

## Application of RS and GIS in the assessment of changes of land use and land cover due to urbanization in Rajpur-Sonarpur municipality, South 24 Parganas.

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### ABSTRACT:

**Urbanization** is a quite natural process and a reflection of signature of human culture. In every parts of the world this process is continuing unabatedly that started since time immemorial. Urban growth is related to the urban sprawl is the result of extreme population pressure within the urban centre and man's desire to live in cities or adjacent to the cities but very limited space in the city heart that already facing over congestion. When a 'formal' space is converted into a 'functional' one many changes occur that can be visualized from the external changes that is the manifestations of the internal intricate socio-economic forces. In this respect land use & land cover changes are very vital that needs an attention to the scholars of all disciplines. The present study is concerned with the assessment of the trend of urban growth and its effect on environment in Rajpur-Sonarpur Municipality of South 24 Pgs, West Bengal. This is one of the fastest growing municipalities of the world. In this study GIS and Remote Sensing techniques have been used to show the built up area of the study area and to detect the growth of urban area in temporal scale. With the help of indexing approach the impact of urban growth on various individual components of natural environment is also studied through this study. In this study it is observed that land use and land cover of the area have changed a lot due to extreme pressure of population, degradation of vegetation coverage and unplanned urban growth that needs proper monitoring and planning to control future hazards related to urban areas.

### INTRODUCTION:

Urban growth refers to the process of increasing concentration of population within a town or a city. It starts from a point eventually spreading in different directions. The growth pattern varies from one urban place to another and it is necessary to study such phenomenon for appropriate urban planning. Urban growth can be mapped, measured and modeled by using remote sensing and GIS techniques. The application of new techniques has created opportunities to analyze the processes of urban growth which has considerable significance in understanding of space

organization, transformation of landscape and socio-economic structure of the concerned area. However in recent times many geographers are becoming aware of the empirical regularities in the size and spacing of towns and cities. In India by virtue of high population growth and strong existence of rural to urban migration process, urban population is rapidly increasing at a rate of 2.3% per annum (Census of India). To keep pace with such a fast urbanization rate small towns and cities are quickly growing up in size by capturing nearby rural area.

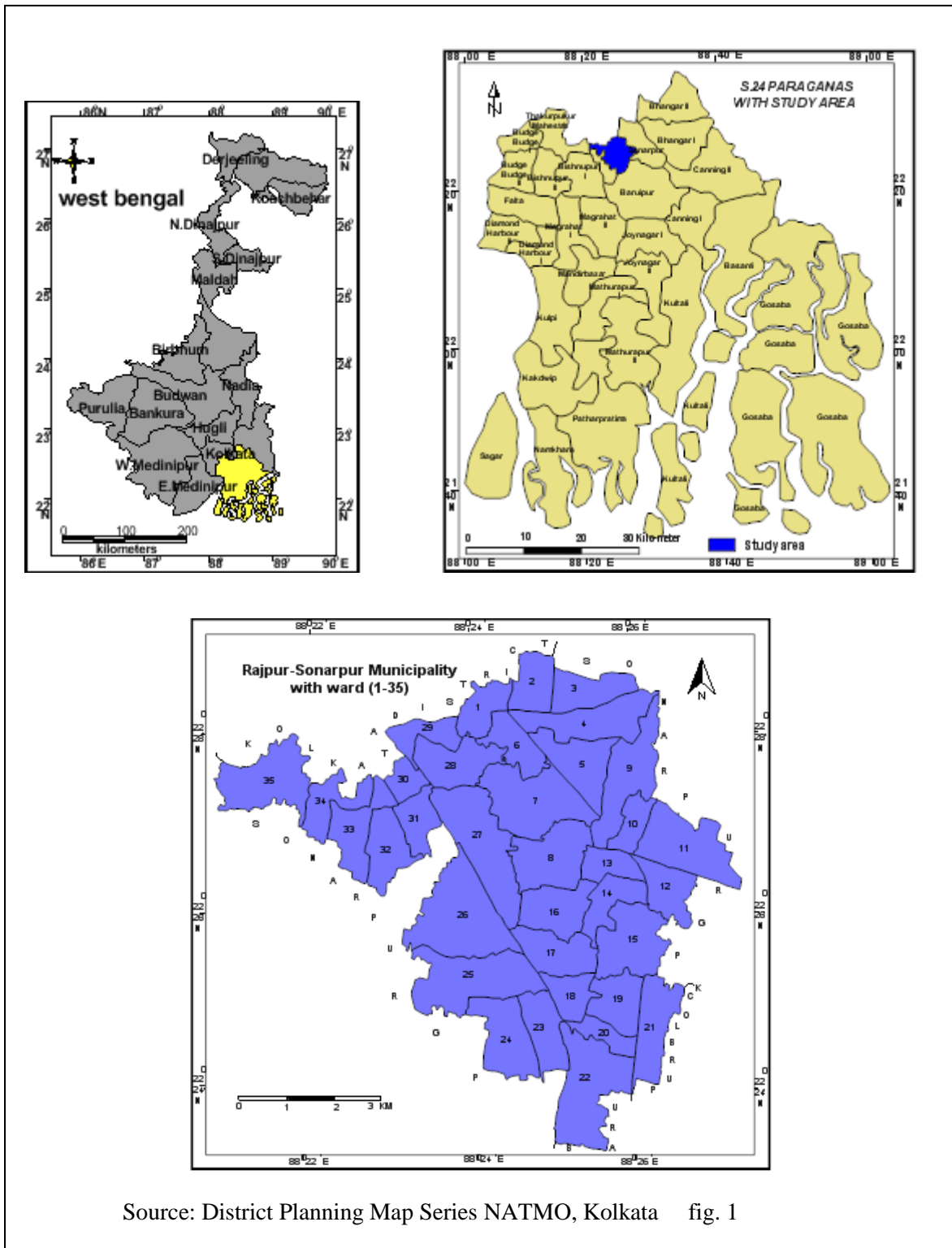
### **Literature review:**

To present the study it is essential to study all information's that have published already. The Researcher has reviewed books, journals, Reports and conferences proceedings, journals like Economic and political weekly etc. **Mandal (2000)** elaborately describe the origin, functions, morphology, urban land use, rural urban linkage and impact of urbanization in his book "Urban Geography". **Banerjee (2013)** highlights in the 4<sup>th</sup> chapter of her book 'Contemporary Urbanization in India: Issue and Challenges' existing problem of urban environment created due to the rapid growth of urbanization and **Singh (1955)** describes the planning and improvements of the city in his book "Benaras: A in study in Urban Geography". **Varma (2006)** examines the urban planning, problems of water, housing, transportation and so on. In the book New Perspective in Urban Geography edited by **Singh (1996)** shows the urban growth in developing countries, urban environment problem in Nepal. All these works and my personal convictions have directed me a lot to pursue works in a guided manner on this area.

### **STUDY AREA:**

Rajpur-sonarpur is a municipality of South 24 Paraganas district in the state of West Bengal, India extends from 22<sup>0</sup>15'N to 22<sup>0</sup>19'N latitude and 88<sup>0</sup>32'E to 88<sup>0</sup>34'E longitude is basically a part of Gangetic Delta with an average elevation of 8.5m. It is the 7th largest municipality of West Bengal in terms of population after Kolkata Municipal Corporation, Asansol, Howrah, Siliguri, Durgapur and Maheshtala with an area of 55.00 sq. km. As per 2011 Census of India study area have a total population of 423,806; of which male and female are 215,983 and 207,823 respectively. Average literacy rate of Rajpur Sonarpur city is 91.06 % of which male

and female literacy is 94.28 and 87.71 percent respectively. The sex ratio is 962 per 1000 males. Child sex ratio of girls is 952 per 1000 boys (fig.1).



Source: District Planning Map Series NATMO, Kolkata fig. 1

## Objectives:

The major objectives are

- To show the trend of population growth and main reasons behind it.
- To delineate the expansion of urban area on temporal scale.
- To analyze the nature and extent of LU / LC change detection.
- To find out the impact of urban growth on the study area.

## Methodology:

The methods adopted to fulfill the purpose of the study are illustrated with the help of following research paradigm (chart 1). Satellite images for the year 1991 and 2011 (OLI\_TIRS TM ) are used in this purpose.

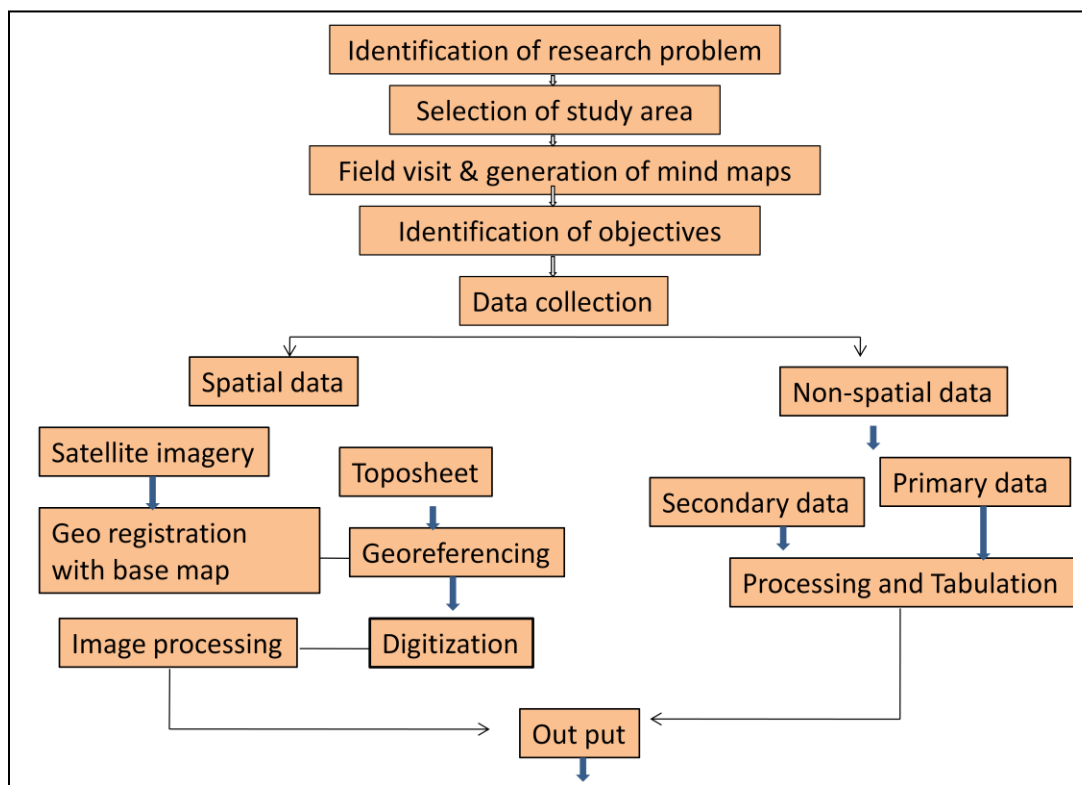
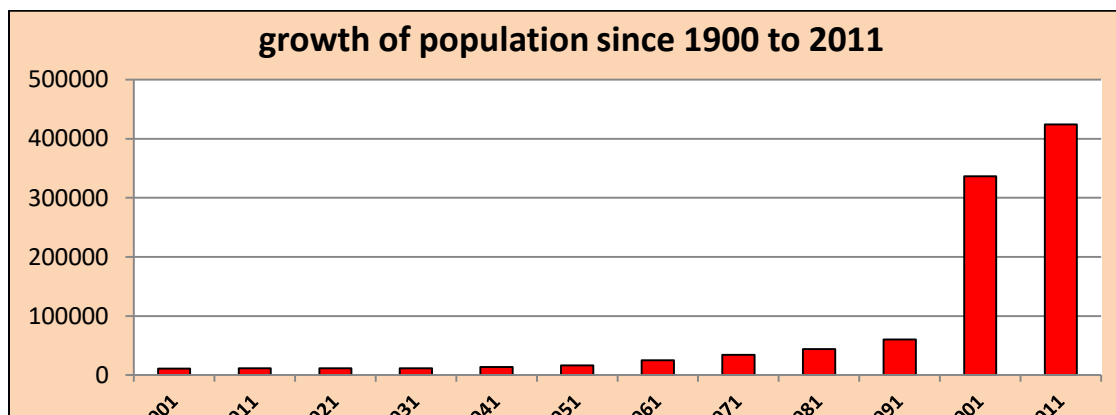


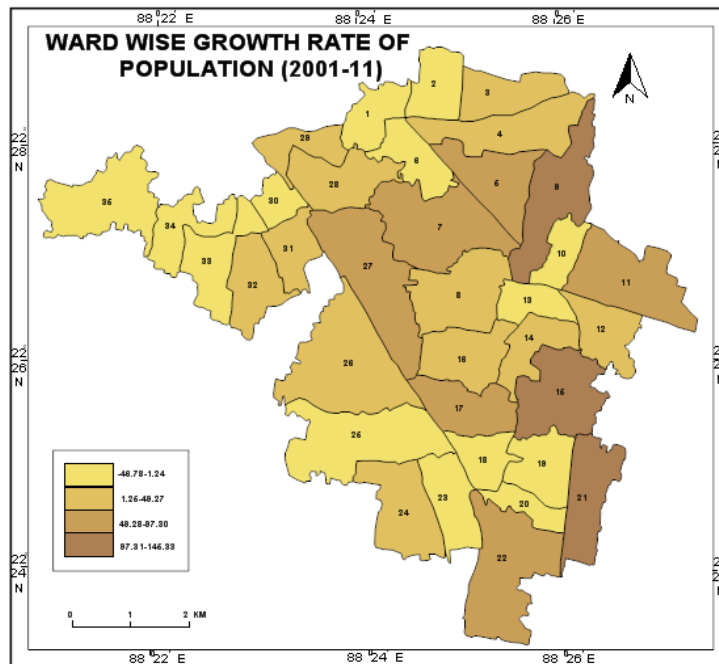
Chart 1

Other sources of secondary data are Census Handbook 2001 and 2011, District Statistical Handbook 2011 South 24 Paraganas district. To delineate the urban growth of the study area built up area map is prepared for both years from the satellite images. For analyzing the impact of urban growth the Land Surface Temperature map, Normalized Differentiate Vegetation map, Wetness map has been extracted. GIS software is used to prepare the map and evaluate the whole scenario.

### History of urbanization:

In India every municipality, every cantonment, all civil lines not included in municipal limits, and every other collection of houses permanently inhabited by not less than 5000 persons even not having any municipal government was defined as urban area in the colonial period. These criteria continued till 1951 census. Since independence India has been experiencing a very high pace of urbanization both in terms of increasing volume of urban population and number of urban centers. South 24 Parganas in West Bengal too had catches the trend. Rajpur-Sonarpur Municipality is located to the 25 km away from the city heart of Kolkata bearing the history of urbanization of over 300 years. The RSM was brought into being in 1869 under the style of south Suburban Town Committee, covering Behala, Tollygunge, Garia, Rajpur etc. Later, in the year 1876, out of the said area Rajpur was segregated to Rajpur Municipality. To start with, the Municipality had a small area of 2 sq.miles with only 5 wards comprising the village Rajpur, Jagaddal, Harinavi, Malancha and Kodalia. In December 1993, it became the Rajpur Sonarpur Municipality (RSM) with 30 wards and area of 49.25sq.km when the surrounding Panchayats got attached with this municipality. After the delimitations in 1998 the numbers of wards have been increased to 33. Now it has 35 wards after March 2009.





Source: compiled by author from census of India (2001-11)

Fig.3

Fig no. 2 shows the Demographic profile of the study area which has revealed that the enormous increase of population between the years 1991 to 2011. According to census of India total population of RSM recorded as 64000 and it increase to 336628 in 2001 and decadal growth rate was 425% due to rapid growth of urbanization. It has been notified that the population density has increased nearly 3 times from 1991 to 2011. Ward wise population growth rate shown by the fig no. 3. Population density of the study area is 8603/sq.km (2011). The main reasons behind this rapid growth of urbanization are-

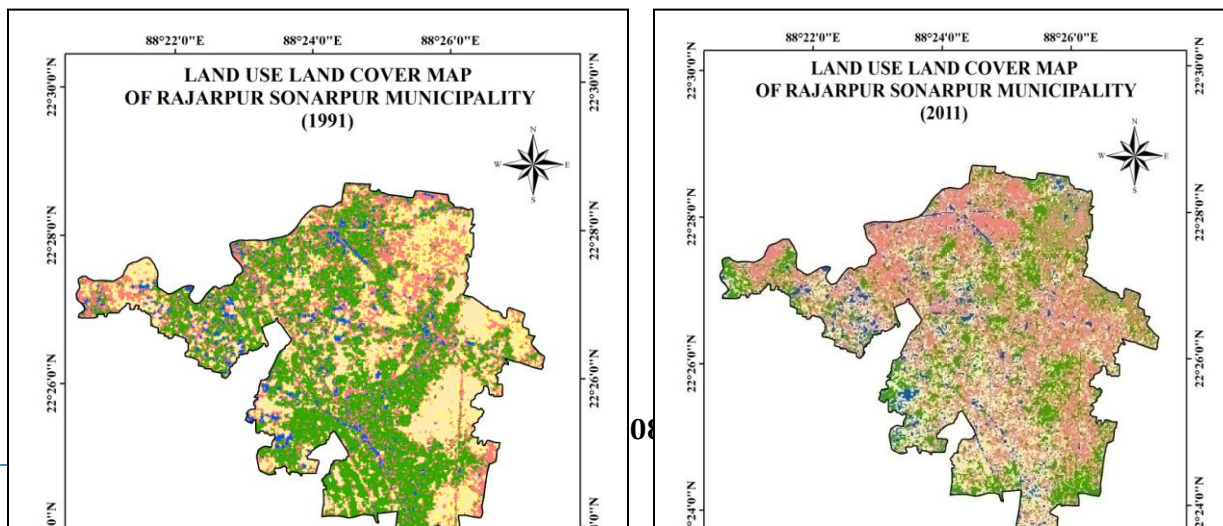
- i. Natural growth caused by decrease in death rates while birth rates remain high.
- ii. RSM is the gateway of S.24 Pgs. People from the adjoining villages infiltrated to get better facilities in this

study area. **iii.** The influx of refugees of the erstwhile East Pakistan (Bangladesh) is one of the most important causes. **iv.** Its closeness to the city of Kolkata. People of this core city migrate to this area to enjoy their life by getting less pollution, fresh food, cheap land value etc.

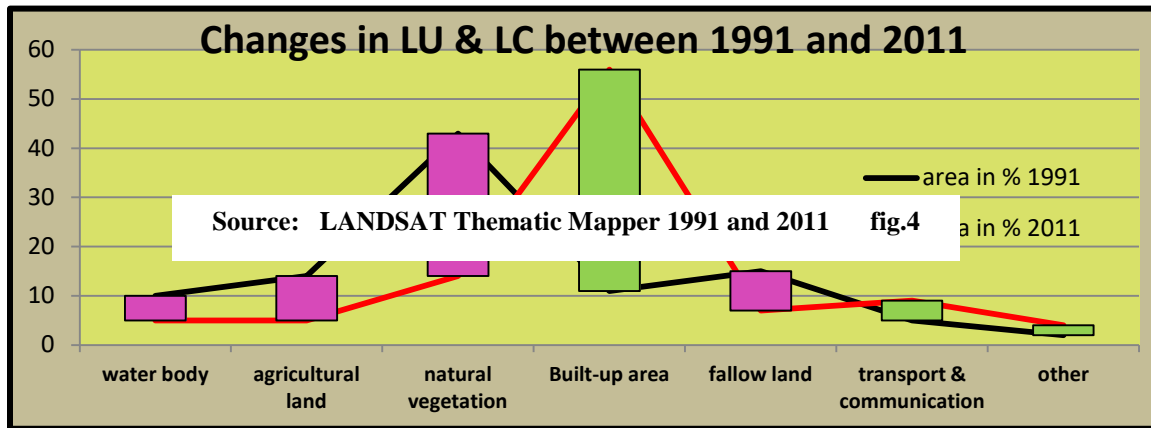
### **MAPPING OF URBAN GROWTH:**

LULC area for 1991 and 2011 are extracted from the rectified imageries and compared on a pixel by pixel basis. This process is often called change detection process of identifying differences in the state of an object or phenomenon by observing it at different dates (Singh 1989). Changes in land use and land cover area from 1991 to 2011 have been shown by fig no. 4. A tremendous change in LULC has been occurred during this period. The land use pattern of the study area initially was rural in character. In 1991 huge percentage of area was under agricultural, vegetation coverage and vacant land (68% approx) but this kind of practice of LULC has been totally changed along with time. At present this category occupies only 27% approximately. The residential used has been significantly increased from 21 % in 1991 to 62% in 2011. Other than residential land use, commercial use has been increased from 5% to 9%. Another important changed has been noticed in area under water bodies decreased from 10% (approx) in 1991 to 5% in 2011.

Fig no. 5 shows the comparative study between LULC of the year 1991 and 2011. In this period major negative change in land use has been observed in case of area under vegetation coverage, water bodies, agricultural and vacant land. Large extent of area under these uses has been transferred into residential uses. Other uses of land like commercial and transportational have been changed positively. During this period the municipality has undergone through jurisdictional expansion as well as delimitations of its wards. It was expanded from 20.98 Sq.km to 49.25 sq.km become the Rajpur Sonarpur Municipality in 1993. This has contributed significantly towards the population growth of the study area.





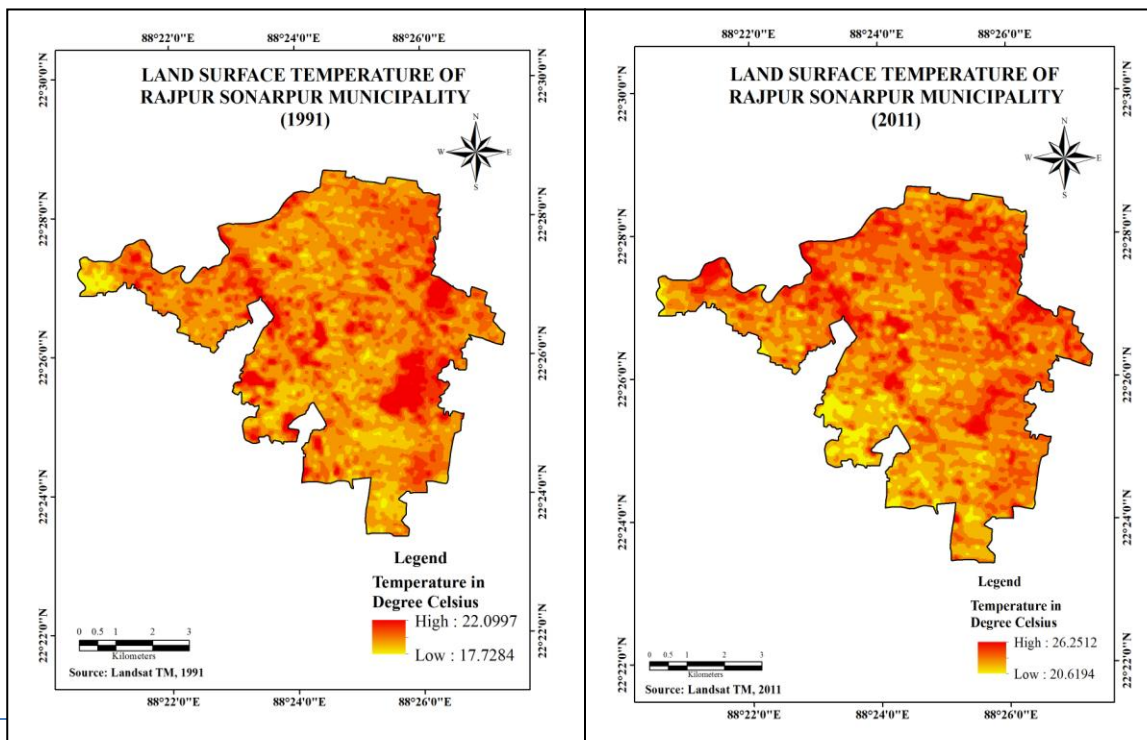


Source: LANDSAT Thematic Mapper 1991 and 2011 fig.4

Source: LANDSAT Thematic Mapper 1991 and 2011 fig.5

Apart from natural growth its location in the Greater Kolkata Metropolitan Area plays an active role in contributing towards its growth pattern. It is the gateway to South 24 Parganas. The area is being crowded by a large number of people who are coming from peripheral area of this district to access different urban facilities.

### IMPACT ASSESSMENTS

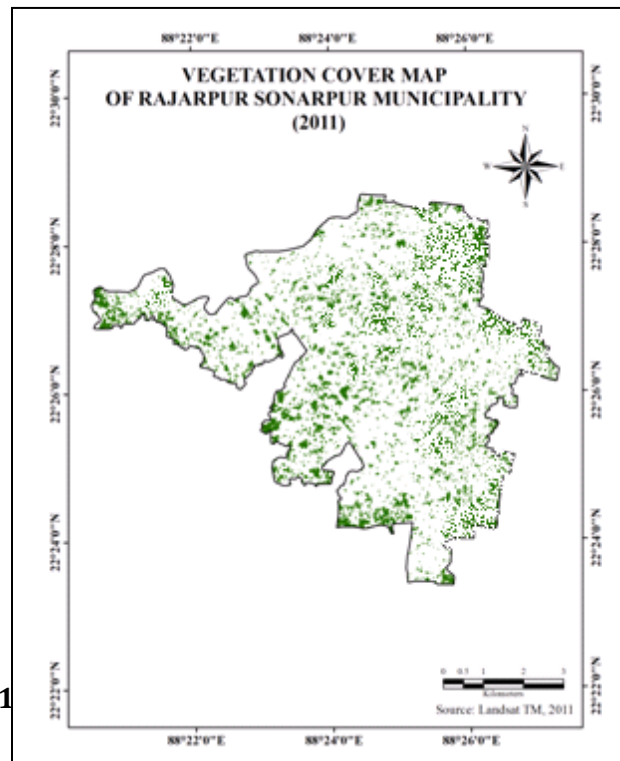
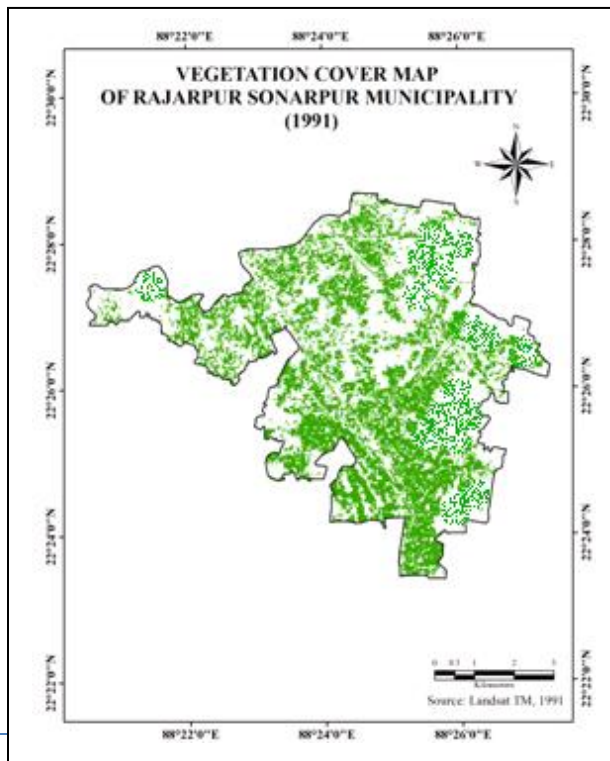




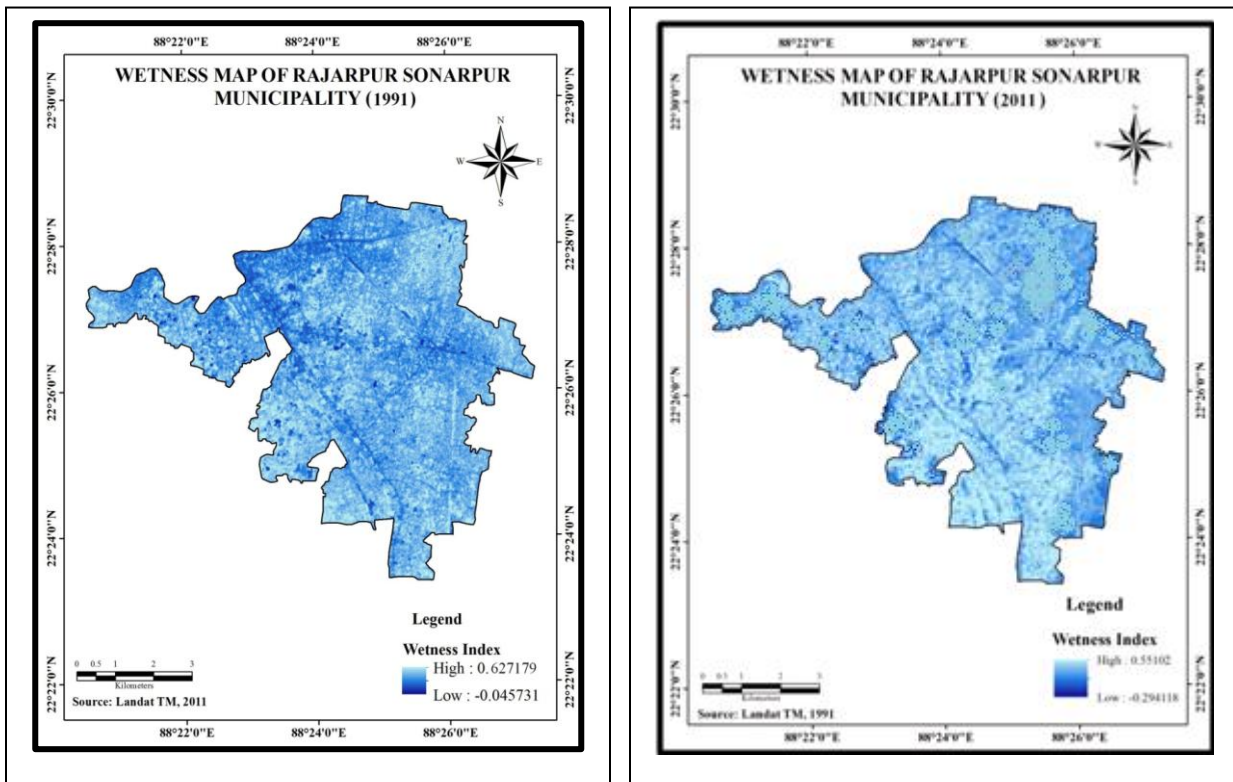
The impact of urbanization is in many folds starting from ecosystem to the socio-economy everywhere. **Source: LANDSAT Thematic Mapper 1991 and 2011 fig.6** Impacts include higher economic production, better employment opportunities, better life style and better services. But uncontrolled urban growth sometime vanishes all these good impacts inviting downsides.

In the present study if urbanization is taken as the function of temperature it is seen that the high temperature range co-exists with urbanized area. Concrete, cement, asphalt, brick and metal surface in urban areas tend to absorb heat energy rather than reflect it, contributing to higher Land Surface Temperature. If the LST map of 1991 and 2011 of the study area compared it is seen that the temperature dispersion is about 5°C (fig no. 6)

In case of Normalized Differentiate Vegetation Index (NDVI) map an inverse correlation is seen with built-up area. A significant change has been observed in vegetation coverage map from 1991 to 2011 (fig no.7). It has been decreased from 43% to 18% in 2011. Unplanned growth of settlements by the depletion of vegetation biomass has an impact on the soil moisture content and ground water infiltration. Due to concretization by different impermeable materials water is less likely to be absorbed into the ground resulting high run-off, water stagnation and water pollution in the area (Field survey 2017).



Another significant changes observed in surface water content. This is expressed by the Wetness map which Source: LANDSAT Thematic Mapper 1991 and 2011 fig. 7 . For the year 1991 it is seen that the wetness was -0.04 to 0.02 but in the year 2011 it is -0.294118 to 0.55102. It is mainly caused by filled up the wet lands and its conversion into build up area (fig no. 8).



Source: LANDSAT Thematic Mapper 1991 and 2011 fig. 8

**CONCLUSION:**

It is very wrong to propose against such modernization process, hence the need of the hour is to make plans and implement such strategies which can have least negative impacts on environment. The primary concern comes from the standpoint of the awareness level of the mass. A little traditional touch with witty modernization can alter the scene to a great extent not only in

this area but in other locals with similar physical and human settings. So to sustain a healthy eco system, the urban development should be in a managed way and for this a land bank data should be archived which will help the ecosystem to be sustained as well as the social needs of human being will be maintained.

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