

AMARAVATI DEEP DIVE WORKSHOP

14, 15 DECEMBER 2017
THE GATEWAY HOTEL, VIJAYAWADA

Liveability | Economic Powerhouse
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Infrastructure

ICT AND SMART CITY

December 14, 2017

ICT Infrastructure and Smart City

The Government of Andhra Pradesh is committed to achieving holistic, inclusive and sustainable development of the state. The state government drafted “Swarnandhra Vision 2029”, with a vision to be among the top three states in India by 2020 and to be the best-developed state by 2029.

The AP government launched Seven Missions, Five Grids and Five Campaigns, designed to help the new state develops rapidly in the next ten years.

Five Grids: The government has a vision of connecting each household to access to the basic amenities by establishing the following five grids in a definite timeframe.

1. Water Grid - To provide regular drinking water supply
2. Road Grid - To provide all-weather access to transport
3. Power Grid - To provide 24X7 uninterrupted quality power supply to domestic and industrial connections and nine hours’ daily power supply to agriculture connections
4. Gas Grid - to provide access to gas
5. Fiber Optic Grid - to provide internet connectivity to each household

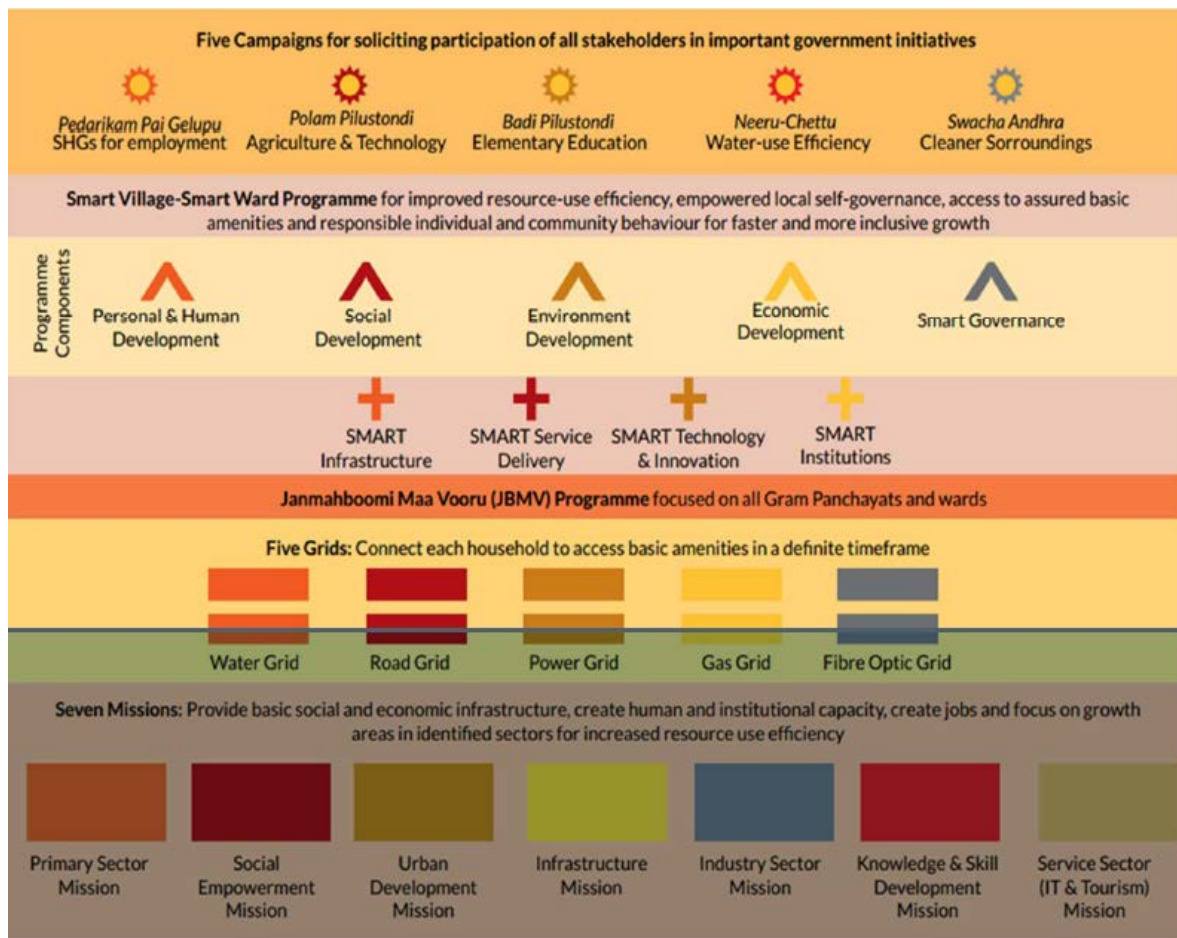


Figure 4: Framework for smart Andhra Pradesh

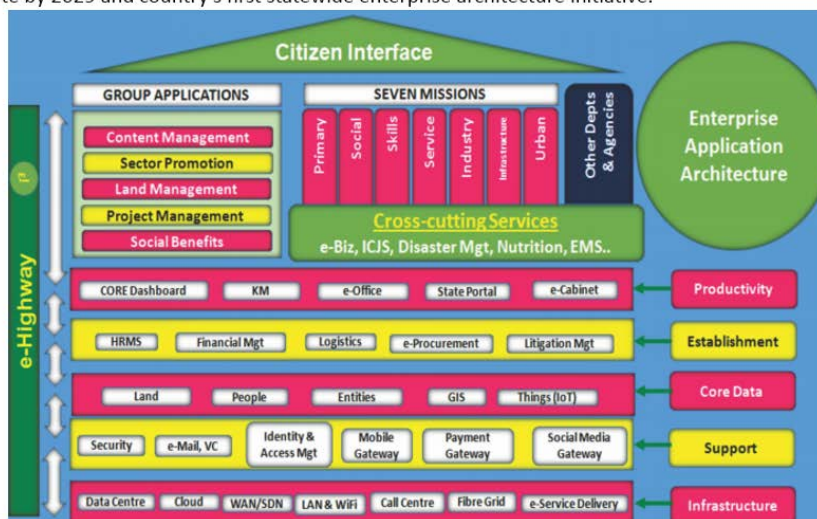
e-Pragati

e-Pragati, the Andhra Pradesh State Enterprise Architecture, is a holistic and coherent framework designed to propel the state into a developed state by 2029 and country's first statewide enterprise architecture initiative. In future, Governments will be more connected than ever before by being FAST (Flat, Agile, Streamlined, and Tech-Savvy). With its ability to manage complexity, e-Pragati will emerge as the essential means to drive public sector transformation and realize connected government with demonstrable benefits.

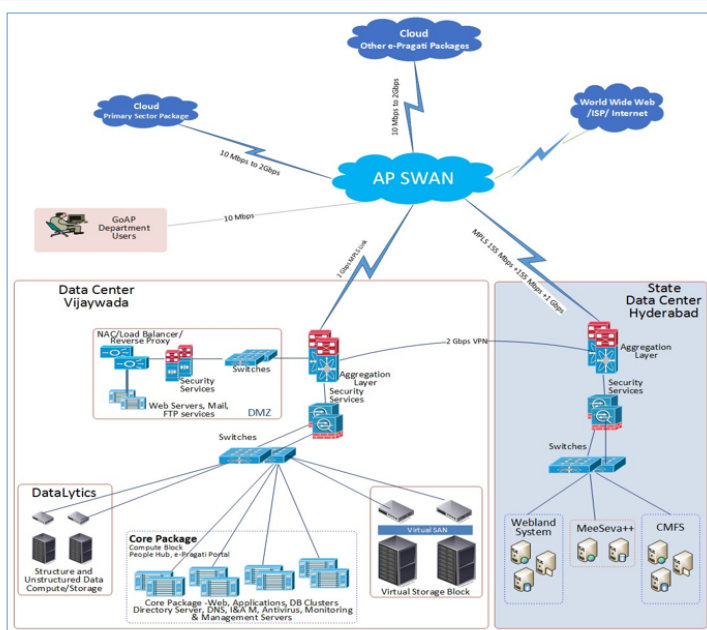
INFORMATION OF SMART CITY IN ANDHRA PRADESH

e-Pragati of Andhra Pradesh

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E-PRAGATI OF ANDHRA PRADESH



NETWORK ARCHITECTURE

- The e-Pragati applications are distributed across multiple Data Centres and different cloud environments.
- The GoAP will procure and establish the network connectivity with required bandwidth requirements.

Some of the key goals of the government towards provision of ICT infrastructure and smart city applications are:

1. Build ubiquitous and reliable infrastructure
2. Create convenient and efficient intelligent transportation
3. Achieve comfortable and resident friendly urban management
4. Provide efficient government services
5. Provide convenient social services
6. Provide Interconnected and shared cultural services

Some of the key objectives for ICT infrastructure are:

1. To provide on demand, affordable and end-to-end broadband connectivity of 15 to 20 Mbps for households and 1Gbps to 10 Gbps for institutions & enterprises
2. To establish a highly scalable network infrastructure, accessible on a non-discriminatory basis

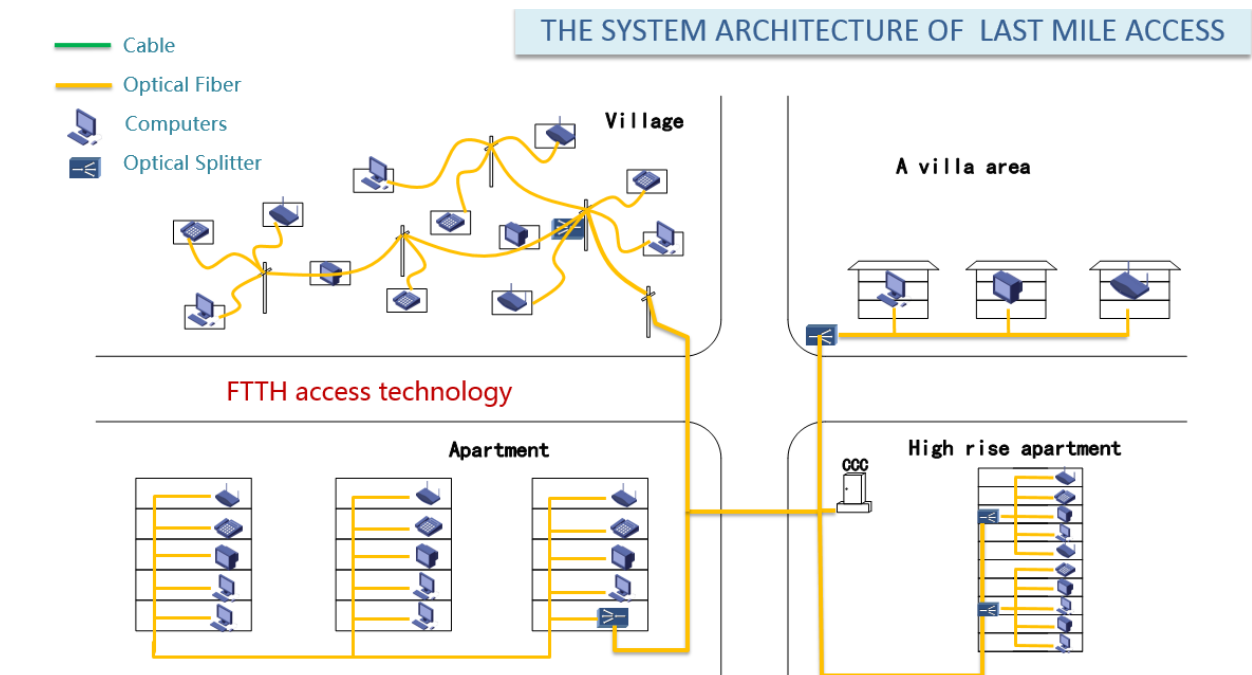
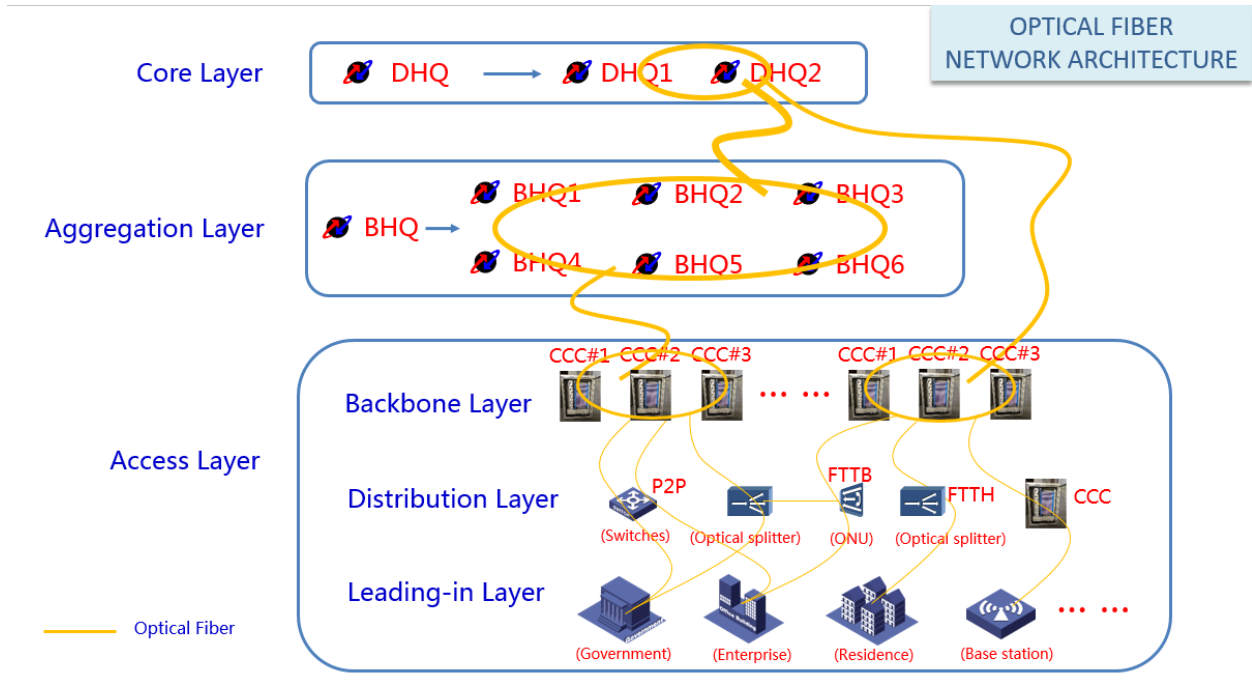
ICT Infrastructure

Amaravati's IT/ICT infrastructure is envisioned to be developed in phases as the city takes the shape. The core network for telecom connectivity, dark fiber, wireless connectivity is expected to be provided by service providers through identified service corridors and communication pipes being provided by the government as part of primary infrastructure. The civil contracts currently awarded for development of road infrastructure and utilities has provisions for laying HDPE/Honey comb pipes in identified configurations to lay the IT/ICT infrastructure at an appropriate time. This allows the system to be flexible to the development requirements as the population builds up and leaves provision for installing any latest technologies at appropriate times.

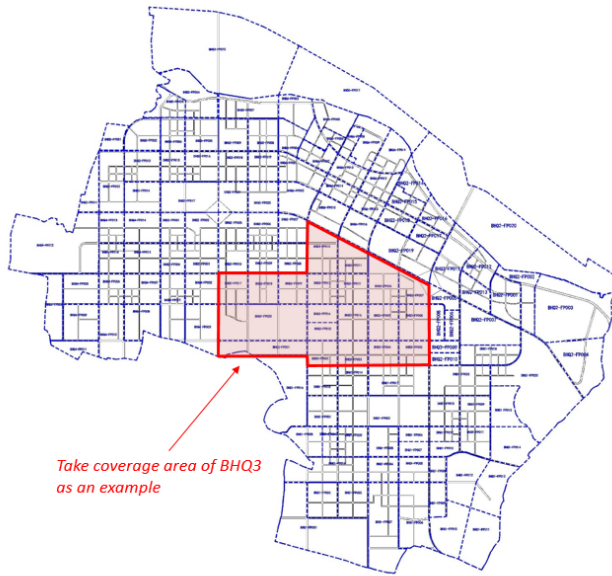
Detailed Project Report (DPR) has been prepared for IT/ICT component of infrastructure – in particular the design of communication infrastructure. This includes:

1. Communication Stations
2. Data Centre Design
3. C2-C4 Command and Control Infrastructure
4. Intelligent Optical Distribution Network
5. Communication pipes, routing and location
6. Design of DHQs and BHQs
7. Wireless Communication Network Design
8. Construction planning for the Communication Infrastructure components

Communication Infrastructure Architecture



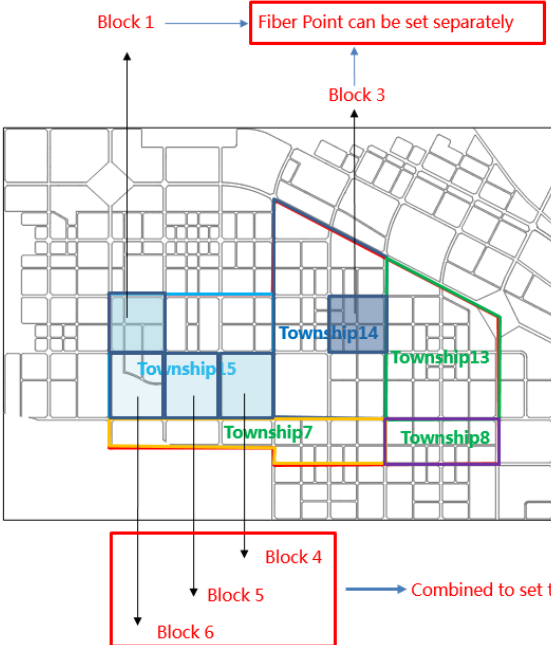
REGIONAL DIVISION OF FIBER POINT



Communication Building	Trunk fiber (cores)	Number of CCC
DHQ1	12281	20
DHQ2	10547	21
BHQ1	10744	16
BHQ2	11289	20
BHQ3	11567	20
BHQ4	10424	16
BHQ5	7803	10
BHQ6	10639	17
Total	85294	140

Division principles:

- 1. Take each block as a unit
- 2. Trunk fiber cores of each fiber point coverage area keep 500-1000 cores.



Block 1 → Fiber Point can be set separately

Block 3

Township 15, Township 14, Township 13, Township 7, Township 8

Block 4, Block 5, Block 6 → Combined to set the fiber point

REGIONAL DIVISION OF FIBER POINT

Step 1 : Take coverage area of BHQ3 as an example
Step 2 : According to the principles of division, determine the coverage area of fiber point.

Trunk fiber cores demand in BHQ3 coverage area

Township	Block	Area (Hectares)	Trunk fiber (cores)	Number
township7	1	147	576	BHQ3-FP001
township7	2	89	551	BHQ3-FP002
township7	3	89	480	BHQ3-FP003
township8	1	89	484	BHQ3-FP004
township8	2	90	469	BHQ3-FP005
township13	1	162	724	BHQ3-FP006
township13	2	105	508	BHQ3-FP007
township13	3	132	427	BHQ3-FP008
township13	4	131	708	BHQ3-FP009
township14	1	165	622	BHQ3-FP010
township14	2	108	395	BHQ3-FP011
township14	3	110	510	BHQ3-FP012
township14	4	110	659	BHQ3-FP013
township14	5	66	691	BHQ3-FP014
township14	5	66	691	BHQ3-FP015
township14	6	131	516	BHQ3-FP016
township15	1	107	694	BHQ3-FP017
township15	2	110	506	BHQ3-FP018
township15	3	104	420	BHQ3-FP019
township15	4	124	505	BHQ3-FP020
township15	5	131	73	
township15	6	127	358	

PIPELINE CONSTRUCTION PLANNING OF THE PRIORITY ROAD (2017-2021)

Road name	Road length (km)	Capacity
N5	8km	3+3
E3	20km	4+4
N3	7km	3+3
E8	18km	3+3
E10	8km	3+3
E13	7km	3+3
N15	7km	3+3
N10	10km	4+4

Note: "4+4" indicates that the capacity of pipe holes to be constructed is 4 holes of corrugated pipes and 4 holes of honeycomb pipes, priority road's pipeline are considered to build double sides.

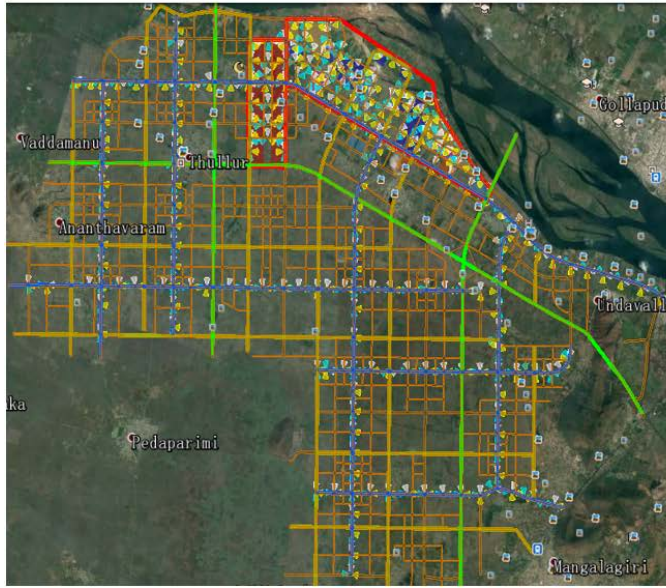
Project	Investment (Crore)	Remarks
Underground communication pipeline	48	About 160 km pipeline construction (including pipeline construction at both sides of 7 arterial roads), and 0.3 crore is planned for each kilometer.

CONSTRUCTION PLANNING OF GOVERNMENT COMPLEX CAMPUS AND SEED AREA (2017-2021)

DHQ2 and BHQ6 are suggested to be constructed first in 2017-2021. DHQ2 is mainly used for the data access in government complex campus, BHQ6 is mainly used for the data access in the seed area.

Project	Investment (Crore)	Remarks
DHQ2	62	40,000 m ² each, including engine room civil construction & decoration, supporting power supply and air conditioning, fire control system, video surveillance system, access control system, dynamic environment monitoring system and excluding engine room IT equipment. Investment for each DHQ is about 62 crore .
BHQ6	50	8,000 m ² each, including engine room civil construction & decoration, supporting power supply and air conditioning, fire control system, video surveillance system, access control system, dynamic environment monitoring system and excluding engine room IT equipment. Investment for each BHQ is about 25 crore .
Underground communication pipeline	36	in the pipeline of government complex campus and seed area ,total distance is 120km and cost is 0.3 crore /km
Fiber access construction	49	Including relay optical cable (0.6 crore), trunk optical cable (4.9 crore) and access line (43.5 crore).

WIRELESS COMMUNICATION NETWORK PLANNING (2017-2021)



- **To 2021:** mainly consider mobile network coverage including **1 seed access road, 7 priority roads, government complex campus, priority area (seed zone), about 230 base stations.**

Government complex campus Priority area (seed zone)



Phase	Investment (Crore)	Remarks
2017-2021	92	With a distance of 500 meters between two base stations in Phase I, The base stations are mainly distributed in 1 seed access road, 7 priority roads, government complex campus, priority area (seed zone). The base station includes the tower, computer room, matching power supply and so on; Do not include optical cable access. Each station will have an investment of 0.4 crore and the planned number is 230 stations.

Amaravati Smart City

In addition to the core IT/ICT infrastructure, the city is being developed as a new age Smart city envisioning the adoption of Smart Andhra Pradesh framework coupled with the vision, goals and principles of Amaravati Smart City. In addition, the Smart Cities Framework of Government of India is helping shape the Smart City strategy and implementation for Amaravati.

A Detailed Project Report has been developed on Smart City, comprising of

1. Smart City Linked Data Framework
2. Geographical Information Systems
3. Smart City Operations Centre
4. Education Facilities
5. Smart Civic Amenities
 - i. Smart Pipeline Network
 - ii. Smart Parks
 - iii. Smart Cables
 - iv. Smart Lighting
 - v. Smart Drainage
 - vi. Smart Roads
 - vii. Smart Sanitation
 - viii. Smart Gas
6. Smart Public Utilities
 - i. Internet of Things
 - ii. Smart applications for Public Utility Management
7. Natural Gas and Electric Power Management
8. Intelligent Transportation System
9. Asset Management
10. Environmental Management
11. Disaster Management
12. Safety and Monitoring
13. Costing

Principles and goals of building a Smart Amaravati

Smart Amaravati is a long-term and systematic project, and needs focus on scientific, rationality, perceptiveness, practicality and expansibility of the plan scheme to ensure that the construction meets basic rules, set development targets of the information construction and guarantee scientific and rational development progress. Smart Amaravati should be constructed in accordance with the basic principles as follows:

1. Top-level design & development by overall planning

It is required to make a scientific, systematic and high-standard plan for Smart Amaravati's top framework based on the positioning of Amaravati to be a world-class capital city and the strategy to build it into an example of smart city in India. Led by the objective to enable informatization in Amaravati and balancing the distance between reality and objective, many planned and hierarchical efforts should have made to start the Smart Application Project and push it forward.

2. Integration for sharing & centralization step by step

It is important to take full advantage of existing resources based on the service need from different regions, fields and systems by extracting, centralizing and restructuring data resources in current systems. First step is to sort out these data based on different fields to form a field based smart city related information resource database, enable business cooperation between different departments in the field and integration, development and utilization of information resources, and then help establish a unified smart city related information resource database.

3. Service-based & people-oriented

It is necessary to go deep into the construction of smart city that can meet the actual needs based on the services provided by smart city to highlight the people-oriented principle. Much emphasis should be put on improvement of social infrastructure and people's life to build the Smart service systems that are affordable, available and suitable for most ordinary people and make smart city play an essential part in improvement of people's life.

4. Mobilization through example power & development step by step

For balanced and sustainable development of Smart Amaravati, it is required to adhere to the combination of unified planning and classified guidance as well as overall development and breakthrough at key points. The project site should be properly selected based on local resource capacity and development features to create a new smart city construction pattern featured with mobilization through example power, experience-based promotion and balanced development step by step.

5. Led by government & cooperative construction

It is recommended to encourage different parties to play an active part in building a government-dominated and market-oriented development system featuring the industry university - research cooperation, and based on the law of development of different fields to form a sustainable operation mode where government's specific departments and general departments and social operators play a role as the main part of construction and operation.

Smart City Planning

The Smart City planning is done under the following citizen centric requirements:



A. SHARED LIFE

- Modular Data Centers
- C2-C4 Facilities
- City Dashboard
- GIS

B. CONVENIENT LIFE

- Smart Transportation such as Intelligent Traffic Management Systems, Smart Parking, Integrated Public Transit, VMS, Traffic enforcement
- Smart Power such as Intelligent Inspection Management System, Intelligent O&M systems, SCADA enabled systems
- Smart Energy Management

C. SAFE LIFE

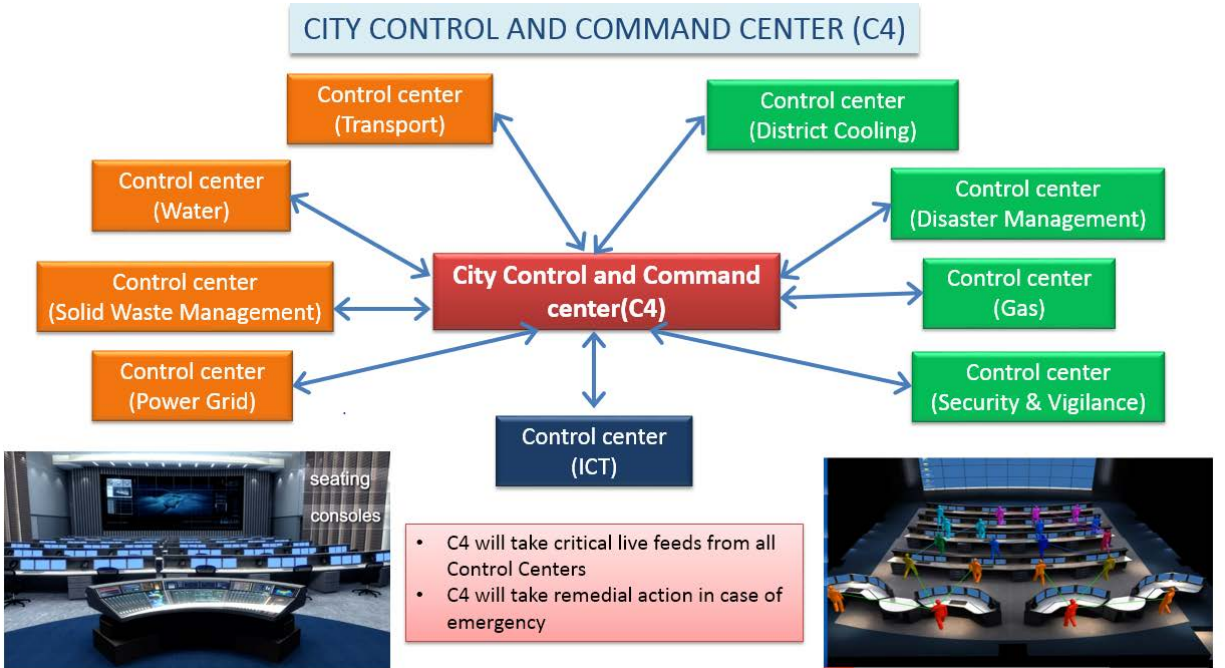
- Video Monitoring such as Smart Poles, Video enforcement (PTZ/Fixed cameras)
- Urban Emergency Command – Surveillance systems, Emergency call buttons, Smart Poles, Incident Management Systems

D. HEALTHY LIFE

- Smart Healthcare Project
- Smart Water Resource Management with SCADA enabled system for Water Treatment Plants, Sewage Treatment Plants, Pumping stations, Water quality monitoring etc.
- Smart Gas
- Smart Solid Waste Management

E. HAPPY LIFE

- Smart e-government
- Smart education



CITY DASHBOARD

Components integrated into a city dashboard are:

- **Environment:** weather (temperature, rainfall, wind speed, atmospheric pressure, clouds) with forecast, air quality (smog, average, good, very good), level of pollution.
- **Traffic information:** traffic jams, average speed in main axes, road works, accidents.
- **City information:** main events, social information.
- **Social Network:** what is told about the city in Twitter, Facebook ...
- **Power health:** in case of expected power outage, global consumption of the city.
- **Water health:** warning in case of pollutants detected. Global quality.
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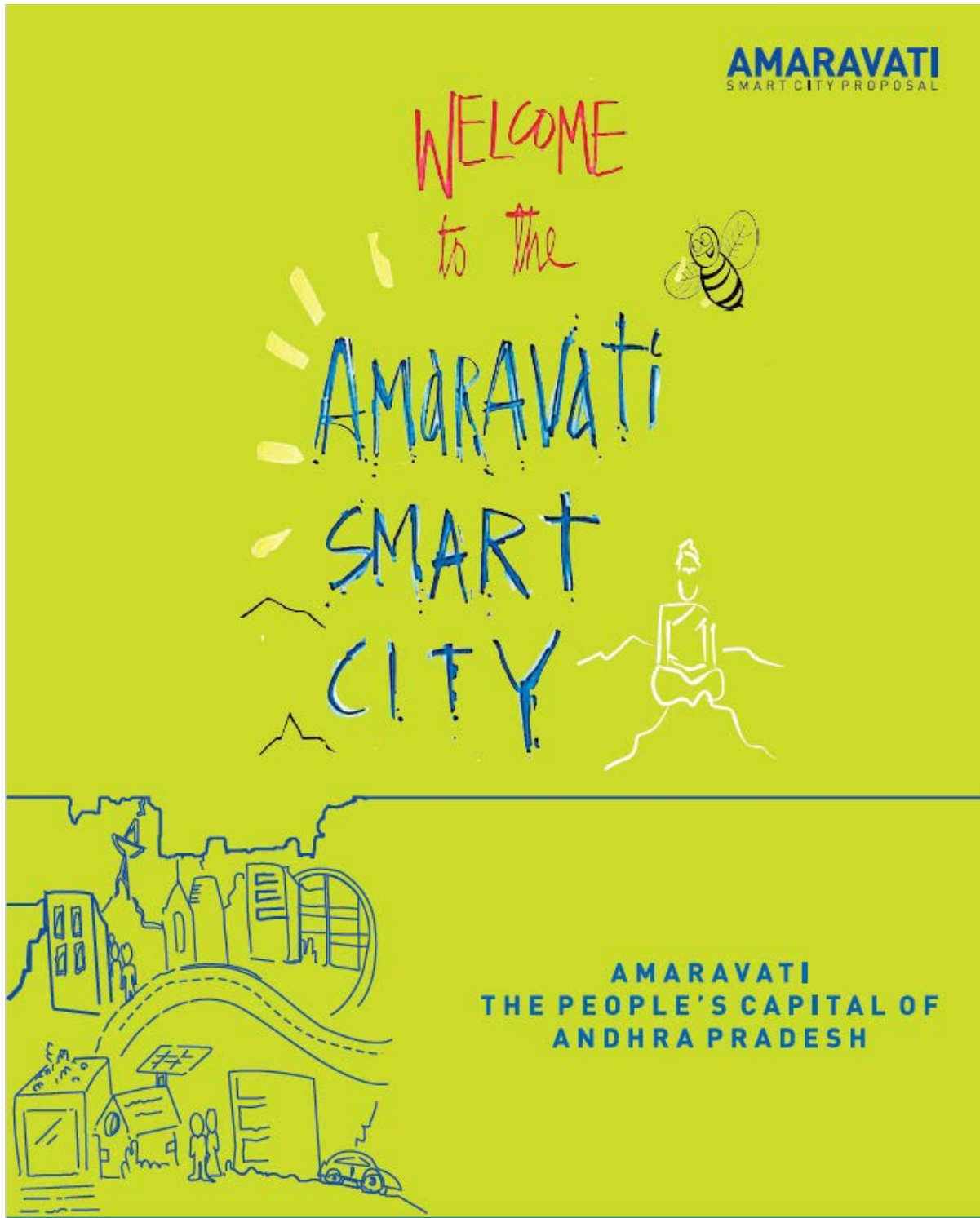
C2-C4 structure

Costing

2016 – 2050 new Capital ICT investment is estimated as follows:

Table 7: Summary table of ICT investment estimation (2017-2050)

S. No	Project	2017-2021	2022-2050
		Investment (Crore)	Investment (Crore)
Part1	Communication infrastructure	1212	8306
Part2	Smart City construction	779	3895
Section-1	Transportation	134	680
Section-2	Urban management	347	1145
Section-3	E-Governance	160	350
Section-4	Social services	118	970
Section-5	Cultural heritage	20	750
Total		1991	12201



WE ASPIRE TO CREATE AN INCLUSIVE PEOPLE'S CAPITAL THAT IS ECONOMICALLY VIBRANT AND SELF-SUSTAINING EQUIPPED WITH WORLD-CLASS SOCIAL AND PHYSICAL INFRASTRUCTURE TO FOSTER CREATIVITY AND UNPARALLELED OPPORTUNITIES. WE WILL CREATE AN ICONIC SMART CITY WITH HIGH QUALITY LIVABILITY SUPPORTED BY EFFICIENT AND EFFECTIVE GOVERNANCE.

Areas Based and Pan City Proposals – Costs

Urban Asset and Infrastructure Management System (UAIMS)

A comprehensive and enterprise wide solution is need of the hour to efficiently plan, manage and maintain the Urban Assets, Infrastructure and planning at City level and regional levels. The aspirations of APCRDA in building UAIMS is to be supported with automation of existing business processes and enriched with 2D and 3D GIS capabilities to achieve the following objectives:

- Building of an enterprise web based solution to enable efficient management of Assets, Infrastructure Management, tools to facilitate Urban Planning at City level and Regional Level, and Development control of Buildings, Infrastructure (both surface and Underground) within APCRDA.
- Building a 2D / 3D enabled web GIS application to provide tools for Planning, framework for modelling and review design plans with a complete perspective to assess the impact of design changes, creation of models to perform spatial analytics in Urban and Infrastructure planning to aid in decision making.
- Enterprise GIS database creation for viewing of 2D and 3D GIS data with attribute linkage as per the NUIS Standards.
- Seamless Integration of Business processes of all departments in APCRDA and seamless information dissemination.
- Management Dashboards with Provision for Spatial representation.
- APIs to enable exchange of Information with other departments outside APCRDA.
- Development of Mobile GIS and Android based applications.
- Augmenting efforts to make Amaravati “Smart City” ready.
- Provide technical support

This will consist of the following modules:

- 1) Urban Planning System
- 2) Infrastructure Planning and Maintenance System
- 3) Asset Management System
- 4) Tax Management System
- 5) Estate Management
- 6) GIS Integration & 2D / 3D enabled Web GIS Interface with spatial analytics
- 7) Citizen centric services
- 8) Development Control Regulations

1. Urban Planning Systems

A GIS based spatial data management system is being designed and deployed to ensure all the urban planning activities shall be seamless and real time. Some of the important ones include:

- Master Plan of Capital City and Capital Region
- Zonal Development Plans and Zoning Regulations
- Infrastructure Master Plan
- Urban Extension Projects, Special Projects

- Policy Modifications and Notifications / Proposals
- Zone wise approved layout/Schemes/Projects
- Details of Approval of Layout / Scheme / Projects
- Land Assembly
- Layout Plans /Drawings
- Traffic and Transportation
 - Roads module – create, update and maintain master plan roads
 - Traffic Module – Input and update data on assets
 - Bus route planning module
- Buildings Permissions
- Spatial tools for Impact assessment, parametric simulation of plans.
- 2D and 3D enabled spatial map viewers.

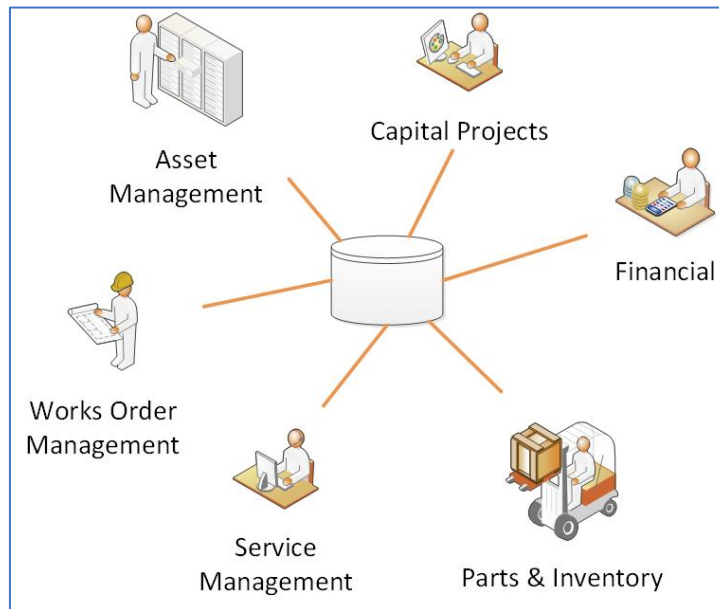
2. Infrastructure Management

Infrastructure module shall have following functionalities:

- Interface to create, update and maintain surface and underground infrastructure plans with all relevant attributes both spatial and non – spatial.
- 2D and 3D spatial viewing capabilities of the infrastructure plans with Open Standard formats.
- Impact analysis on the changes to the infrastructure plans with provision to view underground assets in 3D cross sectional views.
- Dashboard for progress tracking of infrastructure projects.

3. Asset Management System

UAIMS Asset Manager (SAM) brings the following together into a single system. This will cover different kinds of property, plant and equipment including all primary infrastructure like roads and storm water, electrical, water and sanitation, community/recreational facilities etc. The system will provide for template for asset creation, location and operational hierarchies, bulk editing facilities, auditing trails, dashboard etc.



4. Property Tax Management System

Tax Collection module shall have following functionalities:

- Assess property tax for various plots that have been registered.
- Generate bulk demand notices and issue notices via email and SMS for registered users.
- Generate defaulters report, both textual and spatial thematic maps zone wise, block wise etc.,
- Interface for online payment of taxes and Issue of tax certificates.
- Interface to update property usage type and modification of tax.
- Update and recording mutation of ownership in tax certificate.
- Interface to input signage assets, assess advertisement tax, management of signage leases and auctions.
- User collection fee module

5. Estate Management System

Estate, Land and Properties module shall have following functionalities:

- To manage all survey related datasets and processes for cadastral, engineering and other surveys.
- Validation of survey datasets with respect to the standards prescribed by SOI.
- Make available survey datasets for other departments for their planning activities.
- Interface with land assignment application to store attributes of land; update plot data such as mutation, amalgamation and bifurcation of lands.
- Interface with economic development work to capture attributes on plots sold, leased to developers / investors.
- Parametric analysis of land demand and management of land bank.
- Create government housing related assets; allotment of housing for government officials, economically weaker sections.
- Input information pertaining to public buildings, assets and related attribute

6. GIS Integration

GIS Integration system shall have the following functionalities:

- Base Map Creation with all Topographical Map layers, Contours, Cadastral Maps
- Land Use Maps of Capital City and Capital Region
- Integration of Master Plan of Capital Region, Capital City, LPS Layouts and Final LPS Layouts with Lottery Data.
- API services to other Government Departments and 3rd party service providers

7. Citizen Centric Services

Citizen centric services shall include the following functionalities:

- Online Search for Master Plan of Capital City, Capital Region, LPS Layout and generation of Reports for Land Registrations
- Online application for Change of Land use
- Traffic advisory and Emergency services
- Provide location data analysis and geospatial information for the benefit of all citizens and the visiting population to meet their daily needs such as travel, leisure, information, tourism, during emergencies, etc.
- Adoption of features similar or equivalent to that of Singapore's one map.
- Record of objects / grievances and complaints
- Online payments, such as of property taxes

8. Development Control

Development Control module shall have following functionalities.

- Develop module to accept applications and CAD plans.
- Validate compliance with detailed zoning regulations.
- Validate compliance with detailed development control regulations.
- Approval of building permits based on compliance.
- Issue of completion certificates.
- Issue of notices for irregularities and violations against compliance.
- Accept layout permits. Validate layouts with zoning regulations. Approve layout permits.
- Interface with the land permit application to provide attributes and parameters associated with parcel of land under consideration; generate GIS ID and record data on system upon approval.
- GIS integration.
- MIS Reports