



STUDY OF URBAN MORPHOLOGICAL CHARACTERISTICS AND GREEN INFRASTRUCTURE ELEMENTS – CASE OF BANGALORE CITY

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Abstract

Urban morphological study describes the spatial aspect of a city in terms of Built form, connectivity, land uses, and green areas. Morphological characteristics has a great impact on the Urban Form. Every city has its own spatial and temporal layers which unfolds the story of time and space it belongs to. This paper tries to analyze the morphological characteristics and its impact on the Green Infrastructure elements of Bangalore city. Bangalore is one of the important cities of India and is one of the world's top 10 fastest growing cities. It has a very strong historical background. It is the capital city of Karnataka and today well known as IT City or Silicon Valley due to its recent development in IT Sector. In the process of urbanization, Urban form, culture, and the character of the cities go through a lot of change. Bangalore is one such city which has undergone many changes over the time. Bangalore was founded by Kempe Gowda, who built a mud fort at the center of the city in 1537. The founder had divided the town into Pete (Market) and Kote (Fort). He had also built many Lakes and Gardens keeping the topography of Bangalore in mind. Bangalore was identified based on 4 important elements when Kempe Gowda first built Bangalore and they are Pete (Market), Kote (Fort), Kere (lakes) and Thota (Gardens). Bangalore gained its popularity as Garden City because of these elements. Today Bangalore's Urban Form has many more layers of development added to it, which can be observed through Morphological study. In this paper, we examine two aspects, one will be the study of different zones of Bangalore city and second is the Green Infrastructure Elements present in these zones. Aim of this research paper is to methodologically study the characteristics of different zones of Bangalore city in terms of Land use, demographics, Urban form, Green Infrastructure Elements etc and investigate associated Issues and challenges. The methodology followed here is to identify sample Planning Districts in each zones of Bangalore city and study the Land use, demographics, Urban form, Green Infrastructure Elements. A comparative study of these planning districts can reveal the potential and challenges which can lead to further research, recommendations, and design suggestions.

Introduction:

Bangalore is one of the important cities of India and is one of the world's top 10 fastest growing cities. It has a very strong historical background. It is the capital city of Karnataka and today well known as IT City or Silicon Valley due to its recent development in IT Sector. In the process of urbanization, Urban form, culture, and the character of the cities go through a lot of change. Bangalore is one such city which has undergone many changes over the time.

Bangalore was founded by Kempe Gowda, who built a mud fort at the center of the city in 1537. The RMP 2015 divided the BMA into three concentric zones as per their characteristics, although this division is primarily to inform the zonal regulations like FAR, TDR etc to regulate growth of the city. This paper aims to study the 3 concentric rings and understand morphological characteristics and Green Infrastructure Elements present in these zones. This analysis helps to identify potential Green Infrastructure Elements, issues connected with these and further evaluation.

Aim of this paper is to study various Green Infrastructure Elements present in Bangalore city in different zones, compare and analyze them. These analysis helps us to further evaluate and come up with beneficial strategies.

Study of Morphological zones of Bangalore City:

It is mentioned in various Master Plan documents that Bangalore has been divided into 3 zones for the purpose of Byelaws and other related administration.

Five concentric belts:

1st Belt – The core area consisting of the historic Petta,

the Administrative Centre and the Central Business District.

2nd Belt – Peri-central area with older planned residential areas surrounding the core area;

3rd Belt – Recent extensions of the City flanking both sides of the Outer Ring Road, a portion of which lacks services and infrastructure facilities and is termed as a shadow area;

4th Belt – New layouts with some vacant lots and agricultural lands;

5th Belt – Green belt and agricultural area in the City's outskirts including small villages.

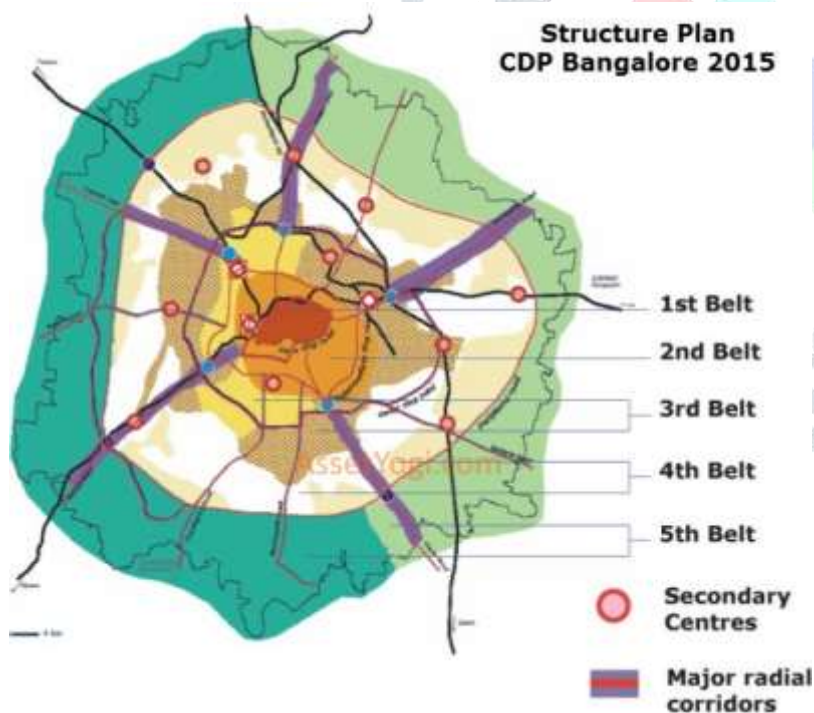


Figure 1 - 5 Concentric Rings in BMA as recognised by the Structure Plan 2015

Source: Structure Plan CDP Bangalore2015

Three concentric Zones:

Bangalore Local Planning Area is divided into three Planning Zones, in BMA that have variable characteristics in terms of development profile.

Planning Zone A, Planning Zone B and Planning Zone C, as per the following spatial extents for the consideration of Development Control Regulations for the LPA:

1. Planning Zone A (Ring 1+Ring 2 of the RMP 2015) : consists of the area falling within the Outer Ring Road (ORR).

- Limited Land availability
- High Density
- traffic congestion and environmental pollution
- Less Scope for Growth

2. Planning Zone B (Part of Ring 3 of the RMP 2015) : consists of the area falling outside the ORR and upto the Conurbation Limit of RMP 2031.

- Narrow roads and absence of a good network hierarchy
- Poor Infrastructure
- Numerous lakes and water bodies present an opportunity to
- conserving the overall valley and tank network in the BMA
- zone of consolidation – one where development can be further encouraged through strengthened infrastructure.

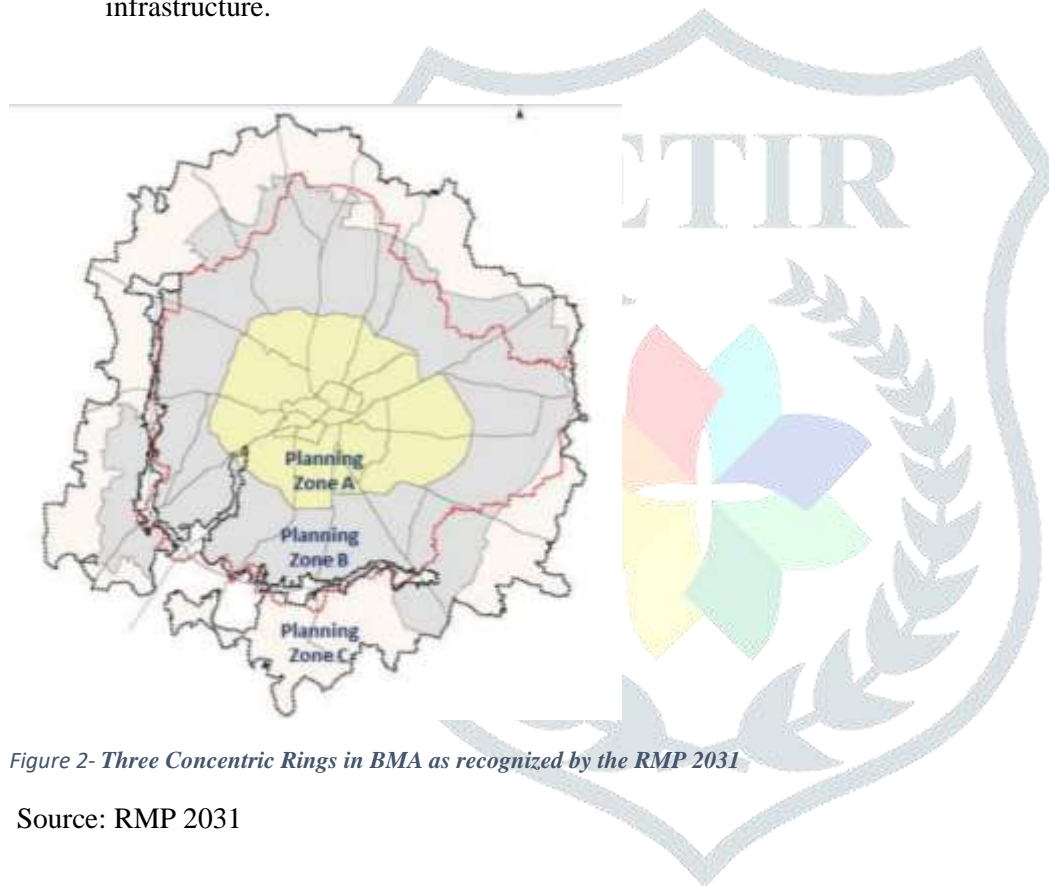
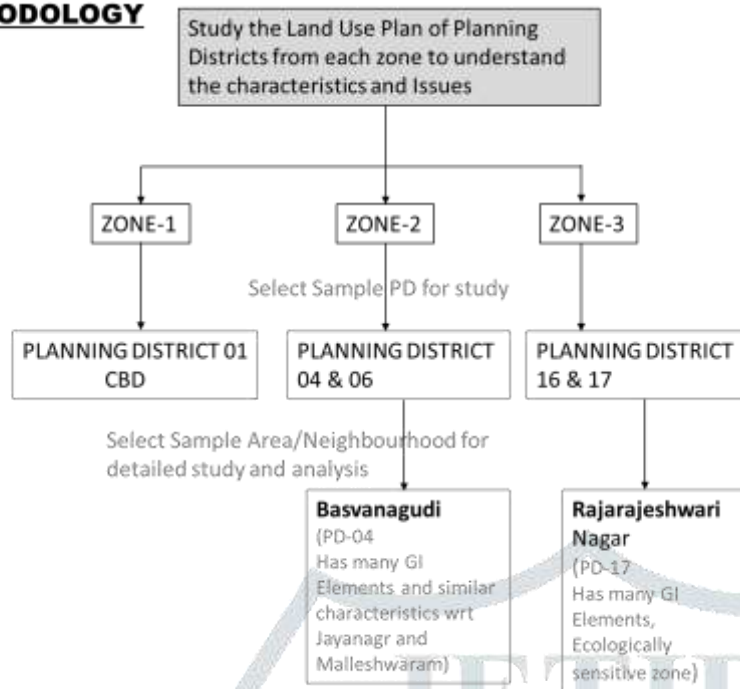


Figure 2- Three Concentric Rings in BMA as recognized by the RMP 2031

Source: RMP 2031

Methodology of selecting study area to understand Urban Morphological characteristics and Green Infrastructure Elements:

After the study of 3 concentric zones of Bangalore city, and Understanding the Land use Patterns and other characteristics of each zone, 2 Planning Districts were chosen from each zone of homogeneous characteristics and Landuse. Under each Planning District one neighbourhood is selected as sample where residential Landuse is predominant.

METHODOLOGY**Study of Sample areas for each zone-**

Out of 42 PDs Selected one Planning Districts from each zone and selected one neighbourhood from each zone as sample to understand the characteristics and issues and do the comparative analysis of Green Infrastructure Elements.

What is Green Infrastructure and why study the Green Infrastructure Elements in these zones?

Green infrastructure or Blue and green infrastructure is defined as an “interconnected network of green open spaces, Lakes/Water Bodies and cultural sites that conserves natural ecosystem values and functions and provides associated benefits to human population”. Green Infrastructure Elements are part of the Green Infrastructure Network - Green open spaces, Lakes/Water Bodies, Drains/Nalas and Cultural sites etc. These GI elements play major role in Ecological balance and determine quality of life in cities. They perform many eco system services like improving quality of air, Protection of Biodiversity and make place for recreation spaces, community farming spaces, playing fields, Sports areas etc.

Study of Zones in Bangalore city:**Zone-1 -****Planning District- 01 CBD**

Criteria for Selection of sample area-

Geographically Lies in center of Bangalore, Old Historic core with large Urban Parks.

Zone-2 -**Planning District- 06 Yashwanthapur - Malleshwaram**

Criteria for Selection of sample area-

- Geographically Lies in the North and South of Bangalore
- Planned Residential Neighbourhoods with similar characteristics
- Green Infrastructure Elements present here needs more attention.

Zone-3 –**Planning District- 16 Gottigere, Anjanapura**

Criteria for Selection of sample area-

- Geographically Lies in the South and Southwest Region of Bangalore which is recognized as Ecologically Sensitive Area,
- More Green Infrastructure Elements are present here.

ZONE – 1**PLANNING DISTRICT 01 – CBD**

Population (2011 Census): 5,93,883

Area of PD: 2774.3 ha

Wards in PD: 19

Gross Density: 214PPH

CHARACTERISTICS:

- Dense City core with lots of Heritage zones
- Large city level green spaces like Cubbon Park, Freedom Park and Racecourse
- Commercial and Public Semipublic Landuse is dominating
- Less percentage of Lakes or water bodies.

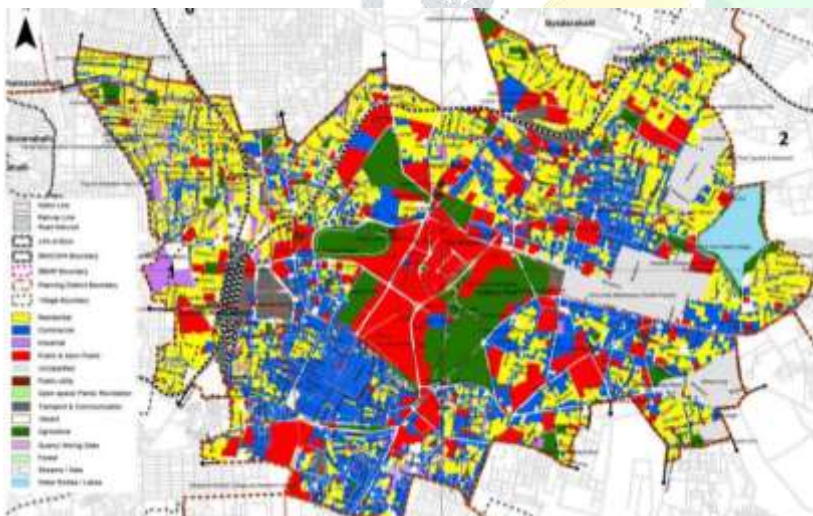


Figure 3 LandUse Map of Zone-1 (Source: RMP 2031)

Landuse Category	Area (in Ha)	Percentage to Total Area (%)
Residential	702.68	25.33
Commercial	586.52	21.14
Industrial	54.47	1.96
Quarry/ Mining Sites	0.00	0.00
Public Semi Public	458.51	16.53
Unclassified	148.33	5.35
Public Utility	7.72	0.28
Parks & Open Spaces	230.50	8.31
Transport Communication	431.00	15.54
Vacant	101.98	3.68
Agriculture	0.00	0.00
Forest	0.00	0.00
Streams	9.40	0.34
Water Bodies	43.04	1.55
Total	2774.28	100.00

Figure 4 Landuse Distribution (Source: RMP 2031)

ZONE – 2

PLANNING DISTRICT 06 – YASHWANTHAPURA-MALLESHWARAM

Population (2011 Census): 621302

Area of PD: 2774.3 ha

Wards in PD: 16

Gross Density (2015): 223PPH

CHARACTERISTICS:

- The Planning District is characterized by **planned residential areas similar to PD 04.**
- High Density
- Mixed use developments
- Education and health institutions, city's major markets, water bodies and a hierarchy of large and small open spaces.
- Industrial Landuse 12%

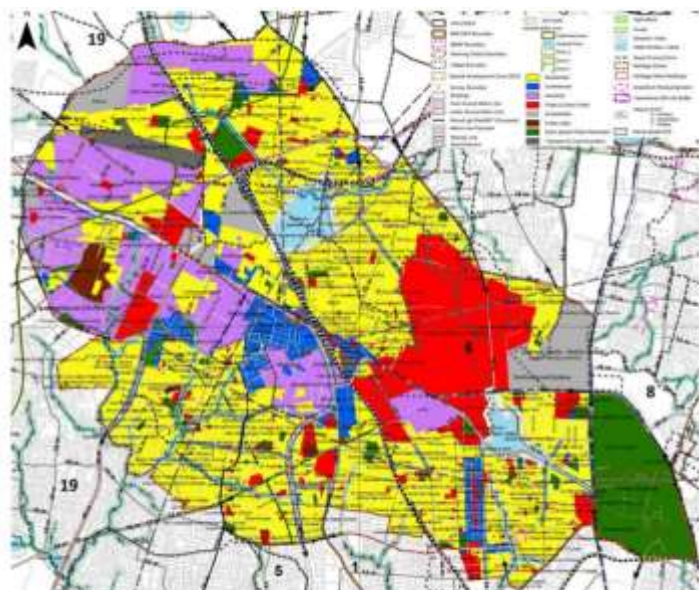


Figure 5 Land Use Map of Zone 2 PD 06(Source: RMP 2031)

Landuse Category	Area (in Ha)	Percentage to Total Area (%)
Residential	1043.88	29.97
Commercial	261.36	7.50
Industrial	422.28	12.12
Quarry/ Mining Sites	0.00	0.00
Public Semi Public	488.85	14.03
Unclassified	133.84	3.84
Public Utility	35.04	1.01
Parks & Open Spaces	297.12	8.53
Transport Communication	497.95	14.30
Vacant	271.59	7.80
Agriculture	0.00	0.00
Forest	0.00	0.00
Streams	7.11	0.20
Water Bodies	24.05	0.69
Total	3483.08	100.00

Figure 6 Landuse Distribution (Source: RMP 2031)

ZONE – 3

PLANNING DISTRICT 17 - NAYANDAHALLI

Population (2011 Census): 2,49,522

Area of PD: 2423.7 ha

Wards in PD: 3 Wards (full)

2 Wards (part)

Gross Density: 102 pph

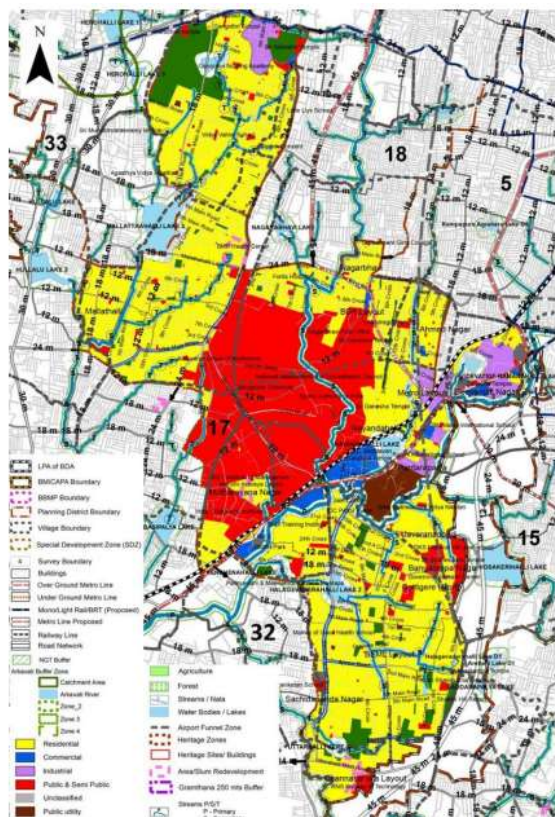


Figure 7 Land Use Map of Zone 3 PD 17(Source: RMP 2031)

CHARACTERISTICS:

low rise, high density in the residential areas in the north and south of the PD, while the central part is of Public-Semi-Public areas.

Large Institutional open spaces like University campus as green breathing space.

Ecologically sensitive zone/ south west region

Vrushabhavathi River and 5 Lakes.

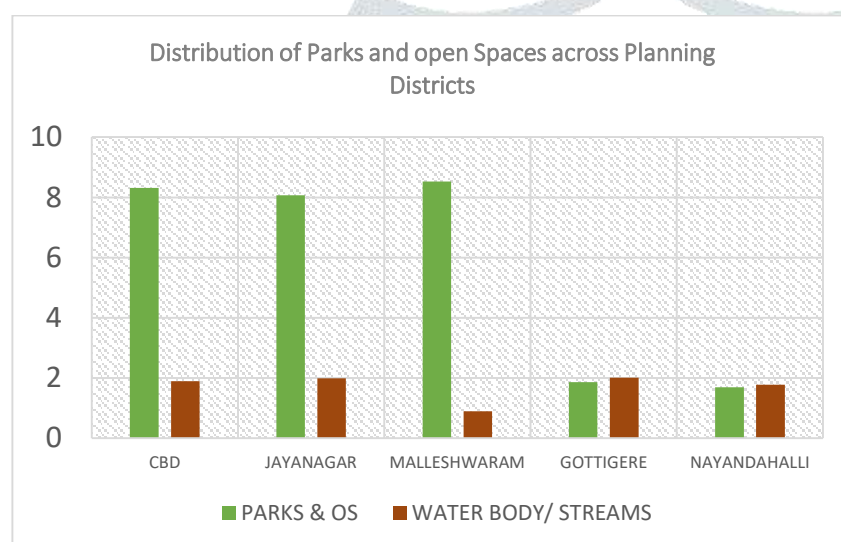
Landuse Category	Area (in Ha)	Percentage to Total Area (%)
Residential	596.08	24.59
Commercial	88.41	3.65
Industrial	72.54	2.99
Quarry/ Mining Sites	0.00	0.00
Public Semi Public	544.93	22.48
Pubic & Semi Public - Unclassified	0.00	0.00
Public Utility	39.02	1.61
Parks & Open Spaces	41.07	1.69
Transport and Communication	267.61	11.04
Vacant	731.09	30.16
Agriculture	0.00	0.00
Forest	0.00	0.00
Streams	26.80	1.11
Water Bodies	16.16	0.67
Total	2423.71	100.00

Figure 8 Landuse Distribution of PD 17(Source: RMP 2031)



Figure 9 Nalas present in Zone 3

Observations of GI Elements in PD-17(Zone-3): Nala Buffer Zones are the special characteristic present in his zone. Due to negligence Nala Buffer Zones are polluted by garbage dumping, weeds etc. Lack of maintenance has led to growth of unwanted plants.



Inference: Accessible Parks and open spaces are less in percentage in Zone 3 compared to zone 1 and 2.

Conclusion: Bangalore city is growing radially outwards. The outer zones lack Green Infrastructure Elements like Parks and open spaces. These zones are not planned well, and growth is organic. These outer zones also have many ecologically sensitive elements like drains and nalas which can be protected to avoid encroachments. It is important to properly investigate the distribution of Green Infrastructure Elements throughout the city.

References:

RMP 2031, Integral Sustainable Design-transformative perspective by Mark Dekay

Designing Greenways by Paul cawood Hellmund and Daniel soers smith

Time savers standards for urban design

www.googleearth.com (Accessed on 04-04-2014), www.wikipedia.org

www.planning.org, www.outinthelandscape.com, june-2014 retrieved from books.google.co green infrastructure, june 2014 www.globalwarmingnet.info green cities.com

www.urbanecocycles.net, http://wgbis.ces.iisc.ernet.in, Planning and design of ecological networks in urban areas by Maria Ignatieva, Glenn H. Stewart Colin Meurk, www.spcn.org