Multi-Layer GIS for Digital Transformation ("Smart Governance" & "Planning" and Decision-Making)

Using Technology to increase Government capacity and capability in Geo-Enabling Work-Flows for Transformation

National Informatics Centre

- The Mandate

- Trusted Technology Partner of the Government
- Design & Develop IT Systems for Government
- Provide ICT Infrastructure on demand
- Explore & Advise on different dimensions of ICT in Government
<table>
<thead>
<tr>
<th>Government ICT Infrastructure Setup by NIC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pan India Government Network</strong></td>
</tr>
<tr>
<td><strong>Video Conferencing</strong></td>
</tr>
<tr>
<td><strong>Cyber Security</strong></td>
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<tr>
<td><strong>Webcast</strong></td>
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<tr>
<td>Products / Platforms</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>eProcurement</td>
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<tr>
<td>Vaahan &amp; Saarathi</td>
</tr>
<tr>
<td>ePrison</td>
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<td>ServicePlus</td>
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<tr>
<td>PFMS</td>
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<tr>
<td>e-Hospital</td>
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<td>MyGOV</td>
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<tr>
<td>Elections</td>
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<tr>
<td>eOffice</td>
</tr>
<tr>
<td>eSamiksha</td>
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<tr>
<td>PRIASoft</td>
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<tr>
<td>Biometric Attendance</td>
</tr>
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<td>CollabCAD</td>
</tr>
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<td>Open Data</td>
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</table>

More....
## Major Projects

<table>
<thead>
<tr>
<th>eCourts</th>
<th>Jeevan Pramaan</th>
<th>TPDS</th>
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</thead>
<tbody>
<tr>
<td>Swachh Bharat Gramin</td>
<td>National Scholarships Portal</td>
<td>ePanchayat</td>
</tr>
<tr>
<td>IVFRT</td>
<td>eCounselling</td>
<td>Soil Health Card</td>
</tr>
<tr>
<td>Land Records</td>
<td>mFMS</td>
<td>NGO Portal</td>
</tr>
</tbody>
</table>

*More....*
Digital India is a Programme to transform India into a digitally empowered society and knowledge.
Vision of Digital India
Centered around 3 Key Areas

Digital Infrastructure as a Utility to Every Citizen

Governance & Service on Demand

Digital Empowerment of Citizen

Leveraging GIS For Decision Support Systems & Development

Asset Mapping

Location Based Services

GIS is a common technology platform and service cutting across key areas covered as Digital India Vision
Nine Pillars of Digital India

1. Broadband Highways
2. Universal Access to Phones
3. Public Access Internet Programme
4. e-Governance - Reforming Govt. through Technology
5. e-Kranti – Electronic Delivery of Services
6. Information for All
7. Electronics Manufacturing - Target NET ZERO Imports
8. IT for Jobs
9. Early Harvest Programme

National GIS Mission for Digital India:
GIS is a Technology for Planning, Decision-Making & Electronic Delivery of Services (Pillar-5), Geo-enabling e-Governance (Pillar-4) to facilitate location based information for all (Pillar-6):
Location as “Primary Unit” for Digital India

- “Location” - Important dimension in Network Connected Digital World of Information Highways.

- “Geo-Tagging” of Location of Assets, Infrastructure, Natural and Human Resources - Essential requirement to understand ground reality of development process & services to be made available to citizens.

- “Geographical Information System (GIS)” as “Technology Platform” to facilitate Location-Specific “Governance & Services on Demand”, as key implementation strategy for “Knowledge–Driven-Digital India”.

- GIS to facilitate Planning, Decision-Support, Monitoring & Evaluation for Good Governance as well as Social Auditing of Government Action for Development with participation of citizens.
GIS as major E- (or G-) Governance Sub-System is an important lever to accelerate growth and increase focus in different domains

- **Government**
  - Internal Security,
  - Rural Development
  - Financial Planning
  - Infrastructure
  - Agriculture
  - Land Records

- **Education**
  - Research,
  - Higher Education
  - Technologists

- **Environment**
  - Climate
  - Water,
  - Land,
  - Wildlife,
  - Vegetation

- **Natural Resources**
  - Agriculture,
  - Forestry,
  - Mining,
  - Petroleum,
  - Pipeline

- **Utilities organizations –**
  - Telecom
  - Power Management,
  - Electricity
  - Gas
  - Water and Waste management

- **Businesses –**
  - Banking,
  - Logistics,
  - Real Estate,
  - Retail,
  - Media

---

**Digital India demands Sustainable Framework for Location Based Services for Good Governance to fulfill the aspirations of Citizens of the country.**
Multi-Layer GIS Platform

► A standards based framework to deploy Digital GIS Assets
► Represents common intent of major ministries/departments
► Part of larger e-gov initiatives to support backend governance applications
► Facilitate real-time update through departmental ownership and driving force
► Involvement and participation of citizens through crowd-sourcing
► e-gov applications to drive Location Based Services and facilitate use of “Maps” through “Apps” within the work-flow and process of governance needs
► Integration with Social Media for data authentication and social auditing

Planning Services – National
  - State & Region 1:1,00,000
  - District (with village) 1:2,50,000
  - Urban/City/Utility 1:50,000 to 1:10,000

Project Management Services 1:10,000 to 1:5000
Transaction Services (Cadastral Level) 1:2,000 to 1:4000
Regulatory Services 1:10,000
GIS Initiatives Enabling Digital Transformation

- Bharat Maps – Multi-Layer GIS Platform
- GIS for Financial Inclusion (DBT-GIS Portal)
- BBNL GIS Portal (Bharat Broadband Network Limited)
- BharatNet Project Monitoring (National Optical Fiber Network, BBNL)
- School Location Mapping (School GIS)
- Utility Mapping – Smart Cities
- Punjab GIS – An Example of Collaborative Mapping
Bharat Maps

Bharat Maps’ is a multi layered GIS platform/web service comprising of seamless country wide base maps, satellite images and hybrid maps aligned as per the global geo-spatial standards, it is an essential component of Digital India program to ensure easy governance, effective governance and economical governance. It would provide GIS based decision support system to central/state government departments for delivering citizen centric services.

Salient features

- A robust and scalable framework based on service oriented architecture (SOA).
- Incorporated OGC standards based spatial data repository.
- Tiled base maps at 14 different scales up to 1:4K
- Seamless mosaics of IRS images of varying resolutions like AWiFS (56m), LISS-III (23.5m) and PAN (5.80m).
- Terrain Base Map service featuring shaded relief imagery.
- Leveraging addition content with external global services using mash ups.
- Rich Internet Application (RIA) with cross platform support based on open API’s like Flex and JavaScript.
- Linkage to attribute data like census etc.

Spatial Data (Layers)

- National/State/District/Block Village Location
- Census Village Location and Habitations
- Settlements and footprints
- Roads, Railway Lines and Stations
- Airports
- Surface Water Features
- Historical Places
- National Parks

Functionalities

- Map Viewer with GIS Navigation Tools (Zoom In, Zoom Out, Pan and Full Extent)
- Identify
- Table of Content
- Measure
- Base map Gallery
- Bookmark
- Legend
- Print
- Area of Interest
- Geo-Code Locator Search
- Upload and view CSV
- Swipe/Spotlight Tool
- Elevation Profile
Bharat Maps
Objective
GIS for Financial Inclusion is a web application of mapping of financial infrastructure across the country to facilitate the financial inclusion of rural masses so that the Direct Benefit Transfer can reach.

Future Road Map
- Citizen Service to people to find out financial services in their neighborhoods.
- Bringing value-added analytical services as per the needs of various stakeholders to facilitate advanced Decision Support System (DSS) for financial inclusion.

Features
- Framework Spatial Data Services
- Robust & Scalable framework based on Service Oriented Architecture (SOA)
- Linkage of attribute data of financial institution, Post Offices, etc.

GIS Functionalities :-
- Standard GIS Navigational Tools
- Layer Legend List
- ESRI ArcGIS Online (Street, Topo, Aerial) Base map Toggling
- Identify
- Distance Measurement
- Area of Interest Navigation & Statistics
- Search
- Buffer
- Proximity Analysis
- Print

Spatial Data (Layers)
- Village Location
- Bank Assets
  - Bank Branch
  - ATM
  - Bank Mitra
  - CSC
- Post Offices Assets
  - GPO
  - HPO
  - SO
  - BO
  - Mobile Tower

Stakeholders
- DBT Mission Directorate
- Dept. of Financial Services
- Dept. of Electronics & IT
- Dept. of Post

GIS for Financial Inclusion (DBT-GIS Web Portal)

Objective
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- Bank Assets
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  - HPO
  - SO
  - BO
  - Mobile Tower

Stakeholders
- DBT Mission Directorate
- Dept. of Financial Services
- Dept. of Electronics & IT
- Dept. of Post
GIS for Financial Inclusion (DBT-GIS Web Portal)

Financial Inclusion Platforms
- Public Finance Management System (PFMS)
- Bharatkosh (Non-Receipt Tax Receipt Portal)
- Digital Payments (through apps, Aadhar Seeding, E-wallet, UPI, USSD etc.)
High Level View for BBNL GIS

Application Layer
- Data Viewing
- Data Editing
- Dash Board
- MIS App.
- Mobile App.
- Thematic App.
- User Authentication
- Role based access
- Report Generation & Analysis

Data Preparation & Processing
- Network Layer (OSP)
  - Existing OFC Layer
  - Actual Network (After Survey)
  - Network Attributes (Only OSP Related)
  - Route Survey Layer
  - Updated Network after Commissioning
- Base Layer
  - Bhuvan Map Service
  - External global Map Services
  - Limited Satellite Images for critical areas
- Existing Multi-layer GIS framework

Data Layer
- Enterprise GIS Software, IT Security Software, Control & Monitoring Systems
- NIC Data Centre Infrastructure

External Users
- Other Government Department/Ministries
- Common Citizen

Internal Users
- BBNL
- DOT
- PSU's

Application for Integrating with NMS/OSS
- NMS Server
- CRM Server
- Billing Server
- ERP Server

Internal Users
- BBNL
- DOT
- PSU's

External Users
- Other Government Department/Ministries
- Common Citizen

Application for Integrating with NMS/OSS
- NMS Server
- CRM Server
- Billing Server
- ERP Server
BBNL GIS Portal (Bharat Broadband Network Limited)

Objective

• To carry on the business of establishment, management and operation of National Optical Fibre Network (NOFN) this has been envisaged by the Government of India to provide high speed broadband connectivity to all gram panchayats.
• To provide access to bandwidth in a non-discriminatory

Salient features

Interactive GIS based system created by stringing together a set of web telecom applications which include:

- Web GIS Telecom Application is a web mapping application to perform various query operations and analysis on existing gram panchayat and fiber data.
  - It allows viewing of various (NIC & ESRI) online base maps on the existing spatial data.
  - It calculates analytical operations like: Buffer, Proximity Analysis, Coverage and Nearest Location .
- Web GIS Editing Application for online spatial and attribute editing on existing gram panchayat and fiber data
- Web GIS Dashboard Application for monitoring the status of the work progress of the existing panchayat and fiber data through charts and reports.
- Network Management System (NMS) Integration is a real time data

Spatial Data (Layers)

- Administrative Boundaries (State/District/Block Boundaries)
- BBNL (ONT, OLT, OFC, FPOI, Joints, Splitters)
- NMS (OLT,ONT)
- BSNL (Exchange, OFC_LD, OFC_SSA)
- Railtel(Railtel, Railway station, LC Gate)
- PGCIL (Transmission Towers, Joint Box, Pop Repeater, OPGW Underground, PGCL OFC)
- Towers (Towers)

Functionalities

- Map Viewer with GIS Navigation Tools (Zoom In, Zoom Out, Pan and Full Extent)
- Table of Content
- Base map Gallery
- Measure
- Identify
- Area of Interest
- Query Builder
- Proximity Buffer
- Buffer
- Spatial Query
- Statistics Builder
- CSV File Uploader
- Go To XY
- Global Search
- Dashboard
- Editor
- NMS
BBNL GIS Portal (Bharat Broadband Network Limited)
BharatNet application aims to capture the data of the various activities covered under the NOFN Project using the mobile application and validate the same using the web application. The data captured can be visualized and monitored by all the senior officials on the application.

**Salient features**
- User management module
- Mobile based data capture
- Review and validation process through CPSU and BBNL users
- Dashboard for project monitoring
- Seamless integration of GIS and MIS
- SMS alert integration

**Spatial Data (Layers)**
- Route capturing activities
  - Trenching
  - Deducting
  - Cabling
  - Depth AT
- Point Capturing activities
  - GPON Installation
  - GPON Lit
  - End to End AT

**User management Structure**

**Functionality**
- User Creation by BBNL Supervisor
  - Creates Agency Supervisors as per the list
  - Then creates the Contractors under Agency Supervisor
- The contractor will be provided with a mobile application for data capture
- The captured data will be first viewed by the Agency Supervisor and reviewed
- BBNL supervisor views and authenticates the data.
- Provision for Contractor editing and Agency Supervisor.
- Dashboard view.
**School Location Mapping (School GIS Version 1.0)**

Web Based School GIS application is an initiative of the Department of School Education and Literacy, Ministry of Human Resources Department, Government of India for seamless visualization of school locations across the country. Geographic location of schools collected by the various School Education Departments of the states has been collated and mapped on GIS Platform established by National Informatics Centre.

**Objective**

The objectives of the School Location Mapping GIS application is to help improve the quality of planning and to better the utilization of resources available under the Sarva Shiksha Abhiyan (SSA) and Rashtriya Madhyamik Shiksha Abhiyan (RMSA).

**Salient features**

- A robust spatial representation of data
- Incorporates a map view that allows for visualization of Schools based on their location and also allows for analysis of said data.
- GIS Tools - Standard GIS functions, Identify, Navigation, Search, Buffer and Distance Measurement.
- Thematic Mapping of Schools based on the various categories of Schools that are located on the Map, so as to provide a comprehensive representation of the spread of schools in any

**Spatial Data (Layers)**

- National/State/District/Block Village Location
- Data Received Status (To identify the status of School Mapping in each State)
- School Location
- KVS School Location

**Functionalities**

- Map Viewer with GIS Navigation Tools (Zoom In, Zoom Out, Pan and Full Extent)
- Identify
- Table of Content
- Measure
- Base map Gallery
- Area of Interest
- Thematic Mapping of Schools Based on Categories
- Category Based Buffer
- Proximity Buffer
- Graphical Selection of Schools
- Schools Search by Locators (By School Name, School Code and Village Name)
School Location Mapping (School GIS Version 1.0)
Geo-Enabling E-governance - Probable List of GIS DSS Application

<table>
<thead>
<tr>
<th>Plan-GIS for Planning Commission</th>
<th>GIS for Aadhar integrated with UID</th>
</tr>
</thead>
<tbody>
<tr>
<td>supporting the planning, monitoring and reviewing plans and development.</td>
<td>Census-GIS for Registrar General of India</td>
</tr>
<tr>
<td><strong>GIS for Public services</strong> as part of PIII services in various areas</td>
<td>Weather-GIS and ES-GIS for IMD/MoES.</td>
</tr>
<tr>
<td><strong>Rural-GIS</strong> for various rural development programmes of the Ministry of Rural Development.</td>
<td><strong>GIS for Security</strong> as a support for the security programmes of Ministry of Home Affairs.</td>
</tr>
<tr>
<td><strong>City-GIS service</strong> to planning, management and development of ~5200 urban areas for Ministry of Urban Development.</td>
<td><strong>NE-GIS</strong> for meeting the GIS data and DSS needs of MONER</td>
</tr>
<tr>
<td><strong>Roads Monitoring service</strong> for PMGSY as well as a Roads-GIS for NHAI/Ministry of Surface Transport</td>
<td><strong>Coal &amp; Mines -GIS</strong> for Ministry of Coal &amp; Mines for supporting mining activities</td>
</tr>
<tr>
<td><strong>Health-GIS service</strong> as part of support to the Ministry of Health &amp; Family Welfare</td>
<td><strong>Heavy Industry-GIS</strong> for Department of Heavy Industries</td>
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<tr>
<td><strong>Water Resources-GIS</strong> for water resources management of Ministry of Water Resources</td>
<td><strong>New Energy-GIS</strong> for Ministry of New and Non-Renewable Energy</td>
</tr>
<tr>
<td><strong>Agri-GIS service</strong> for the Agriculture and Farm sector through Ministry of Agriculture</td>
<td><strong>Tourism-GIS</strong> for supporting Ministry of Tourism</td>
</tr>
<tr>
<td><strong>GIS for Disaster Management Support</strong> for supporting management of disaster for NDMA</td>
<td><strong>Panchayat-GIS</strong> in support of Ministry of Panchayati Raj</td>
</tr>
<tr>
<td><strong>GIS for Infrastructure sector</strong> be they in roads and highways, rail systems, airport infrastructure or other social infrastructure.</td>
<td><strong>Stat-GIS</strong> for the Ministry of Statistics and Programme Implementation</td>
</tr>
<tr>
<td><strong>Env-GIS</strong> for Environment and Climate Change monitoring of Ministry of Environment and Forests</td>
<td><strong>Power-GIS</strong> in support of Ministry of Power</td>
</tr>
<tr>
<td></td>
<td><strong>Steel-GIS</strong> in support of Ministry of Steel and its mining PSUs</td>
</tr>
<tr>
<td></td>
<td>GIS data access applications for use for Defence GIS requirements.</td>
</tr>
<tr>
<td></td>
<td>Provide for private sector GIS applications to be hosted and published on the National GIS.</td>
</tr>
<tr>
<td></td>
<td>Crowd-Sourcing- Citizen access to National GIS would be enabled through simple GIS Applications and integrated e-services.</td>
</tr>
</tbody>
</table>
Utility Mapping Services – Smart Cities

• Digital Basemap of the Scale of 1:1000 of Seven Metro cities is available online in G2G mode.
• Digital Basemap is located in NDCSP and can be accessed through secured connection.
• Cities Departments are using these maps for mapping and managing their assets
• The cities are:
  • Ahmedabad,
  • Bengaluru,
  • Chennai,
  • Delhi,
  • Hyderabad,
  • Kolkata,
  • Mumbai
Slum Rehabilitation Authority, Mumbai

- Slum Rehabilitation Authority (SRA) is accessing the Mumbai Digital Basemap and mapping their Slum boundaries with the accuracy of 6 cm.
- GIS cell in SRA premises to analyze and updating of the data.
- Slum boundaries are surveyed using latest technology like GPS.
- Slums are also surveyed using Lidar and get the accurate 3D map which will superimpose on the Mumbai Basemap.
- SRA complete 70% of the GIS work in just 3 months using Mumbai Basemap.
- This will give a complete and accurate prime land detail to SRA to plan for making it commercial and residential purposes.
Details of an individual property

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<thead>
<tr>
<th>Field</th>
<th>Value</th>
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<tbody>
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<td>Property Expiry</td>
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</tbody>
</table>
Land Parcel Information System
Address System

40, Mayurdhwaj Aptt, 92

Address Tool
3-D map

- Ahmedabad
- Mumbai
- Hyderabad
- Bangaluru
- Kolkata
- Chennai
- Delhi
Punjab GIS – An Example of Collaborative Mapping
Displaying All Roads of Amritsar
### Custom Query Result

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<th>District Name</th>
<th>Road Code NIC</th>
<th>Road Name</th>
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<th>Road FK</th>
<th>Road TO</th>
<th>Road Length</th>
<th>Road Width</th>
<th>LD Surface MM</th>
<th>LD Surface YY</th>
<th>Block Name</th>
<th>AC Code</th>
<th>AC Name</th>
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No. of Affected Records: 6
SEARCH BASED OUT OF VILLAGE

Punjab State Agricultural Marketing Board
Government of Punjab

Select District: Amritsar

TOC VILLAGE SEARCH

Select Village: Lakhwali

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Web Editor for Roads and Mandi Locations
Web Editor for Roads with Imagery..
Marketing Committee Boundaries
Marketing Committee Boundaries
Conclusion

• GIS Enabling (“Digital”) “Transformation” – means end to end service delivery covering work-flows, business activities, processes, competencies and models to fully leverage changes in planning & decision making so that benefits & positive impact and opportunities get created at all levels of society.

• “GIS enabling” – “Embedded as Core to “Transformation”.

• “Digital” – Technology Solutions (viz. Big Data, Location Intelligence, IOT, Sensor Enablement etc. with GIS as part of end to end service delivery platform)