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FORMULATION OF GIS BASED MASTER PLAN FOR AMRUT CITIES

Design & Standards

Town & Country Planning Organisation
Ministry of Urban Development
Government of India

August 2015

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Ministry of Urban Development
Government of India
&
National Remote Sensing Centre
Deptt. Of Space
Government of India

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1. INTRODUCTION

The urban settlements of the country have experienced relatively rapid population growth and the percentage of India's population living in urban areas has more than doubled from 14% at the time of Independence to 31.8 % in 2011 (Census of India). This is expected to increase even further to nearly 40% by 2026 and is expected to be more than 50% by 2051. The class-wise distribution of statutory towns/cities as per Census 2011 is as follows.

S.No	Class	Population Range	No. of Statutory Towns 2011 Census
1	Metro	10 lakh plus	46
2	Class I	1-9.99 lakhs	430
3	Class II	50,000- 99,999	546
4	Class III	20,000- 49,999	1321
5	Class IV	10,000-19,999	1091
6	Class V	5000-9,999	474
7	Class VI	Below 5000	133
	Total		**4041**

Most of the urban settlements, especially smaller urban settlements, are characterized by haphazard and unplanned growth, non-conforming land uses, mushrooming unauthorized colonies, and land conversion from agriculture to urban resulting in environmental degradation and poor quality of life. The proper management of urban areas calls for accurate and vital information to be available on a regular basis in order to formulate a spatial planning framework.

Master Plan/ Development Plan is a statutory plan to provide detailed intended actions in the form of strategies, physical proposals for the sustainable development of city/town. The horizon year for these plans is generally 20-30 years, which is followed by most of the urban development authorities and urban local bodies. These plans are made in phases of five years for periodic reviews and revision. Preparation of master plans start with base map and existing land use preparation and relevant socio-economic data necessary for reviewing the existing situation and proposing the future land use development plan. With the advances in remote sensing and geographic information system, the plan making process can become expeditious and with integration of both spatial and attribute data, detailed assessment can be made in terms of spatial growth of towns/cities, physical infrastructure facilities in anticipation of the projection population growth. The most crucial information for preparation of Master Plan is an accurate and updated Base Map of the planning area, showing roads and building layouts, spatial extent of development and information on the use of each parcel of land etc. Preparation of Base maps from Very High Resolution Satellite Images and GIS technology can be time and cost effective solution. In NUIS, 152 town's Base and Urban Thematic GIS database have been prepared using 2.5m (Cartosat-1+LISS-IV) Remote sensing images. The GIS database of these towns has been hosted on Bhuvan and developed a web based GIS (Bhuvan-NUIS) for Master Plan Formulation by the ULBs. The NUIS has

made basic foundation to understand and experience the utilisation of remote sensing & GIS technologies for urban base and thematic mapping, GIS database creation.

2. NEED FOR THE REVISION OF EXISTING NUIS DESIGN AND STANDARDS

State Town and Country Planning Organisation/Departments have initiated the utilisation of NUIS 1:10,000 Scale GIS database and Master Plan formulation on Bhuvan. However, it was expressed by the Town planning experts that 1:10,000 scale database content and accuracy was inadequate to meet the Master Plan/Development plan formulation. During workshop conducted by TCPO/MoUD on 17th February 2015, TCPO/MoUD with Chief Town Planners/Directors of the States/UTs, the following technical criteria are suggested for preparing the comprehensive GIS database for Master Plan formulation:

1. Utilisation of Very High Resolution Satellite Data for preparing Large Scale Urban Base map at 1: 5,000 scale or better.
2. Use of GIS based Master Plan formulation approach as per URDPFI -2014 Guidelines.
3. Present NUIS Design and standards are pertinent to 1:10,000 scale. This may not qualify for Large Scale maps in terms of the input satellite data, map content, geometry and accuracy.
4. It is also observed that various Town & Country Planning Organisation/Departments are following the different methods and procedures for Base map and GIS database preparation using Remote Sensing & GIS technology which calls for National standards.
5. Hence, the existing NUIS standards has to be revised to support for generation of comprehensive GIS databases to meet the present National schemes like Smart cities, AMURIT cities, HRUDAY cities and also State level Urban & Municipal development projects.

2.1 Formulation of GIS based Master Plan for AMRUT Cities

Government of India has launched Atal Mission for Rejuvenation and Urban Transformation (AMRUT) in 2015 as Centrally Sponsored Scheme with the objective to (i) ensure that every household has access to a tap with assured supply of water and a sewerage connection; (ii) increase the amenity value of cities by developing greenery and well maintained open spaces (e.g. parks); and (iii) reduce pollution by switching to public transport or constructing facilities for non-motorized transport (e.g. walking and cycling). One purpose of the Mission is to improve governance through a set of Reforms. During the Mission period, 11 Reforms will be implemented, of which Preparation of Master Plan using GIS is one of the most important reforms.

In order to develop uniform national level design and standards, Ministry of Urban Development has constituted a National committee with the members from ISRO, and central and state level senior town planning experts (Annexure I).

3. ELEMENTS OF STANDARD

Remote Sensing data, Base map & Urban Land use GIS database including spatially linked socio-economic attribute information and administrative boundaries are important datasets for the formulation of Master Plans. Development of uniform design and standards is necessary to enable the Central and state level departments to adopt the implementation of national/state urban schemes. The main elements of Standards are given below.

1. Remote Sensing Image Standards
2. Spatial Reference Standards
3. Feature Content - Spatial and Attribute Data Standards
4. GIS Database Standards
5. GIS database dissemination to ULBs for Master Plan formulation
6. Metadata standards

3.1 Remote Sensing Image Standards

Very High Resolution satellite images or Aerial Large Format Digital Camera (LFDC) multi-spectral photography data are the best input sources for large scale mapping. The following table describe the input image standards (1) Raw image standards- required for satellite data procurement (3) Ground Control Points (GCPs) – for geo-referencing / ortho-rectification of satellite image (3) Geo-referenced / Ortho-rectified image – the final image used for feature extraction.

3.1.1 Raw Image Standards

S. No	Description	Value	Remarks
1	Spatial Resolution	0.5mts or better	
2	Spectral Resolution	PAN Sharpened **(Bands:** Red, Green, Blue Panchromatic and Near Infrared)	IR band is optional
3	Band to Band registration	Less than 1/4th of pixel size	
4	Radiometry	10 bit or better	
5	Image Resampling	Nearest Neighbourhood	
6	a. Monoscopic / Stereoscopic	**Plain Areas:**Monoscopic **Highly Hilly areas:**Stereoscopic	Need of Stereoscopic to be reviewed case by case
	b. Monoscopic data View angle	Less than 10 degree from nadir	In specific cases, maximum upto 15 degrees shall be allowed

S. No	Description	Value	Remarks
	c. Stereoscopic	One of the stereo image view angle should be less than 10degrees from nadir	Base to Height ratio between (B/H) 0.6<B/H< 0.8
7	Vantage imaging	Should be less than 6 months	If one town/city is covered by multiple scenes, the time difference among the scenes should be less than one month.
8	Product type	Image data should be associated with corresponding Rational Polynomial Coefficients (RPCs) **Format**: 1. *image data*: Geo-tiff 2. RPCs : Open standards	Ortho-kit data with RPCs
9	Spatial Reference	Datum : WGS84 Projection : UTM	
10	Cloud Coverage	Zero % in the core town/city, Less than 10% in the periphery of town/city limits	Cloud free data

3.1.2 Ground Control Points (GCPs) Standards required for Photogrammetric Block Adjustment and Ortho-rectification of satellite data

S. No	Description	Value	Remarks
1	Survey method used for GCPs	Differential GPS Survey (DGPS)	DGPS survey points should be processed using closed network traverse. The reference station coordinate shall be computed using ITRF reference frame.
2	Accuracy	Positional accuracy (X,Y): better than 0.5mts Height accuracy (Z) : better than 0.5mts	With reference to absolute accuracy of Reference station coordinates in ITRF reference frame

S. No	Description	Value	Remarks
3	Spatial reference	**Horizontal** Datum : WGS84 Projection : UTM **Vertical** Datum : WGS84/MSL Units : Meters	Towns for which Stereo data is selected: The GCPs vertical Datum must be MSL.
4	No. of GCPs	a. Uniform Distribution for the entire city/town planning area b. At least one GCP for every 5 sq.km c. At the overlap of images GCPs should be available d. The position of GCPs should be on the non-variable features	GCPs must be clearly visible in the Satellite image. GPS reference station shall be monument in Cement concrete and embedded brass-plate to ensure station revisit whenever the need arises.

(Brief DGPS survey method is given Annexure-I1)

3.1.3 Ortho-rectification of Satellite data Standards

S. No	Description	Value	Remarks
1	Procedure / Methodology	Photogrammetric Bundle block adjustment for both monoscopic and stereoscopic data using DGPS surveyed GPCs	Photogrammetric Bundle Block level accuracy better than one pixel
2	Ortho-rectification	**DEM Source:** **Monoscopic data:** CartoDEM or open source DEMs **Stereoscopic data:** DEM/DTM generated the stereo pair	
Ortho-rectified image Output Format			
4	Spatial Reference	Datum: WGS 84 Projection : UTM / Geographic	

S. No	Description	Value	Remarks
5	Spatial Resolution	0.5 m	.
6	Spectral resolution	PAN shared Natural Color Composite (NCC)	
7	Radiometry	Input Data radiometric resolution	
8	Planimetric Accuracy	RMSE = better than 1 mts (Root Mean Square Error)	
9	Resampling	Nearest Neighbourhood	While interpretation of image online resampling may be changed to bi-linear or cubic as per interpreter's choice.
10	Format	town/city mosaic in Geo-tiff	

3.2. Spatial Reference Standards

3.2.1 Coordinate System

Spatial reference is selected as per National Map Policy (NMP) 2006, accordingly spatial reference standards are given below:

S. No	Description	Value	Remarks
1	Datum	WGS84	
2	Projection	➢ For publishing / interpretation / printing maps=UTM ➢ For GIS database, storing &management = Geographic	Data will be stored in Geographic co-ordinate system and will be projected to UTM online for interpretation, analysis & printing.
3	Extent	Extent of each town = Minimum bounding box to Planning area boundary with 5km buffer	

3.2.2 Map Sheet Frame for Hardcopy Prints

With the advancements in GIS, the utilisation of hard copy maps is limited to the field work and field verification of data. The digital GIS environment has been used for spatial and attribute data analysis and GIS based Master plan formulation. The proposed 1:4,000 scale under this scheme is not compatible to National Scheme of Map series. In view of this, it is proposed to use the existing National Map Scheme which was developed and adopted in NUIS.

Whenever required hard copy maps can be printed for visualisation purpose at different scale for example at 1: 10,000 for town/city map; 1:2,000 or 1:1,000 for field verification and data collection purpose. The World Map Series Template is given in Figure 1.

To enable the compatibility of cadastral map scales, it is proposed to adopt State specific cadastral map sheet series at 1:4,000 scale, 1:8000 scale or any other specific scale. The extent of the Map sheet, Map sheet number and size shall be according to the scale adopted by the respective State / UT.

3.3. Feature Content - Spatial and Attribute Data Standards

After the detailed deliberations and interactions with Central and State Town Planning departments and experts, it was proposed that 1:4000 scale is ideal for formulation of Master Plan/Development Plans. The spatial features are extracted from high resolution images at 1:4000 scale and are classified based on attribute data collected from field. Further, it is also proposed to improve the feature content from the line departments data as well as additional attribute information from the field as required for the Master Plan /Development Plan formulation. This section gives the details on Base and Urban Thematic spatial data Standards and Attribute information, commensurate to 1:4000 scale as given below:

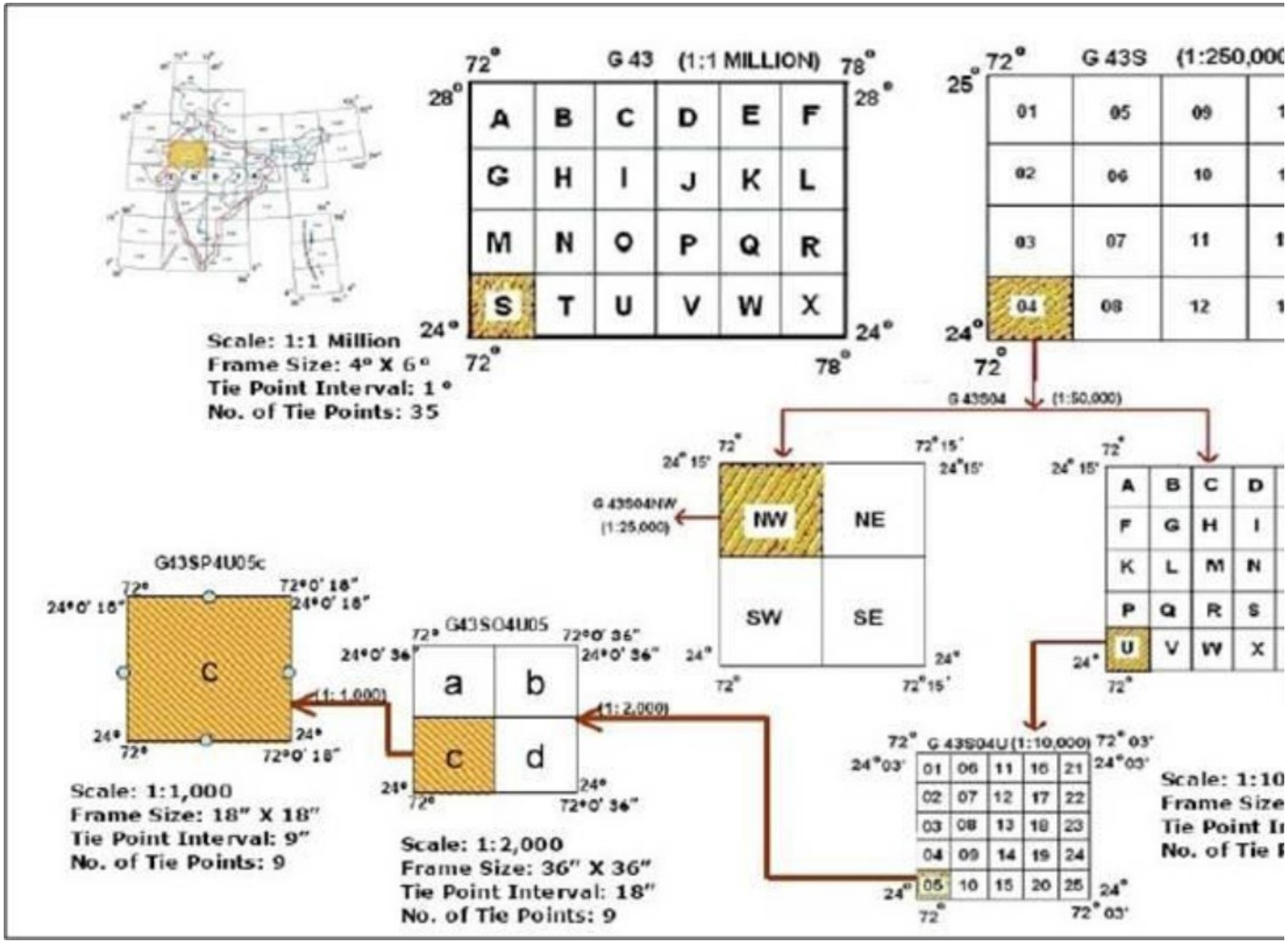
3.3.1 Spatial Data Content Standards
3.3.2 Attribute Data Content Standards
3.3.3 Accuracy Standards

3.3.1 Spatial Data Content Standards

The spatial data content is broadly divided into Base, Urban Land use, Utilities, DEM, Contour, Cadastral, Administrative boundaries and Ground Control Points (GCPs) as is given in the following tables: –

Table 1: Base Layer *(5 major Base Layer Classes with 42 Sub classes)*; Table 2: Urban Landuse Layer*(28 major Base and Urban Landuse Classes with 202 Sub classes)*; Table 3: Building Footprint Layer with use *(22 major Classes and 142 Sub classes)*; Table 4 - 7: Utility Layers *(Water Supply Network, Storm water Drainage Network, Sewage Network and*

Figure 1: Schematic Representation of Map Frame and Tie Points for NUIS-N



Electricity Supply Network); Table 8: DEM, Table 9: Contour; Table 10: Cadastral layer, Table 11: Administrative boundary layer, Table 12: Ground Control Points (GCPs) layer.

Unique Coding Scheme – In order to improve the readability and interpretability of the feature code, the codes are being simplified to contain four characters to represent 1:4000 scale geographic features. The same code can be further extended to features at 1:2000 and 1:1000 scales based on the requirement. The first two characters of the code represent the Class and next two characters represent the Sub Class (for example Road is a Class and National Highway is Sub Class).

Table 1: Base Layer

The spatial features in Base layer are extracted from high resolution images and classification based on attribute data collected by ULBs from the field, Lined departments and other secondary sources.

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
1	**01-01**	**Road** Road area - Polygon Carriage way, Right of way, Centreline - Line	*National Highway*	Polygon / Line
	01-02		*State Highway*	Polygon / Line
	01-03		*District Road*	Polygon / Line
	01-04		*Expressway*	Polygon / Line
	01-05		*Bypass*	Polygon / Line
	01-06		*Ring Road*	Polygon / Line
	01-07		*Service Road*	Polygon / Line
	01-08		*Major Road*	Polygon / Line
	01-09		*Minor Road*	Polygon / Line
	01-10		*Other Public Road*	Polygon / Line
	01-11		*Other Private Road*	Polygon / Line
	01-12		*BRTS*	Polygon / Line
	01-13		*Cycle Track*	Polygon / Line
	01-14		*Village road*	Polygon / Line
	01-15		*Foot path*	Polygon / Line
	01-16		*Cart track*	Polygon / Line
2	**02-01**	**Rail**	*Broad Gauge*	Polygon / Line
	02-02		*Narrow Gauge*	Polygon / Line
	02-03		*Meter Gauge*	Polygon / Line
	02-04		*Metro/MRTS*	Polygon / Line
	02-05		*MMTS*	Polygon / Line
3	**03-01**	**Bridges**	*Culvert*	Line

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
	03-02		*Ropeway*	Line
	03-03		*Tunnel*	Line
	03-04		*Bridge across river*	Line
	03-05		*Over Bridge*	Line
	03-06		*Under Pass*	Line
	03-07		*Road Bridge across Rail*	Line
	03-08		*Subway*	Line
	03-09		*Foot over bridge*	Line
4	**04-01**	**Flyovers**	*Flyover*	Line
5	**05-01**	**Water Bodies**	*River*	Polygon
	05-02		*Stream*	Polygon
	05-03		*Canal*	Polygon
	05-04		*Drain*	Polygon
	05-05		*Ponds*	Polygon
	05-06		*Lake*	Polygon
	05-07		*Tank*	Polygon
	05-08		*Island (River/Lake)*	Polygon
	05-09		*Reservoir*	Polygon
	05-10		*Back Water*	Polygon
	05-11		*Sea*	Polygon

Table 2: Urban Land use Layer

The spatial features in Base layer are extracted from high resolution images and classification based on attribute data collected by ULBs from the field, Lined departments and other secondary sources.

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
1	**06-01**	**Residential**	*Residential Area/Colony*	Polygon
	06-02		*Township*	Polygon
	06-03		*Housing scheme*	Polygon
2	**07-01**	**Commercial**	*Retail*	Polygon
	07-02		*Wholesale*	Polygon
	07-03		*General Business*	Polygon
	07-04		*Hotel / Lodge /*	Polygon

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
			Restaurant	
	07-05		*Shopping Centre / Mall*	Polygon
	07-06		*Multiplex / Cinema*	Polygon
	07-07		*Function Hall*	Polygon
	07-08		*Warehouse*	Polygon
	07-09		*Storage Godown*	Polygon
	07-10		*Resort*	Polygon
	07-11		*Petrol Pump*	Polygon
	07-12		*Informal Shop*	Polygon
	07-13		*Hostel*	Polygon
	07-14		*Market (Daily & Weekly)*	Polygon
3	**08-01**	**Industrial**	*Manufacturing*	Polygon
	08-02		*Service*	Polygon
	08-03		*Chemical*	Polygon
	08-04		*Pharmaceutical*	Polygon
	08-05		*Textile*	Polygon
	08-06		*IT Parks*	Polygon
	08-07		*Industrial Estate / SEZ*	Polygon
4	**09-01**	**Mixed**	*Residential & Commercial*	Polygon
	09-02		*Residential &Household Industry*	Polygon
	09-03		*Residential & Educational*	Polygon
	09-04		*Residential & Health Services*	Polygon
	09-05		*Commercial & Industrial*	Polygon
	09-06		*Commercial &Health Services*	Polygon
	09-07		*Commercial and Educational*	Polygon
	09-08		*Commercial and Recreational*	Polygon
5	**10-01**	**Educational**	*School*	Polygon
	10-02		*College*	Polygon
	10-03		*University*	Polygon
	10-04		*Vocational Institute*	Polygon
	10-05		*Anganwari*	Polygon

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
	10-06		*Training Institute*	Polygon
6	**11-01**	**Health Services**	*Govt. Hospital*	Polygon
	11-02		*Private Hospital*	Polygon
	11-03		*Diagnostic Centre*	Polygon
	11-04		*Clinic / Dispensary*	Polygon
	11-05		*Nursing Home*	Polygon
	11-06		*Primary /Community Health Centre*	Polygon
7	**12-01**	**Central Govt. Property**	*Office*	Polygon
			Quarter	Polygon
8	**13-01**	**State Govt. Property**	*Office*	Polygon
			Quarter	*Polygon*
9	**14-01**	**Railway Property**	*Railway Property*	*Polygon*
10	**15-01**	**Public& Semi-public**	*Private Office*	Polygon
	15-02		*Banks / ATM*	Polygon/Point
	15-03		*Credit Society*	Polygon
	15-04		*Foreign Establishment*	Polygon
	15-05		*Police Station*	Polygon
	15-06		*Cantonment /Battalion*	Polygon
	15-07		*Jail*	Polygon
	15-08		*Crematorium / Burial Ground / Grave Yard*	Polygon
	15-09		*Guesthouse*	Polygon
	15-10		*Community hall*	Polygon
	15-11		*Dharmashala*	Polygon
	15-12		*Tourist Facility Centre*	Polygon
	15-13		*Auditorium*	Polygon
	15-14		*Convention Centre*	Polygon
	15-15		*Museum*	Polygon
	15-16		*Public Library*	Polygon
	15-17		*Art & Cultural Centre*	Polygon
	15-18		*LPG/ CNG Gas Booking Office*	Polygon
	15-19		*Ticket Booking & Reservation Office*	Polygon
	15-20		*Stock Exchange*	Polygon
	15-21		*Disaster Management Centre*	Polygon

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
	15-22		*Metrological Station*	Point
	15-23		*Dhobi Ghat*	Polygon
	15-24		*Crech / Day Care*	Polygon
	15-25		*Public / Community Toilet*	Polygon
	15-26		*Social Welfare Centre*	Polygon
	15-27		*Orphanage*	Polygon
	15-28		*Old Age Home*	Polygon
	15-29		*Night Shelter*	Polygon
	15-30		*Fire Station*	Polygon
	16-01	**Religious**	*Temple*	Polygon
	16-02		*Mosque*	Polygon
	16-03		*Idgah*	Polygon
11	**16-04**		*Church*	Polygon
	16-05		*Gurudwara*	Polygon
	16-06		*Monastery*	Polygon
	16-07		*Synagogue*	Polygon
	16-08		*Chhatri*	Polygon
	17-01	**Recreational**	*Garden*	Polygon
	17-02		*Park*	Polygon
	17-03		*Play Ground*	Polygon
	17-04		*Club*	Polygon
	17-05		*Sports Centre*	Polygon
	17-06		*Gymnasium*	Polygon
	17-07		*Swimming Pool*	Polygon
12	**17-08**		*Stadium*	Polygon
	17-09		*Planetarium*	Polygon
	17-10		*Aquarium*	Polygon
	17-11		*Open Air Theatre*	Polygon
	17-12		*Golf Course*	Polygon
	17-13		*Race Course*	Polygon
	17-14		*Exhibition Ground*	Polygon
	17-15		*Theme Park*	Polygon
	18-01-01	**Public Utilities**	*Water Treatment Plant*	Polygon
13	**18-01-02**		*Water Pumping Station*	Polygon
	18-01-03		*Ground Level Reservoir*	Polygon
	18-03-01		*Sewage Treatment*	Polygon

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
			Plant	
	18-03-02		*Sewage Pumping Station*	Polygon
	18-04-01		*Electric Power Plant*	Polygon
	18-04-02		*Electric Sub Station*	Polygon
	18-05		*Rain Water Harvesting System*	Polygon
	18-06		*Effluent Treatment Plant*	Polygon
14	**19-01**	**Solid Waste Management**	*Land Fill Site*	Polygon
	19-02		*Dumping Yard*	Polygon
	19-03		*Recycling Plant*	Polygon
	19-04		*Garbage Collection Point / Dumper*	Point
15	**20-01**	**Communication**	*Telephone exchange*	Polygon
	20-02		*Post / Telegraph Office*	Polygon
	20-03		*Radio/TV Station*	Polygon
	20-04		*Satellite & Telecommunication Centre*	Polygon
	20-05		*Public Telephone Booth*	Point
	20-06		*Cell Tower*	*Point*
	20-07		*WiFi Hotspot*	*Point*
16	**21-01**	**Heritage**	*Historical Monument*	Polygon
	21-02		*Fort*	Polygon
	21-03		*Archaeological*	Polygon
17	**22-01**	**Slum**	*Notified Slum*	Polygon
	22-02		*Non notified Slum*	Polygon
	22-03		*Squatter*	Polygon
18	**23-01**	**Vacant Land**	*Private Vacant*	Polygon
	23-02		*Municipal Asset*	Polygon
	23-03		*Government Asset*	Polygon
	23-04		*Reclaimed Land*	Polygon
	23-05		*Layout / Plotted*	Polygon
19	**24-01**	**Transportation Node**	*Bus stand*	Polygon
	24-02		*Bus Terminus*	Polygon

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
	24-03		*Railway Station*	Polygon
	24-04		*Railway Yard / Siding*	Polygon
	24-05		*Airport / Airstrip*	Polygon
	24-06		*Helipad*	Polygon
	24-07		*Port*	Polygon
	24-08		*Harbour*	Polygon
	24-09		*Jetty*	Polygon
	24-10		*Truck Terminus*	Polygon
	24-11		*Freight Complex*	Polygon
	24-12		*Taxi Stand*	Polygon
	24-13		*Auto Stand*	Polygon
	24-14		*Cycle rickshaw / Cycle /Cart stand*	Polygon
	24-15		*Bus Bay*	Polygon
	24-16		*Bus Stop*	Point
20	**25-01**	**Traffic related**	*Traffic Island*	Polygon
	25-02		*Median / Divider*	Polygon
	25-03		*Parking Space / Area*	Polygon
21	**26-01**	**Rural**	*Village / Abadi Area*	Polygon
22	**27-01**	**Green Areas**	*Reserved Forest*	Polygon
	27-02		*Green belt*	Polygon
	27-03		*Tree*	Point
23	**28-01**	**Agricultural Land**	*Cropland*	Polygon
	28-02		*Fallow land*	Polygon
	28-03		*Plantations*	Polygon
	28-04		*Orchard*	Polygon
	28-05		*Horticulture*	Polygon
	28-06		*Plant nursery*	Polygon
24	**29-01**	**Wetlands**	*Waterlogged*	Polygon
	29-02		*Low lying area*	Polygon
	29-03		*Marshy*	Polygon
	29-04		*Swampy*	Polygon
	29-05		*Mudflat*	Polygon
	29-06		*Creek*	Polygon
25	**30-01**	**Wastelands**	*Scrubland*	Polygon
	30-02		*Barren*	Polygon
	30-03		*Rocky*	Polygon
	30-04		*Sandy area*	Polygon
	30-05		*Salt affected*	Polygon

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
	30-06		*Gullied*	Polygon
26	**31-01**	**Town Specific Land use**	*Hill / Mountain*	Polygon
	31-02		*Snow covered area*	Polygon
	31-03		*Mining Area*	Polygon
	31-04		*Grazing land*	Polygon
	31-05		*Pastures*	Polygon
	31-06		*Meadows*	Polygon
	31-07		*Tea Garden*	Polygon
	31-08		*Ghats*	Polygon
	31-09		*Beach*	Polygon
	31-10		*Coral Reef*	Polygon
27	**32-01**	**Eco-Sensitive Areas**	*Bird Sanctuary*	Polygon
	32-02		*Bio-diversity Park*	Polygon
	32-03		*Botanical Garden*	Polygon
	32-04		*Zoo*	Polygon
	32-05		*National Park*	Polygon
	32-06		*Mangrove*	Polygon
28	**33-01**	**Others**	*Salt pan*	Polygon
	33-02		*Aquaculture*	Polygon
	33-03		*Brick kiln*	Polygon
	33-04		*Quarry*	Polygon
	33-05		*Dam*	Polygon
	33-06		*Barrage*	Polygon
	33-07		*Aqueduct*	Polygon
	33-08		*Weir*	Polygon
	33-09		*Farm house*	Polygon
	33-10		*Dairy farm*	Polygon
	33-11		*Poultry form*	Polygon
	33-12		*Slaughter House*	Polygon
	33-13		*Dairy Booth*	Polygon/Point
	33-14		*Lighthouse*	Point

Table 3: Building Footprint Layer with Use

Building footprints are extracted from high resolution images and classification done based on attribute data collected by ULBs from the Field, Lined departments and other secondary sources

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
1	**06-04**	**Residential**	*House*	Polygon
	06-05		*Group of Houses*	Polygon
	06-06		*Apartment*	Polygon
2	**07-01**	**Commercial**	*Retail*	Polygon
	07-02		*Wholesale*	Polygon
	07-03		*General Business*	Polygon
	07-04		*Hotel / Lodge / Restaurant*	Polygon
	07-05		*Shopping Centre / Mall*	Polygon
	07-06		*Multiplex / Cinema*	Polygon
	07-07		*Function Hall*	Polygon
	07-08		*Warehouse*	Polygon
	07-09		*Storage Godown*	Polygon
	07-10		*Resort*	Polygon
	07-11		*Petrol Pump*	Polygon
	07-12		*Informal Shop*	Polygon
	07-13		*Hostel*	Polygon
3	**08-01**	**Industrial**	*Manufacturing*	Polygon
	08-02		*Service*	Polygon
	08-03		*Chemical*	Polygon
	08-04		*Pharmaceutical*	Polygon
	08-05		*Textile*	Polygon
	08-06		*IT Parks*	Polygon
	08-07		*Industrial Estate / SEZ*	Polygon
4	**09-01**	**Mixed**	*Residential & Commercial*	Polygon
	09-02		*Residential &Household Industry*	Polygon
	09-03		*Residential & Educational*	Polygon
	09-04		*Residential & Health Services*	Polygon
	09-05		*Commercial & Industrial*	Polygon

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
	09-06		*Commercial &Health Services*	Polygon
	09-07		*Commercial and Educational*	Polygon
	09-08		*Commercial and Recreational*	Polygon
5	**10-01**	**Educational**	*School*	Polygon
	10-02		*College*	Polygon
	10-03		*University*	Polygon
	10-04		*Vocational Institute*	Polygon
	10-05		*Anganwari*	Polygon
	10-06		*Training Institute*	Polygon
6	**11-01**	**Health Services**	*Govt. Hospital*	Polygon
	11-02		*Private Hospital*	Polygon
	11-03		*Diagnostic Centre*	Polygon
	11-04		*Clinic / Dispensary*	Polygon
	11-05		*Nursing Home*	Polygon
	11-06		*Primary /Community Health Centre*	Polygon
7	**12-01**	**Central Govt. Property**	*Office*	Polygon
			Quarter	Polygon
8	**13-01**	**State Govt. Property**	*Office*	Polygon
			Quarter	*Polygon*
9	**14-01**	**Railway Property**	*Railway Property*	*Polygon*
10	**15-01**	**Public& Semi-public**	*Private Office*	Polygon
	15-02		*Banks*	Polygon
	15-03		*Credit Society*	Polygon
	15-04		*Foreign Establishment*	Polygon
	15-05		*Police Station*	Polygon
	15-06		*Cantonment /Battalion*	Polygon
	15-07		*Jail*	Polygon
	15-08		*Crematorium / Burial Ground / Grave Yard*	Polygon
	15-09		*Guesthouse*	Polygon
	15-10		*Community hall*	Polygon
	15-11		*Dharmashala*	Polygon
	15-12		*Tourist Facility Centre*	Polygon
	15-13		*Auditorium*	Polygon
	15-14		*Convention Centre*	Polygon

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
	15-15		*Museum*	Polygon
	15-16		*Public Library*	Polygon
	15-17		*Art & Cultural Centre*	Polygon
	15-18		*LPG/ CNG Gas Booking Office*	Polygon
	15-19		*Ticket Booking & Reservation Office*	Polygon
	15-20		*Stock Exchange*	Polygon
	15-21		*Disaster Management Centre*	Polygon
	15-23		*Dhobi Ghat*	Polygon
	15-24		*Crech / Day Care*	Polygon
	15-25		*Public / Community Toilet*	Polygon
	15-26		*Social Welfare Centre*	Polygon
	15-27		*Orphanage*	Polygon
	15-28		*Old Age Home*	Polygon
	15-29		*Night Shelter*	Polygon
	15-30		*Fire Station*	Polygon
11	**16-01**	**Religious**	*Temple*	Polygon
	16-02		*Mosque*	Polygon
	16-03		*Idgah*	Polygon
	16-04		*Church*	Polygon
	16-05		*Gurudwara*	Polygon
	16-06		*Monastery*	Polygon
	16-07		*Synagogue*	Polygon
	16-08		*Chhatri*	Polygon
12	**17-01**	**Recreational**	*Garden*	Polygon
	17-02		*Park*	Polygon
	17-04		*Club*	Polygon
	17-05		*Sports Centre*	Polygon
	17-06		*Gymnasium*	Polygon
	17-07		*Swimming Pool*	Polygon
	17-08		*Stadium*	Polygon
	17-09		*Planetarium*	Polygon
	17-10		*Aquarium*	Polygon
	17-11		*Open Air Theatre*	Polygon
	17-12		*Golf Course*	Polygon
	17-13		*Race Course*	Polygon

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
	17-14		*Exhibition Ground*	Polygon
	17-15		*Theme Park*	Polygon
13	**18-01-01**	**Public Utilities**	*Water Treatment Plant*	Polygon
	18-01-02		*Water Pumping Station*	Polygon
	18-01-03		*Ground Level Reservoir*	Polygon
	18-03-01		*Sewage Treatment Plant*	Polygon
	18-03-02		*Sewage Pumping Station*	Polygon
	18-04-01		*Electric Power Plant*	Polygon
	18-04-02		*Electric Sub Station*	Polygon
	18-05		*Rain Water Harvesting System*	Polygon
	18-06		*Effluent Treatment Plant*	Polygon
14	**19-03**	**Solid Waste Management**	*Recycling Plant*	Polygon
15	**20-01**	**Communication**	*Telephone exchange*	Polygon
	20-02		*Post / Telegraph Office*	Polygon
	20-03		*Radio/TV Station*	Polygon
	20-04		*Satellite & Telecommunication Centre*	Polygon
16	**21-01**	**Heritage**	*Historical Monument*	Polygon
	21-02		*Fort*	Polygon
	21-03		*Archaeological*	Polygon
17	**24-01**	**Transportation Node**	*Bus stand*	Polygon
	24-02		*Bus Terminus*	Polygon
	24-03		*Railway Station*	Polygon
	24-04		*Railway Yard / Sliding*	Polygon
	24-05		*Airport / Airstrip*	Polygon
	24-06		*Helipad*	Polygon
	24-07		*Port*	Polygon
	24-08		*Harbour*	Polygon
	24-10		*Truck Terminus*	Polygon

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
	24-11		*Freight Complex*	Polygon
18	**25-04**	**Traffic related**	*Multi Level Parking*	Polygon
19	**26-02**	**Rural**	*House*	Polygon
	26-03		*Group of Houses*	Polygon
	26-04		*Apartment*	Polygon
20	**31-07**	**Town Specific Land use**	*Tea Garden*	Polygon
	31-09		*Beach*	Polygon
21	**32-01**	**Eco-Sensitive Areas**	*Bird Sanctuary*	Polygon
	32-02		*Bio-diversity Park*	Polygon
	32-03		*Botanical Garden*	Polygon
	32-04		*Zoo*	Polygon
	32-05		*National Park*	Polygon
	32-06		*Mangrove*	Polygon
22	**33-07**	**Others**	*Farm house*	Polygon
	33-08		*Dairy farm*	Polygon
	33-09		*Poultry farm*	Polygon
	33-10		*Slaughter House*	Polygon
	33-11		*Dairy Booth*	Polygon

Utility Layers: All utility layers like Water Supply Network, Drainage Network, Sewage Network, Electricity Supply Network layers database will be prepared from the data collected by ULBs from the concerned engineering and lined departments.

Table 4: Water Supply Network Layer

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
1	**18-01-01**		*Water Treatment Plant*	Point
	18-01-02		*Water Pumping Station*	Point
	18-01-03		*Ground Level Reservoir*	Point
	18-01-04		*Trunk Line*	Line
	18-01-05		*Main Pipeline*	Line
	18-01-06		*Branch Pipeline*	Line
	18-01-07		*Service Pipeline*	Line
	18-01-08		*Supply Valve*	Point
	18-01-09		*Over Head Tank*	Point
	18-01-10		*Public Stand Post*	Point
	18-01-11		*Tube Well*	Point
	18-01-12		*Hand Pump*	Point

Table 5: Storm Water Drainage Network Layer

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
1	**18-02-01**	**Storm water Drainage**	*Storm Water Drain*	Line
	18-02-02		*Storm Water Vent*	Point

Table 6: Sewerage Network Layer

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
1	**18-03-01**	**Sewage Network**	*Sewage Treatment Plant*	Point
	18-03-02		*Sewage Pumping Station*	Point
	18-03-03		*Trunk Line*	Line
	18-03-04		*Main Sewer Line*	Line
	18-03-05		*Branch Sewer Line*	Line
	18-03-06		*Service Sewer Line*	Line
	18-03-07		*Manhole*	Point
	18-03-08		*Vent Valve*	Point

Table 7: Electricity Supply Network Layer

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
1	**18-04-01**	**Electricity**	*Electric Power Plant*	Point
	18-04-02		*Electric Sub Station*	Point
	18-04-03		*Transmission Tower*	Point
	18-04-04		*Transformer*	Point
	18-04-05		*33 Kv Line*	Line
	18-04-06		*11 Kv Line*	Line
	18-04-07		*Pole*	Point
	18-04-08		*Street Light*	Point

Table 8: DEM Layer

Towns for which monoscopic data is selected, the DEM shall be generated by Total Station survey and Towns for which stereo data is selected, the DEM shall be generated from stereo data. The DEM is a DTM which represent bare earth surface.

S.No	CLASS	ACCURACY	PIXEL VALUE	GEOMETRY
1	**Digital Terrain Model (DTM)**	*0.5 m*	Height in metres	Raster

Table 9: Contour Layer

Contour shall be generated from the DTM.

S.No	CODE	CLASS	CONTOUR INTERVAL	GEOMETRY
1	**34-00**	**Contour**	*1 m*	Line

Table 10: Cadastral Layer

Cadastral layer will be prepared from the data collected by ULBs from the Lined departments.

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
1	**35-00**	**Cadastre**	*Boundary*	Polygon

Table 11: Administrative Boundary Layer

Administrative layer will be prepared from the data collected by ULBs from the Lined departments.

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
1	**36-01**	**Administrative Boundaries**	*International Boundary*	Polygon
	36-02		*State Boundary*	Polygon
	36-03		*District Boundary*	Polygon
	36-04		*Tehsil / Mandal / Block Boundary*	Polygon
	36-05		*Village Boundary*	Polygon
	36-06		*Planning Area Boundary*	Polygon
	36-07		*Municipal Boundary*	Polygon
	36-08		*Zone Boundary*	Polygon
	36-09		*Ward Boundary*	Polygon
	36-10		*Taxzone Boundary*	Polygon
	36-11		*Industrial Zone / Area*	Polygon
	36-12		*Special Economic Zone*	Polygon
	36-13		*Forest Boundary*	Polygon
	36-14		*Revenue Boundary*	Polygon
	36-15		*National Park / Sanctuary / Conservation Area*	Polygon

Table 12: Ground Control Points (GCPs) Layer

DGPS survey is used for generation of GCPs. DGPS survey data shall be processed using closed network traverse and the reference station coordinate shall be computed using ITRF reference frame.

S.No	CODE	CLASS	SUB-CLASS	GEOMETRY
1	**37-01**	**GCP**	*Reference station*	Point (X,Y,Z)
2	**37-02**		*Rover Station*	Point (X,Y,Z)

3.3.2 Spatial Attribute Information

The spatial attribute information is to be collected from field by Urban Local Bodies, PWD, Water Supply & Sewerage Board, Electricity, Transport, Education, Health, Engineering, State Town & Country Planning departments, Development Authorities and other related lined departments as part of Master Plan preparation. The attribute information content for the relevant layers is given in following tables: –

Table 13: Attributes for Road Layer

Attribute Name	Type
Road Id	Alphanumeric
Road Name	Text
Road Construction Material	Concrete / Asphalt/WBM/AnyOther
Carriage Width (in m)	meters
Right of Way Width (in m)	meters
Maintained By	Municipal body / NHAI / R & B Dept. / Other
Foot Path Status	Yes / No
Foot path width(in case Yes in Meters)	meters
Foot Path Construction material	Shabad/Tiles/Concrete/Other Stone

Table 14: Attributes for Rail Layer

Attribute Name	Remarks
Rail Id	Alphanumeric
Railway Line Name	Alphanumeric

Table 15: Attributes for Bridges / Flyovers

Attribute Name	Remarks
Bridge ID	Alphanumeric
Ward Number	Alphanumeric
Road ID	Alphanumeric
Locality Name	Text
Width (Meters)	meters
Length (Meters)	meters
Construction Material	Iron / Masonry / Concrete / Any Other
Construction Year	Alphanumeric

Table 16: Attributes for Waterbodies

Attribute Name	Remarks
WB Name	Alphanumeric

Table 17: Attributes for Community Toilet

Attribute Name	Remarks
Point Id	Alphanumeric
Ward Number	Alphanumeric
Road ID	Alphanumeric
Road Name	Text
Locality	Text
Status	Working / Not working
Type	Eco-friendly / General
Mode	Public / PPP

Table 18: Attributes for Fire Station

Attribute Name	Remarks
Ward Number	Alphanumeric
Road ID	Alphanumeric
Road Name	Text
Locality	Text
Status	Working / Not working

Table 19: Attributes for Garbage Collection Points

Attribute Name	Remarks
Point Id	Alphanumeric
Ward Number	Alphanumeric
Road ID	Alphanumeric
Road Name	Text
Locality	Text
Garbage Type	Domestic / Biomedical/ Kitchen / Construction/Mixed
Status	Temporary / Permanent and Collection point / Transfer point
Coverage area (No of houses /Colonies)	Alphanumeric

Table 20: Attributes for Landfill Sites and Dumping Yard

Attribute Name	Remarks
Ward Number	Alphanumeric
Road ID	Alphanumeric
Road Name	Text
Locality	Text
Name	Text

Table 21: Attributes for Cell Towers

Attribute Name	Remarks
Point Id	Alphanumeric
Ward Number	Alphanumeric
Road ID	Alphanumeric
Road Name	Text
Locality	Text
Description	On Building / On ground

Table 22: Attributes for Slums

Attribute Name	Remarks
Slum Number	Alphanumeric
Slum Name	Alphanumeric
Locality	Text
Area	Numeric

Table 23: Attributes for Bus Stops

Attribute Name	Remarks
Ward Number	Alphanumeric
Road ID	Alphanumeric
Road Name	Text
Locality	Text

Table 24: Attributes for Buildings

Attribute Name	Remarks
Ward Number	Alphanumeric
Road ID	Alphanumeric
Road Name	Text
Locality	Text
Colony	Text
Use	Text
Type	Text
Floors	Numeric
Construction Type	Pucca / Semi Pucca / Kutcha
Area	Numeric

Table 25: Attributes for Water Treatment Plant

Attribute Name	Remarks
Ward Number	Alphanumeric
Road ID	Alphanumeric
Road Name	Text
Locality	Text
Capacity	Text

Table 26: Attributes for Water Pumping Station

Attribute Name	Remarks
Ward Number	Alphanumeric
Road ID	Alphanumeric
Road Name	Text
Locality	Text
Capacity	Text

Table 27: Attributes for Water Supply Network

Attribute Name	Remarks
Water Supply ID	Alphanumeric
Ward Number	Alphanumeric
Road ID	Alphanumeric
Road Name	Text
Locality Name	Text
Distance from road(Mts)	meters
Construction Material	PSC / DI / HDPE / MS / RCC / Others / GI / AC / CI / PVC
Supply line type	Distribution / Service/Pumping / Raw Water Main
Pipe Dia in Mts	meters

Table 28: Attributes for Overhead Tanks

Attribute Name	Remarks
Water Supply ID	Alphanumeric
Ward Number	Alphanumeric
Road ID	Alphanumeric
Road Name	Text
Locality Name	Text
Distance from road(Mts)	meters
Construction Material	PSC / DI / HDPE / MS / RCC / Others / GI / AC / CI / PVC
Supply line type	Distribution / Service/Pumping / Raw Water Main
Pipe Dia in Mts	meters

Table 29: Attributes for Storm water Drainage Network

Attribute Name	Remarks
Drainage ID	Alphanumeric
Ward Number	Alphanumeric
Road ID	Alphanumeric
Road Name	Text
Locality Name	Text
Distance from road(Mts)	meters
Depth of Drainage (Mts)	meters
Construction Type	Box / Open Channel
Network Line Type	Mainline / Service/ Pumping
Name	Text

Table 30: Attributes for Sewerage Network

Attribute Name	Remarks
Sewerage Network ID	Alphanumeric
Ward Number	Alphanumeric
Road ID	Alphanumeric
Road Name	Text
Locality Name	Text
Distance from road(Mts)	meters
Depth of Drainage (Mts)	meters
Pipe Dia (mm)	millimetre
Construction Material	RCC / CI / SWG / PVC / GI / AC / Others
Network Line Type	Pumping / Sewer / Service

Table 31: Attributes for Electrical Supply Network

Attribute Name	Remarks
Electrical Line ID	Alphanumeric
Ward Number	Alphanumeric
Road ID	Alphanumeric
Locality Name	Text
Electrical Line Name	Text

Table 32: Attributes for Transformers

Attribute Name	Remarks
Ward Number	Alphanumeric
Road ID	Alphanumeric
Road Name	Text
Locality	Text
Capacity	Text

Table 33: Attributes for Street Lights

Attribute Name	Remarks
Street Light ID	Alphanumeric
Ward Number	Alphanumeric
Road ID	Alphanumeric
Locality Name	Text
Pole Type	Iron / Concrete / Other
Street Light Type	HP MV/ Sodium / Tube Light / CFL / High Mast / Others
Source of Energy	Electricity / Others / Solar

Table 34: Attributes for Cadastral Layer

Attribute Name	Remarks
Khasra Number/ Survey Number	Alphanumeric
Area	Numeric
ROR	Alphanumeric (Optional)

Table 35: Attributes for Municipal Boundary Layer

Attribute Name	Remarks
ULB Name	Text
Area	Numeric

Table 36: Attributes for Ward Boundary Layer

Attribute Name	Remarks
Ward Number	Numeric
Ward Name	Text
Ward Area	Numeric

Table 37: Attributes for Tax Zone boundary Layer

Attribute Name	Remarks
Tax Zone Number	Numeric
Tax Zone Name	Text
Tax Zone Area	Numeric

3.3.3 Accuracy Standards

Spatial data has to meet the feature's Planimetric accuracy and thematic accuracy in compliance to the 1:4000 scale databases.

Planimetric Accuracy

Large scale Base maps and thematic databases, for example at 1:4000 scale, shall be incompliance to topographic mapping standards. Planimetric accuracy of the Base and Thematic spatial features shall be 0.25mm of the scale (as per ASPRS, NNRMS standards).

The Planimetric accuracy defined for 1:4000 is 1m (0.25mm of the scale).

Thematic Accuracy of Classification/Mapping

The spatial features are extracted from the High Resolution Satellite data and UrbanLanduse classification shall be based on attribute data. This defines the accuracy of mapping a thematic feature and its classification

The Thematic accuracy shall be defined as 90% accuracy at 90% confidence/probability.

3.4 GIS Database Standards

The spatial data shall be organised as Polygon, Line and Point GIS layers, in compliance to OGC standards and the attribute information shall be attached to the corresponding layer. All Base and Urban land use features with polygon geometry will be in a single layer. Base and Urban land use features with line and point geometry, All Utility layers, Cadastral layer, Contour , Administrative boundary layer and Ground Control Point layer will be in separate layers with the respective attribute fields attached to it. The GIS structure for each layer is given in the following tables:

1. Base and Urban Land use Polygon Layers:

Table 38: Structure for Base and Urban Land use Polygon (Base_ULU_Poly)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table1 &2
Class	Text	25	Class as given in Table 1 &2
Sub_Class	Text	50	Sub Class as given in Table 1 &2
Area	Double	Up to 4 decimals	Area of corresponding feature
Name	Text	50	Specific Name of the feature, if any
Descr	Text	50	Details of the Sub Class if any

2. Base and Urban Land use Line Layers:

Table 39: Structure for Road Centre Line (Road_CLine)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 1
Rd_ID	Alphanumeric	5	Unique Id
Sub_Class	Text	20	Sub Class as given in Table 1
Length_Km	Double	Up to 4 decimals	Length (in Km)
Ward_No	Numeric	5	Ward Number
Rd_Name	Text	25	Specific Name of the feature, if any
Cons_Mat	Text	10	Road Construction Material as given in Table 13
CW	Double	Up to 4 decimals	Carriage Width (in m)
ROW	Double	Up to 4 decimals	Right of Way Width (in m)
Maintain	Text	15	Maintained By as given in Table 13
FP_Status	Text	3	Foot Path Status as given in Table 13
FP_Width	Numeric	10	Foot path width(in case Yes in Meters)
FP_CM	Text	15	Foot Path Construction material as given in Table 13

Table 40: Structure for Road Carriageway & Right of Way (Rd_CW_ROW_Line)

This line feature will be prepared from data provided by lined departments

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 1
Rd_ID	Alphanumeric	5	Unique Id
Sub_Class	Text	20	Sub Class as given in Table 1

Table 41: Structure for Rail Line (Rail_Line)

Field Name	Field Type	Field Width	Description
Code	Numeric	5	Code as given in Table 1
Sub_Class	Text	20	Sub Class as given in Table 1
Rly_Name	Text	30	Specific Name of the feature, if any

Table 42: Structure for Bridges & Flyovers (Brid_Fly_Line)

Field Name	Field Type	Field Width	Description
Code	Numeric	5	Code as given in Table 1
Ward_No	Numeric	5	Ward Number
Rd_ID	Numeric	5	Rd ID same as in Road_CLine
Rd_Name	Text	25	Rd Name same as in Road_CLine
Locality	Text	30	Locality Name
Width	Numeric	10	Width (Meters)
Length	Numeric	10	Length (Meters)
Cons_Mat	Text	15	Bridge Construction Material as given in Table 15
Cons_Yr	Text	4	Construction Year

3. Urban Land use Point Layers:

Table 43: Structure for Community Toilet (Community_toilet)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 2
Ward_No	Numeric	5	Ward Number
Rd_ID	Numeric	5	Road ID same as in Road_CLine
Rd_Name	Text	25	Road Name same as in Road_CLine
Locality	Text	30	Locality Name
Status	Text	15	Status as given in Table 17
Type	Text	15	Type as given in Table 17
Mode	Text	5	Mode as given in Table 17

Table 44: Structure for Fire Station (Fire_Station)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 2
Ward_No	Numeric	5	Ward Number
Rd_ID	Numeric	5	Road ID same as in Road_CLine
Rd_Name	Text	25	Road Name same as in Road_CLine
Locality	Text	30	Locality Name
Status	Text	15	Working / Not working

Table 45: Structure for Garbage Collection Points / Dumper (Garb_Coll_Pnt)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 2
Ward_No	Numeric	5	Ward Number
Rd_ID	Numeric	5	Road ID same as in Road_CLine
Rd_Name	Text	25	Road Name same as in Road_CLine
Locality	Text	30	Locality Name
Garb_Type	Text	30	Type as given in Table 19
Status	Text	30	Status as given in Table 19
Cov_area	Numeric	5	Coverage area (No of houses or Colonies covered by a point)

Table 46: Structure for Landfill Sites and Dumping Yard (Landfill_Dumpyard_Pnt)

This layer will be generated from Urban Land use polygon layer.

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 2
Ward_No	Numeric	5	Ward Number
Rd_ID	Numeric	5	Road ID same as in Road_CLine
Rd_Name	Text	25	Road Name same as in Road_CLine
Locality	Text	30	Locality Name
Name	Text	30	Specific Name of the feature, if any

Table 47: Structure for Cell Towers and Wi-Fi Hotspots (Cell_Tow_WiFi_Pnt)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 2
Ward_No	Numeric	5	Ward Number
Rd_ID	Numeric	5	Road ID same as in Road_CLine
Rd_Name	Text	25	Road Name same as in Road_CLine
Locality	Text	30	Locality Name
Descr	Text	15	Description as given Table 21

Table 48: Structure for Slums (Slum_Pnt)

This layer will be generated from Urban Land use polygon layer.

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 2
Sub_Class	Text	20	Sub Class as given in Table 2
Slum_Num	Numeric	5	Slum Number (from ULBs)
Slum_ Name	Text	25	Name of the Slum
Locality	Text	30	Locality Name

Table 49: Structure for Bus Stop (Bus_Stop_Pnt)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 2
Ward_No	Numeric	5	Ward Number
Rd_ID	Numeric	5	Road ID same as in Road_CLine
Rd_Name	Text	25	Road Name same as in Road_CLine
Locality	Text	30	Locality Name

Table 50: Structure for Tree (Tree)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 2

Table 51: Structure for Other Urban Landuse Points: ATM, Meteorological Station, Public telephone Booth, Dairy Booth, Light House and Other if any**(ULU_Pnt)**

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 2
Class	Text	25	Class as given in Table 2
Sub_Class	Text	50	Sub Class as given in Table 2
Ward_No	Numeric	5	Ward Number
Rd_ID	Numeric	5	Road ID same as in Road_CLine
Rd_Name	Text	25	Road Name same as in Road_CLine
Locality	Text	30	Locality Name

Table 52: Structure for Buildings (Building_footprint)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 3
Class	Text	25	Class as given in Table 3
Sub_Class	Text	50	Sub Class as given in Table 3
Ward_No	Numeric	5	Ward Number
Rd_ID	Numeric	5	Road ID same as in Road_CLine
Rd_Name	Text	25	Road Name same as in Road_CLine
Locality	Text	30	Locality Name
Colony	Text	30	Colony Name
No_floors	Numeric	5	Number of floors in a building
Cons_type	Text	15	Construction type as given in Table 24
Area	Double	Up to 4 decimals	Area of corresponding feature
Descr	Text	50	Details of Sub Class

4. Utilities Line layers and Point Layers:

Table 53: Structure for Water Supply Network (Water_NW_Line)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 4
Ward_No	Numeric	5	Ward Number
Rd_ID	Numeric	5	Road ID same as in Road_CLine
Rd_Name	Text	25	Road Name same as in Road_CLine
Locality	Text	30	Locality Name
Dis_frm_rd	Numeric	5	Distance from road in meters
Cons_Mat	Text	10	Construction Material as given in Table 27
Sup_Ln_Typ	Text	20	Supply Line type as given in Table 27
Pipe_Dia	Numeric	5	Pipe Diameter in meters

Table 54: Structure for Water Supply Network Points (Water_NW_Pnt)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 4
Ward_No	Numeric	5	Ward Number
Rd_ID	Numeric	5	Road ID same as in Road_CLine
Rd_Name	Text	25	Road Name same as in Road_CLine
Locality	Text	30	Locality Name
Capacity	Text	10	Capacity in the respective units

Table 55: Structure for Storm water Drainage Network (Str_Drain_NW_Line)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 5
Ward_No	Numeric	5	Ward Number
Rd_ID	Numeric	5	Road ID same as in Road_CLine
Rd_Name	Text	25	Road Name same as in Road_CLine
Locality	Text	30	Locality Name
Dis_frm_rd	Numeric	5	Distance from road in meters
Depth	Numeric	5	Depth of Drainage in meters
Cons_Type	Text	10	Construction Type as given in Table 29
NW_Type	Text	15	Network Line Type as given in Table 29
Name	Text		Specific Name if any

Table 56: Structure for Storm water Drainage Network Points (Str_Drain_NW_Pnt)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 5
Ward_No	Numeric	5	Ward Number
Rd_ID	Numeric	5	Road ID same as in Road_CLine
Rd_Name	Text	25	Road Name same as in Road_CLine
Locality	Text	30	Locality Name
Dis_frm_rd	Numeric	5	Distance from road in meters

Table 57: Structure for Sewerage Network (Sew_NW_Line)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 6
Ward_No	Numeric	5	Ward Number
Rd_ID	Numeric	5	Road ID same as in Road_Cline
Rd_Name	Text	25	Road Name same as in Road_Cline
Locality	Text	30	Locality Name
Dis_frm_rd	Numeric	5	Distance from road in meters
Depth	Numeric	5	Depth of Sewer line in meters
Pipe_Dia	Numeric	5	Pipe Diameter in millimeters
Cons_Mat	Text	10	Construction Material as given in Table 30
NW_Type	Text	15	Network Line Type as given in Table 30

Table 58: Structure for Sewerage Network Points (Sew_NW_Pnt)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 6
Ward_No	Numeric	5	Ward Number
Rd_ID	Numeric	5	Road ID same as in Road_Cline
Rd_Name	Text	25	Road Name same as in Road_Cline
Locality	Text	30	Locality Name
Dis_frm_rd	Numeric	5	Distance from road in meters

Table 59: Structure for Electrical Supply Network (Elect_NW_Line)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 7
Ward_No	Numeric	5	Ward Number
Rd_ID	Numeric	5	Road ID same as in Road_Cline
Rd_Name	Text	25	Road Name same as in Road_Cline
Locality	Text	30	Locality Name
El_Name	Text	30	Electrical Line Name if any

Table 60: Structure for Electrical Supply Network Points (Elect_NW_Pnt)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 7
Ward_No	Numeric	5	Ward Number
Rd_ID	Numeric	5	Road ID same as in Road_Cline
Rd_Name	Text	25	Road Name same as in Road_Cline
Locality	Text	30	Locality Name
Capacity	Text	10	Capacity in the respective units
Pole_Type	Text	15	Pole Type as given in Table 33
St_Lt_Ty	Text	15	Street light Type as given in Table 33
Sou_ Energy	Text	15	Source of Energy for Street Light as given in Table 33

5. Other Layers: Cadastral and Administrative boundary layers will be prepared from data provided by lined departments.

Table 61: Structure for Contour layer (Contour_Line)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 9
Cntr_Val	Numeric	5	Height in metres

Table 62: Structure for CadastralLayer(Cadastre_Poly)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 10
Survey_Num	Alphanumeric	10	Khasra Number/ Survey Number
Area	Double	Up to 4 decimals	Area of corresponding feature

Table 63: Structure for Administrative BoundaryLayer(Admin_Bnd_Poly)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 11
Sub_Class	Text	50	Sub Class as given in Table 11
Area	Double	Up to 4 decimals	Area of corresponding Admin boundary
Name	Text	50	Specific Name of the Admin Boundary, if any
Ward_No	Numeric	5	Ward Number
Taxzone_No	Numeric	5	Tax zone Number

Table 64: Structure for Ground Control Points(GCP_Pnt)

Field Name	Field Type	Field Width	Description
Code	Alphanumeric	10	Code as given in Table 12
GCP_Id	Alphanumeric	10	Unique Id
Sub_Class	Text	25	Sub Class as given in Table 12
X	Double	Up to 8 decimals	X Coordinate
Y	Double	Up to 8 decimals	Y Coordinate
Z	Double	Up to 8 decimals	Z Coordinate
Descr	Text	250	Description
Monument	Text	5	Yes / No
Sketch	Blob		Sketch Map or image
Gr_Photo	Blob		Ground Photo

3.5. GIS database Dissemination to ULBs for Master Plan Formulation

Maintenance of GIS database at ULBs for GIS based Master Plan formulation demands the basic pre-requisites such as computer hardware infrastructure like workstations and error resistance storage like NAS; GIS software packages and IT experts at ULB level. In view of this, NRSC/ISRO and TCPO/MOUD has developed web based application "Bhuvan-NUIS for GIS based Master Plan formation" and imparted the nationwide training & capacity building for Town Planning personnel. The main features / advantages of Bhuvan-NUIS are:

Databases

- Ortho-rectified Satellite image
- Existing Urban GIS database (Layer wise) including attribute information, Admin boundaries.
- Older versions of databases
- 1:4000 Scale GIS database for Formulation of Master Plan
- Meta data

GIS Tools for Master Plan formulation for the ULBs

- GIS data can be edited/modified and updated with latest Satellite images/ground information.
- Local attribute data can be updated or new attributes can be added
- GIS analysis (both Spatial and attribute) tools required Master Plan formulation.
- On line approval and governance for creation, updating database within the ULB according to the approval procedure

Access control and Management

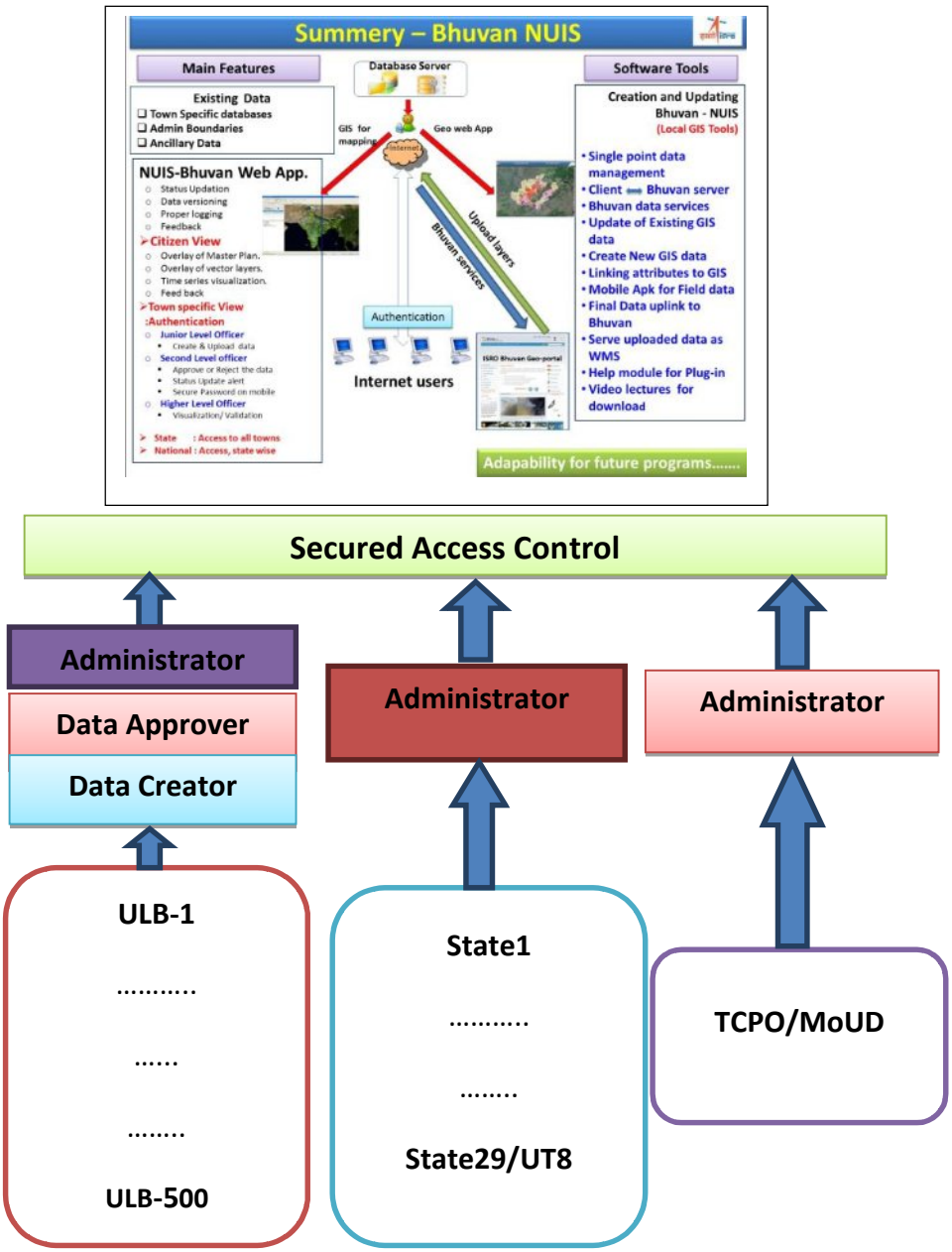
- Authorised personnel at ULB level can only access the specific town/city data
- Authorised personnel State Town Planning Directorate level can view and read the status of towns within the particular state
- Authorised personnel at TCPO/MoUD level can view and read the status of all the towns.

Advantages

- No need of maintaining any spatial computer systems and commercial software for Remote Sensing data processing and GIS analysis**. Complete database storage, management including backup at Bhuvan-NUIS server. No cost to ULBs.**
- Only desktop system with internet facility can enable GIS database creation, updating and GIS based Master Plan preparation at ULB.
- Avoid the database redundancy, duplicate work in different division of State and Central government departments
- Data can be shared with line departments; which would enable updating of database in near real time.

- Enable the investment protection and facilitate cost & time effective revision of Master plans periodically.

Figure 2: Bhuvan-NUIS based architecture for GIS database dissemination to ULBs in compliance to OGC standards



Each town GIS data would be maintained as individual database unit and respective town ULB shall own the responsibility of secured access control, updating data for Master Plan formulation.

3.6. Metadata Standards

Meta data describes data characteristics of content, quality, access, format, scale, when, who, where, how data generated and availability of the data. Meta data standard is required to enable the users to be aware of method, accuracy, exchange of data and limitations of the data for the intended purpose.

NSDI ver 2.0 Metadata standards are proposed to be adopted. The following are main Metadata Elements as per OGC compliance standard.

I. Data Identification Information

S.No	NAME OF THE ELEMENT	VALUE
1	Name of the Dataset	Text
2	Theme	Text
3	Keywords	Text
4	Access Constraints	Text
5	Use Constraints	Text
6	Purpose of creating data	Text
7	Data Type	Text
8	Edition	Text
9	Status	Text

II. Contact Information

S.No	NAME OF THE ELEMENT	VALUE
1	Contact Person	Text
2	Organisation	Text
3	Mailing Address	Text
4	City/Locality	Text
5	Country	Text
6	Contact Telephone	Text
7	Contact Fax	Text
8	Contact Email	Text

III. Geographic Location

S.No	NAME OF THE ELEMENT	VALUE
1	Datum	Text

IV. Coverage

S.No	NAME OF THE ELEMENT	VALUE
1	Upper left	Float
2	Upper right	Float
3	Lower right	Float
4	Lower left	Float

V. Citation

S.No	NAME OF THE ELEMENT	VALUE
1	Data Prepared by	Text
2	Original Source	Text
3	Source Date	Text
4	Lineage State: Area of Interest (Sq.Km): Scale:	 Text Float Text
5	Corporate Name (Partner Institution)	Text

VI. Metadata Stamp

S.No	NAME OF THE ELEMENT	VALUE
1	Metadata Date Stamp	Date (DD/MM/YYYY)

VII. Dataset Topic Category

S.No	NAME OF THE ELEMENT	VALUE
1	Data Identification topic category	Text

VIII. Language

S.No	NAME OF THE ELEMENT	VALUE
1	Language ISO 0639-2Bsh	Text

IX. Abstract describing the data

S.No	NAME OF THE ELEMENT	VALUE
1	Data Identification abstract	Text

4. INDICATIVE FORMAT FOR URBAN DATA COLLECTION

Master Plan formulation requires a variety of data at different stages of the planning process as a diagnostic tool for the health of the city, assessment of existing conditions in a settlement, spatial variations within the city, time series information, etc. as well as analysis and projections for future requirements in respect of various activities. While primary data collection involves time-consuming surveys, most socio-economic data may be obtained from published or un-published secondary sources. In order to streamline the process and diminish delays in the plan preparation process, a standardized data collection format has been provided as an effort to simplify and speed up the process. Most of data collection can be taken up as a separate research/ survey before plan formulation to provide processed data inputs.

This format for urban data collection at town/ward level consists of 25 tables which cover key areas such as demography, physical & locational aspects, physical and social infrastructure, environment, housing and slums, governance, etc. which are vital for study of existing situation and framing of proposals for master plan formulation.

The format is an indicative format. Town planning is a State subject and a great variety of legislations exist which specify requirements for master/ development plan formulation, and different State Town Planning Acts may specify different requirements of data to be collected. Further, since the cities vary in size from megapolitan to Class VI cities, with a great variety of topographic settings, functional specializations, etc., the data requirement for plan formulation cannot be uniform. Therefore, the format may be modified suitably by the State Nodal Agencies as per their requirement depending on size and other characteristics of the urban settlement.

The indicative format for urban data collection is given at Annexure-III. Guidelines to fill the proforma are at Appendix-1.

Annexure I

K-14011/2/2012-UCD(Pt.)
Government of India
Ministry of Urban Development
UCD/LSG Section

Room No.202-C, Nirman Bhawan, New Delhi,
the 13th February, 2015.

Office Memorandum

Sub: Constitution of Committee for Revision of NUIS Guidelines & Design Standards – Reg.

As per the directions of Hon'ble Prime Minister of India Chief Planner, TCPO appointed as Nodal Officer for Ministry of Urban Development for leveraging tools of space technology in efficient governance, held interactions with Department of Space, NRSC and SAC to identify and formulate programmes/ scheme for urban and regional planning and development. Accordingly, Ministry of Urban Development has proposed to develop GIS databases for formulation of master plans for 4041 cities/ towns as per Census 2011 using very high resolution satellite images at 1:5000 scale or higher. The design standards and guidelines of NUIS Phase-I are to be revised accordingly. The same databases can also be used for programmes such as Smart Cities as well as National Urban Renewal Mission.

The Ministry of Urban Development has constituted a Committee for Revision of NUIS Scheme Guidelines and NUIS Design Standards. The terms and conditions and composition of the Committee are as under:

Terms and Conditions

- Review and suggest modifications in the methodologies in database development of NUIS Phase-II, in view of changing technologies and as well as the lessons learnt
- Evaluate /review of NUIS Design and Standards Document
- Review and Modify NUIS Scheme Guidelines, 2006
- The Committee will submit its report in two months from the date of its first meeting.

The composition of the Committee is as under:

1.	Dr. P.G. Diwakar, Deputy Director (Applications), National Remote Sensing Centre, Dept. of Space, Balanagar, Hyderabad – 500625	Chairman
2.	Shri S.V. Singh, Director, GIS & RS, Indian Institute of Survey and Management, Uppal, Hyderabad – 500039	Member
3	Prof. Mahavir, School of Planning & Architecture, 4-A, I.P. Estate, Vikas Marg, New Delhi – 110002.	Member
4	Dr. K. Venugopala Rao, Group Head, Urban Studies & Geo-informatics Division, National Remote Sensing Center (NRSC), ISRO, Dept. of Space, Balanagar, Hyderabad – 500625	Member
5	Dr. Vinod M Bothale, Scientist/ Engineer 'G', Bhuvan, National Remote Sensing Center (NRSC), ISRO, Dept. of Space, Balanagar, Hyderabad – 500625	Member
6	Dr. Rajeev Kumar Jaiswal, Scientist/Engineer, Earth Observation Systems Programme Office/ NNRMS Secretariat, ISRO, Department of Space, Government of India, Antariksh Bhavan, New B.E.L. Road, Bangalore – 560231.	Member
7	Shri B.D. Bharat, Scientist-SE, Indian Institute of Remote Sensing, 4, Kalidas Road, Dehradun – 240 001, Uttarakhand	Member
8	Dr. Vivek Katare, Sr. Scientist, Incharge, Landuse & Urban Studies, M.P Council of Science & Technology, Remote Sensing Application Centre, Vigyan Bhavan, Nehru Nagar, Bhopal – 462 003	Member
9	Shri Iftikhar Ahmed Hakim, Chief Town Planner, Town Planning Organisation, Habitat Complex, NH By-Pass, Bemina (Near SDA), Srinagar, Kashmir – 190017.	Member

10	Smt Anjali Goswami, Director, Town & Country Planning Deptt., Govt. of Assam, Dispur, Post Sachivalaya, Guwahati – 781006, Assam	Member
11	Shri P. Thimma Reddy, Director, Town & Country Planning Deptt., Govt. of Andhra Pradesh, 2nd Floor Mithri Vihar, Ameerpeth, Hyderabad – 500038, Andhra Pradesh	Member
12	Shri S. Surendra, Town & Country Planner, Town & Country Planning Organisation, New Delhi.	Member
13	Mohd. Monis Khan, Town & Country Planner, Town & Country Planning Organisation, New Delhi.	Member-Convener

The Committee may co-opt any other member if required.

(Sunil Kumar Pal)
Under Secretary to Govt. of India
Telefax:011-23061072

To:

1. Dr. P.G. Diwakar, Deputy Director (Applications), National Remote Sensing Centre, Dept. of Space, Balanagar, Hyderabad – 500625.
2. Shri S.V. Singh, Director, GIS & RS, Indian Institute of Survey and Management, Uppal, Hyderabad – 500039.
3. Prof. Mahavir, School of Planning & Architecture, 4-A, I.P. Estate, Vikas Marg, New Delhi – 110002.
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12. Shri S. Surendra, Town & Country Planner, Town & Country Planning Organisation, New Delhi.
13. Mohd. Monis Khan, Town & Country Planner, Town & Country Planning Organisation, New Delhi.

Copy to:

1. Chief Planner, TCPO, New Delhi.
2. PS to JS(UD).
3. PS to Secretary(UD).
4. PS to UDM.

(Sunil Kumar Pal)
Under Secretary to Govt. of India
Telefax:011-23061072

Annexure II

DGPS Survey for GPS points for Geo-referencing / ortho-rectification of Satellite Image

ESTABLISHING GEODETIC REFERENCE FRAME FOR ULBS USING GNSS TECHNIQUES

GPS provides accurate and uniform reference frame for the geospatial data. DGPS techniques are required for geo-referencing of high resolution image data which essentially needs positional accuracy that matches the spatial resolution.

The satellite image shall cover the entire ULB area and sufficient no of GCPs shall be planned to geo-referenced the satellite image data as well as to check the accuracy parameters of the corrected image datasets with the aid of check points.

The GCP configuration and density of the GCPs are key parameters to be implemented suitably to achieve high quality data product after for geo-referencing process. Spatial distribution of the GCPs over the study area and type of features that are being selected as GCPs, play an important role in this process.

The DGPS survey procedure involves:

- Establishment of Monumented Reference station
- Data collection and processing procedures
- Upkeep of the reference station for future surveys

A permanent station shall be established which can be used as a reference station for the GPS surveys. A location, preferably in the central part of the ULB area, which is clear to sky without obstructions like tree canopy, high-raised building, HT electrical lines, shall be identified, either on ground or on the top of a building for constructing the reference station.

A cement concrete structure of 2 ft x 2 ft x 2ft shall be made and a brass plate marked with dot and circle shall be embedded on the top of the monument. A survey-grade dual frequency GPS receiver shall be operated with Tripod in static mode at this reference monument for a period of 3 consecutive days with a minimum of 12 hrs per day with 15 sec epoch rate and the 3 days data shall be processed with Single Point Positioning or Precise Point Positioning technique to derive the geodetic coordinates of the reference station in ITRF reference frame.

Establishing reference station coordinates in ITRF reference frame serves multiple benefits to the geospatial data in terms of maintaining uniform reference frame in future updates and also to use other datasets in GIS environment. ITRF reference frame can be implemented in two ways either linking the reference station to a IGS station nearby or processing using Precise Point Positioning technique using IGS data precise ephemeris and clock files. The derived Reference station geodetic coordinate shall be recorded properly and is documented in the records for future use by the ULB authorities.

Each GCP shall be identified with suitable permanent feature which is seen on the ground as well as on the image data. The location where GPS is being operated shall be clear to sky

without obstruction to track GPS signals. Geodetic survey grade GPS receivers shall be employed to collect the data. Base station and rover stations shall be operated at 15 sec epoch rate and observation period of min. 1 hr shall be adopted for base line length of 10 kms. Baseline distances of 10 km -20 km shall be observed with min. of 2 hrs time period.

Survey parameters like Receiver and Antenna make and model no., Antenna height, Observation time session, GDOP value, epoch time, Making of Sketches, filed photographs in all direction shall be documented properly on the field log sheet for every GCP location. Geometric Dilution of Precision (GDOP) shall be monitored and recorded, and should not exceed 2.5 nominally.

Observations shall be made using dual-frequency GPS receivers and L1/L2 geodetic ground plane antennas tripods with bubble levels shall be used to minimize setup errors. Post processing of the data shall be carried out on daily basis using broadcast ephemeris and post-processing software. Validity checks shall be documented with analysis of base line vector solutions and loop closure errors. All the data produced shall pass ambiguity resolved vector solutions and loop closure exceeding one part per million relative positioning accuracy.

GPS antenna shall be mounted on tripod during survey for reference station as well at GCP location during data collection. The GCP location shall be marked with paint to ensure relocation at later data and it shall be post-pointed on the image. A detailed description of the GCP location shall be written in the field log sheet with a neat sketch.

Data quality parameters like cycle slips, no of satellite tracked, observed GDOP values shall be checked soon after the survey to ensure good quality of the data collected at reference station as well as at rover stations before data processing.

Data processing shall be carried out with baseline processing for each session and network adjustment for all the sessions and ensure that loop closure accuracy results shall be better than 1 on 50000 which is the geodetic standard for static surveys. The final adjusted coordinates shall be in Geographic coordinate system and also in WGS-84 coordinate system and UTM projection.

A project report shall be submitted with the details about GCP planning diagram, GPS equipment details and manuals, reference station details and its geodetic coordinate in ITRF latest epoch, data collection parameters, field photographs of all the locations, processing results, GCP network diagram and list of adjusted coordinates.

****

Annexure III

Formulation of GIS-based Master Plan

INDICATIVE FORMAT FOR URBANDATA COLLECTION

(Proforma may be modified as per the requirement of State governments)

TABLE 1: PHYSICAL ASPECTS AND LOCATIONAL PARTICULARS

1.1.Name of City/Town

1.2. Civic Status

1.3.Name of Tehsil/ Mandal/ Block

1.4.Name of District

1.5. Name of State/UT

1.6 Area of City/Town

Ward		**Area (Sq.kms.)**	
	1991	**2001**	**2011**
1			
2			
3			
…			
Total			

Source of above data: _____

Extent as per various authorities may be specified as under:

Area as per Census of India _____

Extent of Local Planning Area _____

Municipal Area _____

Extent as per Urban Development Authority/ Planning Authority

Urbanisable Area _____

Controlled Area _____

1.7 Distance from Town

Sl.No	Description	Name	Distance (km.)
i	State Head Quarters		
ii	District Headquarters		
iii	Tahsil/Taluk/Mandal Headquarters		
iv	Nearest city (having 1 lakh & above population)		
v	Nearest Railway Station/s		
vi	Nearest Airport/Air strip		
vii	Nearest Port		
viii	Nearest Bus Stand (govt/private)		

1.8 Nearness/Distance of Major River/Canal/ coastline from Town

Sl.No.	River name &distance (km)	Canal name &distance (km)	Distance of Big Drains	Distance of major Dams & Reservoirs	Distance from Coast lines	Indicate High/Low Flood Levels (meters)	Indicate high/Low tide Lines (meters)

TABLE 2: DEMOGRAPHIC & BASIC SOCIO-ECONOMIC DATA

Note: Please attach Primary Census Abstract 2011, District Census Handbook (for whichever Census it is available), Housing Tables, Slum Tables and Economic Tables of Census of India. Also any Report by Bureau of Economics and Statistics or any other State Government Report

2.1 Population and Growth Rates

	1961	1971	1981	1991	2001	2011
Total population						
Decadal Growth rate						

Source: _____

2.2 Primary Census Abstract 2011

Ward	Population			Child Pop (0-6)			SC Pop.			ST Pop.			Literates		
	T	M	F	M	F	T	M	F	T	M	F	T	M	F	T
1															
2															
…															
Total															

Source: _____

2.3Housing Data(For Ward/Town)

Ward	Population 2011	No. of Households	Occupied residential houses	Houseless population
1				
2				
…				
Total				

Source: _____

2.4Vital Statistics (Townwise) **Year: _____**

Sl.No	Vital Statistics	Male	Female	Total
1	Birth rate (%)			
2	Death Rate (%)			
3	Infant Mortality (%)			
4	Life Expectancy at birth (years)			

Source: _____

2.5 Persons below Poverty Line **Year _____**

Ward	No. of BPL	
	Families	Population
1		
2		
…		
Total		

Source: _____

Note: Poverty Line defined as: _____

TABLE 3: OCCUPATIONAL CLASSIFICATION

3.1 Workforce 2001 – 2011

Ward	Main Workers			Marginal Workers			Other workers			Total Workers			Non-workers		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
1															
2															
…															
Total															

Source: _____

Note: Separate Table can be made for 2001 and 2011

Workforce Participation Rate (WFPR) 2001: _____

Workforce Participation Rate (WFPR) 2011: _____

3.2 Occupational Classification of Main Workers, 2001

Ward	A, B, C									D						E			F			G			H			
	Cultivators			Agricultural labourers			Plantation, Livestock, Forestry, Fishing, Hunting & allied activities			HHI			Non HHI			Electricity, Gas and Water Supply			Construction			Wholesale and Retail Trade			Hotels and Restaurants			T C
	M	**F**	**T**	**M**	**F**	**T**	**M**	**F**	**T**	**M**	**F**	**T**	**M**	**F**	**T**	**M**	**F**	**T**	**M**	**F**	**T**	**M**	**F**	**T**	**M**	**F**	**T**	**M**
1																												
2																												
…																												
Total																												

Industrial Categories as per Census 2001

INDUSTRIAL CATEGORIES: A – Agriculture, Hunting and Forestry; B – Fishing; C – Mining and Quarrying; Electricity, Gas and Water Supply; F – Construction; G – Wholesale and Retail Trade; H – Hotels and Restauran Communications; J – Financial Intermediation; K – Real Estate, Renting and Business Activities; L – Public Ad Compulsory Social Security; M – Education; N – Health and Social Work; O – Other Community, Social and Private Households with Employed Persons; Q – Extra-Territorial Organisations and Bodies.

Industrial Categories as per Census 2011

If data is available in above categories, please provide. If not, then provide in 4 categories for which it is availabl workers, household industry and other services.

Source: _____

Note: Separate Table can be made for 2001 and 2011

Table 4: INDUSTRIAL ASPECTS (Town level)

S.No.	Type of Industries	Up to 2005	2006	2007	2008	2009	2010	2011
1	Large							
2	Medium							
3	Small							
4	Household							
5	Hazardous							

Source: _____

Definitions:

(as per ---------- Act)

4.1: Industries details **Year: _____**

S.No.	Types of Industries	No. of units	No. of workers	Run by Manual/ HP	H.P
1	Large				
2	Medium				
3	Small				
4	House hold				
5	Hazardous				

Source: _____

4.2: TRADITIONAL INDUSTRIES (Year _____)

Sl.No.	Type of Traditional Industries	No.of units associated with each industry	No. of employees associated with each industry	Raw materials used	Commodities manufactured
1	Handicrafts				
2	Pottery				
…					

Source: _____

4.3. Most important commodities imported

4.4 Most important commodities manufactured

4.5 Most important commodities exported

4.6 Most Important agricultural produce

Note: Please attach Lead Bank Report, DIC Report, and any other industrial report

TABLE 5: LAND USE (in Hectares)

Sl.No	Type of Land	1991	2001	2011	Proposed 2021
1	Residential				
2	Commercial				
3	Industrial				
4	Recreational				
5	Public and semipublic				
6	Transportation				
7	Public Utilities				
8	Reclaimed land				
9	Vacant land				
10	Agricultural land				
11	Built Up area (Rural)				
12	Forest				
13	Wastelands				
14	Wetlands				
15	Water bodies				
16	Others				
Present Land use Notified ---------- on date ----------					

TABLE 6: AVAILABILITY OF DRINKING WATER

6.1 Important sources of drinking water Year _____

Ward	No. of Households covered by								
	Tap water		Well	Hand Pump	Tube well	Tanks/ Ponds/ Lake	Spring	River/ canal	Others
	from treated source	from un-treated source							
1									
2									
…									
Total									

Main source of drinking water _____

Distance from source _____

Treatment Plant (nos& names) _____

Source: _____

6.2 Water Supply Details Year _____

Ward	Quantity of Water Supplied (MLD)	Times/ Hours of supply per day	No. of Connections	Per Capita Consumption (LPCD)	Area Covered (sq.kms)	Metering Achieved (%)	Efficiency in collection of charges
1							
2							
…							
Total							

Source: _____

6.2**Supply Infrastructure:**

Ward	No of Over Head Tanks/ Reservoirs & Capacity	Capacity of WTPs	Treated supply as % of total water supplied

Source: _____

6.2.1 Is there any scheme for recycling of waste water in the town? Yes | No

6.2.2 Is the ground water table receding in the city? Yes | No

If yes, please give present water table

(Please attach any available report of CGWB/ State Govt)

6.2.3Is there any separate water supply line for non-drinking purposes such as industry, parks etc. If yes, give area covered under the scheme.

6.2.4 Details of ongoing and committed projects under water supply with agency

TABLE 7: ELECTRICITY (Town wise) Year _____

Source of Power	Distance (Kms.)	Total Electricity Demand (MW)	Total electricity Supply (MW)	Total Consumption (MKWH)

Type	Residential	Commercial	Industrial	Agricultural	Others	Total
No. of Electric Connections						
Electric Consumption (KWH)						

Source: _____

Proposed power projects to be taken up in the city

TABLE 8: POST &TELECOMMUNICATIONS (Town wise) Year_____

No. of telephone Exchanges	
No. of telephone connections (land line)	
No. of Public Telephone booths	
No. of Mobile Connections	
No of Mobile Towers	
No. of Post /telegraph office	
No of Internet Connections	
No. of Wi-fi hotspots	

Source: _____

TABLE 9:EDUCATIONAL FACILITIES Year_____

Type of Institutions	No. of Institutions		No. of Class Rooms		Enrolment		No. of teachers	
Educational Institution	**Govt.**	**Private**	**Govt.**	**Private**	**Govt.**	**Private**	**Govt.**	**Private**
Anganwadi								
Primary								
Middle								
Secondary								
Senior Secondary								
School for Special Needs								
Colleges								
General								
Medical								
Engineering								
Law								
Others								

Type of Institutions	No. of Institutions		No. of Class Rooms		Enrolment		No. of teachers	
Vocational Training								
Adult Education program								
Others								

TABLE 10: MEDICAL FACILITIES Year_____

10.1 Number of hospitals, dispensaries, etc., doctors, nurses, paramedical staff and total number of beds available therein

Type of Hospital	No. of Units		No. of Beds		No. of Doctors		No. of Nurses		No. of Paramedical staff		Patients Treated	
Hospital	**Govt**	**Pvt**	**Govt**	**Pvt**	**Govt**	**Pvt**	**Govt**	**Pvt**	**Govt**	**Pvt**	**Govt**	**Pvt**
Allopathic												
Ayurvedic												
Homeopathic												
Unani												
Family welfare & maternity center												
Others												
Dispensary												
Allopathic												
Ayurvedic												
Unani												
Homeopathic												
Others												
Primary Health Centres												
Nursing Home												

Source: _____

Note: Please follow standard classification if specified by Govt/ Local Authority and give data in that format, namely Sub-Centre, PHC, CHC, District Hospital, Super Specialty Hospital, Nursing Home, etc.

10.2Epidemiological Details (Period from _____ to _____)

Name of Predominant Diseases	No. of persons Affected
Leprosy	
Phylaria	
Tuberculosis	
Cholera	
Dengue	
Chikungunya	
Malaria	
Others (Specify)	

Source: _____

TABLE 11: AVAILABILITY OF SANITARY FACILITIES

What is the major sanitary system in the town: Sewerage/ Septic Tank/ LCS (please tick)
Does the Town have a sewerage system: _____
If yes, Combined or Separate: _____
Length (Km) _____
Area Covered: _____sq km _____%
Population covered _____(nos) _____ %

11.1 Household Sanitary Facilities (Town/Ward wise) Year _____

Ward	Households having following sanitary facility (%)						
	Water Closet			Pit Latrine	Other Latrine	No Latrine within the premises	
	Piped sewer system	Septic tank	Other system			Public latrine	Open
1							
2							
…							
Total							

Source: _____(Please attach relevant Census Reports)

11.2 Network Details Year _____

	Open surface drains	Covered drains	Underground sewerage	Others
Length in Kms				
Area served (sq.kms)				

Source: _____

11.3 Estimated quantity of sewage generated (MLD) _____

11.4 Quantity treated (MLD) _____

11.5 No. of sewage treatment plants (with capacity) _____

11.6 Disposal of treated sewage (river, nala, open land) _____

11.7 Disposal of untreated sewage (river, nala, open land)_____

11.8 Disposal Industrial wastewater (treated/ untreated) (river, nala, open land)_____

11.9 Public Toilets

Public toilets (in no.)	
No of Toilets Pay & Use	
Users per toilet daily (in No)	
Average User Charge	
Average yearly expenditure on maintenance (Rs. in Lakh)	

Source: _____

11.10 : Major Storm Water Drains

SL No	Name of the Drain	Wards coverage	Length (Kms)	Capacity	Open/ Covered
1					
2					
…					
Total					

Source: _____

TABLE 12: SOLID WASTE MANAGEMENT (Ward /Town wise data)

Is there door to door collection system: _____

Is there municipal disposal of waste: _____

12.1 Solid waste generation Year _____

Ward	Average generation (Tons/day)	Average collection (Tons/day)	No. of Houses covered for House to House Collection	Total Area Used for Sanitary Land Fill (sq. Km)	Manpower deployed	No. of Sites used for Land Fill
1						
2						
…						
Total						

Source: _____

12.2 Disposal method of solid waste (Put a tick mark on appropriate column) Year __

Sanitary land fill	Incinerated	Open dump	Recycled	Burned openly	Others

Source: _____

12.3 Vehicles deployed for Collection and Disposal of Solid waste, Year _____

Type of Vehicles deployed	Trucks/ Lorry	Tippers	Dumpers / Placers	Tricycle	Others

Source: _____

12.4 Employees details Year _____

No. of Sanitary supervisors	No. of Health Assistant	No. of Health workers	Others

Source: _____

12.5 Is there any system of segregation of solid waste?

Yes	No

If yes, please furnish following details (%age of quantum)

Degradable	Biodegradable	Hospital waste	Others

Source: _____

12.6 Details of ongoing and committed projects under solid waste disposal management

TABLE 13: AVAILABILITY OF RECREATIONAL, CULTURAL, BANKING AND CREDIT FACILITIES

13.1 Community&other Facilities Year_____

Sl.No	Facilities	Numbers
1	Corporation Gardens	
2	Community Hall	
3	Swimming Pool	
4	Corporation Playgrounds	
5	Gymnasia	
6	Corporation Stadium	
7	Cinemas	
8	Open Air Theatres	
9	Zoo	
10	Public libraries	
11	Art Galleries	
12	Museum	
13	Other (specify)	
14	Fire Services	
	No. of Fire stations	
	No. of fire tenders	
	Personnel	
15	Cremation/Burial Ground	
16	Petrol/Gas Station	
17	Hotels and Eating Places	
18	Others	

Source: _____

13.2 Number of banks and credit societies Year_____

No. of Banks	No of ATMs	Agricultural credit societies	Non-agricultural credit societies

Source: _____

13.3 Details of Self Help Groups(SHG) & NGOs Year _____

	No. of Self Help Group	No. of Members	No. of NGOs	No. of Resident Welfare Associations (RWAs)

Source: _____

TABLE 14: LAW AND ORDER – CRIMES REPORTED (No.)
Year wise for Last Five Years

Type	2012	2011	2010	2009	2008
Theft					
Burglary					
Kidnapping					
Robbery					
Riots					
Murder					
Crimes against women					
Fatal Accidents					
Non-fatal Accidents					
Cyber crimes					

Source: _____

No. of CCTVs installed _____

TABLE 15: HOUSING

15.1 Distribution of House Holds (HHs.), No. of persons and Tenure, Year_____

Tenure Status	Number of	
	HHs	Persons
Owned		
Rental		
Sub-letting		
Rent free		
Squatter without Rent		
Squatter with Rent		
Others		
Total		

Source: _____

Distribution of Persons by living rooms	Number of	
	HHs	Persons
One room		
Two rooms		
Three rooms		
Four rooms		
Five & above		
Total		

Source: _____

15.2 Categories of Houses

Type of Houses	No. of Houses	Age of Building
Pucca with RCC Roof and flooring		
Pucca with Tiles Roof and Kaccha floor		
Semi pucca		
Kaccha		
Others		
Total		

Source: _____

Note: For Housing Data, please attach relevant abstract of Housing Tables

TABLE 16: LAND OWNERSHIP AND COST (Ward wise)

16.1 Land Ownership Pattern Year_____

Type of ownership		No. of Dwelling Units(DU)	Area covered (Sq. km)	Average cost of DU per sq. mt (Rs.)
Public				
Private	Developers & Promoters			
	Authorized Individuals			
	Unauthorized Individuals			
Others (Specify)				
Total				

Source: _____

16.2 Land Prices (Ward wise), Year _____

Ward	Land Price in Planned Area (Rs./Sq.mt.)	Land Price in Unplanned Area (Rs./Sq.mt.)	Annual Rent of Dwelling Unit (Rs.)
1			
2			
…			
Total			

Source: _____

TABLE 17: DISASTERS

Are there any structures which have been damaged by disaster during last ten years? Yes/No
If yes, please give following details

(Year _____)

Type of Disaster	Year of disaster	No. of Houses damaged	Persons affected	Property Loss (Rs. Lakhs)	Action Taken
Earthquake					
Floods					
Cyclone					
Landslides					
Tsunami					
Fire					
Others (specify)					

Source: _____

TABLE 18: PUBLIC-PRIVATE-PARTNERSHIPPROJECTS IMPLEMENTED IN THE TOWN (PPP)

Agency	No. of Housing units (area in sq.kms)	Water supply (MLD)	Solid Waste (area cove-red in Sq. Kms)	Sewerage (Kms)	Roads (Kms)	Electricity			Community Development		City Beautification & Park maintenance (Area in Sq.kms)	Others
						Generation (MW)	Distribution	Maintenance (Rs.)	Improvement of Slum (Area in Sq. kms)	Slums and Squatters resetlement(Area in Sq.kms)		
Public												
Private												
PPP												

Source: _____

TABLE 19: SLUMS

19.1 Slum Concentration, Year _____

	Notified Slum		Non-notified Slum		Squatters		Total land	
	Public	Private	Public	Private	Public	Private	Public	Private
No. of Slum HH units								
Population								
Area covered (Sq.km)								

Source: _____

19.2 Availability of Basic Amenities in Slums Ward wise

Type of Amenity	No. of HHs covered
Water Supply	
Electricity	
Community toilets	
Other (specify)	

Source: _____

Note: Please attach relevant extract of Slum Tables of Census of India with year.

19.3 Houseless Population

Is there any scheme functioning for promotion of housing for houseless population?

Yes	No

If yes, please give details as under

Name of Scheme	Dwellings constructed during last five years	Size of the dwelling unit in Sq.mt.	Price of house	Mode of payment	No. of households benefited

Source: _____

Note: Please attach relevant extract of Houseless Tables of Census of India with year.

TABLE 20: TRAFFIC & TRANSPORTATION- Time Series Yearly Data

20.1 Registered Vehicles

Type of Vehicles		No. of Vehicles
Heavy vehicles:	Trucks Public Private Buses Public Private	
Light Vehicles:	Two wheeler Car Jeep Three wheeler Omni Buses Taxies / Cabs	
Non-motorized	Cycle Rickshaw Tonga Others	

Source: _____

20.2 Work Trips Undertaken from Residence to Work Place

Type of vehicles	No. of Work Trips per day	Average Time taken for one way trip (in minutes / per day)
Private motorized • Private cars • Two wheelers • Buses/ cabs/ mini car		
Sub-Total		
Public Transport • Trains • Trams/metro • Bus/mini bus		
Sub-Total		
Non-motorised • Cycle / Rickshaw • Walking • Others		
Sub-Total		
Total		

Source: _____

20.3 Road length and Footpath (in Kms.)

Surfaced road (Kms.)	Unsurfaced road (Kms.)	Total road length (Kms.)	Foot paths (Kms.)	Cycle Tracks (Kms.)

Source: _____

20.4 Railway

Items	No.
No of railway Stations	
Types of rail gauge; viz broad, narrow and meter gauge	
Length of rail network (in km)	
No of platforms	
No of yards	

Source: _____

20.5 Inland Water ways

Items	No.
No. of major and minor ports	
Length of the coastline (in Kms)	
No. of navigable rivers and canals	
Total no. of boats	
Ships	
Oil tankers	
Vessels	
Total tonnage of goods carried by ships/tankers etc	
No. of shipping yards	

Source: _____

20.6 Air

Items	No.
No. of Airports (Domestic & International)	
Traffic volume and passenger data	

Source: _____

TABLE 21: ENVIRONMENT

Does the town have Air Quality Monitoring Station _____

21.1 Air Pollution Concentration (μg/m3) (Date _____)

Type of pollutant	Area			
	Residential	Industrial	Commercial	Others
SO2				
NO				
SPM				
CO				

Source: _____

21.2 Level of Noise Pollution (Db) (Date _____)

Residential	Commercial	Industrial	Silence zone

Source: _____

21.3 Water Pollution (Mg/l) (Date _____)

BOD level	Coliform level	PH value

Source: _____

Please attach any report of Pollution Control Board, etc. if available.

TABLE22: Animal Husbandry details Year _____

Sl. No.	Description	Number
1	No. of Veterinary Hospital or dispensary or clinic	
2	No. of Dairy outlets & collection centers (Milk Co- Operative Societies) (MILMA)	
3	No. of Dairy Farm	
4	No. of Poultry Farm	
5	No. of Slaughter Houses	
6	No. of Hatcheries	
7	No. of Broiler Farm	
8	Others (Specify)	

Source: _____

Table 23: TRAVEL AND TOURISM Year _____

Sl. No.	Description	No. of Units
1	Tourism Destination Centers	
2	Tourism Information Centers	
3	Tourism Season	
4	Average No. of Foreign Tourist	
5	Average No. of Domestic Tourist	
6	No. of Star hotels	
7	No. of House boats	
8	No. of Travel Agencies	
9	No. of Tourism Promotion Councils	
10	Other institutions promoting Tourism	

Source: _____

TABLE 24: GOVERNANCE

24.1 Civic Status of the Town:
24.2 Size & Class of the Town:
24.3 Status of Master Plan/ Development Plan

Whether town has a statutory Master/ Development Plan? Details

1st D.P. & Date	Date of latest revision D.P	D.P implementation percentage

24.4 Name & Address (with Phone, Fax & e-mail) of Commissioner / Executive Officer of ULB:

Sl. No.	Name (with Designation)	Address (with Phone, Fax & e-mail)

24.5 Name & Address (with Phone, Fax & e-mail) of Mayor / Chairperson of ULB:

Sl. No.	Name (with Designation)	Address (with Phone, Fax & e-mail)

24.6 Total Staff Strength of ULB (in Nos.) :

24.7 Division-wise breakup of Staff Strength:

Sl. No.	Name of Division	Sanctioned Post	No. of Posts filled	Posts Vacant
1.	**Administration**			
2.	**Education**			
3.	**Finance**			
4.	**Engineering**			
5.	**Agriculture/Horticulture**			
6.	**Environment/Conservation**			
7.	**Housing**			
8.	**Public Health & Utilities**			
9.	**Social Services**			
10.	**Transportation**			
11.	**Security including Fire Services**			
12	**Other, if any**			

24.8 Is the local body elected?

Yes	No

If yes, state the year of last election.

24.9 Functions entrusted to local bodies as per 12th Schedule appended to 74th Constitutional Amendment Act, 1992.

24.10 List of Government Offices

25: Revenue and Receipt of Local Body: Year_____

(Rs. in Lakh)

Revenue Receipt	
Revenue Expenditure	
Revenue less expenditure	
Resource Mobilization	
Debt service charges	
Revenue and Receipt of Local Body or Department of state Government	
Detailed Revenue Receipt heads	

25.1 Proposed Large Projects

Proposed Capital Projects	Source of Finance	Investment	Project period
Upgradation			
New Infrastructure			
Expansion / Diversification			

Appendix I

Guidelines for Filling the Format

Introduction

The format for collection of town level data consists of 25tables which cover key areas such as demography, physical & locational aspects, physical and social infrastructure, environment, housing and slums, governance,etc. This data is to be collected by the Nodal Agency at city/ town level, in most cases the Urban Local Bodies.

Census Town

As per the Census definition, Towns comprise the following:

(a) All statutory towns, i.e., all places with a municipality, corporation, cantonment board, or a notified town area committee, etc.
(b) All other places which satisfy the following criteria:
- a minimum population of 5,000 ;
- at least 75% of the male working population engaged in non-agricultural activities; and
- a density of population of at least 400 persons per sq.km.

The city/ town which do not have an urban local body as per (a) above, but satisfy conditions given in (b), are called by Census of India as Census Towns.

Urban Agglomerations

Urban Agglomerations represent a continuous urban spread constituting a town and its adjoining urban outgrowths or two or more physically contiguous towns having a common boundary together with continuous well-recognised urban outgrowths, if any, of such towns. Very often, around a core city or statutory town, there are come up fairly large well recognized railway colonies, university campuses, etc. Even though these places lie outside the precincts of a statutory city or town or within the revenue limits of the village(s) which (are) contiguous to the town, such areas may not be themselves qualify to be treated as towns. But if they form a continuous spread with the town, they are outgrowths of the town and deserve to be treated as urban. Such towns, together with their outgrowths, have been treated as one urban unit called `Urban Agglomeration'. Thus, an urban agglomeration may constitute:

(a) A city or a town with continuous outgrowth, the outgrowth being outside the statutory limits but falling within the boundaries of the adjoining village or villages; or
(b) Two or more adjoining towns with their outgrowths, if any, or
(c) A city and one or more adjoining towns with or without outgrowths all of which form a continuous spread

Definitions, explanations of the parameters (including abbreviations) used in different Tables of the Proforma are as follows:

TABLE 1: PHYSICAL ASPECTS AND LOCATIONAL PARTICULARS

1.1 Name of City/Town

Names of the city/ town selected under the Scheme

1.2 Civic Status

The civic administration status is a determinant for categorization of a place as urban which is to be indicated using the following abbreviations:

	Civic Status	**Abbreviation**
	Municipal Corporation/Corporation	M.Corp.
	Municipal Committee/ Municipal Town Committee	MC
	Municipality	M
	Municipal Board	MB
	Municipal Council/ Town Municipal Council/ City Municipal Council	M Cl
	Cantonment Board/Cantonment	CB
	Notified Area/Notified Area Committee/ Notified Committee/ Notified Town Area Committee	NAC
	Industrial Notified Area	INA
	Town Committee/Town Area Committee	TC
	Town Area	TA
	Municipal Township	MTS
	Township	TS
	Town Board	TB
	Panchayat Township	PTS
	Gram Panchayat/Village Panchayat	GP
	MandalPanchayat	MP
	Nagar Panchayat/Town Panchayat	NP
	Panchayat	P
	Sanitary Board	SB
	Special Area	SA
	Special Area Development Authority	SADA
	Estate Office	EO
	Census Town/Non-Municipal Census Town	CT
	Non-Municipal/Non-Municipal Area	NM

1.3 Name of the Tehsil/ Mandal/ Block

1.4 Name of the District

Name of the district where the city/town is located

1.5 Name of the State

State name

1.6 Area of the City/town

The area figures of statutorily notified towns are given by the civic bodies/municipal committees based on available records.

Area figures are also given in the Census Town Directory/ District Census Handbook is the municipal/ UA area. However, the Planning Area of the city/town may be much larger. Further, for purposes of planning, urbanisable and controlled areas may have been defined by the development authorities. These are vital, because master plan is to be prepared for the urbanisable area.

1.6 Distance from Town in Kms.

State HQs., District HQs., Tahsil/Taluk/Mandal HQs., nearest city (having 1 lakh and above population) and nearest Railway Station along with distances

These columns provide details on locational particulars of the town with reference to names of the State Hqs., District Hqs., Tahsil/Taluk/MandalHqs., nearest city (having 1 lakh and above population) and nearest Railway Station, indicating their distances in km., from the town. In case the nearest city or the railway station is situated in a state other than the state to which the town belongs, name of the nearest city or nearest railway station alongwith the name of the state may be indicated.

In some north-eastern states, namely, Arunachal Pradesh, Assam and Nagaland where `Circle' is equivalent to Tahsil, etc., names of Circle Hqs., have to be reported whereas in Manipur and Sikkim, Sub-Division is the equivalent to Tahsil, names of Sub-Division Hqs., have to be indicated. Apart from these in some states, Community Block/Rural Development Block is the equivalent of Tahsil, in both cases Block of Police Station may be indicated as Tahsil.

1.7Nearness/Distance of Major River/Canal

This column provides details of navigable river/canal passing nearby (within a distance of 10 km.), or through the town.

TABLE 2: DEMOGRAPHIC DATA& BASIC SOCIO-ECONOMIC DATA

2.1 Population and Growth Rates

Population of the City/town in time series from Census of India. This is available in Town Directory published by Census of India. Growth rates may be given or calculated.

2.2 Primary Census Abstract 2011

This information may be derived from PCA and extract from PCA could also be provided for the city/town and if the plan formulation is to be done for planning/urbanisable area, then other administrative units covered. For example, the planning area for a particular city may cover one or more revenue villages, census towns, outgrowths, etc.

2.3 Housing Data

This table covers basic housing data from Housing (H-series) Tables from Census of India.

Number of households: In Census, a household is defined as a group of persons who commonly live together and take their meals from a common kitchen.

Number of occupied residential houses: This Table gives the number of occupied residential houses in respect of each town. A Census house is a building or a part of building having a separate main entrance from the road or common courtyard or staircase etc., used or recognized as a separate unit.

2.4 Vital Statistics

- ***Crude Birth Rate****:* The Crude Birth Rate (CBR) is defined as the number of live births in a year per 1,000 of the midyear population.
- ***Infant Mortality Rate*** : Infant Mortality Rate (or IMR) is defined as the number of infant deaths in a year per 1,000 live births during the year
- ***Life expectancy at birth*** = *Total child births - death of Children at the time of birth.*

2.5 Persons below Poverty line

Households whose total income is below the poverty line as defined by the national/state/local standards. Poverty line is defined by the State Governments and records will be available with State Departments of Economics & Statistics or other sources.

TABLE 3: OCCUPATIONAL CLASSIFICATION

3.1 Workforce 2001-2011 – Definitions as per Census of India

Workers and Non-workers

A ‘worker’ is a person who mainly participates in any economically productive activity either physically or mentally. Work not only involves actual work but effective supervision and direction of work as well.

Total workers
Total workers = Main workers + Marginal workers

Main workers
Main workers were those who had worked for the major part of the year preceding the date of enumeration i.e., those who were engaged in any economically productive activity for 183 days or six months or more during the year.

Marginal workers
Those who worked any time in the year preceding the date of enumeration but did not work for a major part of the year i.e., those who worked for less than 183 days or six months were classified as Marginal workers.

Non-workers
Those who had not worked any time at all during the year preceding the date of enumeration are non-workers. Non-workers include (i) those engaged in household duties at home, (ii) students, (iii) dependents, (iv) retired persons (v) beggars, (vi) inmates of institutions and (vii) other non-workers.

3.2 Occupational Classification of Main Workers

Main workers classified into 9 major categories are given in Census of India B-series tables. This is called the Functional Classification and helps in understanding the functional classification of the city/town. This data may be provided for the Census year for which it is available.

TABLE 4: INDUSTRIAL ASPECTS

Number of units of different type of industrial units (Large, Medium, Small House Hold, Hazardous etc) of the town/ward for the last five years to be furnished.

4.1 Industries – provide latest details for the year available.

4.2 Traditional Industries: details may be provided for the types of traditional industries found in the city/town. Some towns specialize in certain traditional industry, often at household level, for which special provisions are to be made in Master Plan.

4.3 Most important commodities imported

The names of the most important commodities decided in terms of estimated volume of commodities imported are to be indicated.

4.4 Most important commodities manufactured

The names of the most important commodities manufactured are to be indicated. This is decided in terms of the volume of total output of the commodities concerned.

4.5 Most important commodities exported

The names of the most important commodities decided in terms of estimated volume of commodities exported are to be indicated.

4.6Most important agricultural produce

The region surrounding the city/town may be rich in a particular type of produce, for which markets/ mandis, processing industry etc. may be located in the city.

TABLE 5: LAND USE (in Hectares)

The area under different landuses in 1991,2001,2011 to be furnished.Details regarding landuse classes, etc. is given elsewhere in the Design Standards document. The table may be modified as per requirements.

TABLE 6: AVAILABILITY OF DRINKING WATER

6.1 Important sources of drinking water

Indicate the important sources of drinking water and also indicate the distance in Kms. from the main source, and number of households covered from different sources. Refer HH-series tables (Tables on Houses, Household Amenities and Assets) from Census of India.

6.2 Water Supply details

Ward wise details of the quantity of water supplied (MLD), No. of Connections, Per Capita Consumption (LPCD), Area Covered (sq.kms), Capacity of WTPs, percentage of treated water water recycling, etc.to be furnished.

TABLE 7: ELECTRICITY

The information on electric supply to the town is presented in the form of number of connections under different consumption groups viz., domestic, industrial, commercial, and others which includes electricity for agricultural purpose, proposed projects requiring land in the city/town.

TABLE 8: COMMUNICATIONS &TELECOMMUNICATIONS

Details of number of telephone connections (land line), mobile connections, Post Office etc. to be furnished here.

TABLE 9: EDUCATIONAL FACILITIES

Pre-primary schools have been treated as Anganwadi, Schools upto Class IV have been treated as Primary, schools upto Class VIII as Junior secondary or middle schools, schools upto Class X as Secondary schools and schools or colleges upto XII as Senior secondary schools or at places Intermediate and Junior college.

If there are composite schools like middle schools with primary classes, or secondary schools with middle classes, these have been included in the number of primary and middle schools respectively. For example, if in a town, there are two primary schools and one middle school with primary classes, the number of primary schools in the town will be given as three and that of middle schools as one even though there are only three educational institutions. Same is the case with secondary or senior secondary schools.

Number of vocational training institutions
This includes vocational institutions like Applied Art/Painting College, Pharmacy College, B.Ed. College, Teachers Training Institutions, Govt./recognized polytechnics, Shorthand, Typewriting, Music/DanceSchools, etc.

Number of colleges
The number of different types of colleges offering various courses in the town is to be indicated under following sub-heads:

(1) General
(2) Medical
(3) Engineering
(4) Law

A general college means Arts, Science and Commerce colleges.

Table 7: Number of Adult Education centers
This aspect was first introduced in the Town Directory of 1981 Census keeping in view the Minimum Needs Programme of the Planning Commission. In this column the number of adult education centres conducting regular classes are to be indicated.

TABLE 10: MEDICAL FACILITIES

10.1 Number of hospitals, dispensaries, etc., doctors, nurses, paramedical staff and total number of beds available therein

The particulars of various type of medical institutions in various system of medicines like Allopathic, Ayurvedic, Unani, Homeopaththic etc. and their numbers viz., Hospitals, Dispensaries, Health Centres, Family Planning Centres, Nursing Homes and other medical institutions and the capacity with reference to total beds, doctors, nurses, paramedical staff available is to be given. The data is to be provided for both Govt./Private institutions.

10.2 Epidemiological Details

No. of persons affected by diseases like Leprosy, Phylaria, Tuberculosis, Cholera etc.

TABLE 11: AVAILABILITY OF SANITARY FACILITIES

The sanitation facilities in a city/town could be based on septic tanks or sewerage system or low cost sanitation. Studies have shown that proper sewerage systems cover less than 20% of Indian Cities. Therefore, the correct data has to be filled in here so that planning could be undertaken accordingly.

Sewerage System

Sewerage system implies the network of mains and branches of underground conduits for the conveyance of sewage to the point of disposal. Sewers that carry only household and industrial wastage are called separate sewers; those that carry storm water from roofs, streets and other surfaces are known as storm water drains, while those carrying both sewage and storm water are called combined sewers. However, towns which are not provided with such underground sewerage system normally have open surface drain, covered drains, etc.

11.2 Network Details

The details about the sewerage/ drainage network to be provided.

11.3-11.8 Details of sewage generation, treatment and disposal

11.9 Public Toilets

11.10 Major Storm Water Drains

TABLE 12: SOLID WASTE MANAGEMENT

There are three major steps involved in the management of solid waste viz. collection, transportation and disposal. Disposal of solid waste is generally done through land filling.

Municipal solid waste includes commercial and residential waste generated by a community
Collection means collection and removal of solid waste from different collection points
Disposal means final disposal of solid waste;

Recycling means the process by which waste is transformed into new products in such a manner that the original products lose their identity;

Land fill: Means disposal of solid waste by spreading it in layers over a lined surface or land, compacting it to the smallest volume and covering it by impervious soil layer at the end of the day or more frequently. A landfill is operated to prevent leachate for contaminating ground water and maintaining ambient air quality;

Incineration: Incineration is a process of controlled combustion for burning of waste and residue, containing material, Carbon dioxide, water vapour, ash and non-combustible end products.

Biodegradable substance means a substance that can be degraded by micro-organisms.

Hospital Waste: Waste generating from the hospitals is called hospital waste

TABLE 13: AVAILABILITY OF RECREATIONAL, CULTURAL, BANKING AND CREDIT FACILITIES

13.1 Community Facilities

The particulars of recreational facilities such as stadia, museum, cinema halls and auditoria/drama/community halls and their number in the town are to be recorded. The availability of cultural facilities in the form of the number of public libraries and reading rooms, if any, available in the town is to be indicated. If firefighting facility is not available in the town, the name of the nearest place where this facility is available is to be indicated and the distance of the same is given in column.

13.2 Number of banksand credit societies

Banks
Number of banks, commercial as well as co-operative functioning in the town has to be indicated. It gives the number of banks both the head as well as branch offices of banks in each town, which actually transact banking business. The head or branch offices not actually transacting any banking business are not to be taken into account.

Credit Societies
The information on Agricultural Credit Societies and Non-Agricultural Credit Societies are to be furnished.

The agricultural credit societies include service, multipurpose, agricultural produce, marketing cooperative societies, etc. The non-agricultural credit societies include consumer cooperative societies and also credit co-operative societies of certain categories of persons like teachers, postal-workers, etc.

TABLE 14: LAW AND ORDER / CRIMES
TABLE 15: HOUSING

TABLE 16: LAND OWNERSHIP AND COST

16.3 Mortgage to credit ratio for housing (Rs. in Lakh)

Mortgage / loans
Percentage of dwellings purchased during the past year that are covered by mortgage and percentage of dwellings that are covered by non-mortgage.

TABLE 17: DISASTERS

TABLE 18: PUBLIC PRIVATE PARTNERSHIP PROJECTS IMPLEMENTED IN THE TOWN (PPP)

TABLE 19: SLUMS

All the inhabitants of the areas, which have been notified as slums by the state governments under any legal provisions or even recognized by them, are to be accordingly considered as slum population. Besides areas in cities/towns, which satisfy the usual criteria for declaring an area as slum have also been included.

As per Census of India, the slum areas broadly consist of:-

1. All specified areas notified as 'Slum' by State/Local Government and UT Administration under any Act;
2. All areas recognized as 'Slum' by State/Local Government and UT Administration which may not have been formally notified as slum under any Act;
3. A compact area of at least 300 population or about 60-70 households of poorly built congested tenements, in unhygienic environment usually with inadequate infrastructure and lacking in proper sanitary and drinking water facilities.

Houseless Population: As per Census of India 2011, households which do not live in buildings or Census houses but live in the open or roadside, pavements, in hume-pipes, under fly-overs and staircases, or in the open in places of worship, mandaps, railway platforms, etc., are to be treated as Houseless households

TABLE 20: TRAFFIC & TRANSPORTATION

20.3 Road length and Footpath (in Km.)

The road length to be shown in these columns pertains to Surfaced i.e., Pucca and Un-surfaced i.e., Kutcha roads and its total road length.

TABLE 21: ENVIRONMENT

Environmental pollutant means any solid, liquid or gaseous substance present in such concentration as may be or tend to be, injurious to environment and environmental pollution means the presence in the environment of any environmental pollutant.

20.1 Air pollution

Air pollution is the excessive concentration of foreign matter in the air, which adversely affects the well being of the individual or cause damage to property. The important air contaminants are SO2, NO, Suspended Particulate Matter (SPM), CO. Air pollutants are measures in µg/m3.

Sulfur dioxide (SO_2): SO_2 is an irritant colourless gas, which affects the mucous membranes when inhaled. Exposure at low level can cause increased upper respiratory symptoms such as cough, sore throat and affects lung function.

Oxides of Nitrogen (NO): Of the seven oxides of nitrogen known to exist in the ambient air, Nitrogen dioxide is the main oxides affecting human health. Oxides of nitrogen are released in all the types of combustion as they are formed by the oxidation of atmospheric nitrogen at high temperature. Exposure to excessive NO_2 affects the defense mechanism of human body.

Suspended Particulate Matters (SPM): Particulate is a term given to the minute particle of solid or semi solid material dispersed in the atmosphere. SPM presence in the air cause respiratory diseases.

Carbon Monoxide (CO): Carbon monoxide is a colourless, odourless gas with relatively poor solubility in water. CO emission is due to incomplete combustion of fuel of vehicles. CO affects the central nervous system and also responsible for heart attacks and a high mortality rate.

20.2 Noise Pollution: Noise is an unwanted sound without agreeable musical quality. Noise levels are measured in decibels. One decibel is the threshold of hearing.

20.3 Water pollution: Water pollution is any physical or chemical change in water that can adversely affect organisms

Biochemical oxygen demand, or BOD

The amount of organic material that can decompose in the sewage is measured by the biochemical oxygen demand. BOD is the amount of oxygen required by micro-organisms to decompose the organic substances in sewage. Therefore, the more organic material there is in the sewage, the higher the BOD. Dissolved oxygen is an important factor that determines the quality of water in lakes and rivers. The higher the concentration of dissolved oxygen, the better the water quality. BOD level measured in mg/l.

Coliform level: Coliform level is an important index to measure pollution by human waste. Water pollution due to human excreta is caused mainly by the lack of proper municipal sewerage.

pH Value: A number used to express degrees of acidity or alkalinity in solution.

TABLE 22: ANIMAL HUSBANDARY DETAILS

Animal husbandry continues to be an important activity in most Indian cities/ towns, most often found in urban villages and peri-urban areas. Details are essential for master plan formulation.

TABLE 23: TRAVEL & TOURISM

Aspects related to travel and tourism closely affect demand for facilities, demand for land and economic activity generated such as hotels, parking, eateries, water demand, electricity demand, etc.

TABLE 24: GOVERNANCE

Civic Status of town: see para 1.2.

Status of Master/ Development Plan: Many cities/ towns will have at least some kind of pre-existing plan document.The details such as date of sanction of the Ist Plan, plan revision are to be furnished.

Revenue and Receipt of Local Body (Rs in Lakh)

The actual revenue receipt and revenue expenditure figures of the administrative body governing the town are to be filled. Data is to be presented not only in respect of statutory bodies but also in respect of non-statutory bodies managing the civic administration of the towns if they have separate budgets and accounts of their own pertaining to the town.

City Product

Total product of the city as defined in national accounts procedures. It may either be taken as the total income or value-added (wages plus business surplus plus taxes plus imports), or the total final demand (consumption plus investment plus exports).

City Product = (GNP) x (number of households in the city) x (average household income in the city) (Total national household income, from national accounts)

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3. Urban And Regional Development Plans Formulation And Implementation (URDPFI) Guidelines, January 2015, MoUD, New Delhi.

4. Andhra Pradesh Municipal Development Project (APMDP), Terms of Reference, 2013, Govt. of AP.

5. For more details on AMRUT may visit Mission website http://amrut.gov.in/