

Critical analysis of the density zoning proposed for Thiruvananthapuram city

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Abstract— In 2012, the draft Master Plan for Thiruvananthapuram Corporation 2031 proposed a density zoning for the city. The research question is whether the proposed density zoning is apt or not. A critical analysis of the density zoning proposed in the Master Plan is the broad aim of the study, for which a detailed analysis of the population density, existing land use and built up density was done. It was found that the proposed densities vary from the achievable maximum in each zone and hence the proposed density zoning needs revision. However the zoning was found to be correct as it precisely groups the regions with the same trends of population density, land use and built up density.

Keywords—Density zoning; Thiruvananthapuram; Urban planning

I. INTRODUCTION

In 2012, the draft Master Plan for Thiruvananthapuram Corporation 2031 proposed a density zoning for the Corporation area. Thiruvananthapuram Corporation area, henceforth referred to as Thiruvananthapuram city, comprises of an area of 215.86 sqkm (Fig 1).

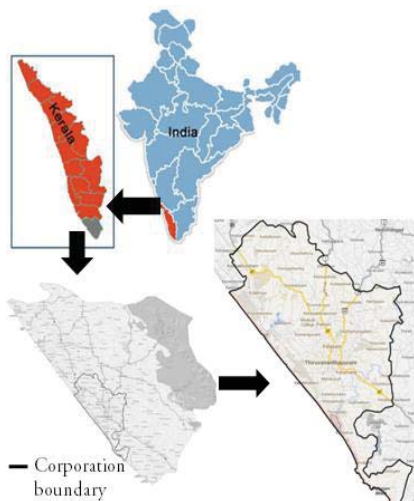


Fig. 1. Location of Thiruvananthapuram city
Source: Compiled from multiple sources

A density zoning was proposed in the draft Master Plan for Thiruvananthapuram Corporation 2031, 2012[1] henceforth referred to as the Master Plan. To analyze whether the proposed density zoning is apt or not, a critical appraisal was done through the analysis of population density, existing land use and built up density. The limitation of the study is that height of buildings could not be analyzed due to non availability of data.

II. PROPOSED DENSITY ZONING

In the proposed density zoning, the entire Thiruvananthapuram city has been zoned into four and density targets were fixed. The zones in the proposed density zoning are shown (Fig 2).

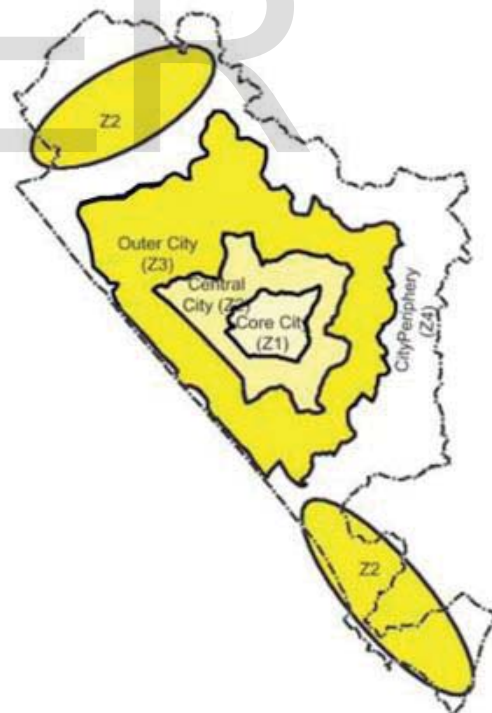


Fig. 2. Proposed density zoning
Source: Master Plan, 2012

The characteristic features and the proposed densities of each zone as stated in the Master Plan are summarized (Table 1).

TABLE I. CHARACTERISTICS OF EACH ZONE

Zone	Characteristics as stated in the Master Plan
Zone 1 (Z1)	<ul style="list-style-type: none"> the city core with the highest built up coverage suggested to have restricted development recommended to avoid further densification the existing average density of 7500 persons/sqkm is to be continued
Zone 2 (Z2)	<ul style="list-style-type: none"> the area surrounding the city core (central city) area having comparatively lesser built up coverage suggested for regulated development a density of 4000 to 7500 persons/sqkm is suggested
Zone 3 (Z3)	<ul style="list-style-type: none"> the city extension adjacent to the central city proposed for intensive development supposed to cater to the future residential demand proposed to have a density of 2000 to 4000 persons/sqkm
Zone 4 (Z4)	<ul style="list-style-type: none"> the peripheral area of the city most area under dry agriculture use suggested to be retained as such conservation of these areas is recommended proposed to have a density of 2500 persons/sqkm

Source: Compiled from Master Plan, 2012

III. CRITICAL ANALYSIS

A. Population density analysis

The population of each ward as per the Census 2011 was collected and divided by the respective ward areas to get the population density. The population density gradient map (Fig 3) was prepared as per the figures from Census 2011 and zone wise analysis map was (Fig 4) prepared by overlaying the generated map with the density zoning map of the Master Plan.

The major findings from the population density analysis are summarized below-

- Zone 1 in the proposed density zoning has the highest population density, the average being 8500 persons/sqkm
- Zone 2 has certain regions of very high population density (above 10,000 persons/sqkm) in the region outer to Zone 1. However the Northern and Southern parts has very low population density (less than 2500 persons/sqkm). So, it is found that the overall population density is low, the average being 4000 persons/sqkm.
- Zone 3 has moderate population density, the average being 6500 persons/sqkm.
- Zone 4 has the lowest population density, the average being 3500 persons/sqkm.

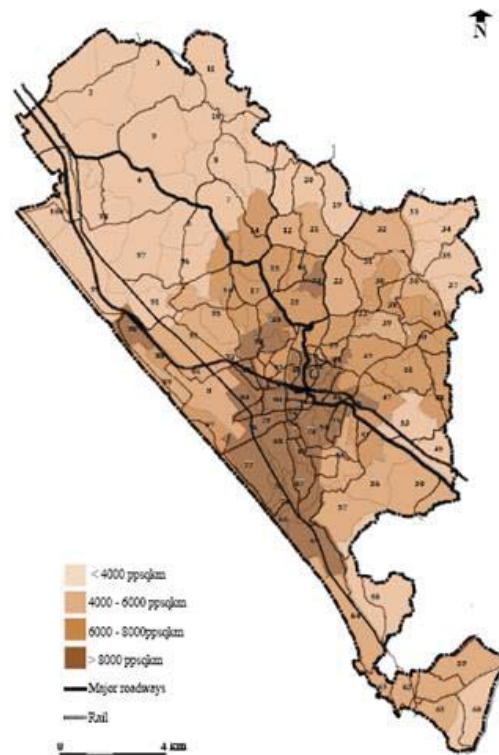


Fig. 3. Population density gradient map of Thiruvananthapuram city
Source: Author generated, 2013

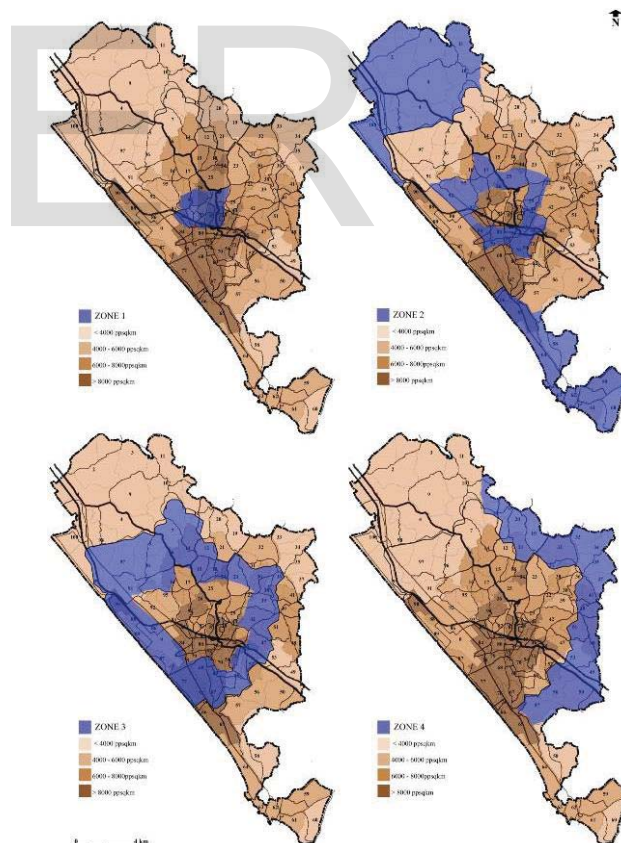


Fig. 4. Zone wise population density analysis
Source: Author generated, 2013

The inferences from the population density analysis include the following. The city core has the highest population density and hence zoning these areas into Zone 1 and aiming for regulated development as proposed in the density zoning is desirable. Similarly, redevelopment in Zone 2 and intensive development in Zone 3 is also apt as the population density is found to be low, 4000 and 6500 persons/sqkm respectively. Grouping the city periphery into Zone 4 and aiming for conservative development is also found to be desirable as the present population density of 3500ppsqkm has to be preserved. Hence the zoning as in the density zoning proposed in the Master Plan is apt.

B. Existing land use analysis

The existing land use map (Fig 5) was overlaid with the density zoning map to generate the zone wise analysis map. From the zone wise land use map, the maximum achievable density of each zone was found by calculating the percentage of residential areas. The average residential built up space requirement of a family of four to five persons was assumed to be around 120-200 sqm. For calculation purposes the residences in plotted development were assumed to be two storeyed buildings with total area of 160 sqm with footprint 110 sqm. As per KMBR, the maximum permissible coverage for residential occupancy is 65%. Further, a minimum front yard of 3m, rear yard of 2m and set backs of 1.2m on one side and 1m on the other need to be provided. Abiding by all these regulations, the minimum plot area required for one dwelling unit is calculated to be approximately 200 sqm. Hence for one hectare, after providing 10% for internal roads and 10% as green spaces, the number of dwelling units that can be accommodated is 40. Therefore, the maximum net density that can be achieved under the aforesaid conditions is 40 Dwelling units /hectare.

The major findings from the zone wise land use analysis (Fig 6) are summarized below-

- Zone 1 – Since the residential zone accounts for 53% as evident from the zone wise analysis , the maximum gross density that can be achieved in plotted development is 21 du/ha, that is 9500 persons/sqkm.
- Zone 2 – Since the residential zone accounts for 39% as evident from the zone wise analysis , the maximum gross density that can be achieved in plotted development is 15 du/ha, that is 7000 persons/sqkm.
- Zone 3 – Since the residential zone accounts for 49% as evident from the zone wise analysis, the maximum gross density that can be achieved in plotted development is 19 du/ha, that is 8500 persons/sqkm.
- Zone 4 – Since the residential zone accounts for 30% as evident from the zone wise analysis, the maximum gross density that can be achieved in plotted development is 12 du/ha, that is 5000 persons/sqkm. Since zone 4 constitutes the city periphery, the targeted density must be reduced to curb urban sprawl. Hence the target density is fixed at half the achievable density, which is 2500 persons/sqkm.

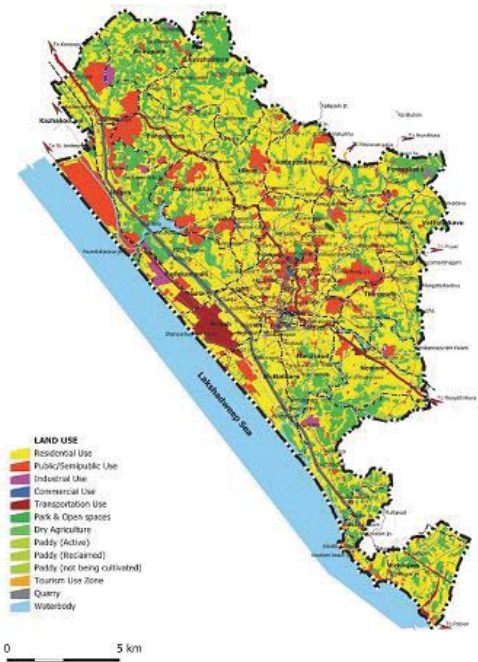


Fig. 5. Existing land use map of Thiruvananthapuram city
Source: Master Plan, 2012

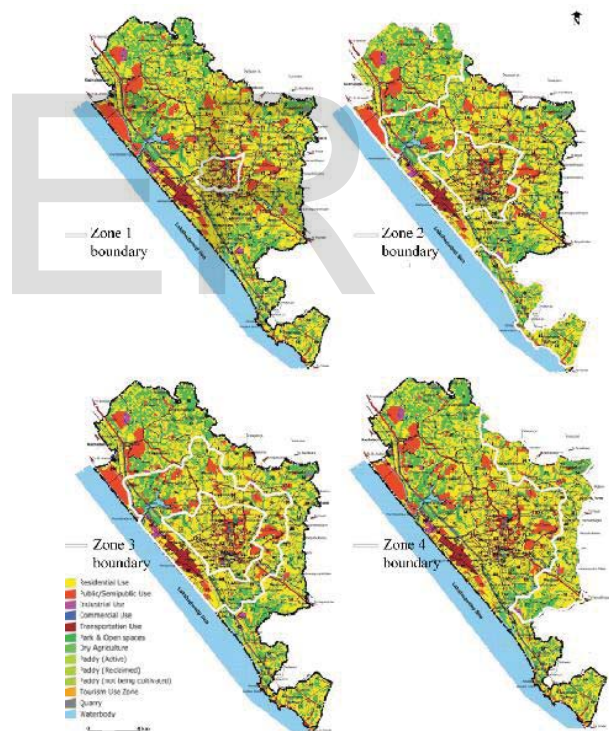


Fig. 6. Zone wise existing land use analysis
Source: Author generated from Master Plan, 2013

The inferences from the existing land use analysis include the following. The calculated densities vary from those proposed in the Master Plan. It is recommended to avoid further densification in the city core. However the existing land use analysis shows that the achievable maximum density has not been reached yet. Zones 2 and 3 also have more

potential for densification than that proposed in the Master Plan.

C. Built up density analysis

The building footprint density grid for the city was prepared in the Master Plan for built up density analysis. The entire Thiruvananthapuram city has been divided into grids of 500m x 500m and the building footprint density calculated using the formula, building footprint density = total built area in a grid / total area of a grid. The zone wise built up density analysis map was prepared. The major limitation of using building footprint density as a measure of built up density is that it does not take into account the height of the buildings. .

The inferences from the built up density analysis include the following. The city core has the highest built up density and hence zoning these areas into Zone 1 and aiming for regulated development as proposed in the density zoning is desirable. Similarly, redevelopment in Zone 2 is also apt as the population density is found to be low. The proposed intensive development in Zone 3 is also desirable as this zone has a moderate built up density. Grouping the city periphery into Zone 4 and aiming for conservative development is also found to be desirable as the low built up density at present has to be preserved. Hence the zoning as in the density zoning proposed in the Master Plan is apt.

IV. CONCLUSIONS

The inferences from the population density analysis and built up density analysis show that the zoning in the Master Plan is as per the characteristic features of the region. However the proposed densities are found to be different from those calculated from the existing land use analysis. Hence it can be concluded that though the zoning is accurate, the proposal needs revision with regard to the proposed densities.

Acknowledgment

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References

- [1] Department of Town and Country Planning, "Master Plan for Thiruvananthapuram Corporation 2031(draft)", Government of Kerala, Thiruvananthapuram, Kerala, 2012.

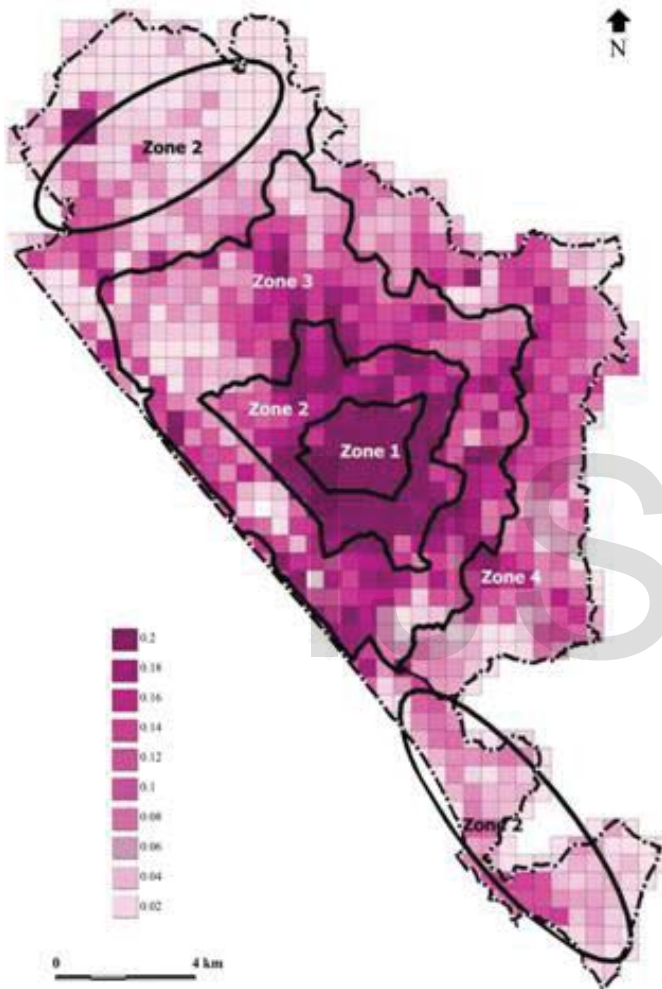


Fig. 7. Zone wise built up density analysis
Source: Master Plan, 2012

The major findings from the zone wise built up density analysis (Fig 7) are summarized below-

- Zone 1 has the maximum built up density
- Zone 2 has certain regions of very high built up density in the region outer to Zone 1. However the Northern and Southern parts have low built up density.
- Zone 3 has moderate built up density and Zone 4 has the lowest built up density