International Journal of Engineering Science Invention (IJESI)
ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726
www.ijesi.org ||Volume 7 Issue 8 Ver II || Aug 2018 || PP 26-32

Impact Of Urban Growth On Landuse , A Case Study Of Guwahati City, Assam.

Kamal Kumar Talukdar
Project Scientist, ARSAC, ASTE Council,
Corresponding author: Kamal Kumar Talukdar

Abstract:*Change in ratio of total population and settlement area are real indicator of urbanisation. Urbanisation is defined as shift of population from rural to urban areas (by Kingsley Davis). Rural to urban migration is happening on a massive scale due to population pressure and opportunities for jobs in urban areas for general livelihood as well as industrialization .India's urban populations was 17.92% of total populations of India during 1961 (i.e 79 million).Over the year due to population pressure/migration to urban areas it has increased to 31.30 % of total population as per 2011 census. The total population during 2011 census was 388 million. Urban sprawl has resulted in loss of productive agricultural lands, open green spaces and loss of surface water bodies. In this study, an attempt has been made to monitor land use/land cover of part of Guwahati city over periods of time (i.e. from 1972 to 2016). Satellite remote sensing and GIS is found to be an very effective tool for spatial change detection analysis and inventory of urban areas.*

Key words *: Urban sprawl, Urbanization ,GIS, Remote Sensing*

Date of Submission: 29-07-2018 Date of acceptance:16-08-2018

I. Introduction:

Urbanization has been an important social and economic phenomenon taking place at an unprecedented scale and rate all over the world (Sunet al., 2013). Although, urban areas cover a very small fraction of the world's land surface, their rapid expansion has significantly altered the natural landscape and created enormous environmental, ecosystem, and social impacts.

The rapid urbanization through industrial development is responsible for unsystematic and unplanned growth of cities and the pressure of urban population in the city has a direct (positive and negative) impact on its adjoining rural area. This type of urban growth creates the tribulations like unhealthy slums, infected environment, industrial and commercial areas resulting in traffic bottle necks and such many other problems (Sangwan et.al. 2012). Urbanization makes unpredictable and long lasting changes on the landscape (Singh and Kumar, 2012). In this regard, Guwahati city is no exception because of its prime location on North -East India and its easy accessibility and connectivity. The new economic environment of the city demands sustainable land management and spatial information of land use and their change over the time are important for planning and management. The association between urban growth and land use changes and their impacts on cityscape has been analyzed in the present study. So, satellite data of different time periods are useful to monitoring urban growth and development of a sustainable land use plan for the future.

II. Study Area:

The present study area, measuring about 179.76 sq. km, encompasses southern part of the Greater Guwahati Municipality in Kamrup (Urban) district of Assam (Fig.1). Guwahati is a part of Kamrup District and is situated between 26°5' and 26°12'North Latitude and between 91°38'and 91°51'East Longitude covering toposheet no78N/12 and 78N/16 Located on the banks of the Brahmaputra River.(Fig.1) The city being most important city in entire north east India, experienced areal expansion several times during its history. This expansion of the city area had taken place mostly due to the need for coping up with increasing population pressure. Hence in course of time the city changed nature from a small town in 1901 to its present form of capital city with cosmopolitan culture.

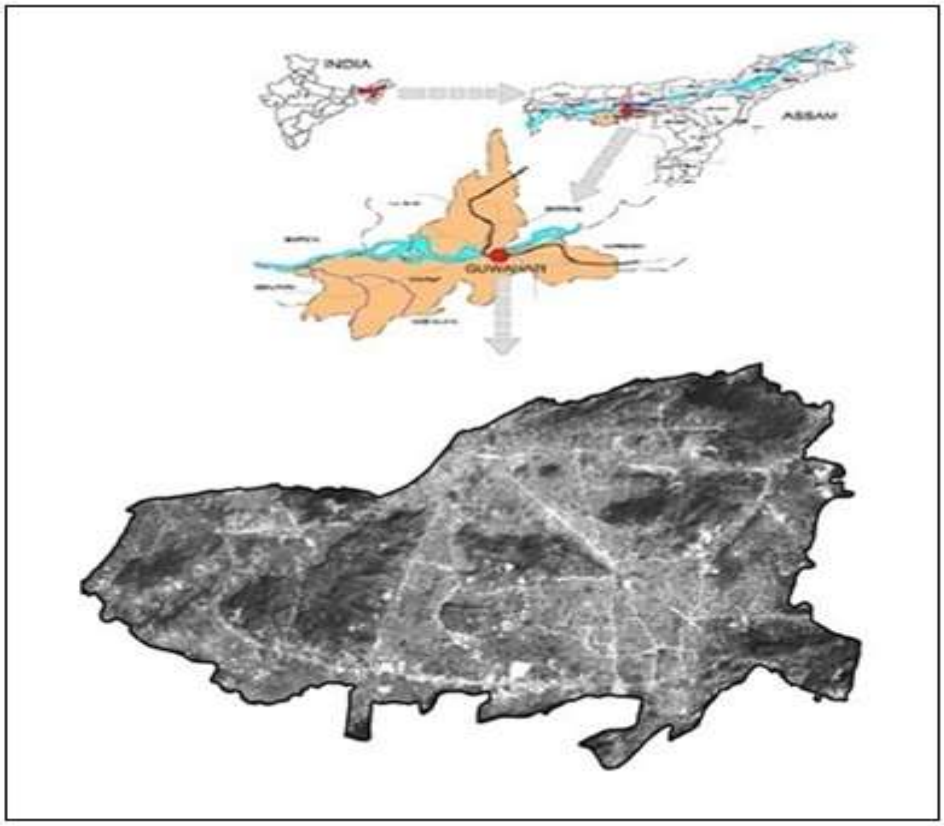

Fig: 1

III. Methodology and Data used:

The detailed methodology is given in the flowchart (Fig. 2). Here a multi parametric dataset comprising satellite data (IRS data, Google Earth imagery and Survey of India (SOI) topo sheets no 78N/12 and 78N/16 data are used. The SOI toposheets covering the study area were scanned separately and all the scanned images were rectified and geometrically corrected. These images were then mosaicked to form a single image and transferred into ARC GIS 10.4 software to prepare thematic layers, namely study area boundary and Landuse map 1972 . Further landuse map of 2006 and 2016 were prepared from IRS imagery . Analysis of Guwahati landuse class over the period of 40 years allows a good understanding of urban development and its impact on land use class of the study area.

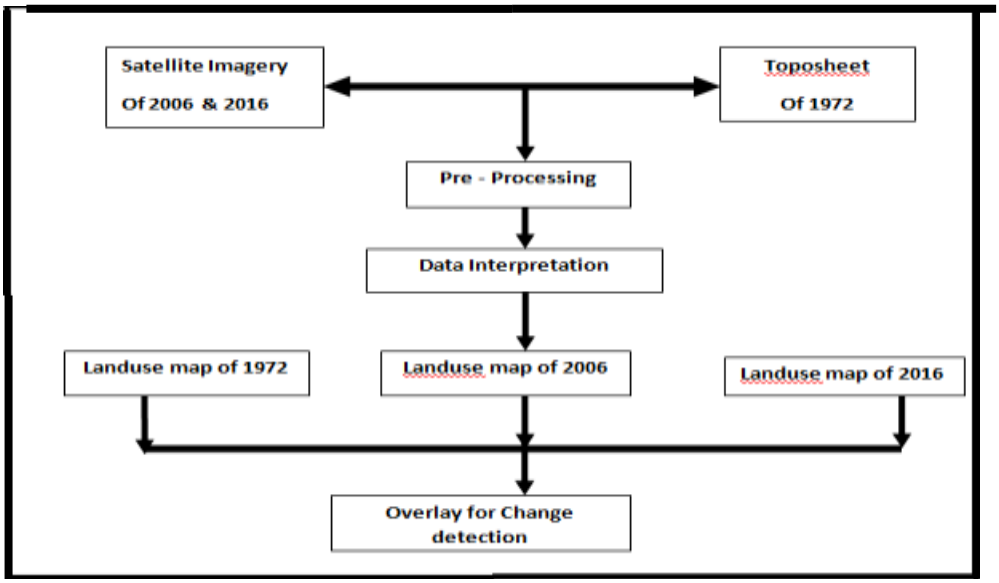

Fig :2

IV. Result and Discussion:

Change detection analysis is performed not only to detect changes that have occurred but also to identify the nature of those changes and to determine the areal extent and spatial pattern of those changes. During this study, it was found that there is an increase in build up area. Land use map of different years is prepared and detail is given below.

Built-up area: Land use of different year's shows that built up area is increasing with time. Built-up area is increasing at the cost of decreasing of open land, forest area(vegetation) and water bodies. In 1972 built up area covered (48.34) Sqkm which increased and reached (102.30) Sqkm in 2006 (table-1). From 2006 to 2016 built-up area increased up to (110.21)Sqkm.

Open Areas: (Agricultural land, waste land, swamp, Scrub/grass land) comes under this landuse class. Satellite data shows that in 1972 open land covered (69.78sqkm) area. In 2006 it reduced up to (36.55sqkm) area (table-1)which further reduced to (31.89 sqkm) in the year 2016 . Deexpansion of crop land is at the cost of expansion of built-up land.

Water bodies: water bodies are get shrieked day by day due to rapid urban growth, population pressure etc. It occupies (3.66) sqkm of total study area according to 2016 data. In 1972 toposheet shows that it occupies (6.88) sqkm which reduced to (4.92) sqkm in 2006.

Forest areas (vegetation): It is also showing decreasing trend. In 1972 forest land covered (54.72) sqkm area and in 2006 it reduced to, (35.98) sqkm area. In 2016 forest area covered is further reduced upto (33.99) sqkm area (table-1). Land use data shows that natural vegetation land is continuously decreasing.

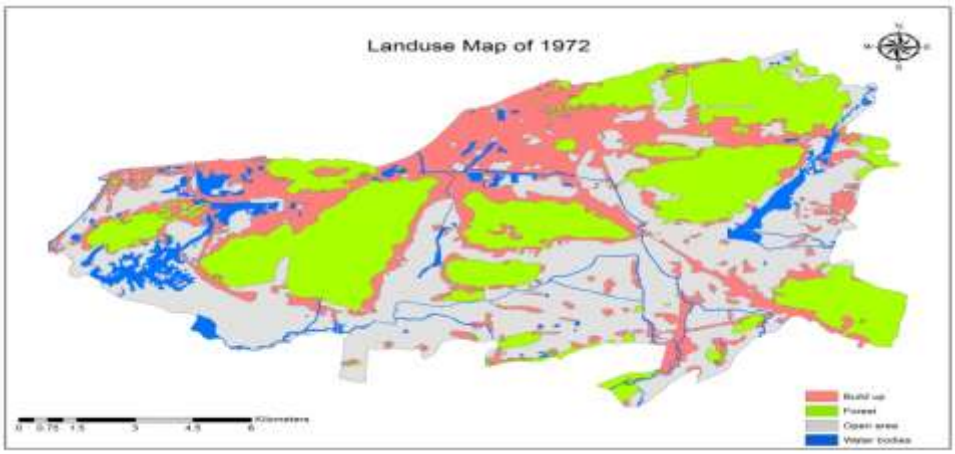

Fig: 3

After the analysis of land use statistics of different years, data shows that built-up area is continuously increasing (table-1) and open area(crop land, waste land and scrub/grass land) and water bodies are continuously decreasing (table-2).

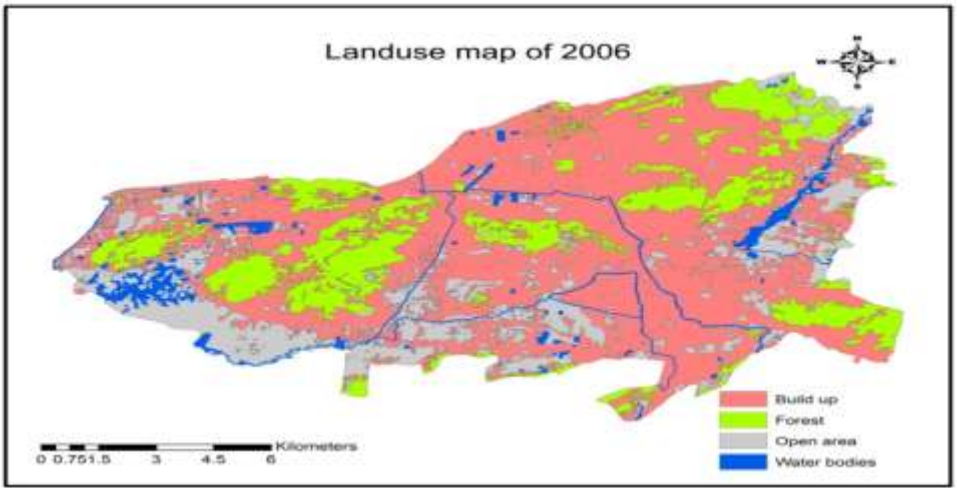

Fig: 4

This land use changing trend is alarm for natural environment. Result clearly suggested that new urban settlement and housing caused a significant impact on the land use pattern in the city during the period 1972 to 2016.In majority of cases the open area (agriculture, vacant land and fallow land) were occupied by new built-up land for housing and industrial commercial activities. The high population growth and being capital of the state enormous human migration occurred during the last decade in the city which resulted in urban sprawl in the city.

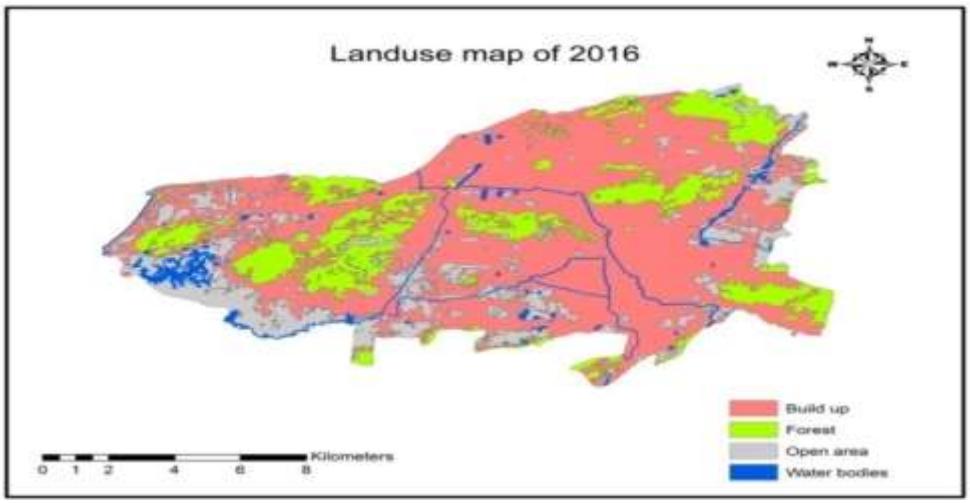

Fig:5

In majority of cases the open area (agriculture, vacant land and fallow land) were occupied by new built-up land for housing and industrial commercial activities.

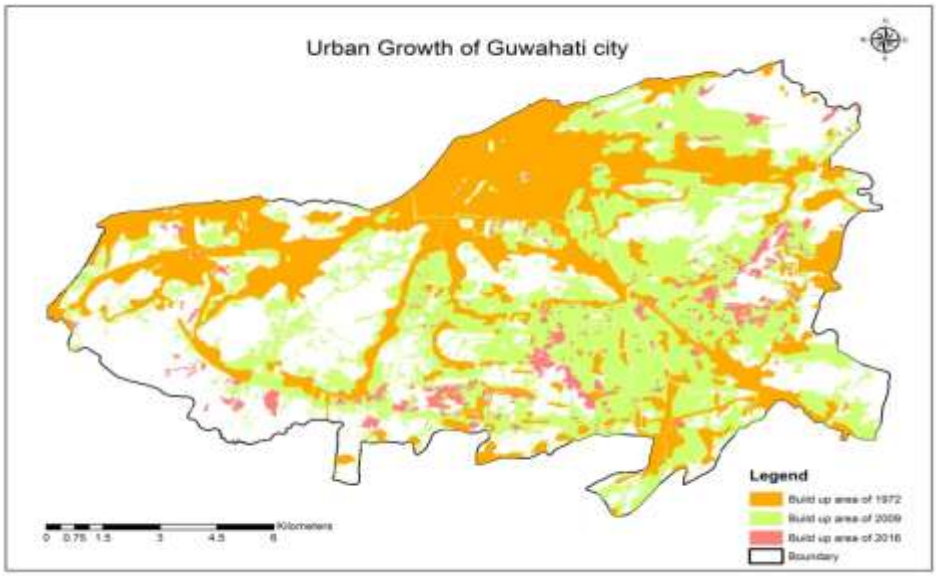

Fig:6

The high population growth and being capital of the state enormous human migration occurred during the last decade in the city which resulted in urban sprawl in the city.

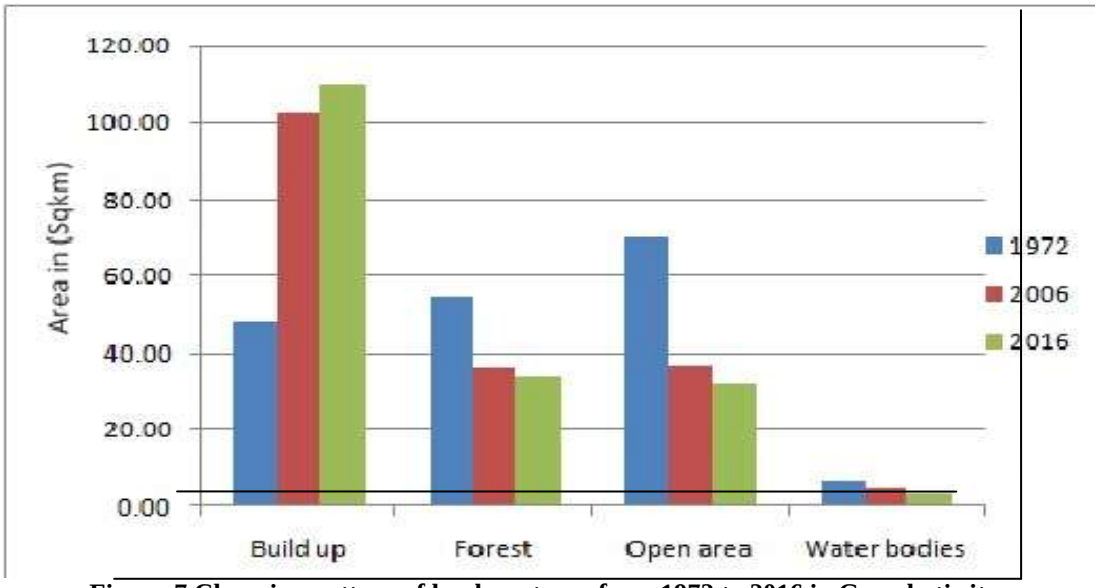

Figure-7 Changing pattern of land use types from 1972 to 2016 in Guwahati city

Category	**1972**	**2006**	Area increasing (Area in sqkm)	Area Decreasing (Area in sqkm)	**2006**	**2016**	Area increasing (Area in (sqkm)	Area decreasing (Area in sqkm)
	Ares in (sqkm)	Area in (sqkm)			Area in (sqkm)	Area in (sqkm)		
Build up	41.21	102.30	61.09		102.30	110.21	7.91	
Open area	71.66	36.55		-35.11	36.55	31.89		-4.66
Water bodies	9.00	4.92		- 4.08	4.92	3.66		-1.26
Forest (vegetation)	57.88	35.98		-21.9	35.98	33.99		-1.99

Table 1: Area and amount of change in different land use categories in 1972,2006 and 2016

The table concludes the positive change and negative change occurred in the above classes in the last 40 years of time period. The positive change of land has been observed in the build up land. While the negative change is observed in the forest, open area (agriculture, vacant land and fallow land) and in water body class. During the last 40 years build up area has increased 38.3 % of the total study area. The open area has decreased -22.12 %.The water body of the study area has decreased -2.79% whereas forest area has decreased 13.28 % of total study area.

Landuse category	1972	Percentage	2016	Percentage	Change	Percentage Change(%)
	Area in (sqkm)		Area in (sqkm)		Area in (sqkm)	
Build up	41.21	22.93%	110.21	61.32%	69	38.3%
Open area	71.66	39.87%	31.89	17.74%	-39.77	-22.12%
forest	57.88	32.19%	33.99	18.91%	-23.89	-13.28%
Water bodies	9.0	5.01%	3.66	2.03%	-5.35	-2.79%
Total	179.7	100	179.7	100		

Table 2: percentage(%) change in Landuse categories from 1972 to 2016

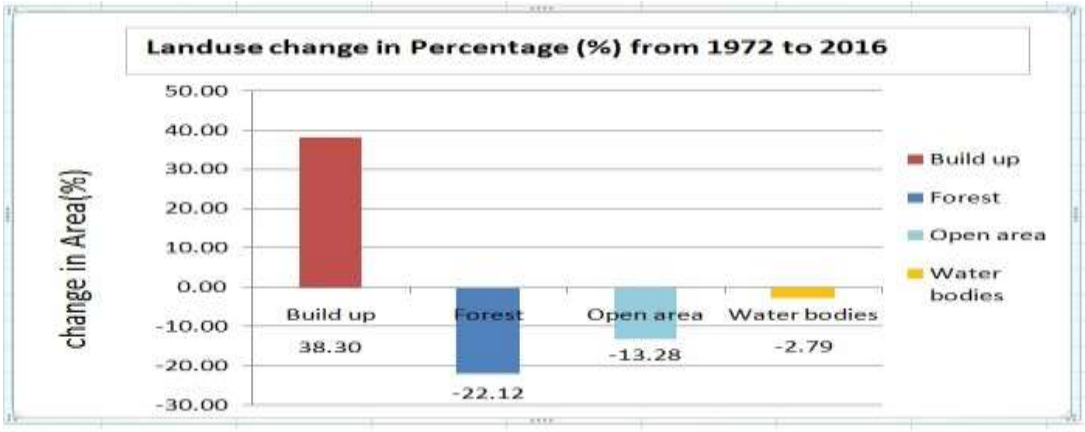

figure 8: Diagrammatic illustration of land use/cover change in percent(%)

To understand land encroachment for different land categories during 1972,2006 to 2016, change detection matrix was prepared (Table 3,4) which reveals the following changes.

	LU 2006				
LU 1972					
Row Labels	Build up	Forest	Open area	Water bodies	Grand Total
Build up	40.77	0.39	0.05		41.21
Forest	21.66	33.09	3.08	0.03	57.88
Open area	38.15	2.44	30.87	0.19	71.66
Water bodies	1.71	0.05	2.53	4.69	9.00
Grand Total	**102.30**	**35.98**	**36.55**	**4.92**	**179.76**

Table 3 Matrix Land use Land cover conversion 1972 to 2006 (sq.km)

	LU 2016				
LU 2006	**Category**	**Build up**	**Forest**	**Open Area**	**Water bodies**	**Grand Total**
	Build up	102.297	0.005	0.000	0.000	102.304
	Forest	0.903	33.451	1.623	0.011	35.989
	Open area	6.444	0.542	29.563	0	36.550
	Water bodies	0.568		0.704	3.652	4.925
	Grand Total	**110.214**	**33.998**	**31.891**	**3.665**	**179.769**

Table 4 Matrix Land use Land cover conversion 2006 to 2016 (sq.km)

V. Conclusions:

This study examines systematically the influence of urbanization on land-use and land cover patterns during 1972 - 2016. This research also proves that by studying quantitatively the effects of urbanization on the land use change trajectory. The pattern of land cover has changed drastically over the past decade with forest cover declining at an alarming rate. The forest, open area and water body in the study area shows

decreasing area change from 1972 to 2016. The increasing area has been noticed in build up including industrial areas. Through in future there are chances of stability of forest but on the other hand, the settlement is increasing at alarming rate.

References :

[1]. Shikhar Deep , Akansha Saklani , Urban sprawl modeling using cellular automata, The Egyptian Journal of Remote Sensing and Space Sciences, (2014) 17, 179–187

[2]. Rohith P. Poyil, Anil Kumar Misra , Urban agglomeration impact analysis using remote sensing and GIS techniques in Malegaon city, India, *International Journal of Sustainable Built Environment (2015) 4*, 136–144.

[3]. Rajpoot Pushpendra Singh, Kumar Ajay and Pandey Gyanendra Kumar, Assessment of Urban Sprawl and its Impact on Natural Environment in and around Jaipur city, Rajsthan, India. *International Research Journal of Earth Sciences*, Vol. 2(3), 1-6, April (2014).

[4]. Kuffer, Monika, Barrosb, Joana, 2011. Urban morphology of unplanned settlements: the use of spatial metrics in VHR remotely sensed images. Procedia Environ. Sci. 7, 152–157.

[5]. Lata, K.M , Sankar Rao, C.H , Krishna Prasad, V, Badrinath, K.V.S., Raghavaswamy, Measuring urban sprawl: a case study of Hyderabad, GIS Dev. 5(12) (2001).

[6]. Kumar A and Rajput P S., Changing Scenario of Land use/Land Cover of Chitrakoot Area, District Satna, M.P., Madhya Bharti, LVII, 62-66 (2013)

[7]. Selvam.S, Use of Remote Sensing and GIS Techniques for Land Use and Land Cover Mapping of Tuticorin Coast, Tamilnadu, Universal Journal of Environmental Research and Technology, 2(4), 233-241 (2012).

[8]. Yedage , Harmalkar , Analysis and Simulation of Landuse / Land cover Change in the Quepem Tehsil Goa, India, Int. Journal of Advances in Remote Sensing and GIS, Vol. 5, No. 1, 2017.

[9]. City development plane of Guwahati , 2006 Guwahati Metropolitan Development authority report.

[10]. J.S. Rawat , Manish Kumar. Monitoring land use/cover change using remote sensing and GIS techniques: A case study of Hawalbagh block, district Almora, Uttarakhand, India. The Egyptian Journal of Remote Sensing and Space Sciences (2015) 18,77–84.

Kamal Kumar Talukdar "Impact Of Urban Growth On Landuse , A Case Study Of Guwahati City, Assam. "International Journal of Engineering Science Invention (IJESI), vol. 07, no. 8, 2018, pp 26-32