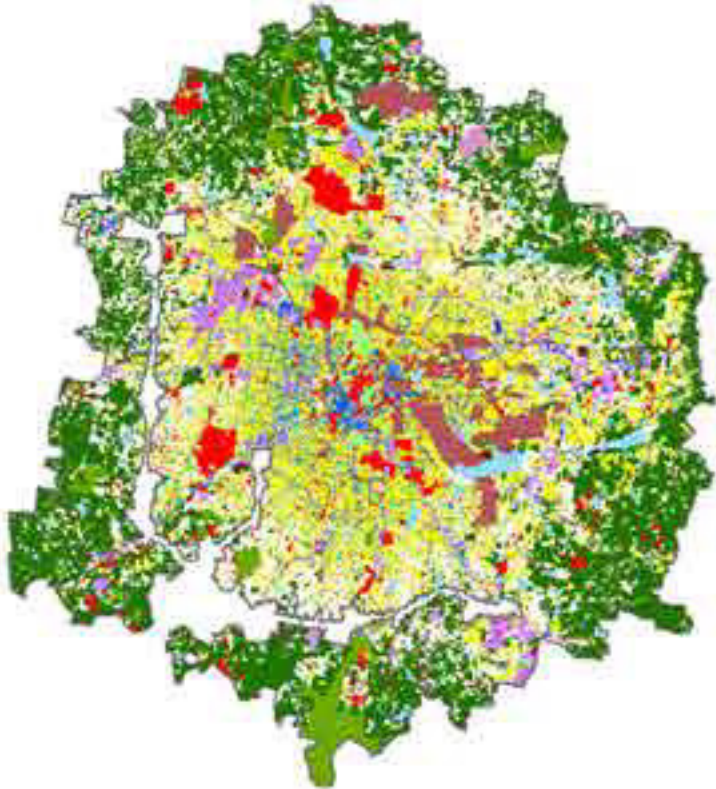# Database/Information for Preparation of Revised Master Plan 2031 for Bengaluru

Bangalore Development Authority

BENGALURU REVISED MASTER PLAN 2031

CONTENTS

PART-1

BENGALURU REVISED MASTER PLAN 2031 (RMP-2031)

LEGAL PROVISIONS, SCOPE, CONTENT, LIMITATIONS AND FAQs

1) WHY PLAN?

✓ Bengaluru, with a sound economic base and congenial-physical and social environment is bound to grow both in its population and area.

✓ Economic factors and growth dynamics throw up major challenges for city administrators, planners and the people in terms of mitigation measures.

✓ With this background and context, BDA (Bengaluru Development Authority) being the Planning Authority for the Local Planning Area, regularly undertakes the preparation and revision of the Master Plan.

✓ This document is prepared to initiate public consultation for preparation of RMP-2031. A number of seminars and workshops will be held wherein experts, voluntary organisations and general public will participate. Considering the feedbacks, the draft RMP will be prepared and published again for suggestions and comments. Thereafter, RMP-2031 will be finalised.

2) WHAT IS A MASTER PLAN?

✓ A Master Plan is a comprehensive document which provides the broad framework and direction for the growth and development of the city.

✓ A Master Plan aims to integrate the various sectoral plans taking into consideration the overall requirements in terms of land, infrastructure services, physical and social amenities, environmental aspects etc. over a 10-20 year time frame. The plan aims to project the population, lay down the overall space, and provide direction for the future growth and development of the City keeping in view the larger perspective. Besides, it aims to provide a clear circulation network and, assess the demand and gap in the facilities and amenities for the present and projected population while also reserving land requirements for future amenities and services (which may be totally uninhabited currently) together with planning for new residential areas, new work centres, new business/commerce areas, new educational and institutional areas, including the amenities and services.

✓ This exercise of the Revised Master Plan for Bengaluru Metropolitan Area (which is the area under the purview of the BDA) is being undertaken for the time period till 2031.

✓ This Revised Master Plan for Bengaluru 2031 will also aim to integrate other sectoral plans and recommendations from different stakeholders and service providers like BMRCL, BWSSB, BESCOM, BMTC, KIADB, BSNL etc.

3) LEGAL PROVISIONS FOR THE REVISION OF MASTER PLAN

✓ The Master Plan for any local planning area in the State of Karnataka is prepared under the provisions of Section 9 of the Karnataka Town and Country Planning Act 1961 (KTCP Act, 1961)

✓ The Master Plan is to be revised once in every ten years as per the provisions of Section 13D of the KTCP Act, 1961. The Master Plan for BMA (i.e. RMP 2015) which had been prepared and approved on June 25, 2007 is currently in force.

✓ The Revised Master Plan for Bengaluru 2031 is being prepared now.

✓ As per Section 81B for the KTCP Act, 1961, the Bengaluru Development Authority shall be the Local Planning Authority and BDA shall exercise the powers, perform the functions and discharge the duties under the provisions of the KTCP Act, 1961 as if it were a local authority constituted for the Bengaluru City.

4) THE CONTENTS OF MASTER PLAN

✓ Under the KTCP Act,1961, the Master Plan shall consist of a series of maps and documents indicating the manner in which the development and improvement of the entire planning area within the jurisdiction of the Planning Authority are to be carried out and regulated, such a plan shall include proposals for the following, viz:-

- zoning of land use for residential, commercial, industrial, agricultural, recreational, educational and other purposes together with Zoning Regulations;
- a complete street pattern, indicating major and minor roads, national highways, and state highways, and traffic circulation pattern, for meeting immediate and future requirements with proposals for improvements;
- areas reserved for parks, playgrounds, and other recreational uses, public open spaces, public buildings and institutions and area reserved for such other purposes as may be expedient for new civic developments;
- areas earmarked for future development and expansion;
- reservation of land for the purposes of Central Government, the State Government, Planning Authority or public utility undertaking or any other authority established by Law, and the designation of lands being subject to acquisition for public purposes or as specified in Master Plan or securing the use of the landing in the manner provided by or under this Act;
- declaring certain areas, as areas of special control and development in such areas being subject to such regulations as may be made in regard to building line, height of the building, floor area ratio, architectural features and such other particulars as may be prescribed; and
- stages by which the plan is to be carried out.

5) WHY THIS REVISED MASTER PLAN?

✓ Planning is a continuous process facilitating updation and revision of the existing Master Plan due to the ever changing dynamics of the city and its region. It also provides an opportunity to undertake mid-course corrections, and incorporate policy changes, if any, arising out of the needs of the population and its activities. The Master Plan is formulated on the basis of certain assumptions related to the present administrative set up, growth rates, household size, present

policies, orders and guidelines with respect to urban development, transportation planning etc., which are liable to be modified as per the State policies.

✓ This Revised Master Plan for Bengaluru -2031 is the fourth such revision. The first Master Plan for Bengaluru had been approved in 1984. This was followed by the Revised Master Plan -1995 and the Revised Master Plan-2007.

6) WHAT IS THE ALTERNATIVE TO A MASTER PLAN?

✓ A Master Plan is a comprehensive and regulatory framework aiming to give direction to the growth, development and management of a city. The city being dynamic in nature and with millions of people residing in it becomes a difficult challenge to address. The Master Plan being the only such statutory tool to guide and address such issues becomes all the more important in such a case.

✓ This has been the subject of discussion at national, state and local levels and it has been felt that the alternative to a "Master Plan" is "a Master Plan", an improvement from the earlier plan.

7) SANCTITY OF THE MASTER PLAN

✓ Once notified under the KTCP Act,1961 after consultations with Municipal Corporations and other public bodies, the Master Plan becomes 'law' .A Master Plan is explicitly binding on everybody including the Government, all public agencies and the general public. BDA is the agency for plan preparation.

✓ Compliance with the Master Plan and its implementation is a combined and collective effort of the Government agencies and the general public.

8) WHAT WILL HAPPEN TO THE MASTER PLAN CURRENTLY IN FORCE?

✓ Once notified by the Government under the KTCP Act, 1961, this Revised Master Plan 2031 for Bengaluru (Bengaluru Metropolitan Area) will replace and override the RMP -2015, presently in force. Till such time, the RMP 2015 will continue to be in force.

9) LIMITATIONS OF MASTER PLAN

✓ The Master Plan is being formulated on certain assumptions related to the present administrative set up, growth rates, household size, current policies and guidelines with respect to urban development, transportation planning, environment etc . This Master Plan makes a sincere effort to capture the current policies in force for various subjects. However, the changes in such policies and its implications after the completion of this exercise will be beyond this master plan. This Master Plan has projected the population for 2031 based on the previous decade's growth rate and trend. Therefore, any major policy change, decisions impacting the economic and physical growth of the state, region and the city may impact these projections. Such changes cannot be foreseen by the Master Plan.

✓ This Master Plan seeks to frame policy and proposals based on the existing jurisdiction of BMA, expecting that all other authorities will follow its proposals and regulations accordingly. It is

expected that the various authorities concerned would align their plans, projects, administrative and institutional arrangements and coordination and integration mechanisms with BMA and this Master Plan, keeping in view the overall development and management of the city. This Master Plan has made use of the existing secondary data and there may be some data that would have changed in due course of time and may continue to do so till the time the Master Plan is finally notified and the implementation commences. This Master Plan needs to be taken as a guiding plan and for implementation aspect, specific studies and actions may need to be taken at that point of time.

✓ The Revised Master Plan will make efforts to minimize non-confirming land uses, certain uses which are already developed such as industrial or commercial units in the residential areas, etc.

✓ The Master Plan will project infrastructure requirements such as public and semi-public uses and public utilities and designate certain land parcels for such purposes. While effort has been made to collect and collate and integrate as much sectoral data as possible, it is however the responsibility of the authorities concerned to acquire the land and develop those facilities.

✓ The proposals perceived by other key stakeholders working in the city beyond the Master Plan provisions should be treated as non-plan measures and Master Plan will not address such aspects.

✓ Success of Master Plan depends on peoples' will and willingness to adhere to certain disciplines in the use of land, road and public spaces. The level of civic awareness in general with a long term perspective and proactive effort from the Government agencies will help implement the plan effectively.
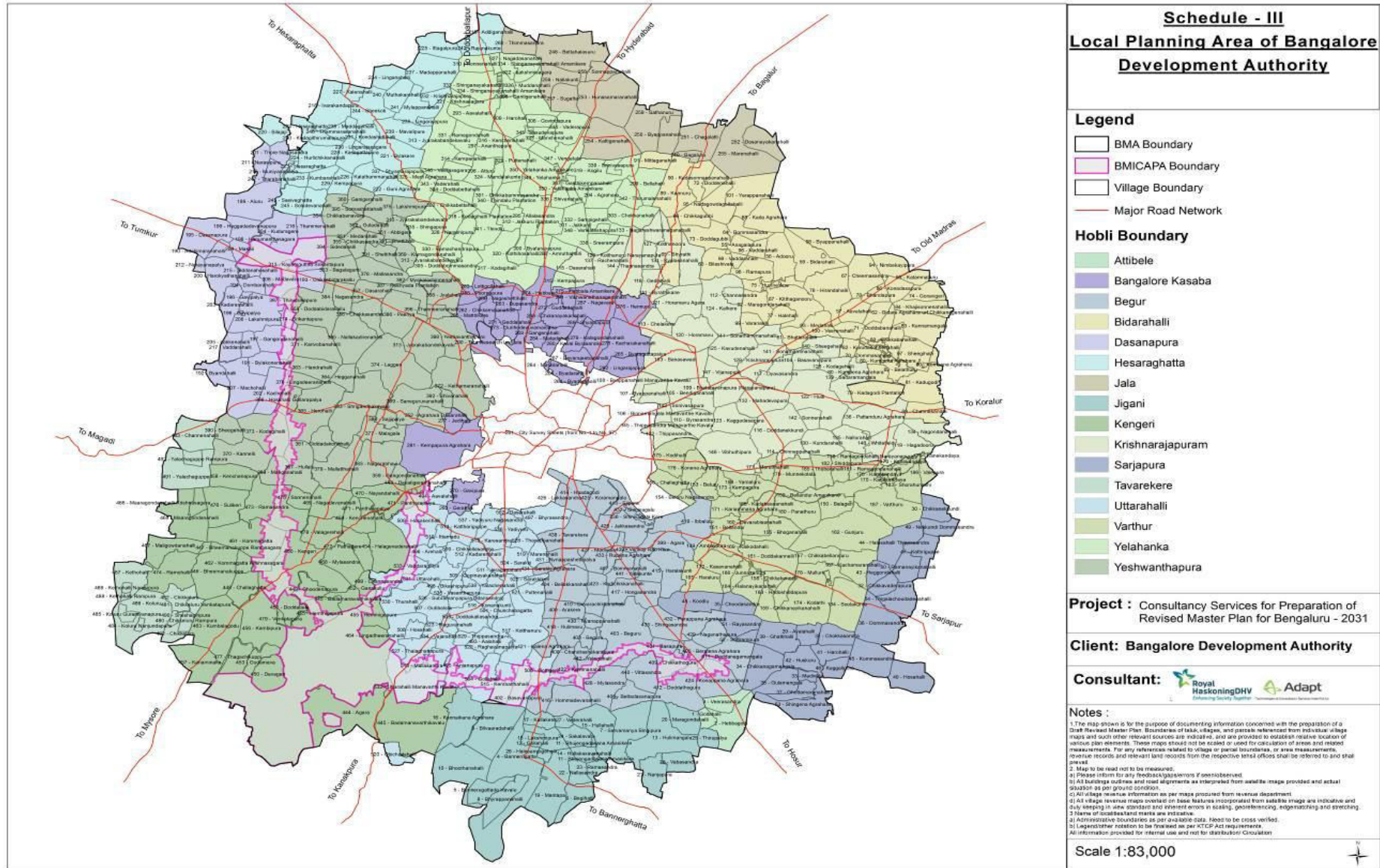
PART-2

BENGALURU REVISED MASTER PLAN 2031 (RMP-2031)

EXTENT OF LOCAL PLANNING AREA OF BENGALURU DEVELOPMENT AUTHORITY

1. The Notifications/ Government Orders issued by Government that define the Local Planning Area of Bengaluru Development Authority are as follows:

    *   Govt. Notification No. S.0.3446 dated 1st November 1965, declaring the Local Planning Area (LPA) for Bengaluru City.
    *   Govt. Notification No. HUD 496 TTP 83 dated 15th March 1984 declaring the Local Planning Area for the environs of Bengaluru.
    *   Govt. Notification No. HUD 167 MNJ 87 dated 1st March 1988 specifying the areas of BDA.
    *   Govt. Notification No. Na Aa Ee130 Bem ru Pra 2001 dated 20th   November 2001 declaring the LPA for BMICAPA.
    *   Govt. Notification No. UDD/ 118/ Bem Ru Pra 2003, dated 3rd March 2006 declaring the extent of Hoskote Local Planning Area
    *   Govt. Notification No. UDD 36N BMR 2009 dated 26th September 2012 specifying exclusion of 8 villages from LPA of BDA, which were overlapping with Hoskote LPA.

2. The Map showing the extent of Local Planning Area of Bengaluru Development Authority is given in the enclosed figure.

Schedule - III
Local Planning Area of Bangalore
Development Authority

Legend

☐	BMA Boundary
☐	BMICAPA Boundary
☐	Village Boundary
—	Major Road Network

Hobli Boundary

☐	Attibele
☐	Bangalore Kasaba
☐	Begur
☐	Bidarahalli
☐	Dasanapura
☐	Hesaraghatta
☐	Jala
☐	Jigani
☐	Kengeri
☐	Krishnarajapuram
☐	Sarjapura
☐	Tavarekere
☐	Uttarahalli
☐	Varthur
☐	Yelahanka
☐	Yeshwanthapura

Project : Consultancy Services for Preparation of Revised Master Plan for Bengaluru - 2031

Client: Bangalore Development Authority

Consultant: Royal HaskoningDHV   Adapt

Notes :

1. The map shown is for the purpose of documenting information concerned with the preparation of a Draft Revised Master Plan. Boundaries of taluk, villages, and parcels referenced from individual village maps and such other relevant sources are indicative, and are provided to establish relative location of various plan elements. These maps should not be scaled or used for calculation of areas and related measurements. For any references related to village or parcel boundaries, or area measurements, revenue records and relevant land records from the respective tehsil offices shall be referred to and shall prevail.
2. Map to be read not to be measured.
a) Please inform for any feedback/gaps/errors if seen/observed.
b) All buildings outlines and road alignments are interpreted from satellite image provided and actual situation as per ground condition.
c) All village revenue information as per maps procured from revenue department.
d) All village revenue maps overlaid on base features incorporated from satellite image and is indicative and duly keeping in view standard and inherent errors in scaling, georeferencing, edgematching and stretching.
3 Name of localities/land marks are indicative.
a) Administrative boundaries as per available data. Need to be cross verified.
b) Legend/other notation to be finalised as per KTCP Act requirements.
All information provided for internal use and not for distribution/ Circulation

Scale 1:83,000

PART-3

REVISED MASTER PLAN 2031 FOR BENGALURU (RMP-2031)

POPULATION PROJECTIONS

1. Bengaluru, a Multifunctional Metropolitan City is the capital of the State of Karnataka and is the fifth largest urban centre in India with population of Municipal Area (BBMP) touching 8.5 million (Census 2011). Around 14.60% of the State's population resides in Bengaluru within 0.64% of land share. Bengaluru contributes around 1.9% to India's GDP and contributed around 33% in year 2012-2013 to the State GSDP (Economic Census 2013-14).

2. Bengaluru, the largest urban metropolis in Karnataka, has witnessed 42% growth rate in population during the decade 2001-2011, which has been the highest in Urban India. The Bengaluru Metropolitan Area (BMA) is spread over an area of about 1294 sqkm which comprises Local Planning area of Bengaluru Development Authority (BDA) and part of local planning area of Bengaluru Mysore Infrastructure Corridor Area Planning Authority (BMICAPA). BMA includes Bruhat Bengaluru Mahanagara Palike(BBMP) with a population of ~85 Lakhs and 251 villages having ~5 lakh population. Thus BMA had ~90 lakh population in the year 2011. BBMP which came into existence in the year 2007 admeasures ~ 710 sq. km, falls within BMA, and currently comprises 198 wards.

3. Bengaluru, due to its prominent position in the region is continuously witnessing challenges in planning & urban management of the metropolis. To achieve coordinated development of city, the BDA is preparing Revised Master Plan for Bengaluru – 2031. The Projected population is the base for preparation /revision of any master plan and so is the case with RMP – 2031.

4. The population size gives an indication of the overall dimension of the physical environment and provides a basic yardstick for the estimation of space/land needs for various categories of land use, in any metropolitan area especially for the land and infrastructure requirements. It also assists in determining the space needed for recreation, schools, and other community facilities for all segments of population..

5. The analysis of census information indicates that the Bengaluru Urban Agglomeration (BUA) has experienced a steady increase in its population from 1,63,091 in 1901 to 84,95,492 in 2011, thus recording an exorbitant growth of 5109% during eleven decades. Figure 1 below depicts the growth trend for the period of 1901-2011(Figure 1).

Figure 1: BUA Population Trend (1901-2011)
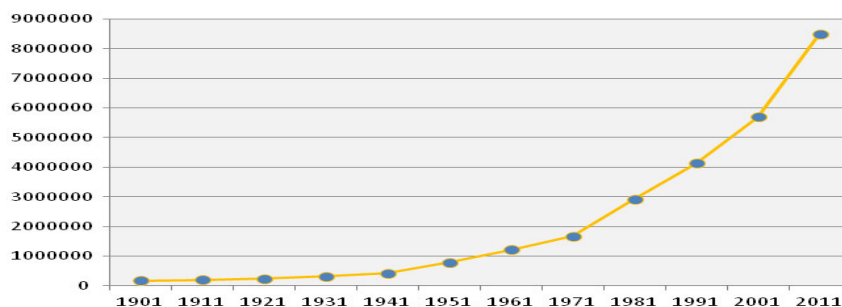
Source: Census of India Handbooks

6. Employment potential, amenable climate and availability of infrastructure facilities are the major to reasons for such steady increase of population in the city. The population growth pattern of Bengaluru Urban Agglomeration during 1901-2011(Figure 2) indicates that it has followed the bimodal pattern with two peaks and the highest peak was in 1951 and in 1981.

Figure 2: BUA Decadal Population Growth Trend
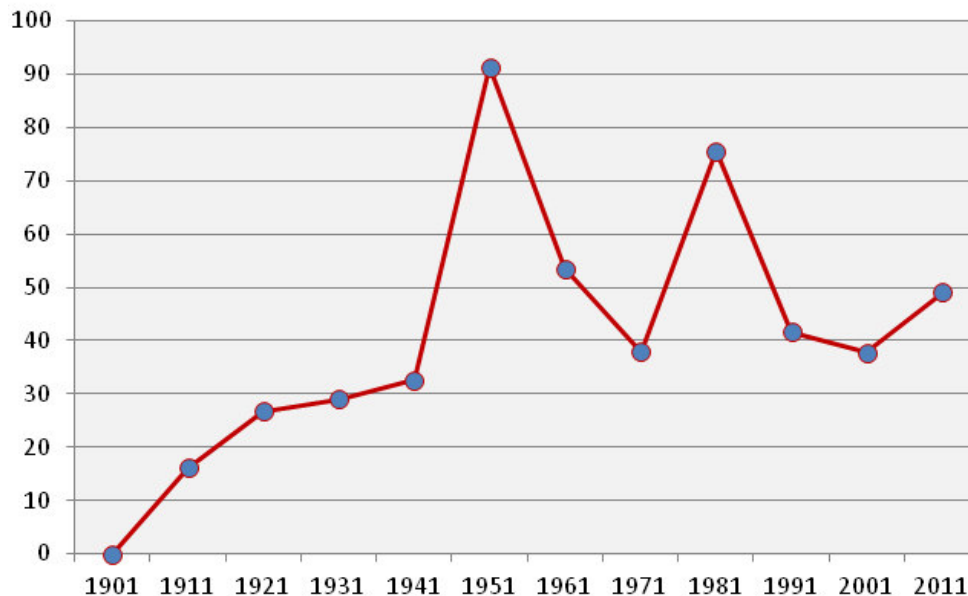
Source: Census of India Handbooks

7. Interestingly, the population growth graph of BUA has registered an upward swing from 2001, and if history repeats, the next peak would be either at 2021 or 2031 which may be either very steep or moderately steep. The occurrence of likely growth peak depends on several key factors such as:

    a) Future development policies evolved by the Government;
    b) Private sector's participation in the future growth process of Bengaluru;
    c) Growth and development of IT and its associated sectors which are responsible for rapid growth of Bengaluru since 1984; and
    d) Evolution/ Development of any other city within Karnataka taking pressure away from Bengaluru

8. Considering the number of changes in the administrative boundaries and Urban Agglomeration limits in the past century, it becomes imperative to analyse the city growth for the unified area. RMP 2031 being prepared for Bengaluru Metropolitan Area comprising BBMP area and 251 villages, the trend assessment has been carried out for the same. Five decades' data from 1971 to 2011 have been extracted using the census information to establish the trend in population growth for BMA.

9. The population growth analysis of the BMA with the available limited time series data from 1971 to 2011 (Table 1), recorded a 350% growth for the period and in absolute terms, it is equivalent to 7032959. The decadal growth trend has followed an exponential pattern by recording the highest growth during the decade 1971-81 with a crater and of course with some recovery during 2001-2011.

Table 1: Population Trends for BMA (~1309 Sq. Km) for Past Five Decades

Year	BBMP			251 villages in BMA			BMA		
	Population	GR%	CAGR	Population	GR%	CAGR	Population	GR%	CAGR
1971	1897826			113879			2011705		
1981	3100811	63.4	5.03%	157664	38.4	3.31%	3258475	62.0	4.94%
1991	4320297	39.3	3.37%	209500	32.9	2.88%	4529797	39.0	3.35%
2001	5887853	36.3	3.14%	302163	44.2	3.73%	6190016	36.7	3.17%
2011	8443675	43.4	3.67%	600989	98.9	7.12%	9044664	46.1	3.87%
Difference/ Avg.	**6545849**	**344.9**	3.80%	**487110**	**427.7**	4.26%	**7032959**	**349.6**	3.83%

Source: Census of India Handbooks

10. The population growth trend indicates that the villages in the BMA have outgrown with an average CAGR of 4.26% against BBMP (3.8%) and BMA (3.83%). Though BBMP has witnessed mixed trends in the assessment period, villages in the BMA have been on the positive growth rate for the entire period. However, due to larger influence of BBMP in the BMA, the BMA trend line is following that of the BBMP and is susceptible to change in future, considering the large quantum of lands available for development in these villages.

11. By looking at the past growth trend and also keeping in view the pros and cons of the future growth of BMA, the following three assumptions have been made on future population growth process in the BMA:

- Assumption 1: Population would increase steadily in a linear pattern;
- Assumption 2: Population would experience fluctuations in growth pattern; or
- Assumption 3: Population would reach saturation at some point in the future; and
- Assumption 4: Population would increase steadily in relation to Karnataka Urban Population

12. In order to realise these assumptions, the following statistical models have been applied to project the future population (year 2031) for BMA:

1. Linear Model   Assumption No.1
2. Quadratic Model   Assumption No.2
3. Cubic Model   Assumption No.2
4. Logistic Model   Assumption No.3
5. Ratio Method   Assumption No 4

13. In addition to the above statistical methods demographic method using birth and death rate and migration rate has been computed. On the basis of recommendations of the Institute for Social and Economic Change, 'Ratio Method' also has been computed for the projection of BMA population by 2031.

14. Population projections for BMA based on different methods ranges from 1.18 crore to 2.47 crore (Table 2) for 2031. However, cubic method of population projections is found to be the best considering the efficiency level of 0.99991.

Table 2: Observed & Projected Population Range for BMA: 1971-2031 & R-square Values

Year	Observed Population	Projected Population					
		Linear	Quadratic	Cubic	Logistic	Component	Ratio Method
1971	20,11,705	16,06,086	21,22,126	20,05,643	21,24,304	NA	NA
1981	32,58,475	33,07,776	30,49,756	32,82,722	30,60,246	NA	NA
1991	45,29,797	50,09,467	44,93,426	44,93,426	44,08,554	NA	NA
2001	61,90,016	67,11,158	64,53,137	62,20,171	63,50,910	NA	NA
2011	90,44,664	84,12,848	89,28,889	90,45,372	91,49,045	97,99,641	90,44,664
2016		92,63,694	1,03,60,280	1,10,51,899	1,09,81,095	1,16,26,014	1,08,20,241
2021		1,01,14,539	1,19,20,682	1,35,51,445	1,31,80,004	1,49,14,377	1,29,44,387
2026		1,09,65,384	1,36,10,093	1,66,16,813	1,58,19,234	1,92,20,054	1,57,92,672
2031		1,18,16,230	1,54,28,515	2,03,20,805	1,89,86,956	2,47,38,038	1,92,67,695
R-square[1]		0.96436	0.99540	*0.99991*	0.99376	NA	

Source: District Census Hand Books for Historical Data (1971 to 2011) and RMP 2031 Analysis, 2015

15. Projection methodology and results were shared with the Department of Economics and Statistics, GoK and Institute for Social and Economic Change for independent review and confirmation. Both the agencies have confirmed that the BMA population could be in the range of 19 to 20 million by 2031. This forms the base for the related planning projections.

---

[1] R-squared = Explained variation / Total variation; R-squared is always between 0 and 1. a) 0 indicates that the model explains none of the variability of the response data around its mean and b) 1 indicates that the model explains all the variability of the response data around its mean. In general, the higher the R-squared, the better the model fits your data. However, there are important conditions for this guideline.

PART-4
BENGALURU REVISED MASTER PLAN 2031 (RMP-2031)

RATIONALIZATION OF JURISDICTIONS OF PLANNING DISTRICTS FOR RMP 2031

1. BDA has so far prepared four Master Plans for Bengaluru, in the past four decades. This highlights the constant effort to propose and regulate its development and growth. Following are the Four Master Plans that Bengaluru has witnessed so far:
   - Outline Development Plan (ODP) in 1976 - Date of approval of ODP 1976: 22/05/1976
   - Comprehensive Development Plan 1984 (CDP' 84)- Date of approval of CDP 1984: 12/10/1984
   - Comprehensive Development Plan 1995 (CDP'95) Date of approval of RCDP 2011: 05/01/1995
   - Revised Master Plan 2015 (RMP 2015)- Date of Approval of RMP 2015: 25.06.2007

2. The concept of Planning District was brought for the first time in the CDP 1984.

3. In the previous Plans for Bengaluru, the planning districts were created primarily for representation purposes or mapping convenience of the overall proposals of the Master Plan. It represented the Master Plan details at area level which otherwise would not be noticeable at the overall scale for the Bengaluru Metropolitan Area. The details like administrative boundaries (ward, zone, local body limits), cadastral information (revenue survey numbers), physical features (water bodies, drainage system, forests), Utilities (High Tension Electricity lines, Water Installations, Sewage Installations, etc) cannot be visualized at city level. Planning District being a subset of larger planning area provides for ease of reading Plan proposals and thereby better enforcement – the rationale used so far. It is noteworthy that the Planning district boundaries have no statutory functions.

4. There were 47 Planning Districts in Revised Master Plan 2015. They are classified in three rings Ring I, Ring II and Ring III. The planning districts of RMP 2015 are shown in the figure below:

LEGEND
I Ring: Planning Districts in Core Area
II Ring: Planning Districts in Developed Urban Areas
III Ring: Planning Districts in Urban Extension area in city outskirts
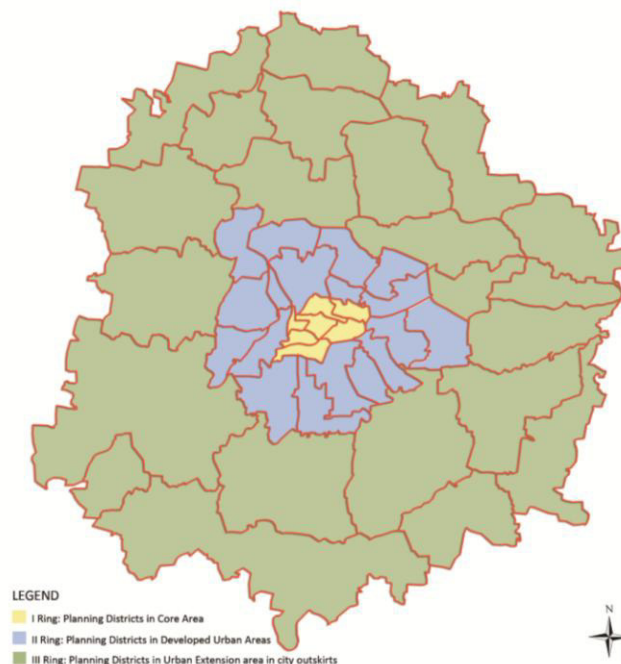
5. The RMP 2031 has now proposed 42 planning districts. The change in administrative boundaries (creation of BBMP in 2007 –same year in which RMP 2015 was approved), the desire to use Planning Districts as Planning tool and for the enforcement and implementation of plan proposals, are the reasons for change or revision and establishing the jurisdiction of planning districts for the Revised Master Plan 2031.

6. Parameters used for Rationalization of PD Boundaries for RMP 2031

Aspect	Parameter
Administrative Boundaries	BBMP Ward Boundary, Taluk Boundary, Hobli Boundary, Gram Panchayat Boundary
Population Considerations	Population Numbers, Population Growth Rate, Population Density
Physical Features (Man-made) & Other Criteria	Road Network (Arterial Roads), Airport Funnel Zones, Defence Area Zones, Metro Rail Network
Natural & Environmental Features	Forest Areas, Hills/ Hillocks, Lakes, T.G Halli Notification Area

7. The 42 planning districts proposed in the Revised Master Plan 2031 are shown in figure below.
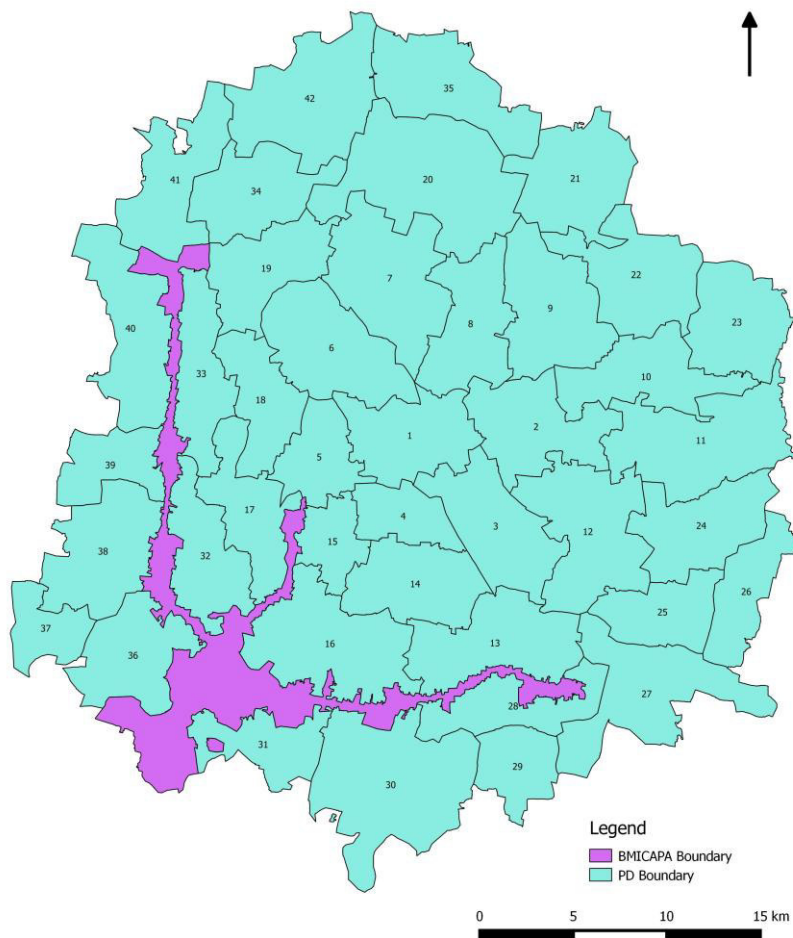
PART-5

REVISED MASTER PLAN BENGALURU -2031 (RMP-2031)

TRANSPORT SECTOR [PRESENT STATUS]

A. BACKGROUND

1. Traffic in Bengaluru has become a scourge and is only getting worse. Network speeds are dropping at an alarming rate as overcapacity of its junctions and links are being reached and traffic jams have become the order of the day. Being a victim of its own success, Bengaluru's traffic infrastructure has just not been able to keep pace with the fast growing IT industry Bengaluru is now famously known for. Today, home to more than 10 million people, the strained network is loaded with more than 90 lakh trips per day. BMTC operates more than 6000 buses and carries more than half these trips, but this is hardly enough and the rest of the traffic has simply overwhelmed the network.

Overall Transport Approach

2. At present, Bengaluru is experiencing huge economic losses due to traffic congestion. It is estimated that the fuel losses are to the tune of 2.8 lakh litres per hour (nearly 50 crore litres per year!) and yearly man hour lost is around 60 crore hours. In monetary terms, this translates to a loss of Rs. 3700 crore per year – Rs. 1350 due to loss of Fuel (at Rs. 27 per litre landed cost), and Rs. 2350 crore towards work hours lost. With the ever increasing congestion tightening its grip over Bengaluru, these figures are only increasing.

3. The resulting negative impact related to this situation, increased personalised vehicles and huge traffic congestion are also taking a toll on the citizens.

4. To understand traffic better and to respond to transport requirements of future more appropriately, for the very first time a transport model covering 500 zones has been developed.

5. Data collection has been focused on providing inputs to the development of the Model. The following lists of data were collected as part of the Master plan preparation process.
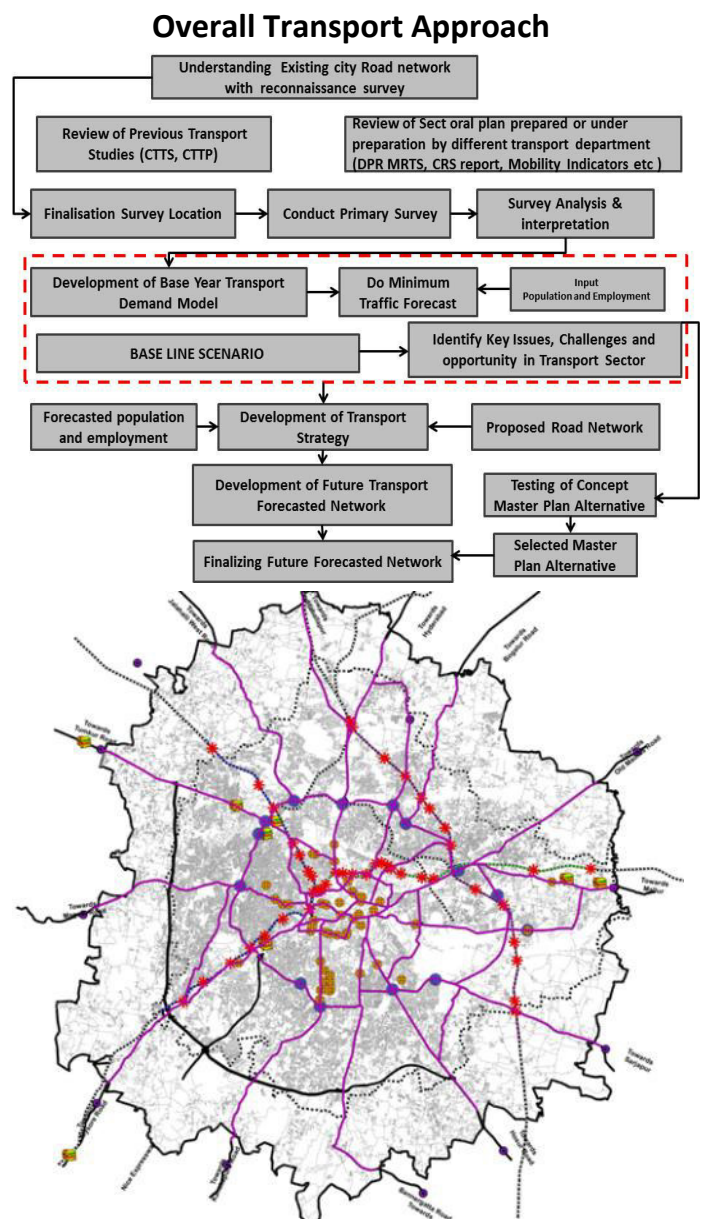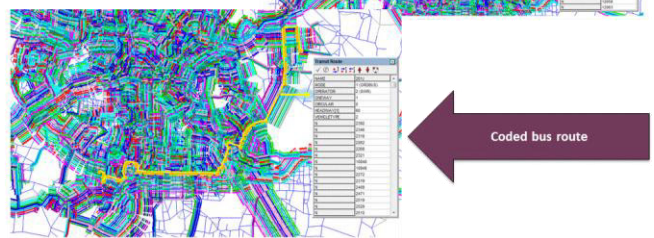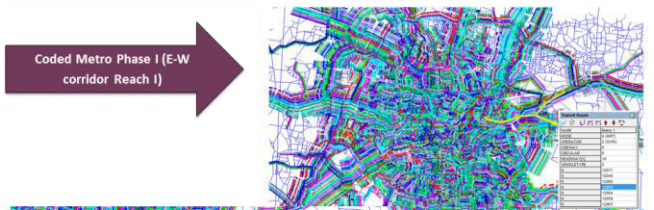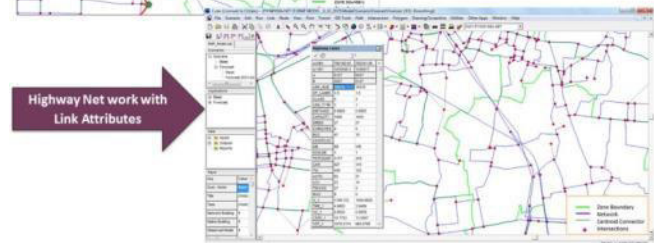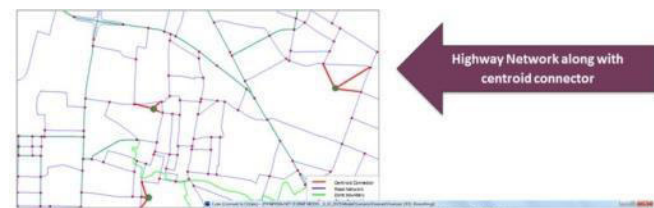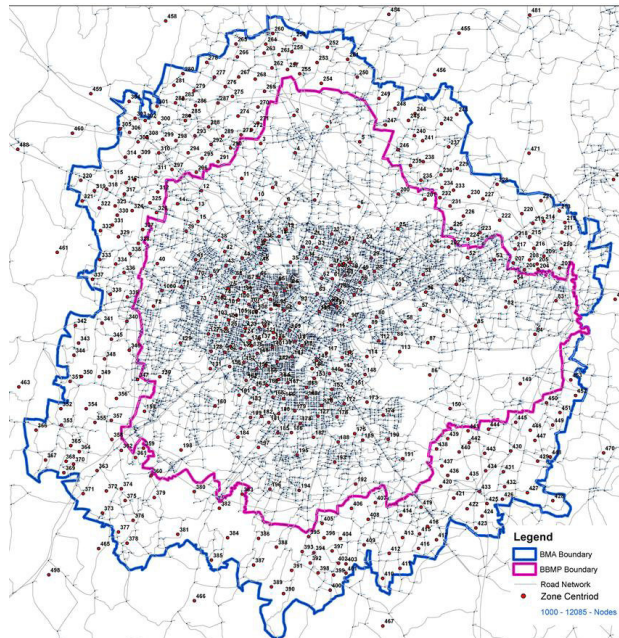
- Socio Economic Household Survey -10,130 samples
- Screen Lines/ Classified Volume counts- 45 Locations
- OD Surveys- 13 Location
- Speed and Delay Surveys – 375 km
- Road Network Inventory – 375 km
- Turning Volume Counts- 14 Locations
- Goods Focal /ICD/ CFS/ Transport Nagar Survey- 8 Locations

6. Apart from this, traffic data from surveillance camera feeds at 50 locations set up under BTRAC was also utilised. Secondary data from all agencies concerned was collected and detailed discussions were also held.

B. MODEL DEVELOPMENT FOR THE REVISION OF MASTER PLAN.

7. A state of the art transportation modelling suite (CUBE VOYAGER) has been employed for the modelling purpose. A very detailed road network was first prepared encompassing more than 15000 links with the help of data from the GIS team of the RMP. On this road network 2300 bus routes were meticulously coded. All the wards in the BBMP zones and the villages up to the BDA limit were considered as individual zones.

8. The model was extended to include the BMR as many transport solutions may include the BMR region as well.

9. The Origin and destination data was estimated from the earlier CTTS (2008) calibrated functions and further refined and brought up to date through a process called "Matrix estimation from Counts".

10. A conventional four stage model was calibrated for Bengaluru afresh, and validated across screen lines to prove that the input data is satisfactorily representing city travel. The model was calibrated over Four (4) modes, Cars and Taxis, Two Wheelers, Auto rickshaws and Public


Legend
- BMA Boundary
- BBMP Boundary
- Road Network
- Zone Centroid
- 1000 - 12085 - Nodes

Highway Network along with centroid connector

Highway Net work with Link Attributes

Coded Metro Phase I (E-W corridor Reach I)

Coded bus route

Transport. Trucks, MAV's LCV's and Bicycles where separately considered for the assignment. The model has been calibrated to represent the morning peak period – the journey to work period (the period used for network capacity analysis)

C. PRESENT SITUATION – A SNAPSHOT

11. In Bengaluru city with 11 million people (as estimated in 2015), travelling is getting more and more difficult as the city witnesses nearly 10 million trips a day. In the past decade, the city has nearly doubled, resulting in:

- Traffic Jams/ extreme congestion;
- Decline in journey speeds from 18 kmph (2008) to 11 kmph (2015) leading to severely overburdened Road Network, long commute times;
- Present trip rate at 0.9 per capita per day – approximately 90 lakh trips per day
- Mode share 52% trips on vehicular traffic and 48% on Public Transport (includes private buses)
- Absence of a clearly defined road network hierarchy ;
- Network congestion hampers bus operations significantly - Share of Public Transport dropping further;
- Growing use of personalised vehicles;
- Intensification of existing economic nodes leading to traffic congestion;
- Deficient Multimodal Integration;
- Movement of Freight/ Goods inside the city area;
- Intercity Bus Travel Movements disorganized, scattered all over the city;
- Non-Motorized Transport: Inadequate provision of footpaths and cycling facilities;
- Parking is disorganized in most parts of the city; and
- Air pollution and High noise levels
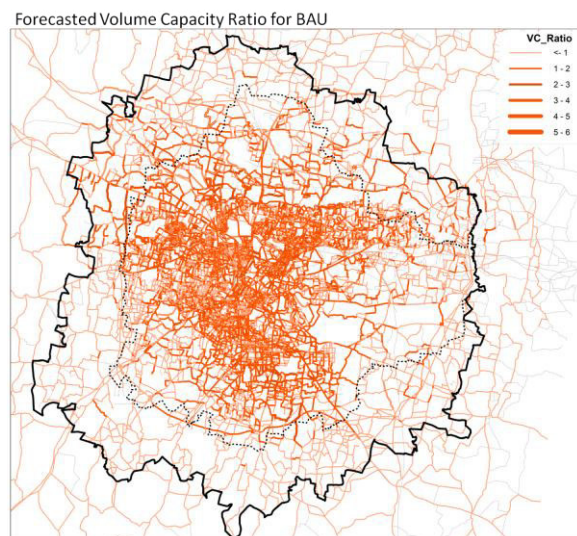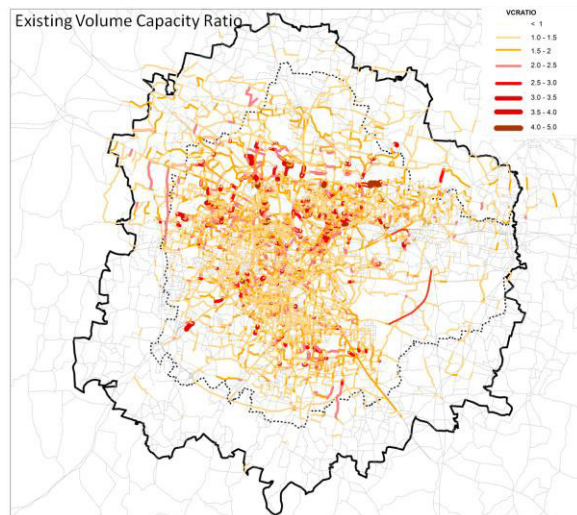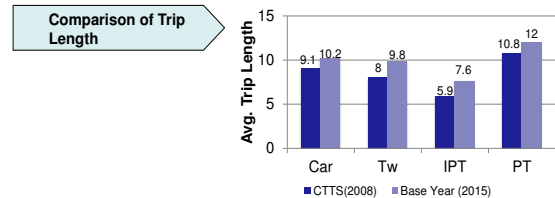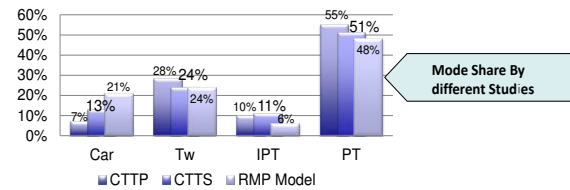
D. FORECASTING WITH THE TRANSPORT MODEL - BUSINESS AS USUAL SCENARIO.

12. The model was run for horizon year 2031 assuming a land use that would grow in line with

the growth trends observed today. It is assumed that the population would reach around 24 crores by 2031 in a 'Business as Usual' Scenario.

13. The Metro Phase 1 and phase 2 were included in the model. The peripheral ring road was included. The existing network was also improved to a limited extent – example the outer ring road was fully completed. Buses have been doubled.

14. The forecast for Business As Usual (BAU) scenario shows very high congestion. The following are the key observations:

- The Vehicular trips increase more than 3 times and the network is severely congested;
- Public Transport share to reduce substantially ;
- Bus frequency would reduce to less than half even with double the fleet;
- All roads will be operating at V/C ratio greater than 1;
- Network speed drops to 8 kmph. In the peak direction it is < 5kmph. A clearly non sustainable situation;
- The pollution levels from vehicular emission would increase 3 times;
- Doing nothing but believing that the Metro phase-II will solve Bengaluru's problem is not a solution
- *Clearly doing nothing - is not an option.*

E. TRANSPORT STRATEGY

15. Considering the current challenges that Bengaluru is facing and the Business as Usual forecasts which shows a totally unsustainable situation, a set of key priorities or principles have been devised that underpin the development of the transport plan.

16. The strategy seeks to address the **concerns of all segments of commuting population by emphasizing the pre-eminence of public transport and non-motorized modes of travel; adopting various elements of Travel Demand Management and integrating with the land use development scenarios. This is in line with the National Urban Transport Policy.**

17. The following measures are being considered in the preparation of the master plan.

- Improve the existing road network by developing a network structure and define the road hierarchy. Provide additional rings/radials wherever possible and consider urban road design as an important element
- Focus on providing more public transport targeting to carry 70% of trips of the city from the present 50%. Seriously consider more transport spends on provision of Metro/BRT/Monorails etc. Push for the Commuter rail system.
- To bring 20-25% of Planning Area under Transit Oriented Development
- Provide a freight movement plan with logistic hubs and warehouses interconnected with dedicated freight corridors
- Reorganize interstate bus and rail hubs.
- Consider that the Pedestrian is also a road user – provide comfortable/safe facilities for pedestrians.
- Re-establish the role of bicycles in Bengaluru and encourage/provide for them.

PART-6
REVISED MASTER PLAN FOR BENGALURU -2031 (RMP-2031)

WATER AND WASTE WATER

I. SOURCING WATER FOR BENGALURU

1. The revised Master Plan intends to provide reservations for various public infrastructure/ utilities and integrate plans prepared by various stakeholder departments. Water demand assessment was carried based on data gathered from existing secondary sources to provide for the reservations for public water infrastructural facilities in terms of GLSRs (Ground Level Service Reservoirs)These will be identified in consultation with BWSSB.

2. Located at 950 Mean Sea Level Bengaluru is only metropolitan city which is not abutting to any major surface water source (River). Bengaluru Water Supply and Sewerage Board (BWSSB) formed in 1964 under BWSSB Act, 1964 is mandated to provide water supply and sewage systems primarily within the BBMP (711 sqkm). However in the Bengaluru Metropolitan Area (admeasuring 1294 sqkm), in addition to BBMP, there are 51 Gram Panchayat's (with 251 villages having spatial extent of 583 sqkm) served by Panchayati Raj Engineering Department, (PRED, GoK). Large areas which are urbanised or in the process of urbanisation need to be covered. under the water supply system.

3. BBMP has a population of 8.4 Million (93% of BMA) whereas the rest of 251 villages together hold 0.7 million persons (7% of BMA). Thus BMA had 9.1 million persons residing as of 2011. The population projections for RMP 2031 suggests that population within BMA could in the range of 18 to 20 million by 2031, thereby, making Bengaluru the third most populous city in the country. It is estimated that the population distribution between BBMP and Villages is expected to change substantially in future.

4. At present BWSSB is withdrawing about 19 TMC of water (1470 MLD) from Cauvery to meet city's water demand. The Plan/ work is on for getting additional 10 TMC (775 MLD) of water as accorded by the Cauvery Tribunal to meet the water demand for BBMP area alone. Thus, altogether about 29 TMC (2250 MLD) of water is available for Bengaluru from Cauvery. Despitewater being available, the city is in short supply of water due to high level of UFW @ 46%, and limited network coverage in the city. It is expected that dependency on Ground Water will further increase in the already over exploited GW, this is particularly in villages within BMA.

5. Total gross domestic water demand for BMA has been pegged at 3920 MLD(~50 TMC) for the projected 20.3 million populations. The water demand has been established considering 135 LPCD net supply to the population and 30% for UFW which accounts to be 2745 MLD and 1175 MLD respectively. Non-domestic water demand for potable purposes has been established considering 45 lpcd for estimated work force (~11 Million) which is pegged at 495 MLD. Equal amount of non-potable water(495 MLD) has been considered for non-domestic sector to establish the total net non-domestic demand which amounts to 990 MLD. With 30% UFW added to supply of non-potable water, total non-domestic demand amounts to about 1420 MLD. Thus, total demand for domestic and non-domestic purposes have been established as 5340 MLD. A perennial source capable of meeting water demand till 2031 and beyond is required to be finalised. It is important to note that estimated demand may be reduced in long term by reducing

UFW to 15-20%, implementation of Dual Pipeline System, use of lakes for water sourcing, etc as discussed in Point 8. Water balance considering the usage of treated water has been prepared to meet the demand for domestic and non-domestic purposes considering the dual pipe line system.

6. Government of Karnataka constituted Expert Committee (2013) after working out the decade wise population, the short fall in water requirement, period of execution and cost have made following recommendations/ prioritised the projects:

➢ **Short Term proposals to meet the water demand upto 2021 (Shortfall 17.60 TMC)**

S.No.	Details	TMC
1	Reduction in unaccounted for water. The savings will improve supply in the local area.	48% to 16% - 4TMC
2	To get an additional 12.88 TMC of water from the river Cauvery within the frame work of the Cauvery Water Tribunal Award to be taken up in two Phase of 500mld each, one immediately and the other after 5 years.	2*6.44=12.88 TMC
3	Rejuvenation of Arkavathi catchment and diverting for the present about 100 mld (1.29 TMC) from the 'V' valley Sewage Treatment Plant to the Arkavathi catchment.	1.29TMC
4	Diversion of 10 TMC of water from Konganahole and Kakkattuhole to the Cauvery basin and draw 6.44 TMC to Bengaluru.	6.44 TMC
	Total	**24.61 TMC**

➢ **Mid – term proposals to meet the shortfall upto 2031 (cumulative shortfall 35.00 TMC)**

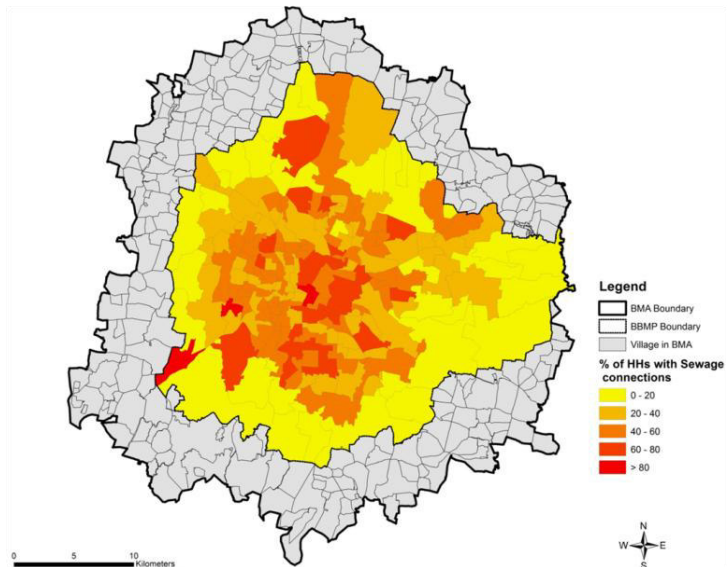| S.No.	Detail	TMC
1	Diversion of water from Ethinahole and other stream to the catchment of T.G. Halli .	10 TMC
2	Diversion of water from Linganamakki Reservoir to the T.G. Halli catchment.	10 TMC
3	Diversion of water from Hemavathi canal to the catchment of T.G. Halli (Optional)	5TMC
	Total	**25 TMC**

➢ **Long Term proposals upto 2051. (cumulative short fall 69.45 TMC)**

S.No.	Details	TMC
1	Diversion of water from the river Cauvery after construction of a reservoir near Mekedatu.-	6.44TMC
2	Further drawal of water from Linganamakki reservoir to Bengaluru.	20 TMC
3	Utilising Rain water that in and around Bengaluru.	10TMC
	Total	**36.44 TMC**

➢ Laying of Dual Pipeline for supply of potable & non – potable purposes separately in future developments to reduce demand for fresh water and Conservation of water and creating public awareness

II. WASTE WATER INFRASTRUCTURE DEMANDFOR BENGALURU- 2031

7. **Present Coverage**: The core area of Bengaluru City has already been provided with comprehensive sewerage system / Under Ground Drainage (UGD) system comprising 243 km trunk sewer network (Hebbal – 45 Km, K&C – 113 km and V Valley 85 km) and 3367 km smaller drains. Construction of 347 Km main and 2072 km of secondary drains work is in progress for providing sewerage system to 8 merged ULBs under KMRP. It is understood that BWSSB is currently preparing DPR for another 2580 km of sewage network and 12 STPs for the 110 villages merged with the corporation. The status in the rest of the 251 villages administered by Village Panchayats is unknown. Figure 1 presents the details of existing coverage in the BMA. Though, the new developments such as AMRUT/SMART Cities may help addressing the future needs of the city the details about the project proposals to be ascertained.

8. **Present Treatment:** As on 2015 there are 17 sewage treatment plants with an installed capacity of 721 MLD against the requirement of 980 MLD. However, only three-fourth of the installed capacity is being utilised as on today to treat the waste water of the city.

9. **Proposed Treatment Facilities by BWSSB:** In addition to the existing STPs, there are 11 STPs with an overall capacity of 339 MLD are under construction and another 8 STPs with overall capacity of 550 are under tendering process. To cater demand for 2049, BWSSB has proposed to construct another 207 MLD capacity of STPs at 16 locations. On overall about 1817 MLD of treatment plants has been proposed to be available for treatment of sewage water.

Table 3: Sewage Treatment Infrastructure Gaps for Domestic Sector

S.No	Head	Units	2011	2016	2021	2026	2031
1	Population	No.,	90,44,664	11071055	13551445	16594465	20320805
2	Water Supply @ 135 LPCD	MLD	1221	1495	1829	2240	2743
3	Sewage @ 80% of Water Supply	MLD	977	1196	1464	1792	2195
4	Treatment Capacity	MLD	721	721	1060	1610	1817
5	Gap in Treatment Infra	MLD	256	475	404	182	378

Source: BWSSB and RMP 2031 Analysis

III. Water Balance:

10. Figure below presents the envisaged water balance in the BMA (considering 20.3 millionpopulation, dual pipe line system and establishing demand for potable and non-potable purposes in the domestic and non-domestic sectors). The water balance is based on the assumption of 30% UFW. Reduction in UFW could further minimise the overall demand for water.

Figure 3: Water Balance for Bengaluru for 2031
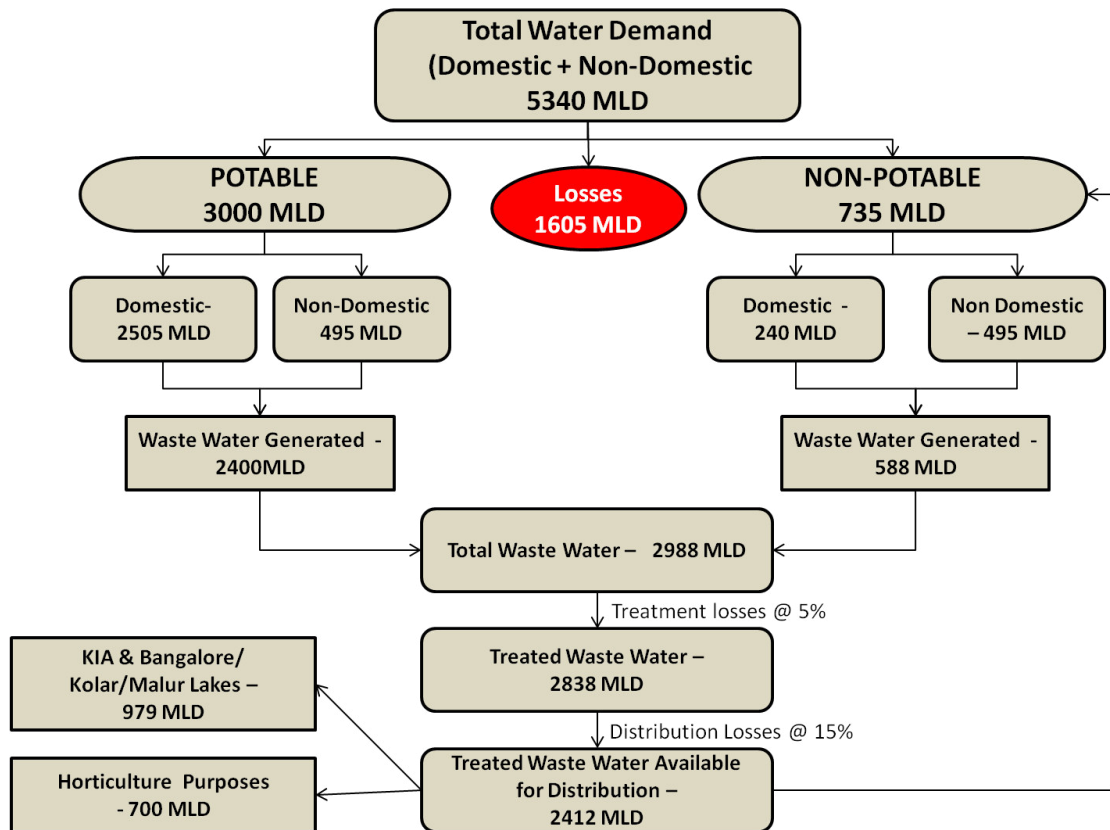
PART-7
REVISED MASTER PLAN FOR BENGALURU -2031 (RMP-2031)

SOLID WASTE MANAGEMENT

1. Background

In light of importance of solid waste management in the city of Bengaluru – which is currently under constant worry of safe disposal of solid waste, an attempt has been made to capture the prevailing solid waste management situation in the city and estimates have been made for future requirements considering the projected population until 2031.

Prima facie the objective of this assessment is to understand the land requirements for processing and disposal of solid waste in the city. An attempt has been made to evolve the present situation based on certain assumptions from the past studies that were made available by various government agencies including BBMP, Karnataka Urban Infrastructure Development and Finance Corporation Limited (KUIDFC) and Karnataka State Pollution Control Board (KSPCB), and statutory rules and guidelines published by Ministry of Urban Development, GoI and Ministry of Environment and Forest, GoI.

2. Brief on Present Scenario

In BBMP, solid waste management is decentralized. Zone wise offices are established to look after the collection and transportation of solid waste. As far as villages are concerned, there is no particular information available about the management pattern adopted. The overall process of waste management in the city of Bengaluru as per BBMP Waste Management Plan 2008 is presented in adjoining Figure.
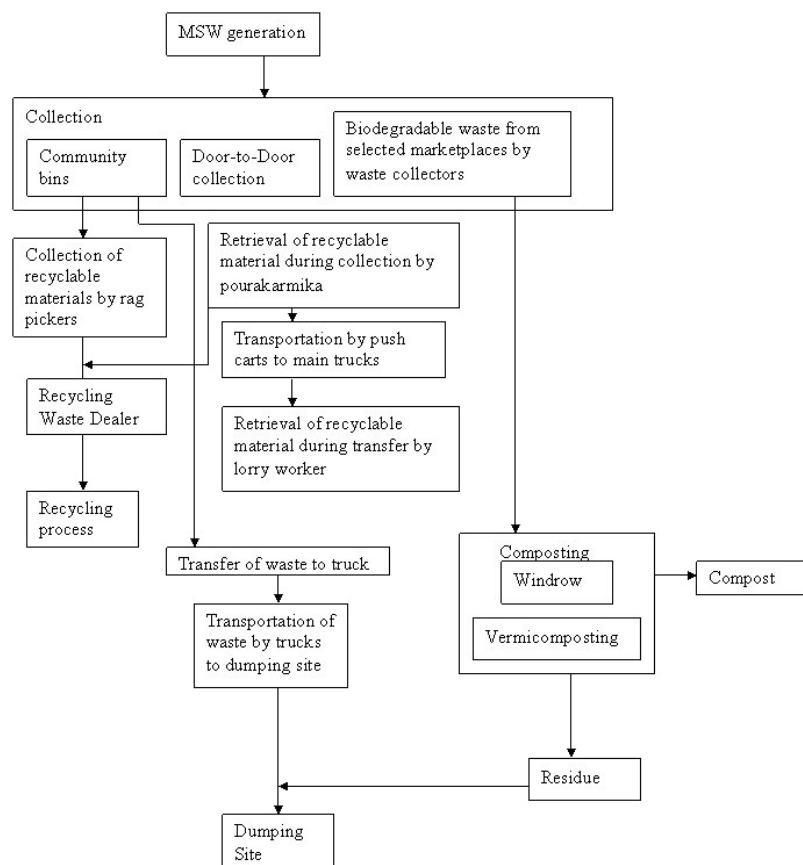
3. Waste Generation

BBMP had prepared Solid Waste Management Master Plan with the help of KUIDFC in the year 2009. Master plan has considered domestic waste, bulk generators and street sweeping and the total MSW generated in 2008 was estimated to be 5033 MT/day, which translate to 644 grams per capita per day (gpcd).

For the Revised Master Plan (RMP 2031) preparation, solid waste generation estimates have been made for the base year 2011 by taking the growth rate as considered in Solid waste master plan-2009. Thereafter, the solid waste generation projections for the next 20 yrs. have been made by considering the per capita waste generation rate (gpcd) @1.3% growth per annum. It is estimated that by 2031 the per capita waste generation rate would increase from 644 gcpd (2008) to 905gcpd. As per the estimates about 7826 MT (2015) of waste per day is being generated in BMA at present and will increase to 18390 MT per day by 2031.

Table 1: Solid Waste Generation Estimates - 2031

| Year	Population Projection	Per capita waste generation rate (gpcd) @1.3% growth per annum	Total MSW Generation (MT/Day)#
2011	90,44,664	700	6331
2015	1,06,37,135	736	7826
2021	1,35,51,445	796	10787
2025	1,59,35,575	838	13354
2031	2,03,20,805	905	18390

Source: RMP 2031 estimates

gpcd – gram per capita per day

#Total MSW comprises of: Residential HH; Bulk waste generators; Street Sweeping

Land Requirement:

To understand the land requirements classification of waste plays major role. Though the present classification of waste suggests 58% waste is biodegradable (SWM Master plan 2009) it is safe to assume about 50% of waste would be under this category which amounts to about 9000 MT of waste. The rest of the 50% is expected to have recyclables and inerts.
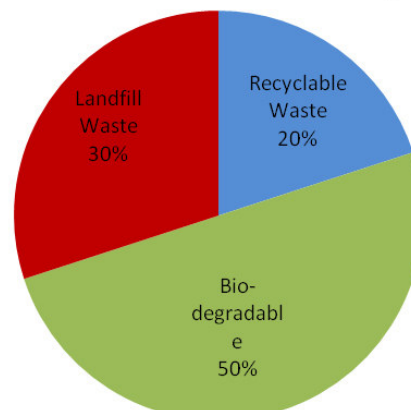
To estimate the landfill requirements about 30% of the total waste which amounts to about 5500 MTD has been considered. To add to this, 15% waste from process rejects if considered, estimates the

waste to be landfilled ~ 7000 MT/day. This quantity may vary and can be reduced if the treatment and processing of solid waste is done as per the ISWM hierarchy and in compliance with the SWM rules 2016.

At present there are no transfer stations established in the city. Considering the population size, each district would be a Class – I city by 2031. This necessitates each planning district to have adequate land for waste storage depots/DWCC or waste transfer stations and truck parking facilities, to be designed as per an integrated solid waste management plan to be prepared for the city.

Identification of Sites for Transfer Station/Processing/Landfill

One of the main objectives of the master plan is allocation of suitable land for SWM infrastructure facilities in accordance to the CPHEEO and SWM Rules 2016. The identification of land for waste management facilities will be carried out jointly with BBMP.

PART-8

REVISED MASTER PLAN 2031 FOR BENGALURU (RMP-2031)

ELECTRICITY/ POWER SUPPLY [PRESENT STATUS AND PROJECTIONS]

A. EXISTING SITUATION

1. With the rapid change and growth in Bengaluru demand for power supply is also ever growing. Bengaluru Electricity Supply Company Limited (BESCOM) is responsible for power distribution in eight districts of Karnataka including Bengaluru Urban District within which Bengaluru Metropolitan Area is located. BESCOM covers a total area of 41,092Sq.km with a population of over 207 lakhs (Census 2011), whereas Bengaluru Metropolitan Area (BMA) covers 1294 sqkm with 90 lakhs population (Census 2011). The company has 3 operating Zones – Bengaluru Metropolitan Area Zone (BMAZ), Bengaluru Rural Area Zone and Chitradurga Zone, 9 Circles, 28 Divisions, 119 Sub-divisions and 453 Section Offices. BMA and BESCOM BMAZ do not correspond to each other. BMA is covered by BESCOM BMAZ and BRAZ. BMAZ of BESCOM is divided into twelve divisions which includes – i) Indiranagar, ii) Shivajinagar, iii) Vidhanasoudha, iv) Hebbal, v) Malleshwaram, vi) Peenya, vii) H.S.R. Layout, viii) Jayanagar, ix) Koramangala, x) Kengeri, xi) Rajajinagar and xii) Rajajeshwarinagar.
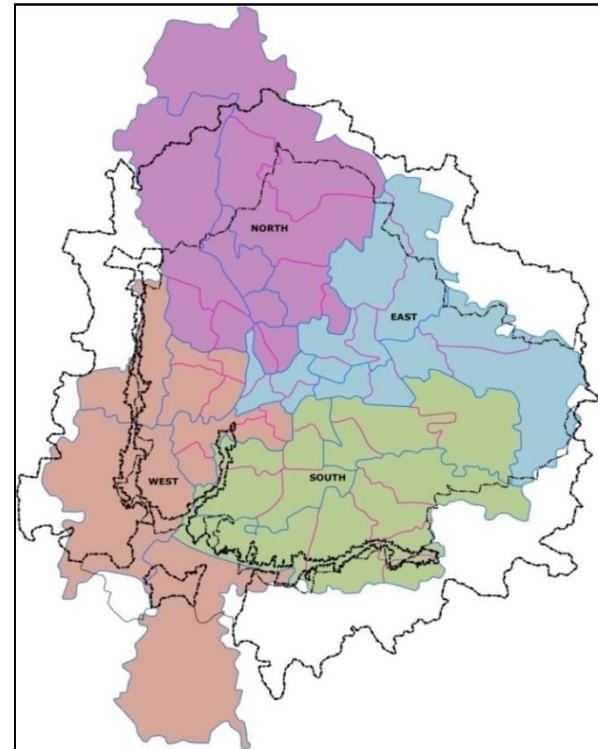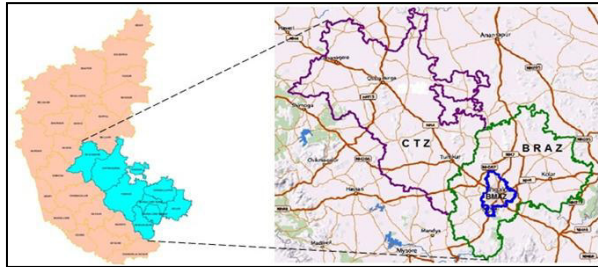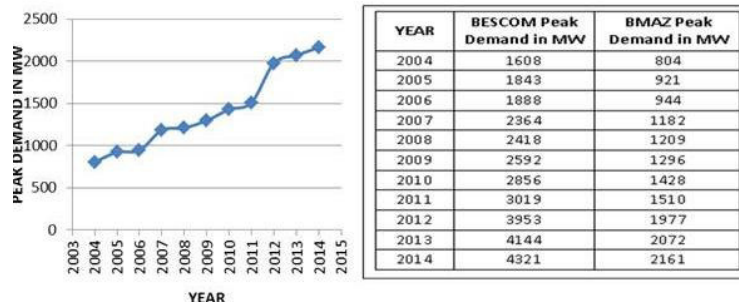
2. Bengaluru is powered by the same southern grid that supplies to the entire state. The sources include hydel, thermal and non-conventional sources like wind and sun. Karnataka state gets power from Central Generating Stations (CGS), hydel power stations and thermal power stations, within the state.

3. Karnataka Power Transmission Corporation Ltd (KPTCL) is in charge of transmitting power to different Electricity Supply Companies(ESCOMs), including BESCOM. Once it gets the power from KPTCL, BESCOM's local network supplies it to consumers. BESCOM is split into three Zones, namely BMAZ, BRAZ & CTAZ. The peak demand of BESCOM in 2014 is observed to be 4321 MW and the peak demand of BMA Zone is 2161MW. Further, it is noted that the share of BMA zone peak demand is 50% of the BESCOM peak. The peak demand for power in the BMAZ is about 2161 MU (2014 statistics) and the energy consumption for the BMAZ is identified as 12455 MU.

4. The peak demand has increased at CAGR of 11.6%. The Energy Demand has increase by 9.5%. The Per capita energy consumption has increased from 827 units in 2005 to 1219 units in 2014 with CAGR of 5%.

5. BESCOM BMAZ has over 45.26 lakhs consumers (as on March 2014) of which domestic and commercial constitutes 92% (80.2% and 11.8% respectively) whereas industrial and agricultural consumers are negligible. Consumers of electricity in BMA include low-tension (LT) consumers – domestic, commercial, agriculture, industries and miscellaneous categories and high tension (HT) consumers – residential apartments, industries, commercial, irrigation, water supply.

YEAR	BESCOM Peak Demand in MW	BMAZ Peak Demand in MW
2004	1608	804
2005	1843	921
2006	1888	944
2007	2364	1182
2008	2418	1209
2009	2592	1296
2010	2856	1428
2011	3019	1510
2012	3953	1977
2013	4144	2072
2014	4321	2161

DESCRIPTION	Growth Rate (2004 TO 2015)
Peak Demand	11.6%
Energy Demand	9.5%
Per Capita Consumption	4.9%

6. The power supply to the city of Bengaluru is made through four 400/220kV power stations located at Hoody, Nelmangala, Bidadi and Somanahalli. Further, electric supply to different parts of the city is made through 220/66kV sub stations, which are equally distributed to all parts of the city. The power supply to consumer is supplied after being stepped down voltage through substations; primarily at 11kV, however 33kV power is also supplied to bulk consumers/industries. BMAZ has 4 of 400/220kV Substations, 25 of 220/66kV Substations and 52 of 66/11kV Substations having total installed capacity of 13245 MVA. On transmission side, BMAZ has 9690.32 ckt km and 18006.94 ckt km of HT and LT lines route length. There are 2801 numbers of Distribution Transformers within BMAZ. Further, KPTCL has planned 18 sub-stationss of different capacities (400kV, 220kV, 66kV sub-stations) in BMA Zone of BESCOM.

7. The power quality in the BESCOM has been reasonably good, except some surges during the monsoon season due to lightning and short circuits caused by tree falling etc. However, the power availability still remains an area of concern due to dependence on hydel power especially during the summer season.

8. Some of the major challenges faced by the BMAZ that RMP 2031 intents to address are as following:
   o **Land Allocation for Sub-Stations**: Some of the distributions transformers are heavily overloaded leading to tripping of the feeder or failure of the transformer and consequent sudden loss of power supply to consumers. Thereby allocating land for sub-stations is being considered in adjoining areas of such distribution transformer by RMP 2031.
   o **Right of Way (RoW):** Most part of the city has narrow roads without adequate space for power corridors for overhead lines or even underground cables. Since right of way has not been planned, it is very difficult to obtain land from land owners for running the transmission lines. The RMP 2031 is contemplating multi-utility zones (MUZ) within the Cross Sections of Proposed Road Networks. In this MUZ, which are located within the RoW, transformers can be located without encroaching footpaths and carriage way.
   o **Transmission Line Corridor**: RMP 2031 is contemplating underground transmission lines.

B. ENERGY DEMAND/ FORECASTS SCENARIOS

9. The Projections of the Energy and Peak Demand have been carried out using three methods, namely i) Trend Analysis, ii) Growth Rate (CAGR) and iii) Per Capita based Projections. It is important to note here that first two methods are independent of population growth and uses historical data for future projections. The results have been compared with the forecasts by Power Research and Development Consultants Pvt. Ltd. (PRDC) and approved by KPTCL. PRDC recommended base case Energy and Peak Demand have been used recommend the projections for RMP 2031 and to calculate the Infrastructure projection for three different Scenarios with different populations.

10. It is observed that the projection based on Per Capita consumption for 24million population is in close proximity to the PRDC Projections which an increase 9.6% of Energy sales and Peak demand from current situation. Though the Master Plan 2031 is aimed at 20.3million population, it may be better to plan for 24million scenario (8952MW peak demand).

11. The Projection of the Renewable energies like the Solar and Biomass is estimated to check the availability of the resources in 2031 and to overcome the deficit of the power demand. Bengaluru has the potential to generate 14850 million units (assumed plant load factor is 0.18) of solar energy (roof top) and 313 million units of biomass energy (assumed plant load factor is 0.25).

PART-9

REVISED MASTER PLAN 2031 FOR BENGALURU

DEVELOPMENT SCENARIOS

Introduction

As Bengaluru grows in the long term, it is important to acknowledge and understand the existing spatial and economic structure, natural environment, growth trend and associated physical social infrastructure requirements to accommodate the future population (projected as 20 million) and development needs.

Also the resources needed to address the existing gaps and meet the future requirements need to be planned properly.

A Master Plan document is a spatio-policy framework to guide the future growth of the city and lays down the road map for future.

In order to facilitate the preparation of Revised Master Plan 2031, a study (Scenario Planning for future) has been undertaken, based on the base line data, growth & development trends, and reflections of public opinion gathered prior to this study, to understand where we are heading (what happens if we continue to grow as we have been so far – Business As Usual Case) and where we want to be (how we want to grow is reflected in three possible scenarios).

I) Business-as-Usual Case (BAU):

The Business-As-Usual (BAU) Case assumes that there will be no significant change in state's policies and priorities, economic activity or interventions by 2031. This premise may be summarised as follows: 1) The State Urban Development Policy will remain Bengaluru-centric, 2) the migration rate to the city will continue to be significant, 3) investments in Karnataka will continue to be Bengaluru-centric and 4) The Agriculture Zone will continue to remain in the current state. Also, that only addition to the existing transportation systems by 2031 will be the northern leg PRR and the completion of Metro Phase 1 and Phase 2

In the BAU Case, the city's population will be 24.7 million in 2031, approximately 58% of the urban population of Karnataka in 2031. The agriculture areas are likely to be urbanised in an unplanned manner because of developments being limited to BMA of BMR. This process will be exacerbated by the fact that the adjacent LPAs have proposing development interventions that are contiguous with the BMA border. The BAU Case is expected to not only encroach on agriculture land, but also impact surrounding village settlements in such a way that they become islands of poverty, with scarce infrastructure. Furthermore, given the current lack of plan enforcement and implementation, there is likely to be a mixed but haphazard development

along major transport corridors. The existing nodes are expected to increase their potential and all transport corridors are expected to be further commercialized (Refer Figure 1). Water will continue to be a dire need given the high population figures. In the absence of any major policy changes on the subjects of recycling, reuse and augmenting new water resources, the city will be heavily dependent on ground water for its survival.

The traffic forecast indicates 3 time increase in vehicular traffic then the present status, resulting in high traffic congestion, economic and environment losses. The Public Transport share is expected to decrease to 36% from the present 47% even if the bus fleet is doubled.

The BAU Case shows that the city is likely to grow in an uncontrolled manner, detrimental to the quality of life of all citizens if the metropolis is not managed pro-actively. It is therefore imperative that the current growth trajectory must be modified to steer and manage the growth of the city.

Figure1: Business-as-Usual Scenario for Bengaluru – 2031
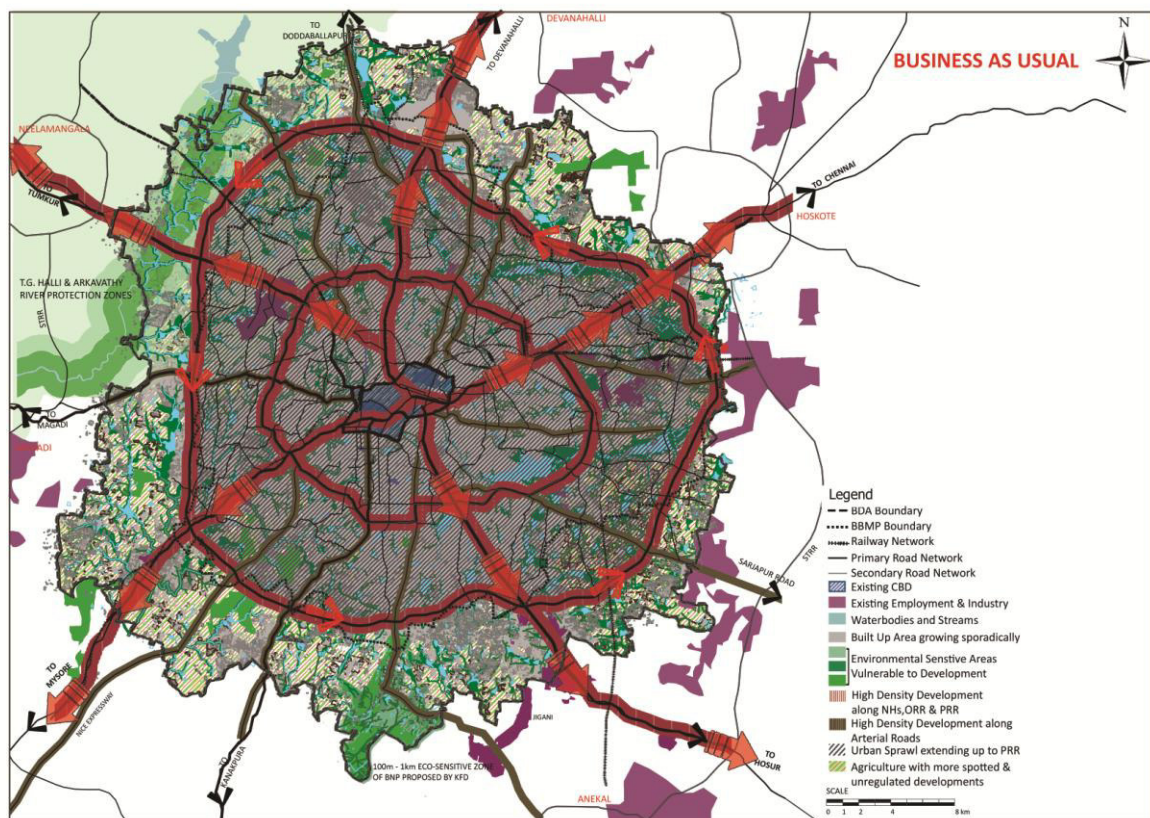
Figure 2: V/C Ratio and Traffic Hotspots identified in the Network for BAU
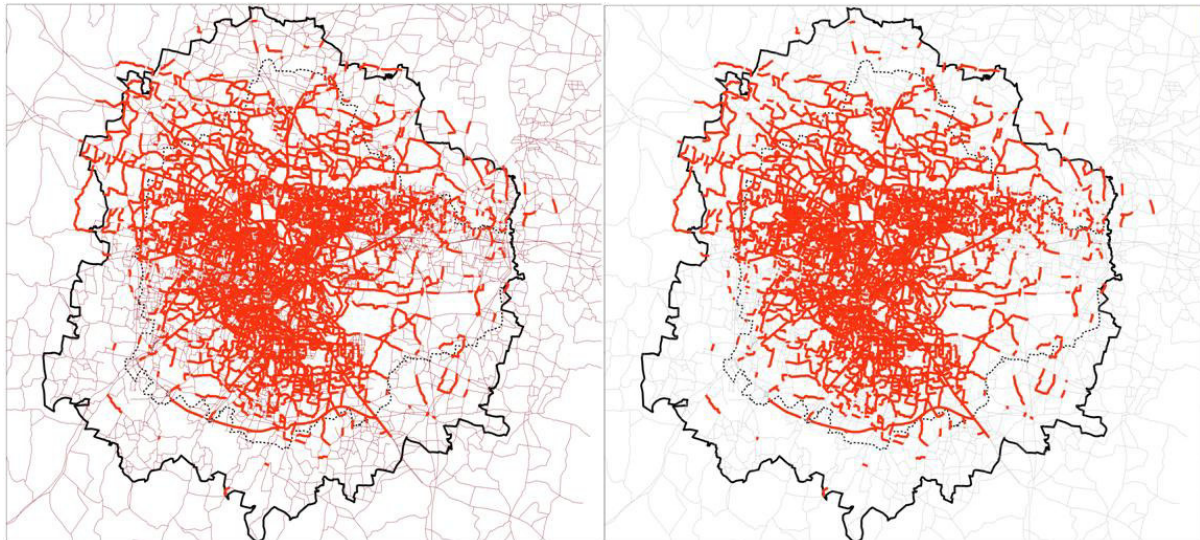
II) Objectives of formulating Options and Scenarios for the RMP 2031

The objectives of formulating scenarios for the future for the preparation of the RMP 2031 for Bengaluru are:

- To conceptualize the future development of Bengaluru in context of regional trends
- To examine the potential spatial growth directions
- To guide the preparation of detailed revised master plan

III)   Key Considerations for Scenario Generation for RMP 2031

The following are the key considerations for the conceptualization of options and future scenarios for the city:

1) Existing Developments and Situation
2) Regional Growth Direction
3) The spatial differentiation and associated growth and development characteristics as noticed in the different zones of the metropolitan area (see fig below):
   a) Core Area (inside ORR or the erstwhile Bengaluru Mahanagara Palike-BMP)
   b) Outer Core (ORR to BBMP Limits)
   c) Transition Area (251 Villages in the BMA)
4) Population projections for the city for 2031
   a) Constraints for development: These are environmental constraints and are therefore viewed as positive:- namely Topography and Natural Features in the City,
5) In addition, the growth scenarios adopt following critical 'non-negotiables'
   a) Circulation Network (Road Network and Commuter Rail System) with focus on public transport system

b) Green networks as consistent with the city's topography (Lakes & Valleys, Forests, Eco-Sensitive Zones).

c) Promotion of Public Transport – as per National Urban Transport Policy

d) Provision of Affordable Housing – as per Housing for All Policy

Spatial Zones

Circulation Pattern

Green Network
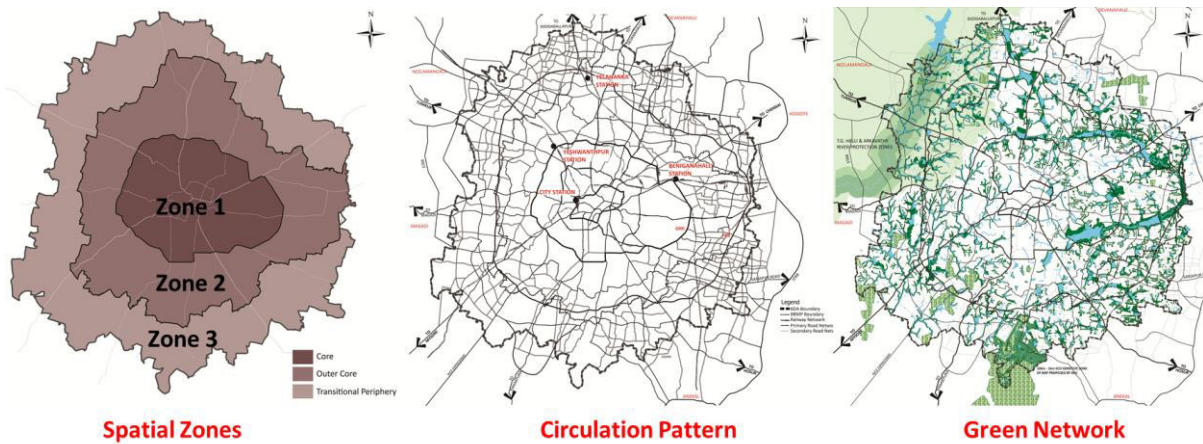
IV) Scenarios for the Future (for Preparation of RMP 2031):

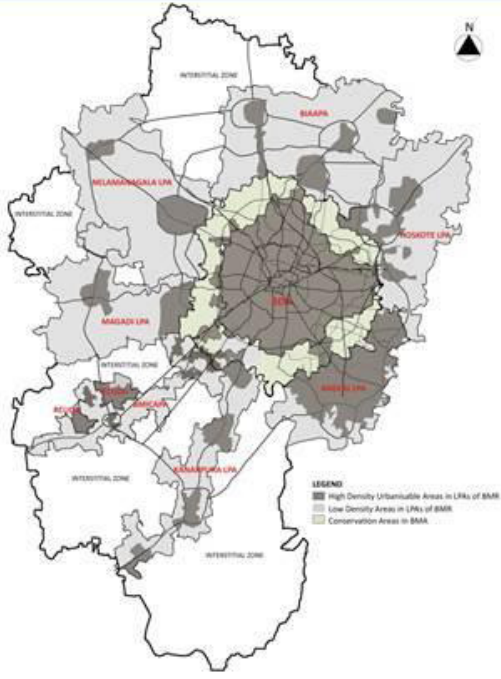Deriving from the above key considerations and the non-negotiable factors, the following three scenarios are outlined:

SCENARIO – 1: CONTAINMENT

SCENARIO – 2: CORRIDOR DEVELOPMENT

SCENARIO – 3: DIFFERENTIAL

Option 1: Containment Scenario (Low Growth)

- Development within present conurbation.
- Limiting population to 15.4 million.
- Water demand met by River Cauvery
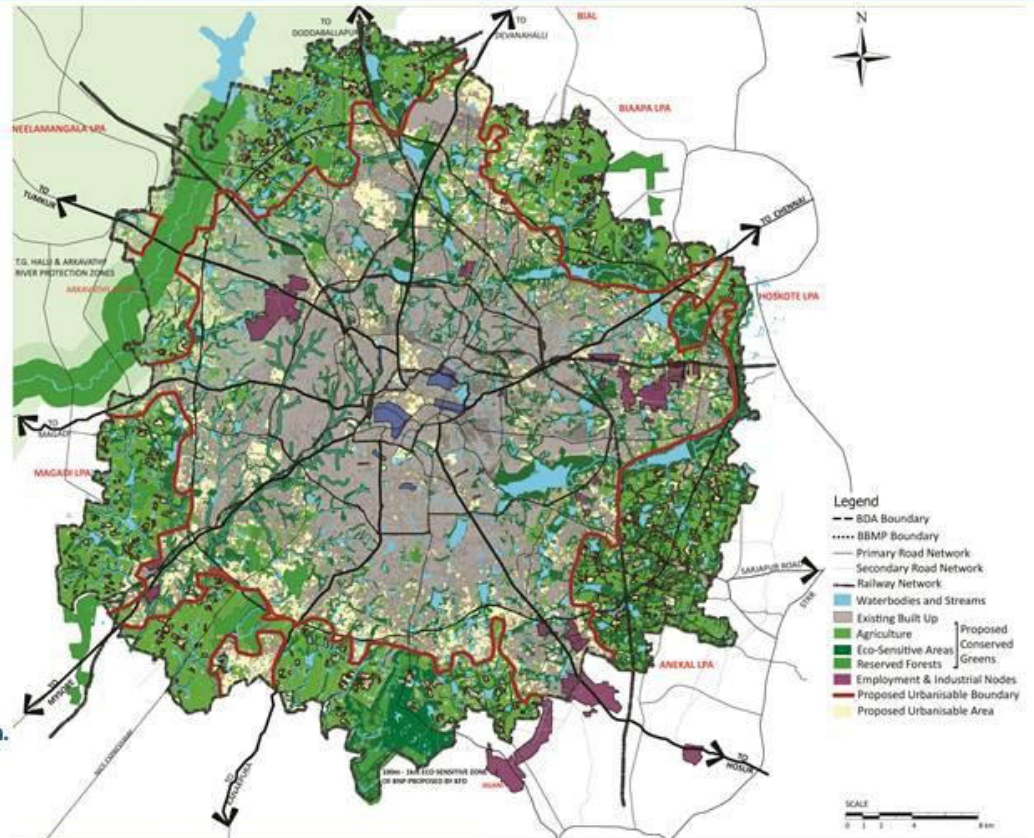
- Population = 15.4 million
- Transport = 18.5 million trips
  - PT share = 66%
    - Metro (New)= 195km
    - LRT/Monorail = 48 km
    - BRT/ EBRT= 79 km
- Solid Waste = ~14025 MTD
- Power = 5890 MW (Peak)

# Option 2: Corridor Driven Scenario (High Growth)
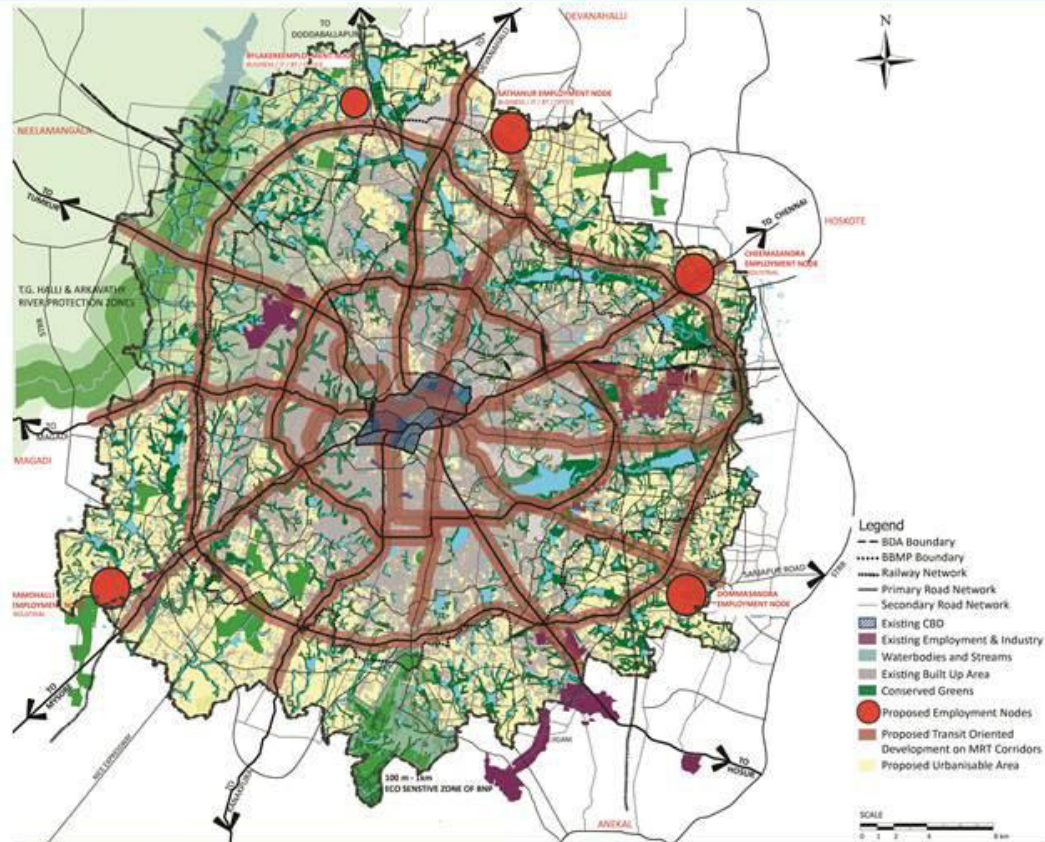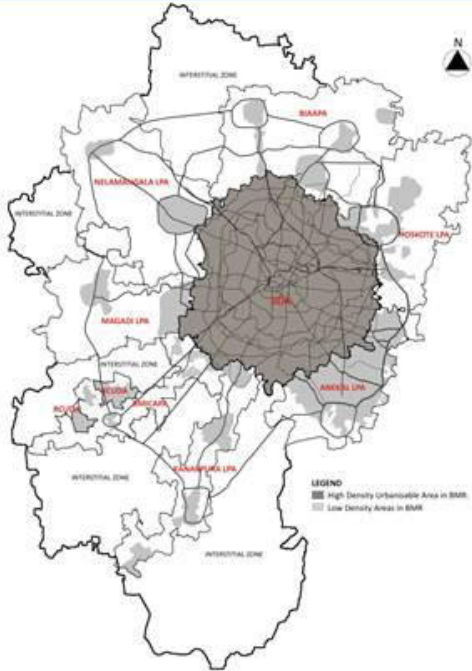
- Corridor-driven development
- Major growth in BMA
- Economic activities focused in BMA.
- Transit-Oriented Development (TOD) on all radials and rings
- Other perennial water sources required apart from Cauvery

- Population = 24.7 million
- Transport = 29.68 million trips
  - PT share = 68%
    - Metro (New)= 148 km
    - LRT/Monorail = 229 km
    - BRT/ EBRT = 124 km
- Solid Waste = ~22000 MTD
- Power = 8825 MW (Peak)

Differential Strategy Scenario (Optimal Growth)
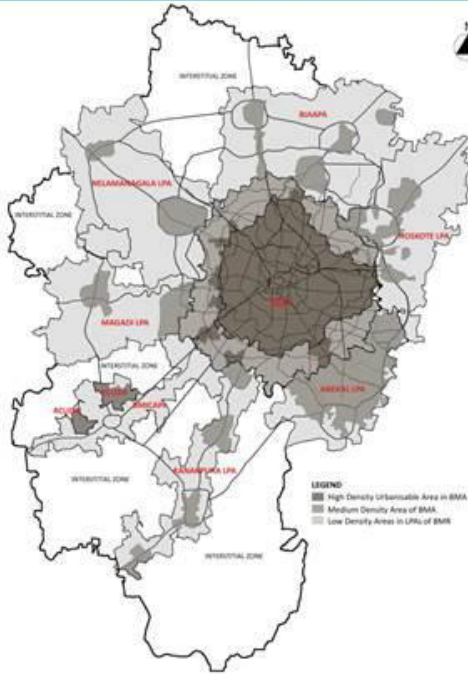
- Optimal growth in the BMA
- New employment centres in BMA to promote regional development
- Several regional parks (like Cubbon Park) across the city
- Restrictions on further commercialisation in the core area
- Water sources: Cauvery + recycled and reuse + RWH
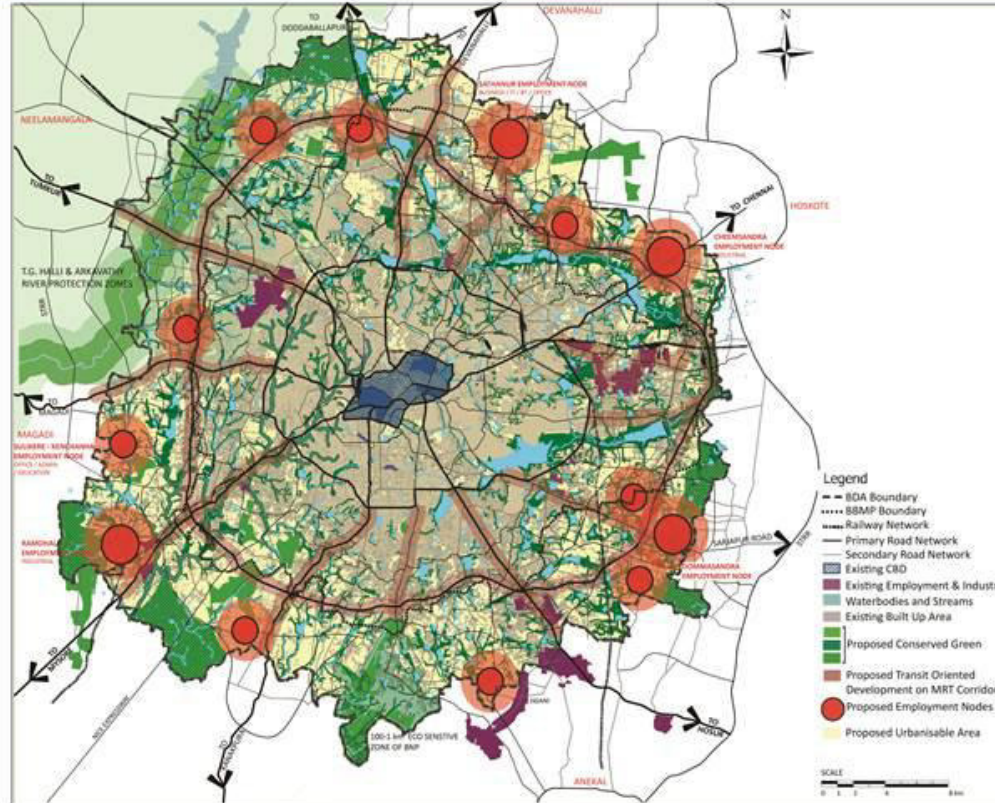
- Population = 20.3 million
- Transport = 24.38 million trips
  - PT share = 67%
    - Metro (New)= 211 km
    - LRT/ Monorail = 63 km
    - BRT/ EBRT = 227 km
- Solid Waste = ~18000 MTD
- Power = 7354 MW (Peak)

V) Merits and Limitations of the Options and Scenarios for the RMP 2031

The following table summarises the Merits and De-merits of each of the three scenarios:

Table 1: Merits and De-merits of Scenarios

Scenario	Merit	De-merit
Containment Scenario	✓ Additional water source not required. ✓ Agricultural Zone partly retained. ✓ Reduction in traffic congestion to a certain extent.	✓ Lower population accommodated ✓ Congestion and Economic and Fuel Loss reduced but not substantially ✓ Economic vitality of BMA distributed to BMR. ✓ Continual preservation of the Agriculture Zone will be difficult due to threat of urban sprawl and spotted developments.
Corridor Driven Scenario	✓ High-rise, high-density developments along corridors. ✓ Higher investment, increased economic opportunities. ✓ Development distributed in entire BMA, and land in agriculture belt not kept locked forcefully ignoring development demand.	✓ Higher population may not be sustainable ✓ Increased traffic congestion, leading to higher fuel losses ✓ Corridor-based development along and within ORR will burden the infrastructure. ✓ Highly insufficient water supply for 24.7 million population. ✓ Threat to environmentally sensitive areas due to high development pressure
Differential Strategy Scenario	✓ Optimal, equitable and sustainable distribution of economic activities and employment all across BMA, well-supported by infrastructure. ✓ Balanced regional development: BMR will develop at par with the BMA. ✓ Multiple public transport modes and greatly decreased traffic congestion. ✓ Green network consisting of lake and stream buffer zones, with suitable hierarchy of regional parks	✓ Availability of surface water. ✓ Need for streamlining of Policy and Institutional framework.

PART-10

REVISED MASTER PLAN 2031 FOR BENGALURU (RMP-2031)

TENTATIVE SCHEDULE FOR STAKEHOLDERS CONSULTATIONS

Sl. No.	Stakeholder	Tentative Period
1	**Bruhat Bengaluru Mahanagara Palike Council**	January/ February 2017
2	**Bengaluru Blueprint Vision Group**	January/ February 2017
3	**Consultation with Architects, Planners, NGOs, Urban Experts**	January First Week to February First Week
4	**Consultation with Industry Bodies**	January 4th Week/ February First Week
5	**Public Consultations Meeting at BBMP Zone Level**	January Second Week to Feb First Week

Please send your suggestions and feedback for the preparation of the Revised Master Plan 2031 to: suggestions.rmp2031@gmail.com

Note: This document is for information and reference purpose only. This document shall not be used for any other purpose.