

Geospatial data modelling for industrial and infrastructure development

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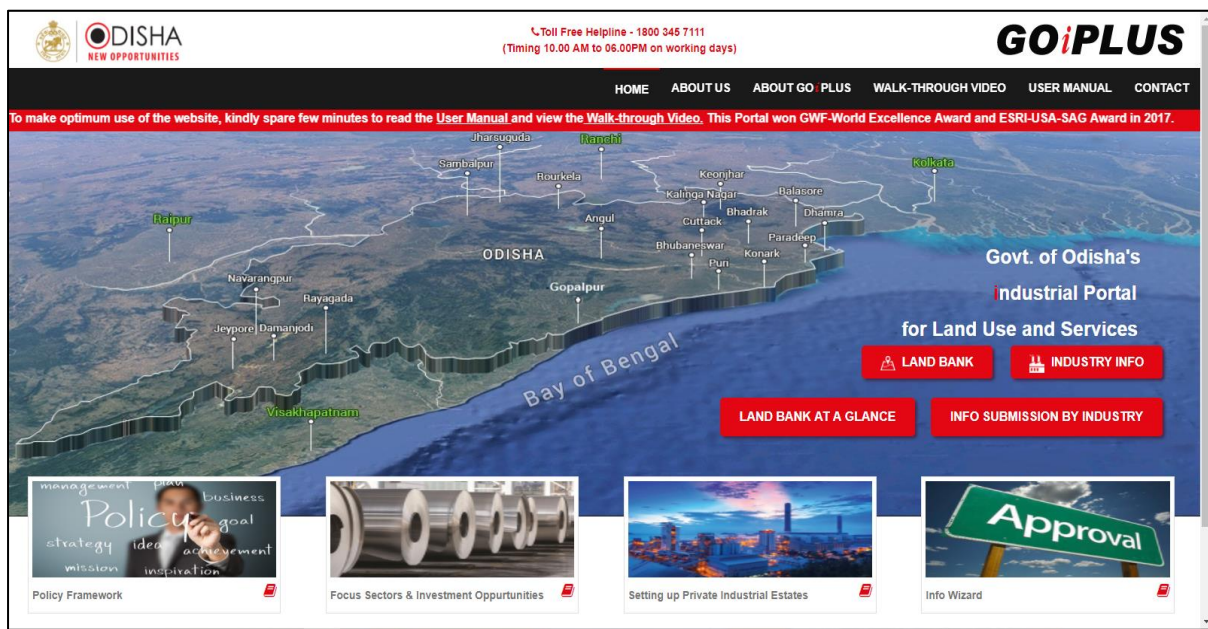
****PCCF, Odisha & CE, ORSAC**

Technological advancement is the key driver for economic growth and sustainable development. Geospatial Technologies are considered as one of the most powerful technologies that can effectively serve overall developmental needs of the modern world. Today such applications and tools are available and are being advanced for improved performance of a country towards all major verticals of economy like agriculture, mining, infrastructure, transportation, logistics, homeland security, disaster management, defence, urban planning etc. As India endeavours to achieve its developmental goals, the multifaceted and specialized capabilities offered by geospatial technologies will play a crucial role for information management in future. Mainstreaming geospatial technologies for effective decision making and better governance is one of the mandates of central and state administration. This paper focuses on role of Geo-spatial technology for industrial and infrastructure development and based on the success of implementation of GOiPLUS project (Government of Odisha's Industrial Portal for Land Use and Services) in Odisha state.

In order to implement the development plans for societal benefits and economic development, several government agencies are trying hard to create a pool of suitable lands for operational use as per the development need. In a bid to attract investment and ensure hassle-free land acquisition for major projects, the Odisha government decided to create land banks for industrial development. Industries Department, Govt. of Odisha assigned the task of Land bank creation using Remote sensing data and geospatial technology applications. Image data, revenue cadastral data and industries department data are integrated to create land banks for 2.4 lakh Acres out of which 95,000 Acres are web-hosted for information of stakeholders. With land acquisition posing a major hurdle in rapid industrialization, technological interventions are made to identify 2.4 lakh acres suitable for industrialisation and to develop a land bank of 100,000 acres as a key initiative for development of industrial infrastructure in Odisha. The solutions provided on the context of above requirement are based on advanced web-geospatial application. In the present paper, efficacy of technologies like geo-informatics, ICT and space imaging are elaborated to highlight the database management concepts for creation of Web-GIS based Odisha Land Bank for industrial development and compensatory afforestation.

The points for emphasis in this paper are a) applications of Geo-ICT, GIS, Space applications and web-technology to provide centralized database service to decision makers, administrators, investors, planners and common public for industrial and infrastructure development; b) efficacy of digital database for investors information along with options of data supply about developed facilities, services, utilities, infrastructure and amenities around

the identified land clusters; c) provision of information along with spatial and attribute data to potential investors for new ventures; d) dissemination of industrial information in public domain in a spatial format for the access and appreciation of common citizen; e) provisions for establishing spatial relationship between industrial clusters and infrastructure and other amenities through an overlay of attributes that measures the suitability of industrial development and creating inventory and prioritise the industrial land utilization to provide strategic direction to industrial and economic development in Odisha state. GOiPLUS (Govt. of Odisha's Industrial portal for Land use and Services) is a GIS based industrial land use and infrastructure information system. GOiPLUS is a web enabled platform to display real time information with regards to land bank, utilities and infrastructure around land banks besides information about existing industries. GIS, Space applications, ICT and DGPS technologies are used to develop the GIS database and Web-Portal. The portal contains 37 layers of information in standardised geo-coded format.



Objectives

- Application of Geo-ICT, GIS, Space applications and web-technology to provide Land Bank related centralized database service to decision makers, administrators, investors, planners and common public.
- Creating digital database of "Land Bank" for investors information along with options of data supply about developed facilities, services, utilities, infrastructure and amenities around the identified land clusters.
- Provide information along with spatial and attribute data to potential investors for new ventures through GOiPLUS.
- To put industrial information (Industry location with info, about estates, sector specific clusters, industrial parks, special economic zones and industrial parks etc.) in public domain in a spatial format for the access and appreciation of common citizen and other stakeholders.

Scope of GOiPLUS Service

- ⇒ GOiPLUS is a web enabled platform to provide investor friendly services. The portal is accessible through gis.investodisha.org
- ⇒ Provides information on Land Bank of Odisha. It maps the existing land parcels and its status along with a query analysis that provide a glimpse of developed infrastructure.
- ⇒ Database of industrial land use and infrastructure along with social infrastructure facilities.
- ⇒ Provides a spatial relationship between industrial clusters and infrastructure and other amenities through an overlay of attributes that measures the suitability of industrial development.
- ⇒ Creating inventory and prioritise industrial land utilization to provide strategic direction to industrial and economic development.

Database used

Component	Attributes	Source data
Land Bank Clusters	1. Geo-coded cadastral level plot boundaries,	1. Cartosat 2.5 and Wordview 0.5m/ Revenue maps
	2. Size of land parcels land bank clusters	2. 1:4000 cadastral maps
	3. Infrastructure/ amenities/ services around Land Bank	3. SIS-DP 1:10,000 maps
Infrastructure	4. Surface water	4. SIS-DP 1:10,000 maps
	5. Power supply- Transmission & distribution	5. SOI topodata 1:50,000
	6. Electric substations	6. SOI topodata/ Google image
Transportation	7. Transport Corridors – National & State Highways/ Other major roads Rail Networks/ Rly stations Port connectivity	7. SIS-DP 1:10,000 maps/ 1:4000 ORSAC urban landuse maps
Social Infrastructure	8. Schools Colleges Hotels Medicals facilities Bank/ATM	8. ODISHA SAMPAD 1:50000 data/ Google image/ Wikimapia/ Bing maps
	9. Technical Institutions Police stations Fire stations	9. ODISHA SAMPAD 1:50,000 data/SOI topodata 1:50,000
Environmental attributes	10. Rivers/ Waterbody	10. SIS-DP 1:10,000 maps
	11. Forests (RF/PF) habitations	11. ODISHA SAMPAD 1:50,000 data/ SOI topodata 1:50,000
Administrative zones	12. Settlement locations/ village/ Gram Panchayat/Tahsil/Block/ District	12. ODISHA SAMPAD 1:50,000 data/ SOI topodata 1:50,000

Software used

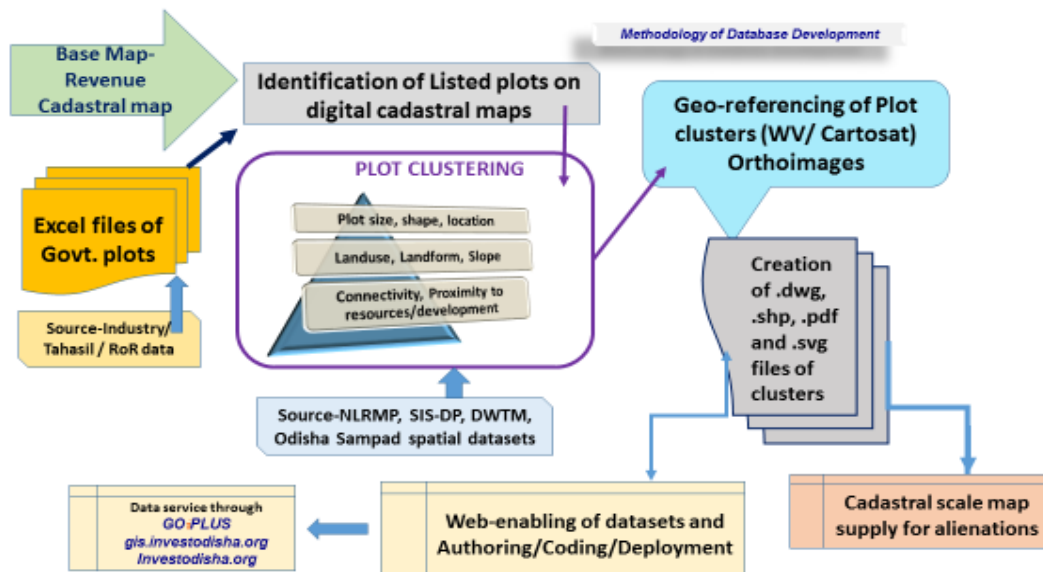
- A.. GIS Softwares
 - ArcGIS Desktop – 10.3
 - ArcGIS Server – 10.3
 - ArcSDE – 10.3
 - ArcGIS Javascript API – Ver3.13
- B. RDBMS
 - Oracle 11g – 11.0.2
- C. Development Technology
 - HTML 5
 - Java Script (DOJO)
 - Asp.net
- D. Development Environment
 - Visual Studio 2012
- E. Web Server
 - IIS(Internet Information Services) Compatible with ArcGIS Server version.
- F. Website URL
 - <http://gis.investodisha.org>

Methodology

Sequence of activities followed to develop the Web-GIS application is as follows.

A) Development of Land Bank maps and data tables

Revenue cadastral maps are used as base maps. Initially the plots are listed considering its government ownership as excel files by Tahasil/Industries Dept. The listed plots are identified on cadastral maps. The shape files of cadastral maps and digitised RoR data are used for identification of plots. Clustering was made considering its shape, size, landuse, location, physiography, morphology, connectivity and contiguous nature. Ortho-rectified Cartosat 2.5m and World-View 0.5 m data are used to geo-reference the plot clusters. Land Bank cluster maps are prepared in revenue scale in digital dwg and shp format.



B) Installation of the software:

Sequence of the software installation is:

- Oracle Database 32/64 bit Software
- Oracle Database client: If 64 bit software is installed, 32 bit client software should be installed and vice-versa.
- Oracle SQL Developer needs to be configured and tested for Oracle database connection
- Visual studio 2012 or later version.
- Compatible Oracle ODAC software to make the ODBC connection from Application to database.
- ArcGIS Desktop: License should be configured properly.
- Compatible version of IIS Manager.
- ArcGIS Server: ArcGIS Server Post installation steps to be done cleanly, to work well with IIS Manager.

C) Development Procedures

I) Map Authoring: Maps used in website are given below:

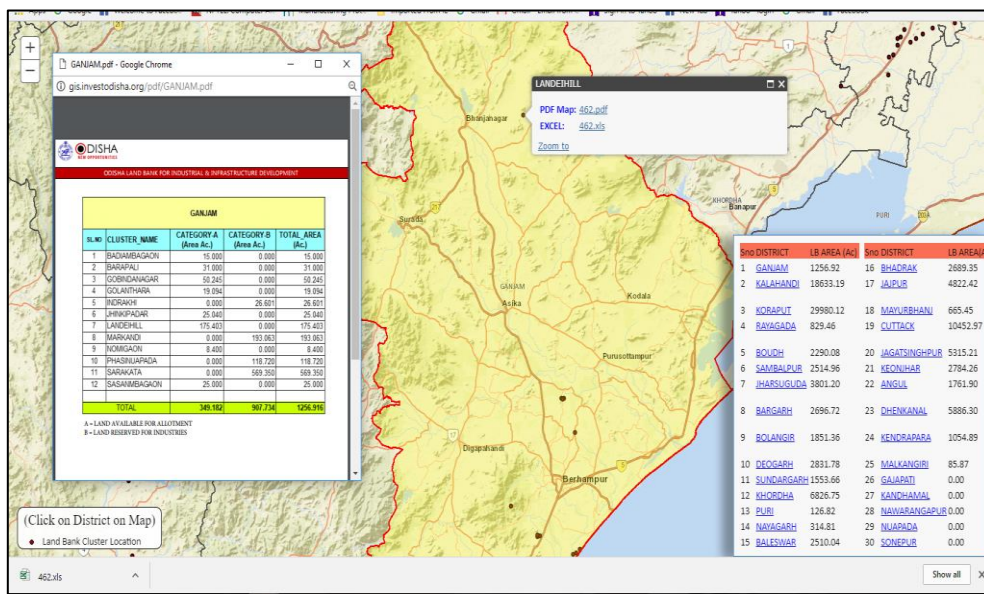
- Industry Locations, Industrial Estates, Land Banks, Plots and Important official setups are included in IndustryInfo Map Document (.mxd).
- Administrative boundaries like State, District, Block, Village, Gram Panchayat and Habitations are represented in Administrative Map document (.mxd)
- National Highway, District Roads, Other Roads, Railway Stations, Railway Lines, Power Sub stations, Power Lines, Canal, Bank and Airport & Ports are in Network Infra map Document.
- Physical/Natural Resources map contain River/Waterbody, Drainage, Forest and Habitation Layers.
- Social Infra Map Document contains Health, Police stations, Fire stations, Technical Institutes, Hotel, Schools, Colleges information as layer.

II) Map Publishing:

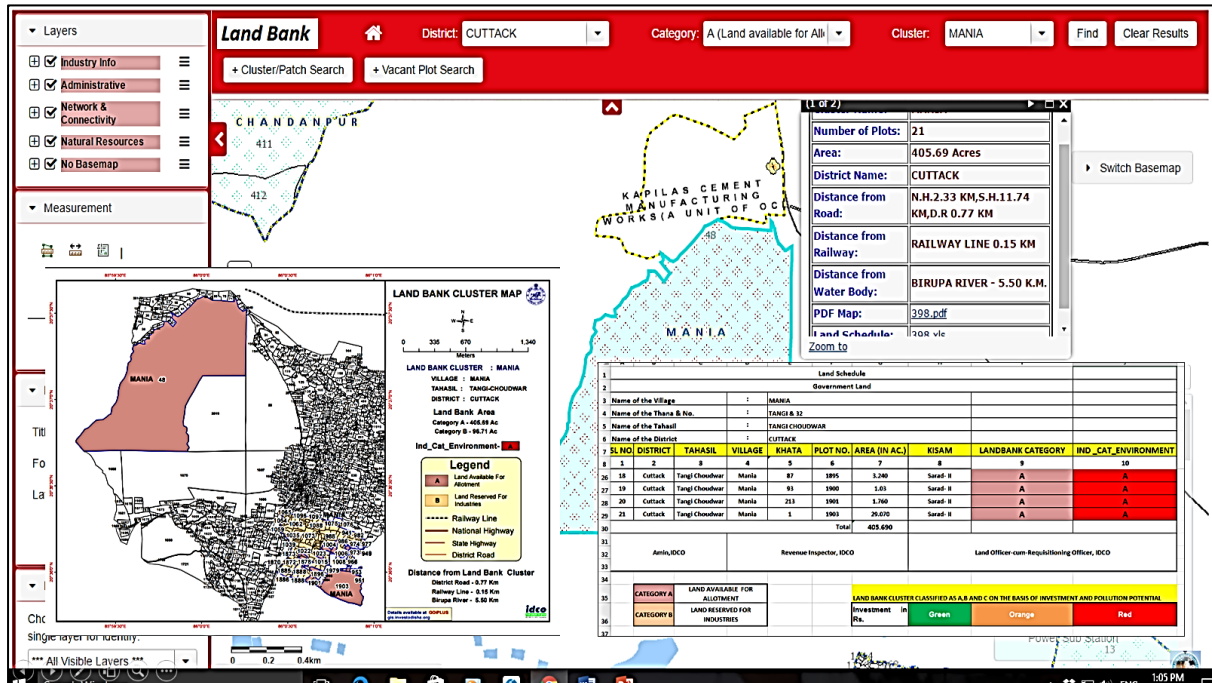
- Maps Prepared in previous steps need to be published to ArcGIS server, So that authored maps can be accessed via URL.
- III) Oracle Database Preparedness:
- Industrial Data in Excel format need to be entered to Oracle Database via Oracle SQL Developer software using Import tool.
- IV) Coding:
- Visual studio is used for development of website to support client/server communication to fetch the Oracle database and showing it to web.
 - HTML 5 is used for the Interface of website.
 - Dojo Libraries are used for GIS Functionality/Tools of the website.
 - This site is developed on widget Programming pattern, which provides Object – oriented programming approach in website development.
 - All the tools are developed separately from its interface design and finally bound together to work as a unit.
 - Website is programmed in such a way that widget codes are hidden from the user.
- V) Deployment:
- Public IP (164.100.141.84) assigned to the Development server is required to access all the published map services on ArcGIS Server. As map services are accessed via URL, so the same public IP is used in URL in the code to make it accessible globally.
 - Gis.investodisha.org is the URL to access the website, so one directory with the same name has been created in Local IIS Manager of the development server.
 - Domain name (gis.investodisha.org) is bound to the Public IP 164.100.141.84, which is given to the development server, so if user hits the gis.investodisha.org, it redirects the request to the public IP i.e. Development server, and to understand the request directory gis.investodisha.org has been created on Development server.

Data service through Website

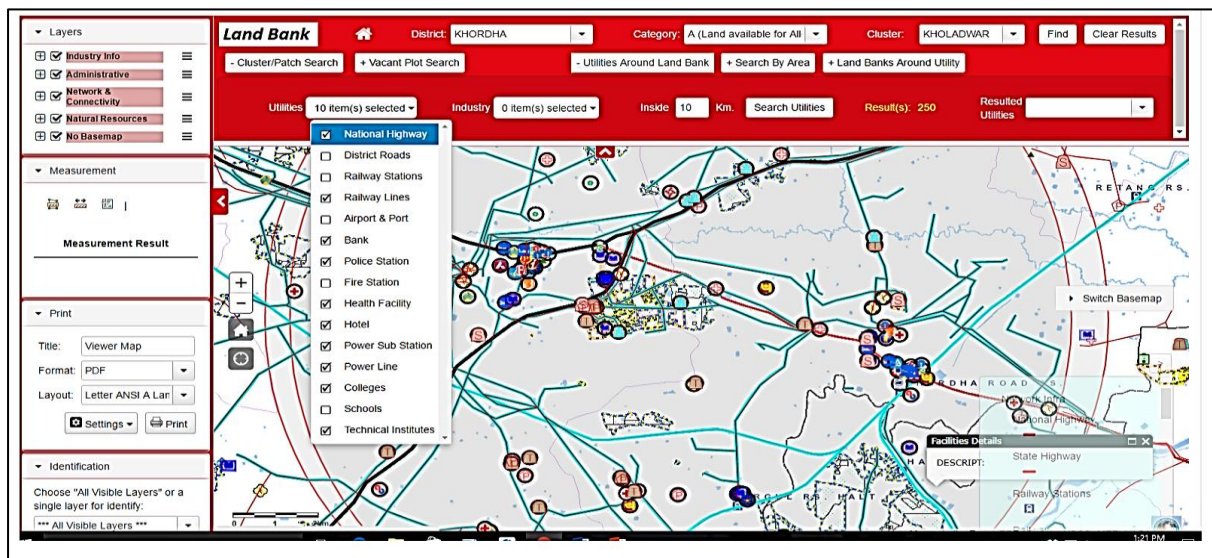
A. Land Bank at a Glance



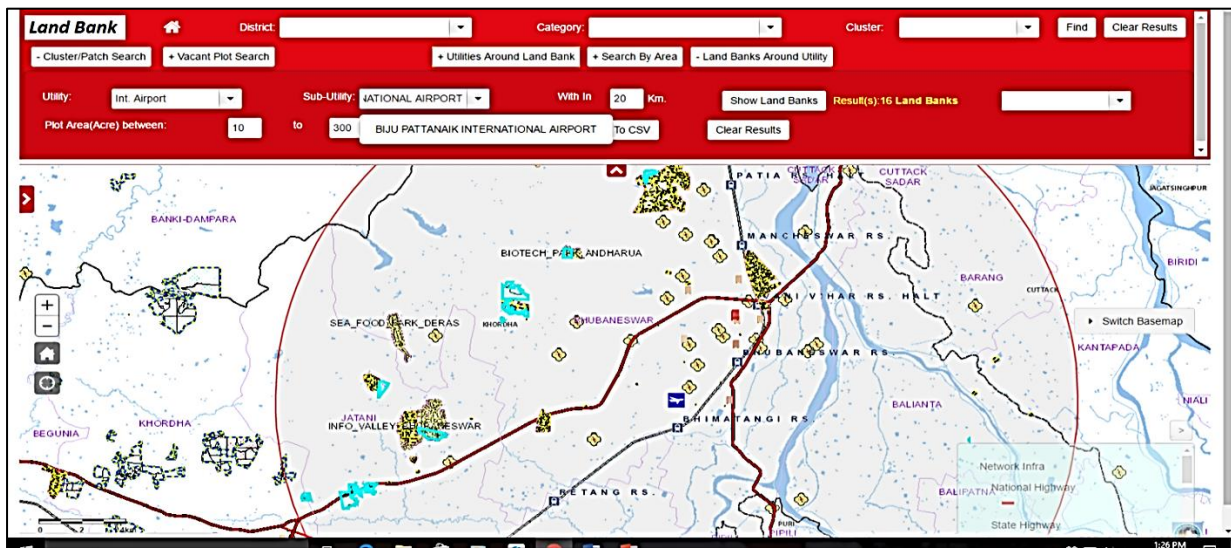
B. Land Bank map/data services



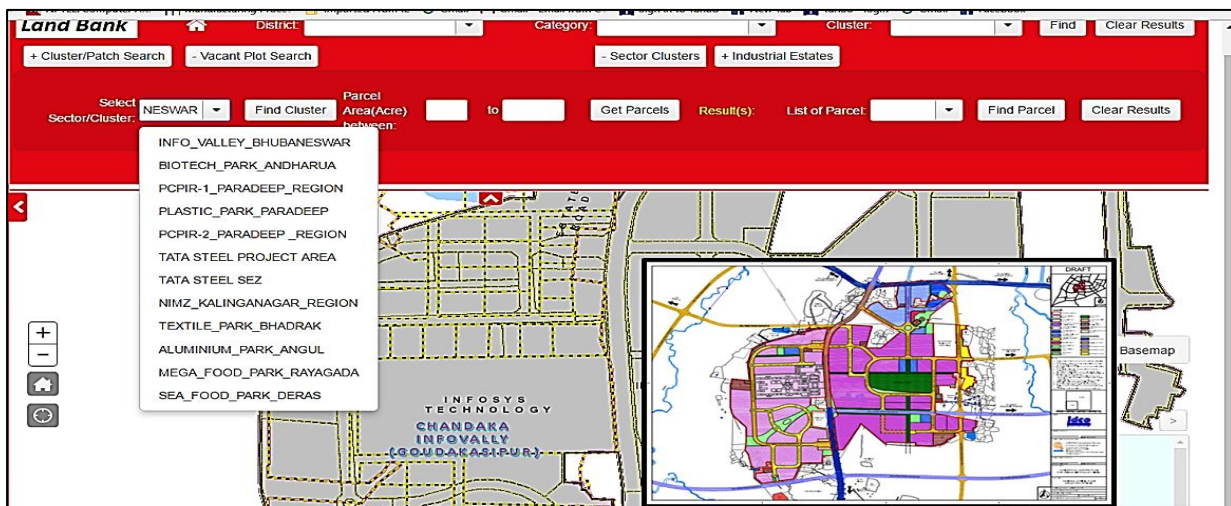
C. Utility search around Land Bank



D. Land Bank search around utilities



E. Land Bank search in Industry cluster/sector zones



Results, Developed database and Services

A. Outputs generated

- Land Bank clusters identified and mapped for 2.4 lakh hectares in 22 districts of the state.
- Land Bank map, data and land schedule for 1.14 lakh Acres are made available in public domain.
- GIS database of 106 industrial Estates, industry location maps and database of 11 sector specific cluster development are made available.
- Information of industries inside and outside industrial estates are provided through the portal.

B. Significant achievements

- To prepare outputs for the project, the cadastral maps of the entire state are digitised, coded, standardise and geo-referenced with ortho-images of the entire Odisha.
- Multisource data are used to generate data on landuse, network infrastructure and social infrastructure of the state.
- Integrating multi-source and multi-scale data in GIS environment starting from 1:50000, 25000, 12500, 4000 and 2000 scale.
- The system provides detailed information pertaining to land with regards to availability of industries, plots under land bank cluster and location specific attributes in terms of connectivity, linkages and availability of other utilities, amenities and services.
- Significantly under this project query based spatial and attribute search and information extraction is provided in web-portal in public domain for benefits of all types of stakeholders.

Conclusion

The portal is an interactive platform and provides detailed information with regards to availability of industrial plots based on location specific attributes in terms of connectivity, rail and road linkages and other physical and social infrastructure available in the vicinity of the selected industrial land. Conversely, the system helps an investor to identify suitable land plots in the vicinity of the utility, sub-utility selected. It enables prospective investors to identify suitable industrial land in Odisha from the comfort of their offices. A prospective investor can define preferred parameters such as the district, size of land required, facilities available in the vicinity, etc. based on which the portal identifies and returns information regarding the suitable land parcels available in the State. It also provides information on zoning of the industrial land in terms of environmental categories i.e. Green, Orange and Red to enable an investor decide on suitable location for the proposed business activities. Using another feature of the portal a prospective investor can get detailed information about the key attributes of existing industries operational in a particular cluster such as sector of operation, products capacity, employment, raw material linkages etc. This information connects buyers and sellers of a particular product and helps establish backward and forward linkages.

The system is of great use to the state officials and is being regularly used by them. The various decision makers that are extensively using the portal are a) IDCO (Odisha Industrial Infrastructure Development Corporation, the nodal agency of providing industrial infrastructure in Odisha); b) IPICOL (Industrial Promotion & Investment Corporation of Odisha Limited, the State Level Nodal Agency and Investment Promotion Agency for the Industries Department, Government of Odisha.); c) Regional / District Industries Centres, the District Level Nodal Agencies for industrial promotion and investment corporation, catering to Micro, Small and Medium Enterprises; d) Prospective Investors. Geospatial technology based decision support systems provides inputs for smart growth strategies and policy framework. Digital web-based datasets provide critical information in the decision making process and planning for future industrial developments in the state.

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31 years' experience, primarily in the areas of space technology & geo-informatics applications in the areas of Natural resources management, Landuse planning, Urban survey, environmental monitoring, Connectivity planning and e-Governance applications.

Key Projects Handled as Project Coordinator

- NRDMS-National Natural Resources Data Management System
- IRS-UP-Indian Remote Sensing Satellite utilization Programme
- IMSD-Integrated Mission for Sustainable Development
- Disaster Management Database
- NUIS-National Urban Information System
- NLRMP- Cadastral Resurvey project
- GOiPLUS-Govt. of Odisha Industrial Portal for Land Use Services
- Land Bank Development
- ODIIIS-Odisha Irrigation Information System

SCHOLASTIC PORTFOLIO: -

PhD (Remote sensing & GIS);

MS; 1991, ITC, Twentee University, The Netherland -DGIS fellowship program

PG Diploma in remote sensing, 1989, Indian Institute of Remote Sensing, Dheradun

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