

# **Population Density Mapping Based on Built up Area using GeoEye Image and GIS Technique: Saltlake City, Kolkata.**

**RUKHSANA and Sarkar HUMAYUN, India.**

**Key words:** Population Density, GeoEye Image, GIS and Kolkata

## **SUMMARY**

Population density is the number of people per unit of area usually per square kilometer. In this research population data of 2011 and GeoEye imagery of 2010 with 0.6 m resolution were used to get the final Population Density Map based on built up area/square km of Saltlake City.

GeoEye image for Saltlake city is suitable for accusation of builtup area because of 0.6m resolution and secondary population data were designed with Personal Geodatabase (PGDB). The high population densities were found in 4, 19 and 20 sector that is 103.58, 103.34, and 119.77 Sq.Km/Person, where the area were measured 187.81, 288.49, 161.89 sq. km respectively. The sector no. 9, 15 and 21 were found as medium density. Rests of sector were found as low density. It was highly appreciate that sector no. 19 is a slum and having highly dense built up area with 9336 population. But for sector 4 and 20 builtup areas are highly dense with arranged multistory building but having 8161 and 7927 population. For medium category population density sector 9 and 15 are fitted but for 21 sector where maximum builtup areas for offices and recreation purposes was not fitted because of low dense population. For low population density all blocks are in acceptable category.

However the experiment over Saltlake city can be explained with four relationship i) Where number of population is higher/sq km, administrative area and build up area relatively lesser the Population Density is experienced high ii) Where the number population is higher/sq km, administrative and build up area is also relatively higher, the Population Density is low. iii) Where the number of population low, administrative and build up area is relatively medium, the population density is low. iv) Where the number of population, administrative and build up area in medium range, the population density also experienced medium. Even there is a hurdle to produce population density map based on build up area but still can be used and tested for other cities of India and this will consume the time and finance for the government authorities for national level Census

# **Population Density Mapping Based on Built up Area using GeoEye Image and GIS Technique: Saltlake City, Kolkata.**

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## **INTRODUCTION:**

In India rapid population growth with unplanned development activities has led to urbanization. This has posed serious implications for the country. Population is a major issue confronting the contemporary world and also the most important factor affecting the modernization. The spatial distribution pattern of urban population is the key to solve the city's problems.

At present, there are two principle methods about the study of population spatial distribution. One method uses demographic data to establish relationship between factors such as population, natural environment and statistical population data. This method usually applied to large scale study. Another method use remote sensing image extracting information related to population spatial distribution to establish the relationship between information and population distribution and stimulated the spatial distribution of population.

Xu Jiangang et al.,(1994) worked on Model of Estimating Population Density in the Residential Quarter. While develop a model of estimating population density which related to reside land area and the model is getting best solved of population density to various kinds of residential land types by GIS technique.

Yunus (1978) mention that there are three techniques for population density measurements. a) Urban population density based on administrative area b) Urban population density based on built up area. c) Urban population density based on housing area.

Population density is the number of people per unit of area usually per square kilometer. The number of individuals residing within a specific area divided by the size of that area (Hussain 2011). "It refers to the number of people in a defined jurisdiction, in relation to the size of the area that they occupy" (www. I love india.com).

Remote sensing and GIS techniques could not directly estimate the population data. There are few approaches like counts of dwelling units, measurements of land areas, land use classification and recently spectral characters of remotely sensed data. Sarkar H et al (2011).

Sarkar H et al (2011) used IKONOS imagery for counting population density based on built up area. In their research shows that population density based on primary source data and built up area still having the differences with actual ground reality.

However, the pressure of population in Salt Lake City expressed as absolute number of additional people every for year. Migration from the other areas to the city in search of jobs and land to stay has also been an important issue. Due to which some sectors lack behind in development as compared to the other sectors. In this research population data of 2010 and GeoEye imagery of 2010 with 0.6 m resolution were used to get the final Population Density Map based on builtup area/sq.km of Saltlake City.

#### **PROBLEMS:**

- a) Remotely sensed data and GIS technique are still not applicable even the technology has been reached to its high end applications.

#### **OBJECTIVES:**

- a) To work out the spatial distribution pattern of urban population density in Saltlake City.
- b) Find out the high resolution satellite imagery like (GeoEye) is suitable for population density mapping or not.

#### **RESULT AND ANALYSIS:**

GeoEye image for Saltlake City is suitable for accusation of buildup area because of 0.6m resolution and secondary population data were designed with Personal Geodatabase (PGDB). The high population densities were found in 4, 19 and 20 sectors that is 103.58, 103.34, and 119.77 Sq Km/Person, where the area were measured 187.81, 288.49, 161.89 sq km respectively. The sectors no.9, 15 and 21 were found as medium density. Rests of sectors were found as low density. It was highly appreciate that sector no 19 is a slum and having highly dense build up area with 9336 population. But for sectors 4 and 20 buildup areas are highly dense with arranged multistory building but having 8161 and 7927 population. For medium category population density sectors 9 and 15 are fitted but for 21, where maximum built up areas for offices and recreation purposes was not fitted because of low dense population. For low population density all sectors are in acceptable category.

The results of Saltlake city for population density found unevenly distributed because of many reasons like Distribution of Market, Milk Booth, Petrol Pump, Banks, Post Office, stadium, Fire Station, Restaurant, Health Facilities and Educational Facilities buildings where it is a buildup area only but not permanent residences. Some of the data were collected from government offices are as given below.

Table 1.1: Sector Wise Percentage Distribution of Market in Salt Lake City, Bidhannagar, 2006.

Sector	Number of Market	Percentage
I	6	37.5
II	2	12.5
III	8	50
IV	–	–
V	–	–
Total	16	100.00

Source: Office of the Municipality Corporation of Bidhannagar, 2006.

Table: 1.2. Sector Wise Total Population and Population Density in Saltlake City, Kolkata.

Sector. No.	Total Population	Sector in Admin Area /Sq.Km	BuiltupArea /Sq.Km	Population Density (Builtup Area)
1	5038	354.16	168.14	29.96
2	5377	369.94	187.82	28.62
3	4831	323.73	165.40	29.20
4	8161	187.81	78.79	103.58
5	4985	371.91	116.84	42.66
6	5113	410.97	133.78	38.21
7	5061	365.46	194.52	26.01
8	4393	374.21	177.04	24.81
9	8762	529.11	179.30	48.86
10	5048	691.21	295.28	17.09
11	4203	502.78	238.54	17.61
12	6597	415.37	199.71	33.03
14	12381	2367.57	452.74	27.34
13	5044	507.51	243.27	20.73
15	8088	330.41	107.79	75.03
16	9327	720.38	282.87	32.97
17	8278	883.28	233.67	35.42
18	5483	447.77	159.43	34.39
19	9336	288.49	90.35	103.33
20	7927	161.89	66.19	119.76
21	12381	1510.47	181.72	68.13

Source: Census of India 2010 and Researcher Individual works.

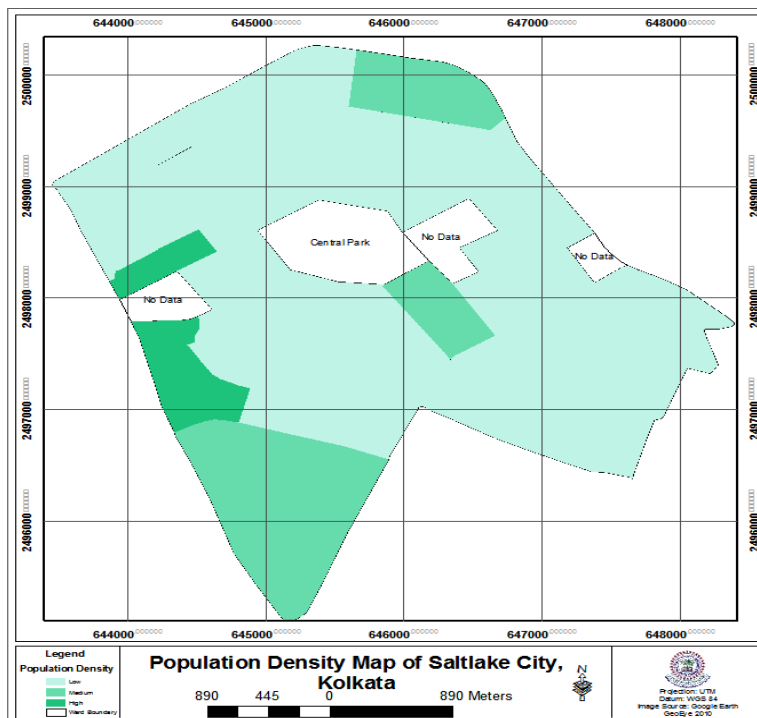
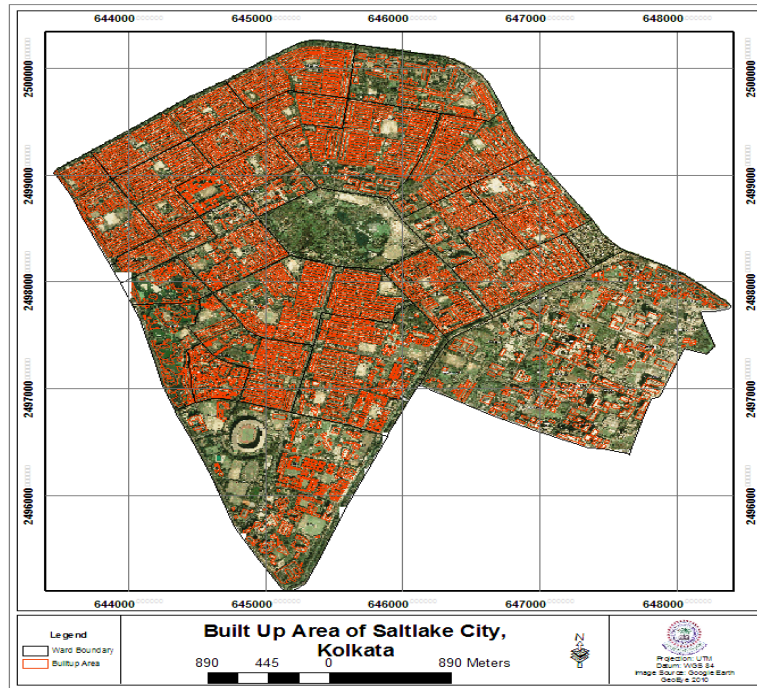


Figure:1.1. a) GeoEye Image with Vector Data b) Population Density Map of Saltlake City based on Builtup Area.

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Table 1.3: Sector wise Percentage Distribution of Police Station in Salt Lake City, Bidhannagar, 2006.

Sector	Number of Police Station	Percentage
I	1	33.33
II	1	33.33
III	1	33.34
IV	–	–
V	–	–
Total	3	100.00

Source: Office of the Municipality Corporation of Bidhannagar, 2006.

Table 1.4: Sector wise Percentage Distribution of Post Office in Salt Lake City, Bidhannagar, 2006

Sector	Number of Post Office	Percentage
I	4	57.15
II	1	14.28
III	2	28.57
IV	–	–
V	–	–
Total	7	100

Source: Office of the Municipality Corporation of Bidhannagar, 2006.

Table 1.5: Sector wise Percentage Distribution of Hospital in Salt Lake City, Bidhannagar, 2006.

Sector	Number of Hospital	Percentage
I	4	26.67
II	2	13.33
III	6	40
V	3	3
Total	15	100.00

Source: Office of the Municipality Corporation of Bidhannagar, 2006.

Table 1.6: Sector wise Percentage Distribution of Schools in Salt Lake City, Bidhannagar, 2006.

Sectors	Number	Percentage
I	12	35.29
II	10	29.41
III	8	23.53
IV	1	2.94
V	3	8.83
Total	34	100

Source:Office of the Municipality Corporation of Bidhannagar, 2006.

Table 1.7: Sector wise Percentage Distribution of Colleges in Salt Lake City, Bidhannagar, 2006.

Sectors	Number	Percentage
I	2	66.67
II	—	—
III	—	—
IV	—	—
V	1	33.33
Total	3	100

Source:Office of the Municipality Corporation of Bidhannagar, 2006

However the experiment over Saltlake city can be explained with four relationship i) Where number of population is higher/sq km, administrative area and built up area relatively lesser the Population Density is experienced high ii) Where the number population is higher/sq km, administrative and built up area is also relatively higher, the Population Density is low. iii) Where the number of population low, administrative and build up area is relatively medium, the population density is low. iv) where the number of population, administrative and build up area in medium range, the population density also experienced medium. Even there is a hurdle to produce population density map based on build up area but still can be used and tested for other cities of India and this will consume the time and finance for the government authorities for national level Census.



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