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Development of Slum Information System for Planning and Governance of Urban Areas Using Geomatics

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Abstract

Established fact is that no urban area exists with the composition of slum dwellers and squatter settlements. As per the UN Habitat, Slum areas are defined as group of individuals living under same roof lacking basic facilities such as drinking water sources, sanitation facilities, durability of housing, security of tenure. In the recent years, Geomatics (RS, GIS, and GPS) has become an indispensible tool for planning and governance of urban areas. It can be applied as decision support system for proper planning and governance of urban areas with respect to resource allocation and generation, social environmental & infrastructural facilities. The present paper makes an attempt to study road network, drainage facilities, electrical network and generation of slum boundaries using GPS by field survey for Addagutta area in Hyderabad, India. Addagutta is one of the Asia's biggest slum area spread over approximately 100 acres, 5000 slum dwellers and population of more than 80,000. With GPS, slum boundary has been generated and laid over Google imagery.Field surveys have been done for socio-economic data, road network, electrical network and drainage. With the help of digital information all the required data are integrated in GIS for urban management which assists the urban local bodies. Keeping in view of the Government of India's prestigious project "Rajiv Awas Yojana", aimed at creating a 'Slum Free India' by giving support to those states who are willing to assign property rights to slum dwellers. Present work enables the planners, administrators, in execution of these kinds of Urban developmental projects.

Key words: RS: Remote Sensing, GIS: Geographical Information System, GPS: Global Positioning System, RAY: Rajiv Awas Yojana.

1. Introduction

Slums may be defined as the group of un-habitat individuals living under same roof lacking basic facilities such as drinking water sources, sanitation facilities, sufficient living area, durability of

housing, security of tenure. A slum being referred to as housing areas that were once excessive but which lowered as the originals moved on to better parts of the city, but has come to include the vast informal settlements found in cities in the developing world. Slum a run-down area of a city characterized by substandard housing and squalor and lacking in tenure security. More than one-third of Hyderabad's populations reside in slums, squatters and other poor settlements. Their contribution to city's economy has been also been growing over the period. In the absence of developed land and clear policy to address their problems, the poor suffer from many inadequacies in terms of access to basic services, socio- economic needs. It is necessary, therefore, to articulate policies and programme to mainstream the slum communities with the city, both in terms of infrastructure provision and socio - economic development. According to the present study the following steps need to be taken for development of slum system:

1. To generate the environmental information system of the study area, to assess the impact of urban population that led to the raise of slums respect to physical parameters, and socio-economic parameters.
2. To generate spatial digital database consisting of road network layer, drainage data electrical network data using remote sensing data, field analysis and collateral data.
3. To generate attribute digital database of selected parameters derived from the analysis of drainage network and road network from pre-determined locations in the study area and computation of area indices for examining the environmental status of the study area.
4. To generate socio-economic database of the study area.
5. Generation of spatial distribution layers of slum area and
6. Analysis of the growth of urbanization raising the slum.

Addagutta the local basthi formed in the year 1979, with area coverage of approximately 100 acres, with more than 5000 slum dwellers and a population of more than 80,000. It is known to be among Asia's biggest slums (GHMC). The Addagutta Founders & Development Committee were formed in 2006. The panel is taking up all developments works and issues concerning the slum dwellers. The entire area is surrounded by well developed colonies viz East Maredpally, TukaramGate, and South Central Railways Railway Recreation Grounds, etc.

The Addagutta basthi was divided into A, B, C, & D blocks, plus, Lohia Nagar, Sasthri Nagar, Azaad Chandrashekar Nagar,Venkat Nagar, waddera basthi etc. All the dwellings were allotted municipal numbers, provided with Manjeera water facility for each house, internal lanes and by lanes and street lighting. There are more than 500 self-help women's groups, each consisting of 15 members, availing of loans at liberalised rates of interest from banks in the vicinity.

As Addagutta is divided into different areas the present area of study has been dealt with Venkat nagar, Waddera basthi and Addagutta area itself. The socio economic, road network, electrical network, and drainage facility details have been collected by field survey. This field survey data has been compared with the 2006 year GHMC data as a reference.

The present objectives of the paper is to enlighten the slum road network coverage, socio economic conditions of the area, drainage patterns and generation of slum boundary using GPS for the Addagutta area. NAV2400-HS is a 12-channel Global Positioning System Receiver (GPSR) chipset solution based on Analog Devices RF front end, ADSST-GPSRF and Analog devices base band processor ADSST-NAVDSP and ADSST-200X Accelerator ASIC. The GPS unit used has some salient

features which include quick cold start, warm start and hot start using efficient algorithms. It has a very fast reacquisition with a blockage of five minutes time. The position solution involves 2D/3D position, with fast velocity and accurate time. The horizontal accuracy is generally 10 m with a velocity of 0.1 m/s. The following is the boundary image of the Addagutta area using the GPS unit.

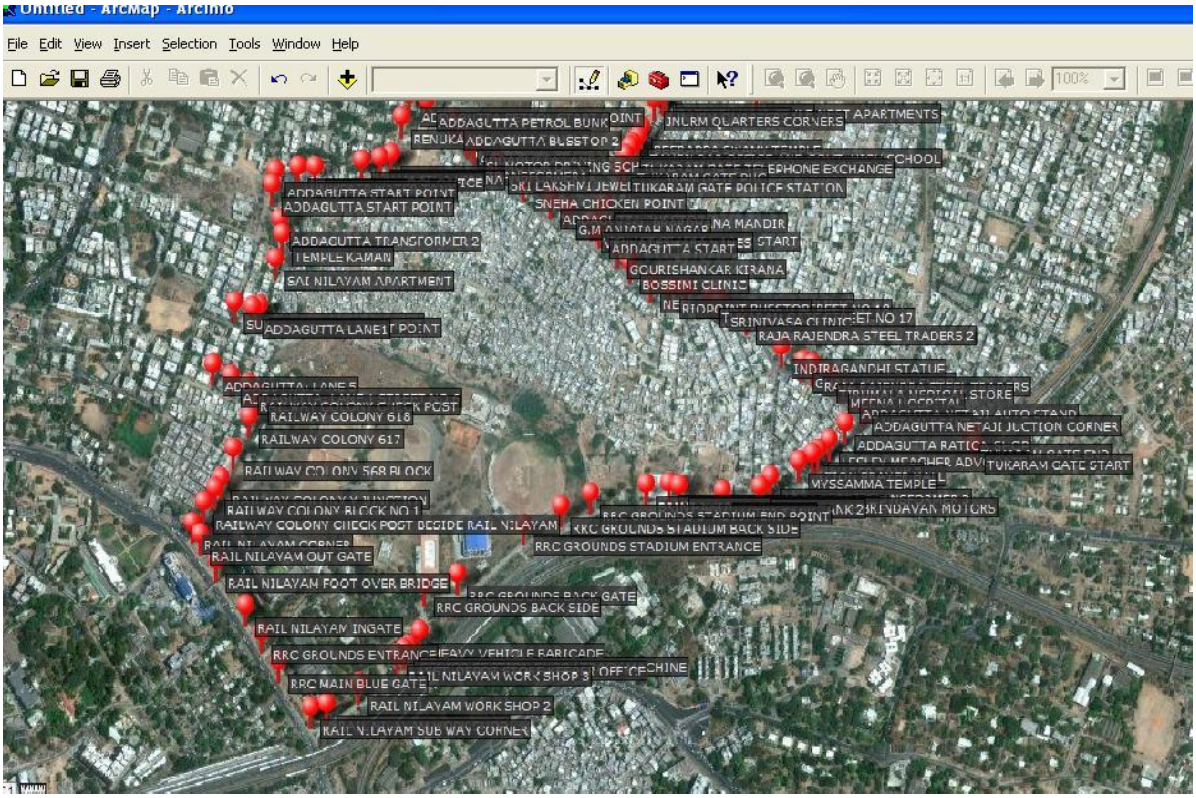


Fig: 1 Addagutta area with GPS boundary points

2. Data and Material

The data used for slum development system was basically collected from a detailed field survey using GPS unit, 2006 GHMC data for reference purpose. The software packages used are ERDAS [9.3 version], ARCGIS [9.3.1version], Microsoft Word and Microsoft Excel.

3. Research Methodology

The research methodology has undergone three phases which includes

Phase 1:

- Includes base map preparation using satellite image (Google) with a Scale 1: 50, 000
- Identifies slum and squatter settlements
- Satellite images will be generally geo-reference and updating of baselines from that of the original SOI images which are inaccurate by not capturing the recent development.
- Final base map contains roadways, boundaries, slum settlements, reference of local land marks and other reference information.

Phase 2:

- Includes *a)* Ground Truthing and *b)* Check list

GROUND TRUTHING

- Field work using GPS for collection of drainage facility details and electric network.

CHECK LIST

- Poor housing conditions
- High population density.

Check list normally includes status of socio-economic conditions, electric facility details and drainage facility.

Phase 3:

- Includes data processing and spatial distribution maps of slums
- Spatial data base creation mainly involves
  - Preliminary identification of slums
  - Generation of base maps using satellite images
  - Survey of slum clusters
  - Final report preparation of maps and data processing

4. Results and Analysis

The following (table 1&2, figure2,3) and their graphical representation is of 2006 GHMC data for drainage and sewage facility. The study says that for the three areas, connectivity to city wide water supply system was not available but by the year 2011 it was available as gone through the field study. In the later part the connectivity to city wide sewage system is available for all the three corresponding areas during both 2006 (GHMC data) and 2011 (field survey).

The following survey data is from a part of Addagutta: 2006 GHMC for drainage and sewage facility:

Drainage & sewage Facility	Addagutta	Venkat nagar	Waddera basthi
Connectivity to City water supply	0	0	0
Strom after Drainage	2579	81	249
Sewer lines	0	0	0
Digester	0	0	0
Not connected to Sewer or Digester	0	0	0
Connectivity to City-wide Water Supply System	0	0	0
Connectivity to Cite-wide Sewage System	1	1	1
Slum is prone to flooding due to rains	1	1	1

Table 1

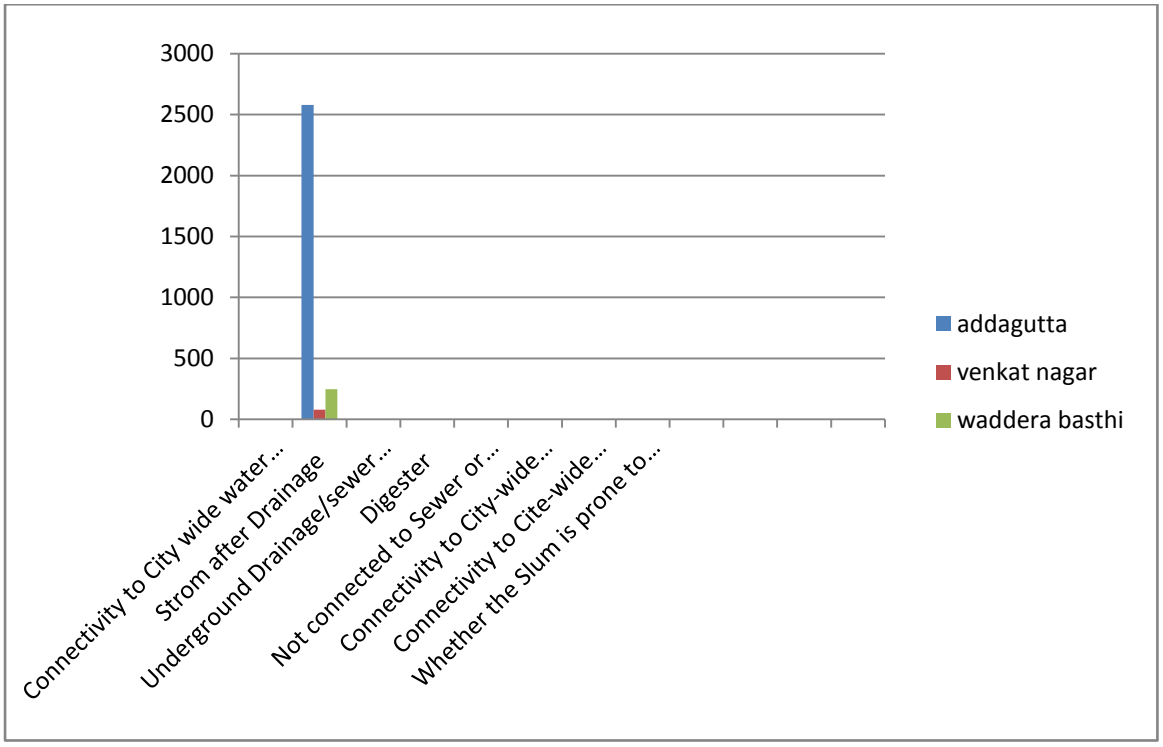


Fig: 2 note: 0=no and 1= yes

The following survey data is from a part of Addagutta: 2011 GHMC for Drainage and sewage facility:

Drainage and sewage facility	Addagutta	Venkat nagar	Waddera basthi
Connectivity to City wide water supply system	1	1	1
Strom after Drainage	2971	81	272
Sewer lines	1	1	1
Digester	0	0	0
Not connected to Sewer or Digester	0	0	0
Connectivity to City-wide Water Supply System	1	1	1
Connectivity to City Sewage System	1	1	1

Whether the Slum is prone to flooding due to rains	1	1	1

Table: 2

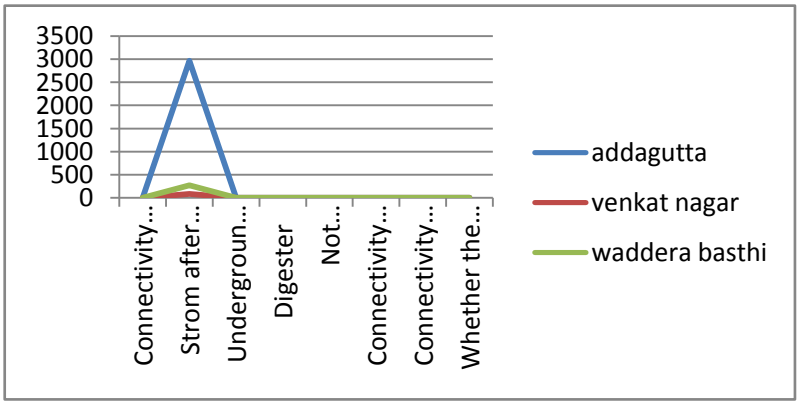


Fig: 3 note: 0=no and 1= yes

The following survey data is from a part of Addagutta: 2006 GHMC for electricity

With electricity	Addagutta	Venkat nagar	Waddera basthi
Pucca	690	48	80
Semi Pucca	0	0	0
Katcha	1889	33	0
Total	2579	81	80

Table: 2

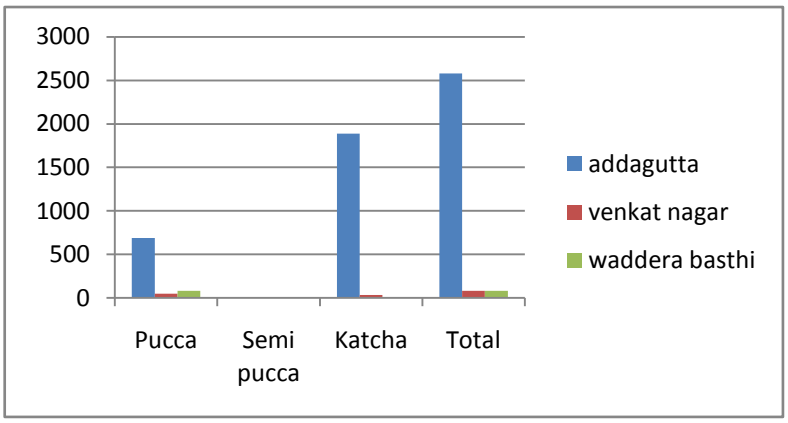


Fig: 4

The following survey data is from a part of Addagutta: 2011 GHMC for electricity

With electricity	Addagutta	Venkat nagar	Waddera basthi
Pucca	720	61	91
Semi Pucca	33	13	186
Katcha	1350	12	49
Total	2403	86	326

Table 3

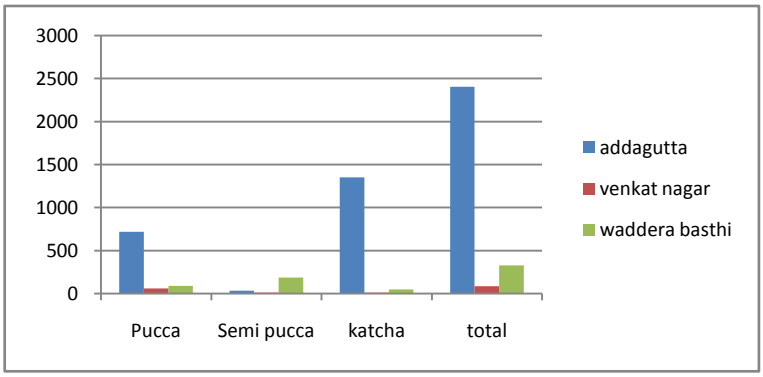
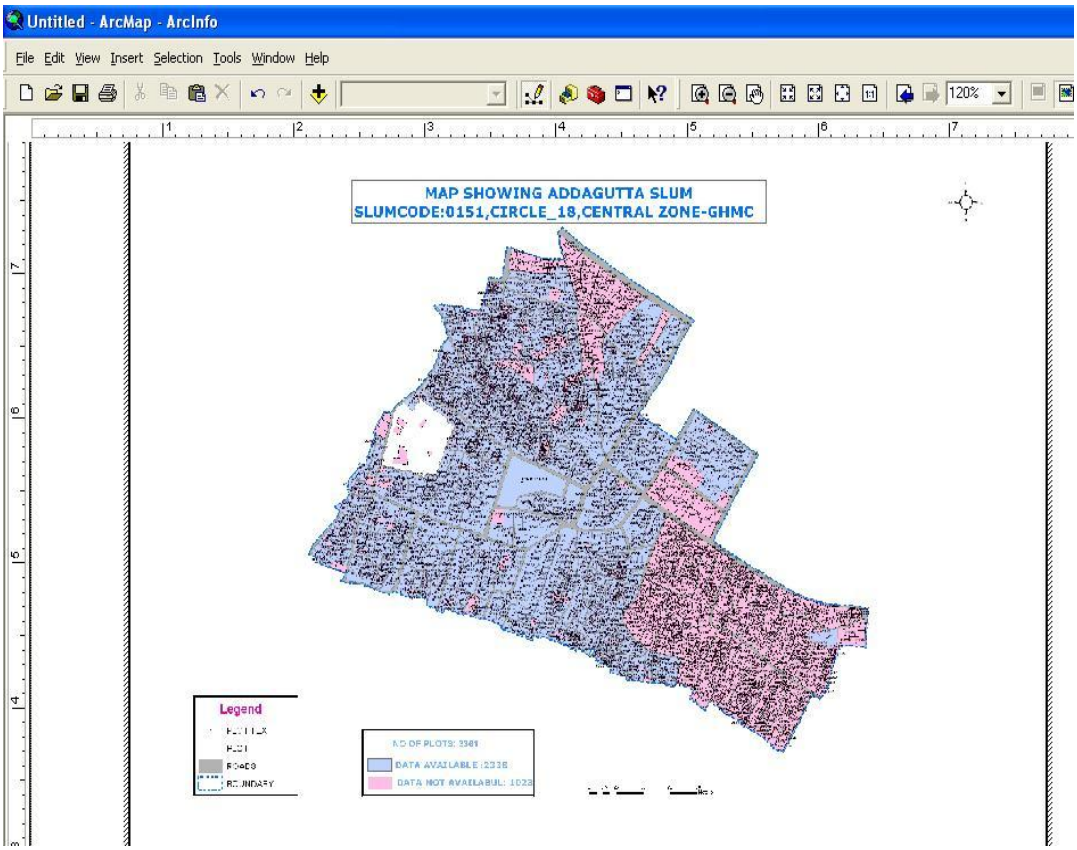


Fig: 5



The above tables (table 3&4 and figure 4&5) and their graphical representation is for the field survey data for electricity facility available for the slums. As observed there has been a drastic change in the three areas. Pertaining to the Addagutta area there has a small decrease in the household conditions wherein for the Waddera basthi area there is a huge rise in the ratio. The following is the map showing Addagutta slum area with its representations as data available and unavailable.

Fig: 6

The below image gives us the clear picture of the road network for the Addagutta area. As we can see the road network is not much developed. The thicker lines in the images are the main road network and the thinner being the streets.

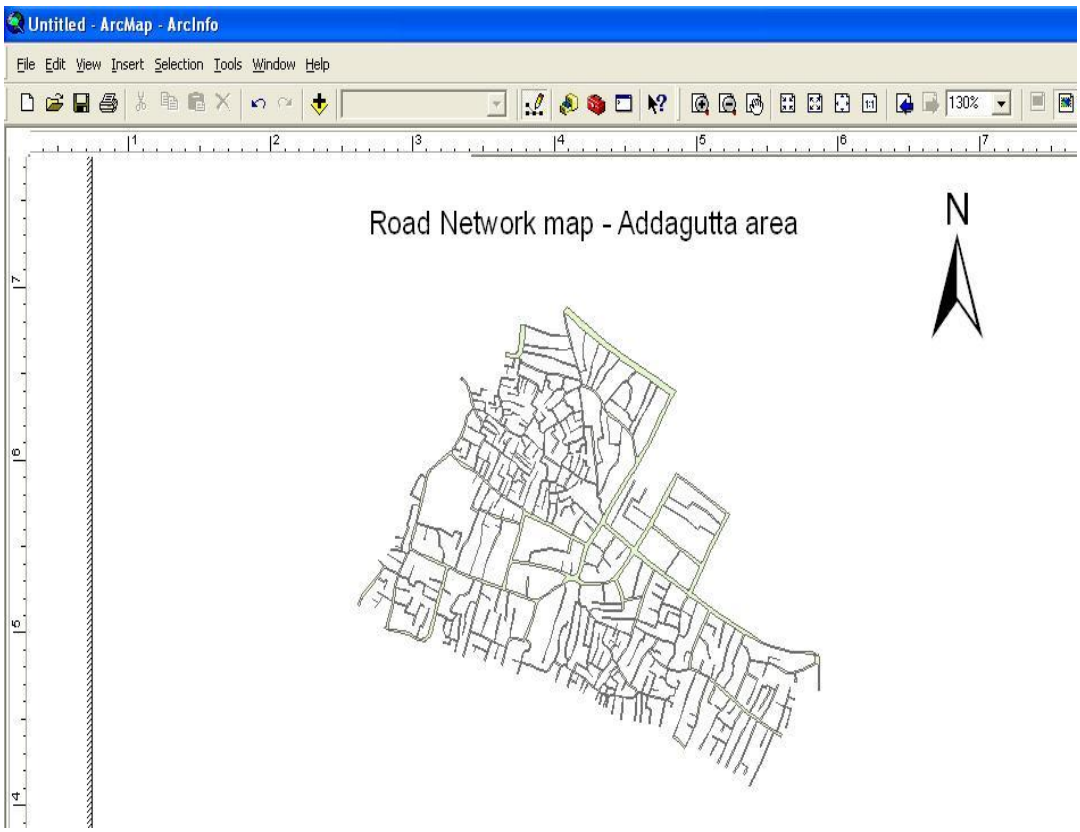


Fig: 7

5. Conclusions

The formation of slums need not be inevitable with rapid urbanization. Such an argument appears to be opposed by evidence of large slum populations in a large number of developing countries and particularly in rapidly urbanizing regions like Asia. The evidence discussed suggests that city authorities faced with rapid urban development lack the capacity to cope with the basic amenities to meet economic and social needs. Not only are strategic planning and intervention major issues in agenda to manage rapid urbanization, but city governments are effectively linking the economic development trajectory to implications for urban growth and hence housing needs. In the above discussion, a case study is presented in support of the argument that city governments have to first recognize and then act to establish the link that is crucial between economic development, urban growth, and housing. Keeping in view of the Government of India's prestigious project "Rajiv Awas Yojana", aimed at creating a 'Slum Free India' by giving support to those states who are willing to assign property rights to slum dwellers.

Acknowledgements

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