

## Monitoring Physical Growth Of Nanded City By Using Geoinformatics Techniques

Yannawar V.B.<sup>1</sup>, Bhosle A.B.<sup>2</sup>, Khadke P.A.<sup>3</sup>, Waghmare P.B.<sup>4</sup>

<sup>1,4</sup>Research Scholar, <sup>2,3</sup>Assistant Professor  
School of Earth Sciences, Swami Ramanand Teerth Marathwada University,  
Vishnupuri, Nanded 431606, (Maharashtra) India.  
E-mail: vbyannawar@gmail.com, abbkandlikar@gmail.com

**Abstract:** This paper highlights the importance of remote sensing and GIS techniques in apprehending the situation in Nanded, (MH) India. **Objectives:** To study different applications of GIS techniques in urban planning. To prepare base layers maps for observed topographical features. Optimal path generation for tourist places. Generation of facility zone for police stations, land use/ land cover, change detection, Digital Elevation model (DEM) and Triangular Irregular Network (TIN). Analysis of database in GIS for delineation of drainage density and generation of digital cartographic database. **Methods:** To achieve plan metric accuracy, the remote sensing scene was rectified with respect to SOI maps on 1:50,000 scale. Then the subset of image has been taken according to the boundary of the study area. The digital classification technique has been used for the extraction of the land use and land cover information from the imagery. **Results:** Use of GIS in a research program for environmental management of the Godavari River in Nanded, and in support of participatory processes for managing environment and health in slums are used to demonstrate appropriate applications of GIS in India. **Conclusions:** The paper analyses the expansion of urbanized areas of Nanded between 1990 and 2012, based on comparison of old topographic sheets, recent satellite images and other similar information of the intervening years. A digital and visual-based classification method is applied to find out the areal extent of the city. It is found that main conversion has taken place from agriculture land to built-up land and road networks. This growth is subsequently discussed with levels of development, with focus on unplanned nature of growth.

[Yannawar V.B., Bhosle A.B., Khadke P.A., Waghmare P.B. **Monitoring physical growth of Nanded city by using geoinformatics techniques.** *Researcher* 2013;5(2):80-86]. (ISSN: 1553-9865).  
<http://www.sciencepub.net/researcher>. 16

**Key words:** Geographic information systems; GIS, Digital Elevation model; DEM, Triangular Irregular Network; TIN.

### 1. Introduction

Geographic Information Systems (GIS) is a technology that can gather, store, analyze, manage, manipulate, map, and display information on a geographical location. GIS technology is a combination of computer-based tools, data, people, and methods that work together to perform tasks related to spatial data. (Brenda and Lerner, 2009) Geographic Information Systems (GIS) are a powerful set of computer-based tools used to collect, store, manipulate, analyze and display spatially referenced information (Burrough and McDonnell 1998). They transform data into knowledge and present this knowledge in various formats for the purpose of supporting decisions. GIS are usually portrayed as knowledge-based and free from bias, but in fact GIS is a socially constructed technology (Warren 1995). GIS (Geographic Information Systems and Science) have always shared many of the foundational ethea (plural of ethos) of Web 2.0 (Kamel and Wheeler 2007). Indians have been enthusiastically and rapidly adopting GIS and remote sensing technology over the past 15 years. In this adoption, technical expertise in the geomatics fields has tended to be concentrated in

scientific research centers, and the related initiatives and programs have been top-town and data centric (Walsham and Sahay 1999; Geogiadou et al. 2005; Singh 2005).

The government is hoping to find new uses for public information in the areas of criminal justice, health and education, and is opening up gigabytes of information for this purpose from a variety of sources like mapping information from Britain's Ordnance Survey, medical information from the NHS (National Health Service), and neighborhood statistics from the Office for National Statistics. (Maged et al.2008) Recent developments in GIS have led to significant improvements in its capability for decision making processes in land allocation and environmental management, among which Multi-Criteria Evaluation (MCE) is one of the most important procedures (Janssen and Rietveld 1990, Burrough et al. 1992, Jankowski 1995). However, changes in land cover and in the way people use the land have become recognized over the last 15 years as important global environmental changes in their own right (Turner, 2002). Most developing countries are urbanizing very fast, much faster than the

advanced countries, which are already predominantly urban. There has been a noticeable change in the urban infrastructure scenario of Nanded City. Recent trends in urban development are analyzed with a focus on the haphazard nature of the spatial development, for example, road network and built-up land due to lack of planning and poor land management.

This study was carried out in Nanded City located within co-ordinates of 19° 09' North latitude and 77° 20' East longitudes. The municipal area of Nanded City comprises 73 wards. Major State Highway (MSH) 6 to Degloor in the south east towards Hyderabad, MSH 2 to Bhokar in the north east and Latur in the south east, MSH 3 to Hadgaon in the north, MSH 6 to Madgaon in the north west, State Highway (SH) 44 to Purna in the west, and SH 223 to Kandhar & SH 224 to Osmannagar in the south passes through the city area. The total area under the Nanded Waghala City Municipal Corporation jurisdiction is 51.76 sq. km. Nanded City is divided in two parts i.e. Old Nanded 20.62 sq. km. North of the Godavari river (on the left bank) and New Nanded 31.14 sq. km. comprising of Waghala and six other newly merged villages and CIDCO area, South of the Godavari river. The population of Nanded city, as per 2001 census was 438397 persons. It is growing up to 550564 persons in 2011.

The present paper aims to identify spatial, environmental and socio-economic consequences of the rapid and haphazard expansion of Nanded City in the surrounding rural areas primarily in the last ten years. Geo-informatics techniques like satellite remote sensing and GIS has been used to assess the rate of the spatial expansion, seen in the perspective of last ten years. Nanded is growing at a very fast rate, acquired a complex urban structure over the years. The central part or the core has gone through unusual changes in terms of social and physical transformations. The increasing demands in urban planning and management sectors call for co-ordinate application of remote sensing and Geographic information system for sustainable development of urban areas. There is an urgent need to adopt Remote Sensing and Geographic information system approach in infrastructure development.

Monitoring process for implementing pragmatic plan in urban development. Efficient urban information system is a vital per-requisite for planned development. The plan must incorporate an integrated approach of spatial modeling using Remote Sensing Data, GIS database and GPS solutions. This helps in evolving efficient and economical models for development and location of industries, education, housing, water supply, and service facility and disposal system.

## 2. Materials & Methods

### 2.1 Study Area

Nanded district is part of Marathwada Region in Maharashtra. For the present study in and around area of Nanded city is selected. Nanded city is situated on the bank of Godavari River. Nanded district has a geographical area of 10,528 Sq. Km., which forms 3.41% of the total geographical area of Maharashtra State. The district is situated in the Deccan Plateau. The district of Nanded has between 18°.15' and 19°.55' North latitude and 77°.7' to 78°.15' east longitudes.

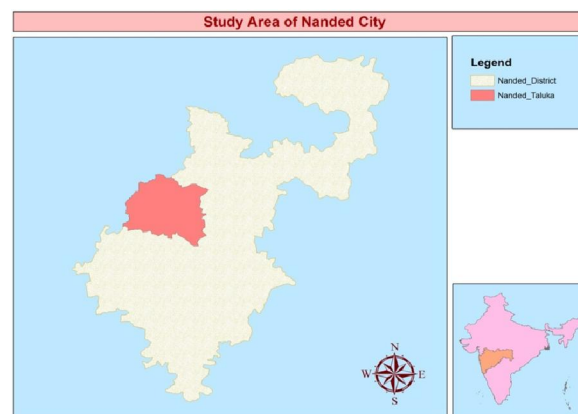


Figure: 1.1 Showing study areas map of Nanded Taluka

### 2.2 Methodology

The random distortions were corrected using well distributed ground control points occurring in raw data. To achieve plan metric accuracy, the remote sensing scene was rectified with respect to SOI maps on 1:50,000 scale. The GCP's in the scene such as railroad intersections, corners of water reservoirs, bunds, etc. were identified on the image as well as on the reference map. Third order model was constructed and finally registration of image was carried out with nearest neighborhood resampling taking map as reference and one map registration was achieved.

Then the subset of image has been taken according to the boundary of the study area. The digital classification technique has been used for the extraction of the land use and land cover information from the imagery. Eleven different land use and land cover classes have been identified in the area under study. Table shows the information about the extent of land use/land cover classes in the study area. Here, Spatial Adjustment technique is being used to remove that gap by retaining its geographic feature, describe as below:

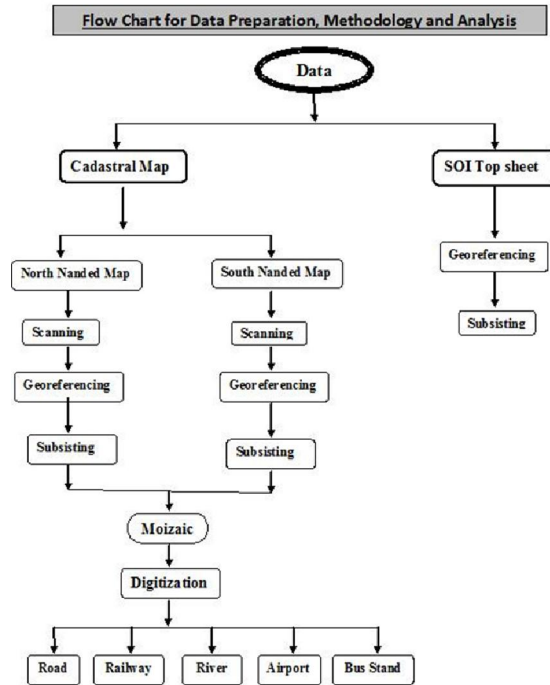


Figure 1.2 Flow chart of methodology and analysis

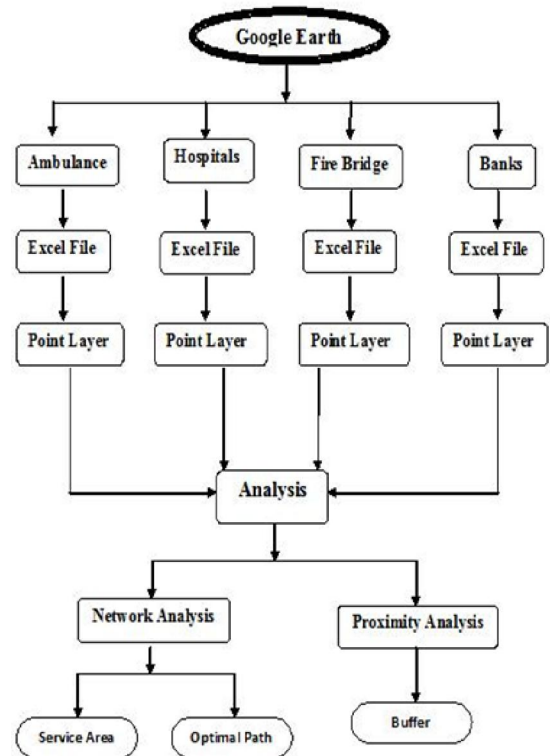


Figure 1.3 Flow chart of data preparation methodology from Google earth and analysis

**3. Result Analysis**

There has been a rapid growth of urban population in India over the last four decades. In India expertise and access to geomantic technology and data tend to reside in departments and institutions among which coordination and communication for spatial data development and project implementation is poor (Walsham and Sahay 1999).

In issues of public participation and empowerment in spatial planning and environmental management situations in developed countries, internet-distributed geographic information systems are starting to be used (Bunch and MacLennan 2010).

The results found in Nanded city are also shown in following figures.

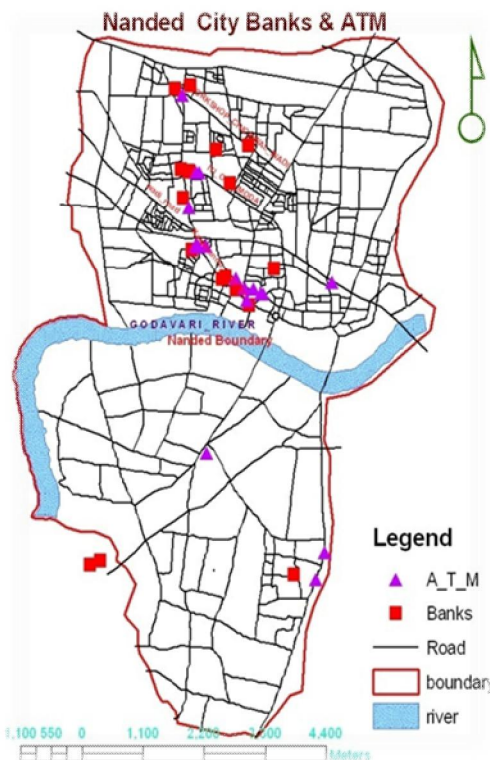


Figure 4: shows city Banks and ATM service map

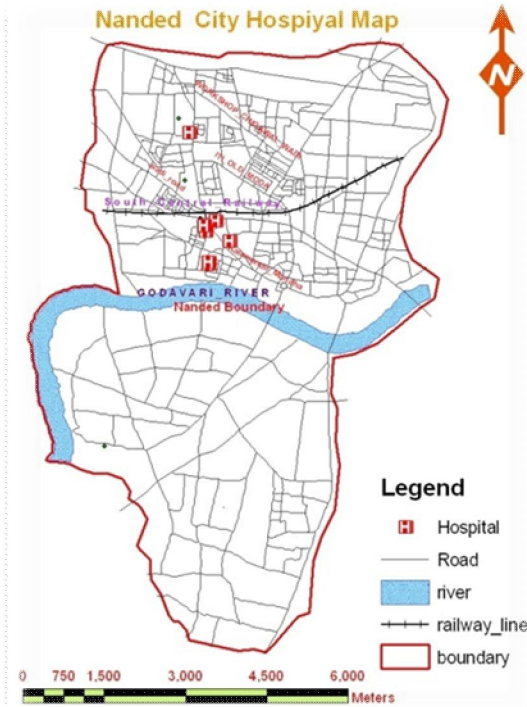


Figure 5: shows Nanded city hospital map

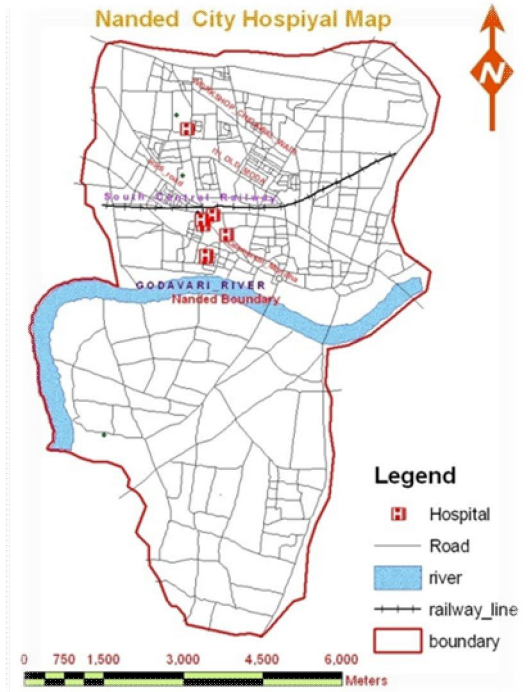


Figure 5: shows Nanded city hospital map

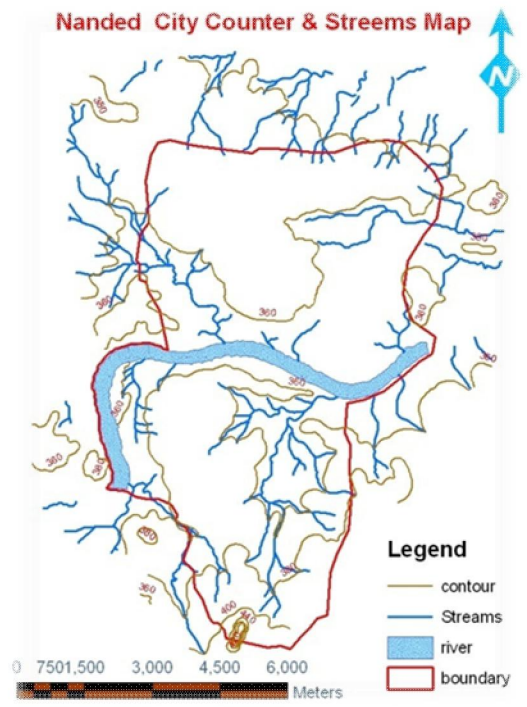


Figure 6: shows counter & streams map

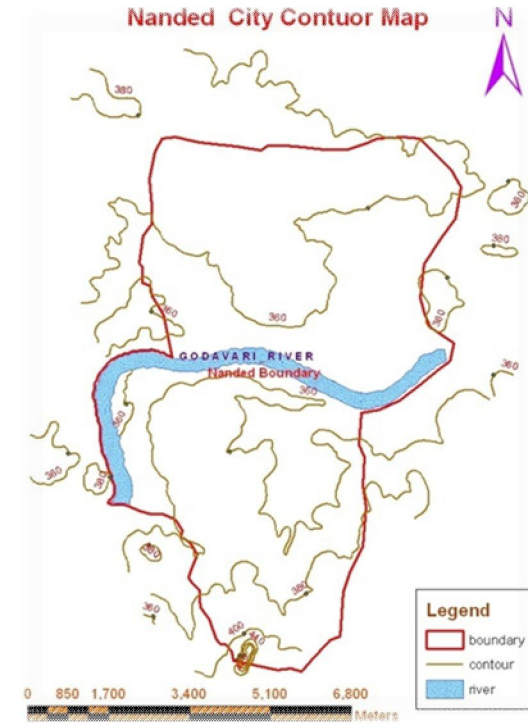


Figure 7: shows the Nanded city counter map



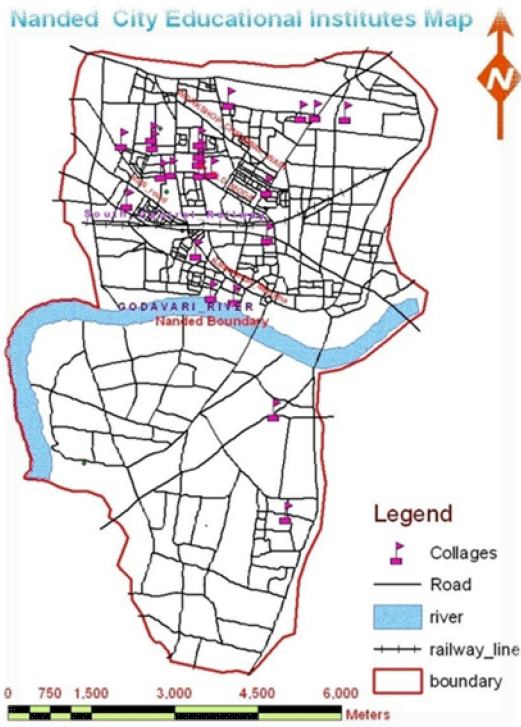


Figure 8: shows city educational institutes map

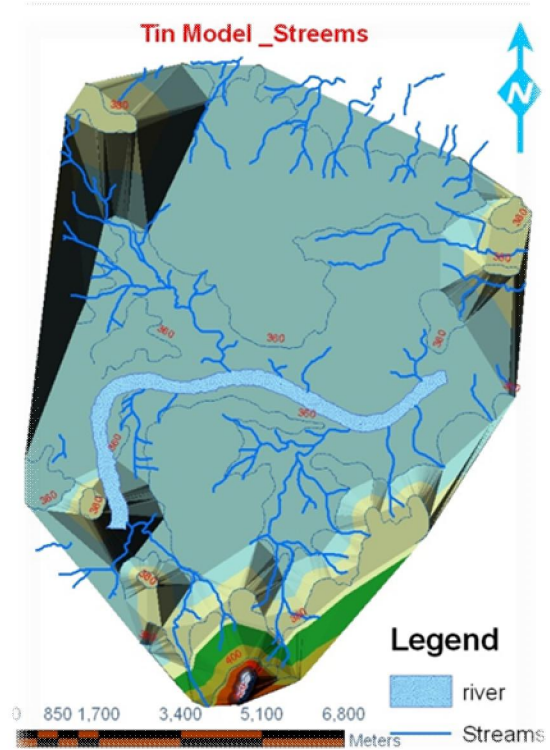


Figure 9: shows the DEM with streams map

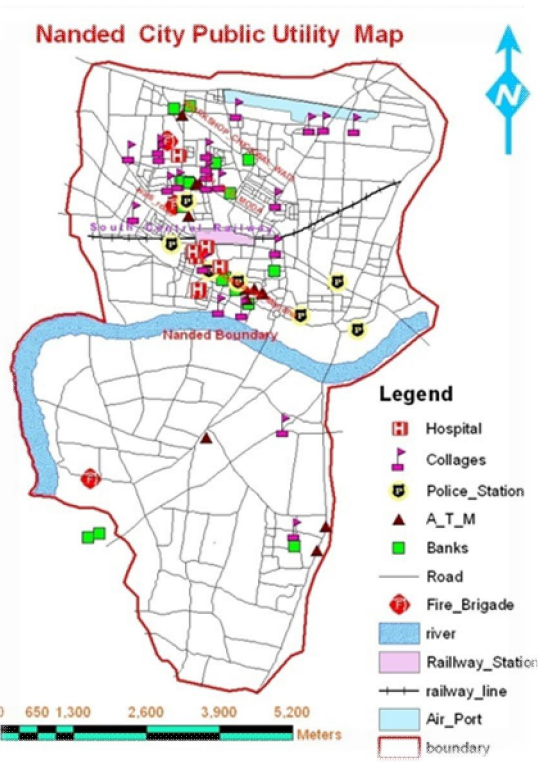


Figure 10: shows Nanded city public utility map

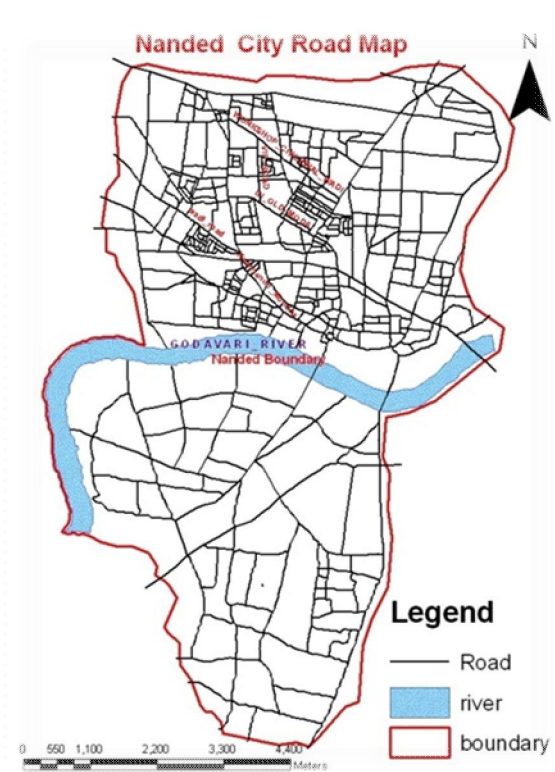


Figure 11: shows the Nanded city road map

### 3.1 Major findings

Nanded city is expanding towards northeast and southwest, encroaching adjacent small towns and engulfing rich agriculture land.

Nanded city has put heavy pressure on the ecologically sensitive areas, due to deforestation and loss of cropped area.

Agricultural land is being gradually converted into built-up land for industrial, commercial, residential and others, uses in Nanded city.

Land use changes and development of infrastructure especially roads has increased due to Guru-Ta-Gaddi program was held in Nanded during Nov.2008.

Growth in infrastructure has not kept pace with the growth of population, resulting in disequilibrium in the level of development of wards.

### 4. Conclusion

The paper shows urban growth and its haphazard nature, which is obvious while traveling on the streets of Nanded. Areas are being converted for urban use without any systematic development plan and without a corresponding investment in infrastructure. As a result of it most of the population concentrated in the middle part of the Nanded Municipal Corporation area, most of the utilities founded in the same place. The travel time require to cover all shown tourist places is less so that can visit all places in a day. Elevation increases from South-West to North region of the study area. The study area falls in the Plateau region as per the DEM. Poor land management has resulted in urban areas with inadequate services and infrastructure and a corresponding lack of accessibility that may prove very costly to resolve in future. While it is not too difficult to pinpoint the magnitude of problems and some of their causes, it is clearly more difficult to pin-point quick solutions that will create a more sustainable growth in the outskirts and fringe areas. This increases the possibilities for assessing the magnitude of the problems in order to create public awareness and handle issues related to land use pattern, infrastructure and environmental planning. These recent development will facilitate efforts to address the problems in a serious manner.

Agriculture area decreases from year 1989 to year 2011 and simultaneously increase in urbanization. This increases the possibilities for assessing the magnitude of the problems in order to create public awareness and handle issues related to land use pattern, infrastructure and environmental planning.

### Acknowledgement:

We are thankful to the School of Earth Sciences, Swami Ramanand Teerth Marathwada University, Nanded for providing laboratory and library facilities.

### Correspondence to:

Yannawar Vyanaktesh Balajirao  
School of Earth Sciences  
SRTM University Nanded 431606, India  
Telephone: 02462-229242  
Emails: [vbyannawar@gmail.com](mailto:vbyannawar@gmail.com)

### References

1. Brenda Wilmoth Lerner & K. Lee Lerner, (2009) Environmental Science: In Context vol.1 & 2, Gale, Cengage Learning, New York.
2. Bunch, M.J. and M. MacLennan (2010) Usability Trumps Features: User needs and the redesign of a web-based GIS to support community environmental monitoring. *OS Geo Journal* vol. 6, pp. 40-52.
3. Burrough P. A. and Rachael A. McDonnell (1998) Principles of Geographical Information Systems. New York: Oxford University Press.
4. Burrough, P. A., MacMillan, R. A. and van Deursen, W. (1992), Fuzzy classification methods for determining land suitability from soil profile observations and topography. *Journal of Soil Science*, vol. 43, pp. 193-210.
5. Daniel Ayalew Mengistu and Ayobami T. Salami, (2007) Application of remote sensing and GIS inland use/land cover mapping and change detection in a part of south western Nigeria, *African Journal of Environmental Science and Technology* Vol. 1, No 5, pp. 099-109.
6. Georgiadou Y., S. K. Puri and S. Sahay (2005) Towards a Potential Research Agenda to Guide the Implementation of Spatial Data Infrastructures: A Case Study from India. *International Journal of Geographical Information Science*, vol. 19 No 10, pp. 1113-1130.
7. Jankowski, P. (1995), Integrating geographical information systems and multiple criteria decision making methods. *International Journal of Geographical Information Systems*, vol. 9, pp. 251-273.
8. Jansen, R. and Rietveld, P., (1990), Multi-criteria analysis and geographical information systems: an application to agricultural land use in The Netherlands. In *Geographical Information Systems for Urban and Regional Planning*, edited by H. J. Scholten & J. C. H. Stillwell (The Netherlands: Kluwer Academic Publisher), pp. 129-139.
9. Kamel Boulos MN, Wheeler S (2007) the

- emerging Web 2.0 social software: an enabling suite of sociable technologies in health and health care education. *Health Information and Libraries Journal*, vol. 24, No. 1, pp. 2-23.
10. Maged N Kamel Boulos, Matthew Scotch, Kei-Hoi Cheung and David Burden,(2008) Web GIS in practice VI: a demo playlist of geo-mashups for public health neogeographers, *International Journal of Health Geographics*, vol.7, No.38, pp. 1-16.
  11. Majid Hussain, (2003) *Urban Geography*, Anmol Publications Pvt. Ltd, New Delhi.
  12. Martin J. Bunch, T. Vasantha Kumaran and R. Joseph. (2012) Using Geographic Information Systems (GIS) For Spatial Planning and Environmental Management in India: Critical Considerations, *International Journal of Applied Science and Technology* Vol. 2 No. 2, pp. 40-54.
  13. Nanded Vision-2025 (2006), City Development Plan, Nanded Waghala Municipal Corporation (NWMC).
  14. Pathan, S. K., Jothimani, P., Pendharkar, S. P. and Sampat Kumar, D., (1989) Urban landuse mapping zoning of Bombay Metropolitan Region using Remote Sensing data, *J. Indian Soc. Remote Sensing*, vol.17, No.3, PP.11-22.
  15. Rupesh Gupta, Dr. Anjan sen., (2008) Monitoring physical growth of ranchi city by using geoinformatics techniques, *ITPI Journal* vol.5, No 4, pp. 38 – 48.
  16. Singh, P.K. (2005) Governance Issues in GIS Infrastructure in India. *International Journal of Rural Management*, Vol.1 No.2, PP. 223-244.
  17. Turner BL II (2002). Toward integrated land-change science: Advances in 1.5 decades of sustained international research on land-use and land cover change.: in Steffen W, Jäger J, Carson DJ, Bradhsaw C. *Challenges of a Changing Earth*. Berlin: Springer. pp. 21–26.
  18. Walsham, G and S. Sahay, (1999) GIS for District-level Administration in India: Problems and Opportunities. *MIS Quarterly*, Vol. 23 No.1, pp. 39–66.
  19. Warren, S. (1995) Teaching GIS as a Socially Constructed Technology, *Cartography and Geographic Information Systems*, Vol. 22 No.1, pp. 70-77.

1/9/2013