Use of Technology in Urban Planning & Management
(Emphasis on GIS)

GREATER VISAKHAPATNAM MUNICIPAL CORPORATION
VISAKHAPATNAM

The context

“Urban and regional planning underlies the very fabric of society as we know it today. Without planning and foresight, our cities, towns, rural areas, and residential communities will not run efficiently. While communities today face many challenges, some of them, such as pollution and traffic, resource management, safety and security, etc. can be addressed by careful and creative planning.”

Pre GIS era…

- Consumed lot of resources and finances for primary analysis and investigation
- Timely and inadequate information for appropriate decision making
- Traditional problems of data redundancy and data accuracy and transfer between departments

GIS technology is quick, exact and economical

- A quick, exact and economical Tool for collecting, storing, retrieving, transferring and displaying geographically referenced spatial data

- Digital maps in the form of layers and can be overlaid to generate new information and facilitates a synergic integration

- Proven essential tool in developing Master Plans, land management plans, transportation planning and engineering, environmental impact assessment, change detection and fire behavior modeling, habitat modeling and with numerous other spatial-temporal problem solving needs

GIS technology *contd*...

- Use of Remote Sensing & GIS has become an important tool in the Urban and Infrastructure Planning and Management

- Can be used to investigate urban physiognomy, hydrology including floods and inundation, water bodies,, points of interest, traffic, land use land cover including biodiversity and construction activities, etc. very quickly

- GIS provides the framework for an integrated workflow across the enterprise for creating, enhancing, and updating Geo databases that can be easily shared both within and across the organizations

Use of GIS in Visakhapatnam – A Case Study
GIS work flow

Digital stereo aerial photographic data generated is ortho rectified and georeferenced using GCPs and SoI data with a resolution of 9 cm.

Digital base map with basic information is prepared for the entire GVMC.

The contour map and the seamless data on spot elevations facilitated many projects from planning – execution - management.

Individual Properties located in 8 zones of GVMC spread over an area of 625 km^2 are geotagged on a GIS platform.

Digital thematic layers centered around 57 themes are generated.

Parameters like plinth areas and no of floors of buildings, vacant lands, location and size of hoardings, distribution of street lights, green canopy areas and many more can be identified and mapped accurately in a very short time without field surveys.


VT-IIC


DMC

Digital aerial Photographic Survey

GCN (Ground Control Network)

DGPS Post points observation		Bench mark observation
		

DGPS Observation in static mode, if the distance is less than 10 kms from base point the minimum observation time is one hour and more than 10 kms the observation time is two hours.

Over view of GCP paneling

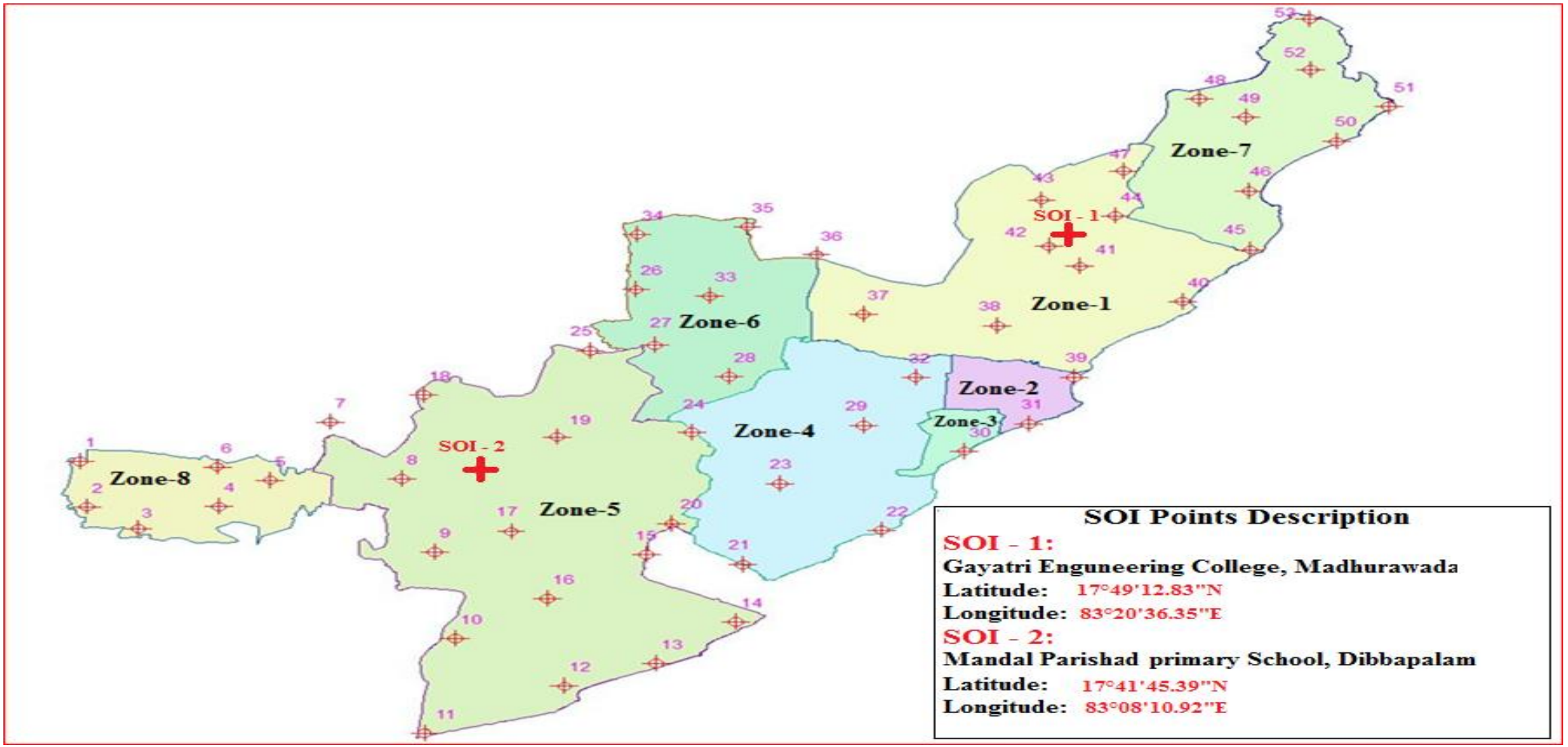
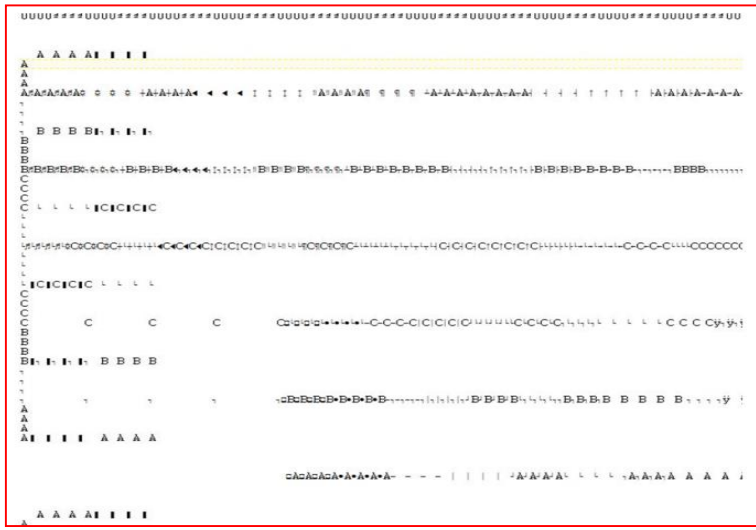


Image Processing - Stages

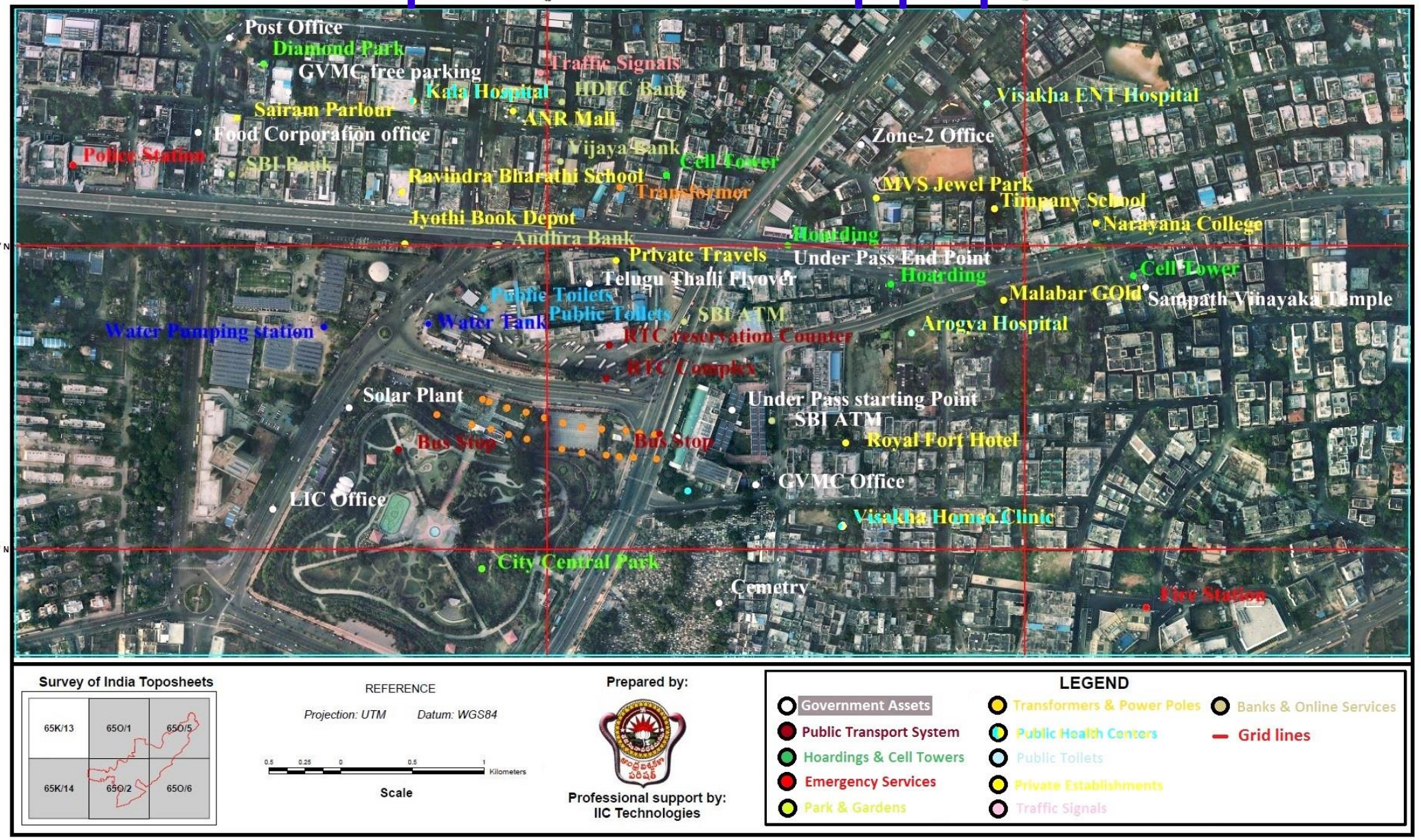


.dat file/Machine file
(At Flying Stage)

Processed Image
(Not Geo referenced)

Final Ortho Image
(Geo referenced)

Aerial photo for Base map preparation

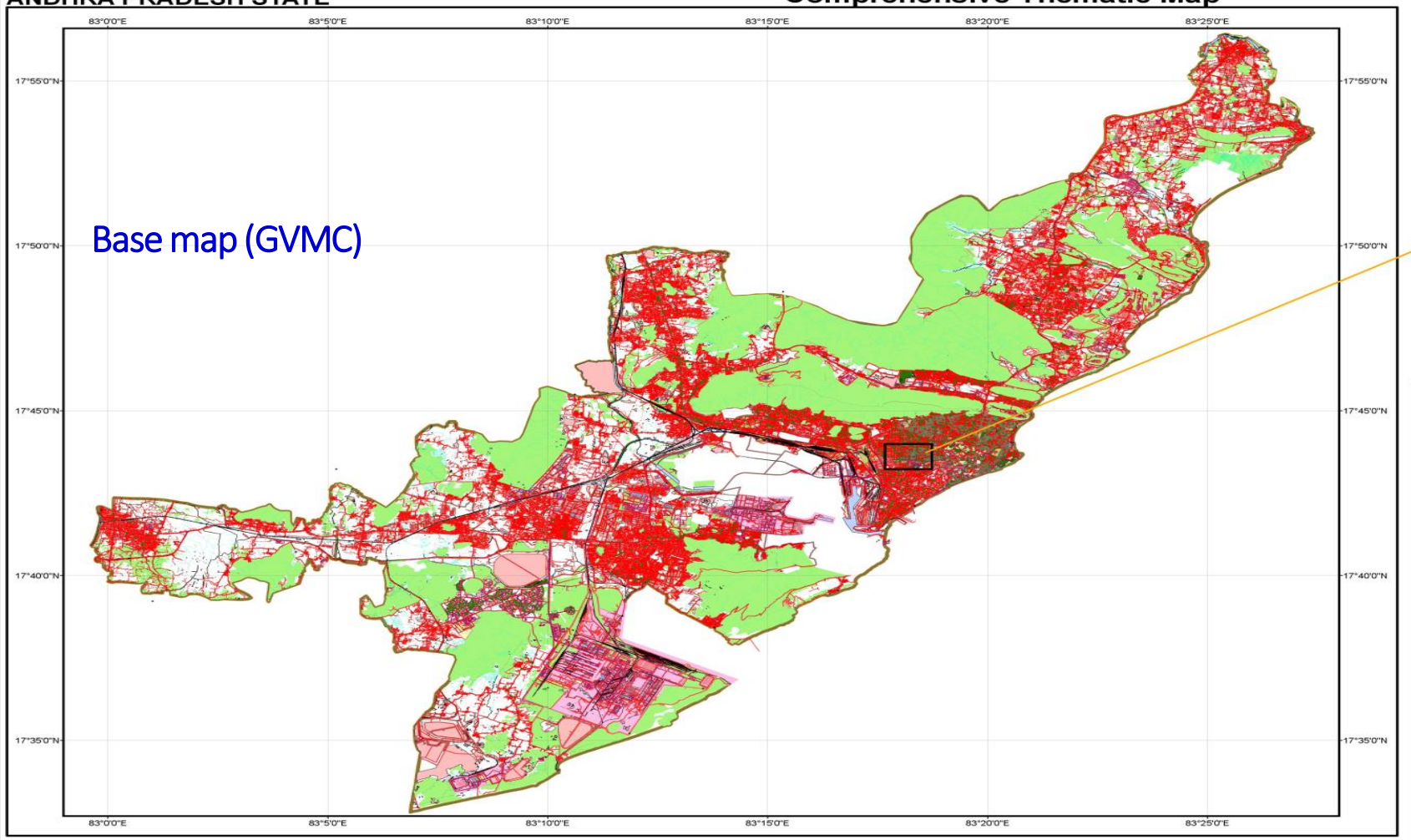


GREATER VISAKHAPATNAM MUNICIPAL CORPORATION (GVMC)

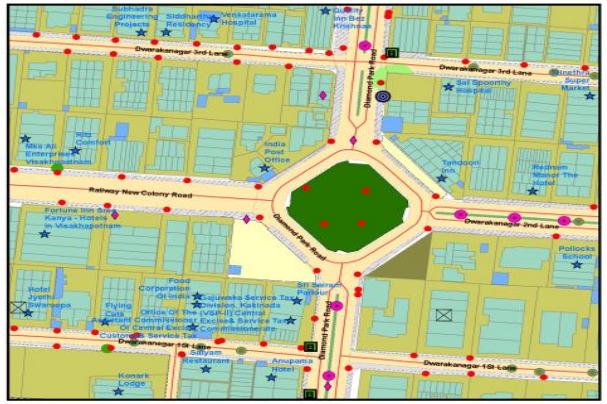
ANDHRA PRADESH STATE

Comprehensive Thematic Map

VISAKHAPATNAM



Detailed View

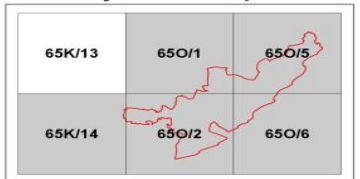


LEGEND

Location : Entire GVMC - 625.47 Sq. Kms.

Manhole		Bus Shelters	
Garbage Collection Point		Drainage Network	0.71%
Cell Phone Tower		Garbage Tranfer Station	
DGPS		Lake Pond	2.95%
Dumper Bins		Landfill Site	
Electric Pole		Layouts	
Electric Transformer		Other Basic Infra	
Fire Station		Park/Garden	0.28%
Hand Pump		Slaughter House	
Hoardings		Tree Area	34.84%
Overhead Tanks		Vacant Plots	
Street Light		Traffic Square	
Tubewell		Road Median	0.15%
Landmarks		Bridge/Flyover	
Drain Manmade		Footpath	
Streams/Canal		Carriage Way	3.72%
Compound Walls		Road Edges	0.93%
Railway Network		Slum Boundary	7.29%
Cart Track		Industrial Zone	
Buildings	4.98%	Tax Zone	
Misc. Buildings	0.03%	Ward Boundary	
Government Establishments	1.08%	Zone Boundary	
Property		Municipal Boundary	

Survey of India Toposheets



REFERENCE

Projection: UTM *Datum: WGS84*

Map Scale 1:1000

5 2.5 0 5 10 Kilometers

Prepared by:

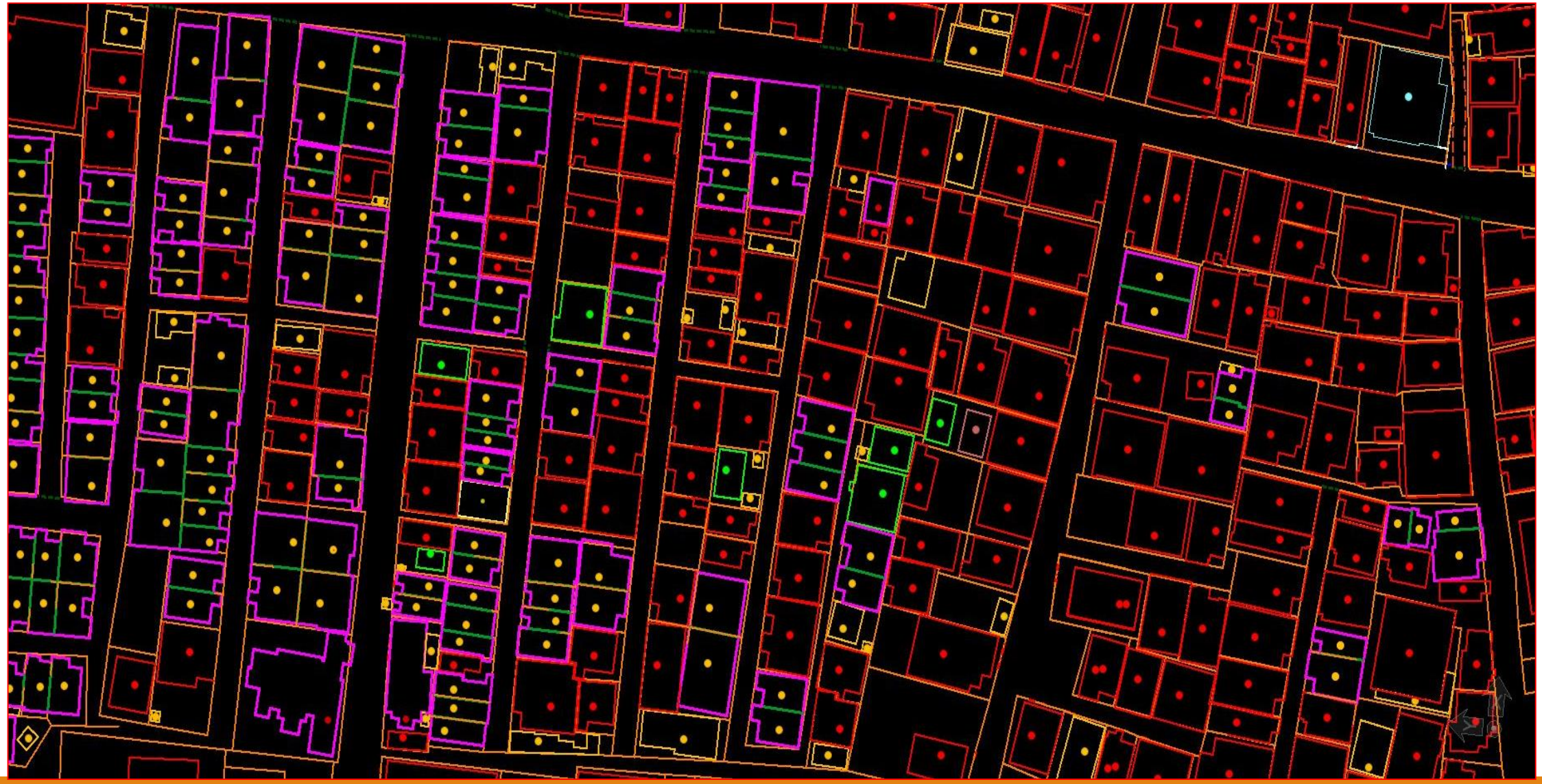
Professional support by:
IIC Technologies

GIS PROJECT BY VISAKHAPATNAM CORPORATION

Visakhapatnam ULB got GIS map prepared by the Andhra University this year. The precision level of the map is 9cm. In addition to a digital base map fifty seven thematic maps are generated for GIS based applications

Comprehensive list of layers					
S.No	Layer	S.No	Layer	S.No	Layer
1	Municipal Boundary	20	Drainage Pumping Station	39	Electric Transformers
2	Ward Boundary	21	Water treatment plant	40	Landmarks
3	Zone Boundary	22	Fire Stations	41	Road Network
4	Tax Zone Boundary	23	Garbage Collection Points – Secondary	42	Carriage Way
5	Industrial Zones/Area	24	Slaughter House	43	Footpath
6	Colony Boundary	25	Street Light	44	Sewage Treatment Plant
7	Slum Boundary	26	Bridges / Flyover	45	Cell Phone Tower/ Telephone Tower
8	Buildings/Plots etc.	27	Parks/Garden	46	Bus Shelters
9	Streams/Drainage/ Canal	28	Tube Well	47	Cadastral Map/Town Survey Maps
10	Over Head Tanks	29	Hand Pump	48	Dumper Bins/Open Points
11	Landfill Site	30	Community Toilet	49	Garbage Transfer Stations/Parking Yards
12	DGPS Points	31	Communication Tower	50	Public Taps
13	Sewerage Network / Drainage Network	32	Water Pumping Stations	51	Layouts
14	Manholes	33	Traffic Square	52	Compound Walls
15	Water Supply Network	34	Railway Line/Station	53	Parcel
16	Vent Shaft	35	Contours	54	Drainage Network
17	Hoardings	36	Power Supply Network	55	Other Basic Infrastructure
18	Right of way	37	Electric pole	56	Permanent bench mark
19	DGPS – photo	38	PBM- photo	57	Sewage Pumping Station

Extraction of thematic information - Buildings



Extraction of thematic information - Roads

Extraction of thematic information – Power Supply Network

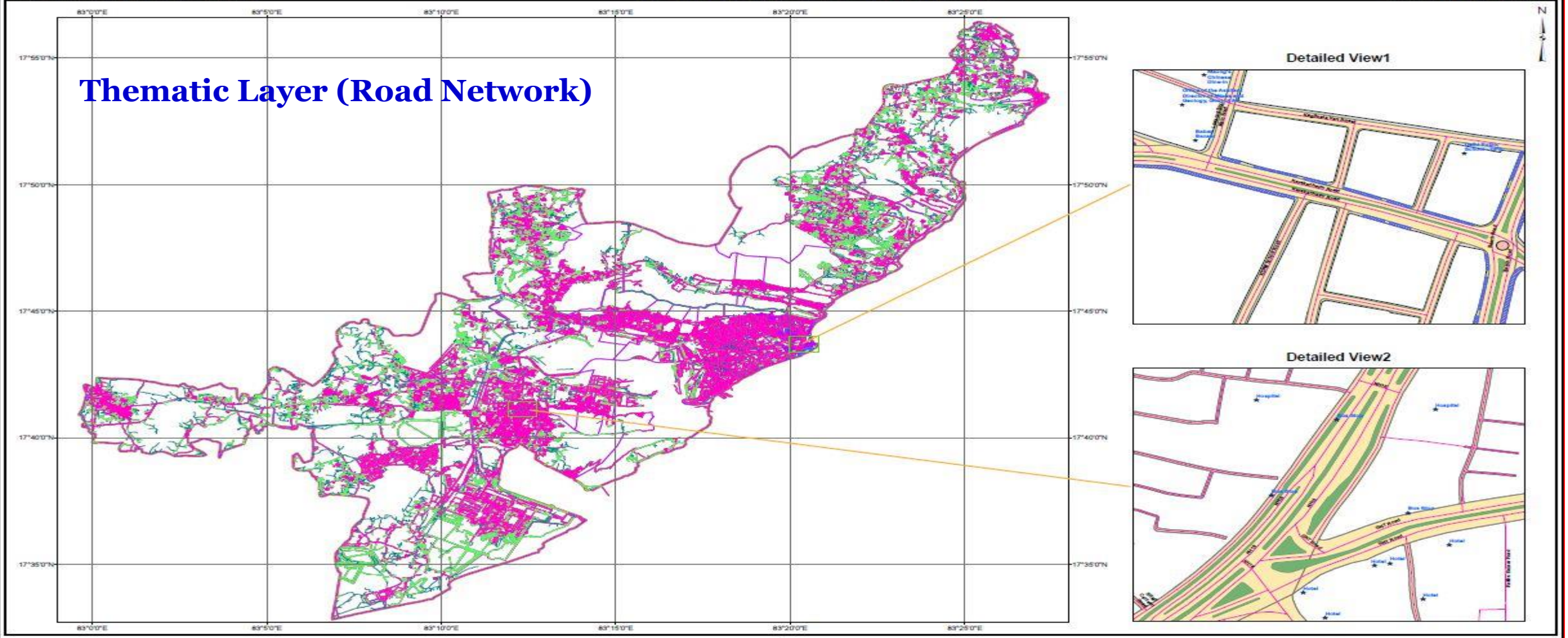
GREATER VISAKHAPATNAM MUNICIPAL CORPORATION (GVMC)

ANDHRA PRADESH STATE

Thematic Layer : Road Network

VISAKHAPATNAM

Thematic Layer (Road Network)



Survey of India Toposheets

65K/13 | 65O/1 | 65O/5
65K/14 | 65O/2 | 65O/6

REFERENCE

Projection: UTM Datum: WGS84

Map Scale 1:1000

Prepared by:

Professional support by:
IIC Technologies

LEGEND

Thematic Layer : Road Network (24.24 Sq. Kms.)

Location : Entire GVMC - 625.47 Sq. Kms.

- Landmarks
- Asphalt
- Concrete
- Under Construction
- Unmetalled
- Cart Track
- Road Edges 96.05%
- Traffic Square 0.06%
- Road Median 3.89%
- Bridge/Flyover
- Footpath
- Carriage Way
- Ward Boundary
- Zone Boundary
- Municipal Boundary

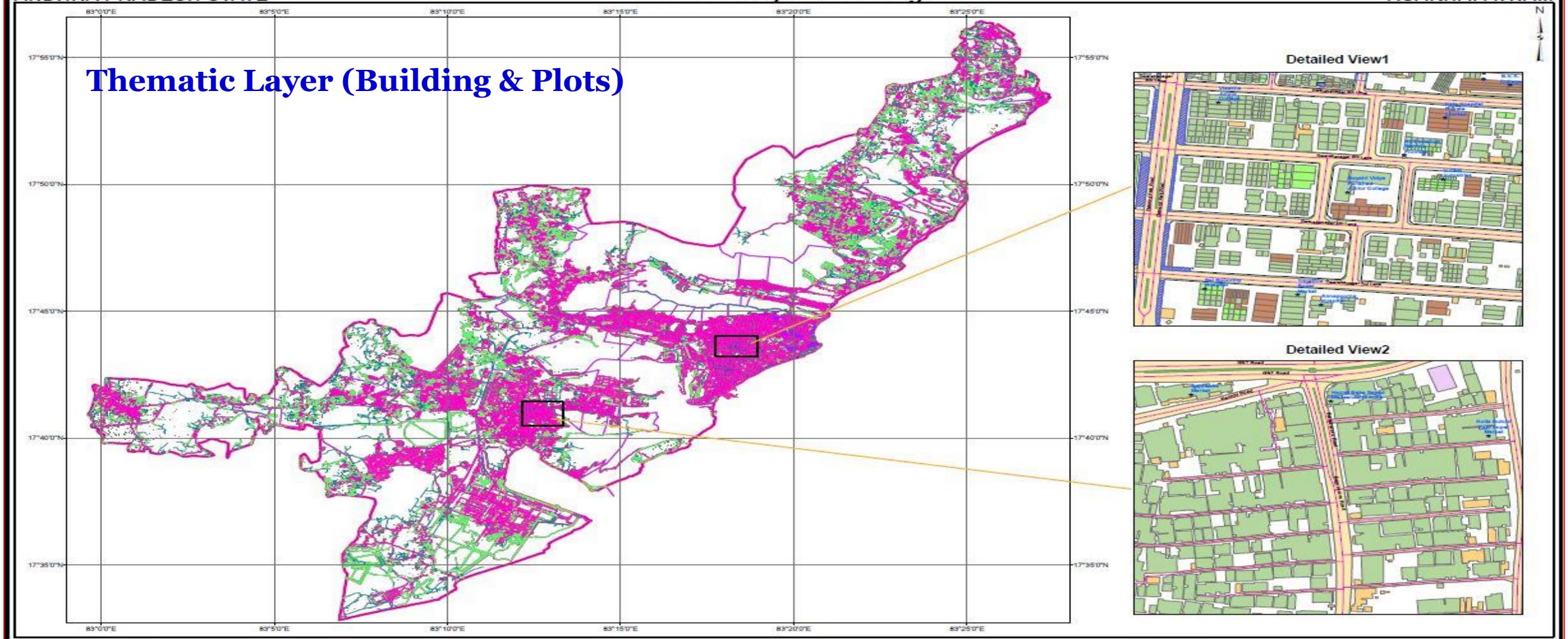
GREATER VISAKHAPATNAM MUNICIPAL CORPORATION (GVMC)

ANDHRA PRADESH STATE

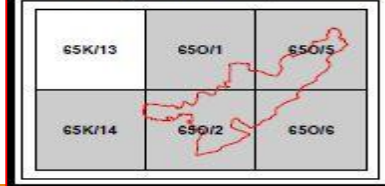
Thematic Layer : Buildings/Plots

VISAKHAPATNAM

Thematic Layer (Building & Plots)



Survey of India Toposheets



REFERENCE

Projection: UTM Datum: WGS84

Map Scale 1:1000

5 2.5 0 5 10 Kilometers

Prepared by:

Professional support by:
IIC Technologies

LEGEND

Thematic Layer : Buildings (37.95 Sq. Kms.)

Location : Entire GVMC - 625.47 Sq. Kms.

Landmarks	Unmetalled		Public Usage	0.35%	Others	0.79%	Carriage Way
Cart Track	Residential	60.92%	Canopy	1.14%	Traffic Square		Road Edges
Asphalt	Business	0.19%	Hut	1.88%	Road Median		Ward Boundary
Concrete	Commercial	0.60%	Shed	14.03%	Bridge/Flyover		Zone Boundary
Under Construction	Govt Establishments	0.06%	Under Construction	0.03%	Footpath		Municipal Boundary

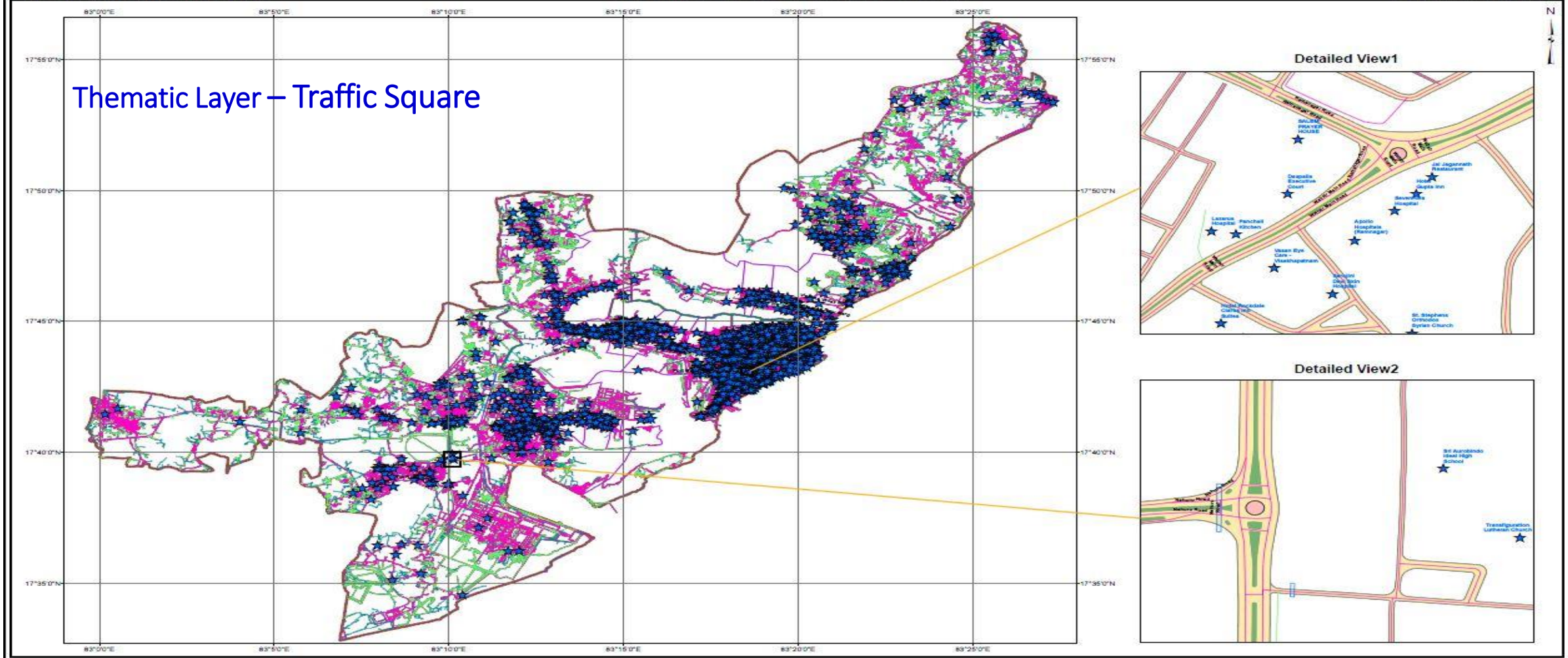
GREATER VISAKHAPATNAM MUNICIPAL CORPORATION (GVMC)

ANDHRA PRADESH STATE

Thematic Layer : Traffic Square

VISAKHAPATNAM

Thematic Layer – Traffic Square



Survey of India Toposheets

65K/13	65O/1	65O/5
65K/14	65O/2	65O/6

REFERENCE

Projection: UTM *Datum: WGS84*

Map Scale 1:1000

5 2.5 0 5 10 Kilometers

Prepared by:

Professional support by:
IIC Technologies

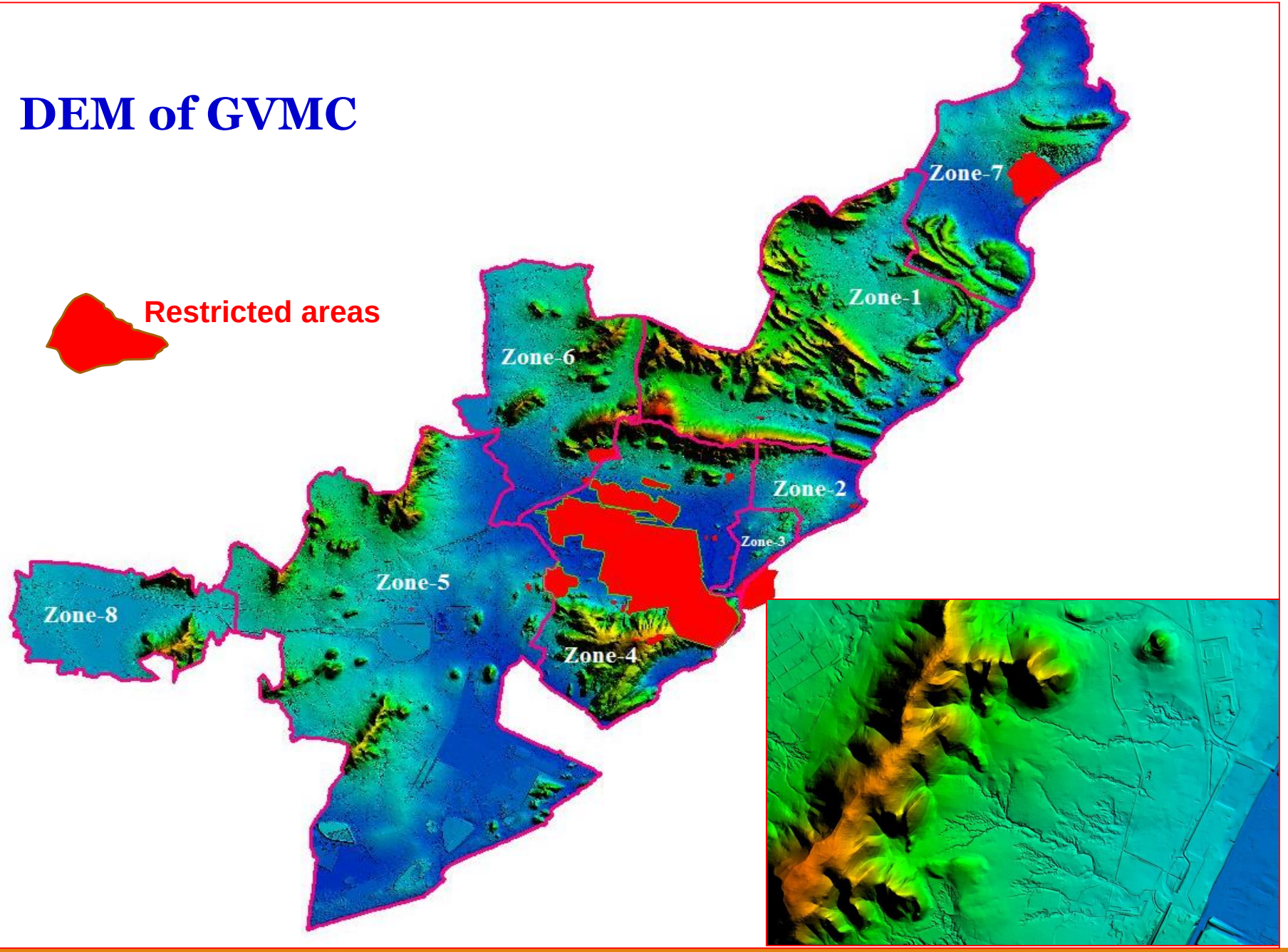
LEGEND

Thematic Layer : Traffic Square

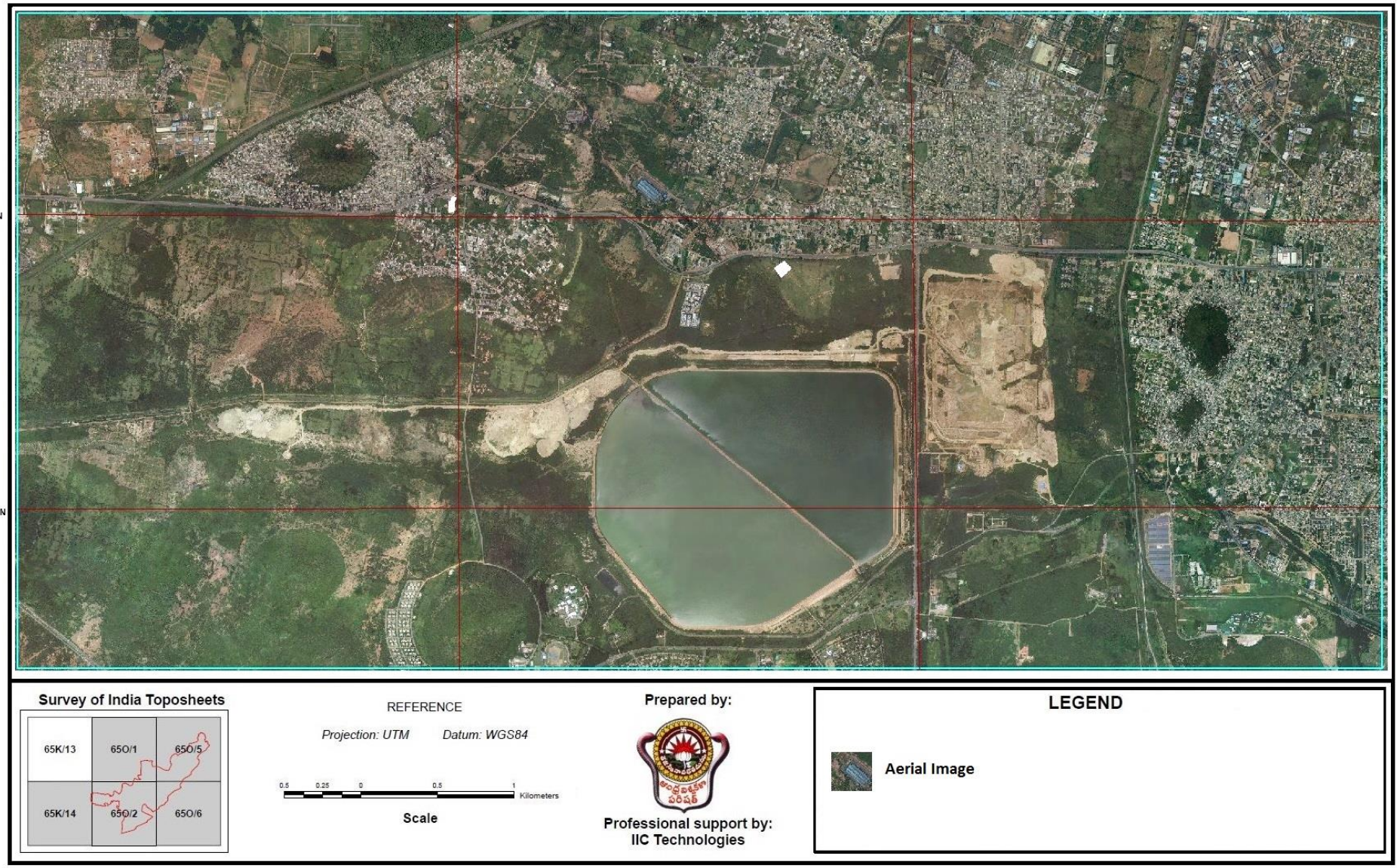
Location : Entire GVMC - 625.47 Sq.Kms.

- Landmarks
- Cart Track
- Asphalt
- Concrete
- Under Construction
- Unmetalled
- Traffic Square
- Road Median
- Footpath
- Carriage Way
- Road Edges
- Ward Boundary
- Zone Boundary
- Municipal Boundary

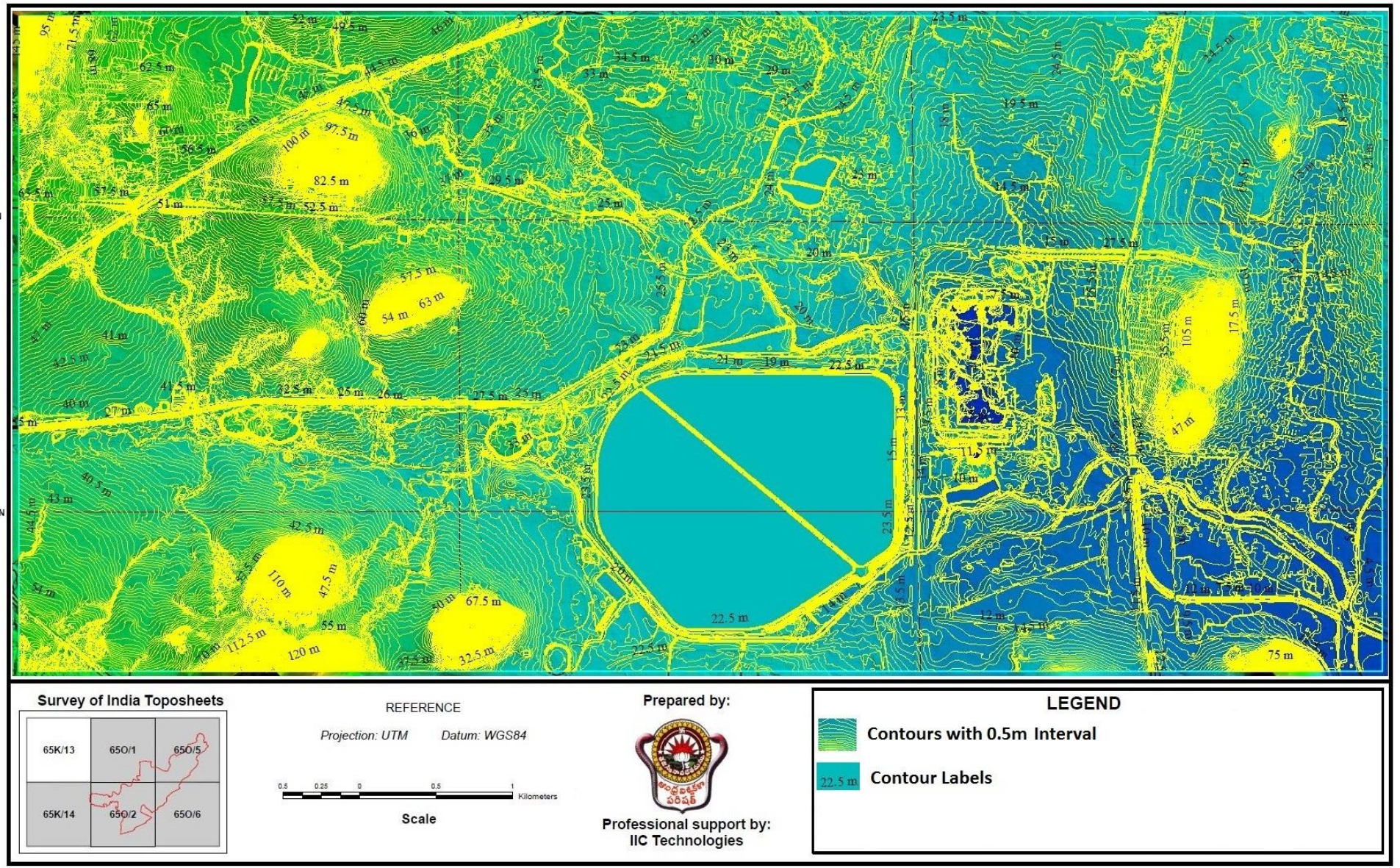
DEM of GVMC


Restricted areas
Zone-7
Zone-1
Zone-6
Zone-2
Zone-3
Zone-5
Zone-8
Zone-4

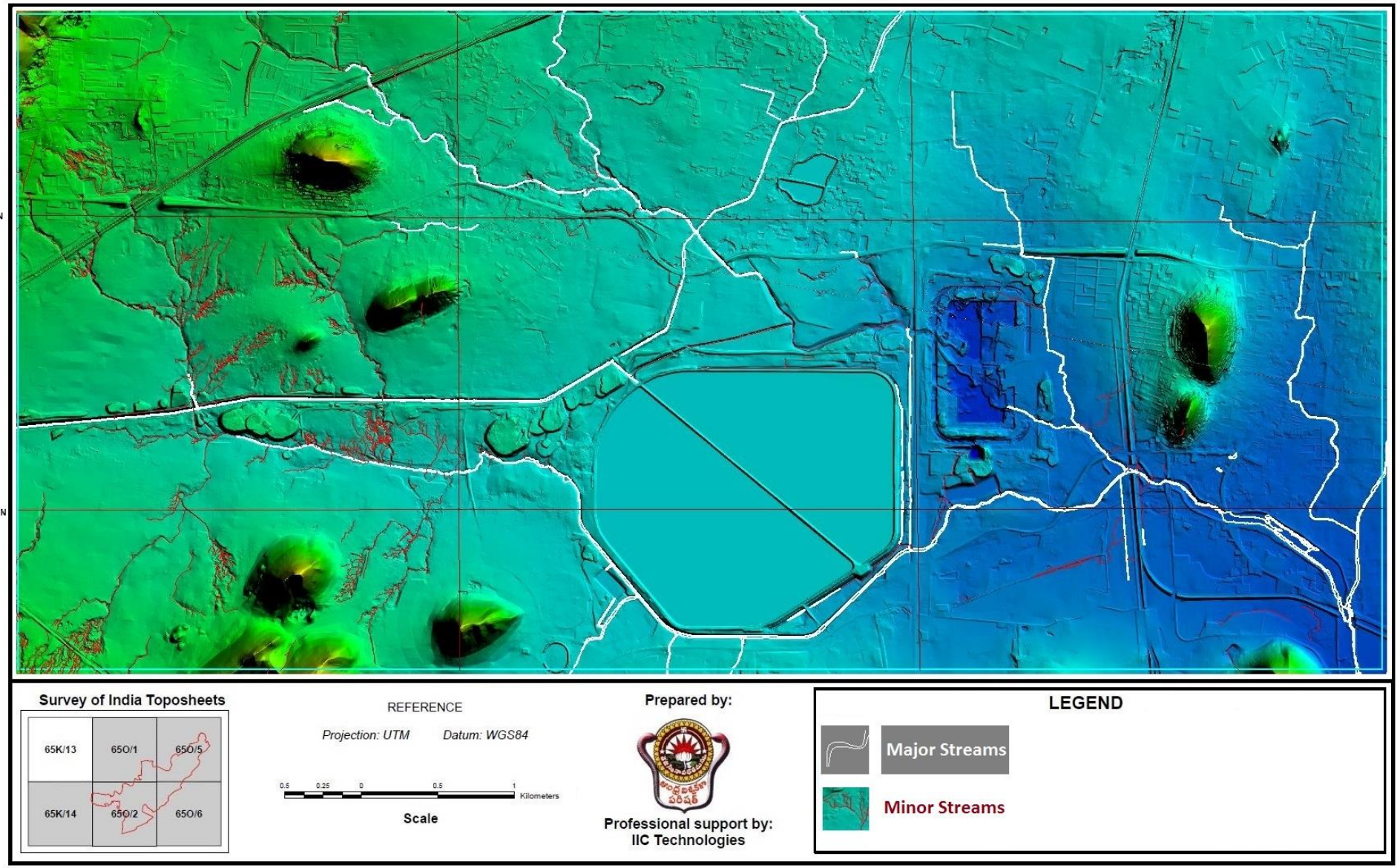
Aerial photo of Kaniti Reservoir Area



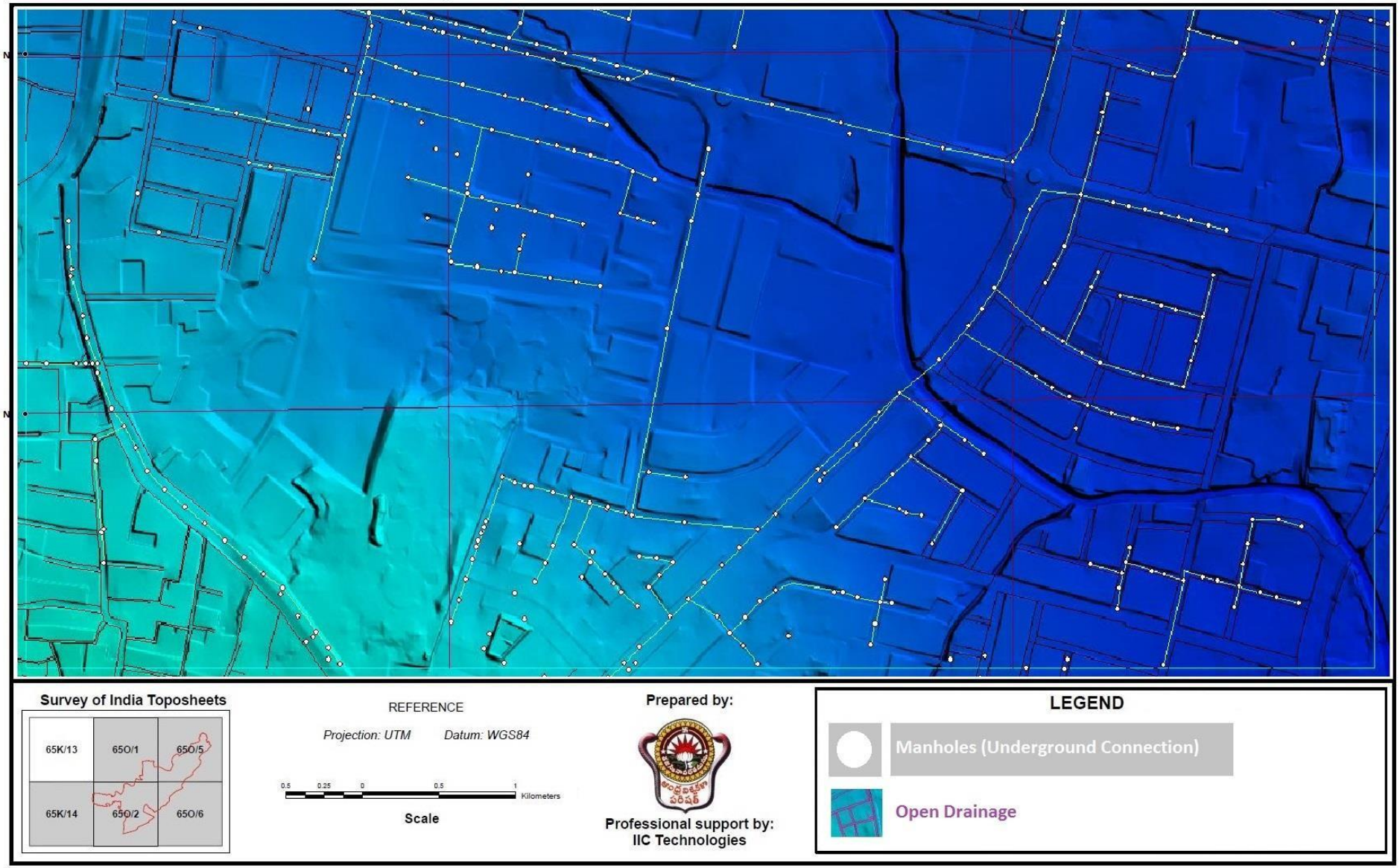
Contour map (0.5 m- area Kaniti Rservoir area



Natural Drainage of Kaniti Reservoir area



Thematic layer- UGD



Summary Report for 123640 floors/Portions

Sl.No	*As per GVMC*	*As per Survey*	*Difference*
No of Records	***123640***	***119882***	***- 3758***
Plinth Area in m^2	8620101	10021691	+ 1401590
Half Yearly tax In Rupees	242157894	287188873	+ 45030979
Yearly tax In Rupees	**484315789**	**574377746**	**+ 90061956**

Summary Report For 8519 New Floors and 1439 New Constructions				
Sl.No	***As per GVMC***	***New Floor***	***New Construction***	***Total***
No Of Records	0	***8519***	***1439***	***9958***
Plinth Area (in m^2)	0	507955.66	73641.93111	*581598*
Half Yearly tax (in ruppes)	0	12800196	1850011	*14650208*
Yearly tax (in ruppes)	**0**	**25600393**	**3700023**	***29300417***

Summary Report For 716 Govt. & 609 ID Bonds				
Sl.No	*As per GVMC*	*Govt. Buildings*	*ID Bond Buildings*	Total
No of records	0	*716*	*609*	1325
Plinth Area (In m^2)	0	89393	14370	103763
Half Yearly tax (in rupees)	0	5999737	251383	6251120
Yearly tax (in rupees)	0	11999474	502765	12502240

Govt. buildings of major Govt. establishments like Andhra University, HPCLare not included

Summary Revenue Statement for GVMC Zone-2

		Plinth Area measurements in m^2			Half Yearly Tax in rupees			Yearly Tax in rupees		
Particulars	No f Records	As per GVMC	As per survey	Difference	As per GVMC	As per survey	Difference	As per GVMC	As per survey	Difference
Existing Floors/ Portions (Records)	119882	8620102	10021691	1401590	242157895	287188873	24117668	484315790	574377746	90061956
New Floors& New constructions	9958	0	581598	581598	0	14650208	14650208	0	29300417	29300417
Hoardings								766	1504	3008000
Sub-total	129840	8620102	10603289	1983187	242157895	301839081	59681186	484315790	603678163	122370373
Govt & ID Bond	1325	0	103763	103763	0	6251120	6251120	0	12502240	12502240
Total	131165	8620102	10707052	2086950	242157895	308090201	65932306	484315790	616180403	134872613

Net revenue enhancement is around 27.84 %in Zone 2

Tax effected due to the following main Reasons

(out of total units of 123640 in Zone 2)

Sl No:	Tax component differs with GVMC with 10% Tolerance	Count in records
1	Plinth Areas	57005
2	Construction	12603
3	Usage	2309
4	Occupation	4136

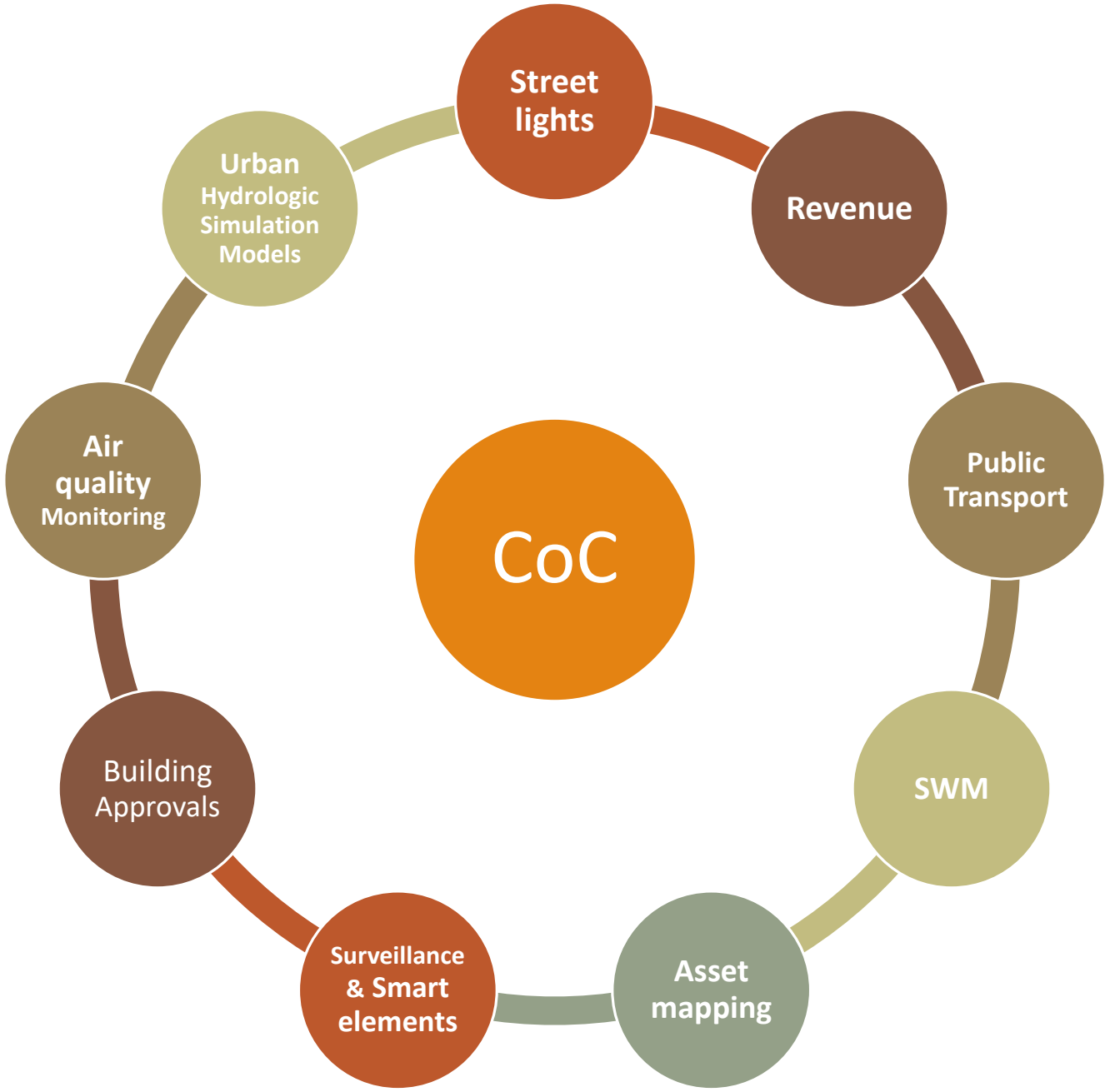
Items against S.Nos. 1&2 can be mapped without filed surveys which comprises 92.75 %of total deviation

Use of GIS in Visakhapatnam – A Case Study *… contd*

- Master Plan of Visakhapatnam is being transposed on to GIS platform
- The Municipal Corporation has used the DEM data for the preparation of DPR of Sewerage Project worth of 1000 Cr saving lot of time, labour and Money with highest accuracy
- The VUDA is using the digital elevation data for the development of Yerada Hill as a tourist attraction of Visakhapatnam- saving huge resources and time.
- Further, 24/7 Water Supply DPR is being prepared on a GIS platform using the digital data generated by GVMC
- Digital maps are integrated to Command and Control Centre operations where several utilities and services are monitored in space and time.
- The geotagged information has helped ULB to enhance its revenues.
- Urban Hydrologic simulation models, help ULB machinery to forecast and initiate appropriate measures during floods.
- Currently being used in execution of 24/7 water supply and sewerage projects in ABD area under Smart City Mission.

Current use of GIS…

Visakhapatnam under Smart City Programme has adopted GIS with the integration of all important and critical elements for an enhanced efficiency and real time Functionality



Scaling of GIS Integration…

Envisioned use of GIS by Visakhapatnam in coming days which will form the fundamental tool of ULB in planning, monitoring, functioning and decision making.

Some applications of GIS in Urban Planning & Management

- Planning and development
- Asset management
- Enhanced revenue collection
- Management of water and waste water resources
- Solid waste disposal and management
- Electricity
- Health and sanitation and environmental protection
- Public transport system
- Govt. schemes
- Command control facility
- Security and surveillance
- Emergency services- automation
- Citizen services

Thank you!