

The PMMIS-GIS is an Internet based GIS application.

The development objectives of the Uttar Pradesh Water Sector Restructuring Project are into:

- Set up an enabling institutional and policy framework for water sector reform in the State for integrated water resources management
- Initiate irrigation and drainage sub-sector reforms in the State to increase and sustain water and agricultural productivity.

The project has six components:

Component 1 initiates water sector reform.

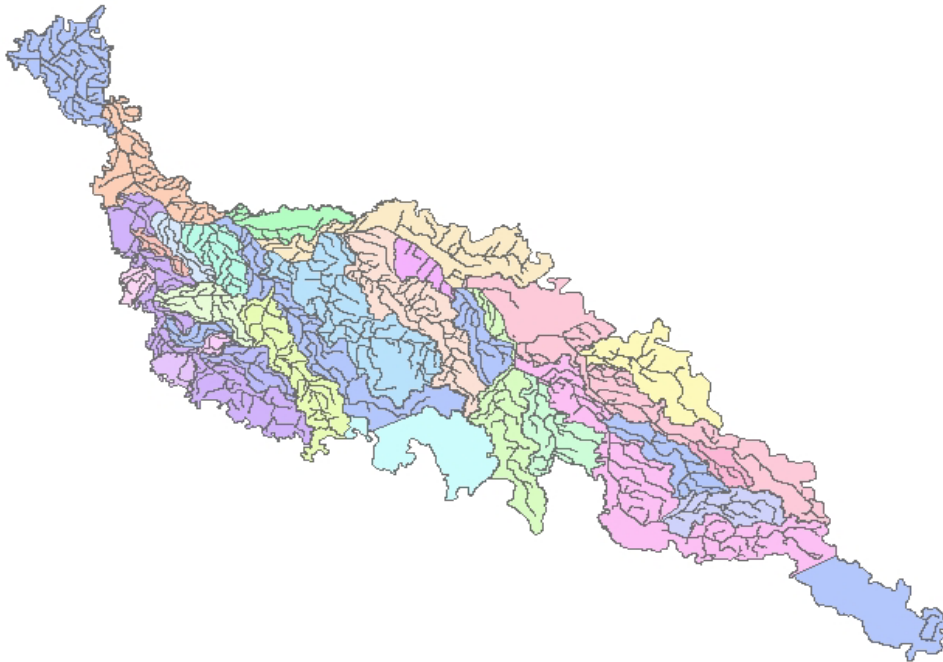
Component 2 finances irrigation and drainage sub-sector reforms.

Component 3 pilots reform options for integrated water resources management at the sub-basin level.

Component 4 pilots reform measures for sustainable and efficient operation and management of irrigation and drainage infrastructure. Specifically, the latter component rebuilds and modernizes irrigation and drainage systems based on community priorities; supports agricultural intensification and diversification through extension services, study tours, and other training; and pilots replicable management options, including transferring management responsibilities to water user associations.

Component 5 initiates topographic surveys and environmental, social, and other assessments, and prepares feasibility studies for activities to be undertaken in a follow-up project.

Component 6 assists the Project Activities Core Team (PACT) with its role in facilitating and guiding the implementation and monitoring of all project activities, ensuring synergy and coordination.



Command and Canal Map of Project Area

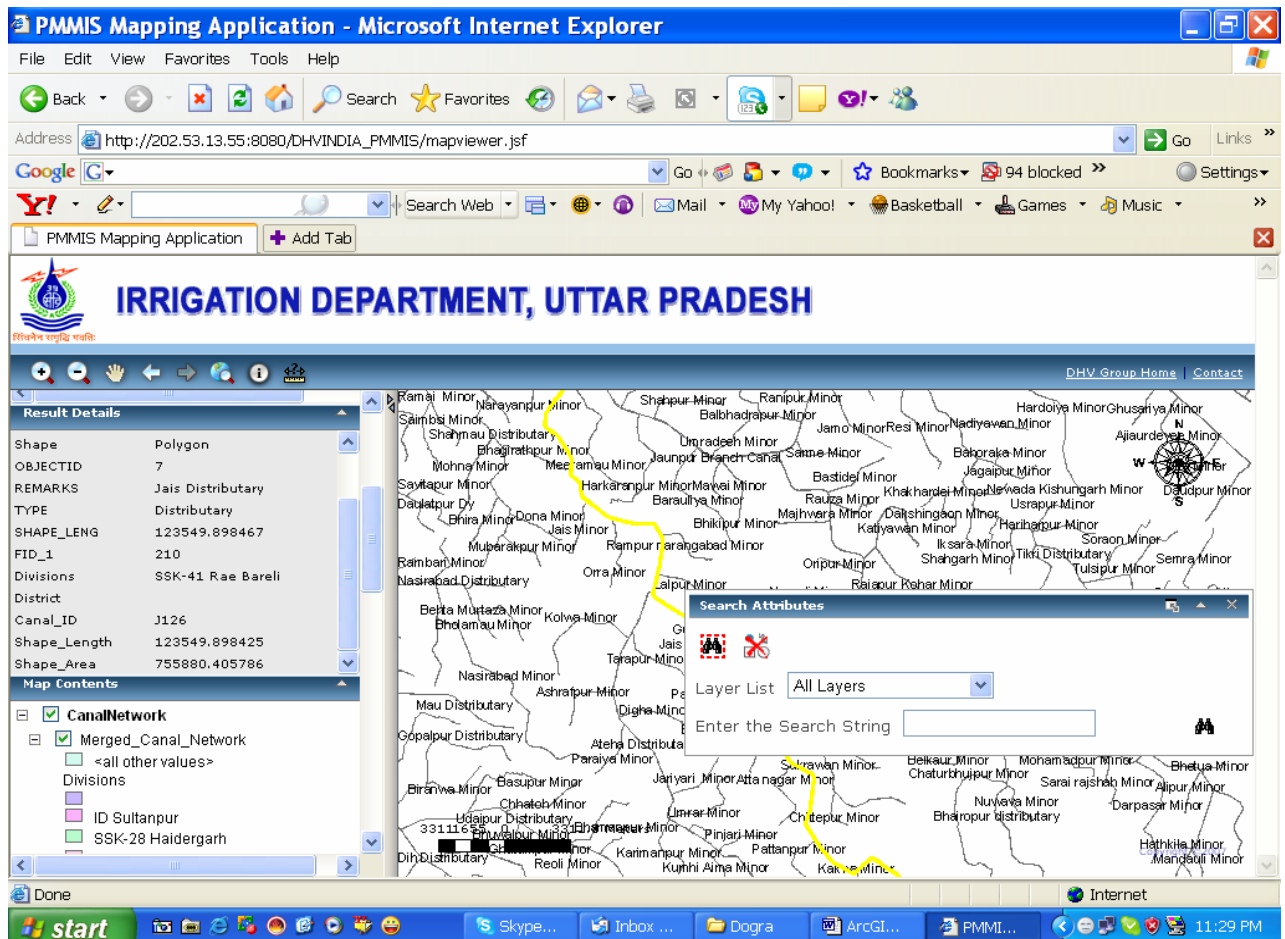
Attributes of Merged_canal_network						
FID	Shape	ID	REMARKS	TYPE	Shape_Leng	Shape_Area
0	Polygon	1	Reoli Minor	Minor	10528.856974	19989.368249
1	Polygon	2	Udaipur Distributary	Distributary	42601.897031	148886.945351
2	Polygon	4	Bhuwalpur Minor	Minor	3758.004830	7381.453842
3	Polygon	5	Nasirpur Minor	Minor	2987.530118	4475.924480
4	Polygon	6	Bhabanpur Minor	Minor	8918.242961	26304.319628
5	Polygon	7	Chhatoh Minor	Minor	8581.466930	23077.288521
6	Polygon	8	Basupur Minor	Minor	11451.239926	17163.671277
7	Polygon	1	Sewai Hengarh Minor	Minor	4263.475187	12769.826358
8	Polygon	2	Khakhardei Minor	Minor	4053.056321	12133.319197
9	Polygon	3	Semra Minor	Minor	8558.340898	25706.120410
10	Polygon	4	Sarwavan Minor	Minor	6742.970278	20129.618094
11	Polygon	5	Korari Lakshmanshah Minor	Minor	2483.033404	7417.966202
12	Polygon	6	Bhusiyawan Minor	Minor	2632.174323	7848.097354
13	Polygon	7	Tulsipur Minor	Minor	7302.197415	21844.752410
14	Polygon	8	Soraon Minor	Minor	8326.195661	24950.855494
15	Polygon	9	Sewai Hengarh Minor	Minor	363.919056	1055.657616
16	Polygon	1	Usrapur Minor	Minor	859.244789	2534.940341
17	Polygon	1	Hariharpur Minor	Minor	6711.489623	20095.266736
18	Polygon	1	Iksara Minor	Minor	4890.648172	14637.795683
19	Polygon	1	Dakshingaon Minor	Minor	2284.543587	6818.992847
20	Polygon	1	Tikri Distributary	Distributary	97893.365911	489812.774977
21	Polygon	1	Shahgarh Minor	Minor	4692.593931	14022.291947
22	Polygon	1	Ujjaini Minor	Minor	14836.464924	44474.249545
23	Polygon	1	Bhusiyawan Minor	Minor	3848.856203	11510.639943
24	Polygon	1	Korari Lakshmanshah Minor	Minor	1374.284611	4086.656234
25	Polygon	1	Dhanapur Minor	Minor	11215.341774	33789.959274
26	Polygon	2	Sultapur II Minor	Minor	1212.852922	3901.194891

Attributes of Command and Canal map

Above map shows the Command boundaries and canals of Irrigation Department in the project area and its associated attributes.

Based on the requirement of PMMIS-GIS application, ESRI ArcGIS Server 9.2 product is chosen for application development. ESRI ArcGIS Server 9.2 is a comprehensive platform for delivering enterprise GIS application such as PMMIS-GIS applications that is centrally managed and support multiple users. ESRI ArcGIS Server 9.2 provides the framework to build and deploy centralized GIS application and services to meet a variety of needs using a variety of clients. The development of PMMIS-GIS application business logic dwells into the ESRI ArcGIS Server 9.2 framework.

PMMIS-GIS application will use the spatial database as well as MIS database to cater to the requirements of PMMIS-GIS application. The Spatial database together with the additional database schemas forms the data tier.



The application is divided into four modules

- Map Drawing and Feature Selection
- Spatial Querying and Statistics
- Event Tracking
- MapViewer Integration

Module / Feature	Description
Map Drawing	
Map Drawing	
	Screen for displaying map and toolbar
	Potlet for map navigation
	potlet for Table of contents for activate layer and symbology
Feature Selection	
Feature analysis	
	Create a screen for personal entry query
	Identify features on a map by pointing at them
	Select features along lines and inside boxes, areas, polygons, and circles.
	Select features with an SQL expression
	Select features within a specified distance of other features.
Spatial Querying and Statistics	
Spatial Querying	
	Provision for navigation through records
	Create a screen for personal entry query
	Calculate basic statistics on selected features
	Switch between execute and prepare query
	Facility to add / update the information
	Navigation facility between listed records

MapViewer Integration: The MapViewer Application can be accessed by other applications by providing a link to MapViewer application.

All the attribute and GIS Data will reside in a Common DB2 database where all the GIS data will reside as Feature Classes and attribute data will reside as Stand alone tables.

PMMIS Java Application and the GIS application will use the Common database for all purposes.

1. Mapping of Requirements

1.1 Map Drawing and Feature Selection

The following table describes the mapping of sub requirements and implementation details:

S.No	Sub Requirements	Components	Implementation details
1.	Display a map with multiple map layers, such as roads, streams and boundaries	1) Exception 2) Struts 3) Authorization 4) ESRI ArcGIS Server.ADF 5) Log	1. Show the MapViewer interface and display the map when the MapViewer tool is invoked

2.	Pan and zoom throughout a map	<ul style="list-style-type: none"> 1) Exception 2) Struts 3) Authorization 4) ESRI ArcGIS Server.ADF 5) Log4j 	1. This MapViewer will include tools (buttons located at the top of the map display) to interact with the map display.
3.	Draw graphic features such as points, lines, circles and polygons.	<ul style="list-style-type: none"> 1) Exception 2) Struts 3) Authorization 4) ESRI ArcGIS Server.ADF 5) Log4j 6) JSP/ Servlets 	<p>1. The application will allow the user to digitize a graphic feature after clicking on the corresponding icon in the tool bar.</p> <p>The action performed shall be free form digitization of line segment (point to point), point or polygon via mouse clicks in the map interface.</p>
4.	Draw descriptive text.	<ul style="list-style-type: none"> 1) Exception 2) Struts 3) Authorization 4) ESRI ArcGIS Server.ADF 5) Log4j 6) JSP/ Servlets 	1. The MapViewer will provide the ability to add new labels to the graphics through the label pull down menu
5.	Identify features on a map by pointing at them.	<ul style="list-style-type: none"> 1) Exception 2) Struts 3) Authorization 4) ESRI ArcGIS Server.ADF 5) Log4j 6) JSP/ Servlets 	1. The MapViewer Application shall provide the ability to draw a selection box (rectangle) around the objects within the map display and retrieve information on the chosen records, when an active layer has been chosen
6.	Select features along lines and inside boxes, areas, polygons, and circles.	<ul style="list-style-type: none"> 1) Exception 2) Struts 3) Authorization 4) ESRI ArcGIS Server.ADF 5) Log4j 6) JSP/ Servlets 	1. The MapViewer Application shall provide the ability to draw a selection box (rectangle) around the objects within the map display and select all the features from all layers that intersect with the rectangle (Envelope)
7.	Select features within a specified distance of other features	<ul style="list-style-type: none"> 1) Exception 2) Struts 3) Authorization 4) ESRI ArcGIS Server.ADF 5) Log4j 6) JSP/ Servlets 	1. The MapViewer Application will provide the user the ability to set buffer distances (search radius) from the selected feature to refine the search. The units (feet, miles, meters, kilometers, decimal degrees) required to set the buffer distances shall be retrieved from the configuration. The default value to be used can also be

			configured.
8.	Select features with an SQL expression.	<ul style="list-style-type: none"> 1) Exception 2) Struts 3) Authorization 4) ESRI ArcGIS Server.ADF 5) Log4j 6) JSP/ Servlets 	1. The MapViewer will have the ability to allow the user to choose values of GIS attribute information (Custom Query). This will be a 1-2-3-step process utilizing a dialog box for querying attribute information based on the spatial data layers and attributes.

1.2 Spatial Querying and Statistics

The following table describes the mapping of sub requirements and implementation details:

S.No	Sub Requirements	Component	Implementation details
1.	Calculate basic statistics on selected features		
2.	Query and update attribute data associated with selected features.	<ul style="list-style-type: none"> 1) JDBC 2) Exception 3) Log4j 4) Struts 5) Authorization 6) JSP/ Servlets 	<ul style="list-style-type: none"> 1. The user selects the features on map. 2. Results will be displayed in a Result Tab. 3. The Result Tab Shall have the ability to update only the attribute data present as tables in an RDBMS; This will not involve any Editing of Feature Data update will be done only to non-gis tables.
3.	Render features with thematic methods such as value maps, class breaks, and dot density.	<ul style="list-style-type: none"> 1) Exception 2) Struts 3) Authorization 4) ESRI ArcGIS Server.ADF 5) Log4j 6) JSP/ Servlets 	1. The MapViewer will have the ability to allow the user to change symbology for a selected layer, by selecting a color schema from the color ramp pull down menu, and graphic type and size via the marker type and width menus
4.	Label features with text from field values.	<ul style="list-style-type: none"> 1) Exception 2) Struts 3) Authorization 4) ESRI ArcGIS Server.ADF 5) Log4j 6) JSP/ Servlets 	1. MapViewer shall provide the ability to Change/add new labels to the features for a layer through the label pull down menu.

1.3 Event Tracking

The following table describes the mapping of sub requirements and implementation details:

S.No	Sub Requirements	Component	Implementation details
1.	Dynamically display real-time or time-series data	1) Exception 2) Struts 3) Authorization 4) ESRI ArcGIS Server.ADF 5) Log4j 6) JSP/ Servlets	Understanding: 1.0 The Application will contain a layer, whose data will be populated dynamically, bases on an attribute query. 2.0 The generation of records (attribute values) in this layer will be dynamic and will change after execution of each attribute query.

1.4 Geocoding

The following table describes the mapping of sub requirements and implementation details:

S.No	Sub Requirements	Component	Implementation details
1.	Type in an address and find a location on a map	1) Exception 2) Struts 3) Authorization 4) ESRI ArcGIS Server.ADF 5) Log4j 6) JSP/ Servlets	1) The MapViewer Application will allow a user to use MapViewer to map a street location on the map.

Technologies: ArcGIS Server9.2, DB2, JSF, ESRI Spatial EJB's, IBM Websphere, IBMRPM, Eclipse, tomcat, jboss