

Business Specific Requirements	
Theme	Existing IT system for internal agencies of MoJS
Application	WIMS expansion-WRIS
Use Case	Water Resources Projects
Use Case ID	WRIS-SSA-05
Other linked Use Case	Surface water Resources (RM-UC-01 to RM-UC-13) & (RBM-UC-01 to 15), Ground Water Resources (GWM-UC-01 to 23), Water Utilization (IM-UC-01 to 11) & (CWM-UC-01 to 27), Water Quality (SWQ-UC-01 to 7) & (GWQ-UC-01 to 7), Water Harvesting (WT-UC-02 to 8), (WB-UC-01 to 10) & (WFP-UC-01 to 7), Event Analysis (GA-UC-01 to 9) & (DA-UC-01 to 9), Project Appraisal & Monitoring (PA-UC-01 to 8), Master Information System (WRIS-MIS-01 to 19).
Description	<p>India's geographical area is 329 Million hectare, total cultivable land is 181.95 million hectare. The gross sown area is 194.40 million hectare and net sown area is 139.93 million hectare. The ultimate irrigation potential of the country is 139.89 million hectare out of which from Major & Medium irrigation projects is 58.45 million hectare and rest is from minor irrigation projects. Upto the end of XI plan 113.93 million hectare potential is created and out of this the share from Major and Medium irrigation project is 47.97 million hectare. As per national Register of Large dam, the country has 5190 dams out of which 4877 are completed and 313 are under construction. The total storage capacity created so far is 253.388 Billion cubic meter (BCM) and 50.959 BCM is under creation. The hydro-electric potential of the country is 148701 MW out of which 145320 MW is from 25 MW capacity. The capacity developed so far is 38257 MW.</p> <p>Water resources projects are broadly categorized into irrigation projects and hydroelectric projects. These projects are planned for various purposes like irrigation, hydro-power generation, water supply for drinking and industrial purpose, flood control navigation etc. Projects which serve more than one purpose are called as multipurpose projects. Generally majority of multipurpose projects are combination of irrigation and hydro-power. There are many irrigation, hydro-power and multipurpose projects which were approved initially as independent projects. Subsequently due to interstate agreements and new projects coming up on downstream and upstream, water planning was done in such a way that operation of these projects are now done in an integrated manner. Such types of projects are now being called as irrigation, hydro power, multipurpose and complex.</p>
Used by	Researcher, Decision makers, administrators, academicians and public.
Priority	High Priority
Phase	Phase I of WARIMS under WIMS expansion-WRIS
Business Problem	<p>Issue:</p> <p>Survey sheets done by various authorised state and central water resources division are provided in the hard copy formats & that requires digitization and further GIS operations for data extraction & final hosting in the module. Manual error while generation of the GIS data in different stages of data creation may increase in different steps.</p> <p>Database containing all the water resources projects/structures are generated, compiled and disseminated under the Water Resources Projects module. The existing system of generation and dissemination of data in respect of major and medium irrigation projects does not provide real time monitoring of inflows of water and its utilisation through canals and the distributory system.</p> <p>Due to improper management of soil and water resources in the command area, the problems of salinity and water logging are reported to be increased.</p> <p>Approach:</p> <p>Currently hardcopy information related to WRP is available for digitization of data, but digital GIS based data is available with mapping and project development agencies. This digital data is highly required to enrich WRP database and its applications.</p> <p>Monitoring the crop acreage and irrigation water requirements vis-a-vis irrigation water supplies is important to obtain a realistic view of the "irrigation potential" and "potential utilised". Satellite data provides information on crop area and thereby net irrigation water requirements of crops.</p> <p>After generation of soil salinity & water logging data which will be incorporated into the WRP module will be helpful for planner and policy makers to address the issue.</p>
Output	This module provides spatial inventory of the water resources projects like irrigation projects & hydroelectric projects as well as structures like (Dam, Barrage, weir, anicut, lift, canal, powerhouse) with their associated non spatial attributes/information in detail throughout the country.
Outcome	Water resources projects module contains a comprehensive database of India's water resources and related structures. Country level digital database of various water resources themes in the form of maps and reports.
Visualization	A) Map at India Level - Map showing the hydrological boundaries and the major medium irrigation commands along with their associated features across the country.

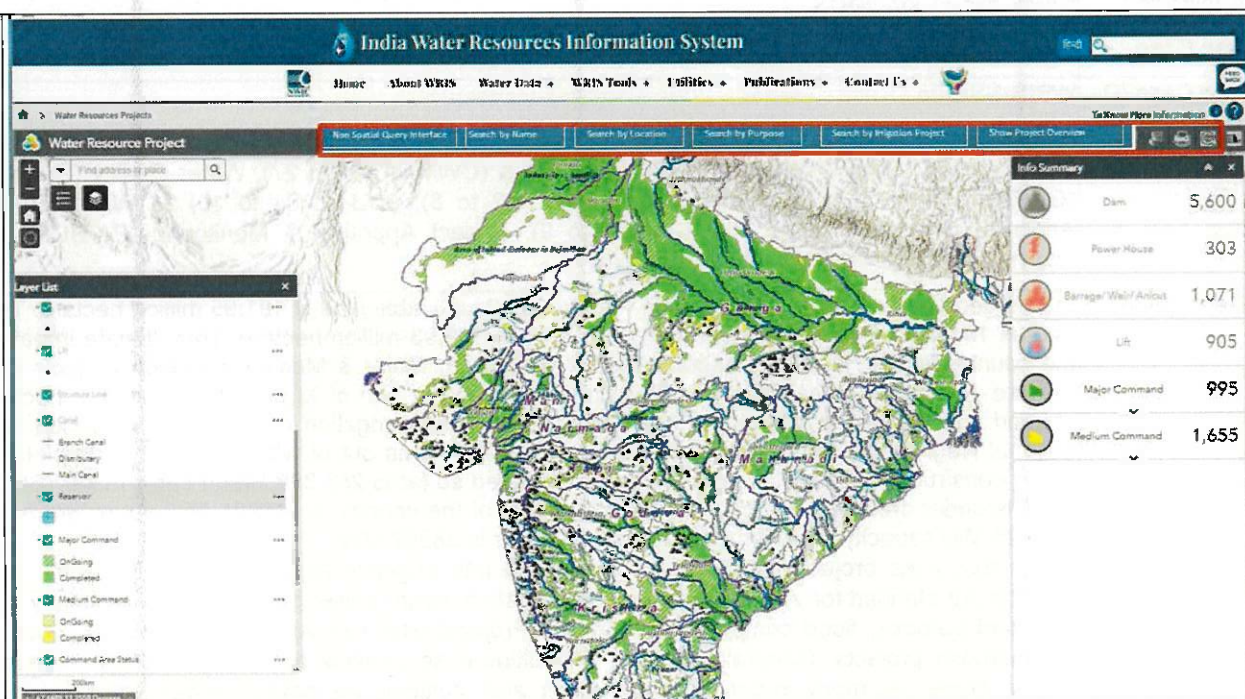


Fig 1: Water resources projects at PAN India Level

B) Visualization :

1) **Spatial Data Query:** Using the "Spatial data query" tool, the user can set his own set of query and get information about the particular project/structure in the map spatially.

i) **Get feature info tool:** User can get information about any particular data/structure by simply clicking individual features as shown in Fig.

ii) **Info Summary tool:** User can view and get overall information of a large database related to Dam, Barrage / Weir / Anicut, Lift stations, Reservoir, Major & Medium Irrigation Projects, Extension Renovation and Modernization (ERM) projects, Hydro-Electric projects in the "Info Summary" tool in the data panel. This summary will be available for country level, administrative (state/district) & Hydrological (basin/sub basin) level as per the user query.

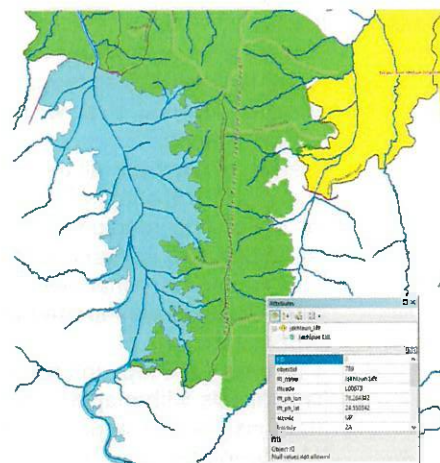


Fig: Get info tool



Fig: Info Summary tool

iii) Option for "Pin Mark" & "drawing tool" will be available to define the user specific area (point, line & Polygon).

iv) There will be a strong feature search option for all the layers of this module.

- search by name,
- Search by Location
- Search by Purpose
- Search by Irrigation Project

Fig: Search bar as shown at the Top of the module

Non spatial Query Interface	Search by Name	Search by Location	Search by Purpose	Search by Irrigation Project	Show Project Overview
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v) As a user search any structure (i.e, Dam, BWA, Lift, power house) the associated structure/ project list will be appear which will be interlinked with the map features & will provide in-depth detail of associated entities as shown below Fig..

Associated Features/ projects of Raighat Dam

Dam_Reservoir

: 1. *Rani Laxmi Bai Sagar*

Dam_Powerhouse

: 1. *Rajghat Power House*

Dam_Irrigation Project

1. *Rajghat Unit-I Dam Major Irrigation Project_ Madhya Pradesh*
2. *Rajghat Canal Major Irrigation Project*
3. *Rajghat Canal Unit-II Major Irrigation Project*
4. *Rajghat Unit-I Dam Major Irrigation Project_Uttar Pradesh*
5. *Bhander Canal Major Irrigation Project_Madhya Pradesh*

While clicking each feature, it will provide all the information about the feature already filled in the database as non spatial attribute.

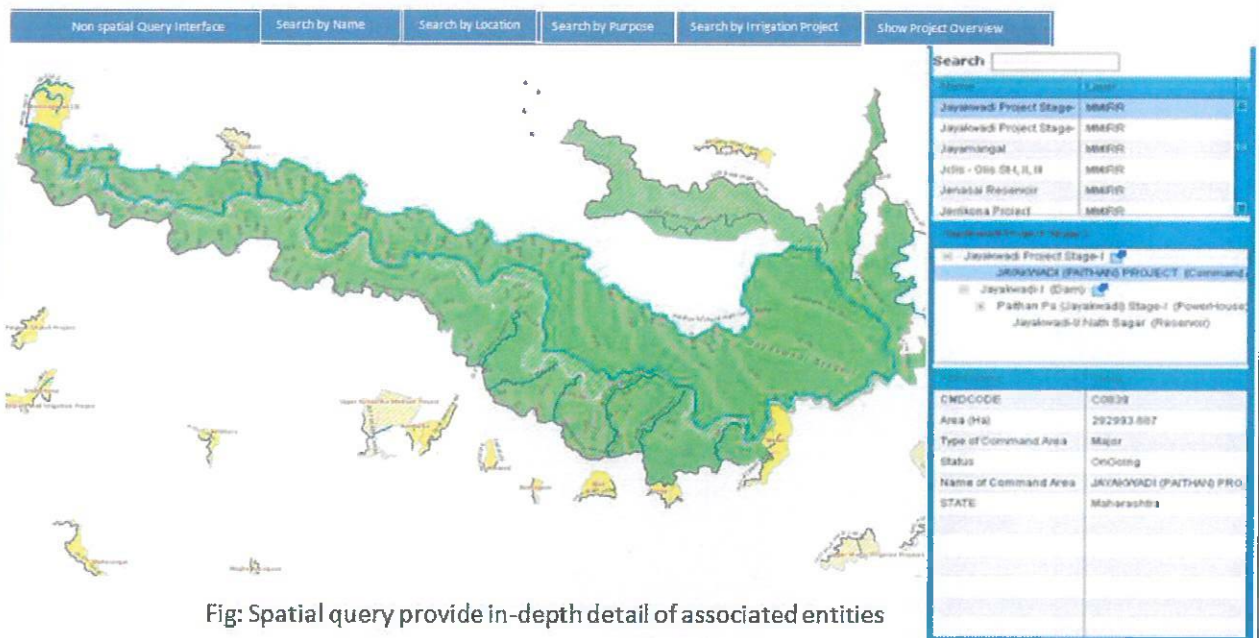


Fig: Spatial query provide in-depth detail of associated entities

vi) Options for uploading (kml or shp file) or enter the latitude and longitude of an user define location/area will be there.

vii) Search by proximity option or search based on the distance/buffer (i.e 1km, 5km, 10 km buffer) of a particular point, all the water resources structures as well major medium irrigation project/hydro electric

projects list will appear (as shown below).

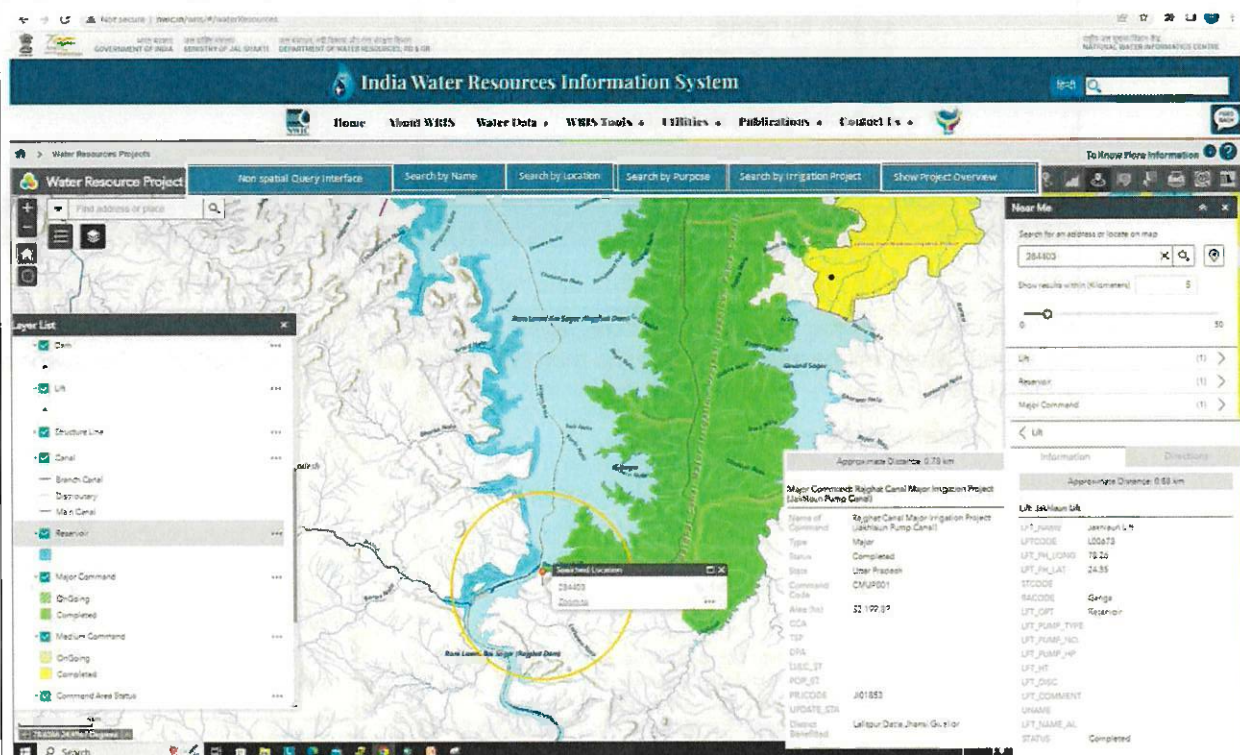
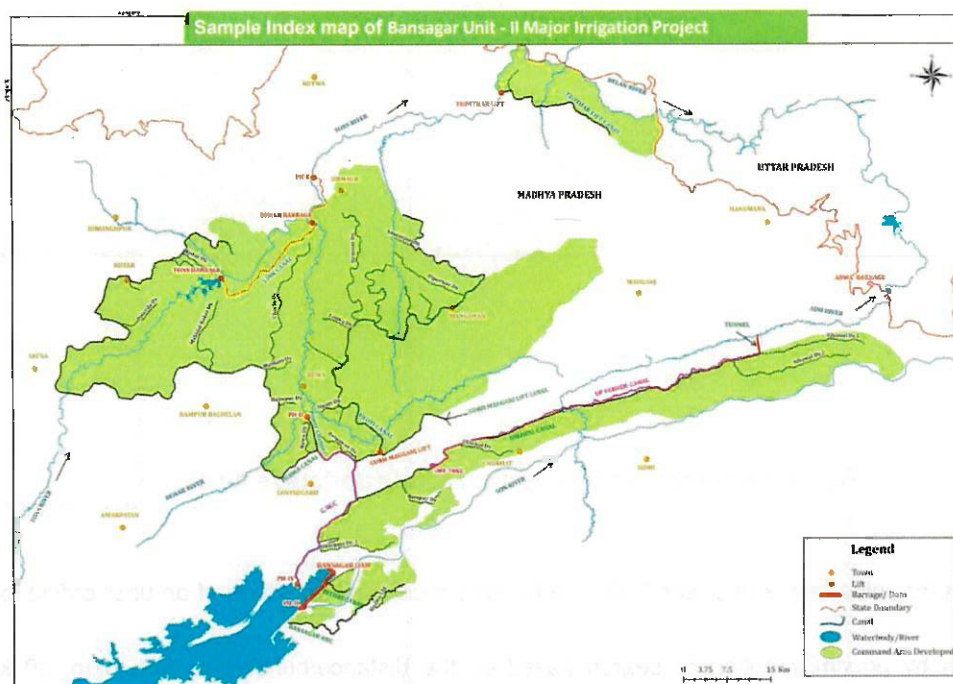


Fig-4: Nearby/proximity tool showing nearby features of Rajghat dam

viii) Based on the administrative/ hydrological basin boundaries tables/reports will be generated based on the user defined query.

ix) **Map Generation:** A map of irrigation project depicting location of its associated dam, reservoir, irrigation command etc will be generated with proper format (north arrow, grid, legend, scale) (Fig-6).



2) Non spatial query builder and report generation:



As the water resources database contains huge non spatial data associated with each feature/structure, non spatial query based on features/attributes/administrative/ hydrological basin can be incorporated with the module. Few Examples – i) Number of dams of any particular district/ state/basin/sub basin; ii) Number of dams having height more than 300m; iii) No of multipurpose projects of the country; iv) Name of the BWA having length more than 1000 m.etc.

The screenshot displays the 'Non Spatial Query Interface' with three tabs: 'Create New Query', 'Existing Query', and 'Results'. The 'Create New Query' tab is active, showing a query builder interface. It includes three main sections: 'Feature/entities', 'Operator', and 'Attribute Name'. The 'Feature/entities' list includes 'Dam', 'Barrage/weir/anicut', 'Lift', 'Power house', 'Major/medium', 'Irrigation project', 'ERM projects', 'Interstate project', 'Multi purpose project', and 'Complex projects'. The 'Operator' section contains buttons for '=', '<>', 'Like', '>', '>=', 'And', '<', '<=', 'Or', 'Is', and 'Not', along with a 'Get Unique Values' button. The 'Attribute Name' list includes 'Type', 'Year of commencement', 'Year of completion', 'Length (m)', 'Max height (m)', 'Design Flood (cumec)', 'Length of spillway', 'Interstate', and 'Volume'. Below these sections, a text box shows the query: 'Select * from Dam where Type="Earthen / Gravity & Masonry"'. At the bottom, there are three buttons: 'Run Query', 'Save Query on Disk', and 'Clear Query'.

Frequency	As per data made available by state and central water resources departments and agencies.
Measures of Success (KPIs)	Irrigation in India helps improve food security, reduce dependence on monsoons, improve agricultural productivity and create rural job opportunities. Dams used for irrigation projects help produce electricity and transport facilities, as well as provide drinking water supplies to a growing population, control floods and prevent droughts. To achieve better synchronization between the water requirement and supply, time series satellite data will support the irrigation management. It will be a effective & guiding tool for planners and policy makers in developing new water resources projects.
Input Data Required	Geospatial Time Series Data: Hardcopy and softcopy data providing agency is state and central water resources departments. Frequency: As per the data availability Resolution : NA. Extent of Coverage: Project based
Process	
Algorithm/Tool	<p>Step 1: State and central water resources departments provided the hard copy and softcopy reports/ canal diagrams etc. Hard copy format is first scanned so that further digitization of various datasets and structures associated with a particular water resources projects can be performed.</p> <p>Step 2: Digitization of components of a particular water resources projects such as Dam, Barrage, weir anicuts, power houses etc.</p> <p>Step 3: Preparation of tables containg the various time series well as data related to particular structure/ project.</p> <p>Step 3: Topology Correction and data harmonization of digitized data.</p> <p>Step 4: Preparation of map document of water resources data layers alongwith relevant hydrological layers i.e Basin, sub basin as well as administrative layers, major rivers, waterbodies/ reservoirs with label, legends, scale and suitable visibility of layers at varying scales.</p> <p>Step 5: Hosting GIS layers in the Water Resources Projects Module in ArcGIS server application.</p> <p>Step 6. Database Server: PostgreSQL is to be used for storing datasets and relationship classes using</p>


	ArcSDE. Step 7. Programming platform: ESRI JavaScript API is to be used for Map and Custom Widget integration.
Data Validations	Digitization of components of water resources structures from hard copy/softcopy maps /toposheets format requires geospatial as well as attribute validation time to time.
Software Requirement (specific if any)	ArcGIS Desktop/ ArcGIS Enterprise
Dependencies & Risks	Error during data preparation (hardcopy to GIS data creation) i.e. RMSE error, Interpretational errors etc. impacts quality of the processed data. Requirement of data updation based upon the current status and data validation by the concerning government agency.
User Acceptance Testing (UAT) By	NWIC/CWC
Development Responsibility	NWIC
Reference material	https://indiawris.gov.in/wris/#/waterResources https://cwc.gov.in/

For any communication/clarification on the BSR, the following Officer may be contacted.

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This is to certify that the above BSR has been vetted and found satisfactory.

Details of Domain Organization SPOC and SME for Verification and Approval of above BSR

 (Signature of SPOC) SPOC Name: SPOC Designation: Organization:	 (Signature of SME) SME Name: SME Designation: Organization:
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