

ESTABLISHMENT OF KARNATAKA GEOPORTAL AND ITS ROLE IN PLANNING

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Abstract

Natural Resources Data Management System (NRDMS) a program implemented by Karnataka State Council for Science and Technology with the support of various National/State level organisations has been involved in providing value added services to Panchayath Raj Institutions and Urban Local Bodies for decentralised planning process since 1992. The NRDMS program is continuously engaged in the development of district level GIS databases to support the process of Local Level Planning at the levels of district, taluk and village. The 73rd and 74th Amendments of the Indian Constitution hastened the process of utilization of spatial data for development planning. The district Spatial data centres set up in Karnataka State are tasked with empowering local communities to make informed decisions in local-level planning initiatives using geospatial technologies. The centers provide custom applications, value-added information, training and support to planners and administrators in local government. District centers have also been providing geospatial services to other users. Respective District/State Line Departments have been depending upon the databases for meeting their planning requirements. Karnataka is one such state in India, where spatial data centers have been institutionalized and there is a progressive utilisation of spatial data for planning. The Council, taking note of the increasing dependence on spatial data by user departments, developed a Geoportal and Data Clearing House to discover/ access spatial data sets useful in the local level planning process through Karnataka State Spatial Data Infrastructure (KSSDI) Project.

Introduction:

The Karnataka state has a good amount of map information in digital format at district level generated/created by various national/state government organizations through topographic surveys, geological surveys, soil surveys, cadastral surveys, various natural resources inventory programmes and the use of the remote sensing images. Now, with the availability of precision, high resolution satellite images, data enabling the organization of GIS, combined with the Global Positioning System (GPS), the accuracy and information content of these spatial datasets or maps is extremely high.

Encapsulating these maps and acquired images and provided by various organizations including government, academic and private sectors in Karnataka into a organized repository and provide access to all users for various developmental needs is the need of the hour. There are new innovative ways of technological innovation in allowing us to capture, store, process and display an unprecedented amount of valuable geographical and spatial information about Society and a wide variety of environmental and cultural phenomena. It is the vision of National Spatial Data Infrastructure (NSDI) that current and accurate spatial data must be readily available to contribute to local, state and national development and contribute to economic growth, environmental quality and stability, and social progress.

The emphasis is made on information transparency and sharing, with the recognition that spatial information is a national resource and citizens, society, private enterprise and government have a

right to access it, appropriately. Only through common conventions and technical agreements, standards, metadata definitions, network and access protocols will be easily possible for this vision to come into existence. In realizing the vision of NSDI and requirements of various state government agencies, Karnataka state through Karnataka State Council of Science and Technology (KSCST) has established the state level spatial data infrastructure. The geo-portal is expected to serve as a centralized hub for other spatial data generating agencies in the State.

About Karnataka Geoportal

Karnataka State Spatial Data Infrastructure (KSSDI) called Karnataka Geoportal is a centralized single window access mechanism for all the spatial data acquired by various agencies in Government of Karnataka using State's resources primarily to support planning activities of the Panchayath Raj Institutions (PRIs), district/state line departments, Urban Local Bodies (ULBs) and civil society organizations in the State. KSSDI is an Internet based GIS Directory for the state that eventually will be extended for the use of the society in exploring the information related to state geography, demography, agro and socio economy, and infrastructure facilities.

The KSSDI Data clearing house and geo-portal would act gateway for various data generating agencies to share the information across various government departments, NGOs, academies, industries and scientific organization. Spatial datasets generated, maintained and provided by various concerned Line Departments of the State Government, academia, private or civil society organizations of Karnataka are being made accessible (web map services) through the portal. It will be a Single window system for discovery, view and access state geo-spatial data sets along with attributes. The individual departments and KSCST would be able to add and update the state geo-spatial data sets thereby providing the up-to-date spatial data dictionary and map directory for the state and facilitate decision support system and helps in local level planning. Thus, KSSDI would provide scientific approach to the decision makers, planners and administrators to facilitate common man usage of valuable Geo-spatial data. Also, the proprietary data prepared by department can also be used for the data sale and purchase, which can be part of the state revenue generation. All the data is shared through the Open GIS Consortium (OGC) recommended standards.

The complete KSSDI portal is developed using the Commercial Off-The-Shelf OGC compliant software's with facilities to share the vector and raster datasets through WMS, WFS and WRS web services along with the solutions. There are a large number of users interested in the visualisation and analysis of the data organized and maintained by different sources, without having to install the specific applications or data on their terminals. They want to be able to connect to data services in real time and create different data combinations, and ultimately publish/share the contents and services to third parties and application developers. This goal is possible with the help of Service Oriented Architecture applied to spatial information. Web services consist of XML based transport protocols and open standards designed to exchange data between different applications. Software developed and written in different programming languages for different platforms can all use Web services to exchange data using the Internet and HTTP protocol. This interoperability is made possible by the use of open standards.

One of the key elements of an SOA is the Service Registry: a record and description of all available services. It allows users not only to find and discover which services could be useful in providing solutions to their needs but also to integrate them into their business applications.

The methodology can thus be described as follows:

- « service providers » set up Web Services ;
- they then publish these Web Services in the service registry : « publish »;

- « consumers / users» then discover these services by means of queries... « find » ;
- ... and integrate them into their applications « bind » ;

Service Oriented Architecture, implemented by means of Web Services is particularly useful for setting up spatial data infrastructures for geographic information systems. *The SDI* provide the means for regulators, planning committees, managers, individuals and their organisations to discover, access and use spatial data.

Users of Karnataka Geoportal

In line with the SOA, the users of the KSSDI Geo Portal are classified into three main categories:

- General User:** Any internet user/ General public wanting to access the portal must register (sign up) online to access the map services.
- Data Provider:** User or representatives from the State or District level Line Departments, and District NRDMS centres participating in the data sharing with KSCST or members within KSCST itself. This user group based on the roles and privileges is sub-categorized further into two: Data Provider and Data Manager.

Data Provider: Will be representing their respective line departments and are authorised to make changes to the data pertaining to their department only.

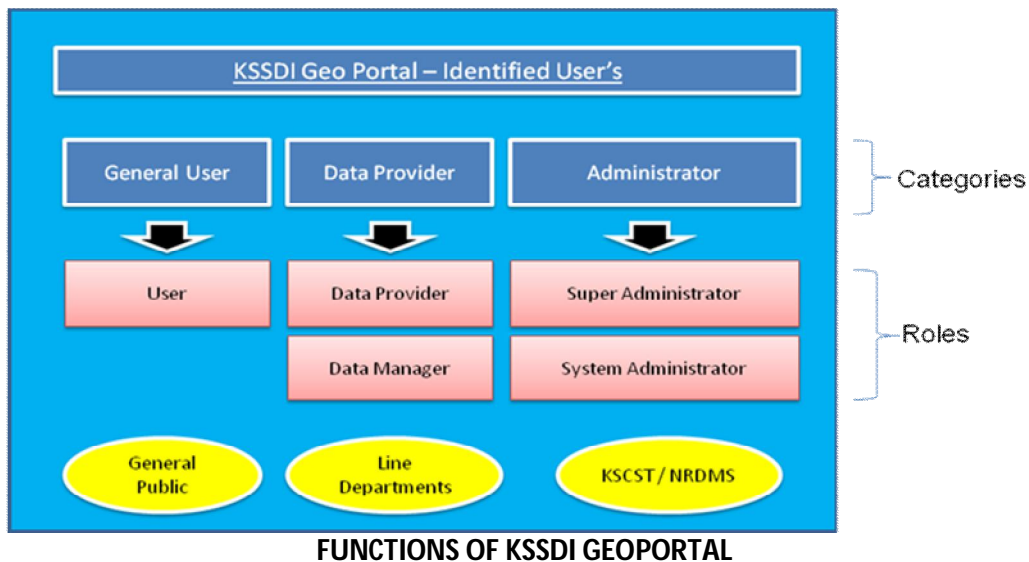
Data Manager: Will be a member of the KSCST staff who is authorised to perform overall data operation across all departments under the guidance of the Administrator of the KSSDI system.

- Administrator:** The administrator is considered as the super user of the system with the sole privileges to administer the complete system. They are further sub categorised as: System Administrator and Super Administrator

System Administrator – who is an authorised KSCST staff to perform administrative operations of the system that includes Managing Users, Roles and Privileges, application resources, system auditing and reports.

Super Administrator: who has the sole authority over the system setup and its resource. He would be responsible for the data uploaded/update, modification of data format, define/modify and managing privileges for all user groups, administrative user profile, login, IP, security etc.

The overview of the user categorization is given below



KSSDI Geo Portal provides an OGC framework for accessing spatial data across organizations or group of users in an efficient and flexible manner. This has the following components

- I. **Map Viewer** is an internet based interactive map viewing applications, which allow a user to view the spatial data. Map Viewer also facilitates map discovery, querying, analysing and update.
- II. **Map Catalogue** is list of map services available as a map directory. It allows the user to browse the directory of spatial datasets that are available as map layers. It facilitates an authorized data provider to publish map data as service that can be accessed remotely.

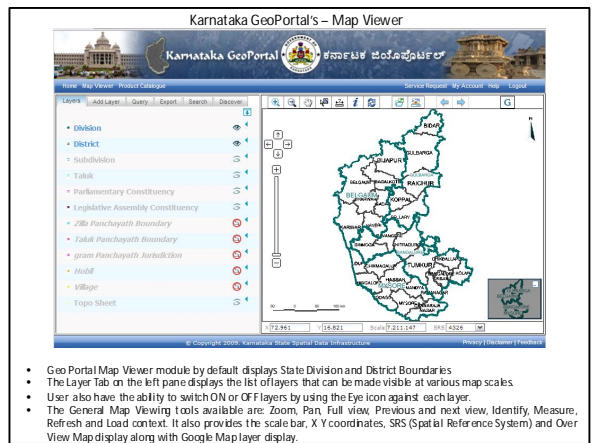
Metadata is information about spatial data. This would enable a user to view the descriptions of the metadata before actually accessing/working with the data. The authorised users would be able to Create, Update, Remove and Export Metadata is provided.

- III. **Product Catalogue:** facilitate spatial datasets as maps to be listed as products and hosted for online sale and purchase with the payment details. Registered users can search for map products, select and download by making online transaction.
- IV. **Service Request:** allows users to post their requests via the portal to publish data as map services or make available as a product. The request can be made to the KSSDI Administrator or to a specific Line Department.
- V. **KSSDI Applications:** KSSDI Applications are prepared based on the currently identified needs of the line departments. The applications are categorized based on the department name or a search keyword.

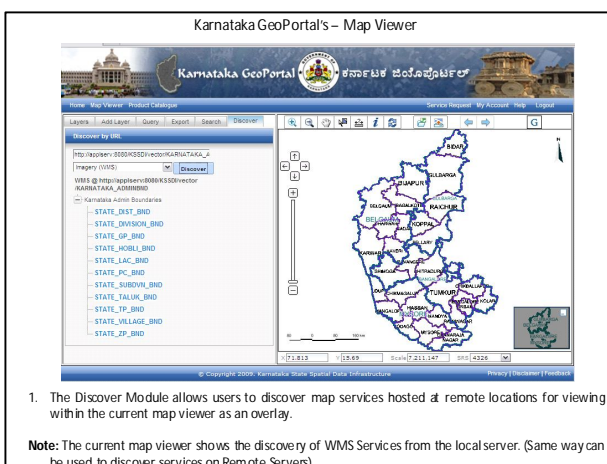
Karnataka Geoportal Services:

The modules in the Karnataka GeoPortal are categorized into

- 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)
- Help/support

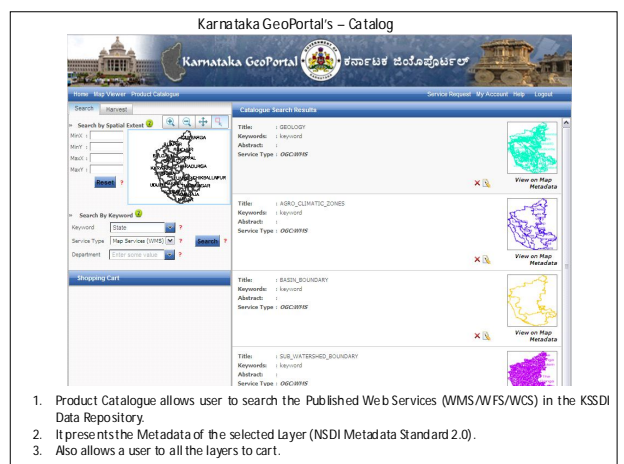


- Geo Portal Map Viewer module by default displays State Division and District Boundaries
- The Layer Tab on the left pane displays the list of layers that can be made visible at various map scales
- User also have the ability to switch ON or OFF layers by using the Eye icon against each layer.
- The General Map Viewing tools available are: Zoom, Pan, Full view, Previous and next view, Identify, Measure, Refresh and Load context. It also provides the scale bar, X Y coordinates, SRS (Spatial Reference System) and Over View Map display along with Google Map layer display.



1. The Discover Module allows users to discover map services hosted at remote locations for viewing within the current map viewer as an overlay.

Note: The current map viewer shows the discovery of WMS Services from the local server. (Same way can be used to discover services on Remote Servers).



1. Product Catalogue allows user to search the Published Web Services (WMS/WFS/WCS) in the KSSDI Data Repository.
2. It presents the Metadata of the selected Layer (NSDI Metadata Standard 2.0).
3. Also allows a user to add all the layers to cart.

Applications development on Karnataka Geoportal

- An application was developed to support the efforts of Ministry of Human Resource Development by setting up a GIS database for managing MHRD schemes in the sector of school/ higher education and demonstrating the usefulness of related technologies at a pilot level. The EMIS has a centralized database of all the educational facilities and its attributes. The web enabled GIS application allows user to display, query and basic analysis apart from the navigation tools like Zoom, Pan, etc. This pilot project has information on 50 schools located in Tumkur taluk of Karnataka State.
- The Council developed web based Biogas plant information system for monitoring the implementation of biogas program in the state under the centrally funded Ministry of New and renewable energy (MNRE) scheme. The portlet has detailed list of beneficiaries under this scheme village wise for the state of Karnataka for the past three years. It has an online updating facility. The information is available both in spatial and attribute format.

Conclusion

The success of Geoportal is measured with respect to the services it offers to its users, and its quality and quantity of information of geographic information it provides to users to access. The users of GIS in Karnataka, in the past the users have been depending on NRDMS program to support them in

planning their activities i.e., value based services. In this context, it is proposed to build a web based decision support Systems in the areas of development for the State using multi domain knowledge and multi faceted approach for demonstrating the utility of geospatial technologies in the State of Karnataka. The portal is now being planned at providing web based geospatial applications and services to user departments to monitor and evaluate state and centrally funded programs/schemes. The web based geospatial applications for selected departments shall include better keyword search options, multi-lingual search facility and crowd sourcing of points of interest through mobile devices. It is also being planned to develop Karnataka Geoportal on open source to reduce the operating and maintenance costs.