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Urbanization Potentiality Based Ring Prioritization of Kondotty Municipality, Malappuram District, Kerala State In India: Using Geospatial Technology

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ABSTRACT

Kondotty town is a developing town with a well connected road transportation network. Since a long time the urbanization is a continuing process in Kondotty municipality area and in a linear pattern it is spreading from the main town to outer area along these well connected road network. At the same time in a span of ten years Kondotty has developed as an urbanized commercial hub with administrative, transportation, education, institutional and tourist potentiality and hence declared as Kondotty municipality in the year 2013.At present there are 40 wards within Kondotty municipality with Kondotty town at the centre.But due to the small size of road, lack of parking area, lack of pedestrian footpath, lack of proper traffic management system, dumping of solid waste along the road etc, the traffic block is a usual scenario in the Kondotty town. There may be several administrative, political, demographic and economic changes that take place in the study are in future, but if there is no proper planning and regulation for development is adopted at this initial stage, it will definitely result in several urban issues as seen in most of the urban areas in Kerala.In the present research work an attempt has been made to use geospatially technology for tracing the level of demographic and landuse stress in Kondotty municipality, Malappuram district, Kerala state in India.

KEYWORDS: Urbanization, Urban planning, Kondotty municipality, Geospatial Technology

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1. INTRODUCTION

The physiographic and demographic study of Kondotty municipality reveals the fact that the geographical location of Kondotty town is an ideal location for development of a commercial hub, educational, transformational, industrial and residential centre as this town is well connected with road network and have airway and railway connectivity within a limit of 16 km proximity. In concern with its physiographic characteristics, Kondotty municipality have undulated topography in the outer edges with steep slopes, there are small hills in the interior part and small elongated stretch of plain area along the banks of the streams. Hence the spread of urbanization is limited to certain areas and is found in linear pattern along the roads. Demographically Kondotty municipality when compared to other municipalities in Malappuram district is less populated and the population distribution is not uniform throughout the study area. The population concentration in very high in the northwestern and central part when compared to the other parts of Kondotty municipality. In case of occupational structure, there are more non workers than the total workers in the study area. Among the total workers, most of them are other workers, followed by agricultural labours, cultivators and household workers. Considering the sex ratio most of the wards have high sex ratio than the average sex ratio of Kondotty municipality. The literacy rate on an average is 82 % throughout the study area. In case of schedule caste and schedule tribe population concentration it shares very less in the total population in Kondottymunicipality. The land use pattern in the Kondotty municipality is mainly dominanted by built up areas with mixed trees, followed by plantation land, crop land, barren land and commercial area. There is an increase in build up area, commercial area and barren land whereas there was decrease in plantation land and crop land within span of 10 years. This change indicates positive sign of urbanization in Kondotty municipality.

2. SIGNIFICANCE OF KONDOTTY TOWN AS A SATELLITE TOWN IN FUTURE

It is a known fact that the road networks have a direct relationship with the accessibility of places. A well developed road network provides easy accessibility to an area and this indirectly increases its land value and brings various provision of development in future. Fig.1 represents the buffer analysis of Kondotty town and Table 1 illustrates the list of infrastructural and mode of accessibility in and around Kondotty town. The buffer analysis was done using Google Earth map and the layers were latter exported from KML file to shapefile and mapped using ArcGIS 10.1 software.
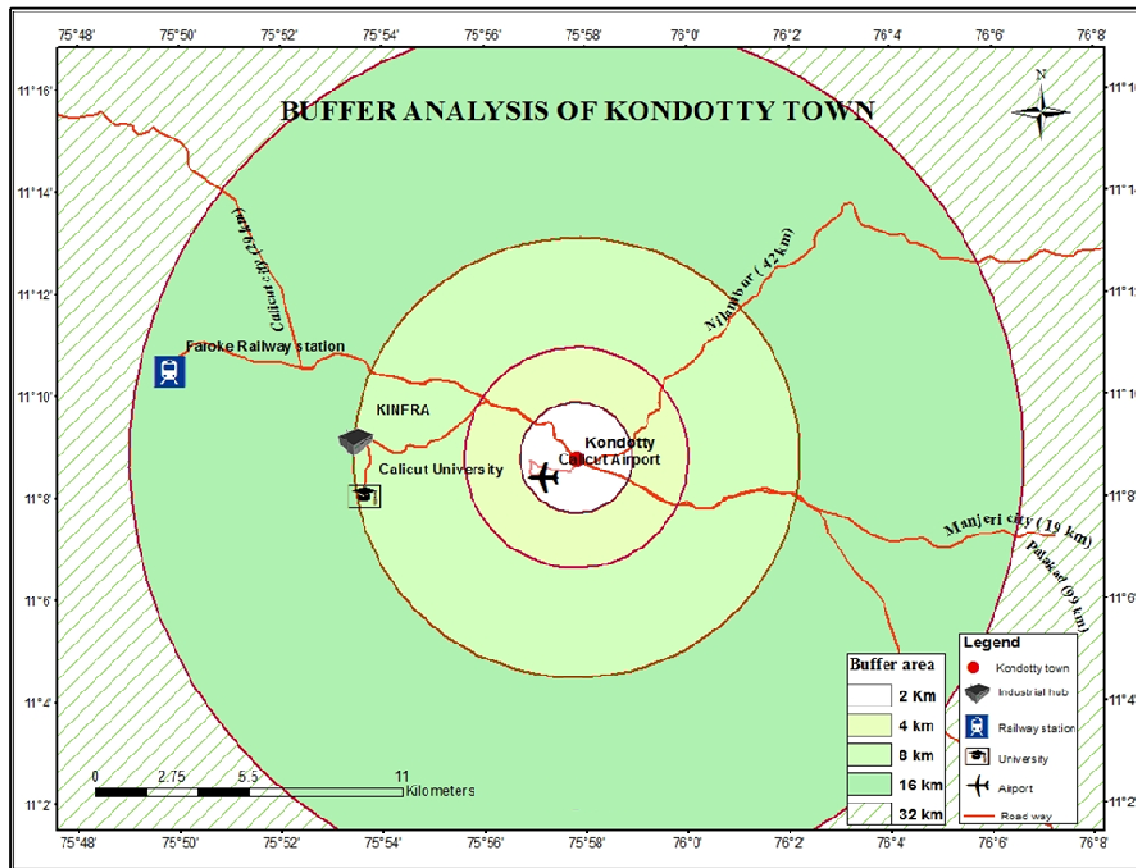
Fig.1 : Buffer analysis of Kondotty Town

Table 1 List of infrastructural facilities and mode of accessibility

Buffer (radius)	Accessibility			Infrastructure											Important places
	Road	Airway	Railway	Bus stop	Airport	Railway station	Hospital	Colleges/ University	Banks	Schools	Religious centres	Police station	Stadium	Market	
2 km	√	√	0	11	1	0	6	12	9	4	17	1	1	6	• Calicut Airport • Kondotty town • Kondotty bus terminal • Tourist spots
4 km	√	0	0	17	0	0	0	1	2	1	6	0	0	3	
8 km	√	0	0	4	0	0	0	3	2	2	8	1	1	4	• Calicut University • KINFRA • Tourist spots
16 km	√	0	√	15	0	1	3	4	6	4	6	2	1	5	• Faroke railway station • Manjeri town • IOC Gas filling station • Tourist spot
32 km	√	0	√	18	0	4	12	4	13	8	12	4	2	7	• Calicut city • Perinthalmanna city • Areekode town • Valanchery town

The buffer analysis illustrate that Kondotty town is located in a nodal point which is easily accessible from all direction. Considering the amenities and infrastructural facilities, Kondotty town have most of the facilities within the buffer zone of 2 km. These are the factors which bring out the

significance of Kondotty municipality. Hence considering the above inferences, the development of Kondotty town in future is a matter of great concern not only for politicians, administrators but also for local people. After being declared as a municipality much consideration is to be given towards the urban development in and around Kondotty town so as to avoid urban problems in future and to develop a well plannedKondotty municipality in future. The Fig 2 shows the spatial and temporal expansion of built up areas in Kondotty town during the period from 2007 to 2017. For this study the Google Earth images of 2007 and 2017 were utilized to demarcate the built up area during 2007 and 2017. The built up areas includes commercial area, residential areas, residential area with mixed trees etc. As Good Earth images does not give an accurate idea about the demarcation of classified build up areas, the approximate demarcation based on the visual interpretation is done which was later on verified based on the ground truth verification.In 2007 the spatial extension of built up area as shown in Fig 2 was of linear pattern along the Calicut Manjeri Road. In Kondotty town there were 2 main bus stands namely Kondotty bus terminal and airport road junction. Many old commercial shops especially textiles, jwellery shops, hotels, banks etc which still exists were found in this area. The built up areas were less densily located with more space in between buildings and there were more concentration of mixed trees in built up areas. In 2017 the expansion of built up areas is slightly extended towards outer area which was demarcated based on the visual interpretation of Google Earth image of 2017. The same built up area that existed in 2007 was found more densely located with closely spaced buildings, less concentration of mixed trees and more network of local roads within the town area. There was an expansion of built up areas towards the northwestern part along Manjeri Calicut road and towards the eastern side towards Manjari town. During this ten years span there occurred several development in this area.Table 2 gives a detailed account of land use change that happened with a span of 10 years in the study area. This change was a result of opening of new link roads, change in land use activities etc. There were both positive and negative changes in land use pattern indicating increase and decrease in area under different land use type.
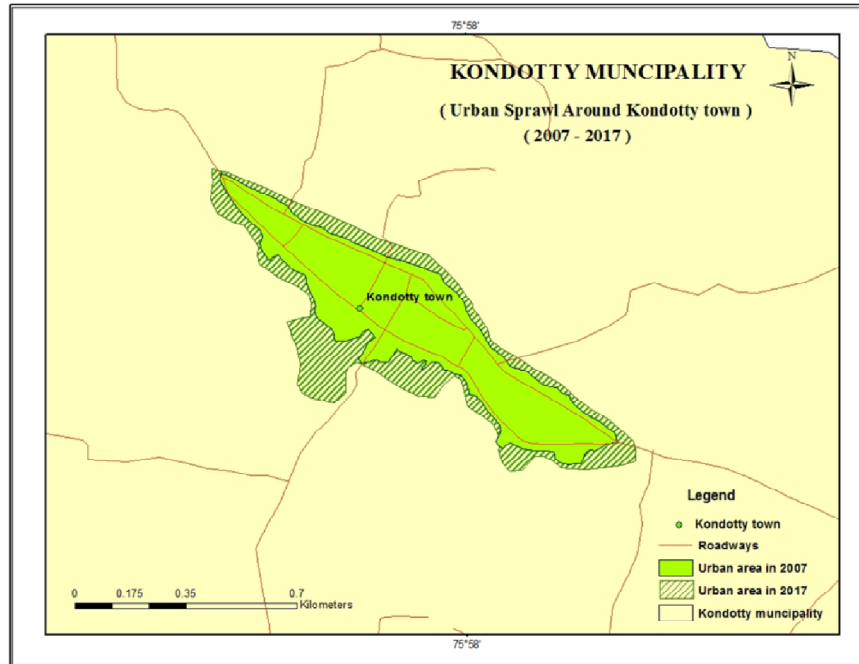
Fig.2: Urban Sprawl around Kondotty Town

Table 2 Land use change – 2007 and 2017

SL.NO	Land Use Pattern	Land Use Pattern in 2007 (in hactre)	Land Use Pattern in 2017(in hactre)	Land use Change (2007 – 2017) (in hactre)
1	Barren Land	92	93	1
2	Commercial Area	43	45	+ 2
3	Build up Area with mixed trees	1780	1804	21
4	Crop Field	194	192	- 2
5	Plantation Land	984	959	-25

In the study area, within a span of 10 years (2007 – 2017), there was an increase of 21 hectare area under the built up area which included residential and commercial plots.   Similarly there was an increase of 1 hectare area under Barren land. There was decrease in area under plantation Land (- 25 hectare) and in crop field (- 2 hectare).

3.   RING WISE CATEGORIZATION OF KONDOTTY MUNICIPALITY

For the present analysis the boundaries of ward have been considered for demarcating rings in Kondotty municipality. Kondotty town being at the centre, the wards which share boundary with Kondotty town forms Ring 1. The wards which share their boundary with the outer limit of Ring 1 come under Ring 2. Likewise the wards sharing their boundary with the outer limit of Ring 2 are taken as Ring 3. At the outer reach of Ring 3, the wards attached to the Ring 3 border belongs to

Ring 4 and wards just attached to Ring 4 comes under Ring 5. Fig. 3 represents the ring wise categorization of wards in Kondotty municipality. It is possible to identify 5 rings of wards in Kondotty municipality with Ring 2 covering the largest area (28.3 %) followed by Ring 3 (26.9 %), Ring 4 (25.9 %), Ring 1 (14.5 %) and Ring 5 (2.4 %). The Kondotty town area in the centre covers 1.9 % of total area in Kondotty municipality. Hence the whole analysis invove 98.1 % of total area of Kondotty municipality. An attempt is made to analyze how the demographic and landuse factors of an area influence its potentiality of urbanization.

3.1   *Ring wise demographic stress inKondotty municipality*

Ring wise demographic study is carried out to understand the demographic characteristics of wards in a generalized area and based on this reference; rings are prioritized highlighting the area which has very high, high, medium, low and very low demographic stress.For the present study the variables such as households, total population, population density, total workers, non workers, agricultural workers, cultivators, household workers, other workers, sex ratio and literacy rate are selected to understand the level of demographic stress in different rings. Here all variables have direct relationship with demographic stress. For example number of household have direct link with the population stress, which means higher the number of household higher will be the stress of population in that area. Similarly higher population density in an area will have high stress of population. The rings are valued based on the data and are later ranked based on their total score. Table 3 (a) gives detailed information of the total demographic characteristics with reference to selected variables for total wards in individual rings. Table 3 (b) represents the demographic stress based ring categorization in Kondotty municipality. The rings are ranks based on their values of individual variables under study.
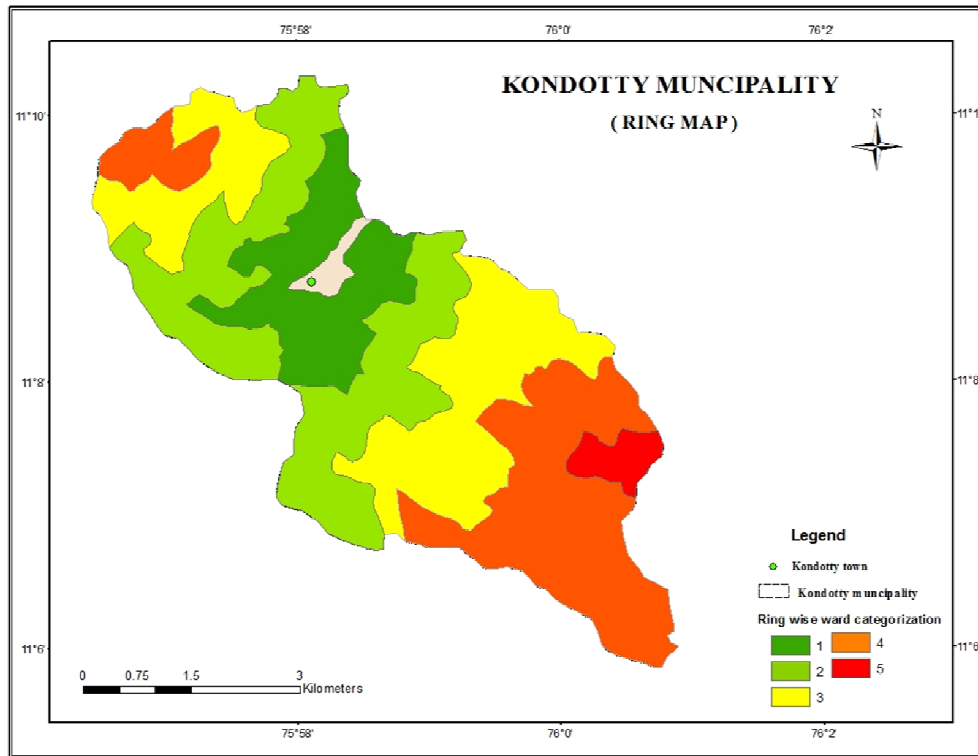
Fig.3: Ring map for KondottyMuncipality

Table 3(a) Demographic stress based ring prioritization in KondottyMuncipality

Rings	Household	Total Population	Population density (in sq.km)	Total Workers	Non Workers	Agricultural Labours	Cultivators	House Hold industry Workers	Other Workers	Sex ratio	Literacy in %
1	2915	15741	3506	3825	11916	278	163	43	3341	1029	80
2	4944	26656	3043	7138	19721	584	208	117	5976	1050	79
3	3690	19008	2285	4804	14204	499	136	19	4100	1055	82
4	3147	16262	2028	3577	12269	475	238	89	3192	1096	80
5	403	2075	2028	493	12269	74	70	10	339	1124	80
total ring	15099	79742	2578	19837	70379	1910	815	278	16948	5354	82
town	5436	28794	48803	7291	21503	588	101	87	6515	1051	82

Table 3 (b) Demographic stress based ranking of rings in Kondotty Muncipality

Rings	Household	Total Population	Population density (in sq.km)	Total Workers	Non Workers	Agricultural Labours	Cultivators	House Hold industry Workers	Other Workers	Total Score	Rank
1	2	2	5	3	1	2	3	3	3	24	4
2	5	5	4	5	5	5	4	5	5	43	1
3	4	4	3	4	4	4	2	2	4	31	2
4	3	3	2	2	3	3	5	4	2	27	3
5	1	1	2	1	3	1	1	1	1	12	5

Fig. 4 represents the demographic stress based ring prioritization, which indicates that Ring 2 is having very high demographic stress, followed by Ring 3 with high stress, Ring 4 with medium stress, Ring 1 with low stress and Ring 5 with very low demographic stress. It is noted that closer to the Kondotty town the demographic stress is more where as it is less in the places far away from the

Kondotty town. In general the northwestern part of the study area has comparatively more stress than the southern, southeastern and eastern part. Hence it proves that the demographic stress in these area leads to the spread urbanization in this direction.
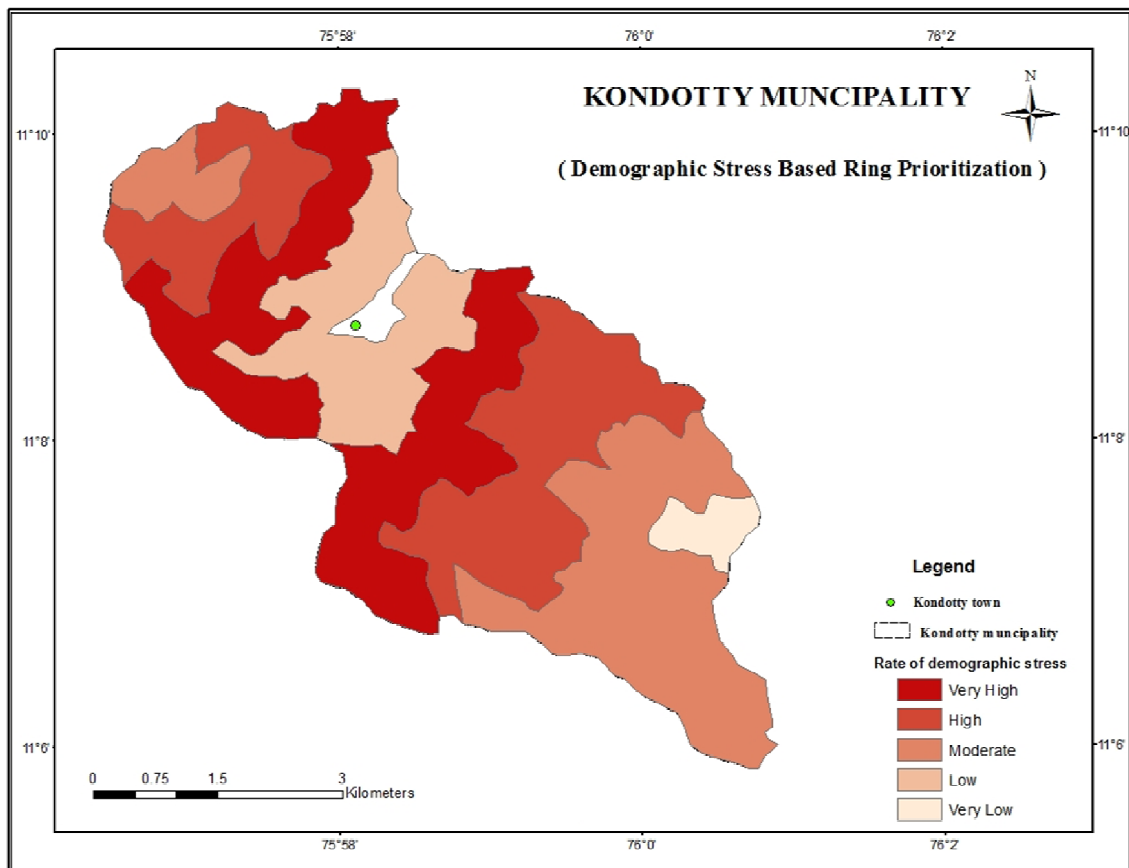

Fig.4: Demographic stress based ring prioritization of Kondotty Municpality

3.2 Ring wise land use stress in Kondotty municipality

Ring wise land use assessment is carried out to understand the land use pattern in a generalized area and based on this reference rings are prioritized, highlighting the area which have high stress of utilization under different activities. For the present study different types of land use such as crop land, barren land, commercial area, build up area with mixed trees and plantation land are selected to understand the level of land use stress in different rings. Here all variables except crop land and plantation land have direct relationship with land use stress. For example more the build up area more will be the stress on land for utilizing the resources and for housing. Similarly higher the barren land area more will be the stress on the land for utilization and for housing. On the other hand higher the crop land the land use stress will be comparatively low   The rings are valued based on the data and are later ranked based on their total score. Table 4 (a) gives detailed information of the total land use areas in total wards in an individual rings.Table 4 (b) represents the land use stress based ring categorization in Kondotty municipality. The rings are ranks based on their values of individual

variables under study. Fig. 5 represents the land use stress based ring prioritization, which indicates that Ring 1 is having very high land use stress, followed by Ring 2 with high stress, Ring 5 with medium stress, Ring 3 with low stress and Ring 4 with very low demographic stress. It is noted that closer to the Kondotty town the land use stress is more where as it is less in the places far away from the Kondotty town. In general the central and northwestern part of the study area have comparatively more land use stress than the southern, southeastern and eastern part. Hence it proves that the level of land use stress in these area leads to change in land use and influencing the potentiality of urbanization in these area.

Table 4 (a) Ring wise area under different land use in KondottyMuncipality

Ring	Crop Land	Commercial area	Build-up area with mixed trees	Plantation Land	Barren Land	Total area in hectare
1	14	34	310	91	0	449
2	57	8	604	194	13	876
3	62	0	491	272	7	832
4	40	0	298	391	73	802
5	19	0	55	1	0	75
total	192	42	1758	949	93	3034

Table 4 (b) Land use stress based ranking in Kondotty Muncipality

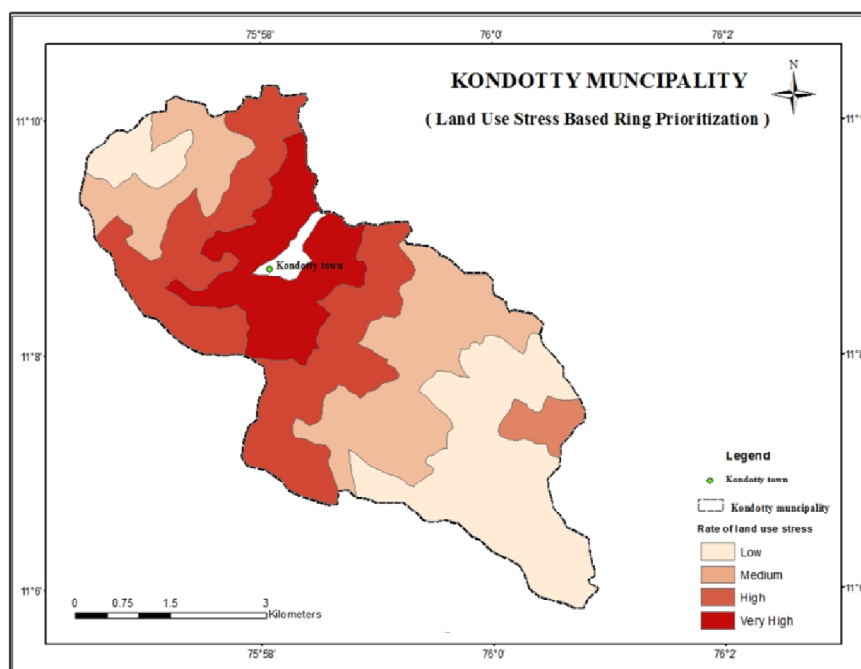| Ring	Crop Land	Commercial area	Build-up area with mixed trees	Plantation Land	Barren Land	total	rank
1	5	2	3	4	0	14	1
2	2	1	5	3	2	13	2
3	1	0	4	2	3	10	3
4	3	0	2	1	1	7	5
5	4	0	1	5	0	10	3

Fig 5 : Land use stress based ring prioritization of Kondotty Muncipality

4   URBANIZATION POTENTIALITY BASED RING PRITORITIZATION IN KONDOTTY MUNICIPALITY

Based on the demographic and land use stress output, an attempt is made to identify the potentiality of urbanization in five rings in Kondotty municipality. The ranks scored by each rings are again ranked based on which the rings with very high, high, medium, low and very low potentiality of urbanization are .identified. Fig. 6 illustrates the potentiality of urbanization based ring classification in Kondotty municipality. Table 5 gives details regarding the potentiality of urbanization in Kondotty municipality. As per the final output the Ring 2 have very high potentiality of urbanization, followed by Ring 1 and Ring 3 with high potentiality, whereas Ring 4 and Ring 5 have low potentiality of urbanization. The wards included in the Ring 2 in both land use and demographical concept are having high potentiality to generate stress on land for utilizing it for different activities and comparatively high concentration of population depending on land for their income and other purposes. Hence these wards have high potentiality of urbanization in Kondotty municipality. In case of wards coming under Ring 1 and Ring 3, these areas have high potentiality of urbanization but are comparatively lower than the wards under Ring 1. The Ring 4 and Ring 5 which are far away from Kondotty town, connected by roadways have low potentiality of urbanization.

Table 5 Urbanization potentiality based prioritization in Kondotty Muncipality

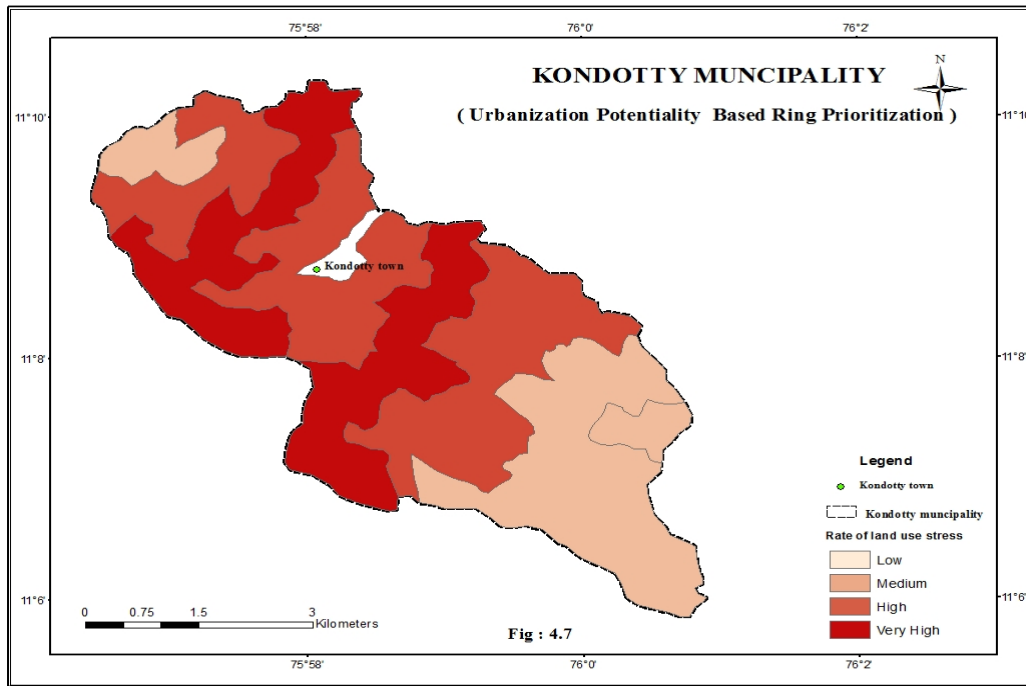| Ring	Demographic stress	Land use stress	total	rank
1	4	1	5	2
2	1	2	3	1
3	2	3	5	2
4	3	5	8	4
5	5	3	8	4

Fig 6 : Urbanization potentiality based ring prioritization of Kondotty Muncipality

5 CONCLUSION

Based on the demographic and land use stress the potentiality of urbanization in wards under different rings was assessed which highlighted the fact that wards in the Ring 2 have very high potentiality of urbanization, followed by Ring 1, Ring 3, Ring 4 and Ring 5. Hence these areas should be given more concern while adopting any planning measure in Kondotty municipality in future.

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