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Solid Waste Disposal – Problems and Solution Recommendations for Diphu Municipal Area using GIS Technology

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ABSTRACT: Solid Wastes are all the wastes arising from human and animal activities that are normally solid and that are discarded as useless or unwanted. Solid wastes encompass the heterogeneous mass of throwaways from residence and commercial activities as well as the more homogeneous accumulation of a single industrial activity. In this study Diphu, the headquarter of Karbi Anglong district, in the state of Assam in India has been taken as the site of study. Geoinformatics data has been collected by surveying the entire area and maps are prepared using GIS software. Unplanned disposal of food wastes, rubbish, ashes and residues etc. are causing a huge problem in Diphu Municipality Area, Assam, India. This study is an attempt to identify the sources of these problems, highlight its affects and recommend certain viable solutions for the aforementioned problems.

KEYWORDS: GIS, Solid Waste, QGIS, Diphu, Assam.

I. INTRODUCTION

Solid Wastes are all the wastes arising from human and animal activities that are normally solid and that are discarded as useless or unwanted. Solid waste encompasses the heterogeneous mass of throwaways from residence and commercial activities as well as the more homogeneous accumulation of a single industrial activity [2]. The safe disposal of solid wastes of a society is a serious problem in India. Open dumping and dumping in streams, drains and rivers clog the channels and cause flood in the area which is one of the most prominent problems in Diphu. Unhygienic environment due to uncontrolled open dumping has also aggravated the problems of Diphu locals. This study is an attempt to assess the current situation of waste disposal of Diphu, Assam and suggest certain guidelines and recommendations through studying the geospatial data using GIS technology.

For the study Diphu Municipality area has been selected which is the Headquarter of Karbi Anglong District in the state of Assam, India. Diphu is surrounded by Jhum controlled forest, reserved forest and settlements. Three major rivers, namely, Baghmara river, Sorsori River, Diphu River and Lorulangso stream passes through Diphu.

GIS based software, QGIS which is a free and open-source cross-platform desktop geographic information system application that supports viewing, editing, and analysis of geospatial data has been used for analysis of data collected by field survey and recommendations are made based on analysis.

II. THE STUDY AREA

Assam lies in the north-eastern region (NER) of India, covering an area of approximately 78,438 km², extending from 24° 8' N to 28° 2' N latitude and 89° 42' E to 96° E longitude. The elevation of the Assam region ranges from 5-1964 m. The neighbouring states of Assam are West Bengal, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, and Meghalaya. Assam shares its boundary with neighbouring countries, Bhutan in the north and Bangladesh in the south. For the study Diphu Municipality area has been selected which is the Headquarter of Karbi Anglong District in the state of Assam, India. The Diphu city is divided into 10 wards for which elections are held every 5 years. The Diphu Town Committee has population of 61,797 of which 31,898 are males while 29,899 are females as per report released by Census India 2011. Population of Children with age of 0-6 is 6796 which is 11.00 % of total population of Diphu (TC). In Diphu Town Committee, Female Sex Ratio is of 937 against state average of 958. Moreover, Child Sex Ratio in Diphu is around 925 compared to Assam state average of 962. Literacy rate of Diphu city is 89.12 % higher than state average of 72.19 %. In Diphu, Male literacy is around 92.78 % while female literacy rate is 85.23 %. Diphu Town Committee has total administration over 13,388 houses to which it supplies basic amenities like water and sewerage. It is also authorized to build roads within Town

Committee limits and impose taxes on properties coming under its jurisdiction [1]. Diphu is surrounded by Jhum controlled forest, reserved forest and settlements. Three major rivers, namely, Baghmara river, Sorsori River and Diphu River passes through Diphu.

Due to a large population in Diphu, the Solid Waste generated by the community is also large. In addition to that, uncontrolled settlements have also accelerated solid waste generation and unsafe disposal of solid waste in the area. Due to this, problems of flooding due to clogged channels, mosquitoes and rodent breeding, air pollution and land pollution has become a common nuisance in the area. Mapping is thereby essential for Diphu to facilitate effective Solid Waste Management practice and planning.

III. METHODOLOGY

Geo Spatial data and field data has been collected by field survey. Ward wise distribution of Solid Waste Disposal facilities and Infrastructure data are collected from field survey and local authorities respectively. Ward wise population data are collected and maps are prepared for the entire Diphu municipality area. Data are then combined in QGIS and assessments are made on the problem of Solid Waste Disposal.

IV. EXPERIMENTAL RESULTS

Figures shows the results of GIS based analysis. Figs. 1 (a) shows the Ward Map of Diphu Municipal Town. (b) shows the present scenario of Solid Waste Disposal of Diphu Municipal Town. There is a cluster of informal dumping sites as shown Fig. 1(b) highlighted in five prominent areas, highlighted as 2, 3, 4, 5 and 6. Most of these areas falls in highly populated and frequently inundated zones.

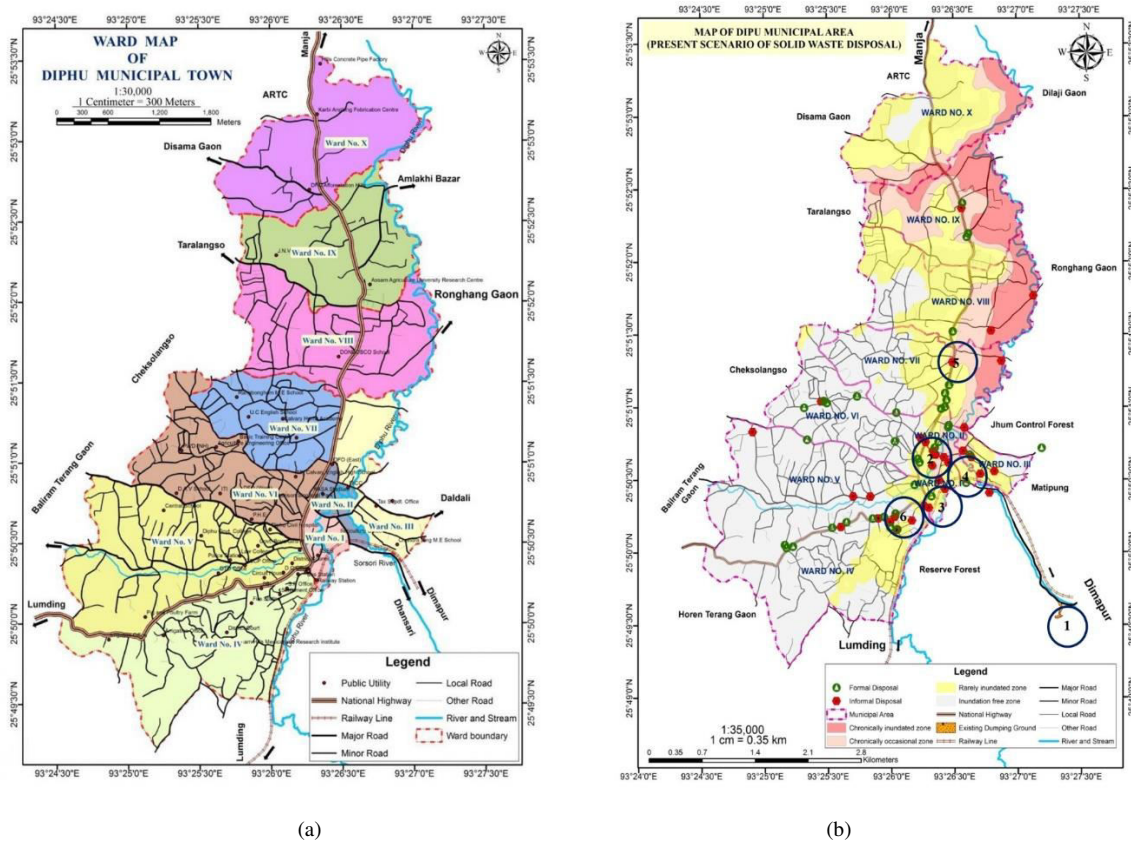
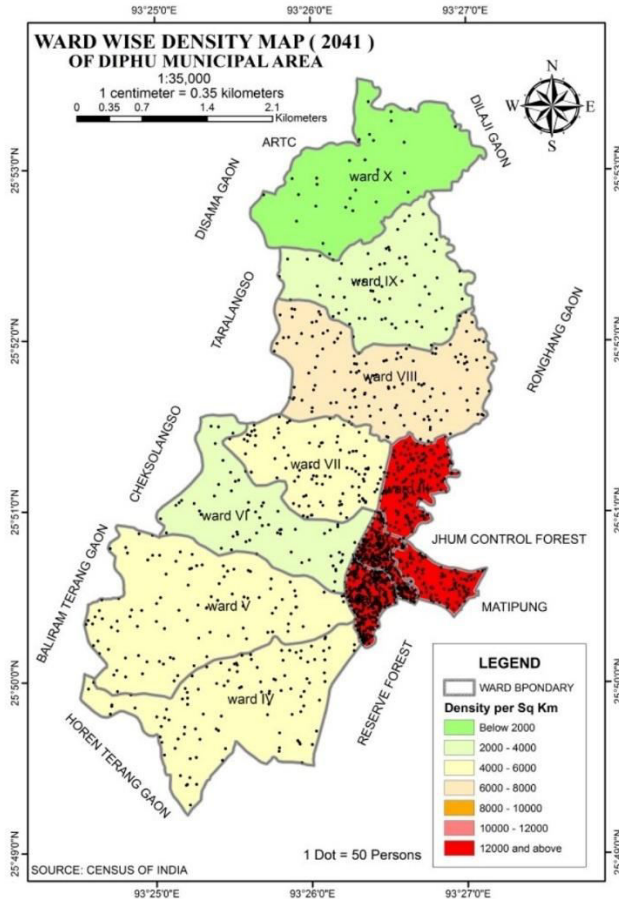


Fig. 1.(a) Ward Map of Diphu Municipal Town (b)Present scenario of Solid Waste Disposal of Diphu Municipal Town



(c)

Fig. 2 (a) Ward Wise Density Map (2041) of Diphu Municipal Area

A Ward Wise Density Map is prepared using GIS. Fig. 2 (a) shows the Ward Wise Population Density Map of Diphu Municipal Town. It can be seen that encroached slum area shown in Fig. 2 (a) has the maximum informal solid waste disposal units with an uncontrollably high population density. It is seen that such area is in frequently inundated zones, Fig. 1(b). Besides in field survey it is seen that solid wastes are being dumped in the rivers, namely, Baghmara river, Sorsori River and Diphu River andstream, namely, Lorulangso stream. This causes clogging of channel which leads to inundation of banks in addition to water and land pollution.

Based on the analysis results a few viable steps are suggested to mitigate the disaster of unsafe solid waste disposal phase wise in the Diphu Municipal Area.

1. Solid Waste dumped in the rivers and streams should be removed safely.
2. Slum Pockets along the river banks should be relocated and a buffer zone of atleast 200m should be allotted where no development activities are allowed, Fig. 3(a).
3. Informal dumping and dumping in open grounds should be banned by authorities.
4. Awareness campaigns regarding health hazards due to unsafe and uncontrolled solid waste disposal should be carried out.
5. Periodic cleaning of formal solid waste disposal zones should be carried out.

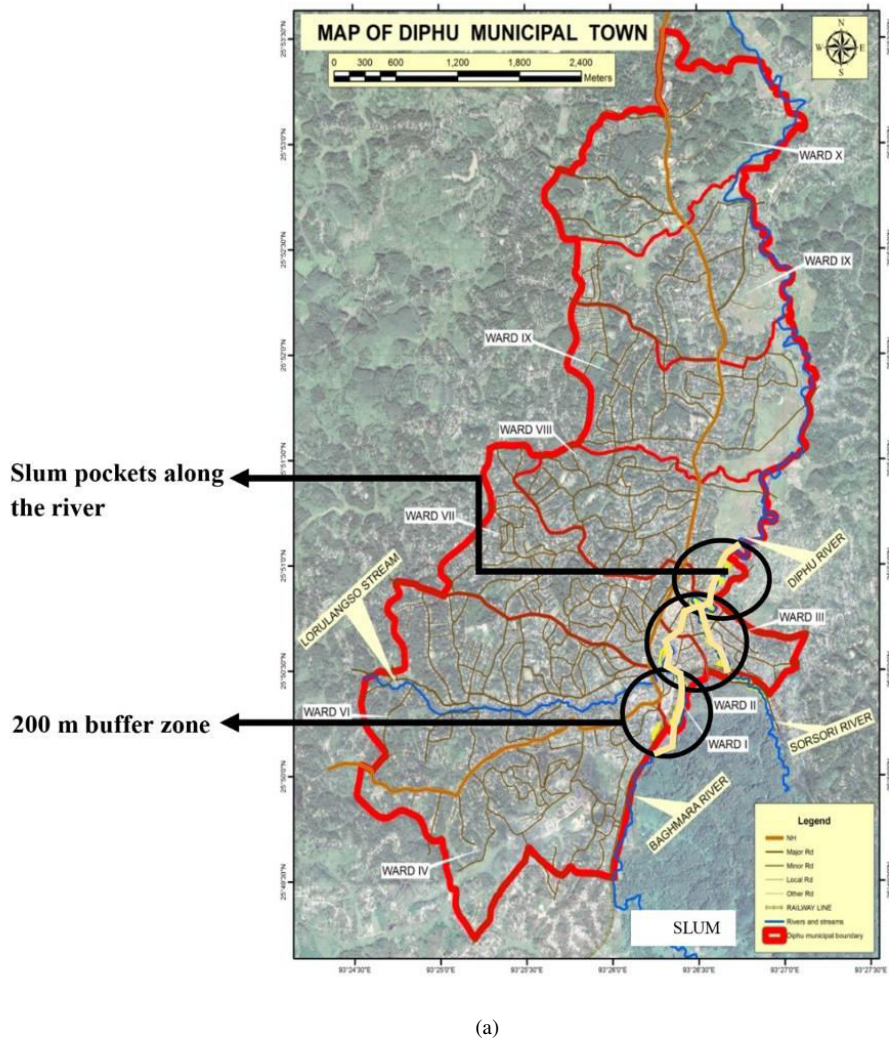


Fig.3 (a) Buffer zone along river banks

VI. CONCLUSION

Solid Waste Disposal is a growing problem for North East India for a long time causing harm to life, livelihood and ecosystem. Earlier, Planning and execution was difficult due to clustered data and lack of reach. But today with the help of GIS technology assessment and planning has become fruitful and effective. This study has been an effort to map and assess the problems of solid waste disposal of Diphu Municipal Area and recommend certain viable solutions for mitigating the disaster caused due to unsafe disposal of solid waste.

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