Geospatial Technologies for informed decision making – Karnataka Experience

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AGENDA

- About Karnataka State Council

- NRDMS Program

- Urban Mapping - Planning

- Karnataka Geoportal – Phase 1

- Approach to SDI Development in Karnataka (KSSDI)

- Karnataka GeoPortal – Phase 2

- Future

KSCST - The Organisation

★ FIRST state council to be formed in the country in the year 1975.

★ A Registered Society - Registered under Karnataka State Societies   Registration Act 1960.

★ Recognised as an Autonomous Organization of the Department of Science and Technology, Government of Karnataka.

★ Receives annual grant from DST-GoI and DST-GoK.

★ Generates funds through scientific services, sponsored projects, scientific consultancy.

★ Operates through a compact Secretariat and Technical staff.

★ Council operates within the framework of rules approved by its Executive Committee.

★ Derives technical support from IISc. & close linkages with R & D and academic institutions, NGO's, Government Agencies and Industries.

★ Implements projects and programs in a network mode within the State.

KARNATAKA STATE COUNCIL FOR SCIENCE AND TECHNOLOGY

KSCST

ORGANISATIONAL CHART OF THE KSCST

vide G.O. No. ವಿಯಇ 159 ವಿತ್ರಮ 2012 ದಿನಾಂಕ 2-11-2012

for a period of 3 years w.e.f. 1-8-2012

COUNCIL

PRESIDENT
(Chief Minister of Karnataka)

Vice-President
(Finance Minister – GOK)

Vice-President
(Director, IISc.)

Vice-President
(S&T Minister – GOK)

+ 38 MEMBERS

EXECUTIVE COMMITTEE

CHAIRMAN (Director, IISc.)

MEMBER SECRETARY + 12 MEMBERS
(including representatives from the GoK)

SECRETARIAT

EXECUTIVE SECRETARY

**SCIENTIFIC &
TECHNICAL PERSONNEL**

FINANCE

ADMINISTRATION

MANDATE OF KSCST

➢ Advise the State Government on Contemporary and futuristic problems confirmed by the society and suggest S & T solutions.

➢ Improvement of infrastructure, amenities, livelihood and environment through Science and Technology intervention.

➢ Playing a pro-active role in the application of S & T with the involvement of Academia, Industry and Research Institutions.

➢ Extend assistance in promotion of quality Science and Engineering education to produce quality Human Resource.

➢ Confidence and Capability building on issues linked to sustainable development / conservation of natural resources and in decision making process.

Linkages and Collaboration with other Departments / Institutions

ACTIVITIES

Survey, Data collection and analysis

Guide Project formulation & Implementation

Awareness, Training and Capacity building

Promotion of new concepts / devises (Lab to Society)

Support Formulation of S&T Policy

DEPARTMENTS

DST - GOK & GOI

Rural Development & Panchayat Raj Institutions

Education

Health

New and Renewable Energy

Environment

Housing

Urban Development

INSTITUTIONS

Indian Institute of Science

Universities including Agriculture & Veterinary Science

National Laboratories

Engineering Colleges

NGOs

Corporate Houses

Urban Local Bodies

Karnataka NRDMS Program

NRDMS Program

- **Karnataka NRDMS - Establishment and Growth - Present status**
- **District centres activities**
- **Applications developed supporting governance & development planning**
- **Integrated database and state level applications - atlas and other projects**

NRDMS to Karnataka Geoportal

- **Policies of Government with regard to data generation & sharing**
- **State Spatial Data Infrastructure**
- **Mobile Applications, Cloud Computing and Crowd sourcing**
- **Karnataka GIS - the need**

Pathway - E Governance to G Governance

NRDMS METHODOLOGY

Inputs (left column, top to bottom):
- DATA FROM TOPOSHEETS
- AERIAL / SATELLITE DATA
- THEMATIC MAPS
- CENSUS REPORTS
- OTHER SECONDARY SOURCES
- LIMITED PRIMARY SURVEYS

Processing flow:
- PROCESSING TO COMPUTER COMPATIBLE FORMATS → DISTRICT DATABASE → PROCESSING

Outputs (middle-right column):
- STATISTICAL TABLES
- THEMATIC MAPS
- CHARTS/ DIAGRAMS
- INPUT TO MODELS
- GENERATED / ANALYSED MAPS

→ DECISION SUPPORT SYSTEM → DECISION

Processing stages (bottom labels):
COLLECTION | PREPROCESSING | STORAGE | ANALYSIS | USER-ORIENTED RETRIEVALS | APPLICATION MODELLING

INPUTS - - - - - → PROCESSING STAGES - - - - - - - - - - - - - - → OUTPUTS

AGENCIES | NRDMS | USERS

National/State Survey and Mapping Organisations

- Survey of India
- Indian Meteorological Department
- Census of India
- Geological Survey of India
- National Bureau of Soil Sciences & Land-use Board
- Forest Survey of India
- National Remote Sensing Establishment
- Research Data – publications, reports etc.
- State Remote Sensing Centre's
- Survey Settlement and Land Records
- **Google/GPS – being used for updation and data capture**

Planning Atlas

(Information available on Inter state/district – 38/71 parameters)

| Literacy | Post Office | Pupil-Teacher Ratio |

Elections

ASSEMBLY CONSTITUENCY MAP - MYSORE DISTRICT

44 - GULBARGA DAKSHIN ASSEMBLY CONSTITUENCY
MAP SHOWING LOCATION OF POLLING STATIONS AND ROUTES

GRAM PANCHAYATH GENERAL ELECTIONS - 2010
KOLAR TALUK, KOLAR DISTRICT
LOCATIONS OF POLLING STATIONS

Information:

✓ **Location & nature of polling booths (sensitive/hyper-sensitive)**

✓ **Parliamentary/Assembly/PRI**

✓ **Booth status with voters list**

✓ **4. Routing map for RO/ARO**

✓ **5. Mustering/demustering**

Prioritisation of for minor irrigation tanks in Karnataka State using geospatial technologies – RDPR, GOK

Karnataka has over 36,000 MI Tanks. Decline in tank irrigation made Government to invest in restoration & rejuvenation of tanks.

Tanks classified for treatment based on GIS data i.e., mainly in

1. Strengthening of bunds & canals
2. Desilting
3. Catchment area treatment

Taluk and Assembly constituency wise report for implementation.

Environment
Relocation of Stone Crushers

STONE CRUSHERS LOCATED IN UDUPI TALUK

LEGEND

- STONE CRUSHER
- TALUK BOUNDARY
- VILLAGE BOUNDARY
- N.H - 2 KM BUFFER ZONE
- S.H - 1.5 KM BUFFER ZONE
- LINK ROADS - 0.5 KM BUFFER ZONE
- SETTLEMENTS - 2 KM BUFFR ZONE
- WATERBODY - 2 KM BUFFER ZONE
- TALUK HQ - 2 KM BUFFR ZONE

PREPARED BY :
DIST. NRDMS CENTER,ZP,UDUPI

✓Identification of safe zones for location & relocation of stone crushing units based on State/Centre guidelines.

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Delimitation of Gram Panchayaths

- ✓ The Government of Karnataka set up a GP Delimitation Committee to look into formation, revision and delimitation of Gram Panchayaths.

- ✓ The state NRDMS centre supported and prepared new GP maps for the Karnataka on the request of the committee based on spatial proximity, population and request from concerned stakeholders including citizens.

- ✓ Population criteria -
    - ▪ **Malnad: 2500- 5000**
    - ▪ **Rest of Karnataka: 5000 – 7000**

- ✓ The report was released in the month October, 2014 by the committee. Deputy Commissioners were entrusted with the responsibility of finalizing the list.

Proposed GPs – 6068, New GP's – 439, Existing - 5629

Election Results

Change detection - watersheds

LISS-4 CLASSIFIED IMAGE OF KADAKOLA SUB-WATERSHED, SAVANUR TALUK, HAVERI DISTRICT.

Location/allocation of Health Facilities

EXISTING AND PROPOSED HEALTH FACILITIES (PHC & CHC) IN BELTHANGADY TALUK
WITH JURISDICTION OF EXISTING PHCS AND CHCS

Jurisdiction of Existing PHCs & CHCs

ALADANGADY (11)
BELTHANGADY (15)
DHARMASTALA (2)
HATHYADKA (4)
INDABETTU (6)
KOKKADA (4)
MUNDAJE (4)
NARAVI (8)
NERIYA (5)
PADANGADY (9)
UJIRE (3)
VENOOR (10)

Existing PHCs

Proposed PHCs

Villages without PHC within 10 Kms.

Existing CHCs

NOTE: SHOWS PHC KANIYURU WHICH IS SANCTIONED BUT NOT STARTED.
HENCE NO SEPERATE JURISDICTION IS GIVEN FOR THE SAME

MAP PREPARED BY:
DK NRDMS
MANGALORE

KSCST

Urban Mapping - Planning

Conversion of hard copy layout maps (BDA) into GIS ready digital layers.

Conversion of hard copy maps into digital layers for access, search, discovery and updation of spatial data of urban local bodies by using latest geospatial techniques and high resolution satellite imageries.

Urban Infrastructure mapping - Mysore (MUDA)

Feature captured
- **Property Information- Owner details, Area details**
- **Roads- Type, Physical details**
- **Water supply lines- Valves**
- **Sewer lines-Man holes,**
- **Electric lines & Poles**
- **Telephone line & Poles**

Technologies Used:

ETS, GPS, GIS and Remote Sensing

CITY MAP - RAMANAGARA

Prepared By: District NRDMS Centre,
Zilla Panchayath, Ramanagara.

Legend

CITY BOUNDARY
ROADS
ROAD BUFFER
LANDMARKS

0 0.1 0.2   0.4   0.6   0.8
Kilometers

Natural Disaster Monitoring - Floods

Flood affected area of Holalu Village in Hadagali Taluk

Karnataka NRDMS program

INDIA

Karnataka

- Initiated NRDMS program in 1992-93

- Joint initiative of Department of Science & Technology

(Government of Karnataka and Government of India)

- Established district spatial data centers in all the districts to support development planning using GIS.

- Karnataka is the 1st state institutionalise spatial data for decision-making.

Karnataka Geoportal

- Strength of Karnataka NRDMS program formed the basis for setting up of 1ˢᵗ State SDI of the country.

- Funding :   Central: State (75:25)

- Developed a web based Geo Portal to acquire, process, store, distribute and improve the utilization of geo spatial data

- Statewide, standardised, seamless GIS database for selected layers

- Use of global standards making the data sets accessible from a variety of GIS packages at districts

Release of Portal during NSDI-9 conference

Karnataka GeoPortal Services:

- Map viewer - Web Map Service (WMS),

- Product catalogue/metadata - Catalogue Service on Web (CS-W),

- Services specific service/ feature data sets - Web Feature Service (WFS),

- Simple Applications (Query based decision support)

- Coverage services/images - Web Coverage Service (WCS)

- Search and Discovery

- Help/support

Information available in Karnataka Geoportal

State Boundary	India Meteorological Department Station
Division Boundary	Rain gauge Station
Subdivision Boundary	Drainage
District Boundary	Land use Land cover
Taluk Boundary	
Parliamentary Boundary	State Head Quarters
Legislative Assembly Constituency Boundary	Division Head Quarters
Hobli Boundary	Subdivision Head Quarters
Zilla Panchayath Boundary	District Head Quarters
Taluk Panchayath Boundary	Taluk Head Quarters
Gram Panchayath Boundary	Gram Panchayath Head Quarters
Village Boundary	Hobli Head Quarters
Agro-climatic Boundary	Zilla Panchayath Head Quarters
Basin Boundary	Taluk Panchayath Head Quarters
Catchment Boundary	Settlements
Geology Boundary	Forest
Sub-catchment Boundary	
Sub-watershed Boundary	Micro watershed
National Highway	Slope
State Highway	Soil
Major District Road	Watershed
Railway	Banking facilities
Village Roads	Drinking Water facilities
Islands	Educational facilities
Reservoirs	Medical facilities
Rivers	Post, Telegraph and Telephone facilities
Tanks	Communication facilities
Un metalled Roads	Credit Societies
Grid	Recreational and Cultural facilities

Karnataka Geoportal – Data Model

Requirements for Geospatial Governance:

- ✓ Perform multi-spatial-attribute queries i.e., geospatial services (WPS).
- ✓ Mobile compatibility
- ✓ Crowd sourcing - to allow crowd sourced data through various devices.
- ✓ Viewing information over publicly available portals eg., Google, Bing, OSM, Bhuvan, etc.
- ✓ Online editing of data (WFS-T): Authorized departments to be made responsible for online editing of data.
- ✓ Integration of existing MIS data.
- ✓ Provision to view versioned raster data as time-series
- ✓ Multi-lingual
- ✓ Policy and coordination among departments.

Approach to SDI Development in Karnataka (KSSDI)

2nd phase activities

Geospatial services (GIS-DSS) for governance

- ✓ Watershed Development Department (GIS integrated with MIS)

- ✓ Directorate of Health and Family Welfare

Approved OGC Standards (most of them have been incorporated in KSSDI)

Catalogue Services
– CS Core
– CS-W ebRIM
– CS-W 19115/19119
– CS-W ebRIM for EO

Processing Services
– OpenLS Core Services
– Sensor Planning Service (SPS)
– Web Processing Service (WPS)
– Coordinate Transformation
Service (CTS)
– WCS Processing (with WCS)
Data Services
– Simple Features (SQL)
– Web Coverage Service (WCS)
– WCS Transactional
– Sensor Observation Service
  (SOS)
– Table Join Service (TJS)
– Web Feature Service (WFS)

Encodings
– Geography Markup Language (GML)
   CityGML
   GML Simple Features
– Filter Encoding (FE)
– GML in JPEG 2000
– KML
– NetCDF
– Observations & Measurements (O&M)
– Open GeoSMS
– Sensor Model Language (SensorML)
– Symbology Encoding (SE)
– Styled Layer Descriptor (SLD)
– SWE Common
– Web Map Context (WMC)
Portrayal Service
– Web Map Service (WMS)
– Web Map Tiling Service
Others
– GeoXACML
– GeoAPI, OWS Common

Login

Home Page for Registered user

Overlay of publicly available WMS

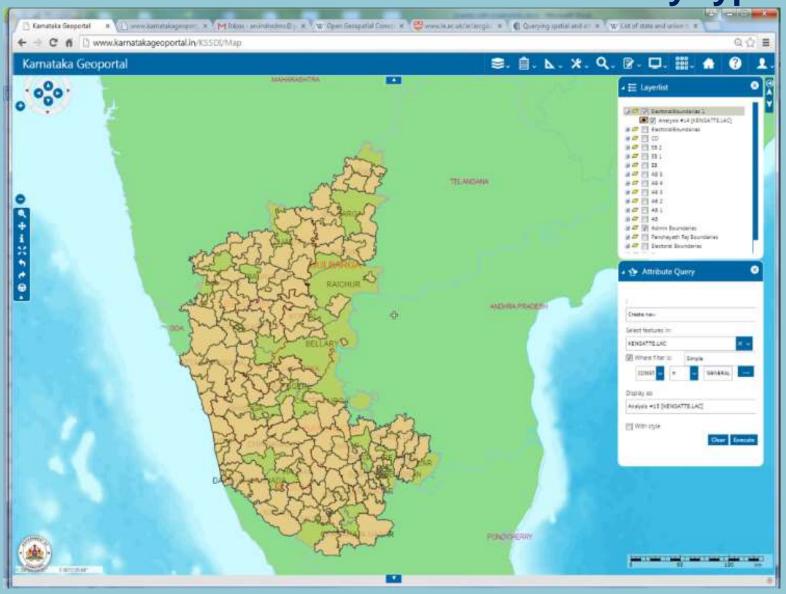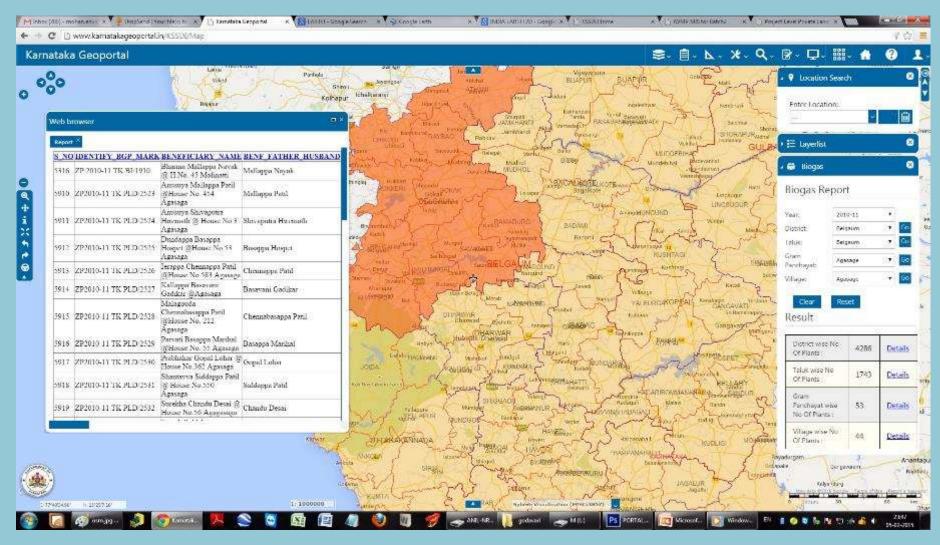# Simple Queries – Using dropdown on administrative/PRI/Electoral
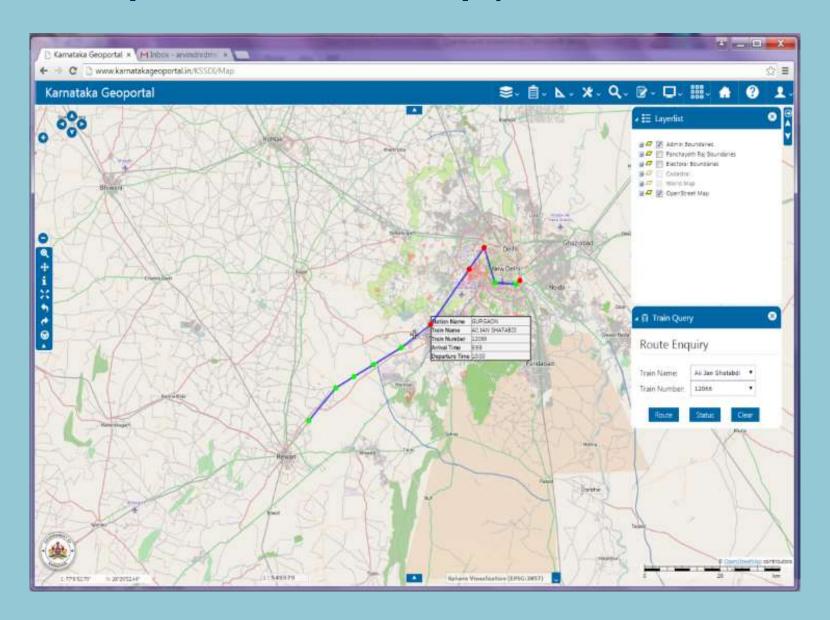
Attribute Query
Electoral boundaries LAC for General Constituency type
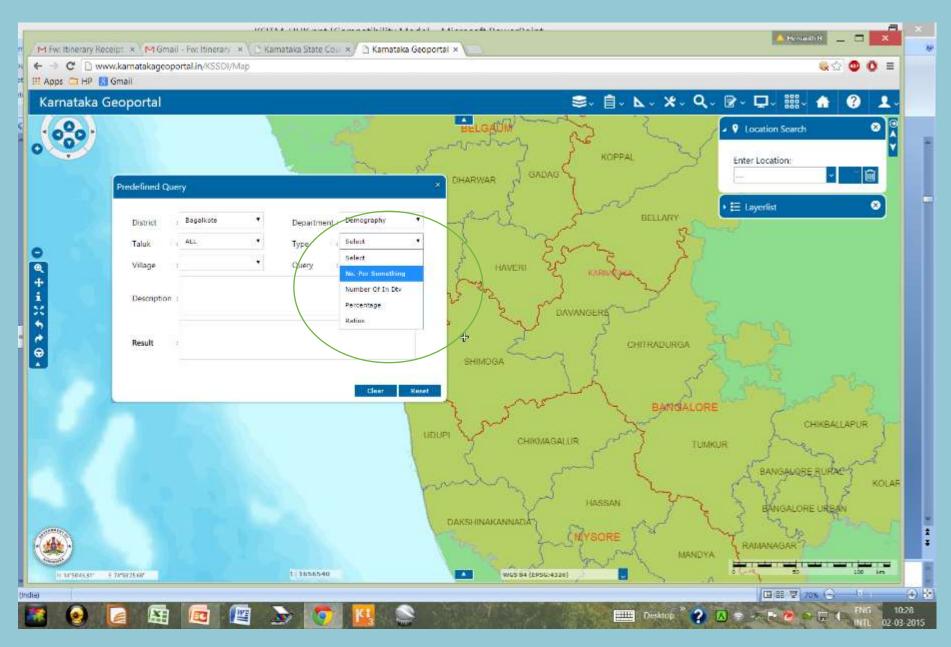
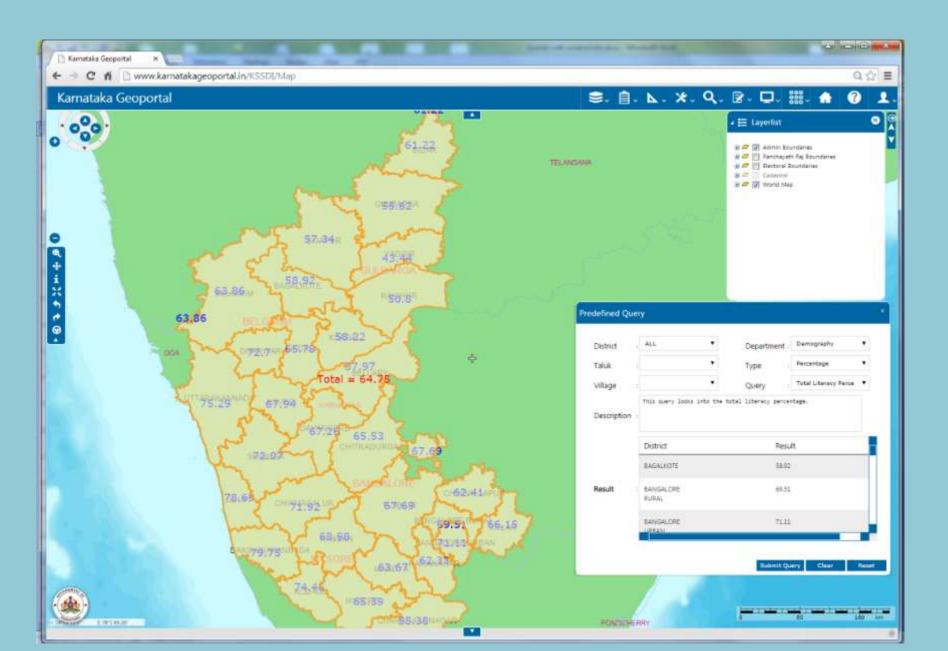# Portal - Biogas installation status

Proof of concept for NSDI –
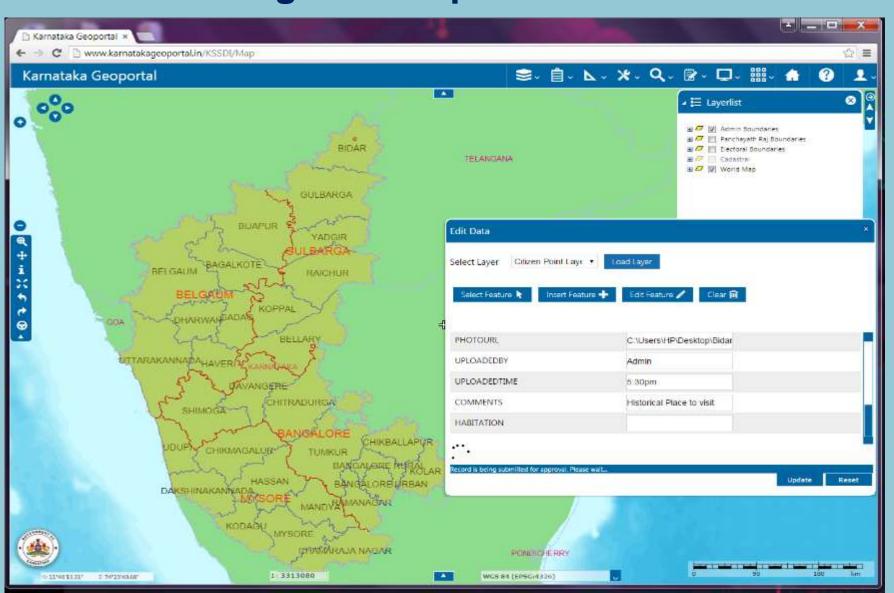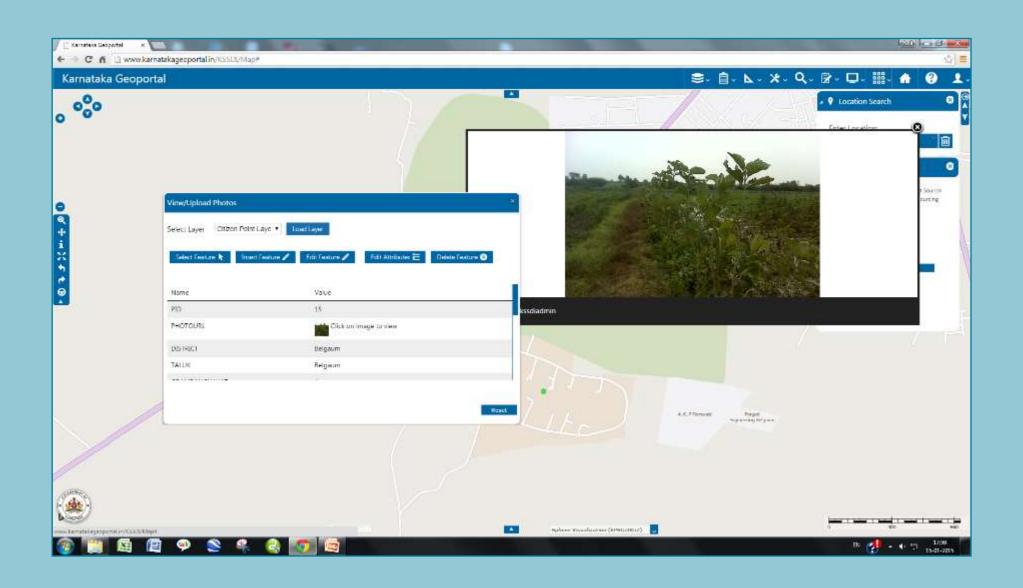# IRCTC (similar to spot the train concept)

Predefined Queries

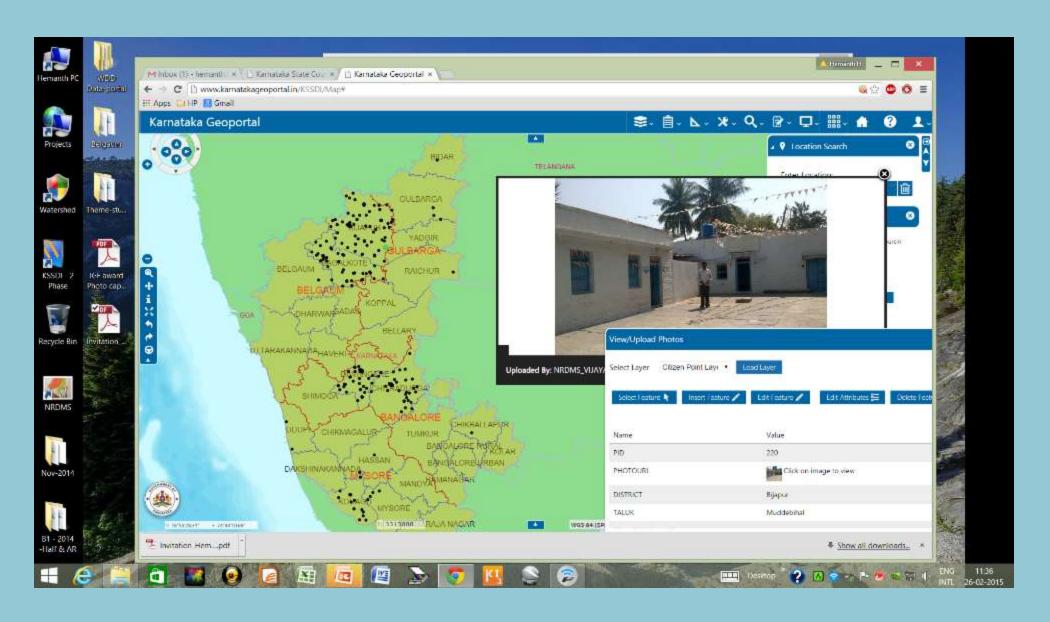# Predefined Queries – Eg., Total literacy

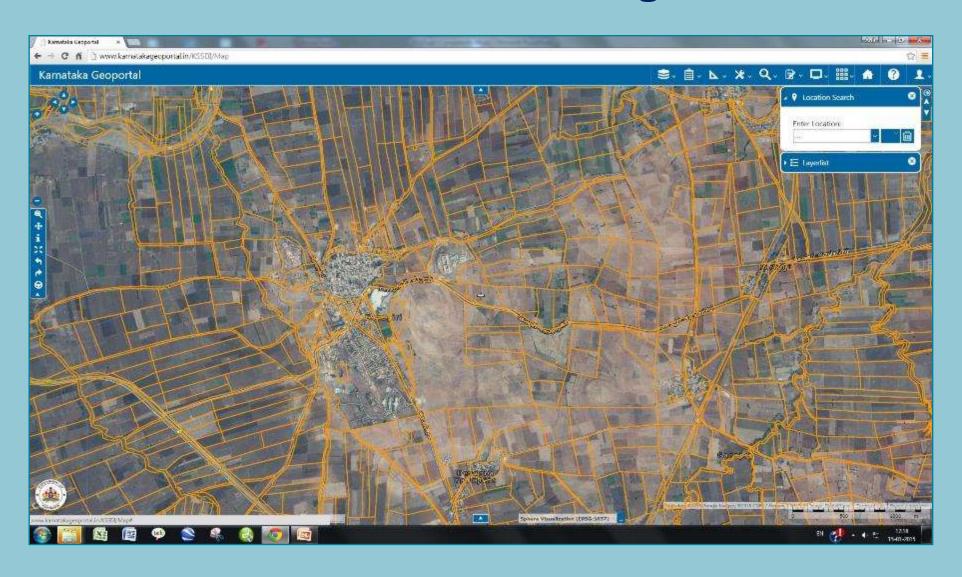# Uploading of geotagged time-stamped photos with attributes – through desktop and mobile devices

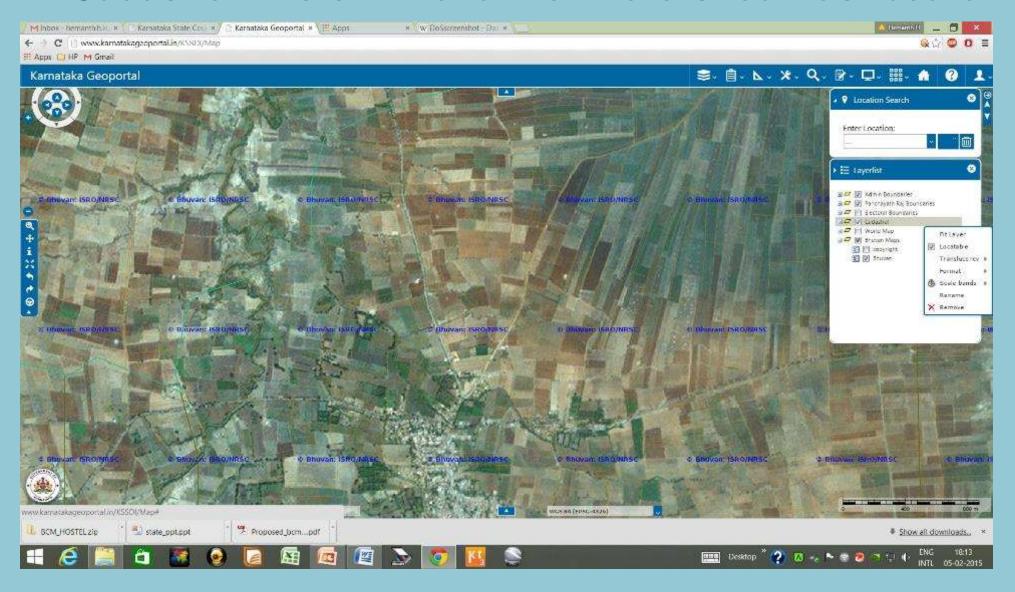# Viewing of uploaded image by registered user

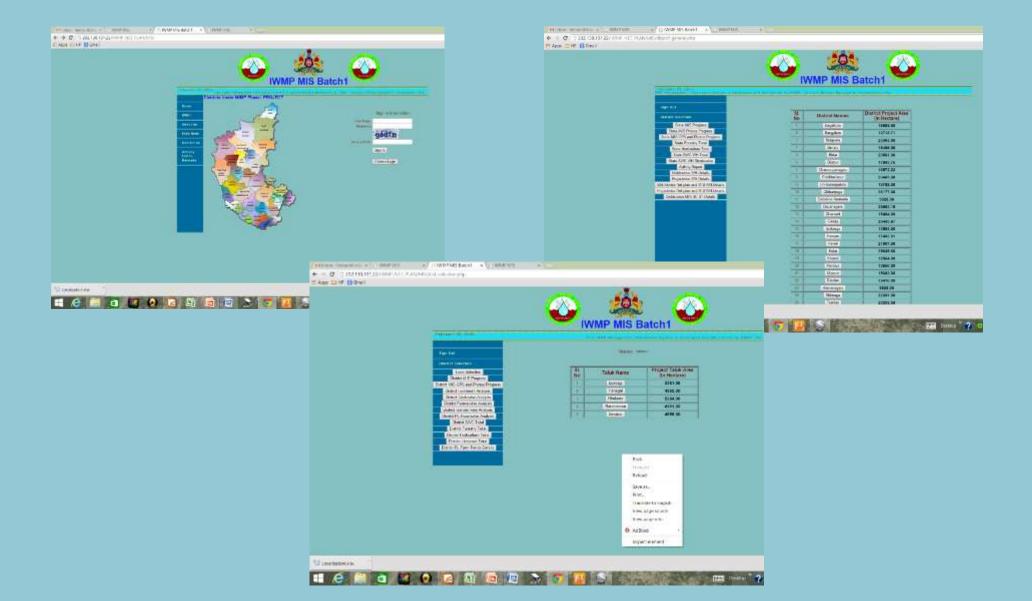# State Government used portal for uploading BCM hostel info
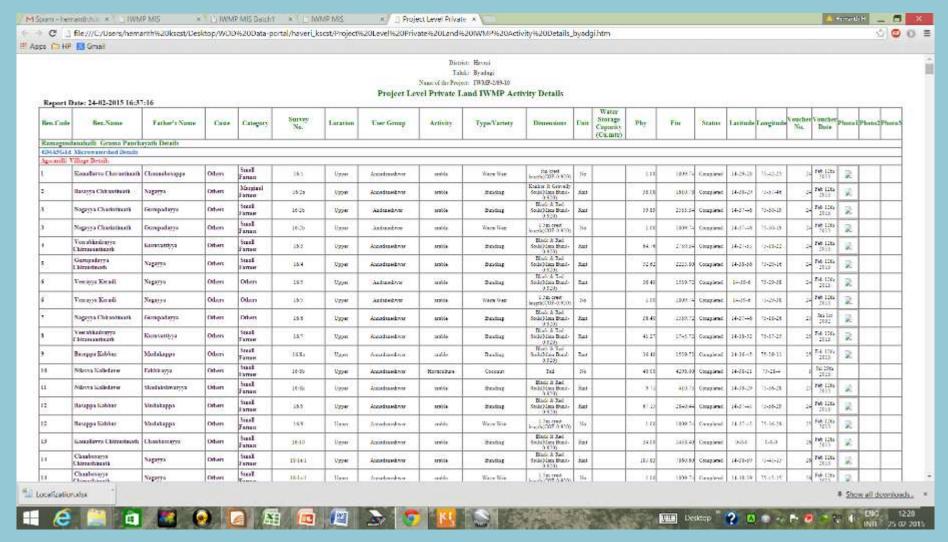
Cadastral info on Bhuvan/Google for Dashboard

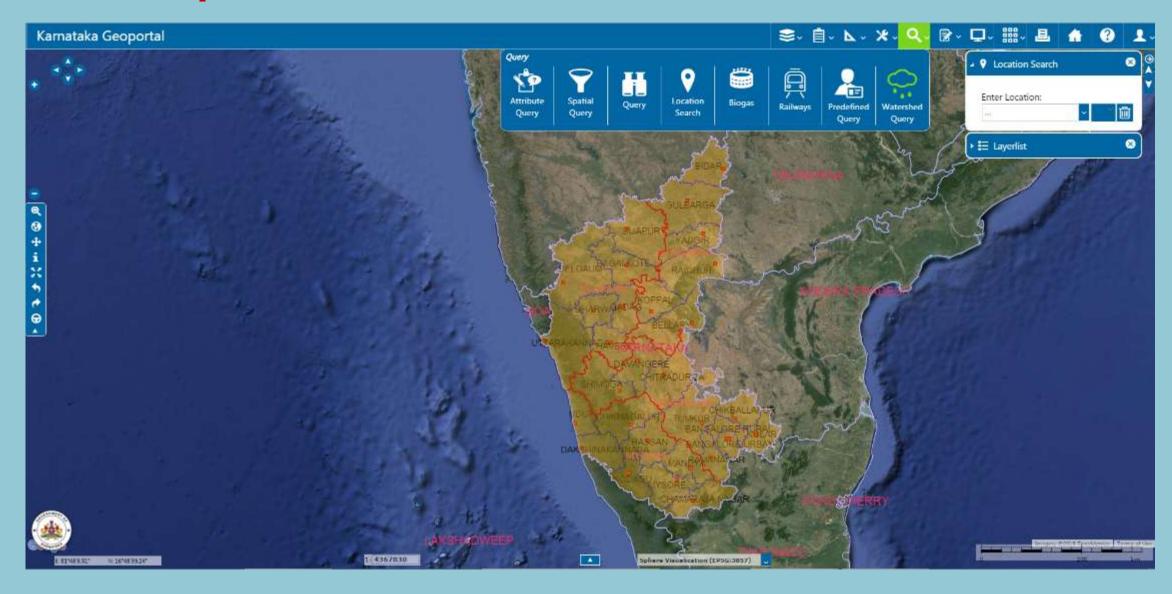# Cadastral info on Bhuvan for Watershed Dashboard
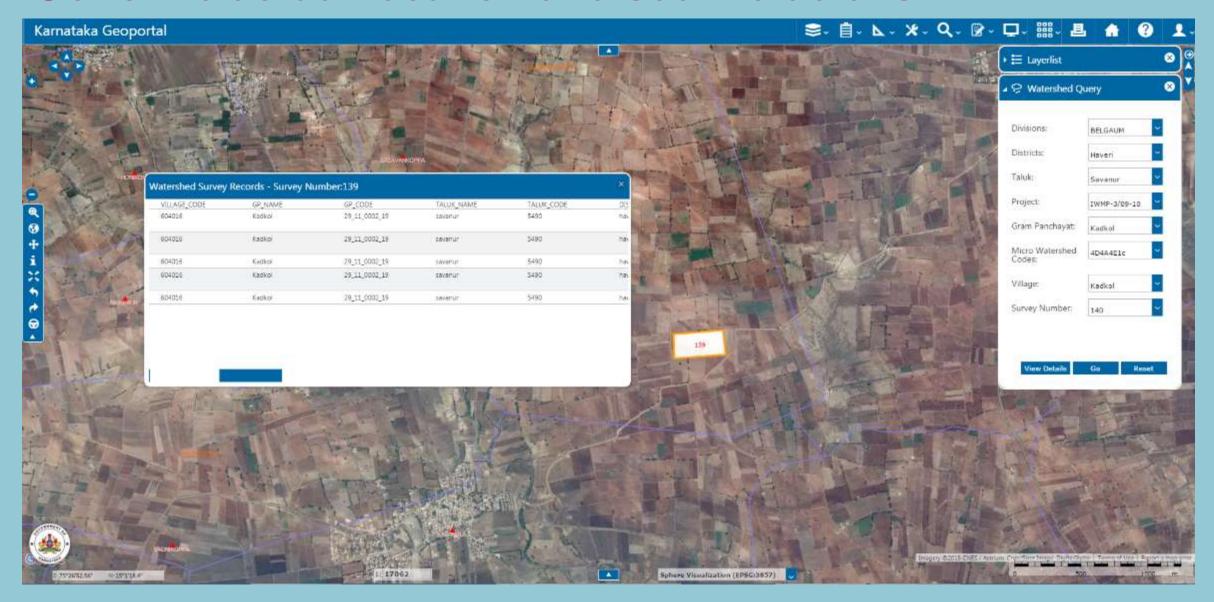
The Old Tabular method

The Old Tabular method

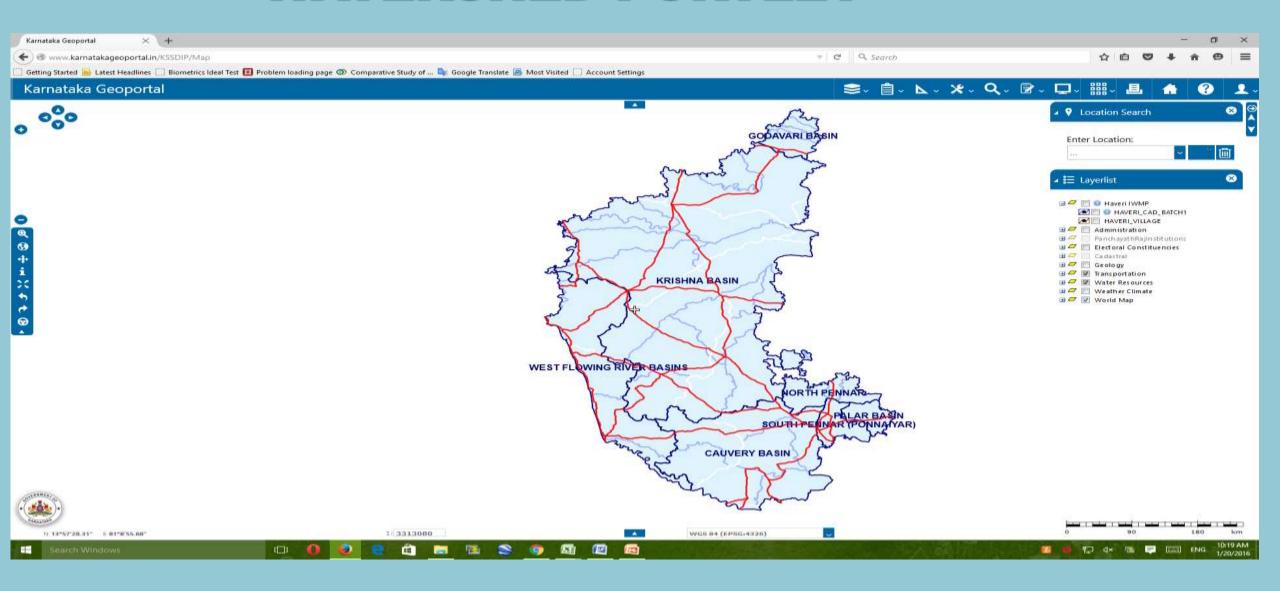**More than 1000 beneficiaries in each watershed projects.**

The new portal based access

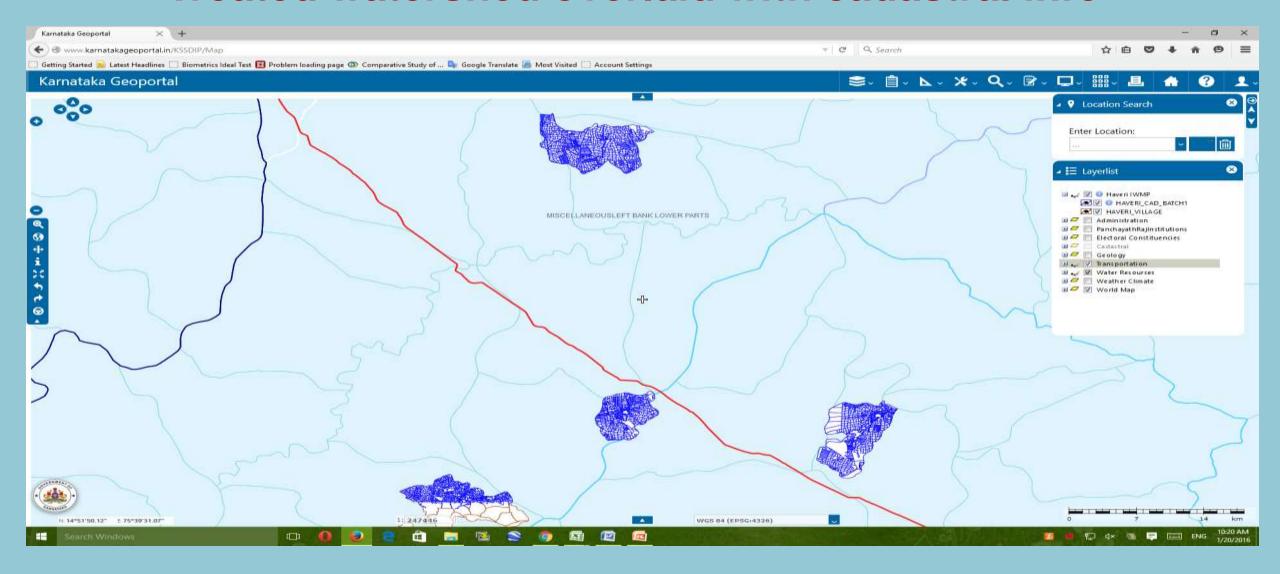# Go to the actual location and see the details.

WATERSHED PORTLET

IWMP PARAMETERS

Sl. No	ID
	ID
1	SURVEY NO.
2	SURVEY 1
3	BEN_CODE
4	BATCH
5	VILLAGE_NAME
6	VILLAGE_CODE
7	GP_NAME
8	GP_CODE
9	TALUK_NAME
10	TALUK_CODE
11	DISTRICT_NAME
12	DISTRICT_CODE
13	DIVISION_NAME
14	DIVISION_CODE
15	PROJECT_CODE
16	SUBWD_CODE
17	MWS_CODE
18	BEN_NAME
19	FATHERS NAME

20	CASTE
21	CATEGORY
22	LOCATION
23	USER GROUP
24	ACTIVITY
25	TYPE/VARIETY
26	DIMENSIONS
27	UNIT
28	WATER_SC_(CUM)
29	AREA_HECTARE
30	PHY
31	FIN
32	STATUS
33	LATITUDE
34	LONGITUDE
35	VOUCHER NO.
36	VOUCHER DATE
37	IMAGE_1
38	IMAGE_2
39	IMAGE_3

Treated watershed overlaid with cadastral info

Karnataka Geoportal Services:

➤Map viewer - Web Map Service (WMS),

➤Product catalogue/metadata - Catalogue Service on Web (CS-W),

➤Services specific service/ feature data sets - Web Feature Service (WFS),

➤Simple Applications (Query based decision support)

➤Coverage services/images - Web Coverage Service (WCS)

➤Web processing Service (WPS)

➤Transactional Web Feature Service (WFS-T)

➤Mobile Mapping

➤Multi-spatial and multi-attribute query and analysis

➤Multi-lingual

➤Help/support

Planned activities

➢ **To develop NRDMS applications using WMS/WFS/WFS-T**

➢ **R&D collaboration with other institutions**

➢ **Crowd sourcing of data through NRDMS/line departments**

➢ **Karnataka Geoportal data asset management plan for select layers.**

➢ **Linkages with KGIS**

➢ **PPP model for development of Apps**

➢ **Formulation of Date Data sharing and Accessibility policy**

Thank You