

# Criteria Analysis using GIS to Priorities the Slums

K.S.A. Dinesh Kumar, G. Janardhanan, R. Ravichandiran

**Abstract:** Due to rapid urbanization most of the people are migrating towards the urban. Urban regions in the developing country are facing enormous challenges. The well planned and managed urban region will provide better environment with good infrastructure and improved quality of life for their people. One of most important issues of the cities, especially in developing countries is the human settlement. Most of the rapidly growing cities keep on sprawling. Due to new migrants and also increasing poverty forced the urban poor to settle in unauthorized area of cities. This leads towards creation of new slums or expanding the existing slums. To make our cities sustainable and also to provide good environment for the urban poor, the slums need to be revamped. This paper is dealing with the slums which had been identified at zone four of Erode City, Tamil Nadu State, India. Erode city is one of the rapidly growing cities in Tamil Nadu. Totally 28 slums had been identified and mapped using GIS in the fourth zone. The tenability status of each slum and information about the basic facilities like drainage, road, water supply, condition of structures had been collected through the site visit. The collected attribute information had been mapped using GIS. Based on the importance of the criteria the weightages given had been assigned. The weightage criterion analysis provides the Prioritization Index (PI) for each slum. This guideline will be useful for the government to facelift the slums which need urgency.

**Keywords :** Tenable Slum, Prioritization Index, Geographical Information System.

## I. INTRODUCTION

The number of slum dwellers in developing countries increased from 689 million in 1990 to 880 million in 2014 [1]. Slums are generally the only type of settlement affordable and accessible to the poor in cities, where competition for land and profits is intense. The main reason for slum proliferation is rapid and non inclusive patterns of Urbanisation catalyzed by increasing rural migration to urban area [2]. In India, as per census 2011 record, the slum population is 22.4 percent of the total population [3]. The Indian government is taking lot of measures to eradicate slums through various schemes like Jawaharlal Nehru National Urban Renewal Mission (JNNURM), Rajiv Awas Yojana(RAY), Pradhan Mantri Awas Yojana etc.[4]. Even though, the unplanned settlements are taking places as faster as the eradication process in cities.

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The unplanned settlement and growth of sprawl, increasing the stress on the local government. The non-monitored government land or waste land are being occupied by these urban migrants. The increasing slum population threatens the administrators of the cities, because these slums are not safe to live which are highly vulnerable place for the human beings. One of the most important sustainable development goal is providing clean water and sanitation which is huge task in developing countries [5]. The most of the slums are not having these basic amenities like portable water and sanitation, solid waste disposal, road access, street light etc. To attain the sustainable development goal and to improve the present status, the process of upgradation of slums is most important. Due to this kind of upgradation the facilities in slums and livelihood of the slum dwellers will automatically improve in multi fold. In such situation, administrator need to respond quickly to rescue the worst slums.

This study is focusing on developing the prioritization index for each slums based on the important criteria related to the essential facilities like water supply, drainage, road access and building structure. The Geographical Information System is used to generate different thematic map intent to create slum prioritization index. The result of this study will help the administrator to identify the slums which are in contemptible condition. Accordingly, the fund may be diverted and the salvage measures may be extended on priority basis, for the betterment of the living poorer.

## II. METHODOLOGY

### 2.1 Study Area

Erode city is governed by Municipal Corporation which comes under Erode Metropolitan Region. The Erode city is located in Tamil Nadu state of India. The city has four zones for the operational convenience. The forth zone is having public important places like railway junction, bus stand, markets etc. The Erode city is having 89 slums.

Most of the slums are falling in the fourth zone of the city which is taken for the study. The study area is shown in figure 1.

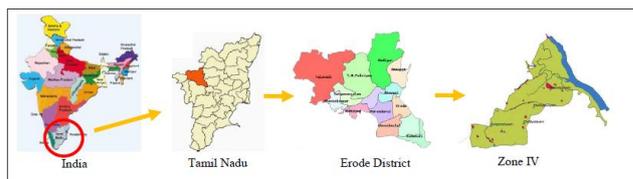


Figure 1. Study Area - Erode corporation Zone IV

India  
Tamil Nadu  
Zone IV  
Erode District



### 2.2 Methodology

In general, slums are having huge demand for basic amenities like sanitation facilities, water supply, waste water disposal system, insufficient road width, electricity supply and street lights. Most of the unauthorized settlement happening on hazardous locations or land which is unsuitable for living conditions. Due to lack of basic facilities, the settlements are facing uncontrolled dumping of wastes, unhygienic disposal of sewage, unplanned development of houses that create unhealthy living condition and polluted environments. These polluted environments are prime cause for origin of different kind of disease. so that appropriate policies can be developed and explored in order to improve the well-being of slum dwellers. This approach requires one to consider slums as multifaceted, with various social and physical constructs at play for each slum. Consequently, slums should be examined using an interdisciplinary approach, ensuring a more holistic and systematic assessment [6]

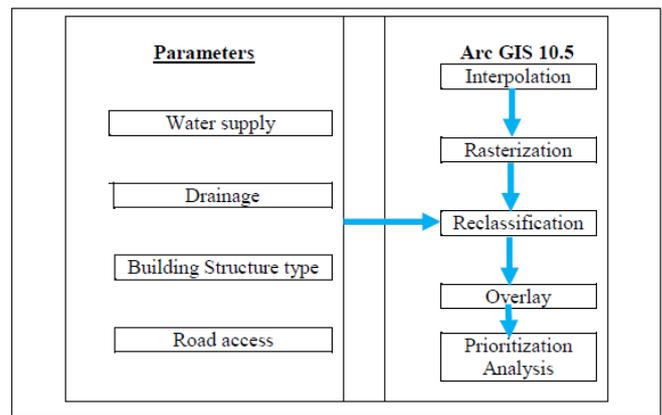
For this study initially the slums had been identified in the field. The location and boundary of the slums had been digitized using the satellite imagery. Then through the questionnaire the field data had been collected to get the information about the facilities available at present condition in all 24 slums of Erode city.

#### 2.2.1 Building structure

Standard housing will provide stable living environment. But the slums are having substandard housing structures which are prone for different types of disaster. Some structures are built with non-permanent materials like mud-and –wattle walls or straw roof or thatched roof. Normally the building structures of the slums are categorized in to pucca, semi-pucca and katcha. The concrete structures are categorized as pucca which is safer to live. The buildings having stabled wall and tiled roofing are called semi-pucca. The building with mud wall or straw roof or with thatched roof are called katchas. The katcha structure is prone to many disasters due to flood, fire, cyclone, earthquake etc. Therefore, the katcha structure is vulnerable for the living condition. In the above situations, the structure of the household is considered as important criteria for the prioritization index.

#### 2.2.2 Water facility

Drinking water is the main source of the human beings. Survival without water will not be feasible. Safe and affordable drinking water is the huge challenge for the slum dwellers. Inadequate water supply facilities and poor sanitary conditions can have a deleterious impact on household outcomes [7]. They have to depend the lorry water or nearby tanks which are not a permanent source. The water should be available when needed within the premises without contamination, which is not at all possible in the unauthorized settlement layout that leads to the issues on health aspects. Due to lack of piped water supply to the slums, the collection of water is an overburden for slum dwellers. The piped water supply to the individual household or to the premises will reduce the burden. So that this criterion has been considered for the preparation of priority index.



**Figure 2. Flow Chart of the Methodology**

#### 2.2.3 Road Accessibility

Due to mushroom growth of unauthorized slum dwells in the location, the pathways are not planned well. Even during the disaster, the rescue team is facing massive problem to rescue the slum dwellers especially during the flood and fire. The existing pathways are very narrow and which is not adequate for the movement of ambulance or fire engines. The cramped houses with lack of accessibility is considered as one of the main aspects for the vulnerability index.

#### 2.2.4 Availability

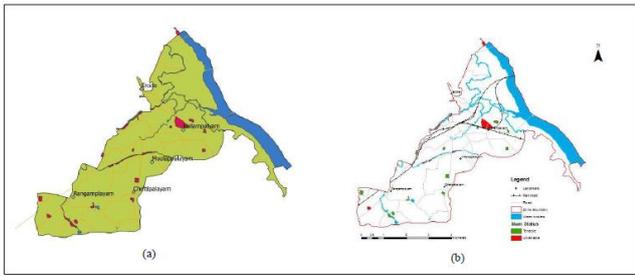
This availability criterion is dealing with the location of the settlement. The most of the settlement happened at location which is not suitable for the settlement, such as industrial zone, bank of river, bank of drains, floodplains, waste disposal sites etc.[8, 9], These locations are highly hazardous zones for any kind of disasters. In view of that this criterion is playing a major role in vulnerability aspects of slums.

#### 2.2.5. Geographical Information System

The geographical information system is a highly powerful tool to make decision when many criteria are handling. It analyzes spatial location and organizes layers of information [10, 11]. This information can be visualized in the form of maps. In addition, the different kind of analysis is possible to make better decision. This GIS is employed for this study for the criterion analysis and to prepare the prioritization index. The flow chart of the methodology is shown in the figure 2.

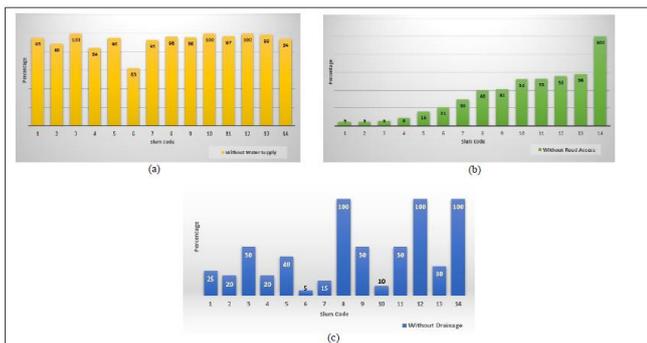
## III. RESULTS AND CONCLUSION

Totally 35 slums have been identified at Zone IV of the Erode City, through the field visit and also the data gathered from the concerned department. Among 35 slums, seven slums have been well equipped by providing basic needs which are not considered for this study. Remaining 28 slums had been taken for the prioritization study. Based on the land use and tenure the 28 slums are categorized as tenable and untenable slums. Figure 3 (a) shows the location of slums in the study area.



**Figure 3. (a) Slum Locations in Zone IV of the Erode City (b) Tenable Status of the Slums**

The slums located in hazardous zones like riverbank, pond sites, bank of canal and on land marked for the public utilities and services such as railway tracks, major road etc. are categorized as untenable slums. The redevelopment of slums is not possible for these untenable slums. These slums need to be relocated from the existing location which is only possible solution for the untenable slums. Hence, the untenable slums are not considered for this prioritization study. Figure 3 (b) shows the tenability status of the slums. Out of 28 slums, 14 slums are falling in untenable locations. The remaining 14 slums had been taken for the study. The redevelopment of slum is enhancing or adding essential services like road, drainage, street light, water supply, sanitation etc for the existing slums.



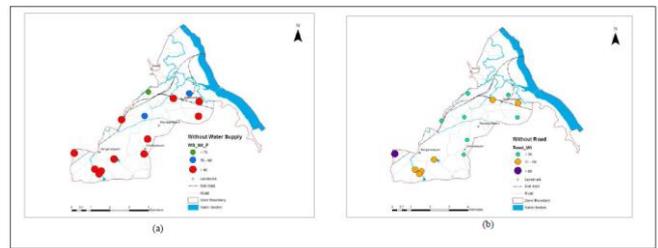
**Figure 4. (a) Percentage of Slum households Without Water Supply (b) Percentage of Slum households Without Road (c) Percentage of Slum households Without Drainage facility**

It has been revealed from the study that most of the slums are not having water supply facility. The 63% of house hold in Eshwaran veethi slum is not having the water supply facility. More than 84% of households are not having the water supply connection. Three slums are not having water supply facility even in single household. Figure 4(a) is showing the percentage of households not having the water supply connection.

Road access is very much important, especially during the disaster or any emergency period to rescue the dwellers. But, the study exposed that out of 14 slums, five tenable slums are not having well-built road access. Figure 4 (b) shows the percentage of households not having the road access slum wise.

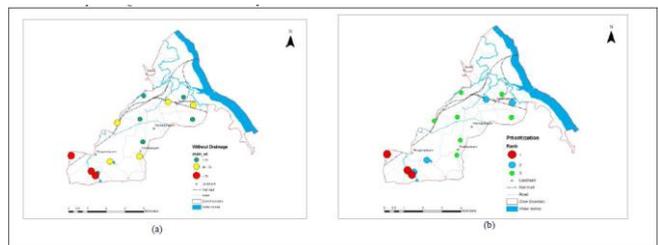
Drainage is one of the criteria to assess the present condition of the slum. As per the data collected, most of the households are having drainage facility. However, three slums are not at all having drainage facility, which may provide unhealthy living environment for the slum dwellers. This may become

sources for spreading the disease. Figure 4 (c) shows the percentage of households not having the drainage facility slum wise.



**Figure 5. (a) Percentage variation of Slum households Without Water Supply (b) Percentage variation of Slum households Without Road facility**

Figure 5 (a) shows the percentage variation of non-availability of water supply facility at slums. It has been observed that in 11 slums out of 14, more than 90% of households are not having water supply facility. Similarly figure 5 (b) shows the percentage variation of road facility in the slums.



**Figure 6. (a) Percentage variation of Slum households Without Drainage facility (b) Prioritization of Slums**

It has been identified that the road facility is very poor in only one slum in which 20% of households are having road facility. Even though other slums are not having road facility for all the households. Figure 6 (a) shows the percentage variation of non-availability of drainage facility. Three slums are not at all having the drainage facility. Some of the slums are having partially. Based on the importance of the criteria the weightage had been given. Using the ArcGIS the weightage analysis had been carried out. The different criterion layers were reclassified based on the weightage and finally the prioritization index had been arrived. This criterion weightage analysis filtered and exposed the slums which needed more attention. Based on the prioritization index, the 14 slums are graded as slums with worst facilities, very poor facilities and poor facilities. Out of 14 slums, three slums had been categorized as worst facilities. Remaining four and seven are categorized as slums with very poor facilities and poor facilities respectively. The figure 6 (b) shows prioritization of slums. This result is very much appreciated by the decision makers, bureaucrats, and administrators to provide attention towards the worst slums to improve the living standard of the slum dwellers by providing needful facility.

### ACKNOWLEDGMENT

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