



# Empowering India through Geospatial Technologies

*Select Stories*



## Rajasthan Urban Information System Enabling e-governance in Rajasthan

### Summary:

Rajasthan was the first state in the country to implement a single GIS based e-governance system for decision makers of eighteen government departments across six cities.

While plenty of such work has been done across the globe for similar requirements, the current project under discussion was unique because of:

1. Scientific collection, organisation, and management of data
2. Data usage across various departments within the government
3. Edit and update of data by 18 departments in a centralised database over the Web
4. Access to the system by a wide range of people, from citizens to almost all the ministries of the government
5. Direct benefit to citizens from the data and access to a grievance management system over the Web for urban assets
6. Enabling workflow to promptly manage grievances by the department officers
7. Routing for citizens, home department and state's main stream business clients – tourists
8. Hierarchical mapping of cities at various scales includes underground mapping
9. System support with limited trained manpower

The case study details the development of this enterprise system and how it is helping citizens and 18 different departments in their daily spatial analysis needs along with providing required information for perspective plans, master development plans, zonal development plans, and town planning schemes.

## Business need

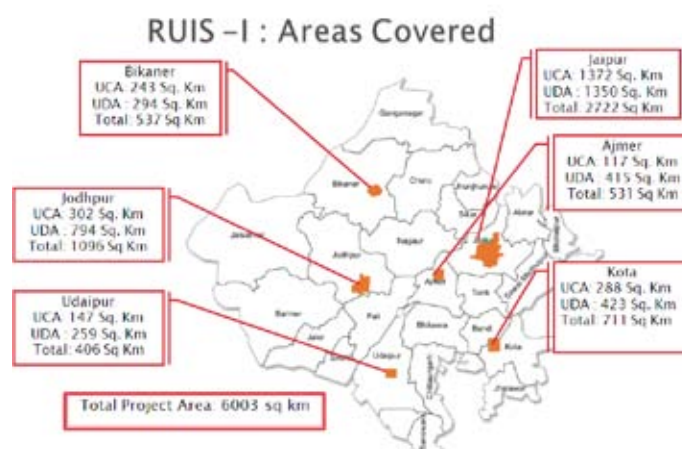
Departments within the Rajasthan government were using traditional paper maps & historical field survey data for their administrative functions such as town planning, traffic management, power, drainage, forestry, mining, & natural resources amongst others. Every department had their own individual databases that resulted in duplication of efforts, considerable waste of time & resources and use of different data for their respective functions. To overcome the above issues and achieve operational excellence, the state government wanted to implement an Urban Information System with a centralised geodatabase for six principal towns in the state - Bikaner, Jaipur, Jodhpur, Udaipur, Kota, & Ajmer (Class I towns with a population base of more than hundred thousand as per the 2001 census) with the following objectives:

- Planning and management by urban local bodies
- Support in preparing detailed Master Development Plans and Zonal Development Plans
- Location of slum areas and their uplifting
- Mapping of land use pattern for potential growth
- Decision support
- Project prioritisation and optimal utilisation of funds for various developmental activities
- Grievance management

The business need for the project was to create a GIS database for the six principal towns of Rajasthan along with a GIS application suite that will enable the success of the information system for its intended use. The project focused on providing mapping & GIS tools for planning, implementation & e-governance solutions for urban development initiatives.

## Geographical area under consideration

Six cities of Rajasthan as shown in the following image (UCA stands for Urban Core Area and UDA stands for Urban Developing Area).



## Solution

RMSI in consultation with the client undertook a detailed User Needs Assessment (UNA) to better understand the client's requirements & come up with the best fit solution. RMSI commissioned a dedicated team that comprised software, GIS, & remote sensing experts. Based on the UNA, RMSI developed an Oracle based system with a customised user interface. RMSI closely worked with the end users at client side for:

- Gathering and consolidating the requirements
- Designing and development of a logical geospatial database to hold all relevant information in a central hub
- Data creation, conversion, and cleaning using survey data and other source data to ensure accurate data is used in the software application
- Creating thematic maps for lithology, physiography, soil, geomorphology and ground water potential
- Creation of a customised user interface with features including user management, grievance management, navigation, routing, spatial data editing and report generation capability
- Implementing advanced functionalities like NUIS based thematic, map book generation, dynamic query and predefined queries developed as part of the application
- Imparting extensive training to the end users (more than 50 users from 18 departments) for using and managing the developed application

Key features of the system include user & grievance management, navigation, routing, spatial data editing, & report generation. Furthermore, the system also supports various master & zonal development initiatives of the state government. The key project activities included:

- **Collection of base data & collateral data:** Ground based area mapping surveys were important sources for spatial data creation. Data was collected through GPS/ DGPS and GCP establishing. Hand operated ground profiling/ penetrating radar was used for survey of sub-surface or underground utilities, viz. sewerage & water networks in the towns. The utilities mapping was undertaken on the scale of 1:1000 (derived from 1:2000 scale map) for urbanized core areas based on line/km survey. In addition to above, collateral data (map/statistical) was generated by conventional field methods including TSS, GPS, DGPS etc. The area (Km) of total survey was 6016 sq. km.
- **Spatial data (on 2 scales - 1:10000 & 1:2000 from satellite & existing aerial data)**
  - City planning zone & jurisdiction boundaries of interest, slopes (city & outside core area)

- Location & attribute information of education & medical facilities with proper categorization, other important settlements/infrastructural nodes of public interest, location of industries & related facilities, location points of major utilities (water, post office, telecom, power, sewerage etc.), location of all heritage/tourist important sites, location of slums, squatters & other blighted areas
- Land value, property maps (foot print only)
- Transportation network (including rail, road & air) nodes, canal
- **Non-spatial data (Collected from secondary sources by limited surveys)**
  - Land use: Location of education & medical facilities, industrial/infrastructural/service, special development/economic zones, inter & intra-settlement linkages, slums & urban poor, heritage, tourist place, traffic generators, reserved zones, arterial road-grid network & hierarchy, conservation & eco-sensitive zones datasets
  - Settlement pattern, housing & property details, property tax details
  - Socio-economic, demographic datasets & characteristics
  - Land resource & utility, water bodies, parks, open spaces - conservation & rejuvenation
  - Air pollution datasets, water level, quality, solid waste management disposal datasets
  - Preservation of erosion & other infrastructure of regional importance
  - Ground water datasets, historical climate datasets
- **Ground based data survey** (Collected from GPR, GPS & other collateral datasets on 1:1000 map derived from 1:2000 map): Undertaking specialized ground surveys to detect & map underground assets - water supply network, sewerage network
- **Database development:** Designing & creating a systematic multi-layered & multi-scale geospatial database to act as a centralized information hub, & store both spatial & non-spatial components. This GIS will also include city-level developmental data & attributes
- **Development of spatial decision support system:** Designing & developing a customized Web based GIS application that will allow easy access to the RUIS on the network, allow extraction of inputs required for master/development planning. The software application is on Oracle Spatial database & built in Java technology;
- **Training** & development of a cadre of GIS-savvy professionals from the departments to administer utilize & manage the RUIS.

#### Software used

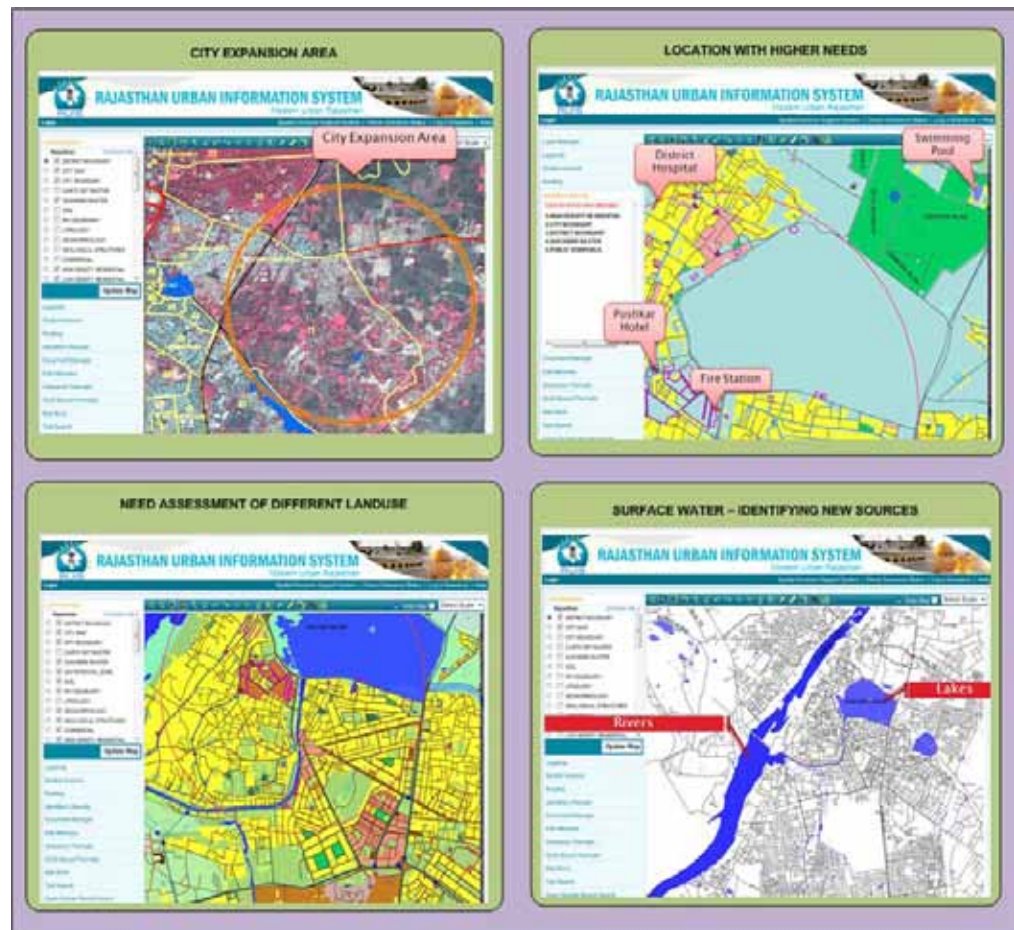
- Database : Oracle 10g release 2 Spatial for LINUX
- Application Server: : Oracle Application Server 10.1.3 for LINUX,
- System Software: : Operating system: Red Hat Enterprise Linux 5.0
- Technologies Used : Java/J2EE, JSP, Javascript

### Benefits

The application is being used for decision support for 18 departments of the Government of Rajasthan. In this document five such cases have been discussed:

- Water Resources Demand Generators
- New water sources for growing demand
- Solid Waste Management
- Emergency Response
- Information to Tourists

**Demand generators:** This application provides functionalities to help departments like PHED and town planning in identifying areas of rapid urbanization (city growth), locations with higher needs, need assessment of different landuse and new sources of surface water.

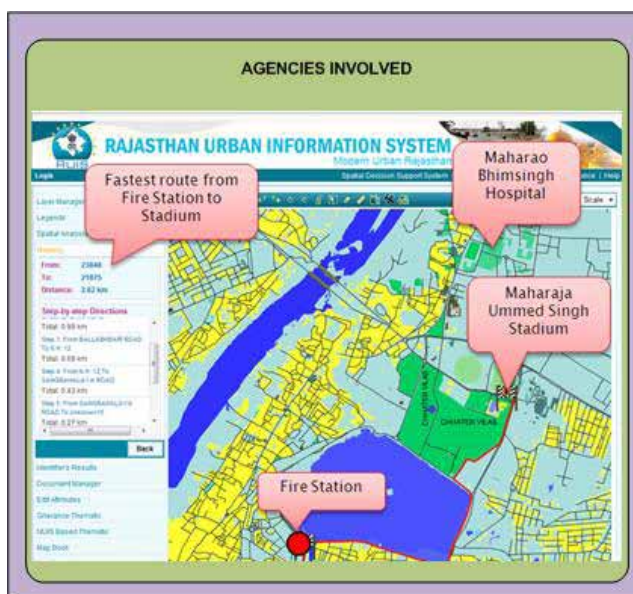


**Identification of groundwater potential zones:** Groundwater potential information can be derived from the application for the above mentioned six cities from geomorphology, lithology, soil and physiography. Ground slope helps optimize height for maintaining

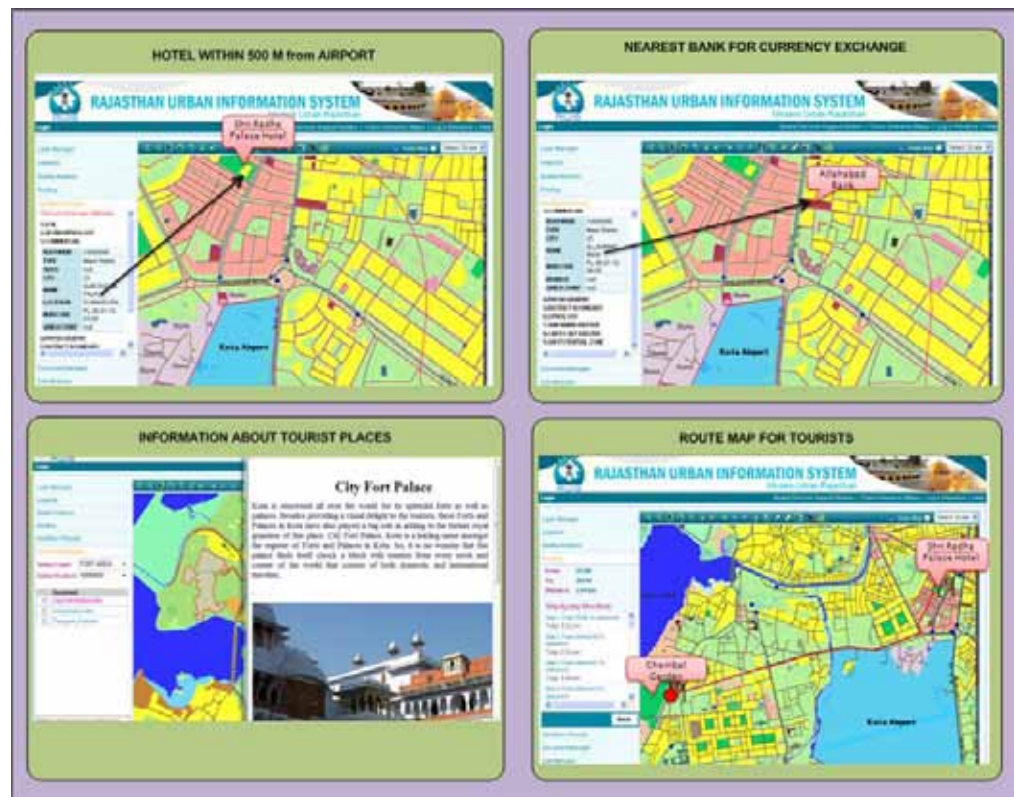
pressure head for the overhead tank, which could be a valuable analysis for PHED (Public Health Engineering Department). Also the related departments can get required information for planning to lay the pipelines for water supply. This information could be 1) what lies below the ground while excavation for the purpose of laying the pipe, 2) site selection for assets such as overhead tank & pipe line etc.

**Solid Waste Management:** Nagar Nigam of respective cities can identify land for solid waste dumping. This identification parameters could be 1) distance from residential areas, 2) road connectivity, 3) proximity to water bodies, 4) type of land (Is it a wasteland?), 5) soil characteristics (to avoid seepage of toxic waste to the ground water). Information related to such parameters is available in the system which will ease the decision making capabilities of the decision makers of the respective departments.

**Emergency Response:** Emergency response efficiency can be enhanced using this application and this service could be of help for all eighteen departments in the city involved in this project. In this document we have taken a simple example of identifying locations for different agencies involved during any emergency such as medical, fire brigade, and police. This consolidated information at one place from all departments and field survey will help respective stakeholder departments in mobilization of resources to minimize the damage during any such accident. This application has a very effective search engine which will provide information such as 1) hospitals with more than 250 beds, 2) fastest route of the incident site from fire station, 3) fastest route from the incident site to nearest water body for fire brigade refill.



**Tourism:** Last scenario discussed in this document is usage of this application for the purpose of tourism. The State of Rajasthan gets maximum revenue from tourism business and hence this RUIS information hub has been made more interactive to help the tourists and new-comers to these cities. Information such as 1) hotels within 500 mtr from the airport, 2) nearest bank for currency exchange, 3) route from one location to other location will make tourists life easy in these cities.



## Conclusion

The above five examples were just to provide a high level information on the project. However in real life the information stored in the system is many folds and has been collected from all possible sources and methods. It's a complete city information system and hundred such scenarios can be created for eighteen stakeholders departments i.e. almost all urban local bodies in the city.

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