IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 8, May 2023

Aurangabad City Blue and Green Infrastructure Change Identification Analysis using GIS and RS

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Abstract: *Blue-green infrastructure has been contemplated as sustainable and very long running solution for reducing the consequences of urbanization on the surrounding environment. This work focuses on adoptation and implementation of blue green infrastructure for some wards of Aurangabad city of Maharashtra State. Aurangabad is the famous industrial and historical city situated in the central part of Maharashtra, falling in parts of Survey of India Toposheet No.47 M/7. The temperature variation is 43ºC to 28ºC in summer and winter 32ºC to 5ºC. The average annual rainfall is about 700 mm to 800 mm. Ground water plays a major role in irrigation as well as domestic uses. The study area included a total of 8 zones which includes 90 wards from various parts of Aurangabad city with an aerial extent of 14181.8 Ha, with the goal of determining existing status of various BGI, and provide sustainable Urban green and Blue spaces in Aurangabad urban area,a standard methodology is proposed to generate geomorphology map, drainage density map, ground water potential map, lineament density map, Water bodies (Blue green spaces) map, land use land cover map, slope map and location map has been created using Arc GIS 10.3. All the thematic maps were converted into grid (raster format), and groundwater potential zones are classified into five categories like very poor, poor, moderate, good, very good with prospective covering area of 5.29 Ha,4726.32 Ha, 884.21 Ha, 8299.25 Ha, 274.74 Ha. The result of change detection shows that rapid urban growth has transformed most of the Blue and green spaces into residential and industrial area and found significant decrease of Blue and green spaces from year 2010 to 2020. There is significant decrease of agricultural area by 4.25%, water body area by 18.09%, and Built up area increased by 20.63% during last decade*

Keywords: *Blue Green Infrastructure, Ground water potential, Arc GIS 10.3, Remote sensing & GIS, Aurangabad Urban area, M.S, India*

I. INTRODUCTION

Blue infrastructure is mentioned in urban infrastructure associated to water. It is correlated to green infrastructure in urban environment and mentioned as “blue-green” infrastructure. Blue infrastructure consists river, streams, reservoir and lakes and exists as natural characteristics in cities and surrounding areas are adjoined to urban environment as an aspect of iys design. Blue infrastructure basically deals with all the water bodies and its resources from which it is originated also It consists of elements such as plants in urban areas such as green roofs or rain garden (Rao,P 2014,Kabisch,N-2015). Water sensitive urban design (WSUD) or sustainable urban drainage system (SUDS) are the core part of blue infrastructure and green infrastructure. SUDS is a concept of water management and amalgamate the principles of urban and landscape planning. Natural water cycle is considered in the designing of urban water cycle in functioning of SUDS. Innovative use of rainwater, waste water treatment, detention and infiltration, stormwater management and evapotranspiration is very important. The application of blue infrastructure regard to the building, concepts include retention of rainfall to slow down runoff and also reuse the water for various purposes such as gardening and flushing,

1.1 Objective and Study Area Details

The primary objectives of study is to contribute towards the systematic study of Urban blue, green spaces and groundwater utilizing remote sensing and Geographic information system (GIS) in the delineation of groundwater

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potential areas. The present study area is located in the Aurangabad urban area of Maharashtra. Aurangabad is the famous industrial and historical city situated in the central part of Maharashtra. The temperature variation is 43ºC to 28ºC in summer and winter 32ºC to 5ºC. The average annual rainfall is about 700 mm to 800 mm. The sources of irrigation are streams, percolation tanks and wells in the study area. Ground water plays a major role in irrigation as well as domestic uses. Aurangabad district is situated in the north central part of Maharashtra, falling in parts of Survey of India Toposheet No. 46 L & P and 47 I & M.

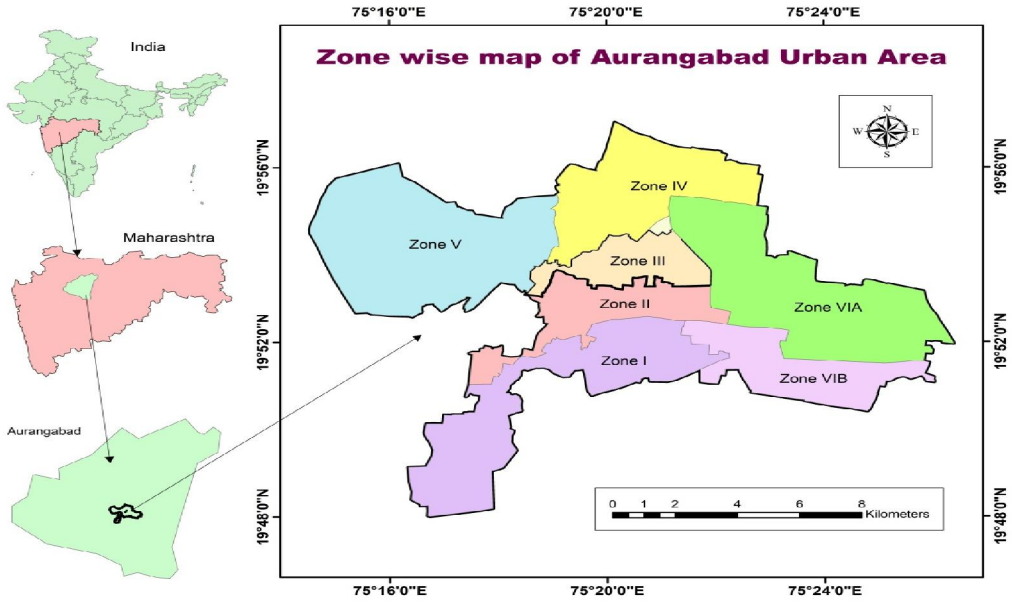

Fig 1: Location of study area with eight Zones in Aurangabad Urban area.

II. DATA COLLECTION AND METHODOLOGY

In this study seven zone of Aurangabad Urban area were considered for study purpose. Table 2 shows details of each Zone's Character. Field survey conducted to collect the Existing detail condition of zone character like Vegetative cover, Gray infrastructure, Surface runoff, drainage condition, water body. Further, initially map of Aurangabad urban area was scanned and digitized selected study area using tools present in ARC-GIS 10.3. Digitization is the process which converts raster to vector format. Spatial interpolation is a means of converting point data to surface data. Finally The collected data has been processed and analyzed by using different quantitative, statistical technique and following mentioned methodology figure 7 ,were used to analyze change detection in study area. In this present study primary and secondary data were used to thematic map preparation. The base map of the study area was prepared based on Survey of India toposheets. The LANDSAT-5 TM (2010), LANDSAT-8 TM (2020) & SRTM DEM satellite image data ware used to prepared Land Use / Land Cover, Slope & Drainage density map.

III. METHODOLOGY

3.1 Factors Influencing Blue Green Infrastructure :-

Surface water bodies like rivers, ponds, etc., can act as recharge zones (Murugesan B. et al., 2012). Groundwater is a form of water occupying all the voids within a geological stratum. The different hydrogeological themes can be used to identify the groundwater potential zone of the present area. The remote sensingand Geographic information system (GIS) tool can open new path in water resource studies. Identification of groundwater occurrence location, condition of blue and green spaces in study area using remote sensing data is based on indirect analysis of directly observable terrain features like geological structures, geomorphology, and their hydrologic characteristics. Also lineaments play significant role in groundwater exploration in all type of terrain. Following are the important factors to consider for efficient assessment of surface water and groundwater (BGI).

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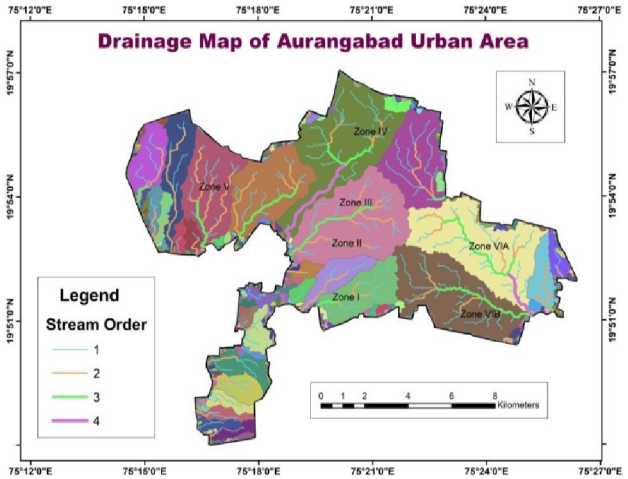
1. 1.Drainage density of basin
2. Slope
3. Lineament density
4. Geomorphology
5. Land use/ Land cover

3.2 Drainage Map

A drainage basin is a natural unit draining runoff water to a common point. This map consists of water bodies, rivers, tributaries, perennial & ephemeral streams, ponds. The study area is fourth order basin joining the rivers, tributaries based on topography depicted. Drainage network helps in delineation of watersheds



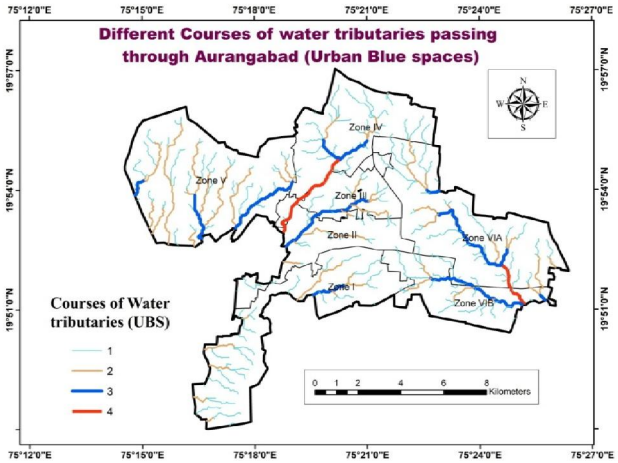


Figure 3.2: - Drainage map of Aurangabad Urban Area Figure2.3:- Different Courses of water tributaries passing through Aurangabad (Urban Blue

3.3 Lineament and Lineament density Map

Remote sensing data i.e. satellite images of an area are useful to map lineaments. For better interpretation of lineaments, the images are digitally processed using image processing software. Further high spatial resolution and multi-spectral data (with color composites suitable for particular application) make the marking of lineaments much easier, accurate and reliable. In present study area with very high lineament density (1.4 to 2.17) has good groundwater potential and an area with very low lineament density (0-0.213) having poor groundwater potential.

3.3 Geomorphology of Aurangabad Urban Area

Geomorphology, along with information on soil, water and vegetation has become one of the essential inputs in planning for various developmental activities. Geomorphology reflects various land form and structural features. Many of the features are favorable for the occurrence of groundwater and classified in terms of groundwater potentiality.

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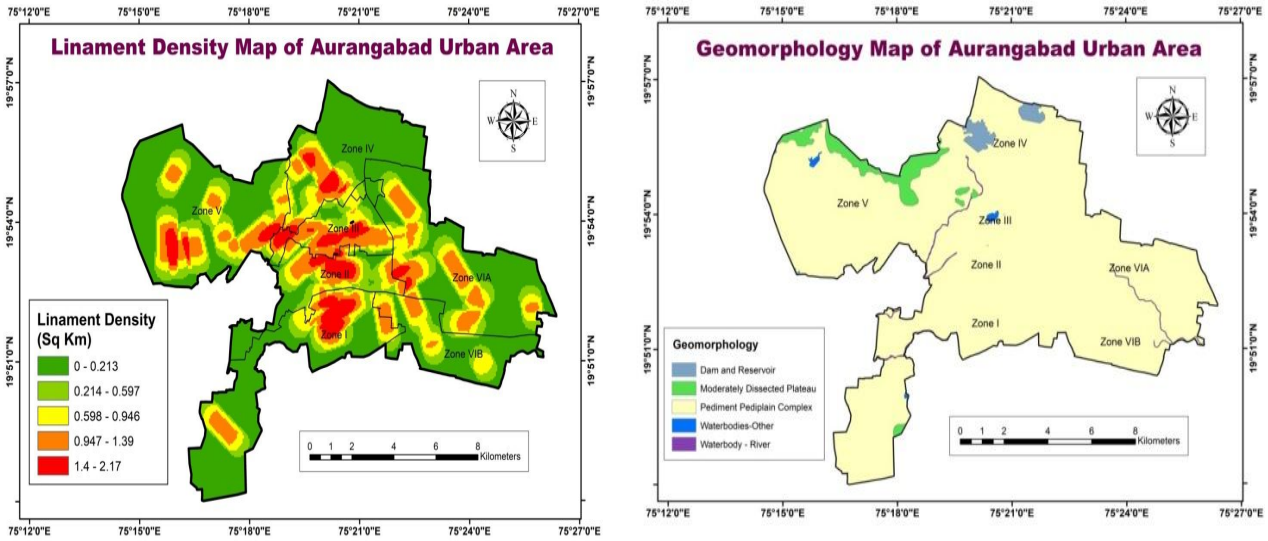

Figure 2.5:- Geomorphology map of Aurangabad urban Area Geomorphology map of Aurangabad Urban Area.

3.4. Water Body

It includes artificial lakes created by construction of dams across the river. They appears in light blue to dark blue and possess regular to irregular shapes. They are associated with crop lands, low land, and hills with or without vegetation. Water body category comprises area with surface water, in the form of ponds, lakes and reservoir or flowing as streams, rivers, canal etc. these appear as blue to dark blue in colour. In study area water body covers total area of 248.72 Ha.It includes Salim ali lake, harsool lake, sawngilake, university lake.

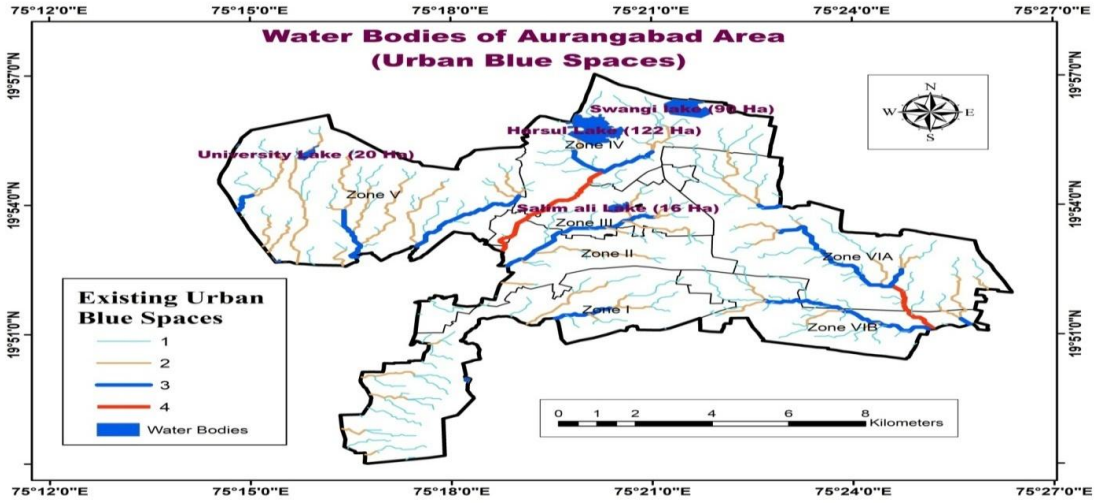

Figure 3.6 : Existing Aurangabad Urban Blue Spaces

3.5 Land Use/Land Cover

LULC of study area has been analyzed for year 2010, Image analyzed is Landsat 5 image. Supervised classification of study area shows that major portion in land use is Agricultural land covering area 8787.68 ha., barren land covering area 1136.8 ha., Built Up Land covering area 3583.05 ha., Vegetation land covering area 1090.68 ha., water body covering area 105.519 ha., as depicted in Fig.8.and also As per analysis of LULC of study area for year 2021,for this image analyzed is Landsat 8 image. It is observed that major portion in land use is Agricultural land covering area

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8412.69 ha., barren land covering area 213.248 ha., Built Up Land covering area 4394.06 ha., Vegetation land covering area 789.589 ha., water body covering area 86.82 ha., as depicted in Fig.9 and Table-5.

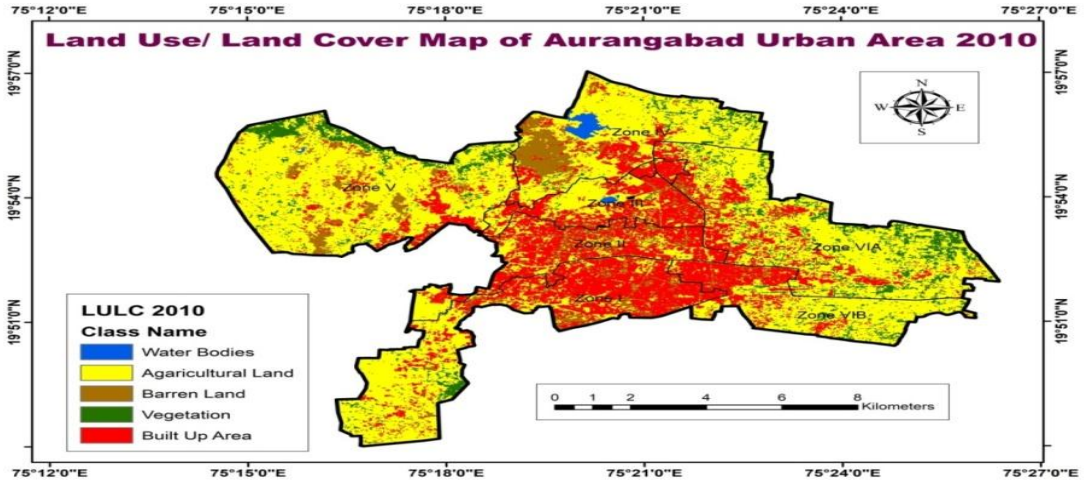

Figure 3.7 : - Land Use and land Cover Map, Aurangabad Urban Area, Year- 2010 Aurangabad city.

The study reveals that integration of six thematic maps such as drainage density, slope, geology, geomorphology, lieament density and land use/land cover first hand information to local authorities and planners about the areas suitable for groundwater exploration. All the thematic maps were converted into grid (raster format), and groundwater potential zones are classified into five categories like very poor, poor, moderate, good, very good with prospective covering area of 5.29 Ha,4726.32 Ha, 884.21 Ha, 8299.25 Ha, 274.74 Ha.

IV. RESULT AND DISCUSSION

In Aurangabad city, Rapid growth in population, due to development of new industrial area, and new construction in the process of urbanization, the active presence of urban blue and green spaces are not sufficient to fulfill the sustainable water demand of Aurangabad citizens. Government of India under Smart Cities Mission (SCM) works on solutions like sanitation, water supply, preserving open spaces, water supply and Atal Mission for Rejuvenation and Urban Transformation (AMRUT) which is focused on improving urban living and that include Blue and Green components as part of the mission intention. AMRUT works on issues of water supply, sanitation and green spaces up gradation. By following all Government aspects and creating awareness in citizens of Aurangabad city to take intuitive to create sustainable blue green infrastructure.

V. CONCLUSION

It has been widely established that the green-cover could improve the unfitting hostile urban environment to congenial fitting environment for the human survival. The newly emerging research knowledge on the urban green-spaces made us to realize 'tree as both the ecological and cultural feature of the city'. In order to obtain the true ecological benefits of the green space, according to the study, the urban forest should be treated as a continuum and it should follow an integrated part of the planning system and the rational management.

Proper and optimum use of all BGI service providing unit will enrich society through the provision of multiple co-benefits, including access to public green space, recreational opportunities, aesthetic enhancements, and improved management of environmental processes such as flooding, drought, urban heat and air pollution. The interconnected network of green spaces can conserve the ecological functions and ecosystem values of the urban area that will provide the required benefits to the population. Therefore, there is necessity of the interconnected networks of the city's green space with the urban infrastructure like, water supply and sewerage system, called the interconnected green-space as the 'urban green infrastructure'. The urban green cover improvement activities require an appropriate planning system based on the ecological principles. There is need to provide tree cover service providing unit like patches, corridors and soil and water conservation structure like gully plug, use of infiltration swales in stream basin which includes

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Ist,IInd,IIrd,IVth order stream which covers total length 2,40,379 meter includeing Khamand sukhana river basin to create sustainable drainage systems (SuDS). Also there is need to ban on release of waste water in this selected natural water course. Available road network in Aurangabad is 83 km in that road divider are available on 49.95 km and 44 parking places, there is need of increase in area under green belt by providing proper tree patches and carridors. . In Aurangabad Municipal Corporation area total 114 Gardens are present out of that 20 garden are major, 60 garden are medium and 34 garden are in sanctioned layout. It is observed that, total land is available for plantation in all AMC garden is 227973 sq.meter out of this plantaion is done on only 112226 sq meter. Total number of plantation done of plants is 26,845 in the year 2015 -17, out of which 25,326 plants are present in the year 2021.

REFERENCES

[1]. Prasanna P. Dange and Dr. K.A Patil "Assessment of Groundwater Quality and its Suitability for Drinking And Agricultural Uses in the waluj MIDC, Aurangabad, Maharashtra, India"

[2]. Dr. P. A. Khadke, & Mr. R. U. Kharat (2017) "Urban Land Use Classification And Change Detection Analysis Using Geospatial Technology: A Case Study Of Aurangabad City "Scholarly Research Journal, MAY-JUNE 2017, VOL- 4/31, ISSN- 2278-8808, Page-5239-5248.

[3]. Mehraj U. Din Dar , AamirIshaq Shah , Shakeel Ahmad Bhat ,, Rohitashw Kumar , Donald Huisingh , RajbirKaur "Blue Green infrastructure as a tool for sustainable urban development" Journal of Cleaner Production 318 (2021) 128474

[4]. SayliUdas-Mankikar and Berjis Driver, "Blue-Green Infrastructure: An Opportunity for Indian Cities," ORF Occasional Paper No. 317, May 2021, Observer Research Foundation.

[5]. M. A. Benedict, E. T. McMahon, et al., "Green infrastructure: smart conservation for the 21st century," Renewable resources journal, vol. 20, no. 3, pp. 12–17, 2002.

[6]. S.D.Shinde,K.A.Patil and P.A.Sadgir," Assessment of river and groundwater quality and its suitability for domestic uses in Aurangabad,Maharashtra,India.

[7]. Dr. P. A. Khadke, & Mr. R. U. Kharat (2017) "Urban Land Use Classification And Change Detection Analysis Using Geospatial Technology: A Case Study Of Aurangabad City" Scholarly Research Journal, MAY-JUNE 2017, VOL- 4/31, ISSN-2278-8808, Page-5239-5248.

[8]. 2. Mr. R. U. Kharat and Dr. P. A. Khadke (2018) "Spatio-Temporal Analysis of Urban Population Growth and Distribution in Aurangabad City" International Journal of Research in Social Sciences, Vol. 8 Issue 3, March 2018, ISSN: 2249-2496 Impact Factor: 7.081, Page-428-440.

[9]. Milan Naik (2013) "Urban Sprawl of Bhubaneswar City Using GIS Applications and Entropy" Thesis Department of Civil Engineering National Institute of Technology, Rourkela May, 2013.

[10]. Sandeep Kumar and Randhir Singh Sangwan (2013) "Urban Growth, Land Use Changes and Its Impact on Cityscape in Sonipat City Using Remote Sensing and GIS Techniques, Haryana, India" International Journal of Advanced Remote Sensing and GIS,2013, Volume 2, Issue 1, pp. 326-332, Article ID Tech-157 ISSN 2320 – 0243.

[11]. SassanMohammady (2014) "A Spatio-Temporal Urban Expansion Modeling A Case Study Tehran Metropolis, Iran" Landscape & Environment 8 (1) 2014. 10-19.

[12]. Eiman A. Mohammed (2015) "Urban Expansion and Population Growth in Omdurman City, Sudan Using Geospatial Technologies and Statistical Approaches" American Journal of Earth Sciences, 2015; 2(1): 1-7, published online January 30, 2015.

[13]. MajidFarooq& Mohammad Muslim (2014) "Dynamics And Forecasting Of Population Growth And Urban Expansion In Srinagar City – A Geospatial Approach" The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Volume XL-8, 2014 ISPRS Technical Commission VIII Symposium, 09 – 12 December 2014, Hyderabad, India.

[14]. Manish K Tiwari (2012) "Mapping and evaluation of urban sprawl using an integrated approach of Remote Sensing and

[15]. GIS Technique (Review)" International Journal of Advanced Technology & Engineering Research (IJATER), ISSN NO: 2250-3536, Volume 2, Issue 1, January 2012.

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International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
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Volume 3, Issue 8, May 2023

[16]. Asad Ali Khan* , Sana Arshad , Muhammad Mohsin (2014) "Population Growth and Its Impact on Urban Expansion:A Case Study of Bahawalpur, Pakistan, Universal Journal of Geoscience 2(8): 229-241, 2014, DOI: 10.13189/ujg.2014.020801.

[17]. T.V. Ramchandra and Uttam Kumar "Geoinformatics for Urbanization and Urban Sprawl Pattern and Analysis" Geoinformatics for Natural Resource Management, ISBN-978-160692-201-8.

[18]. Pardeep Kumar (2016) "Urban Sprawl Of Hisar City Using Remote Sensing & GIS –A Case Study" ISSN: 2278 – 7798 International Journal of Science, Engineering and Technology Research (IJSETR) Volume 5, Issue 5, May 2016.