Achievements and Developments in Geographical Information in Addressing National Issues in India

(Maj Gen Manoj Tayal, Surveyor General of India)

BRIEF HISTORY OF SURVEY OF INDIA (SOI)

• Oldest scientific department of the Govt. of India

• Principal Mapping Agency

• Ensures that the country's domain is explored and mapped suitably

• The great Trigonometric of India - Some of the best geodetic control series available in the world.

• Organized into only 5 Directorates in 1950, mainly to look after the mapping needs of Defense Forces

TRADITIONAL ROLE OF SURVEY OF INDIA (SOI)

o **As NMA Maintains**

- Basic Map Coverage
- Foundation Dataset including the national spatial reference frame
- National DEM
- The National Topographic Template
- Administrative boundaries
- Toponymy

o Advisory Role on Boundary Issues

o Scientific national programs related to the field of geo-physics
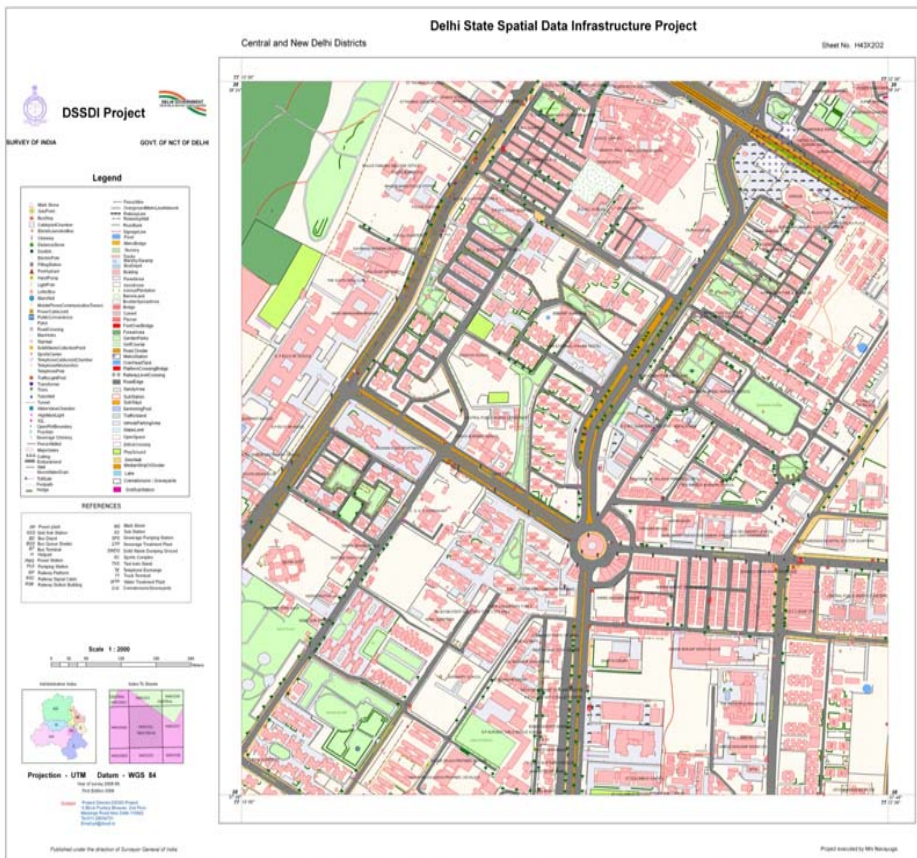
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VISION AND MISSION OF SOI

VISION

- The vision of SOI is to take a leadership role in providing user focused, cost effective, reliable and quality geospatial data, information and intelligence for meeting the needs of national security, sustainable national development and new information markets.

MISSION

- Survey of India dedicates itself to the advancement of theory, practice, collection and applications of geospatial data, and promotes an active exchange of information, ideas, and technological innovations amongst the data producers and users who will get access to such data of highest possible resolution at an affordable cost in the near real-time environment.

SURVEYING AND MAPPING

FROM HAND DRAWN MAPS TO 3D-WALK THROUGHS

STATE OF ART TECHNOLOGY

REDEFINITION OF HORIZONTAL DATUM

CONTROL POINTS FOR GCP LIBRARY - PHASE 1
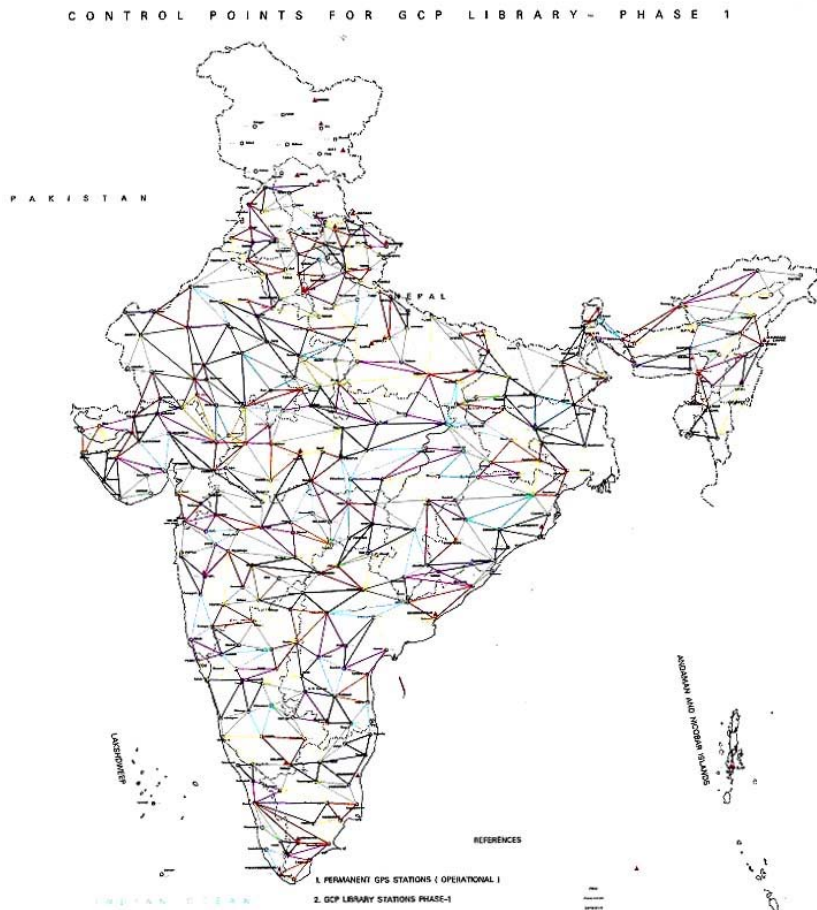
- **PHASE I - establishment of 300 monumented GCPs 250-300 km apart has been completed.**

- **PHASE II- establishment of 2200 GCPs at a spacing of 30km is underway.**

- **These monumented GCPs will have packets of geodetic information such as**
  - **co-ordinates in ITRF,**
  - **height above MSL,**
  - **gravity values in IGSN71 Datum**
  - **total geo-magnetic force**
  - **vertical force of earth's magnetic field.**

- **These stations will be used to transmit differential corrections to GPS users for obtaining positions within 1-2 m in real time.**

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REDEFINITION OF VERTICAL DATUM

- **Provide dense network of precise benchmarks having geo-potential numbers, Helmert Orthometric heights and gravity values.**

- **Connect BMs to National GCP Library**

- **Connect BMs to all tide-gauge BMs**

- **Set up a reference frame for scientific studies**

- **Development of high resolution Geoid Model**

MODERNIZATION OF TIDE GAUGES

INDIAN TIDE GAUGE NETWORK

NATIONAL GPS AND TIDAL DATA CENTRES

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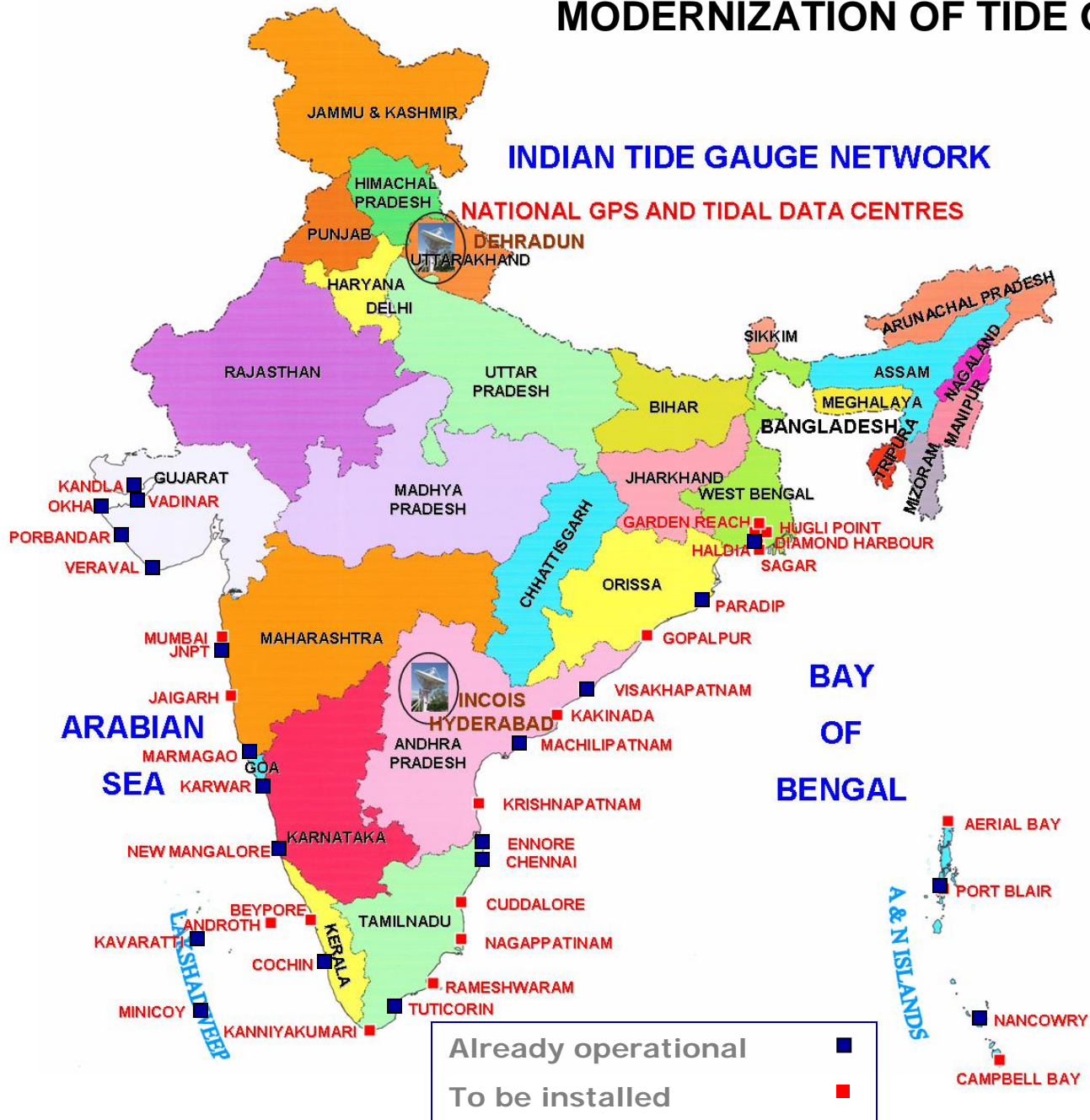
PRESENT STATUS

Sl. No.	PORT NAME	VSAT	TG	GPS
1	Marmagao	√	√	√
2	Visakhapatnam	√	√	√
3	Paradip	√	√	√
4	Cochin	√	√	√
5	Port Blair	√	√	√
6	Kandla	√	√	√
7	Ennore	√	√	√
8	Kavaratti	√	√	√
9	Tuticorin	√	√	√
10	Haldia	√	√	√
11	Machilipatnam	√	√	√
12	Chennai	√	√	√
13	Nancowry	√		√
14	Minicoy	√	√	√
15	Okha	√		√
16	Porbander	√		√
17	Veraval	√		√
18	Karwar	√	√	√
19	New Mangalore	√	√	√
20	JNPT	√	√	√
21	Vadinar	√		√

Note: Equipments already moved to Campbell Bay, Aerial Bay and Hugli Point

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A 5.2 m VSAT antenna has been installed at National Tidal Data Centre, Dehradun to receive tidal and GPS data on real time. Tide gauge stations has been provided with 2.4 m VSAT antennas for transmission of this data. Redundant power supply through UPS has also been arranged.

TSUNAMI WARNING SYSTEM

SATELLITE

VSAT ANTENNA

TIDE GAUGE STATION

SOLAR PANEL
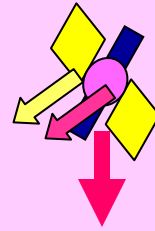
DISASTER CONTROL STATION
TSUNAMI WARNING

VSAT ANTENNA   GPS ANTENNA

TIDE GAUGE

GPS
RECEIVER

NATIONAL TIDAL DATA CENTRE

NATIONAL GPS DATA CENTRE

STILLING WELL
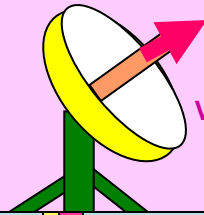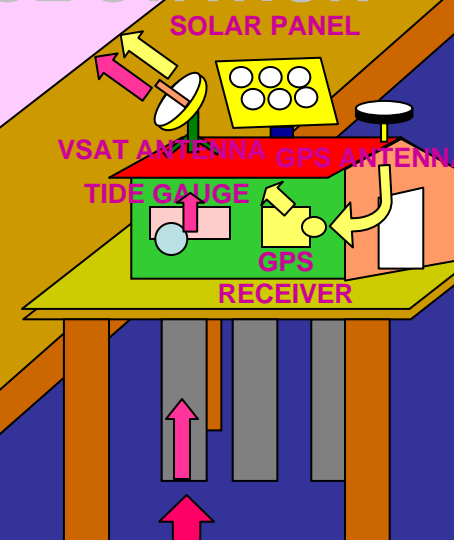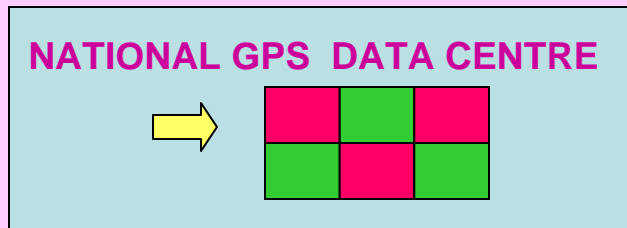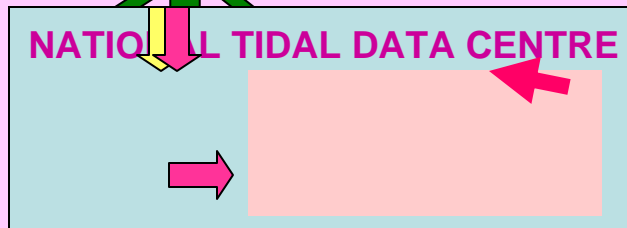
REAL TIME DATA TRANSMISSION
FROM TIDE GAUGE STATION

JETTY

1. VILLAGE INFORMATION SYSTEM

- **INTRODUCTION:**
  - There are more than 600,000 villages in India.
  - There are about 600 district in India. District is the administrative unit.
  - The village boundary of each village is surveyed in the field
  - It is converted to digital form.
  - Attributes are attached to each village. It is compiled district wise.
  - Query system is build as per requirement.

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152 TOWNS UNDER NUIS PROJECT- PHASE I

Legend:
- NUIS_Project (230)
- SCALE_FINAL (19,96...)
- STATE by STATE_NA...
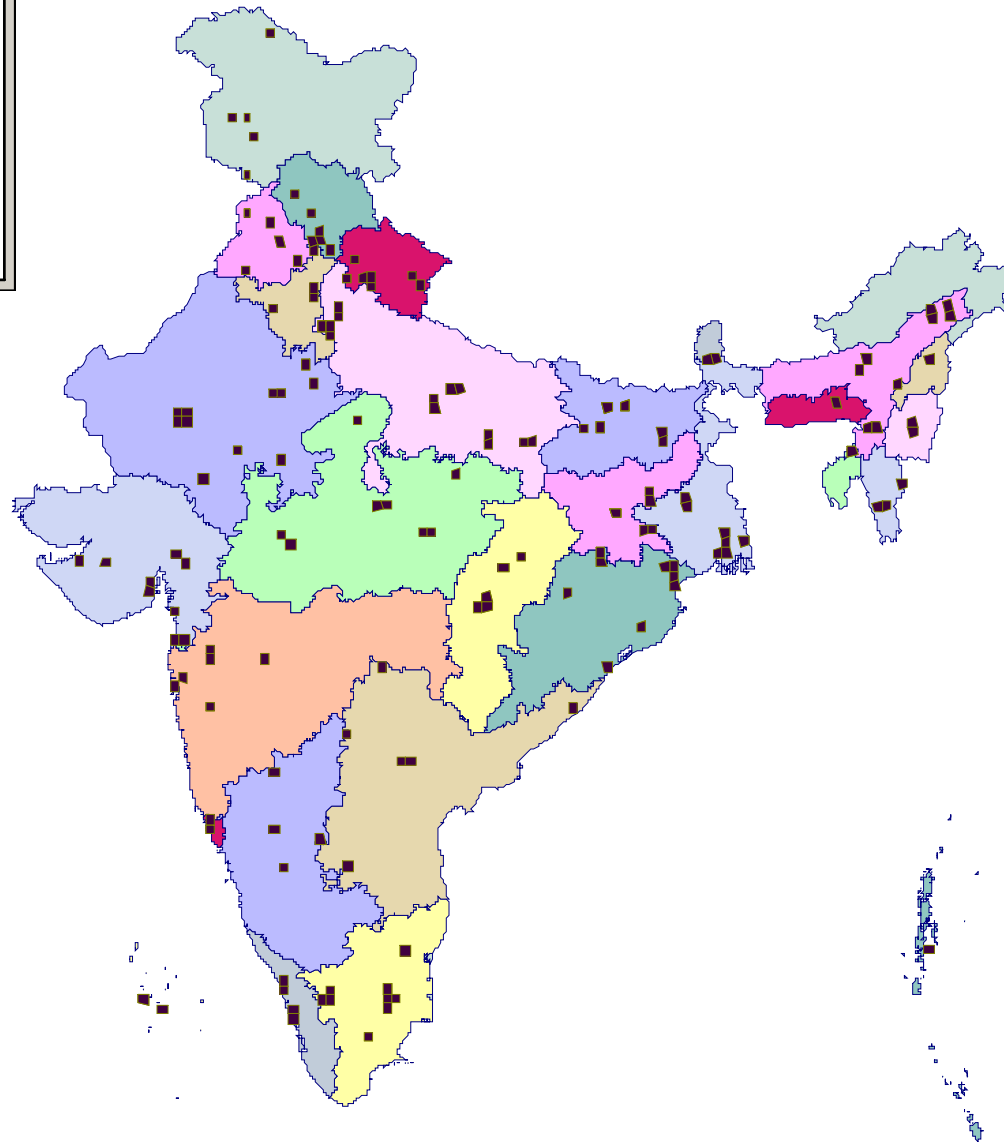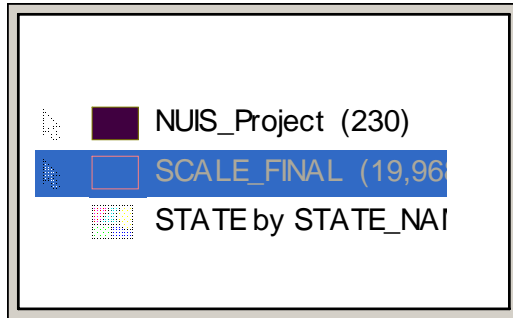
NUIS is required by urban planners, administrators, engineers, utility providers, environmentalists and taxation departments.

OBJECTIVES OF NUIS

- To generate spatial data in terms of maps and images
- To introduce use of modern data sources and methods
- To develop and implement information systems concept to aid as a decision support system in planning and management of urban settlements

MAJOR COMPONENTS OF NUIS

The NUIS Scheme comprises two major components as given under:

- **Urban Spatial Information System (USIS)**
- **NationalUrban Databank and Indicators (NUDB&I)**

CENSUS

- All 29 State Capitals being mapped on 1:2000 scale

- The next census operations of all these cities will be based on these spatial data for collection of house-hold level data

DEVELOPMENTAL SCHEME

PRADHAN MANTRI SADAK YOJNA

- The objective is to provide basic access by way of all weather roads to the all habitations having population "250 or above in desert and tribal areas" and "500 or above for the rest of habitations" in phased manner.

- Geographical Information System (GIS) is being used for monitoring, management and building transparency in programme in two pilot states i.e. Rajasthan and Himachal Pradesh

ELECTIONS

- The spatial data of National Spatial Data Infrastructure was used extensively during the 15th Lok Sabha Elections held in 2009 in which more than 700 million voters participated.

- Mapping the electoral process, redistricting, managing the logistics of holding elections, supplying information to voters both before and after an election, locating the polling booths, Election Day support and analyzing the results of elections.

DSSDI PROJECT

The salient features of this flagship project of government of Delhi are:

- Creation of 3 Dimensional Geographical Information System (GIS). 3D Digital model of the entire city with Photo realistic 3D visualization and texturing ie a High-resolution, three-dimensional virtual walkthroughs of the NCT of Delhi
- Creation of Comprehensive Urban Information System- mapping of details up to manholes, light poles, traffic signals, signage, urban properties including boundary wall, gates, fence, classification and usage etc
- Creation of Comprehensive Land Information System and Property GIS with updated parcel boundaries and revenue records. Ownership/occupancy, population and flagging of changes in the existing and current information.
- Mapping of topographical features with about 335 feature classes on 1:2000 scale and 50 cm Contour Interval and establishment of 1500 monumented Control Points for future survey.

DSSDI PROJECT

- Mapping of underground and over-ground utilities such as cables, pipes etc. with their accurate location, depth and size on 1:2000 scale using a mechanised Terravision.

- Wireless monitoring of the city with IP cameras for monitoring of illegal construction/ encroachments by establishment of 63 IP Cameras.

- Establishment of 2 Control Centres and 14 Monitoring Centres.

- Development, hosting / installation and operationalization of the Geo-Portal at the 2 Control Centres to function as a single window Web-enabled Enterprise GIS system through which the line departments will access information and decision support systems using user friendly and customized applications being developed for each department.

- Capacity building for Line Departments of GNCTD.

Delhi Geo-Portal

Application Development Process in DSSDI — DSSDI GeoPortal (Internet/Intranet)

Process steps (inner cycle):
- Feasibility Study
- Planning & Mobilization
- Requirement Analysis
- Gap Analysis
- Design & Prototyping
- Development
- Testing
- Implementation
- Evaluation
- Deployment at MC & CC

Line Departments of GNCTD (outer cycle):

1. MCD
2. DDA
3. NDMC
4. Revenue
5. DJB
6. DTL
7. BSES Rajdhani
8. BSES Yamuna
9. NDPL
10. IGL
11. PWD
12. DTC
13. Fire Service
14. Delhi Police
15. Election Commission
16. Education
17. Health & Family Welfare
18. DPCC
19. DTTDC
20. Census Dept.
21. DSIIDC
22. Irrigation & Flood Control
23. Dept. of Labour
24. Excise & Entertainment & Luxury Tax
25. Trade & Taxes
26. MTNL
27. DIMTS
28. DMRC
29. Commonwealth Games
30. Forests
31. DDMA

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DSSDI Features (335)

3D GIS (10)
Awning, BuildingRoof, CurvedRoof, InCompleteBuilding, OnionDome, OnionTop, RoofPoint, RoofRidge, SlopeRoof, CourtYard

Boundary (29)
State, District, Sub-Division, Urban Body, Locality, Village, Laldora, MCD Zone, MCD Ward, Census Ward, PIN Code, Constituency, and Dept. boundaries

Building (92)
Building, Fence & Gates, Commercial, Courts, Education, Facility Centres, Medical Facilities, Heritage & Historical Buildings, Industry, Police, Entertainments, Religious, and Residential

Input for Updation (3)
Pencil Point, Pencil Line, Pencil Polygon

Transportation (59)
Roads with its Furniture, Airport, Railway and Metro Railway

Framework (4)
Map2K, Models, Bench Mark, Ground Control Point

Utility (58)
Power, Sewerage, Water Supply, Gas and Oil Services, Communication, and others

Image (5)
Ortho-Photos, Colony Layouts, Masavi Maps, Sijra Maps, Landuse Maps,

Landuse (38)
Vegetation related areas, Cultivation & Plantation Area, Scrub Area, Marshy, Oxbow lake, Rocky & Mountain features, Sand Area, Barren Land, Fire Line, Quarries, Manmade land covers

Hypsography (6)
Contours (Thick & Thin), Break line, DEM, Depressions, Form line or sub features

Cadastre (15)
Masavi Parcel, Village Boundary, Built-Up, Mixed Built-Up, Transportation, Public Semi-Public, Communication, Forest, Grazing land, waste land, Water bodies, Hill, Boundary Pillars

Hydrography (16)
River, Stream, River Island, Dam, Reservoir, Lake, Pond, Tank, Canal, Water Channel, Water Limit, Swimming Pool

Other elements
- GPS Survey & Leveling
- Aerial Images
- Line Depts. Inputs
- GPR Survey
- Ground Validation
- Field Property Survey
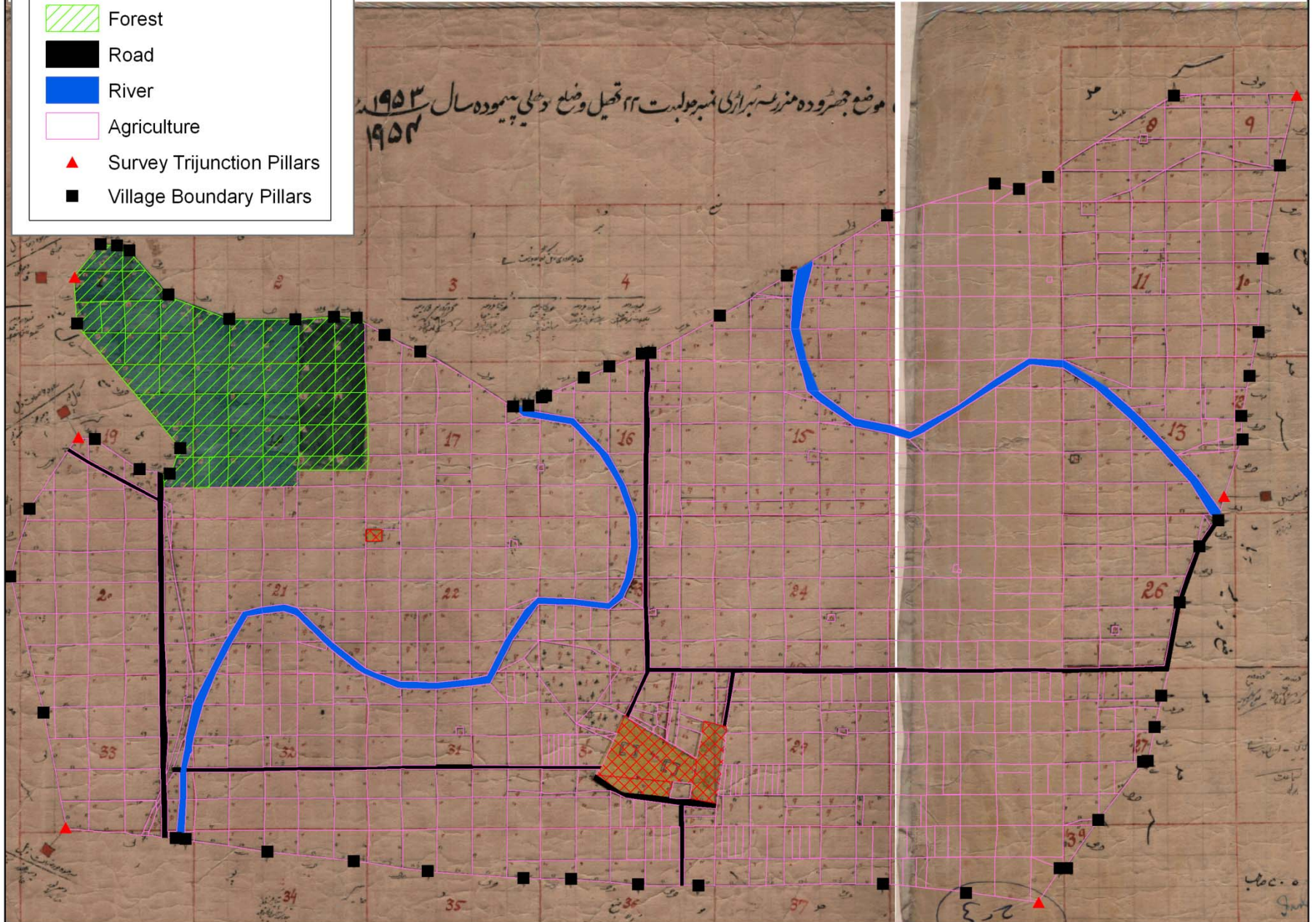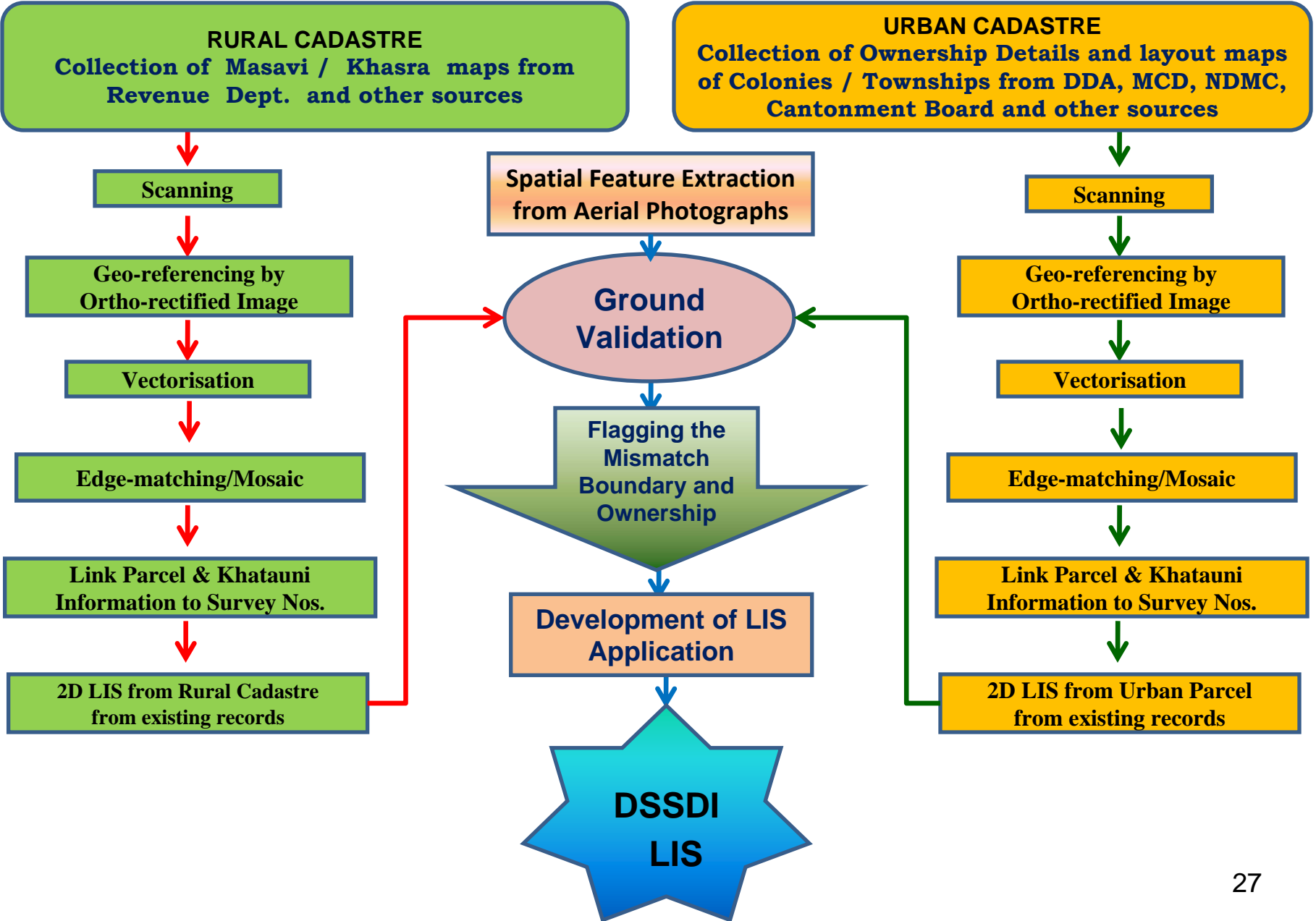- Attribute Collection

Village : Jharoda Majara Burari, Civil Lines, North Delhi District

Legend
- Abadi
- Forest
- Road
- River
- Agriculture
- ▲ Survey Trijunction Pillars
- ■ Village Boundary Pillars

Land Information System

RURAL CADASTRE
Collection of Masavi / Khasra maps from Revenue Dept. and other sources

URBAN CADASTRE
Collection of Ownership Details and layout maps of Colonies / Townships from DDA, MCD, NDMC, Cantonment Board and other sources

Scanning

Geo-referencing by Ortho-rectified Image

Vectorisation

Edge-matching/Mosaic

Link Parcel & Khatauni Information to Survey Nos.

2D LIS from Rural Cadastre from existing records

Spatial Feature Extraction from Aerial Photographs

Ground Validation

Flagging the Mismatch Boundary and Ownership

Development of LIS Application

DSSDI LIS

Scanning

Geo-referencing by Ortho-rectified Image

Vectorisation

Edge-matching/Mosaic

Link Parcel & Khatauni Information to Survey Nos.

2D LIS from Urban Parcel from existing records

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Village-Jharoda Majara Burari, Civil Lines, North District

Concluding Remarks

Thank you.

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