

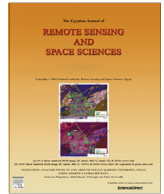
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Research Paper

Identifying peri-urban growth in small and medium towns using GIS and remote sensing technique: A case study of English Bazar Urban Agglomeration, West Bengal, India

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ABSTRACT

Land in the peri-urban interface is of vital importance as there is a lack of clarity in the planning and policies in this region whether they should be governed under the authority of rural administration. In general, these areas are frequently ignored as a specific area in the study of urbanization being neither pure urban nor pure rural. In this regard, an attempt has been taken to detect the spatio-temporal dynamics of sprawl, the nature of land transformation taken place in the identified peripheral settlements with high probability of urban development within the buffer zone of 2.5 km around the boundaries of the two major urban bodies of Malda i.e. English Bazar municipality an Old Malda municipality. The secondary data of Census of India of 2011 and Landsat TM imageries (1987, 2003, 2011 and 2015) have been employed to detect the evolutionary process with the view to capture the urban land-use growth by Land Use–Land Cover classification. The result shows that the built-up area has increased around 30% over the course of 28 years span. Computations of Shannon's Entropy, Urbanisation intensity index, built-up density have helped to explore the degree of transition taking place in each spatial unit under investigation. The spatial metrics with the gradient approach has revealed that beyond the buffer of 7 km from the city centre the increase of residential land uses is maximum which is characterised by a fragmented pattern with nearest entropy value to log N. The suitability analysis in search of most prospective future urban centre suggests the maximum distribution of urban units in the western front of the ULBs.

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1. Introduction

Before 1990s the growth of Indian cities was primarily driven by large scale migration from rural to urban areas and natural growth of population. But the growth of urban population largely confined within the territorial limit of the city resulting in overcrowding of these urban areas and sprung of informal settlements/slums. This pattern of urban growth changes significantly after the economic liberalization, since then outward expansion of the existing cities emerged as the major component of urban growth. As a consequence of the intense outward expansion of the cities rapid changes in land use and occupation have trans-

formed the adjoining rural hinterland into semi urban or peri-urban areas. Contemporary India's urban policies and programmes (such as JNNURM and of more recent one like Smart City Project) have supported metropolitan based 'polarized growth'. Lateral extension of the Indian cities has attracted attention of scholars very recently (Shaw, 2003). The outward expansion of the cities beyond their territorial limits has resulted in mixed land uses which are neither rural nor urban. These transition areas are popularly known as peri-urban. This terminology is derived from the word 'peripheral'. Effectively, these words also convey meanings of being less important, incidental to main activities, outer edge, fringe to the main, spillover or over flown. Conceptually 'Periurban' has come to serve as a term to denote the intermediary zone between the 'rural' and the 'urban', that is, a geographical space where the rural meets the urban (Narain et al., 2013).

Recently, peri-urban areas of Indian metros (i.e. million plus cities) extensively studied in the Indian literature although the peri-urban areas are not exclusive to metros only. The small and

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medium sized towns are also playing a vital role in the process of peri-urbanization in India but are not taken into account in the literature. In some medium and small cities this procedure is rapidly expanding dependent on their location and specific characteristics (Dadras et al., 2015). The Peri urban growth of Indian cities results in sprawl by which the rural land uses are completely or partially transformed into urban uses. The sprawl is occurring at an unprecedented rate but in unregulated and unplanned manner in response to intense peri-urbanization. From this perspective urban sprawl can be visualized as dispersed growth of settlements in the Peri urban areas. This rapid sprawling demanded immediate interventions to mapping and monitoring by employing advanced remote sensing techniques.

This paper brings out the extended pattern of urban sprawl of English Bazar Urban Agglomeration around 2.5 km from its outer limit of official jurisdiction using temporal remote sensing data with zonal gradients and spatial metrics. The study area was divided into eight zones and each zone is further divided into concentric circles of 0.5 km incrementing radii from the city centre extended up to 10.5 km to understand the patterns and extent of urbanization at local level. Its land use analysis has revealed a decline of water bodies from 23.61% (1987) to 6.69% (2015). During 2015 the built up had constituted 32.51%, vegetation comprised of 30.43%, whereas vacant land and agricultural land made up about 19.68% and 10.69% respectively. Increased Shannon's entropy during 2015 highlights the tendency of sprawl that necessitated policy interventions to provide basic amenities. Spatial pattern through metrics indicated a compact and simple structured growth at the centre of the urban body and a distributed complex shape in the buffer region. Further the metrics indicated that the municipalities are on the verge of becoming a single large urban patch that would

affect their ecological integrity. Temporal analysis of spatial pattern of urbanization helps the municipal administration and town planners to visualize and understand the growth of the ULBs so that they can provide better resource planning to create a sustainable urban area (Mosammam et al., 2016).

2. Justification for the selection of the study area

Located between latitudes $24^{\circ}40'20''\text{N}$ and $25^{\circ}32'8''\text{N}$, and longitudes $87^{\circ}45'50''\text{E}$ to $88^{\circ}28'10''\text{E}$ with an area of 3733.66 square kilometres (1441.6 sq mi) see Fig. 1 Malda is a district of West Bengal with low level of urbanization (13.6%) against state's average of 28.03%, which is hardly 2.93% of the entire land of the state whereas only 2.43% of geographical area of Malda is belonged to that of urban areas. Subsequent urban growth in this region had taken place more likely to say along the both sides of Mahananda river as a British commercial centre in the form of two municipalities of the district i.e. English Bazar Municipality (EBM) and Old Malda Municipality (OMM). But the current census data of 2011 has brought a sudden twist in the record where Malda has been captured as the fastest growing town of West Bengal among all remaining districts in terms of growth rate of urban population (124.81%). In this perspective, it is noteworthy to mention that the number of census towns in Malda has grown to 27 according to the last census, in 1991 where there was no census town in Malda.

Different backgrounds play vital roles in this unprecedented growth. English Bazar municipality is the district headquarter of Malda and the only service provider of 3447185 rural population. It has such a significant and strategic position that it has been emerging one of the major urban centre of North Bengal which acts

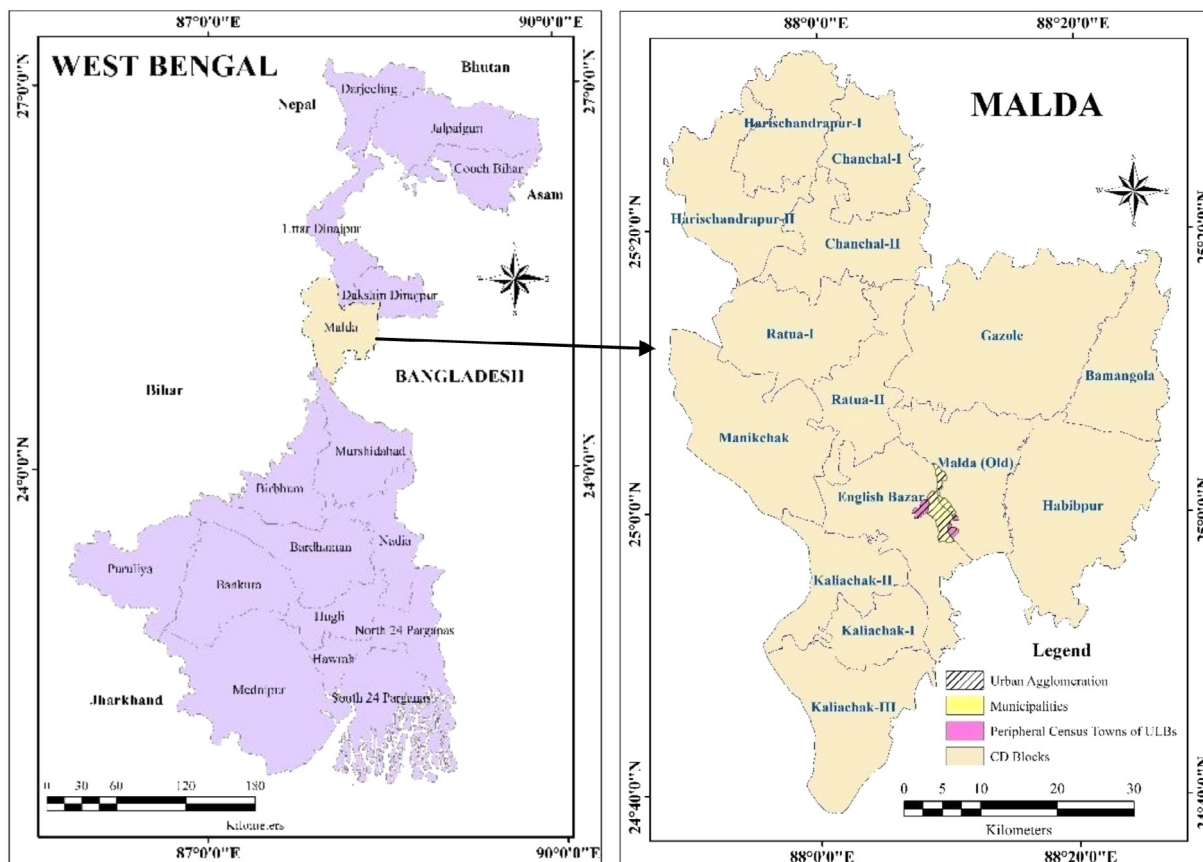


Fig. 1. Study area.

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