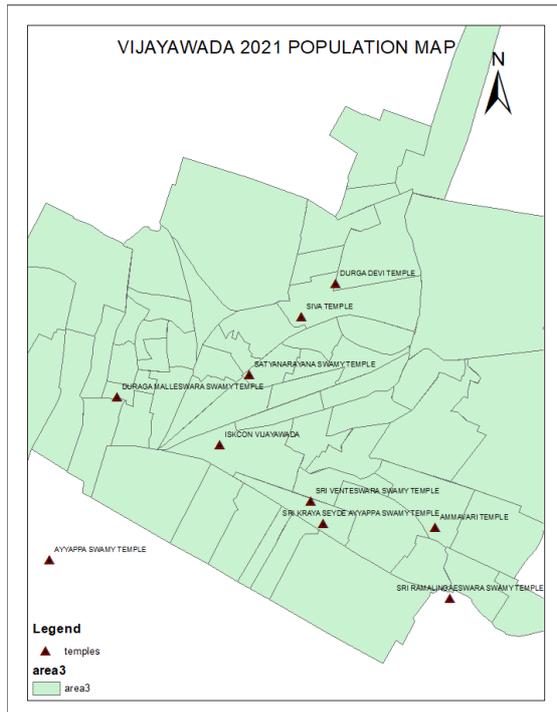


Fig.22.Spatial distribution of Temples

## V. CONCLUSION

This paper focus on study of urbanization in Vijayawada city. For this map of Vijayawada city, as well as data regarding various establishments like Govt. offices, schools, hotels etc along with their locations were collected. We've digitized the wards of Vijayawada using ARC GIS. We've collected the population data. Population data of the years 2001 and 2011 were collected. Future population for the years 2021 and 2031 has been estimated by using geometric progression method. Densities of population for all the years were also estimated. This data is used in GIS to develop thematic maps showing the spatial distribution of population and densities in different years. Data regarding the commercial establishments, Govt. offices etc, were collected and their spatial distribution maps were also prepared and presented. The outcome of this work may be very useful for the urban planners for their activities as well as entrepreneurs for their business activities. These maps can help them to take better decision for establishing a business/school/office etc.

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