Sunset near Mandadam Village

6 DEVELOPMENT STRATEGY AND PERSPECTIVE PLAN FOR CAPITAL REGION

Based on the regional context analysis, existing conditions analysis and the socioeconomic study; a regional growth strategy is developed and discussed with the stakeholders. This strategy will guide the broad land use requirements and physical planning catering to the projected population and economic growth by 2035 and Year X (beyond year 2050). This chapter also presents Perspective Plan illustrating the planning scenario for the region.

This chapter is divided into the following sub-sections:

1 Regional Growth Strategy
2 Draft PerspectivePlan 2050
3. Economic Development Strategy for Capital Region
4. Demographic Projections
5. Workforce Projections
6. Population distribution
7. Key Strategies and Concepts
8. Action Plans
9. The Way Forward

View of Thullur, Tadepalle , Mandadam and Mangalagiri Mandal from Kondapalli Fort

6.1 REGIONAL GROWTH STRATEGY

A long term direction is critical to accomplish the proposed Vision, Goals and Regional development strategies for the Capital Region. This long term direction is guided by key strategies and concept direction that will guide the transformation of the Capital City.

6.1.1 PERSPECTIVE DIRECTION

The analysis of the Capital Region lead the planners and stakeholders together to two conclusions. They are:

- The opportunities and the success of the new Capital City will indefinitely bring in tremendous pressure on it's developments and infrastructure in the long run. Hence, the Capital City cannot function in isolation.
- The proposed Industrial Corridor, Port development, National Waterway and other upcoming projects will change the dynamics of the entire State and the Capital Region to a large extent.

Anticipating the afore mentioned scenario and processing the inherent strengths of the existing cities, the proposed structure for the Capital region is radial corridor development. Key aspects are as follows:

- The Capital Region is divided into eight Planning Areas. A Central Planning Area with the Capital City and seven Planning Areas surrounding it.
- The Capital City together with Vijayawada and Mangalagiri will grow as Mega City, with Capital City and Vijayawada as twin Cities, contained within the Inner Ring Road. Each Planning area is identified with a key city that will function as a 'Regional Centre' with employment generation clusters.
- These Regional Centres are connected to the Capital City through seven development corridors/ economic growth corridors.
- The seven economic growth corridors and the respective Regional Centres are-

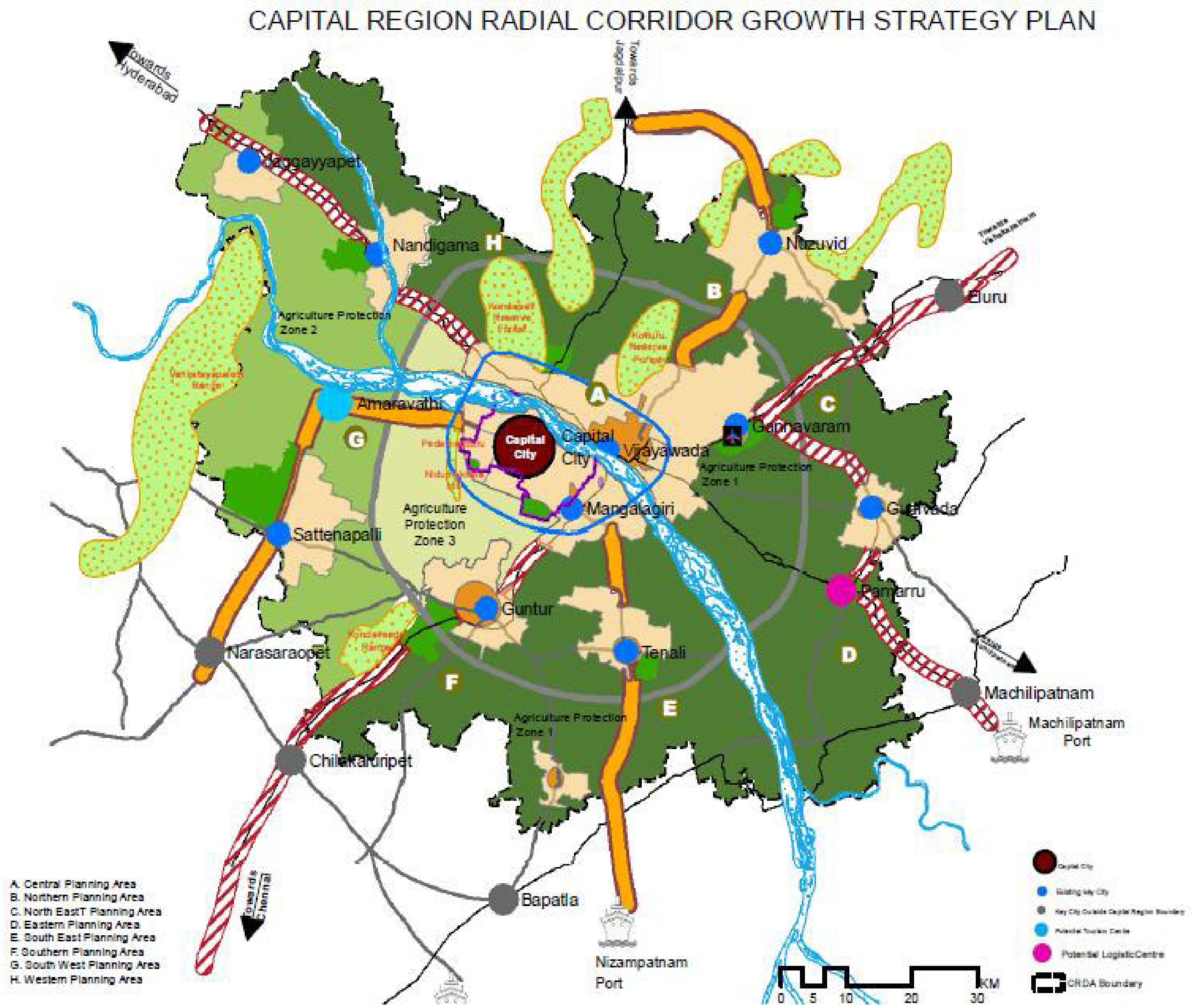


Fig.6.1 Capital Region _ Radial Corridor Growth Strategy Plan

-To Visakhapatnam (NH5) via Gannavaram
-To Machilipatnam (NH9) via Gudivada
-To Hyderabad via Nandigama
-To Chennai (NH5) via Guntur
-To Chennai (NH214A) via Tenali
-To Bangalore via Amaravathi and Sattenapalle
-To Jagdalpur via Nuzivid

- The Regional Centres are further connected to each other with the Outer Ring Road.
- The national High Speed Rail proposal has been integrated in the Capital Region and realigned as per the vision and goals of the region. Additional new connection to Bangalore has also been incorporated.
- The upcoming Dedicated Freight Corridor proposals from the East Coast Economic Corridor and the Delhi Vijayawada Industrial Corridor have been integrated as per the planned economic positioning of the Region.
- Water Logistic Hubs along the upcoming National waterway 4 are proposed.
- The prime fertile agricultural land and plantations are zoned as Agricultural Protection Zone 1. All agriculture land beyond the proposed Outer Ring Road on the westren side of the city and outside the urbanizable boundary of the regional centres is zoned for protecti on under Agricultural Protecti on Zone 2. Other than agricultural land zoning various implementati on strategies have been tested around the world to protect the farmlands from development pressure. A few case studies are illustrated in the Appendix secti on.

- Land is earmarked for the City's future expansion towards the City's west as agriculture Protection zone 3.

- The forests, hills, rivers , all water bodies and other natural features are protected under conservation areas.

6.1.2 STRATEGIES FOR CAPITAL REGION PERSPECTIVE PLAN

The regional growth strategy represents collective vision as to how the region will accommodate 13.8 million people and over 5.65 mi jobs that are expected to be generated in the Capital Region by the year 2050.

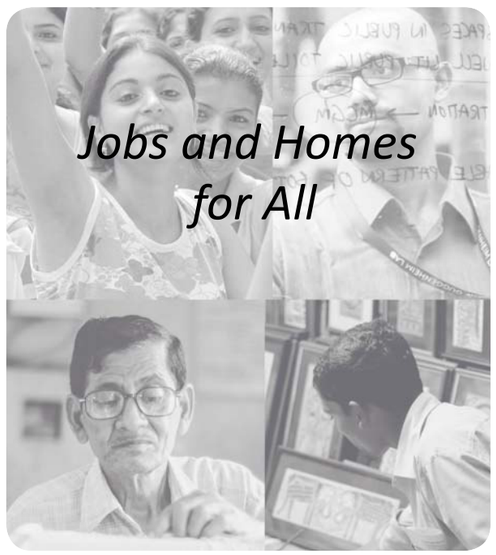
The Regional Growth Strategy focuses on translating the vision, goals and objectives established in the previous chapter into developable landuse parameters. These landuse parameters will guide future development of the Capital Region and support efficient provision of transportation, regional infrastructure and community services. It promotes cities that are socially, economically and environmentally healthy and makes efficient use of public facilities, services, land and other resources.

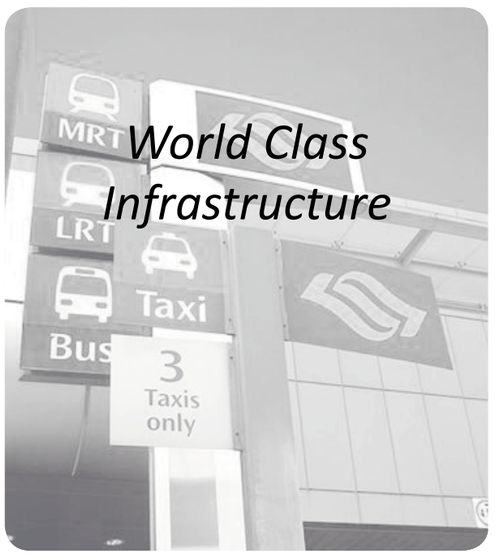
To position Capital Region as a growth centre with equal opportunity to all

- Establish the new capital city as Administrative and Financial hub with high tech business parks to attract people to new jobs.
- Identify Guntur, Tenali, Gannavaram, Gudivada, Nuzivid, Nandigama, Jaggayyapeta and Satt enapalle as Regional Centres with exclusive employment generating clusters.
- Allocate more high-value added agriculture and agro-based industries along the proposed Dedicated Freight Corridor; Near Gudivada, Tenali and Guntur.
- Strengthen the existing economic generators and inject various new game changers for a diverse economy. Key new sectors are electronics / hardware, logistics, leisure & film city and aerospace / defense.
- Create an attractive destination to live, work, play and create a place for all ages.
- Target minimum 50% affordable housing to cater to low and medium Income groups.
- Revitalize and redevelop existing settlements

To Promote regional Connectivity and Transit Oriented Development (TOD)

- Develop a comprehensive highway network, high capacity safe urban roads across the Region.
- Develop a world class airport in Gannavaram to meet the demand of the projected population; plan Gannavaram as a future metropolis.
- Reserve a corridor for the upcoming high speed rail and propose a terminus in the Capital City.
- Reserve Corridor for the Dedicated Freight Corridor along proposed East Coast Economic Corridor with logistic hubs at Gudivada, Vuyyuru and Tenali.
- Develop logistics hub at Tenali and Gannavaram along the proposed National Waterway 4; develop supporting road and industrial infrastructure along this corridor.
- Use extensive green corridors along the waterways to establish walking, jogging and bicycle routes in the city.





To effectively manage and improve infrastructure provision

- Integrate storm water drainage system with the existing canal and village tank network for flood management and recreation purposes.
- Establish state of art waste management and disposal systems across the city.
- Consolidate and reserve land for future infrastructure needs.
- Develop smart grid in the city for efficient management of power and energy.
- Encourage use of renewable energy.
- Give incentives for green building construction practices.
- Protect and integrate nature with parks and open spaces
- Employ innovative and resource efficient infrastructure for a healthy built environment
- Develop electronic database for reticulation infrastructure to facilitate the operation and maintenance of the network.

To preserve the enchanting nature and biodiversity

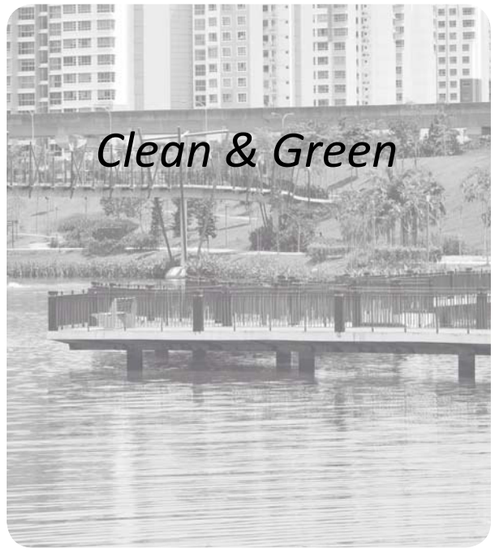
- Conserve the existing forest cover and hills under protected zones.
- Reserve high value agriculture land under agricultural protection zone.
- Create a seamless network of parks and greens by integrating the village ponds, natural features, canal network and water bodies.
- Develop a standard for hierarchy of park systems namely neighbourhood parks, Town Parks, and Regional Parks that are distributed across the region.
- Reserve most of the waterfront along Krishna river for public use.
- Mandate retaining the green network reserved in the Capital City Plan.
- Plan the capital city using water sustainable urban design guidelines.

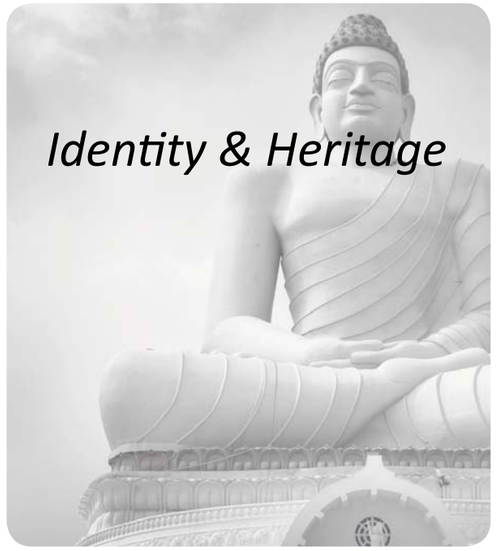
To offer affordable and quality living environment for all

- Create modern planned residential townships in the capital city.
- Provide a range of mixed residential choices especially near the growth centers.
- Revitalize and redevelop existing high and low density informal settlements .
- Ensure access to various amenities and open green space network.
- Plan residential developments close to employment centres where people make a competitive salary and have a plethora of options for entertainment and outdoor activities.

To preserve urban heritage, Promote Tourism and create waterfront identity

- Develop heritage and conservation strategy Plan for the Region.
- Incorporate a tourism circuit catering to various interests - Temple Tourism, Nature and Adventure Tourism.
- Create unique waterfront identity through the New Capital City.
- Tourism & theme based (Film City) developments to be undertaken to enhance the image of the region from an international perspective.
- Promote region's unique traditional arts and engage citizens in its promoting local lifestyle and culture.





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6.2 DRAFT PERSPECTIVE PLAN - 2050

Using the Future direction and the key development strategies, the Proposed Capital Region Perspective Plan is as follows:

A Mega City within the central planning area

- The proposal restructures the Capital Region into Eight Planning Areas by combining the existing mandal boundaries. Fig.6.8 illustrates the Planning Areas in detail.
- The Capital City, along with Vijayawada and Mangalagiri are expected to grow as twin cities and later emerge as a 'mega city'. The growth of the 'mega city' is contained within the inner ring road that passes through the Central Planning Area.
- Various business parks and Industrial Clusters will serve the employment needs within the Central Planning Area.

Development of Regional centres

- The proposal identifies an already established city/town as a Regional Centre within each of the seven surrounding planning areas.
- These Regional Centres will serve as commercial and employment nodes. The clustering of industries is discussed in detail in section "6.3.3 Economic Clusters and Preliminary Sectors". The Regional Centres will host regional level public facilities for health, educational, civic, religious, sports and recreation.
- These Regional Centres will be connected through suburban rail and an outer ring road. The proposed Regional Centres are Guntur, Tenali, Gudivada, Sattenapalle, Nandigama, Jaggayyapeta, Nuzivid and Gannavaram.
- The urban boundary for these Regional Centres is limited within the respective mandal boundaries.

Development Corridors

- The Regional Centres fall within a radius of 30 to 45km from the Capital City and are connected to the Capital City through development corridors. Special Use Developments such as clean industries, Infrastructure

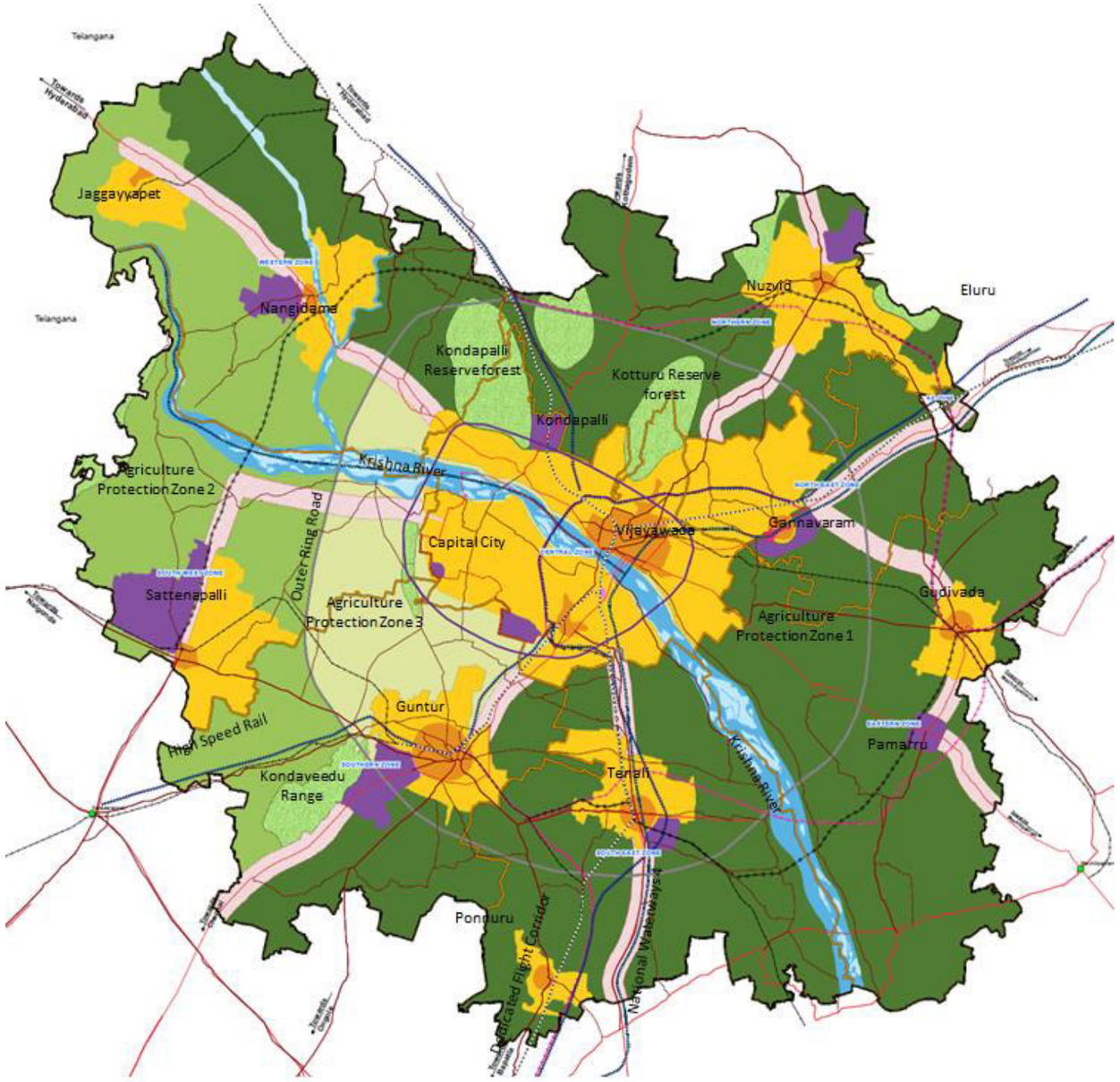


Fig.6.2 Capital Region Perspective Plan

Proposed Land use	Area in Sq km	Percentage
I Agriculture Zone	**5440.26**	**63.23**
Agriculture Protection Zone 1	3820.75	44.41
Agriculture Protection Zone 2	1137.86	13.22
Agriculture Protection Zone 3	481.65	5.60
II Urban Zone	**1619.43**	**18.82**
Existing Urbanized Areas	155.52	1.80
Proposed Urban Area	1463.91	17.02
III Industrial Zone	**245.87**	**2.86**
Proposed Industrial Zone	245.87	2.86
IV Development Corridor Zone	**513.04**	**5.96**
Development Corridor	513.04	5.96
V Infrastructure	**2.77**	**0.04**
Multi Model Integrated Logistic Hub	0.58	0.01
Existing Airport Area	2.19	0.03
VI Protection Zone	**781.95**	**9.09**
River & Islands	393.43	4.57
Forest	388.52	4.52
Total	**8603.32**	**100.00**

Table: Land use Clasification

The Broad Land uses shown in the table above wil lead to sustainable development of the region along with opportunities . for rapid growth in the region.

projects and logistics based activities are allowed along these corridors subjected to CRDA's Approval.

Better Regional Connectivity

- A radial network with well spaced highways, expressways and transport corridors cater to smooth city travel and fast connections within the Capital Region.
- The high capacity urban roads are designed to cater to both fast inter region connections and as alternative bypass to heavy good vehicles traveling across the country.
- Suburban Rail, Mass Rapid Transit MRT), and Bus Rapid Transit(BRT) are proposed as Intercity & Intra-city Public Transport Systems.
- A new Dedicated Freight Corridor (DFC) for the delivery of cargo and a High-Speed Rail (HSR) line for passengers would both pass through the Capital Region; making the Capital City a 'Gateway Hub'. The corridor reserved for high speed rail is subject to change as per the proposals from the Government of India.
- The National Waterway 4 will play a key role for trade and logistics. Waterlogistics Hubs are integrated with Transport Hubs for convenient movement of passengers and goods.

PROTECTED AGRICULTURAL ZONES

- Agricultural land is zoned under two categories. Agriculture Protection Zone 1 is protected agricultural land. It includes fertile lands, existing plantations, and aquaculture areas. This zone provides the opportunity to protect the existing agricultural / rural land use activities to be intact, and only allow a limited range of other uses that will not facilitate urbanization.
- Agricultural land outside the Outer ring road on the western side of the city is zoned as Agriculture Protecti on Zone 2. This zone acts as a green belt (the region's green lungs) and also restricts development beyond the outer ring road. Recreational developments that help preserve nature are allowed in this zone.
- Land is reserved for the City's Expansion in the future. The zone is marked as agriculture Protection Zone 3. All developments in this area will be as per the Master Plans inforce. This zone is around 482 sq.km.

Conservation of Natural Areas and heritage Zones

The Region's rich heritage and environmentally sensitive areas are earmarked as conservation areas. A tourism circuit and heritage conservation plan will be developed by CRDA to prioritize developments in the region.

6.3 ECONOMIC DEVELOPMENT STRATEGY FOR CAPITAL REGION

6.3.1 CONCEPT DEVELOPMENT

The key findings and recommendations of the above modules have been critically analyzed to formulate the preliminary economic development strategy for the capital region. In our opinion, the successful economic development framework of a region should be guided by certain key principles which define the strategy that seeks to build on the strengths and the latent opportunities present in the region. The key guiding principles identified for the overall development concept for the capital region are as discussed in Fig.6.4

These principles when systematically planned and implemented successfully possess the potential to transform the economic development of the region from a resource based manufacturing economy to a capital intensive manufacturing led region and gradually gaining prominence as a regional economic hub.

Fig.6.4 Economic Development Strategy for Capital Region

6.3.2 ECONOMIC DEVELOPMENT STRATEGY

The capital region is a planned city and therefore it has the opportunity to integrate the critical parameters of economic and urban development planning to evolve as the self-sustaining urban agglomeration with state of the art infrastructure for living and doing business.

In view of the above, the economic development strategy for the capital region should take into account the key aspects highlighted in Fig.6.5

The economic development strategy of the capital region that seeks to capitalize on the hinterland synergies, latent opportunities in the established industrial segments supported by the development of Government administrative facilities, infrastructure development and pro-active policy initiatives to promote investment in the region would transform the region into one of the prominent urban agglomeration in the country over the next 10-15 years.

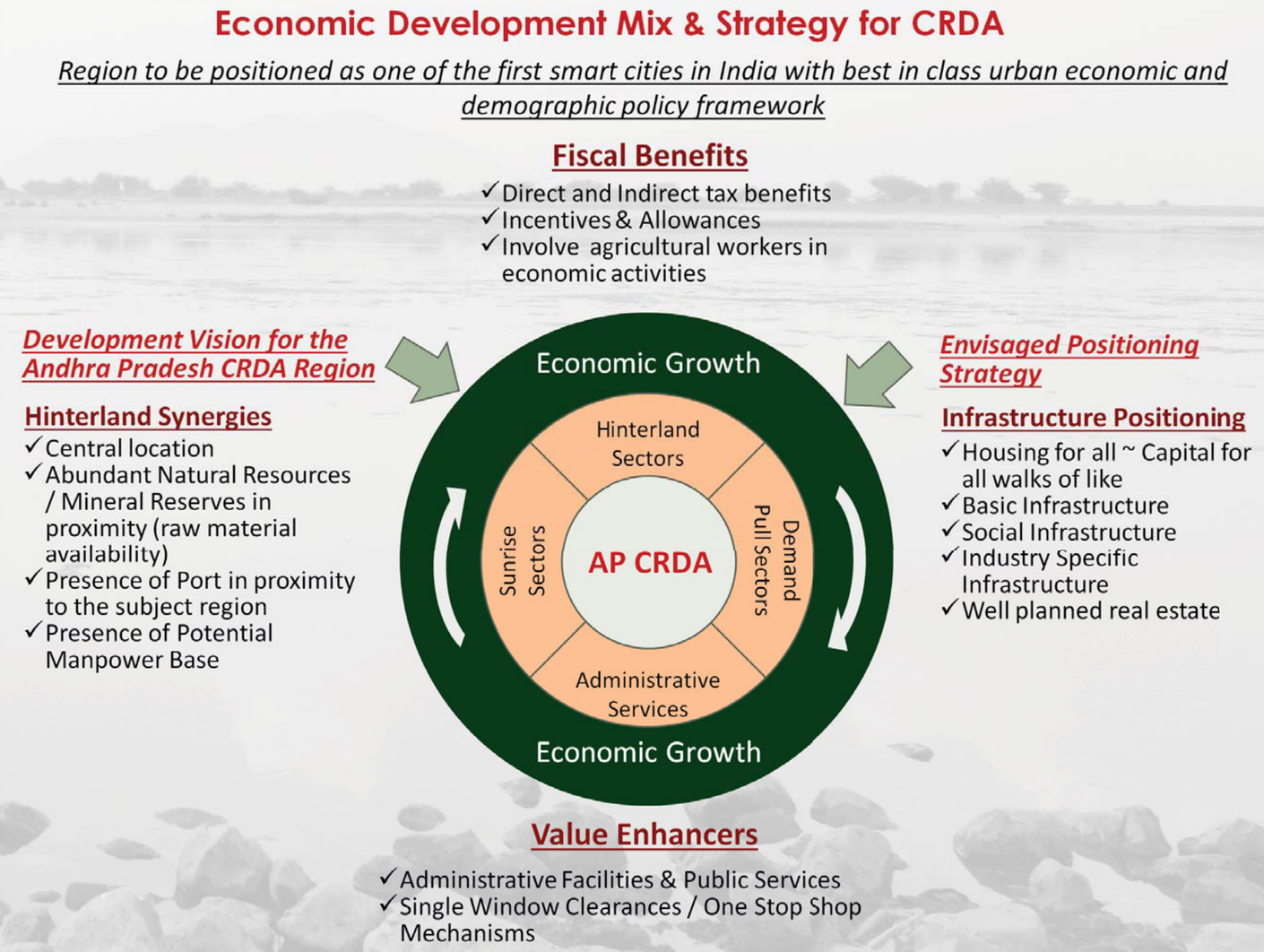


Fig.6.5 Economic Growth Framework

6.3.3 Economic Clusters and Preliminary Sectors

Based on the opportunities identified as a part of the industry assessment section and considering the inherent strengths of various urban nodes situated within the Capital Region and the existing industrial eco-system, a preliminary Clusterization of the identified high potential industrial/ economic drivers has been undertaken. The Clusterization of these sectors with respect to various urban nodes would provide insights to the spatial urban planning within the CRDA region.

Fig.6.6 highlights the preliminary Clusterization of various identified industrial/economic drivers in the Capital Region:

- Industry focus/clusterization based on hinterland synergies
- Focus of Hi Tech, High Value add economic activities at Capital City
- Heavier Industrial clusters at the periphery of the Region
- Logistics City at the connecting transport corridors
- Support Industrial Cluster hub

Key identified Industrial Sectors

1. Food and Beverages
2. Textile
3. Non metallic Minerals
4. Auto and Auto Components
5. Rubber and Plastics
6. Pharmaceutical Industry
7. Electronics
8. Basic and Fabricated Metals
9. Tourism
10. Aerospace
11. Logistics
12. IT/ITes
13. Aquaculture

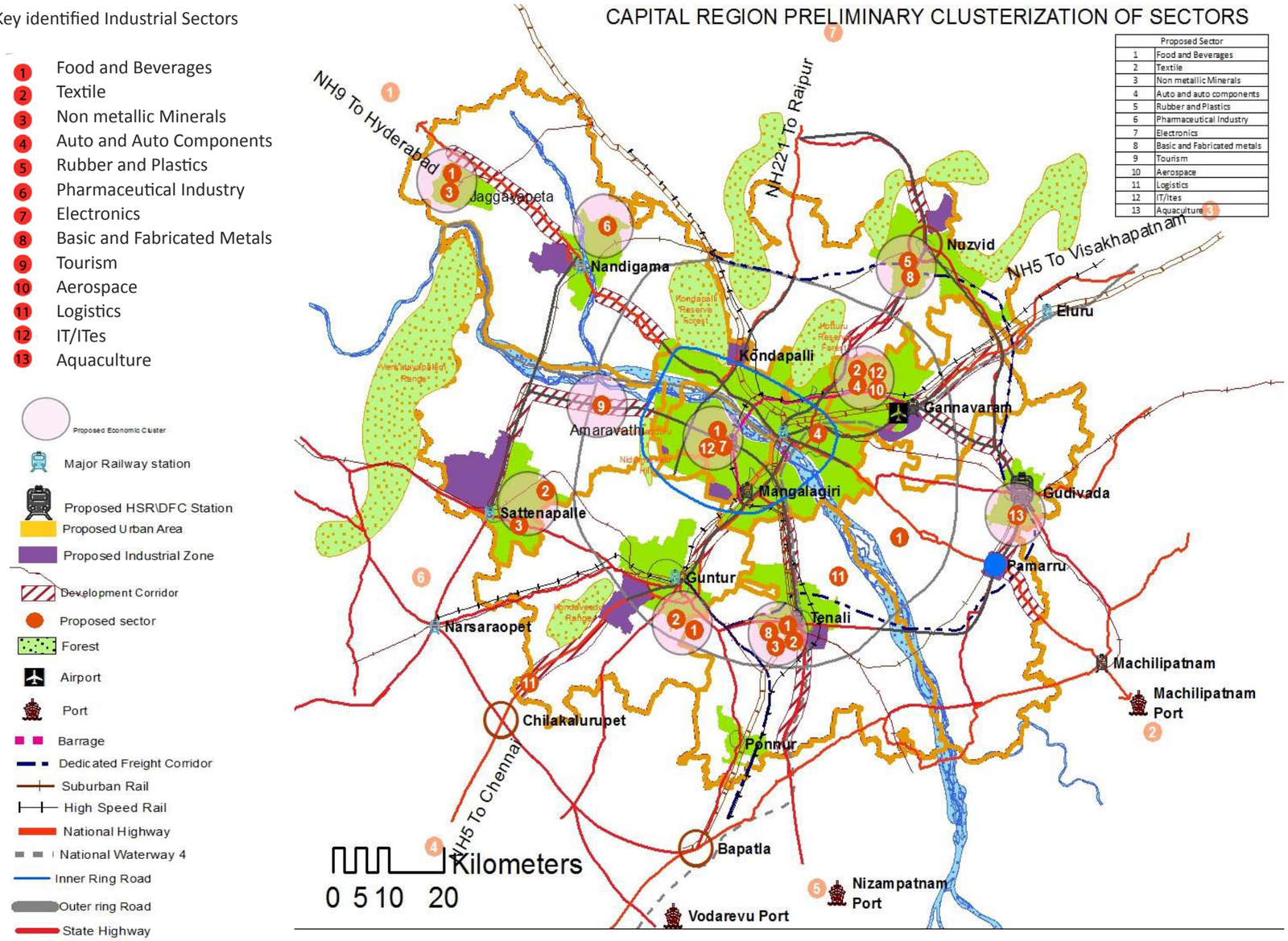


Fig.6.6 Capital Region_Preliminary Clusterization of Sectors

6.4 BROAD DEMOGRAPHIC PROJECTIONS

The proposed Capital Region would be expected to witness significant population growth over the next few decades, due to the development of capital city and other economic developments that have the potential to create considerable direct and indirect employment in the region.

In view of this, we have undertaken a broad estimate of population projections for 2 time horizons of 10 and 20 years.

The broad population projections at this stage of the study are primarily based on the benchmarking of key other capital cities and the anticipated growth of the capital region over the next 20 years.

We have adopted 2 techniques for estimating the population in the capital region over the next 20 years. The exhibit beside highlights the broad methodologies employed to estimate the population in the region.

The findings of the population projections from the above 2 methodologies are presented in the table below:

Table 6.1 Capital Region_Preliminary Clusterization of Sectors

Parameters	Total Projected Population in Capital (In Million)		
	2025	2035	2050
Scenario 1 (Based on growth achieved by key Capital Cities)	8.25	11.25	13.8
Scenario 2 (Based on anticipated economic growth in Capital Region)	17.91	9.13	10.45

6.5 BROAD WORKFORCE PROJECTIONS

6.5.1 BROAD WORKFORCE PROJECTIONS

The anticipated economic development in the capital region necessitates the need for incremental workforce addition to the existing workforce in the region. Therefore, an overview of the existing workforce in the region has been undertaken to understand the total workforce in the region, key sectors contributing to majority of the jobs and the incremental workforce addition expected over a time horizon of 35 years.

An assessment of the existing workforce statistics indicates that the capital region and the capital city have a total existing workforce of approx. 2.19 mn and 0.11 mn respecti vely. Further, majority of the existi ng workforce (approx. 70%) in the capital region and the capital city was observed to be consti tuted by workers employed in services, manufacturing and Govt. machinery. In additi on, it was observed that about 20% of the workers are employed in cultivation and agriculture whereas the remaining workforce was observed to be employed in household industry.

The dynamics of the existing workforce, the trends observed in the workforce participation ratio and the population projections undertaken in the above module have been utilized to estimate the broad workforce addition in the capital region by year 2050.

The exhibits alongside highlights the methodology adopted for workforce projections and the summary of key findings of workforce projections.

6.6 POPULATION DISTRIBUTION

The projected Population of 11.25 mi by the Year 2035 is planned for and distributed across the Capital Region as follows:

HIGH DENSITY PLANNING AREAS:

The Central Planning Area with the Capital City, Vijayawada and Mangalagiri urban agglomeration will be developed as High Density Compact Neighbourhood with an average gross density of 5000 p/sq.km.

MEDIUM DENSITY PLANNING AREAS

The Southern, South East and Eastern Planning Areas will be developed as medium density Areas with definitive 'No development Zone' boundaries to protect the fertile agriculture land.

LOW DENSITY PLANNING AREAS

The South West, Western, Northern and North East Planning Areas are expected to develop in the later phases with Low density Developments.

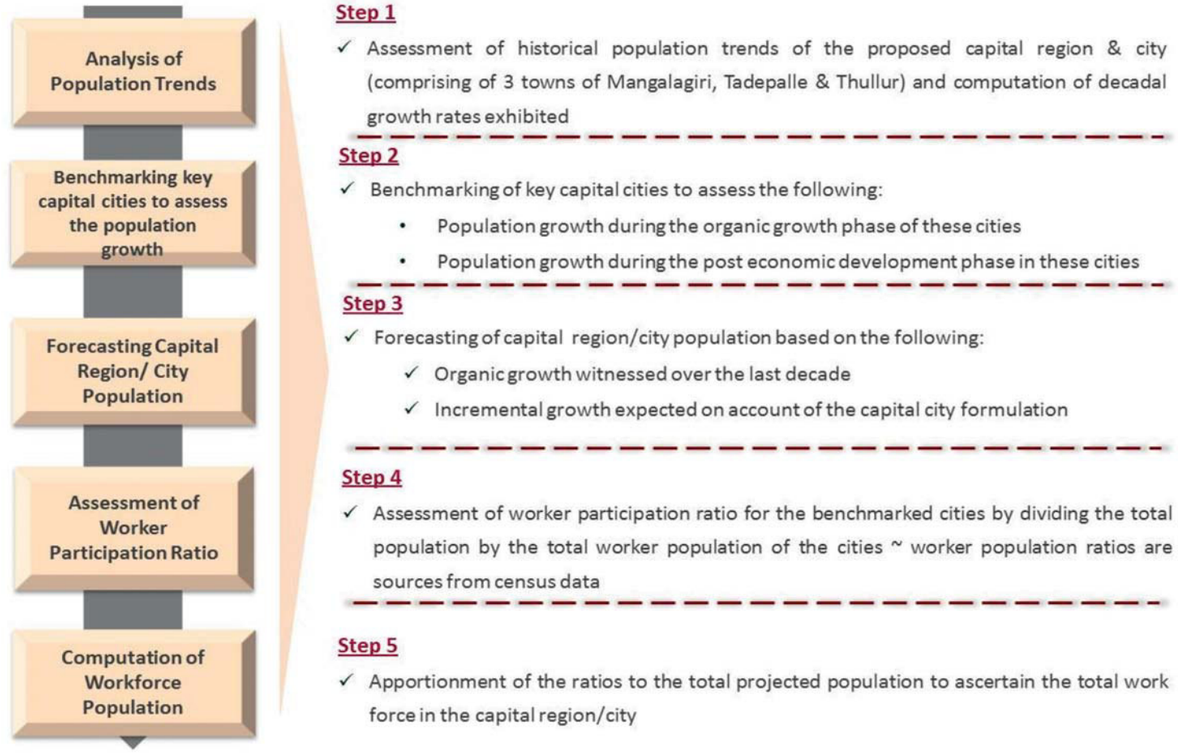


Fig.6.7 Methodology adopted for workforce projections

Table 6.2 Summary of Workforce projections for Capital Region

Parameters	Organic Growth Model			Economic Growth Model		
	2015	2050	Incremental Work-force by 2050	2015	2050	Incremental Work-force by 2050
Existing Workforce in Capital Region* (in million)	2.17	3.33	1.15	2.25	5.90	3.60

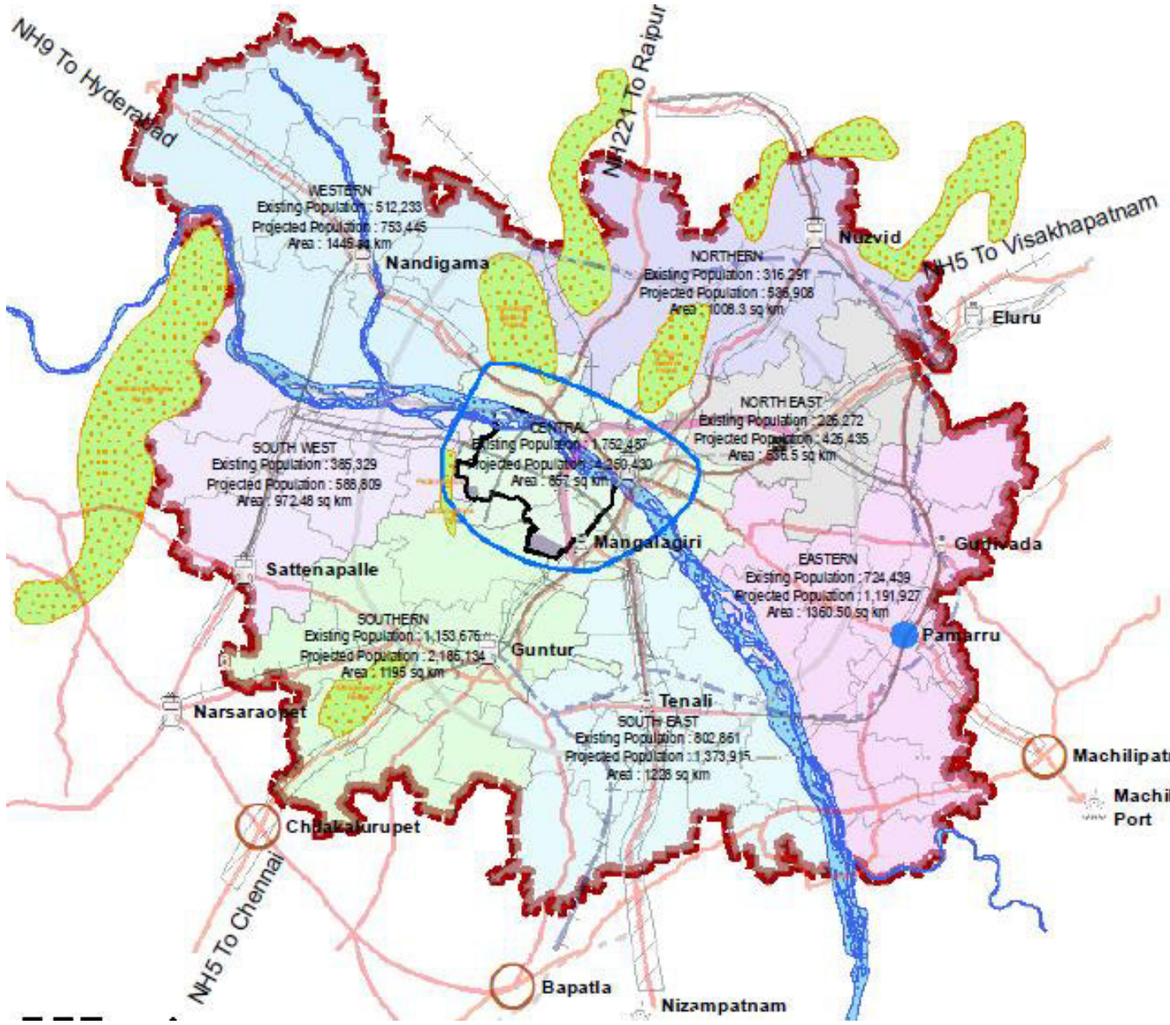


Fig.6.8 Capital Region_Projected Population Distribution _Year 2035

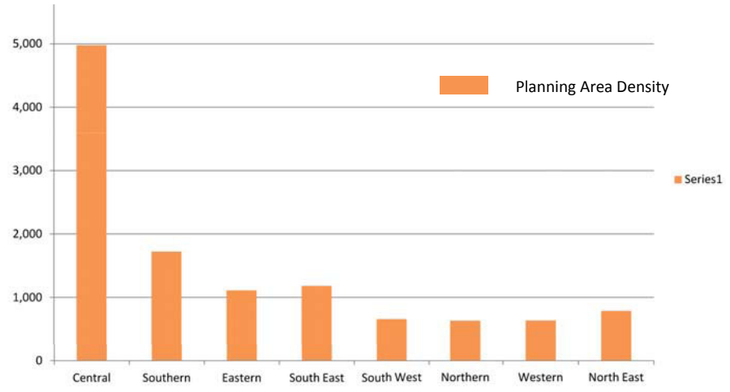
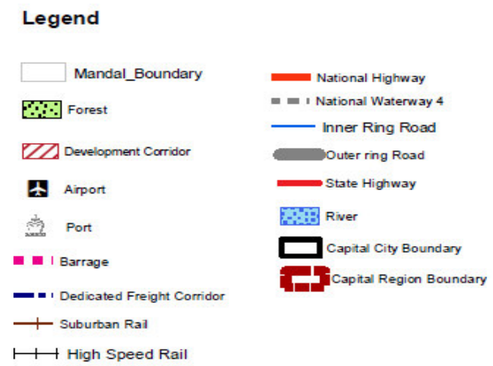


Fig.6.10 Capital Region_Projected Density



6.7 KEY STRATEGIES AND CONCEPTS

6.7.1 Transport strategies

Ring Road & City Bypass

Currently, the Capital Region's road transportation depends heavily on the two busy national highways NH9 and NH5. As these two highways intersect at Vijayawada, they congest the Vijayawada city centre. Through-traffic travels through the city with no alternatives around Vijayawada.

To relieve the existing condition, Vijayawada Bypass (VB), Inner ring road (IRR) and Outer ring road (ORR) are proposed.

The Inner ring road forms a complete closed loop around the Capital City, acting as an expressway. This is supplemented by the Vijayawada Bypass. The bypass will be constructed at the same time as part of the Seed Capital so that it can act as a catalyst for development.

The VB is closer to the Capital City and forms a semi-circle shape through the towns along the city fringe. This semi-expressway serves as a relief road to the traffic volume through the city centre and across the Krishna River to Vijayawada and the airport.

One end of the VB is close to the airport city at Gannavaram, providing a fast route from the city centre to the airport, and the other end intersects with the NH9, diverging the traffic from NH9 to the VB. The VB is connected to the Outer ring road and the Capital City centre through radial roads.

The VB may be constructed as a high-capacity urban road, with the option to upgrade to an expressway in the future. The reserve for the expressway is to be safeguarded for future expansion.

The Outer ring road is envisioned to be a larger orbital connecting the periphery urban centres such as Guntur, Tenali and Gudivada.

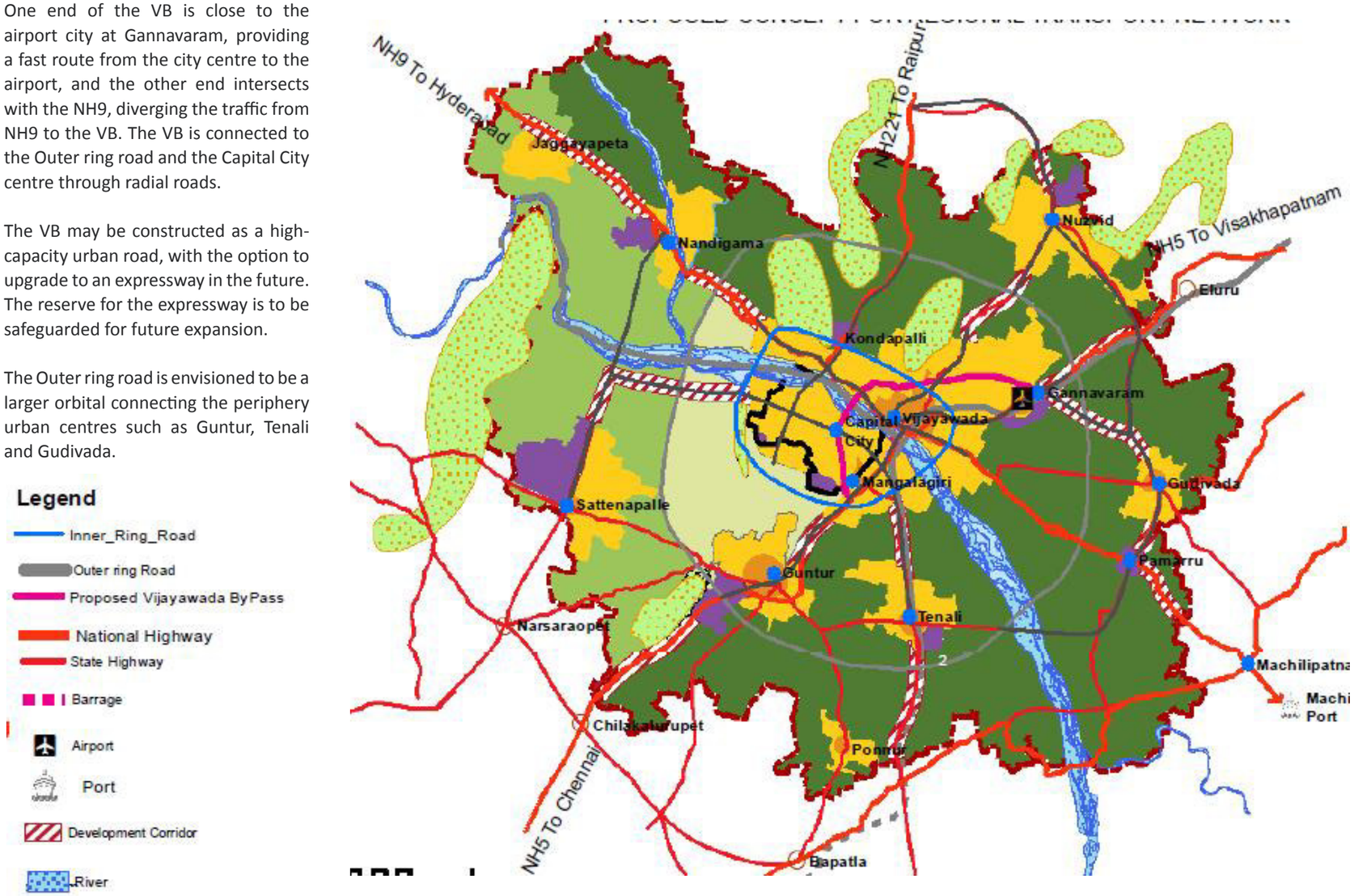


Fig.6.11 Proposed Concept for Regional Transport Network

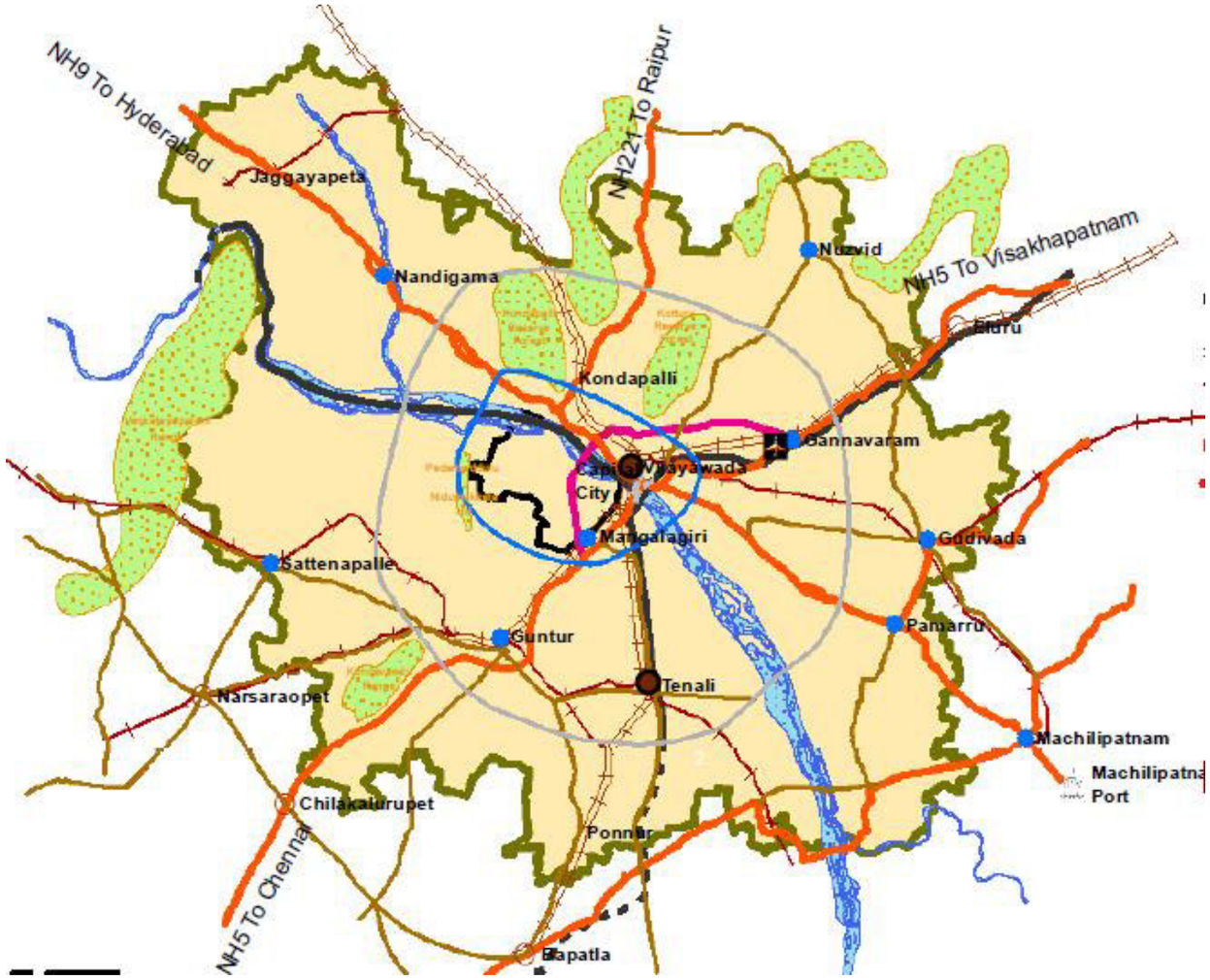


Fig.6.12 Potential National Waterway Transport and Water Logistic Hubs

Upon implementation of the ORR, traffic among these cities and towns has an alternative choice of express route other than the NH9 and NH5. Furthermore, these large cities and towns are connected to the Capital City through radial roads.

Traffic from cities further away from the Capital City such as Hyderabad to the new Machilipatnam Port or from Visakhapatnam to Chennai could go around the Capital City via the ORR, avoiding the busy sections of NH9 and NH5 that pass through the Capital City. The airport city at Gannavaram can also be reached from the industrial centres directly through the ORR. Moreover, the ORR provides two more route choices to cross the Krishna River.

Construction of the ORR is expected to take place in four phases.

The construction of the ORR and VB can be done in sections as and when required, as long as the construction requirements are standardized. By doing so, a standard cross-section can be maintained.

Water Transport Hubs

The National Waterway 4 runs along Buckingham Canal, Krishna River, and Eluru Canal within the Capital Region. These waterways are navigable, and therefore has potential for freight movement.

Prakasam Barrage is the meeting point for the three major waterways, and therefore has potential as a water transportation hub.

In addition, Gannavaram and Tenali are also located along the National Waterway, and therefore are also potential transportation hubs linking water transportation to rail, air and road.

Types of cargo which can be carried via the Waterway are coal, rice, food grains, cement, fertilizer and other bulk cargo. This can significantly reduce transportation costs for low-yield and non-perishable goods.

The potential of the waterways for people movement was studied, however was found to be less relevant due to the availability of rail and road transport within Tenali and Gannavaram.

Dedicated Freight Corridor

The new Dedicated Freight Corridor (DFC) for the delivery of cargo and a High-Speed Rail line for the passengers would both pass through the Capital City and thus make the city a Gateway hub.

The proposed DFC runs between Chennai and Visakhapatnam along the coastal corridor.

There is potential for the DFC to be expanded significantly due to the presence of upcoming and existing ports such as Bapatla and Machilipatnam.

The increased utilization of sea ports for industry can also vitalize the Capital Region as an industrial destination, as shown in the previous sections. The key economic and industrial sectors can benefit from direct access to these seaports via rail and roads.

In addition, freight from Hyderabad is expected to utilize Machilipatnam via rail and NH9. As such, the DFC from Hyderabad may also utilize the existing rail links through the Capital Region.

High Speed Rail Transportation

There are currently plans to build a high speed rail connection from Hyderabad to Chennai via Vijayawada. It is proposed that the High Speed Rail stop runs through the Capital City instead of through Vijayawada Junction so that rail traffic to Vijayawada can be reduced.

There is also opportunity to expand the high-speed rail northeast-wards to Visakhapatnam, and therefore the alignment may provide an opportunity to provide a second high-speed rail station near the Airport.

The provision of the expansion towards Visakhapatnam may therefore encourage growth along the DFC. By providing a stop at Gannavaram, the HSR may also contribute to air traffic movements to Gannavaram International Airport.

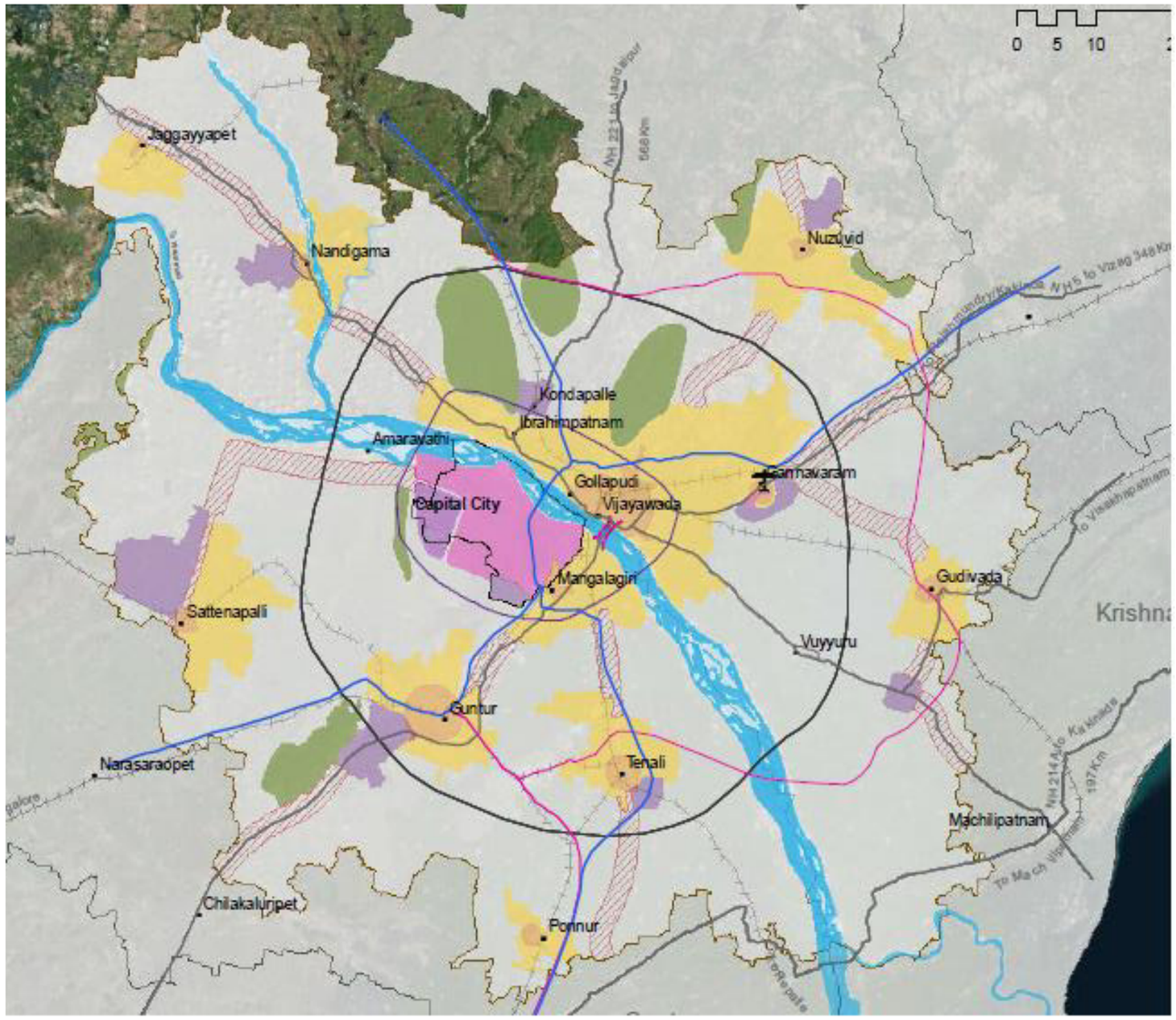


Fig.6.13 Proposed High Speed Rail and Dedicated Freight Corridors

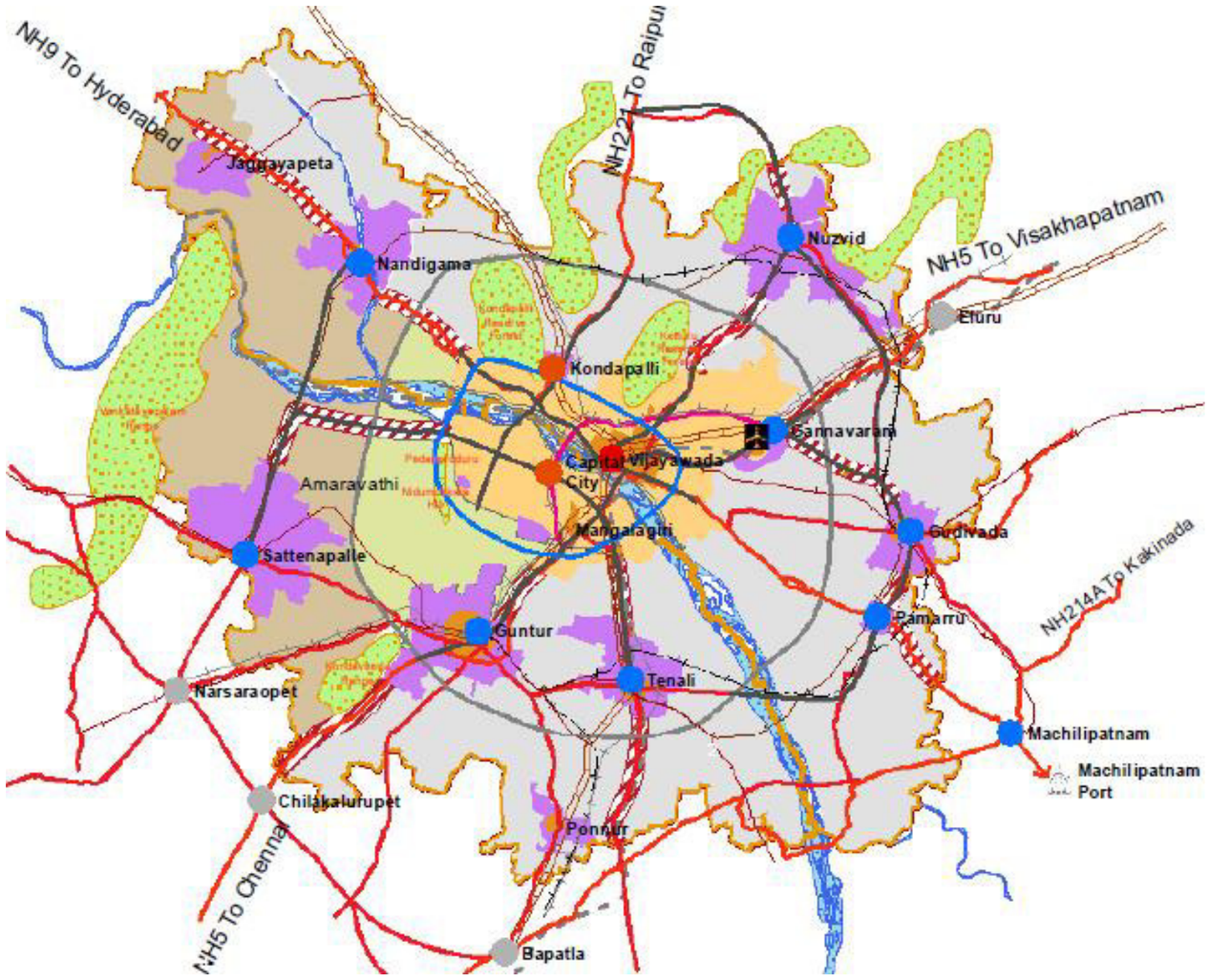


Fig.6.14 Proposed Concept for Regional Rail / Public Transport Network

Multi-modal Transport Hubs

A transport hub is proposed inside the Capital City where Mass Rapid Transit (MRT) terminal, bus terminal, railway station and parking all located at the same location. Thereby, the transitions between these modes of transportation can be done at the transport hub.

A new potential East-West highway would connect the new Machilipatnam Port and the Capital City. Increased traffic will be expected at the two places and makes them the potential transport hubs.

Intercity & Intra-city Public Transport

Inside the Capital City, a Mass Rapid Transit (MRT) network is proposed to ensure that all the commercial area, residential area and business centers in the city are accessible by MRT. This system also has a potential to be extended and connect the Capital City with Vijayawada. Within each of the other large cities such as Vijayawada, Guntur and Tenali, Bus rapid transit (BRT) network would be implemented. At the intercity scale, express bus services would provide fast connection between cities, while rural bus services would serve the villages outside the Capital City and the other industrial centers. Currently, cities are also linked by scheduled railway services. In the future, additional lines will be introduced between the cities and express services will be provided between the Capital City and the other cities.

Sustainable Transport Systems

Road networks are the key infrastructure where investment can be made to support sustainable transport systems. Road infrastructure should be allocated for public transport, pedestrians and cyclists. As part of the Master Plan, transport corridors will be designed with these in mind. Dedicated lanes for BRT, cyclists and pedestrian should be reserved within the cities while none of these lanes is needed for intercity roads.

6.7.2 Water Supply

Objective: Adequate water resource for sustainable future development

Strategies

- Setting up of a centralized institution to manage water supply sector in Capital Region;
- Utilizing alternative water sources;
- Reduction of water wastage; and
- Enhance the existing water bodies

Programmes

1. Setting up of a centralized institution to manage water supply sector in Capital Region

Capital Region has to set up a centralized institution that will comprise representatives of all the stakeholders. This institution will review the national water policy and implement relevant policy within Capital Region. Its duties should also include planning and setting up fund allocation for future water supply project and managing all service providers. Current service provider, Guntur Municipal Corporation (GMC) and Vijayawada Municipal Corporation (VMC), will continue taking charge of the operation and maintaining of new developed urban areas and existing settlement.

2. Water supply augmentation by utilizing alternative water sources

There are two alternative water sources in Capital Region that have not been fully utilized, they are waste water and storm water.

Wastewater can be treated and reused for non potable use. The treatment level required is dependent on the quality of the waste water collected and its intended end use. Currently, only 10% waste water of Capital Region is collected and treated in Sewerage Treatment Plant. The treated effluent is discharged to nearest water bodies and none of them have been reused. If the entire Capital Region is covered by sewers, it would generate significant amount of treated water, which would be an alternative water source.

Storm-water harvesting presents potential for non-potable uses since the annual rainfall of Capital Region is in a range from 800 to 1200 mm. There are various methods to collect rain water, such as tank storage for small catchment and retention pond for big catchment.

3. Reduction of water wastage

Water wastage is mainly caused by water leakage and excessive by the end users. Water leakage can be reduced through operation & maintenance of the water supply network such as pressure management and leak detection. Preventative maintenance along with network rehabilitation strategies, provide an opportunity to prolong the lifespan of existing infrastructure and improve system performance with regards to water leakage.

An electronic database must be set up for all bulk water infrastructure and reticulation infrastructure to facilitate the operation and maintenance of the network. It should be structured under institutional status, asset assessment. Meter readings can be recorded in an electronic format for ease of reference. Water wastage by end users can be managed by installation of water efficient fittings, implementation of progressive water tariff based on consumption volume and education program on how to save water.

Waste Water

Objective: Provide totally sanitized, healthy, and sustainable waste water management system.

Strategies

- Increase access to sanitation facilities
- Provide sufficient STP facilities in all urban/rural areas
- Introduce the concept of Environmental Treatment Zone (ETZ)
- Stop the discharge of untreated waste water into the open drains and water bodies
- Reuse of the treated waste water effluent

Programme

4. Increase access to sanitation facilities

This target can be achieved by upgrading and expanding the existing sanitation facilities and constructing new ones for areas without any sanitation facilities. Appropriate sanitation type would be proposed based on the existing topography and future land use. For new developed

Eco-friendly Sewage Treatment Plant (Organica)

Membrane Filtration Module for Water Treatment Plant

Constructed Wetlands

Vegetates Swales in Residential Area (Puget Sound, WA Action Team)

urban areas, sufficient sewage network would be provided. For the remaining rural areas, maintenance and operation regime would be provided for septic tanks.

5. Provide sufficient STP facilities in all urban areas

By considering the existing sewage treatment infrastructures, there is not enough sewerage treatment capacity provision to serve the entire region of Capital Region. The proposed STW's shall be located at the low lying areas with road access and proximity to the existing water bodies. The current waste water treatment system can be improved by introducing more advanced water treatment technology such as membrane filtration technology. The main advantages of membrane filtration technology are listed as follows:

- Low space requirement;
- Higher quality of treated water; and
- Easy to modify and upgrade by modules based on the requirement.

6. Introduce the concept of Environmental Treatment Zone (ETZ)

The proposed STPs will be located within the Environmental Treatment Zone (ETZ) together with solid waste and storm water treatment system. ETZ is the integrated waste management concept. The ideal of ETZ is to isolate and treat all the unwanted waste far from the residential area and minimize the contact between the residents and the waste.

7. Stop the discharge of untreated waste water into the open drains and water bodies

Strict enforcement of the law and regulation coupled with increased access to sanitation facilities and sufficient STPs are necessary to stop the practice of discharging untreated waste water into the open drains and water bodies. Effluent discharge standard should be introduced in Capital Region in case to control the water quality.

Storm Water

Objective: Provide flood protection to new developments and existing settlements

Strategies

- Provide Flood Protection Zones (FPZ)
- Improve and expand drainage network
- Implement Water Sensitive Urban Design (SUDS)

Programmes

8. Flood Protection Zones

Green Buffer such as grass land and woodland should be provided at the banks of the existing rivers and canals in Capital Region. The green buffer has several important advantages, for example:

- Protecting soils from erosion;
- Slowing down the speed of water flow rate; and
- Protecting water quality

9. Improve and expand drainage network

The current drainage network in Capital Region consists of conventional open drains and irrigation canals. Some canals are polluted and accumulate sediment due to lack of maintenance. As part of the National Disaster Management Guidelines for Floods, roadside drains should be provided for all roads to collect and discharge the storm water properly to mitigate the flooding problem. Meanwhile, operation and maintenance of canals should be provided for all canals, together with revamping of the sanded up canals.

10. Implement Water Sensitive Urban Design (WSUD)

Capital Region of Capital Region is located on a flood plain. To achieve a sustainable storm water system, it is essential to introduce the Water Sensitive Urban Design (WSUD). WSUD is different from the conventional urban storm water runoff management system. Key principles of WSUD system are listed as follows:

- Protecting and improving the water quality of water draining from urban environments into creeks, rivers and wetland;
- Restoring the urban water balance by maximizing the reuse of storm water, recycled water and grey water;
- Conserving water resources through reuse and system efficiency;
- Integrating storm water treatment into the landscape so that it offers multiple benefits such as improved water quality , wildlife habitat, recreation and open public space; and

- Reducing peak flows and runoff from the urban environment simultaneously providing for infiltration and groundwater recharge

The technique of WSUD includes:
- The use of water-efficient appliances to reduce potable water use;
- Grey water reuse as an alternate source of water to conserve potable supplies;
- Detention, rather than rapid conveyance of storm-water;
- Reuse, storage and infiltration of storm water, instead of drainage system augmentation; and
- Use of vegetation for storm-water filtering purposes;

By implementing WSUD, it will help to:
- Reduce potable water demand;
- Incorporate the use of water efficient appliances and fittings;
- Adopt a fit-for-purpose approach to the use of potential alternative sources of water such as rainwater; and
- Minimize wastewater generation and treatment of wastewater to a standard suitable for effluent reuse and/or release to receiving waters.

Waste Management

Objective: Develop an economic and sustainable solid waste management system

Strategies

- Identify Proper Landfill Site for Solid Waste Proposal
- Introduce the hierarchy of waste management (5R) to Capital Region
- Provide General Waste Education, Awareness and Training Program

Programmes

11. Identify Proper Landfill Site for Solid Waste Proposal

Suitable sites for landfill need to be identified in Capital Region to reduce improper solid waste disposal. Solid waste treatment facilities should be allocated nearby the landfill site to provide an appropriate and efficient solid waste treatment cycle.

12. Introduce the hierarchy of waste management (5R) to Capital Region

5R stands for Reduce, Reuse, Recycle, Recover and Remove. This framework is proposed by Government of Andhra Pradesh to improve the solid waste treatment system. It forms the hierarchy of the entire system; aim to promote waste reduction by using less resource and energy, resource reuse by extending the lifespan of resource and utilizing waste and increasing ratio of recyclable materials against the total waste.

There is opportunity to recover energy via Waste to Energy (WTE) incineration plants which can be used to supplement power generation. This can be built within the ETZs at a local level.

13. Provide General Waste Education, Awareness and Training.

Development and implementation of solid waste awareness and education plan for both the municipality staff and public is an essential part to enhance the overall Solid Waste Management.. The training course for the municipality staff should include various aspects such as solid waste collection and transportation, solid waste treatment, management of solid waste collectors, occupational hazards, etc. This will equip the staff with the right expertise to handle solid waste management properly and safely. Awareness program for the public should include tips to reduce, reuse and recycle waste and importance, health and hygiene knowledge, etc.

6.7.3 Power generation

Power supply system consists of generation, transmission, and distribution system. Electricity is generated at power stations from various natural resources such as coal, natural gas, hydro, solar, geothermal and wind. The power stations produce electricity in large quantities where economies of scale can be achieved.

For this planning, it is assumed that power generation plants (Type, location and size) shall be taken care by the government (either through construction of new power plants/ or imported by the neighboring countries) and sufficient power shall be delivered to development area when needed.

Power transmission

The electricity transmission network refers to the pylons, wires and substations that make up the national grid. Power stations are located at or close to the fuel resource which is often a considerable distance from where the major demand for electricity is located. Large quantities of electricity are therefore transported over the transmission network to major substations located in key areas. Supply may also come from power stations in other states via interconnectors which link the transmission systems.

High voltages are needed for the economic transport of large quantities of electricity but these voltages are far too high for customers to use. The transmission voltages are reduced in several stages, initially in substations, by transformers. The substations also contain switchgear which controls the flow of electricity between substations and into the distribution network.

As the bulk supply of electricity is divided into smaller quantities, the voltage can be lowered. The result is a large network of power lines, all operating at different voltages according to how much electricity they have to carry, bringing electricity closer and closer to where customers want to use it and then delivering it literally to their door at an appropriate supply voltage.

For planning purposes, it is assumed that access to the electricity is 100% for the planned development area. Maximum demand shall be based on development data given by planner. The proposed transmission substations and transmission system (756kV, 400kV, 220kV, 132kV) shall be based on estimated maximum demand of the serving area / phasing.

Power Distribution

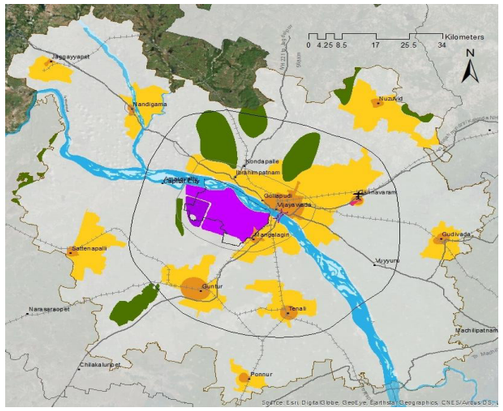
The local substations supply the distribution system which is a network of high voltage (11kv or 33kv) and low voltage (LV) (less than 600V) feeders. These feeders could be overhead power lines or underground cables. Distribution transformers reduce high voltage to low voltage for use within households, shops, businesses, factories, hospitals, schools, etc. Distribution system at the local area can only be carried out during the detail design stage, hence will not be discussed here.

6.8 ACTION PLANS

Actions plans are the priority steps to be taken by the Capital Region Development Authority (CRDA) to implement the Capital Region Plan. These actions plans are mainly to engage the respective third party stakeholders/authorities to initiate National/State/District level projects and reserve land for the same in a planned manner. These action plans are an addition to the extensive policy framework and institutional set up being taken up parallelly by CRDA.

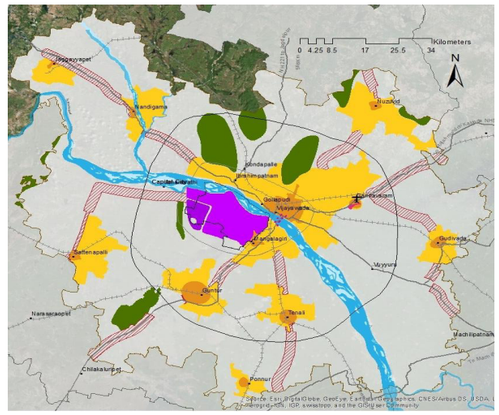
ACTION PLAN 1

Master Plans for First and Second Tier Cities: To do Detailed Land Use Master Plans for the Regional Centres. To identify development boundaries and contain the urbanization within the boundaries and prevent urban sprawl.



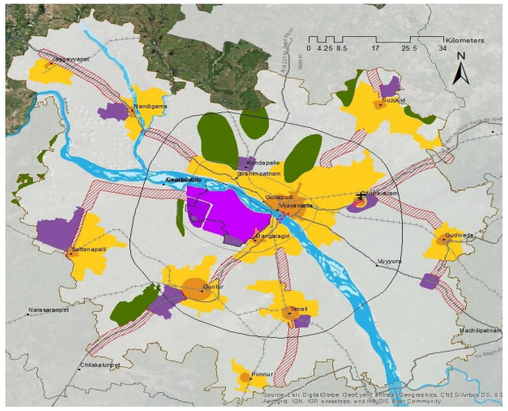
ACTION PLAN 2

Strategic Land Banking: To reserve and protect the land along National Highway 5 and National Highway 9 for Economic Development.



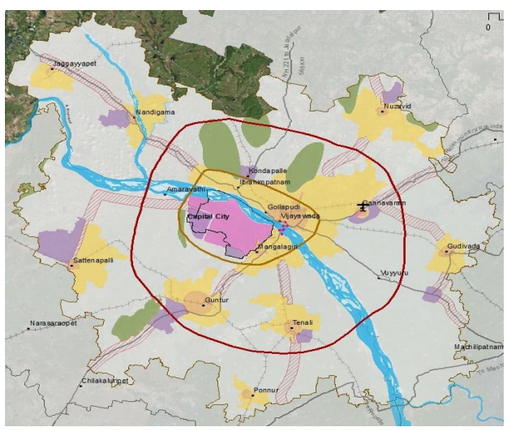
ACTION PLAN 3

Detailed Industrial Study for First and Second Tier Cities: To do detailed industrial master plans for the second tier cities and protect sufficient land at strategic locations.



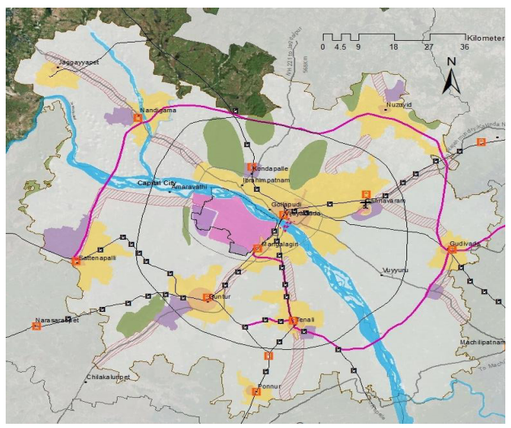
ACTION PLAN 4

Right of Way Protection: To conduct detailed study for the Outer Ring Road and inner ring alignment, phasing and strategy for Land acquisition.



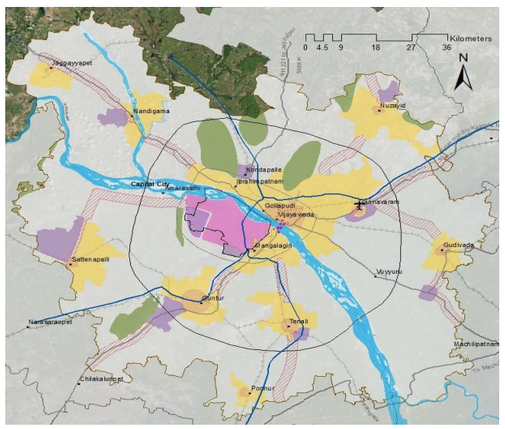
ACTION PLAN 5

Sub Urban Rail Networks: To initiate dialogue with the Indian Railways for strategic connections between Tenali, Gudivada, Nuzvid, Nandigama and Sattenapalle.



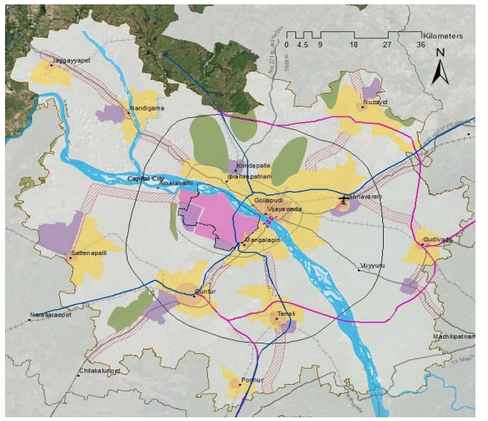
ACTION PLAN 6

High Speed Rail Alignment: To initiate dialogue with the HSRC of India on the possible realignment and the location of stations in Capital City and Gannavaram Airport



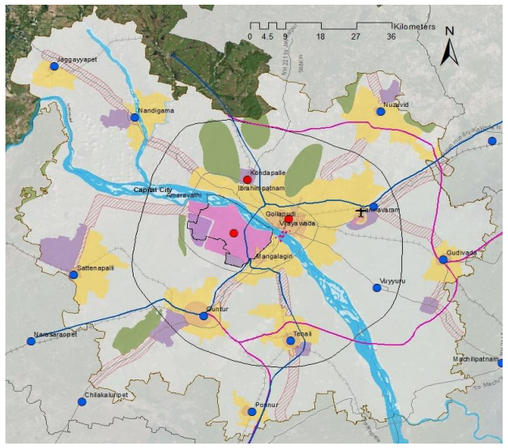
ACTION PLAN 7

Dedicated Freight Corridor Alignment To initiate dialogue with the DFC authority of India on the possible realignment and the location of Logistic Stations in Tenali and Gudivada



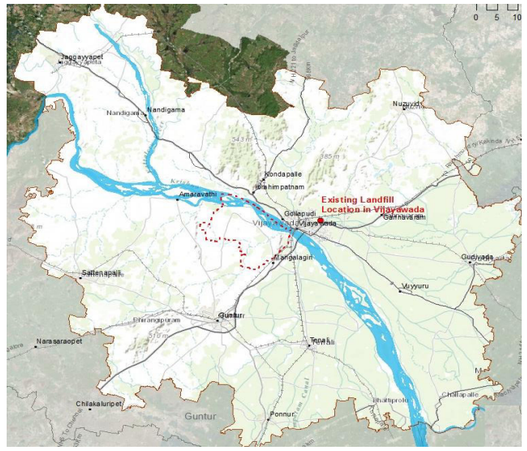
ACTION PLAN 8

Integrated Transport Hubs: To initiate dialogue and development models for the development of Integrated Transport hubs with retail, commercial, recreation and other public facilities



ACTION PLAN 9

Waste to Energy Treatment Site: To initiate detailed study on the viability of the Waste to Energy (WTE) plants and protection of sufficient land at strategic locations.

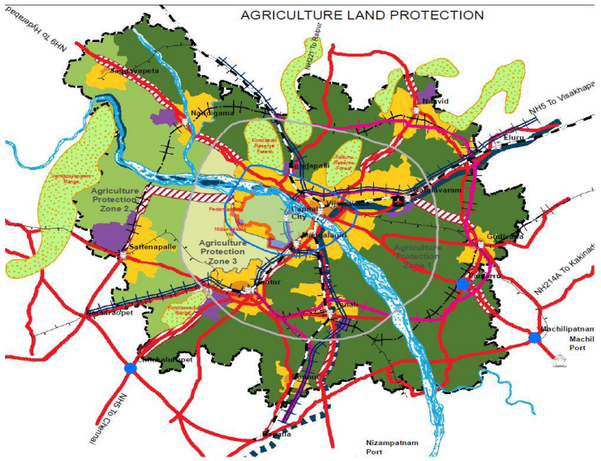


ACTION PLAN 10

Sewage Treatment and Water Treatment Plant Sites: To initiate detailed study on the STP and WTP plants location and safeguard sufficient land at strategic locations.

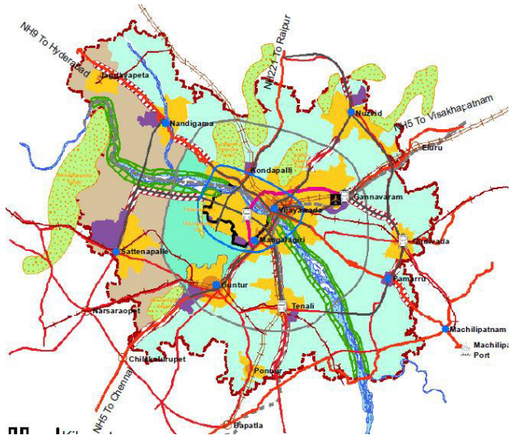
ACTION PLAN 11

Agriculture Land Protection: To legally zone the fertile agricultural lands as conserved areas and protect them from urbanization



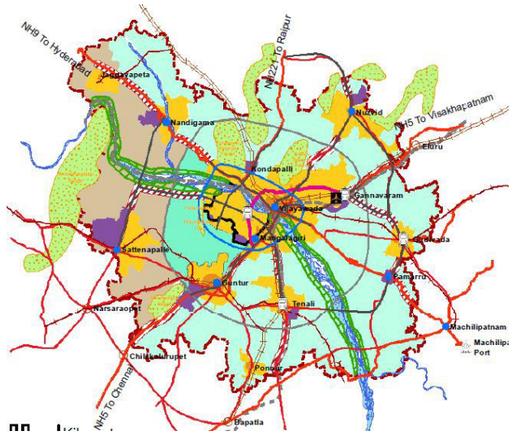
ACTION PLAN 12

Environmentally Sensitive Area Protection: To initiate detailed study on the rivers , tributaries and hills and restore them from Urbanization and also zone them as protected zones



ACTION PLAN 13

Coastal Regulation Zone for river: To implement the 'No development' zone in rural areas; however speak to the authorities to discard the rule in the City Core to enable to develop an active river waterfront.



ACTION PLAN 14

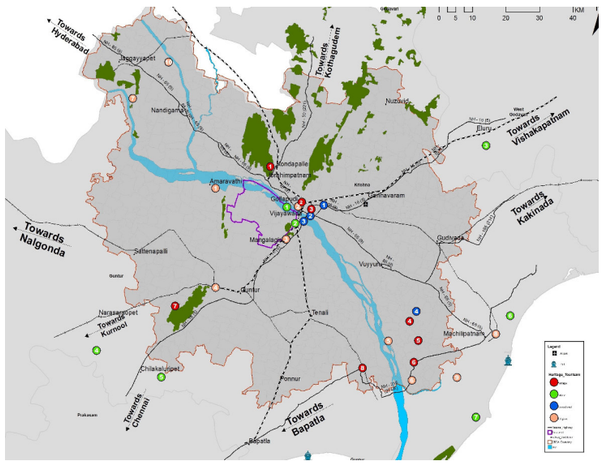
Amenities and Public Facilities: To prepare a facility provision standards template and implement it in all the township plans within the Capital Region.

PUBLIC FACILITIES STANDARDS

		SINGAPORE
COMMERCIAL	NEIGHBOURHOOD CENTRE	1 PER 13,000 - 20,000 POPULATION, 1.7 HA SITE
	TOWN CENTRE	1 PER TOWN, 17-25 HA SITE
	REGIONAL CENTRE	1 PER 0.5 MILLION, CATCHMENT RADIUS - 5 KM , 57 HA SITE
EDUCATIONAL FACILITIES	PRIMARY SCHOOL	1 PER 13,400 POPULATION. 1.8 HA SITE
	SECONDARY SCHOOL	1 PER 19,150 POPULATION. 3.0 HA SITE
	PRIMARY + SECONDARY SCHOOL (COMBINED)	DATA NOT AVAILABLE
	VOCATIONAL / ICT INSTITUTE	1 PER TOWN. 5.0 HA SITE
	HIGHER EDUCATION INSTITUTE	1 PER 500,000 POPULATION. 6.0 HA SITE
SOCIO-CULTURAL FACILITIES	COMMUNITY HALL*	1 PER 40,000 POPULATION. 0.4 HA SITE
	REGIONAL LIBRARY	1 PER 65,000 POPULATION. 0.4 HA SITE
	RELIGIOUS FACILITY	1 PER 25,000 POPULATION. 0.2 -0.45 HA SITE
	CEMETERIES	DATA NOT AVAILABLE
	MUSEUMS/ CULTURAL CENTRE ETC.	DATA NOT AVAILABLE
HEALTH FACILITIES	HEALTH CLINIC *	SERVED BY PRIVATE PRACTITIONERS AS PART OF COMMERCIAL FACILITIES
	POLYCLINIC	1 FOR MINIMUM POPULATION OF 150,000 (EXCLUDING PRIVATELY OPERATED CLINICS). 0.5 HA SITE FOR 150,000 - 200,000 POPULATION
	REGIONAL HOSPITAL	4.5 BEDS PER 1,000 POPULATION. 5.0 HA SITE
PARKS & OPEN SPACES	NEIGHBORHOOD PARK	DATA NOT AVAILABLE
	TOWN PARK	1 PER TOWN. 10 HA SITE
	SPORTS FIELD	1 PER 125,000 POPULATION. 3.0 HA SITE

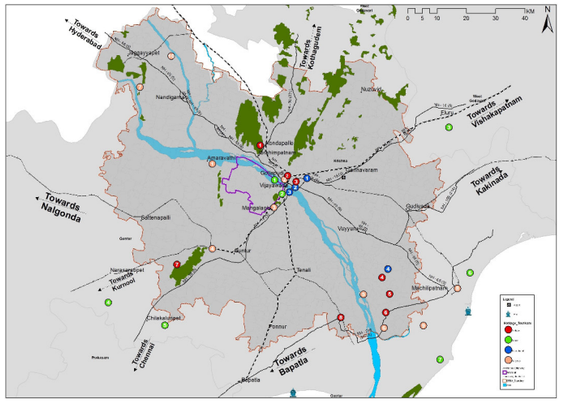
ACTION PLAN 15

Cultural, Religious and Heritage Sites: To identify and protect Cultural, Religious and Heritage sites as AP State Heritage Monuments



Action Plan 16

Tourism Master Plans: To initiate a detailed Tourism Master Plans to integrate the Cultural, Religious and Heritage Sites and other tourism spots within the capital region and beyond.



6.9 THE WAY FORWARD

The Capital Region Concept Plan sets the macro planning directions and the regional structure of the Capital Region. This plan will help divert investments phase wise in an organized manner. This concept, however, is not cast in stone; the plan will be reviewed by the CRDA every 5 - 20 years to incorporate the market dynamics into the Regional Plan if deemed necessary.

View of Pedemadduru Hill from Nelapadu Water Tank

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GLOSSARY

Perspective Plan: The Perspective Plan is a strategic plan and that guides the region's development over the next 40-50 years. Reviewed every ten years, the Concept Plan ensures that there is sufficient land to meet long - term population and economic growth needs while providing a good quality living environment for the people.

Capital City Master Plan: The Capital City Master Plan (MP) is the statutory land use plan which will guide the Capital City development in the medium term over the next 10 to 15 years. It is reviewed every five years and translates the broad long-term strategies of the Concept Plan into detailed plans to guide the development of land and property. The Master Plan shows the permissible land use and density for developments in the Capital City.

Regional Centre : is a second-tier commercial zone after the main central business district in the Capital City. Regional Centres are meant to decentralize the functions and services of the Capital City , helping to alleviate congestion there and to bring the workplace closer to peoples' homes. Regional centres primarily serve people in each region, with people from other regions as a secondary concern. These regional centres contain a collection of shopping malls, markets, Office, recreational, health and other forms of commercial facilities.

Economic Growth corridor : Economic Growth corridor connect economic agents along a defined geography. They provide important connections between economic nodes or hubs that are usually centered in urban landscapes. They do not stand alone, as their role in regional economic development can be comprehended only in terms of the network effects that they induce' - source -ADB Working Paper Series on Regional Economic Integration

Planning Area: Few mandal boundaries are integrated into one Planning Area. This boundary is for administrative purpose as opposed to electoral divisions. Dividing the Capital Region into these smaller Planning Areas assists in easy implementation and management of resources. Each Planning Area is identified with a Regional Centre as its focused Economic Hub.

Agricultural Protection Zone : This zone provides the opportunity to protect the existing agricultural / rural land use activities to be intact, and only allow a limited range of other uses that will not facilitate urbanization.

View from the Canal Road looking at Kaleswara Rao Market Main Bus Stop, Vijayawada