Integrated Operational Forecasting System

UT of J&K and UT of Ladakh

User Manual

For the attention of:

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1 Accessing the Integrated Operational Forecasting System (IOFS)

A web-based application has been developed with an interface to allow users to view the results generated from the HEC-RTS model in the form of maps, graphs or tables. Users have also been provided the feature to generate a detailed forecast report on Flood Forecast, Flash Flood, Avalanche Drought and Landslide forecast for the Union Territories of Jammu & Kashmir.

1.1 Getting Started

Open the internet browser (Internet Explorer, Google Chrome, Firefox etc.) and enter the application URL to open the login page as shown in Figure 1-1. At the time of publishing this manual the URL is:

https://www.jkiofs.in/iofs_jk_ld/index.aspx

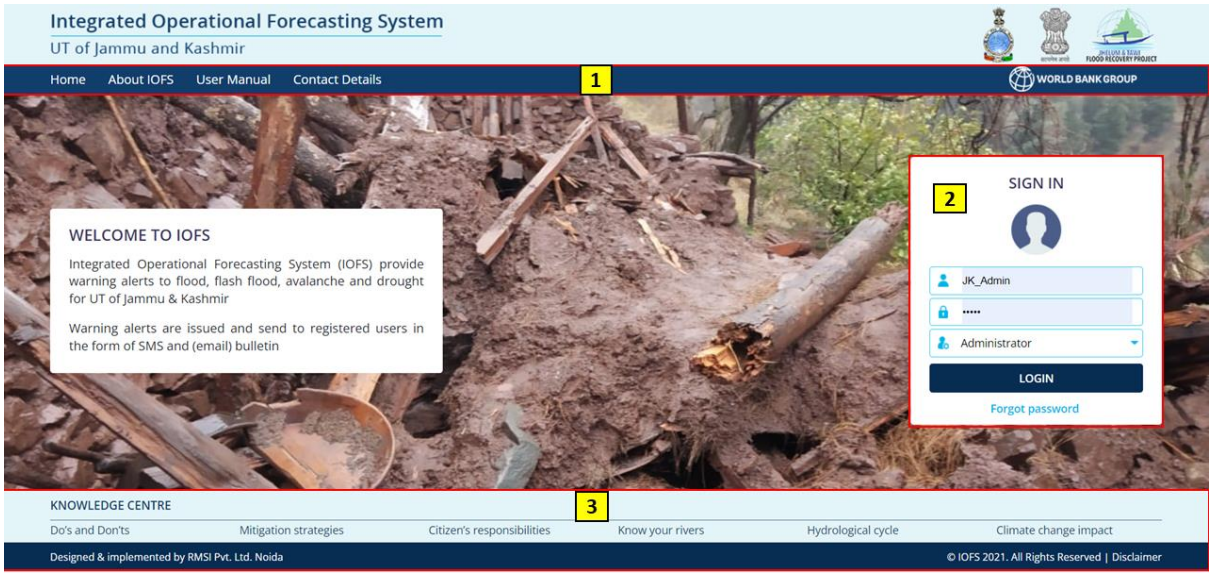


Figure 1-1:Login page screen.

Login page is divided into following parts:

1. Top Panel [1]
2. Center Panel [2]
3. Footer [3]

1.2 Login Top Panel

Top panel of the application has following links:

- Home
- About IOFS
- User Manual
- Contact Details

1.2.1 HOME

By clicking on the Home button, the user will land on the IOFS Homepage as shown in Figure 1-2.

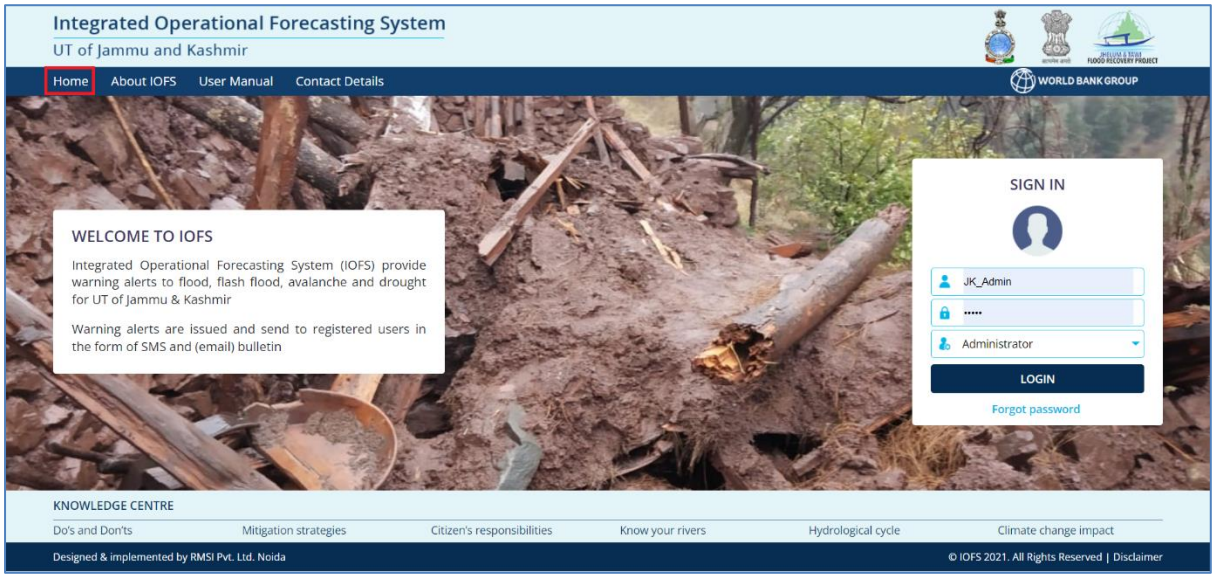


Figure 1-2: Home page screen

1.2.2 ABOUT IOFS

- Click on the About IOFS link to display the About IOFS page as shown in Figure 1-3.
- This page displays background information about the IOFS application and the project.

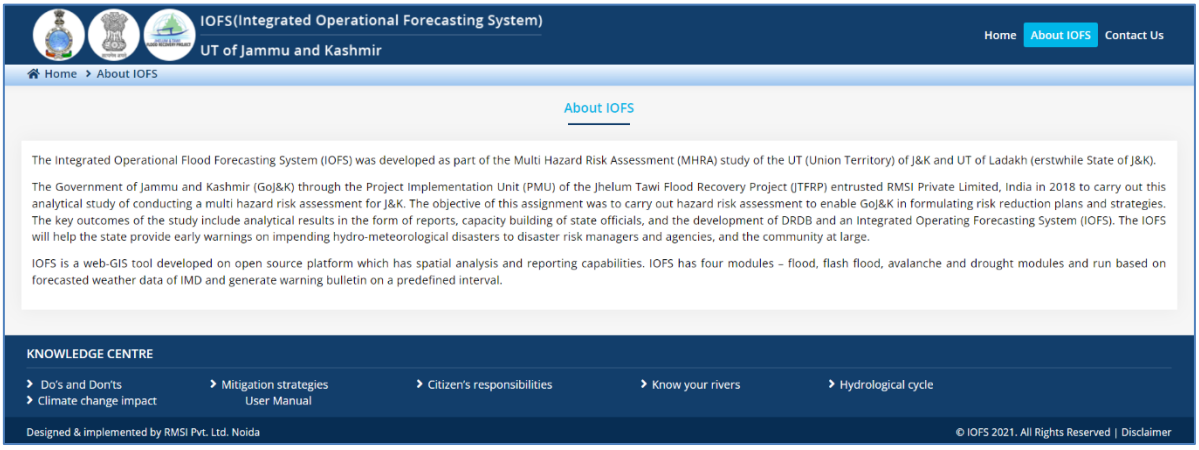


Figure 1-3: About IOFS page.

1.2.3 USER MANUAL

Click on the User Manual link to display the User Manual page as shown in Figure 1-4.

Figure 1-4: User manual screen

1.2.4 CONTACT US

Click on the Contact Us link to display the contact details page as shown in Figure 1-5**Error! Reference source not found.**.

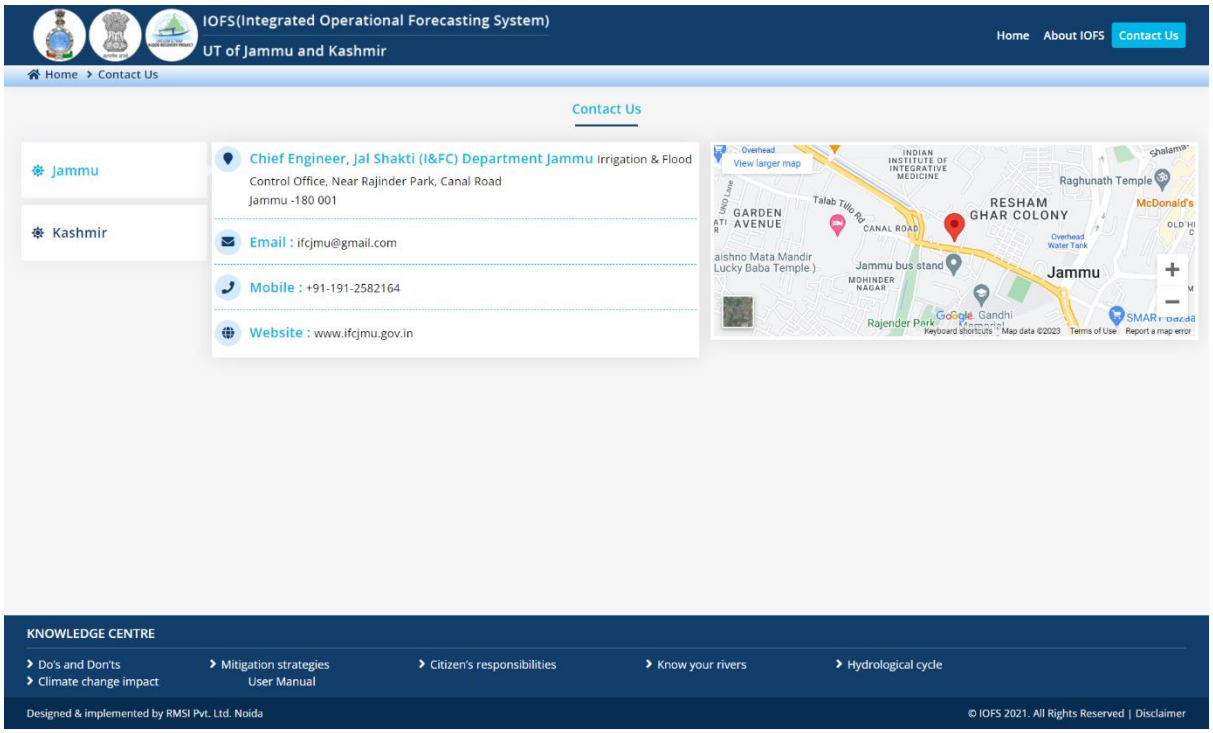


Figure 1-5: Contact Us screen

1.3 Login

Type in the Username, Password and select the Role, click on the login button to logged in to the application as shown in Figure 1-6.

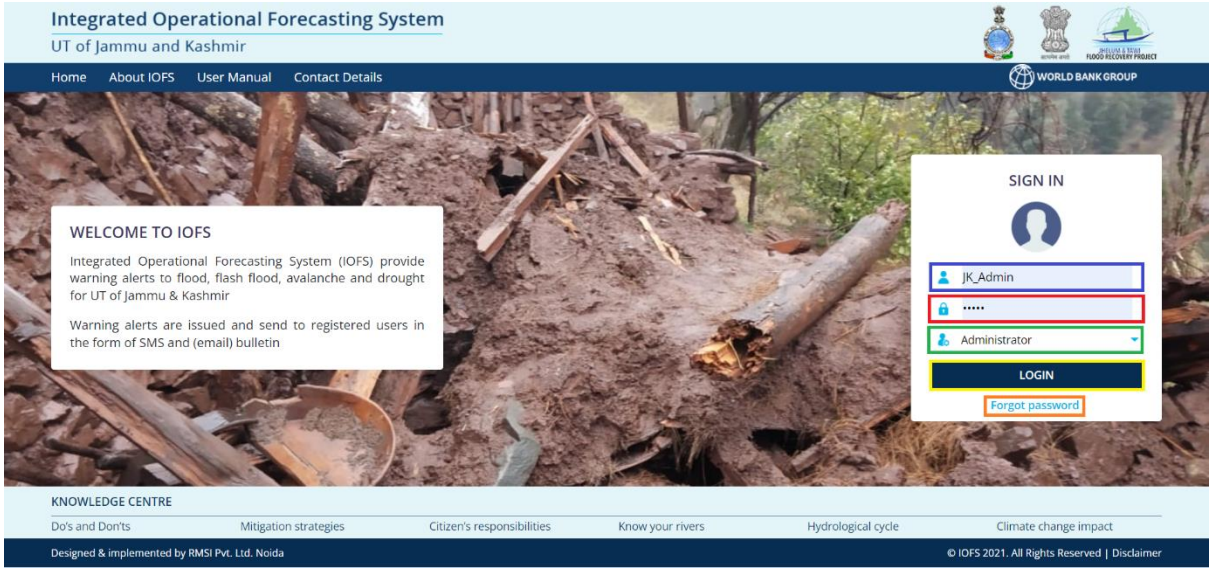


Figure 1-6: Login screen

There are three types of User in the application:

- Administrator (Have the option of data upload, download and approval).
- Editor (Have the option to edit and use data upload).
- Guest User (Only have the option to view the application).

1.3.1 FORGOT PASSWORD

Click on the Forgot Password link to open the pop up as shown in Figure 1-7.

Enter the Username and registered email and click on Send Password to mail button.

Password will be sent to registered mail id.

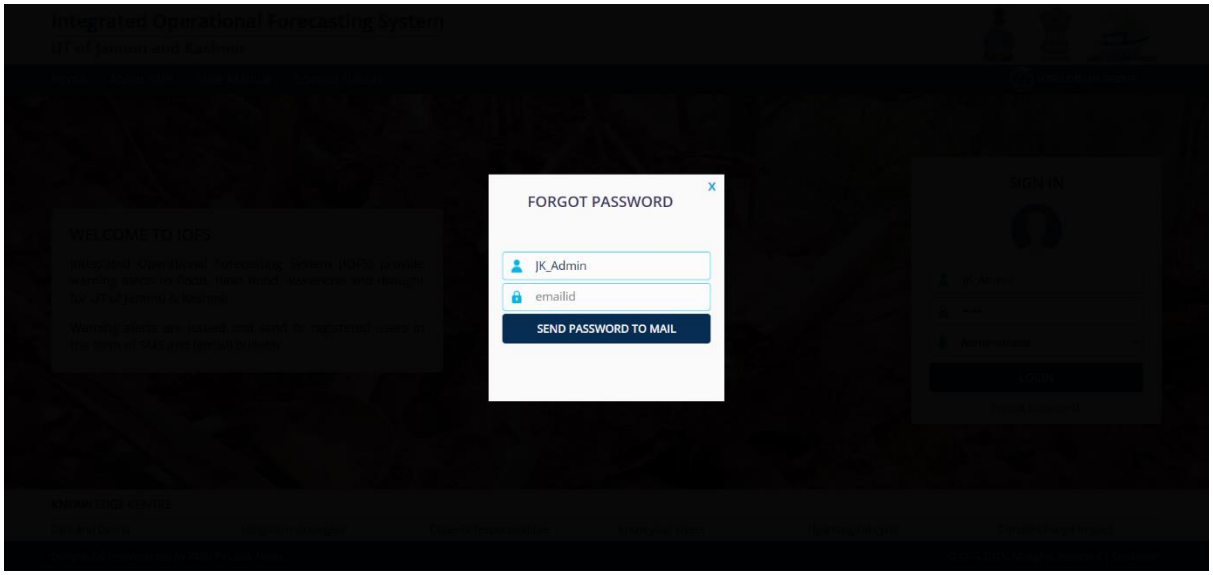


Figure 1-7: Forgot Password screen

1.4 Footer/Knowledge Centre

Users can view the following links in the "*Footer/Knowledge Centre"* [3] section of the Login screen (Figure 1-1).

- Do's and Don'ts
- Mitigation Strategies
- Citizen's responsibilities
- Know your rivers
- Hydrological cycle
- Climate change impact

1.4.1 Do's and Don'ts

Click on the Do's and Don'ts link within the Knowledge Centre section to display the Do's and Don'ts page about Flood and Avalanche as shown in Figure 1-8

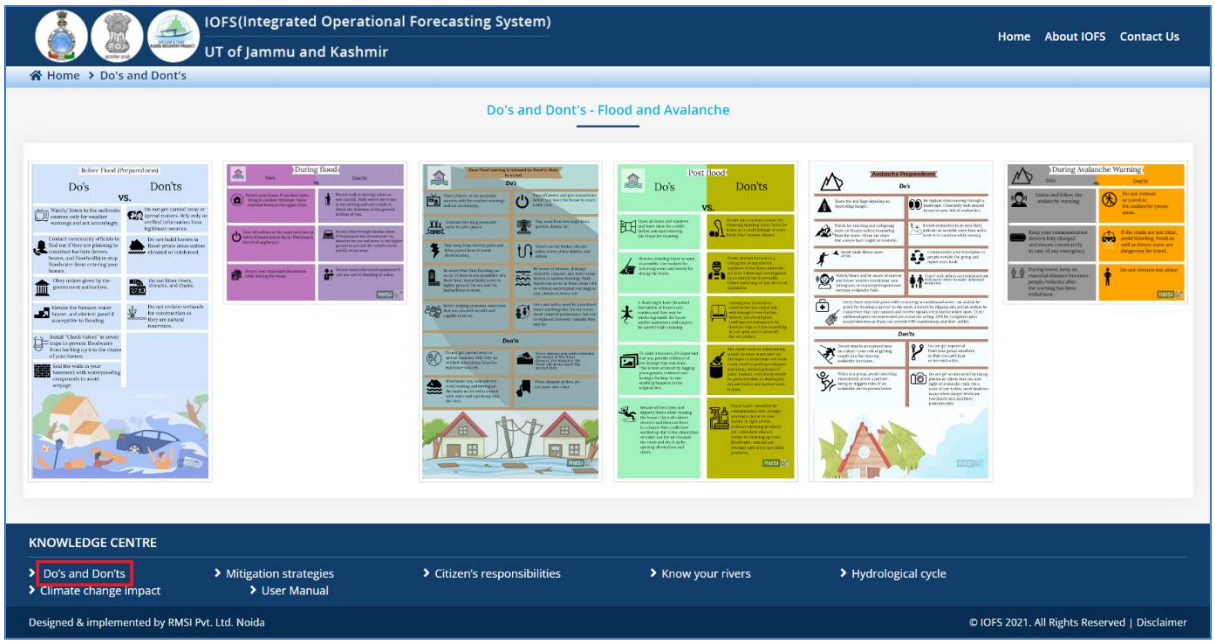


Figure 1-8: Do's and Don'ts screen.

1.4.2 Mitigation Strategies

- Click on the Mitigation Strategies link in the Knowledge Centre to display the Mitigation Strategies page as shown in Figure 1-9
- The mitigation strategies explained here focus more on the principle hazards of the UTs – flood, landslide, avalanche, and drought.

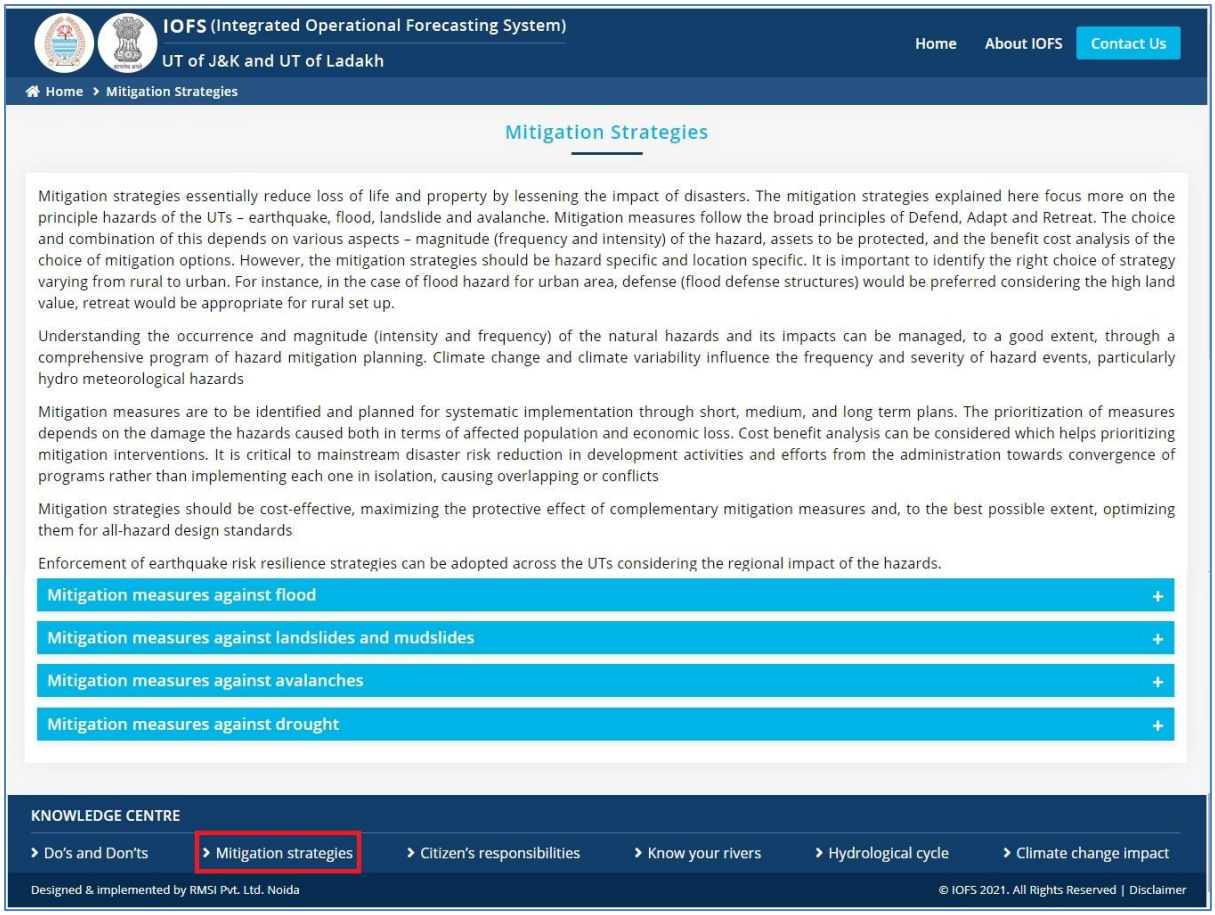


Figure 1-9: Mitigation strategies screen.

1.4.3 CITIZEN'S RESPONSIBILITIES

Click on the Citizen's responsibilities link within the Knowledge Centre to display the Citizen's responsibilities page as shown in Figure 1-10

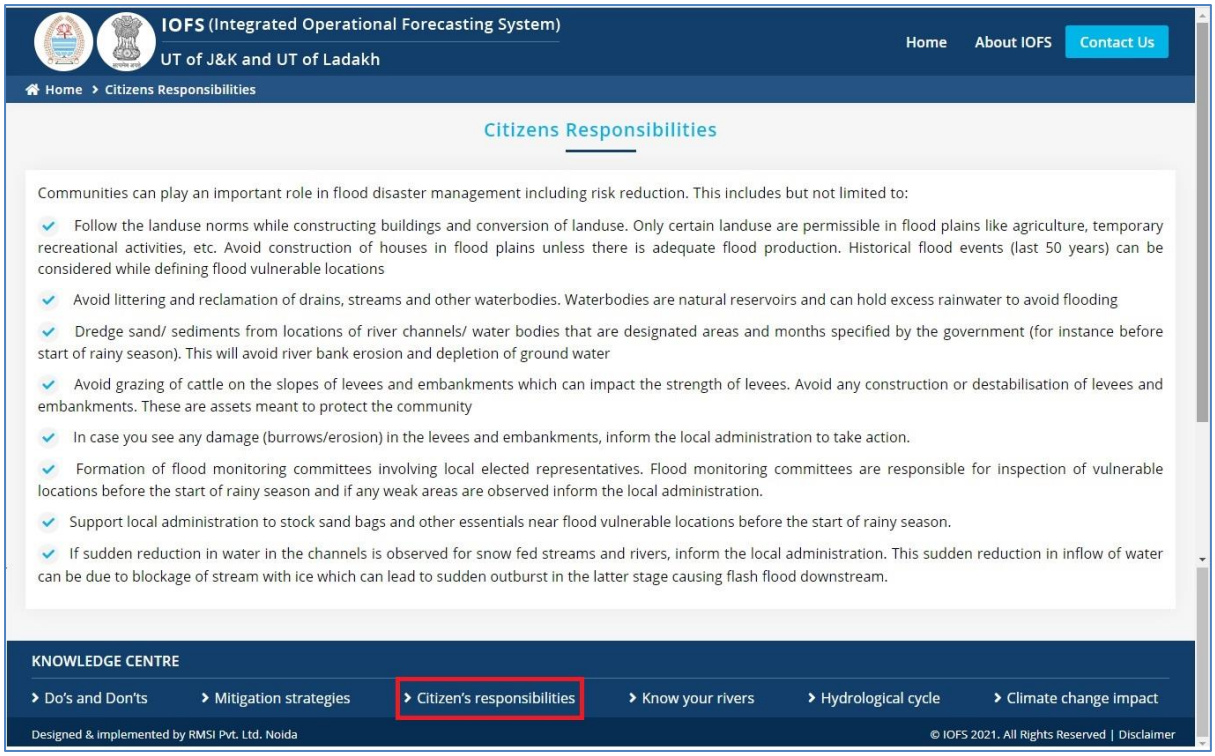


Figure 1-10: Citizen Responsibilities screen.

1.4.4 KNOW YOUR RIVERS

- Click on the Know Your Rivers link within the Knowledge Centre to display the Know Your Rivers page as shown in Figure 1-11
- This page displays information about the prominent rivers of the Union Territories of Jammu & Kashmir.

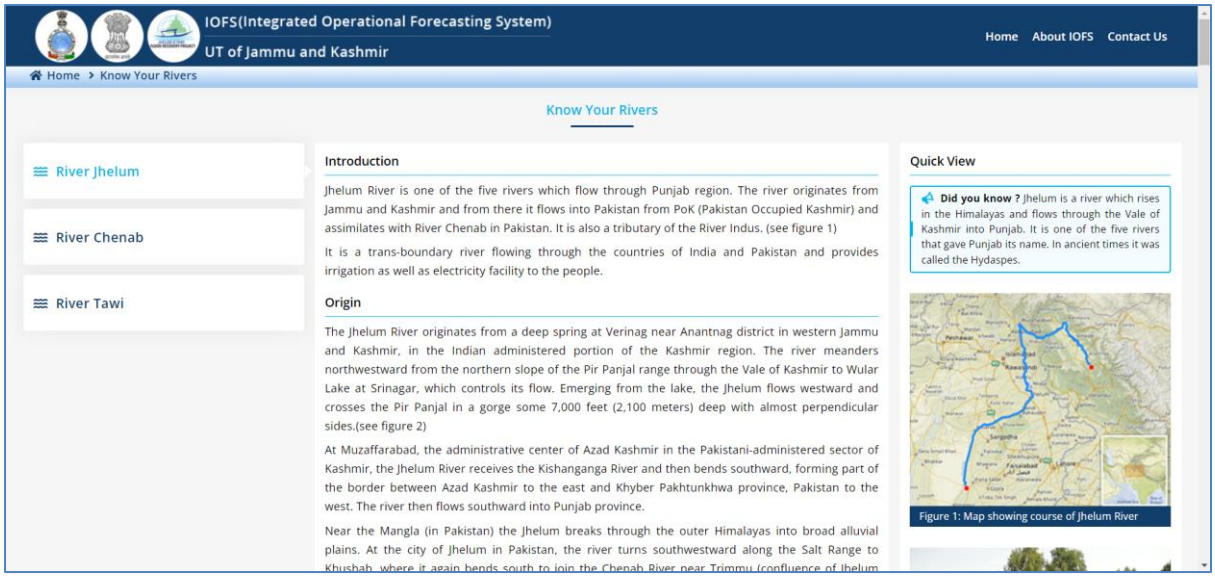


Figure 1-11: Know Your Rivers screen

1.4.5 HYDROLOGICAL CYCLE

- Click on the Hydrological cycle link within the Knowledge Centre to display the Hydrological cycle page as shown in Figure 1-12.
- This page displays background information about the Hydrological cycle in relation with the Indian Himalayas.

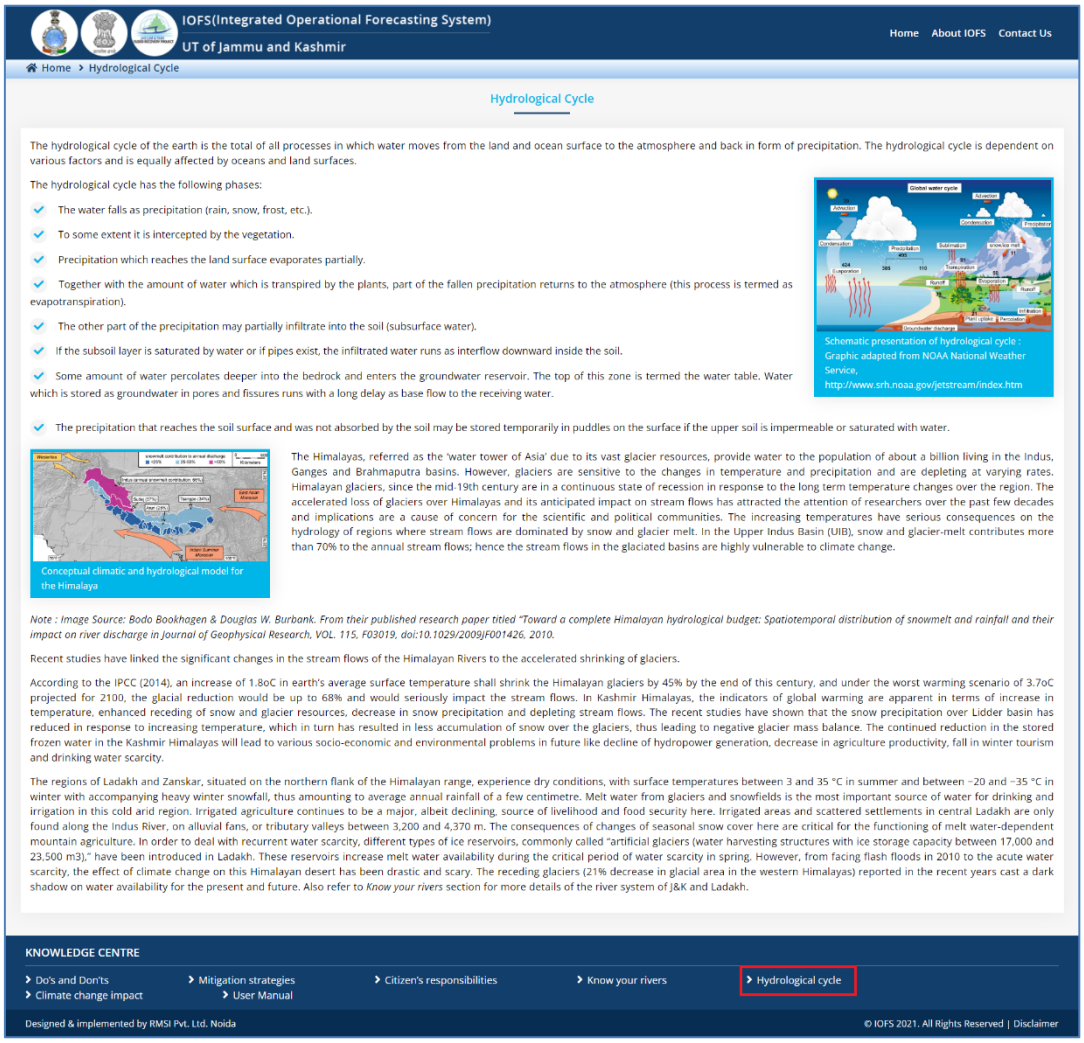


Figure 1-12: Hydrological cycle screen.

1.4.6 CLIMATE CHANGE IMPACT

Click on the climate change impact link within the Knowledge Centre to display the climate change impact page as shown in Figure 1-13.

This page provides details about the following topics:

1. Climate change & its impact on natural disasters.
2. Green house gas growth rates.
3. The three largest climate forcing.
4. The impact of climate change in UTs of J&K, Ladakh.
5. Emission inventory of Co_2 in erstwhile State of Jammu & Kashmir.
6. Efforts to address climate change threats in UTs of J&K and Ladakh.
7. Hydro-meteorological disasters and climate change.

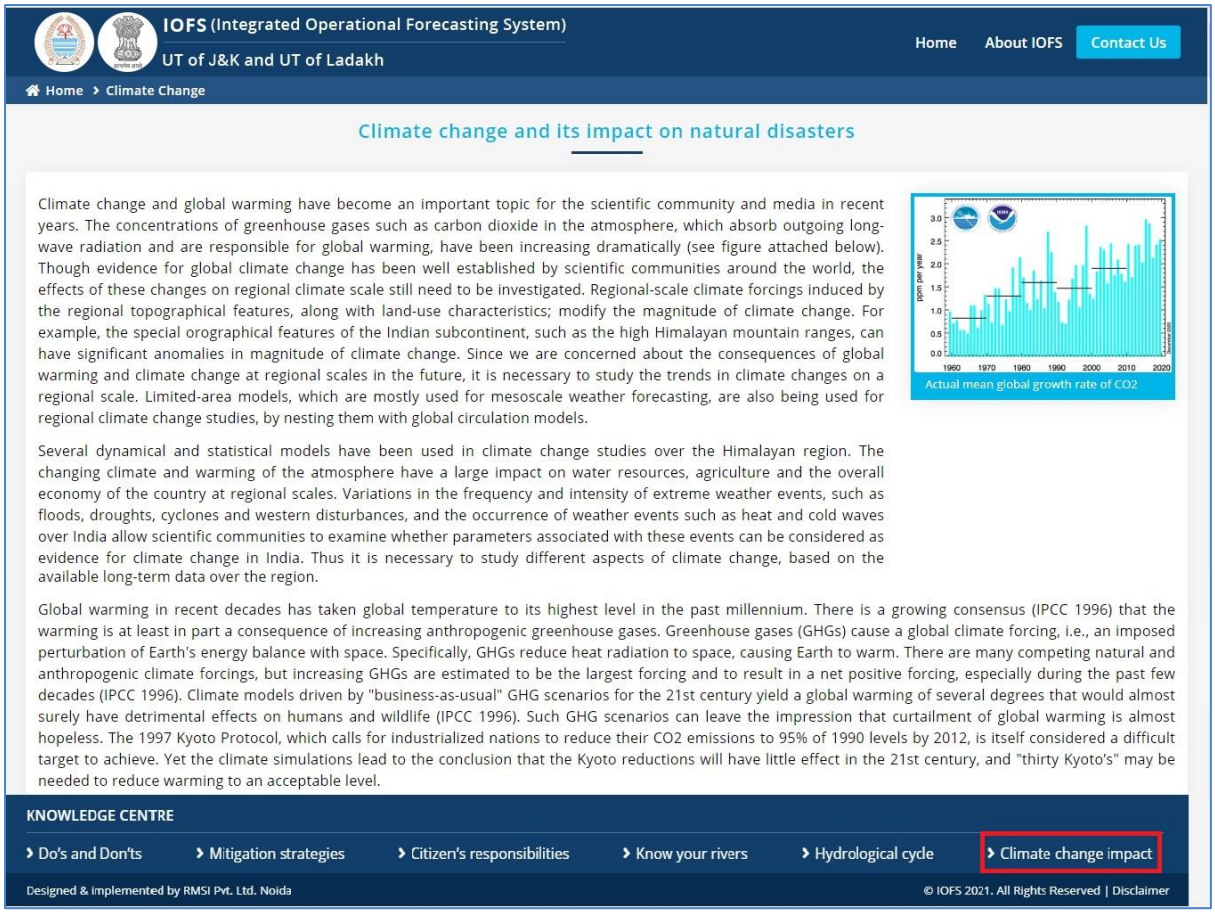


Figure 1-13: Climate change screen.

The Homepage screen of the application is displayed in the browser window as shown in Figure 1-14.

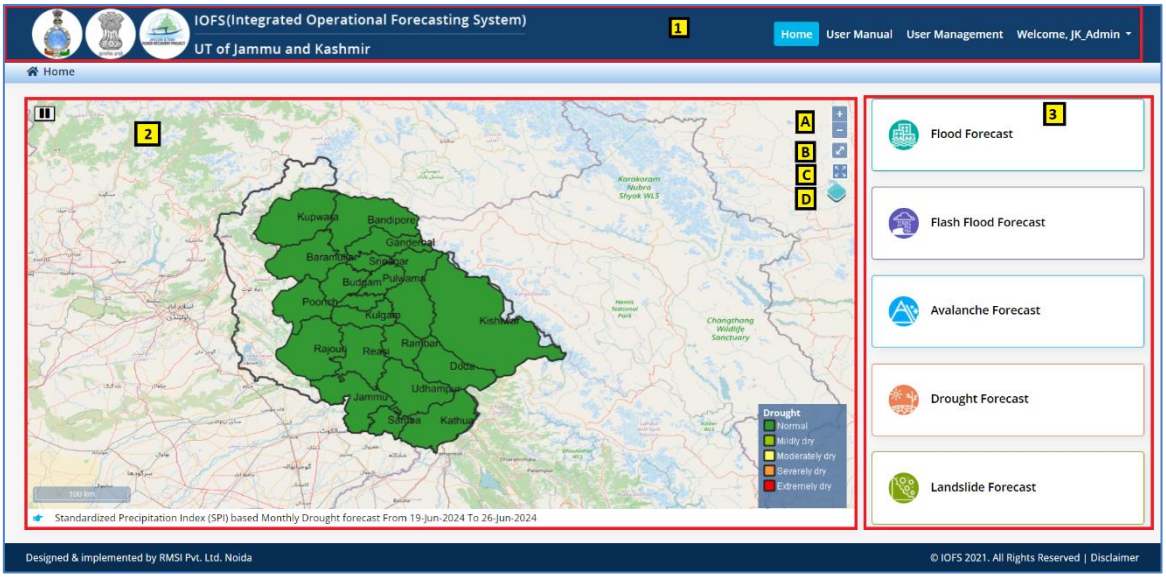


Figure 1-14: Homepage screen.

The IOFS interface can be broadly divided into three different parts as shown in Figure 1-14.

1. Top Panel [1]
2. Map Window [2]
3. Module Interface [3]

1.5 Top Panel

Top Panel includes following links:

- Home
- User Manual
- User Management
- User Name Dropdown

1.5.1 HOME

Click on Home button to redirect application to the Home page.

1.5.2 USER MANUAL

Click on User Manual button to open the User Manual for guidance to access the application.

1.5.3 USER MANAGEMENT

Click on User Management link to open the User Management page with two tabs:

- Search User
- Add New User

1.5.3.1 Search User

Search User page displays the list of users and an option to search using Username and Designation or both.

Selected user details can also be Viewed, Edited, Access Rights and Deleted using options from the Action Dropdown as shown in Figure 1-15.

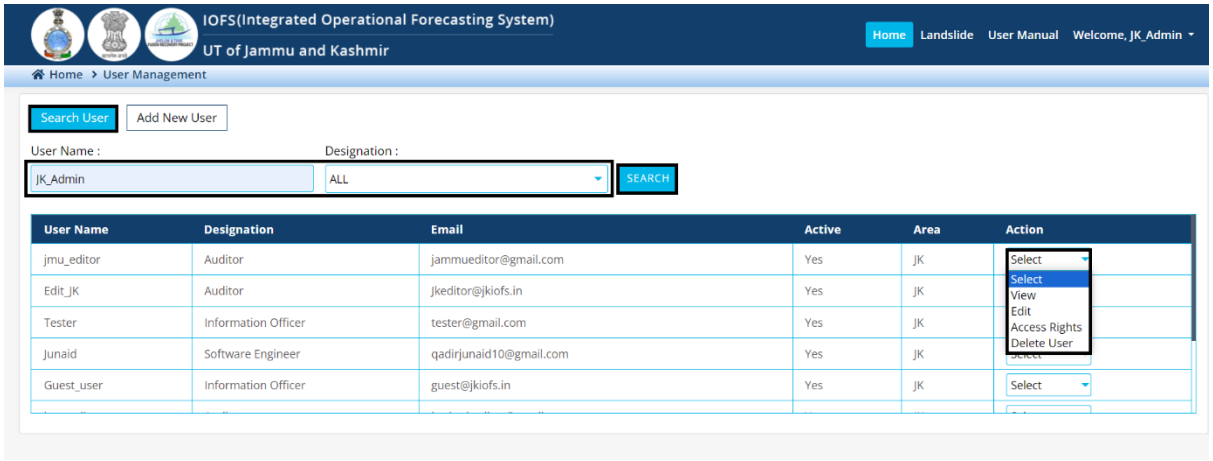


Figure 1-15: Search User screen.

Click on the View button at the action dropdown to View the User details and user can also go back to User Management Search page by clicking on back button as shown in Figure 1-16.

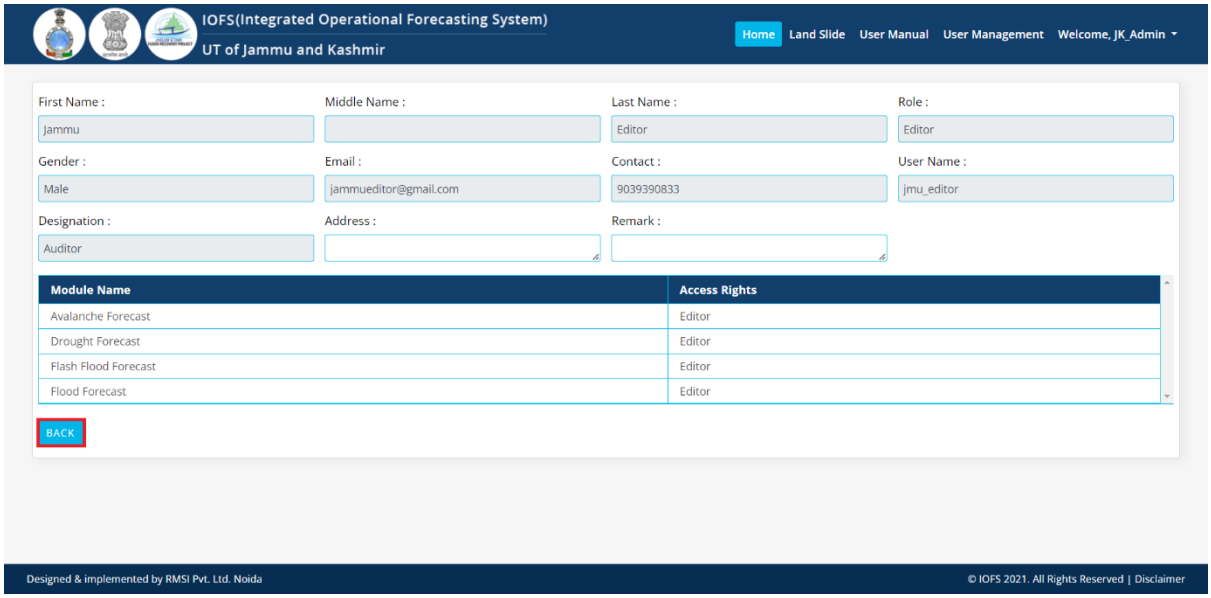


Figure 1-16: View User screen

Click on Edit option at the Action dropdown to edit the User details and click on Update button at the Edit page to update the edited details

User can also go back to User Management Search page by clicking on back button as shown in Figure 1-17

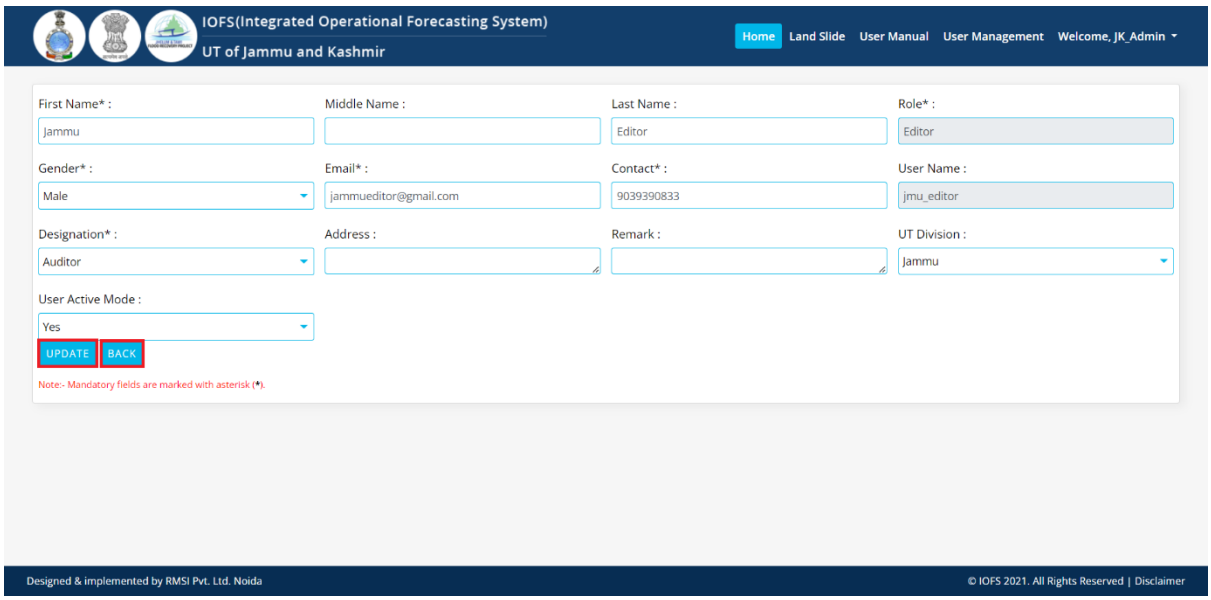


Figure 1-17: Edit User screen

Click on Access Right option at the Action dropdown to provide access of the given modules to the user.

At the Access Panel page, select the type of user by clicking on checkbox highlighted by black box

Select the modules from the Module box and transfer it to selected module box using arrow button user can also do the vice versa using arrow button (highlighted by red box)

Click on the Submit button to provide the access of the selected module and click on back button to go back to search user page as shown in Figure 1-18

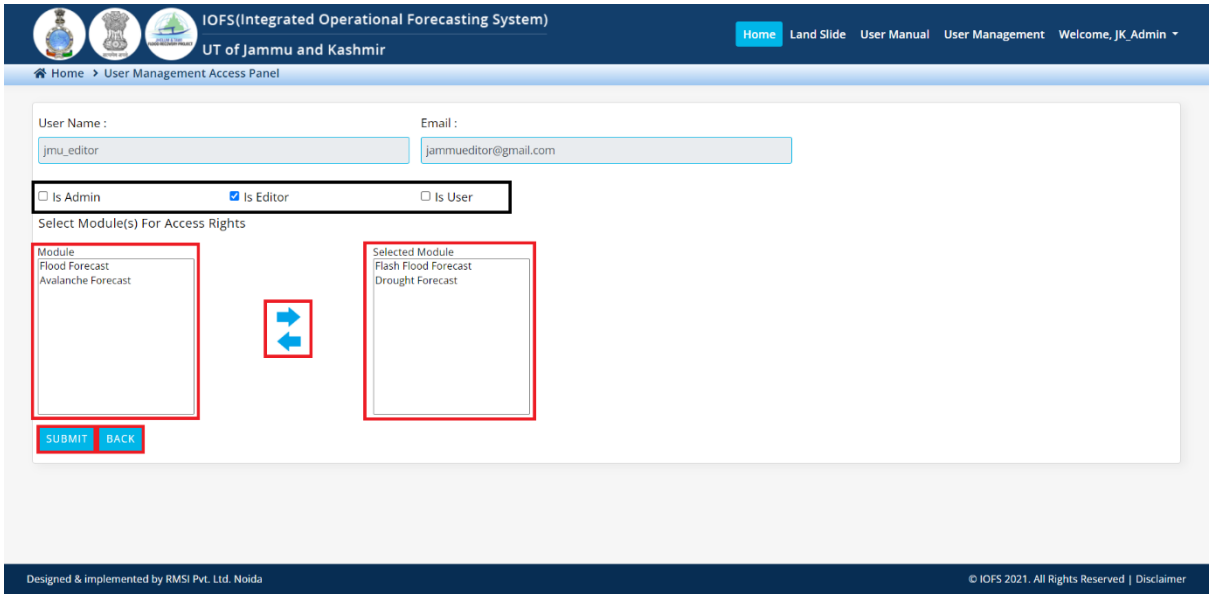


Figure 1-18: User Management Access panel screen

Click on the Delete User option at the action dropdown and it will display a confirmation message to delete the user.

Click on OK to delete the user and “Cancel” to cancel deletion.

1.5.3.2 Add New User

Click on Add New User tab at User Management page to open the Add New User page as shown in Figure 1-19.

Fill in the details and click on the Submit button to add new user at the User list of Search User page.

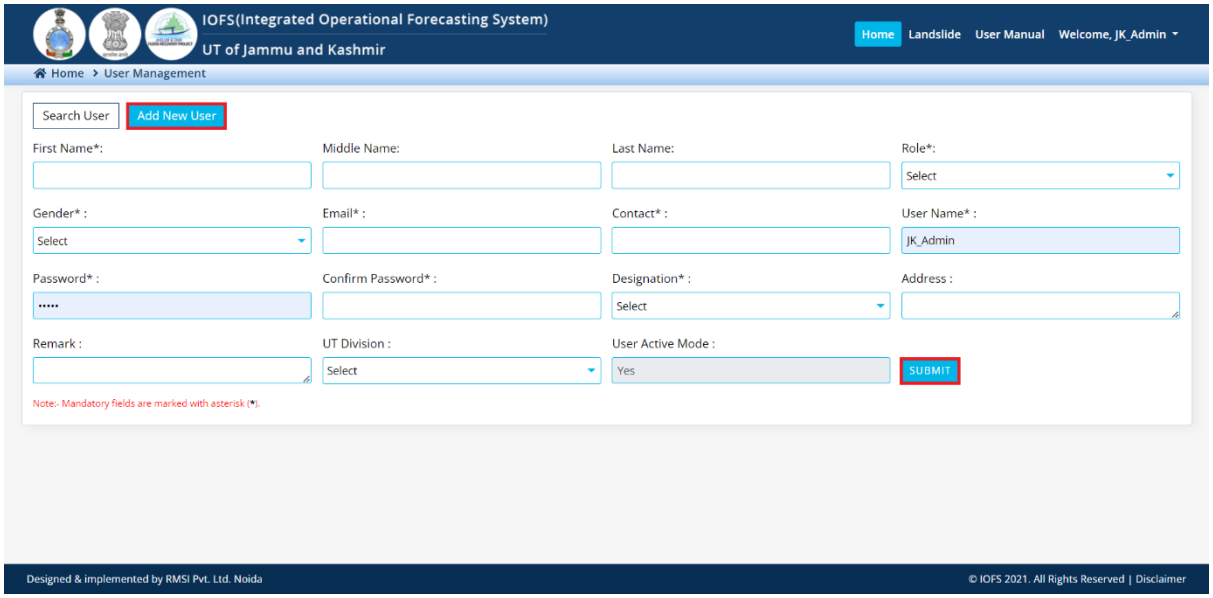


Figure 1-19: Add New User screen

1.5.4 USERNAME DROPDOWN

Username dropdown has two options:

- Change Password
- Logout

1.5.4.1 Change Password

Click on the Change Password link to open a pop screen of change password where user has to enter Old Password, New Password and Confirm Password and click on Reset button to change the password as shown in Figure 1-20.

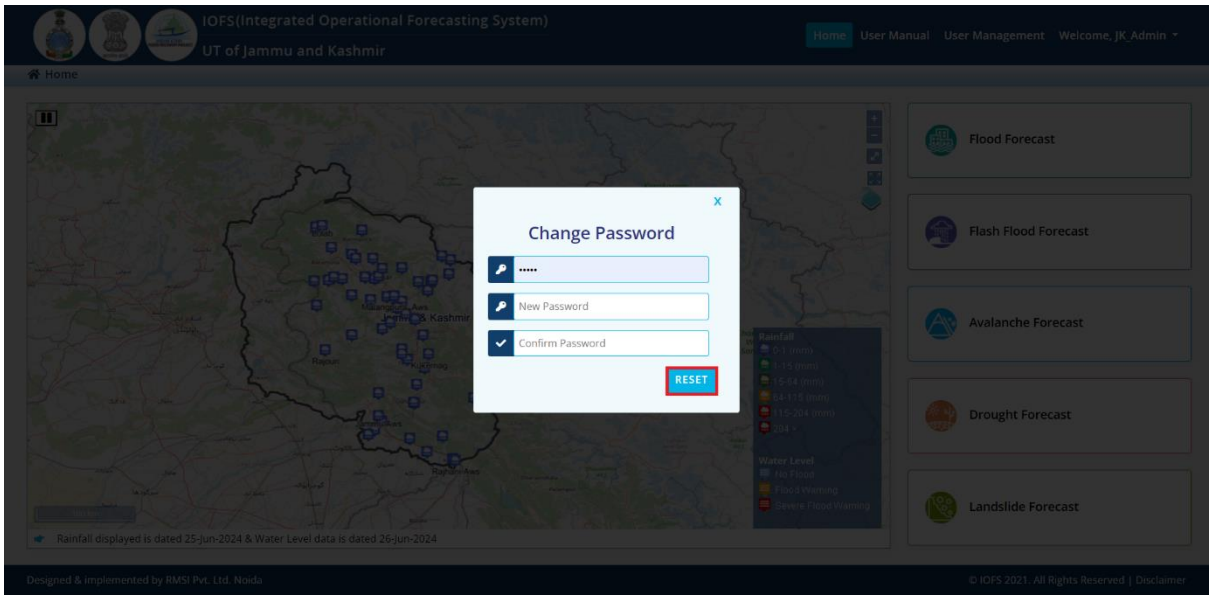


Figure 1-20: Change Password screen

1.5.4.2 Logout

Click on the Logout option at the username dropdown and application will display a confirmation message “Do you really want to Logout??”

Click on “Ok” to Logout of the application and “Cancel” to cancel logout.

1.6 Map Window

- The “*Map window”* [2] provides a map view of the area of interest.
- By default, the Map window displays the Open Street map view in the window.
- The Map window has the following components:

Zoom tool bar with +/- to zoom in or out button on the top Right side of the Map Window screen is highlighted by [A].	
Toggle full-screen is highlighted by [B].	
Fit to Extent is highlighted by [C].	

Change Base Map layer is highlighted by [D].	

1.7 Module Interface

By default, "*IOFS Module interface"* [2] is divided in five different Modules:

Flood Forecast	
Flash Flood Forecast	
Avalanche Forecast	
Drought Forecast	
Landslide Forecast	

Their respective functionalities are described in the subsections below:

2 Flood Forecast

2.1 Accessing the Flood Forecast

Click the Flood Forecast button within the “IOFS Module interface” [2] as shown in to display the “Flood Forecast” homepage (Figure 2-2).

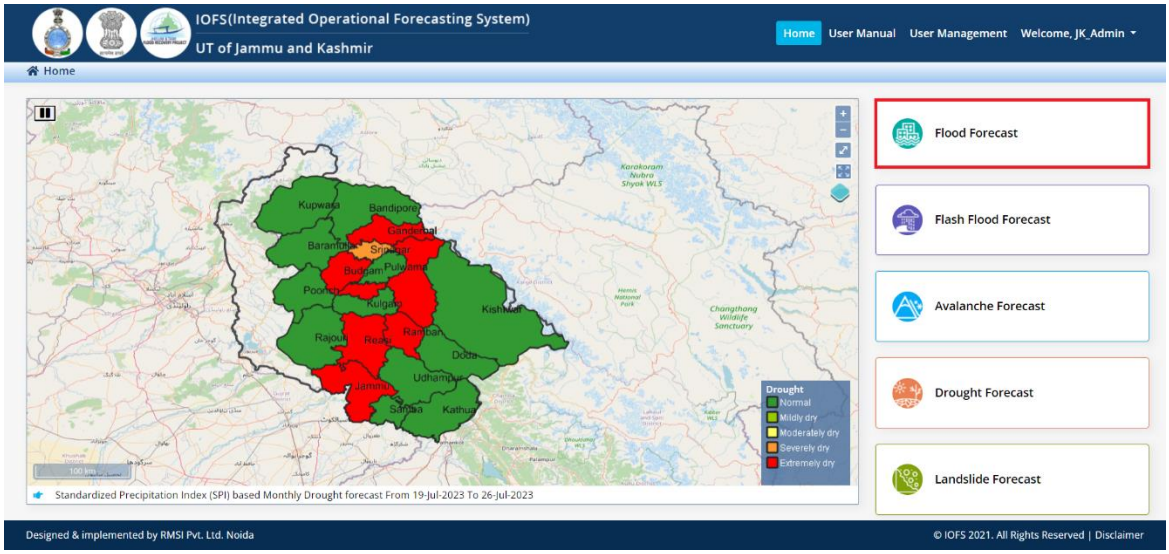


Figure 2-1: Flood Forecast module screen

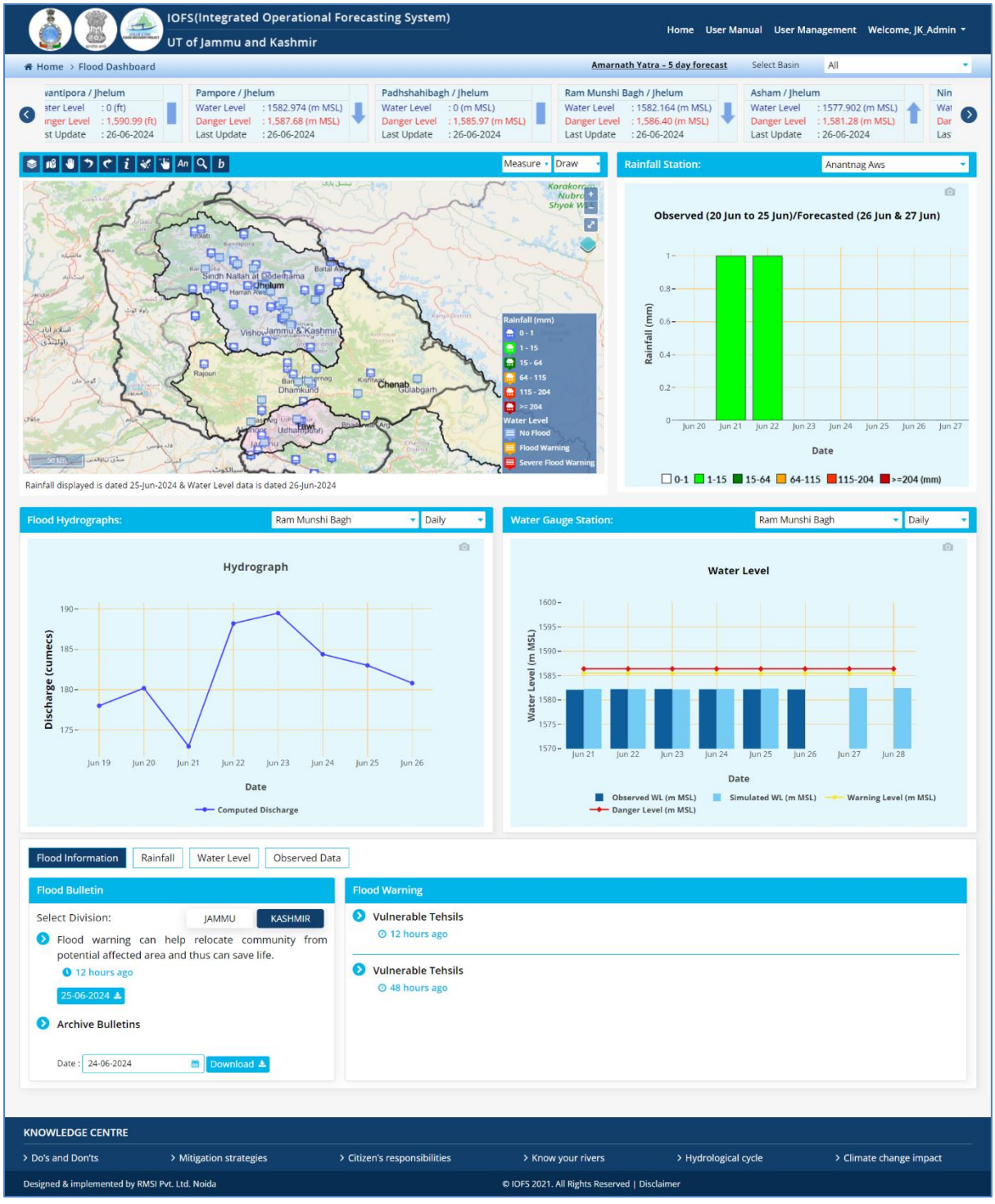


Figure 2-2: Flood Forecast homepage.

The Flood Forecast dashboard can be broadly divided into four different parts as shown in Figure 2-3.

- Amarnath Yatra-5 days Forecast, Select Basin and Trend panel [2-A]
- Flood Forecast Map Window [2-B]
- Station Data [2-C]
- Alert Window [2-D]

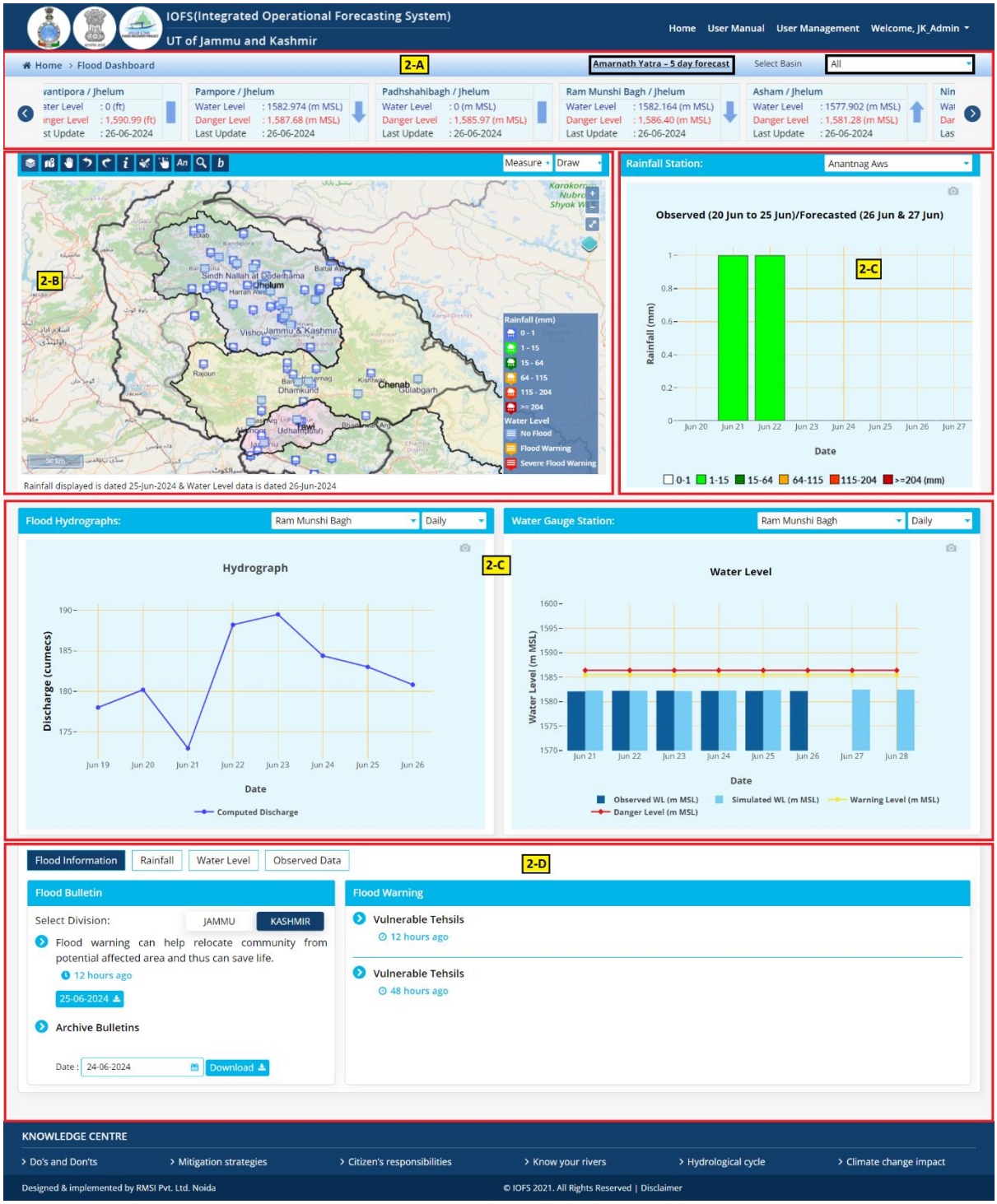


Figure 2-3: Flood Forecast Dashboard.

2.1.1 AMARNATH YATRA – 5 DAYS FORECAST

Click on the Amarnath Yatra – 5 days forecast link and application will redirect to the https://mausam.imd.gov.in/amarnath/ as shown in Figure 2-4.

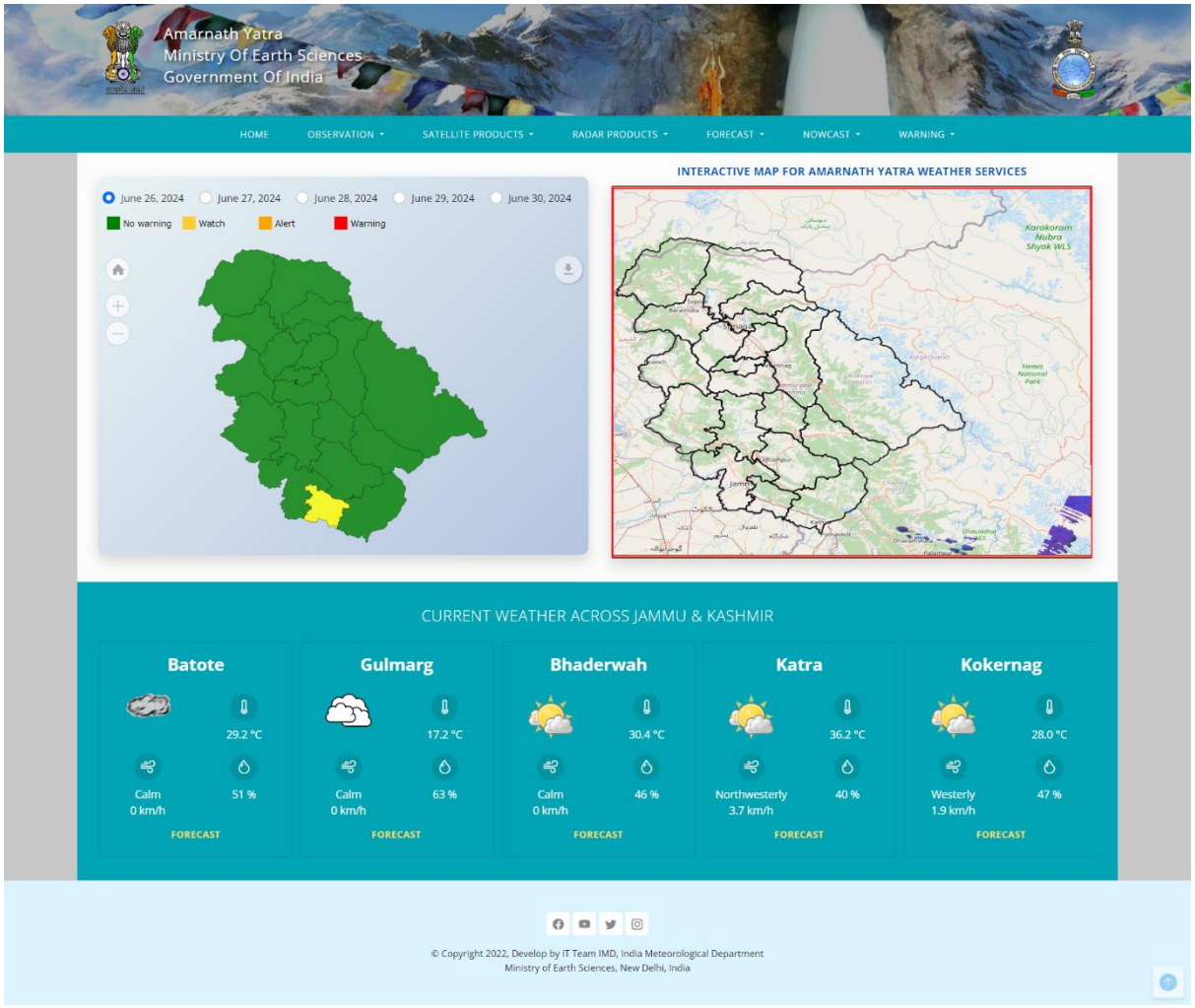


Figure 2-4: Amarnath Yatra 5-days forecast screen

2.1.2 SELECT BASIN

Select the basin from the dropdown and all the maps, trends and graphical data will be displayed as per the selection as shown in Figure 2-5.

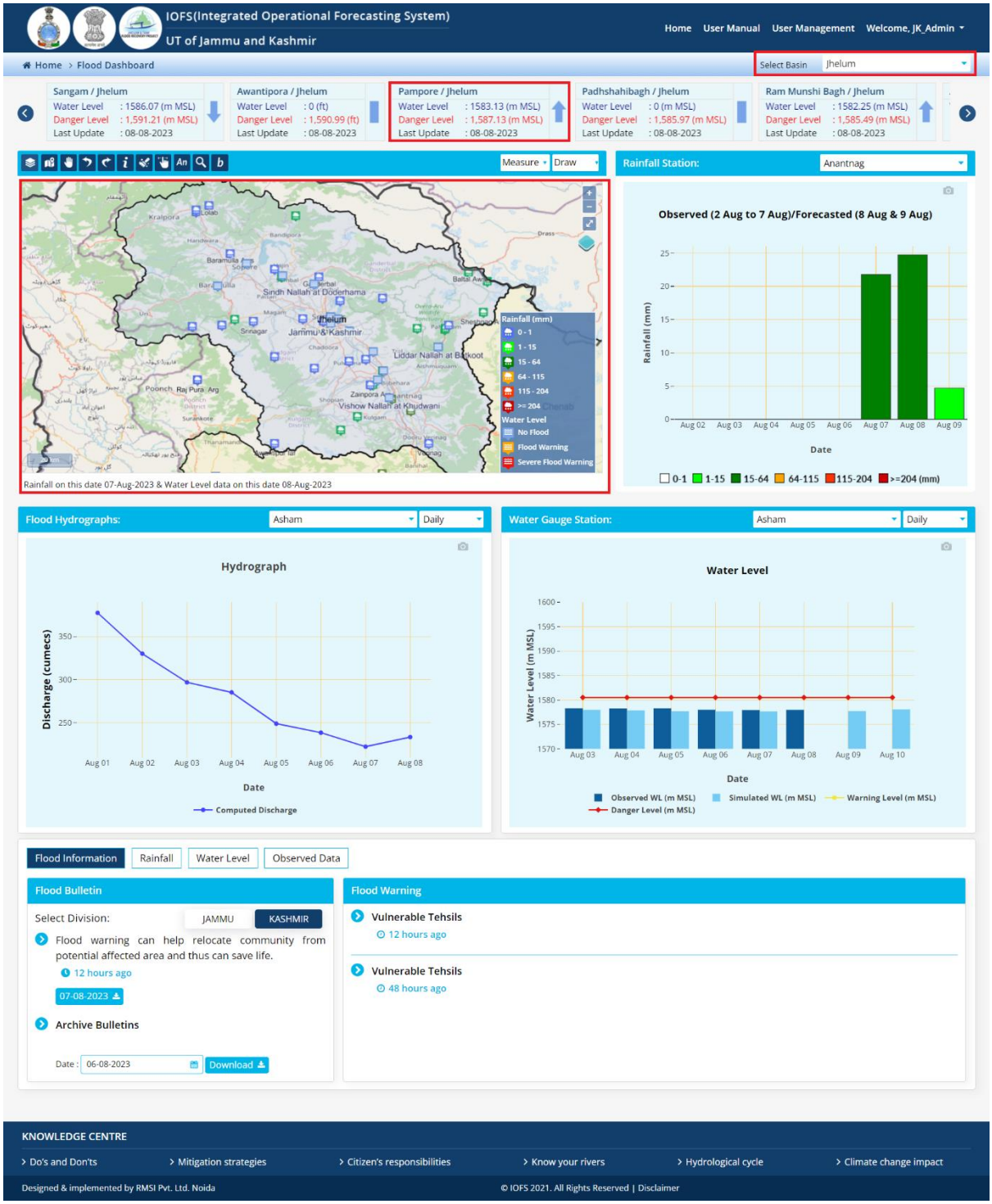


Figure 2-5: Basin selection screen

2.1.3 TREND PANEL

- Click on the water level trend link to display the water level data window page as shown in Figure 2-6.

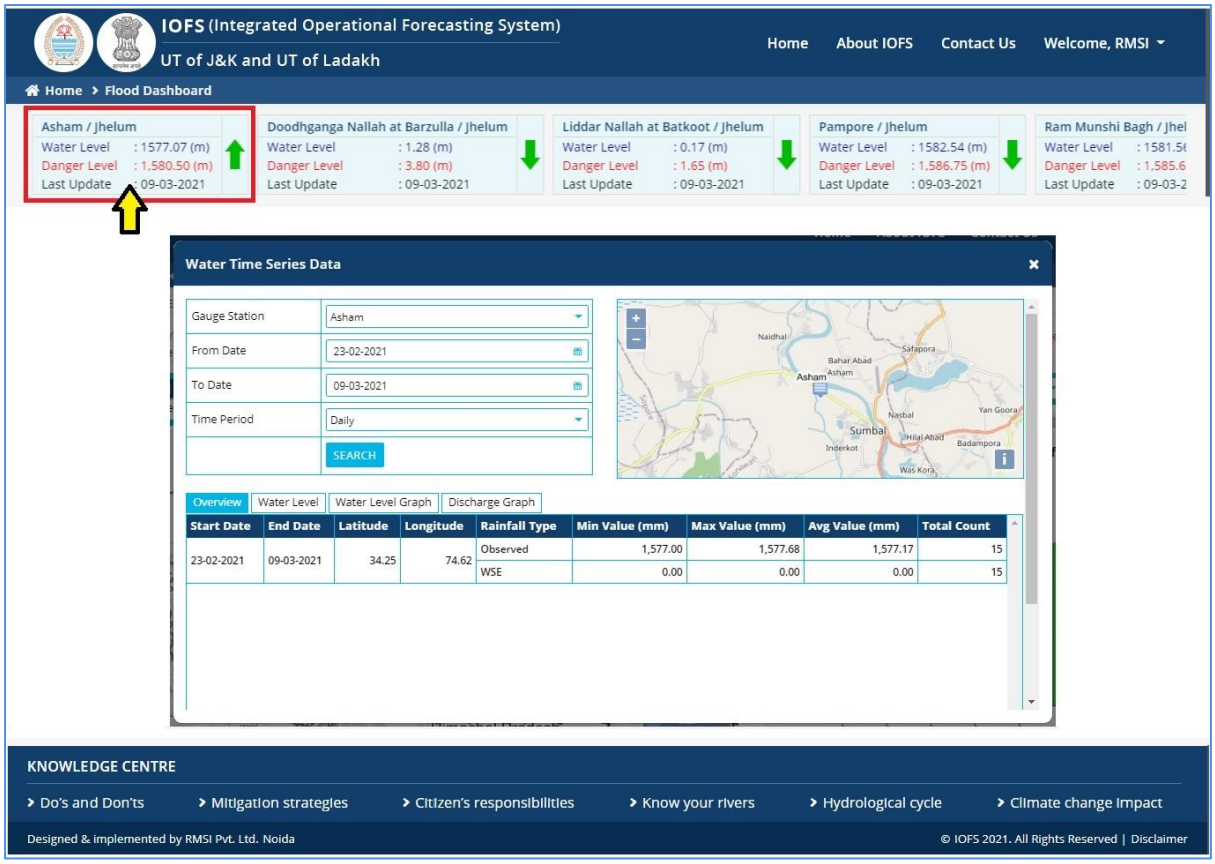


Figure 2-6: Water level time series screen

- Select any of the following *"Gauge Stations"* from the drop down list as shown in Figure 2-7.
- Click on the *"From Date" and "To Date"* options to select an initial and the final day of the monitoring period.

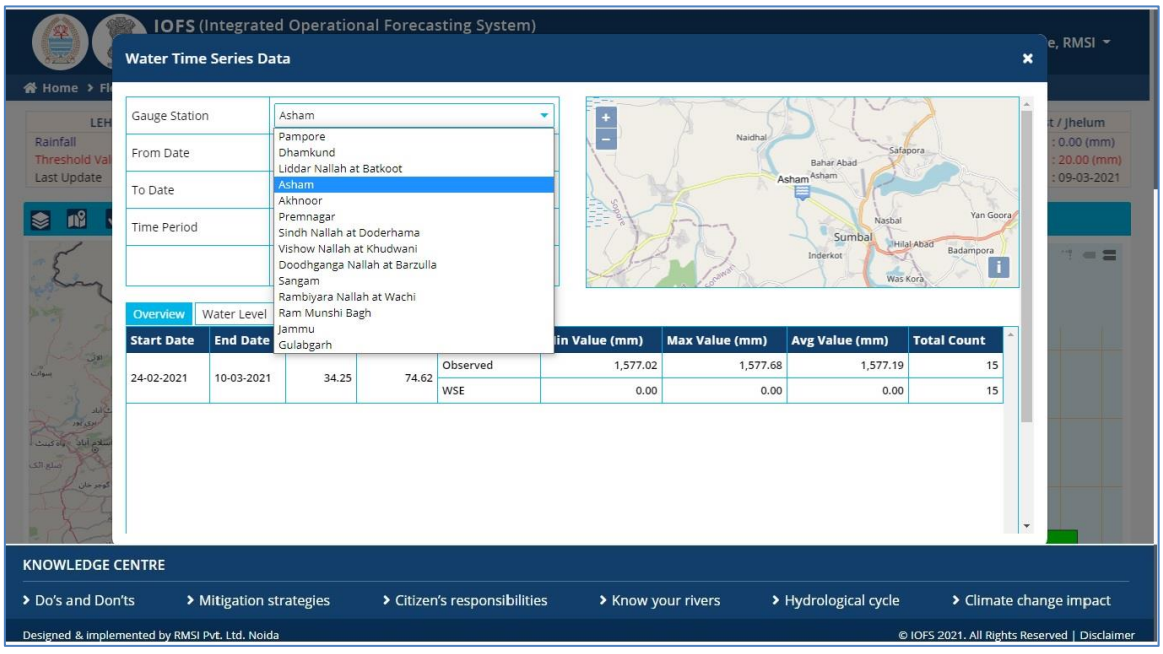


Figure 2-7: Gauge Station screen.

- User can then click on the *"Time period"* to select "Daily or Hourly option from the drop down list as shown in
- Click on *"Search"* button to view the monitoring results from the "*Overview" section as* shown in Figure 2-8.

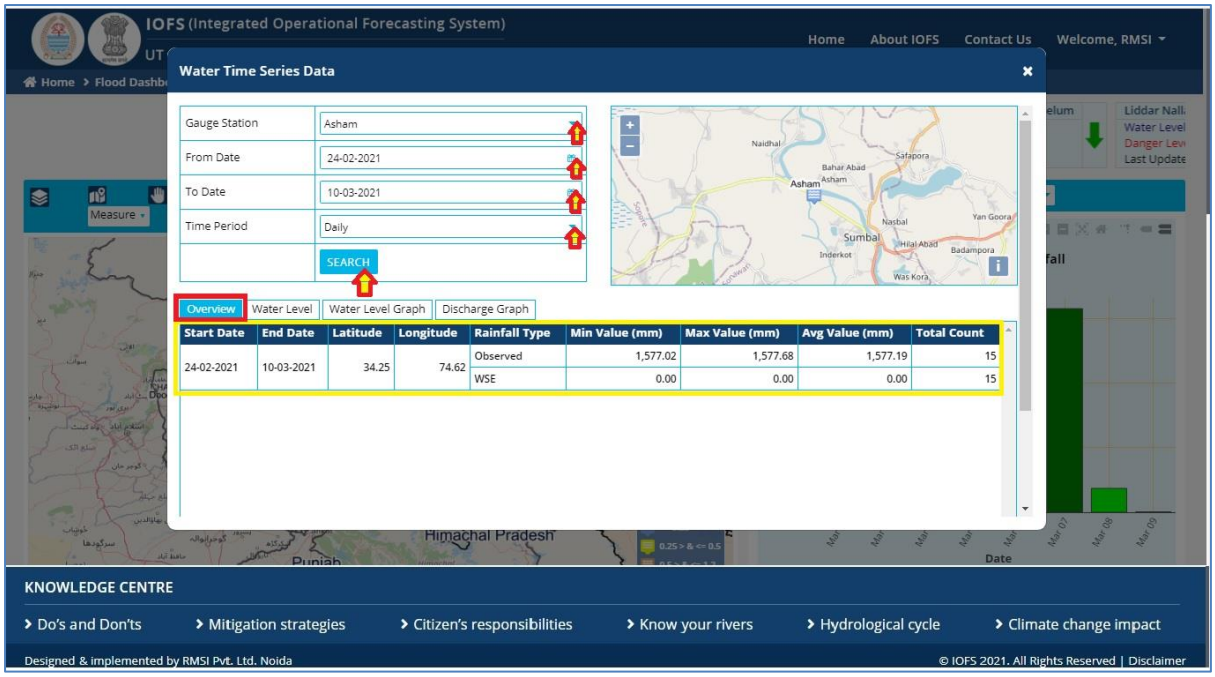


Figure 2-8: Overview screen.

- User can further scroll to other options i.e. "*Water Level", "Water Level Graph", and "Discharge Graph"* within the window to view the actual status of any selected gauge station. An example of *"Water level"* section is highlighted and shown in Figure 2-9.

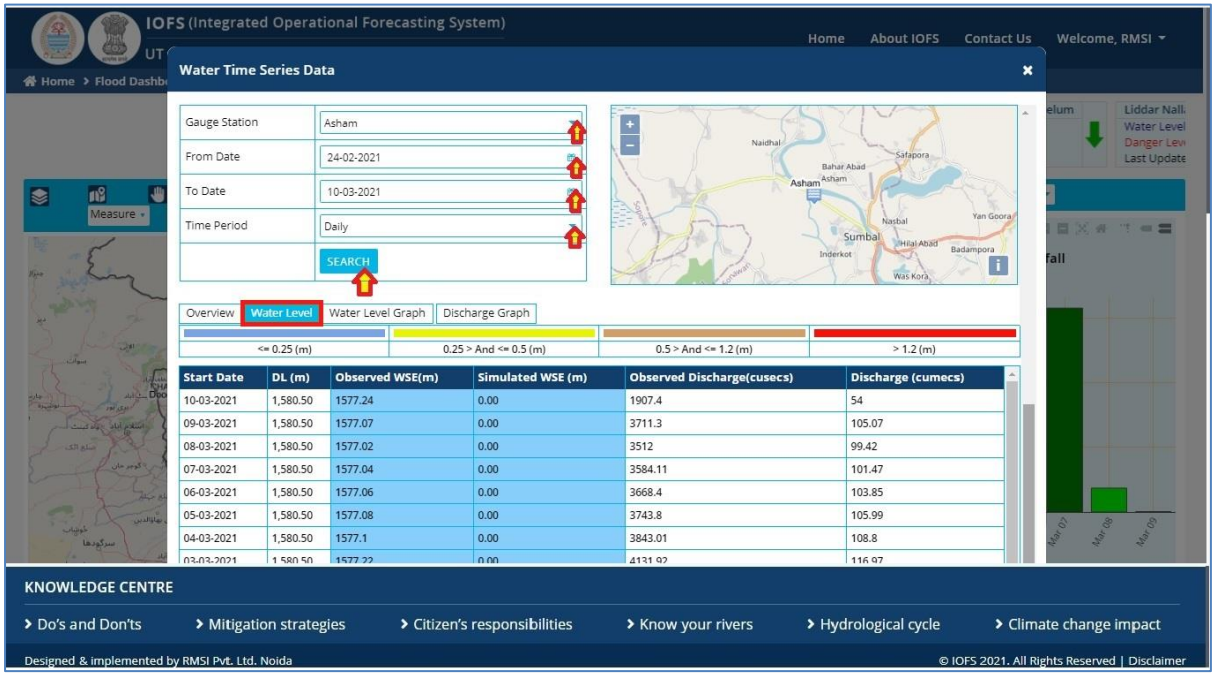
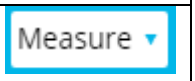


Figure 2-9: Water level screen.

2.1.4 FLOOD FORECAST MAP WINDOW

- The "*Flood Forecast Map window"* [2-B] as shown in Figure 2-10, provides a map view of the area of interest. By default, the Map window displays the Open Street map view in the window.
- The Map window has the following components or parts:

Database Layers button is highlighted by [1]	
Fit to Extent is highlighted by [2]	
Pan is highlighted by [3]	
Undo button is highlighted by [4]	
Redo is highlighted by [5]	
Information is highlighted by [6]	
Reset button is highlighted by [7]	
Layer Swipe Tool is highlighted by [8]	
Depth Animation is highlighted by [9]	
District Search is highlighted by [10]	
Create Buffer Area is highlighted by [11]	
Measure is highlighted by [12]	
Draw is highlighted by [13]	
Zoom tool bar with +/- to zoom in or out button on the top Right side of the Map Window screen is highlighted by [14].	
Toggle full-screen is highlighted by [15].	
Change Base Map layer is highlighted by [16].	

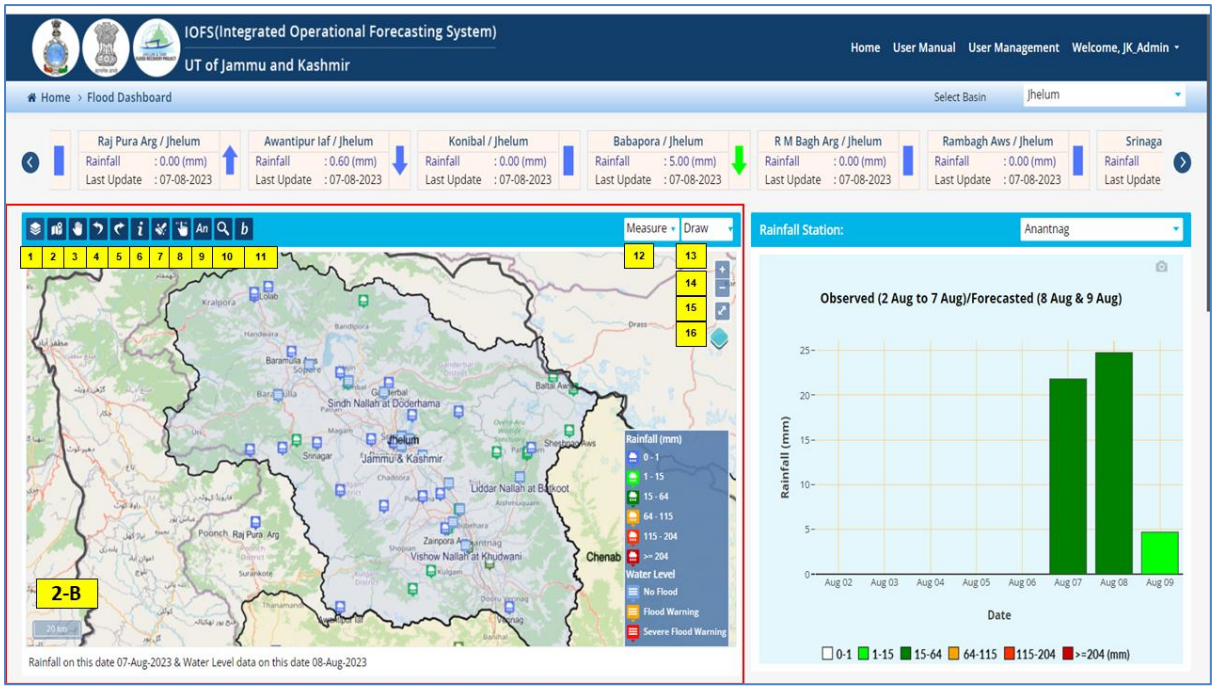


Figure 2-10: Flood Forecast screen.

Their respective functionalities are described in the subsections below:

2.1.5 DATABASE LAYERS

Database Layer window displays the following sub-layers as shown in Figure 2-11:

- Admin Boundary.
- Jhelum Basin.
- Chenab basin.
- Tawi Basin.
- Essential Facilities.
- Historical Floods.
- Hypothetical Event.
- Return Period.
- Buffer Analysis.

When a user clicks on the various checkboxes, corresponding to the layers, their thematic representation is displayed in the map window.

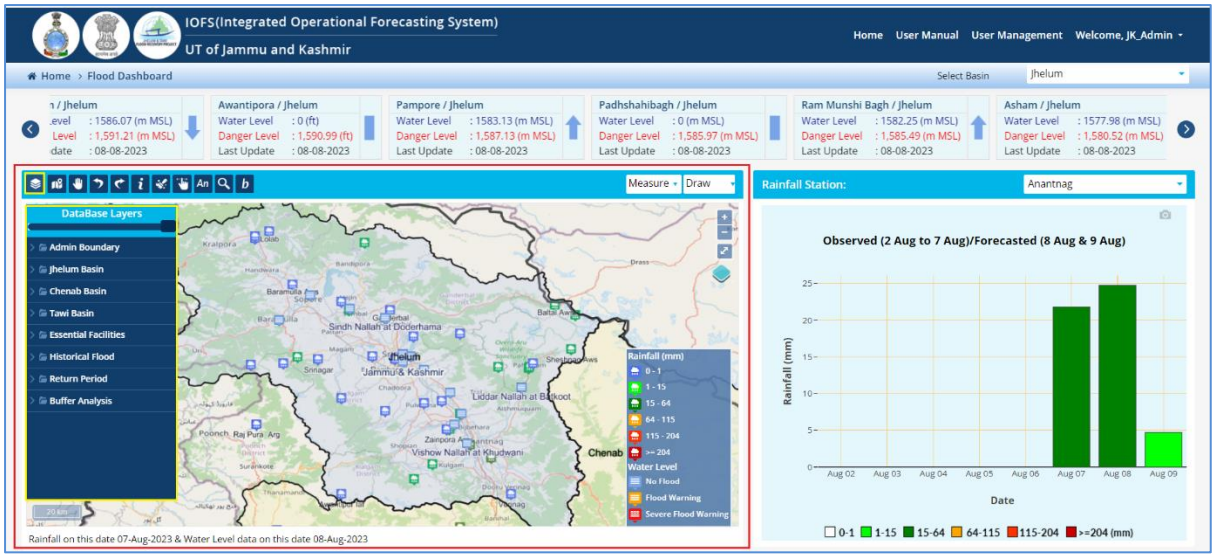


Figure 2-11: Database Layer screen.

2.1.6 ADMIN BOUNDARY

Users can select single or multiple checkboxes under “Admin” Layer as highlighted by a red box as shown in to display the corresponding layers as shown in Figure 2-12.

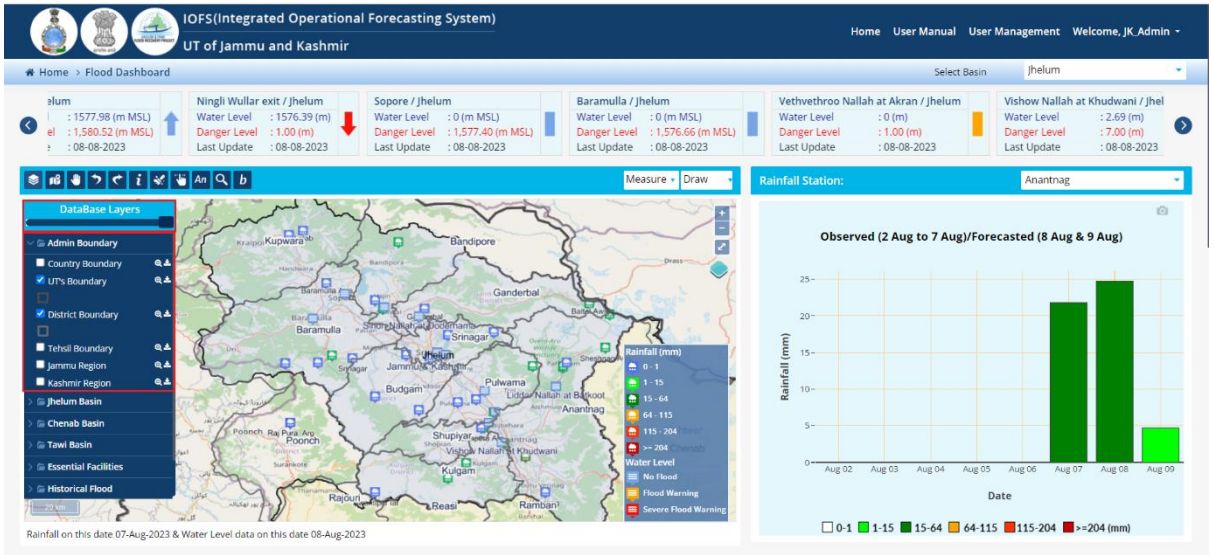


Figure 2-12: Admin Boundary screen.

2.1.7 BASIN LAYERS

2.1.7.1 Jhelum Basin

Click on the *“Sub basin”* layer within the *“Database layers”* section to display the entire Jhelum sub-basin as shown in Figure 2-13.

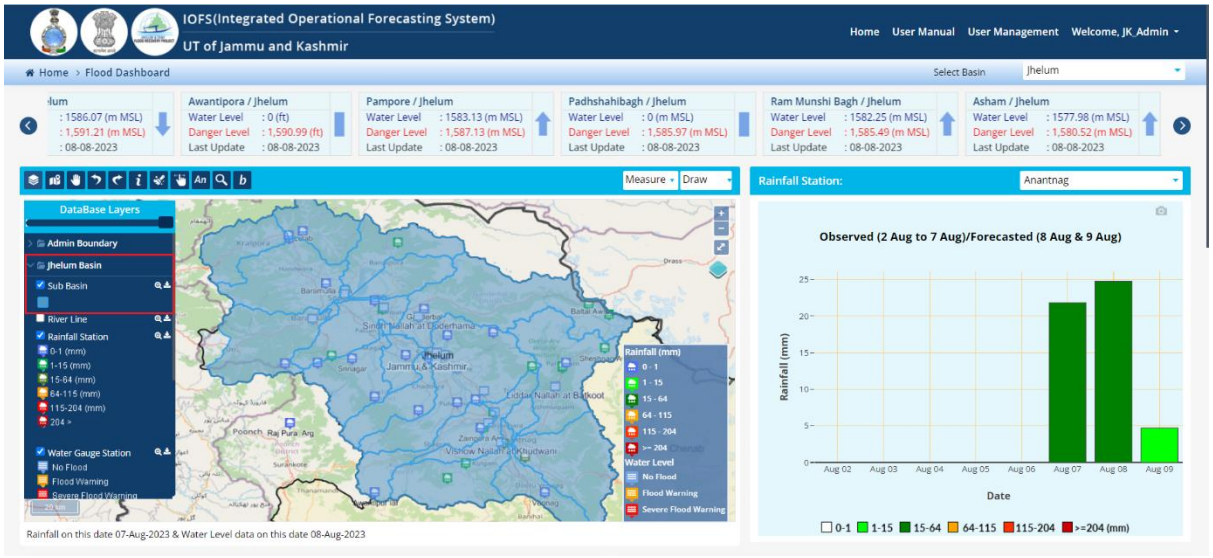


Figure 2-13: Sub basin layer screen.

Select on the *"River line"* layer to view the *"Main River"* and *"Tributary"* of the Jhelum sub basin as shown in Figure 2-14.

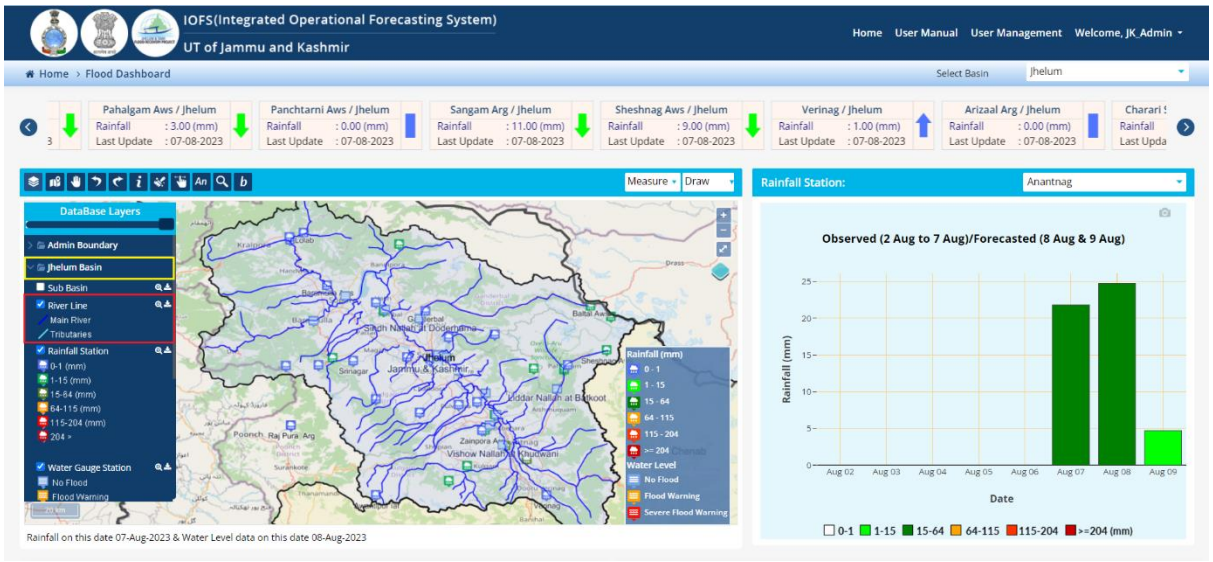


Figure 2-14: River line screen.

Click on the *"Rainfall Station"* layer within the *"Database layer"* section to view all the rainfall-monitoring stations of the Jhelum sub-basin as shown in Figure 2-15

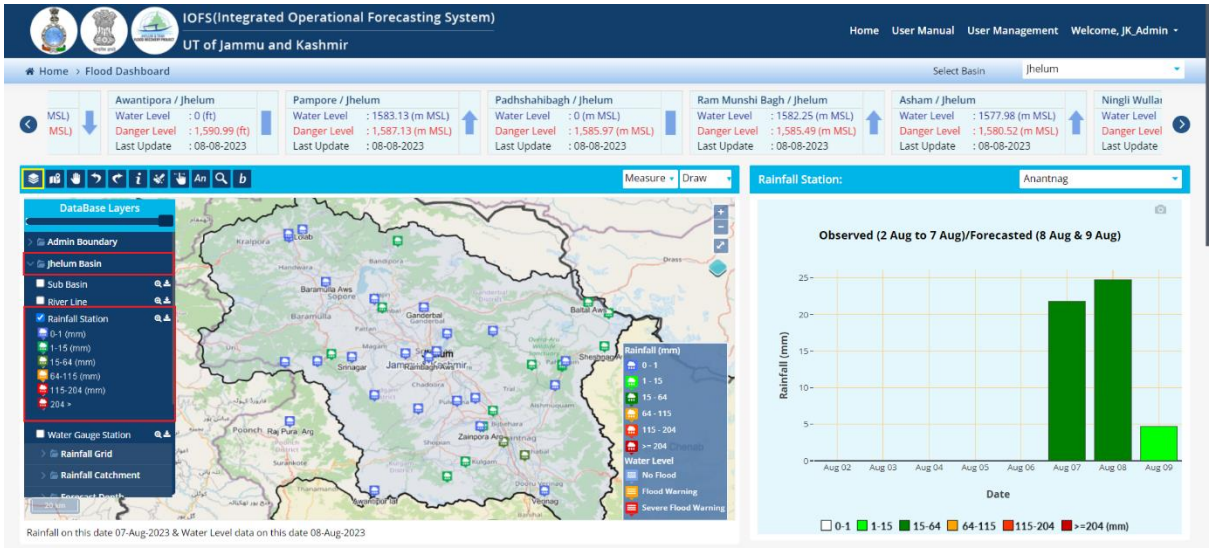


Figure 2-15: Rainfall Station screen.

Click on the *"Water Gauge Station"* layer within the *"Database layer"* section to view all the water gauge monitoring stations of the Jhelum sub-basin as shown in Figure 2-16.

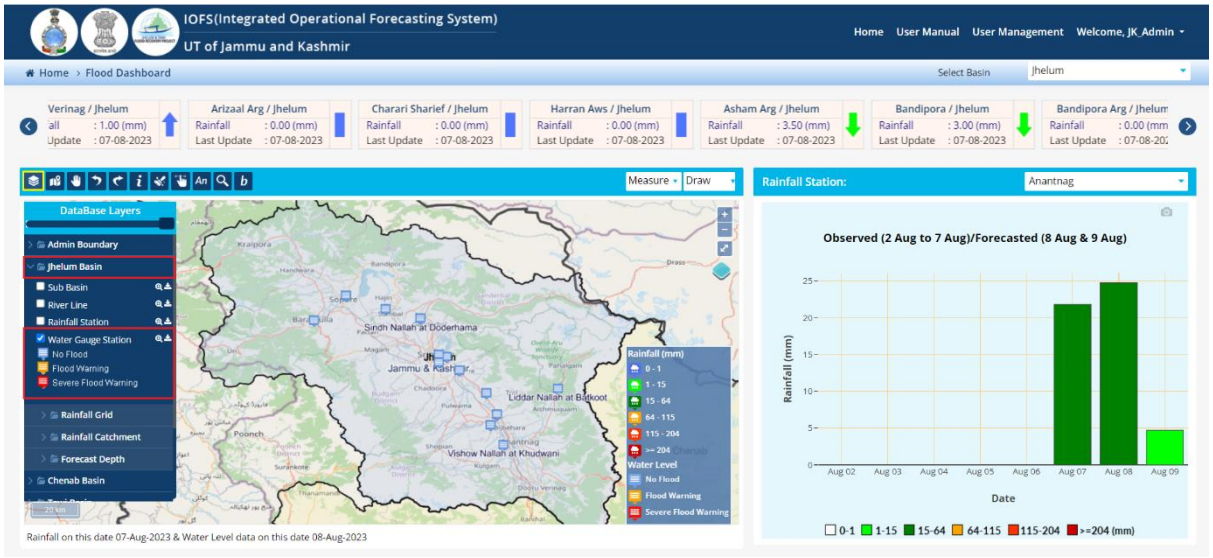


Figure 2-16: Water Gauge station screen.

Click on the *"Rainfall Grid"* layer within the *"Database layer"* section to view the four-day rainfall forecast in the Jhelum sub-basin as shown in Figure 2-17.

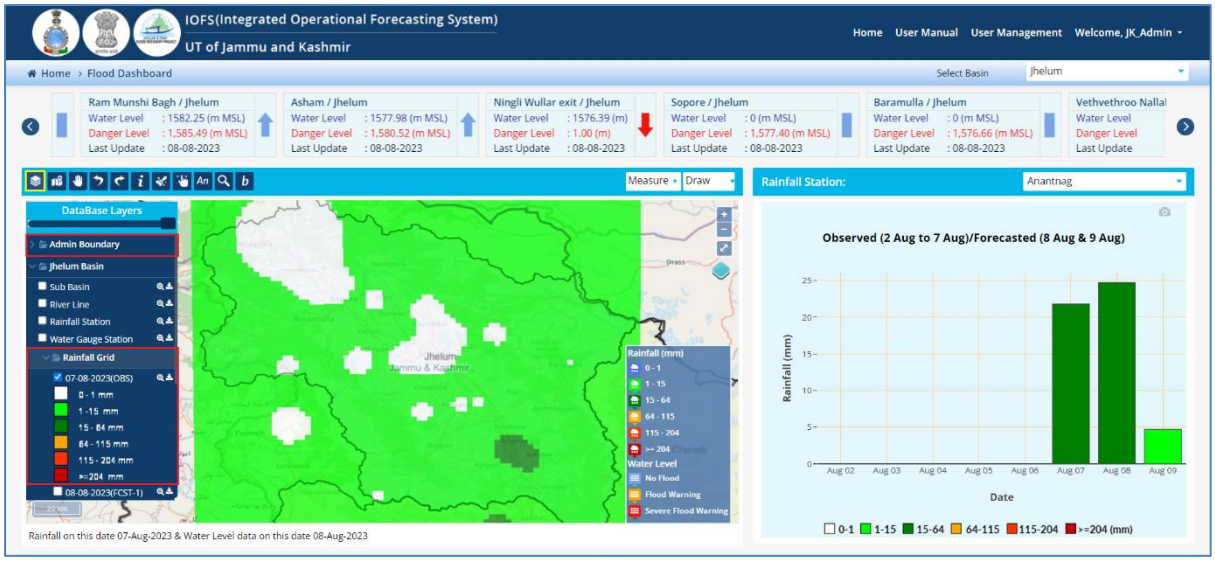


Figure 2-17: Rainfall Grid screen.

Click on the *"Rainfall Catchment"* layer within the *"Database layer"* section to view the four day rainfall forecast in each of the catchments of the Jhelum sub-basin as shown in Figure 2-18.

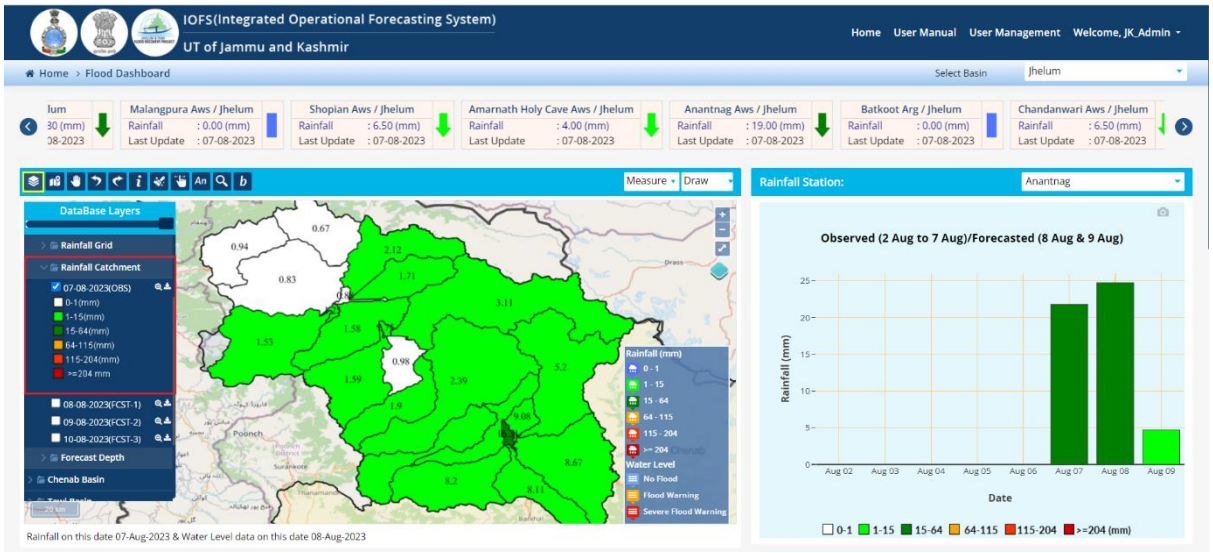


Figure 2-18: Rainfall Catchment screen.

Click on the *"Forecast depth"* layer within the *"Database layer"* section to view the four day forecast depth in the Jhelum sub-basin as shown in Figure 2-19.

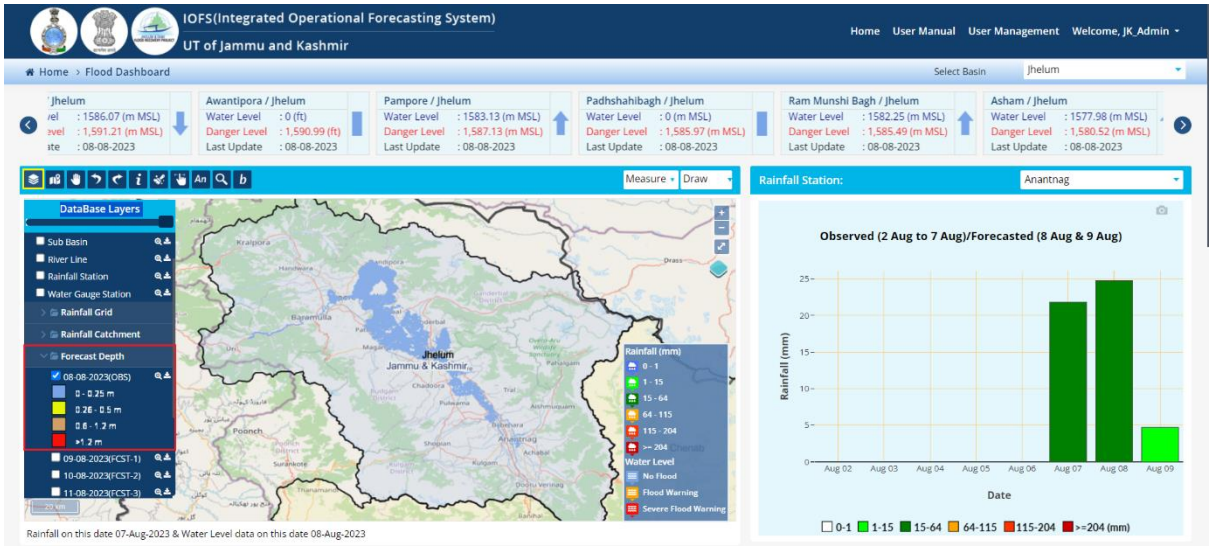


Figure 2-19: Forecast Depth screen.

2.1.8 ESSENTIAL FACILITIES

Users can select single or multiple checkboxes under *"Essential Facilities"* Layer as highlighted by a red box as shown in Figure 2-20 to display the corresponding layers such as School, Hospital, Police Station, Fire Station, and Religious Place.

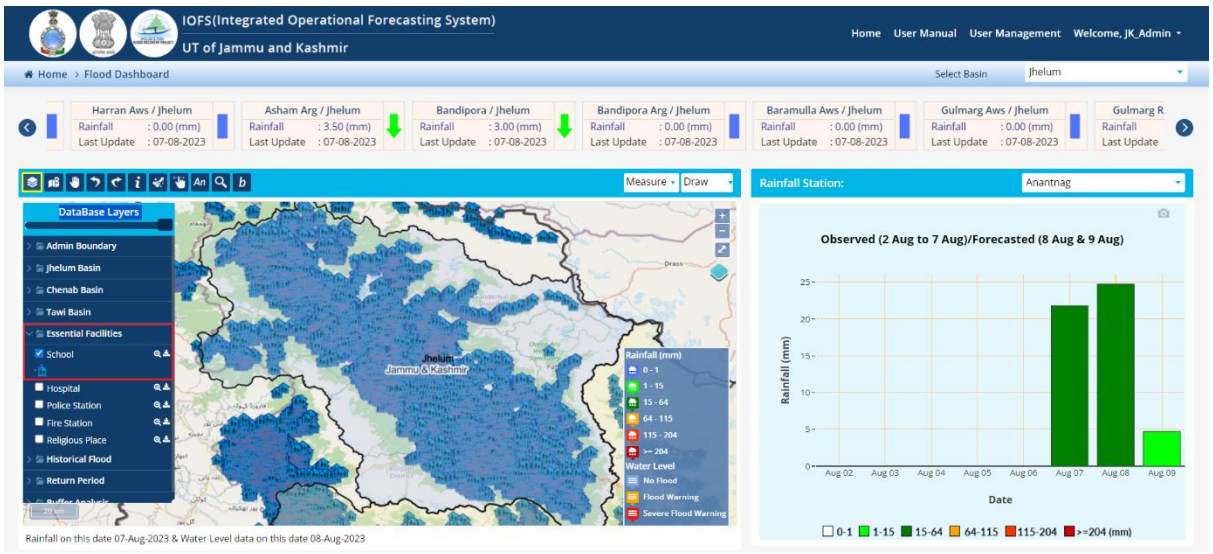


Figure 2-20: Essential Facilities screen.

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2.1.9 HISTORICAL FLOOD

Users can select the *"September 2014 event"* checkbox under *"Historical Flood"* Layer as highlighted by a red box as shown in Figure 2-21 to display the corresponding layer.

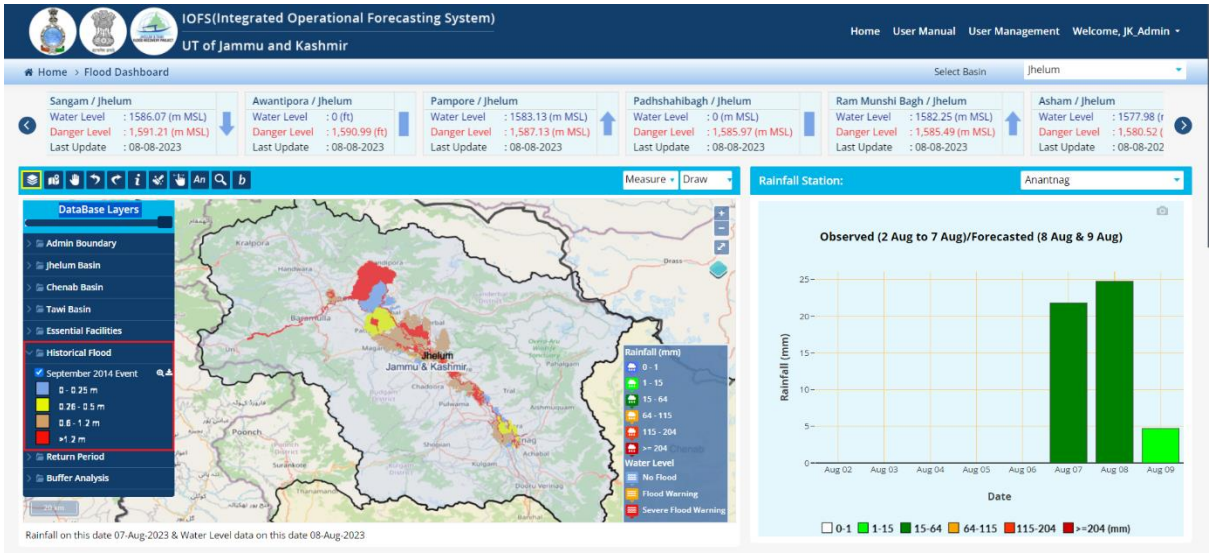


Figure 2-21: Historical Flood screen.

2.1.10 HYPOTHETICAL EVENT

Users can select the *"60K Sangam"* checkbox under *"Hypothetical Event"* Layer as highlighted by a red box as shown in Figure 2-22 to display the corresponding layer.

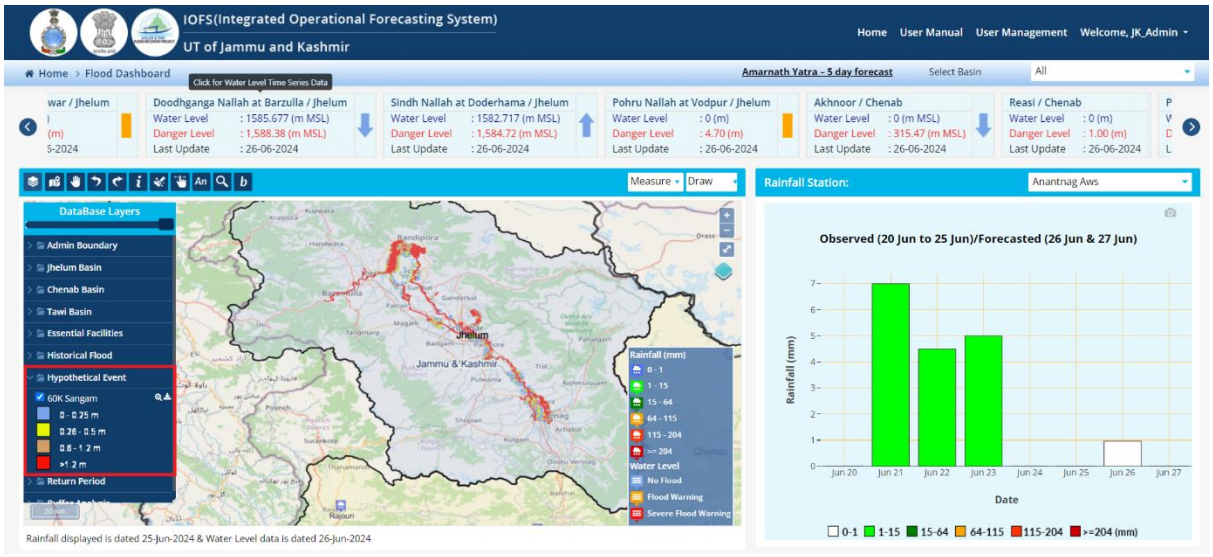


Figure 2-22: Hypothetical Event screen.

2.1.11 RETURN PERIOD

Users can select single or multiple checkboxes under *"Return Period"* Layer as highlighted by a red box as shown in Figure 2-23 to display the corresponding layers.

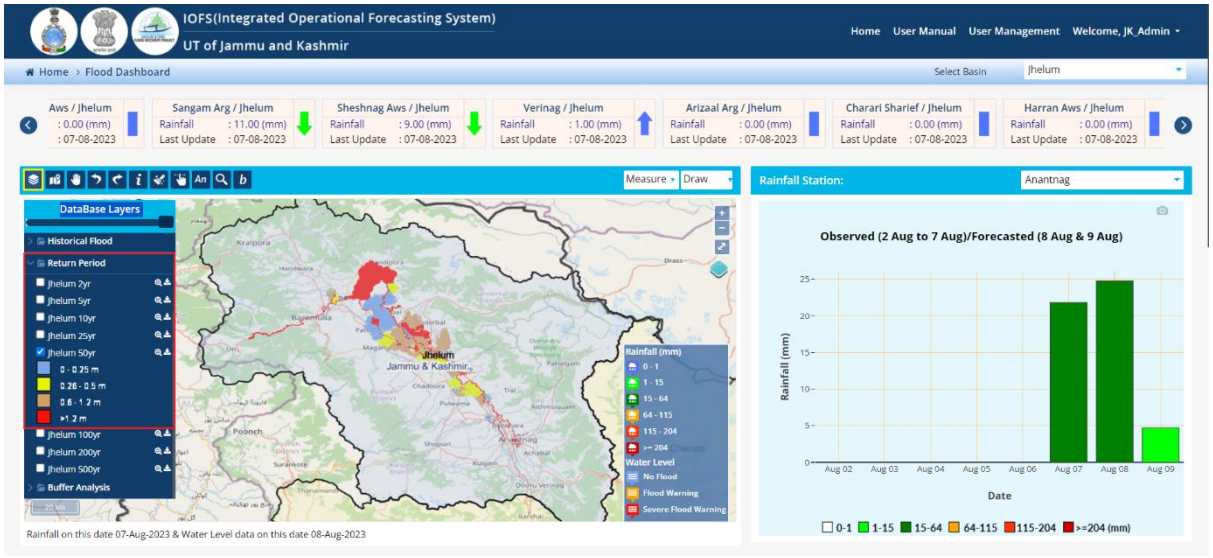


Figure 2-23: Return Period screen.

2.1.12 BUFFER ANALYSIS

Users can select single or multiple checkboxes under *"Buffer Analysis"* Layer as highlighted by a red box as shown in Figure 2-24 to display the corresponding layers.

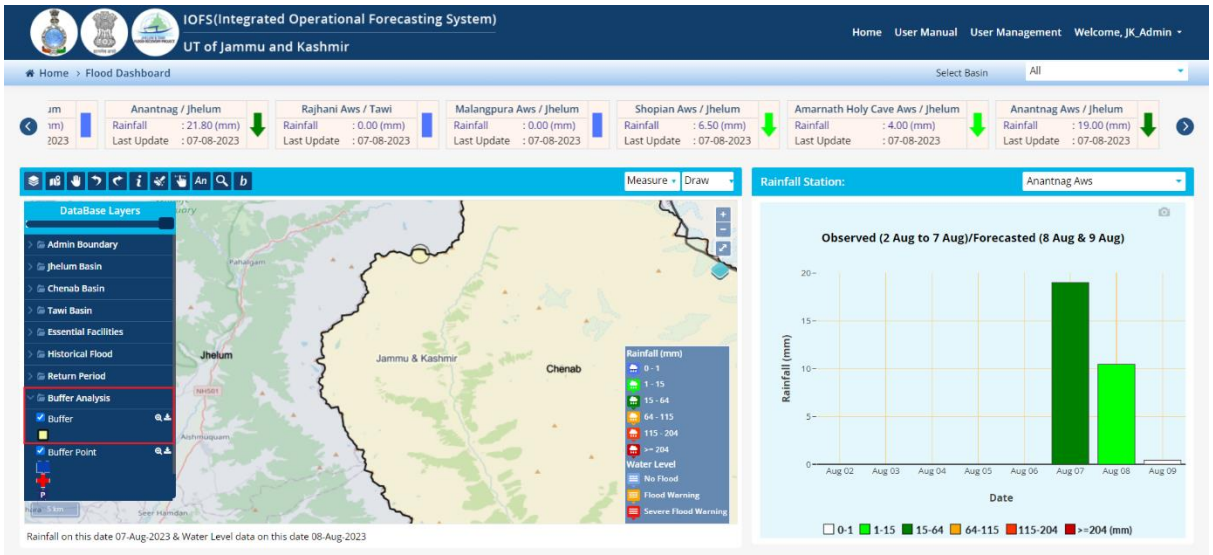


Figure 2-24: Buffer Analysis screen.

2.1.13 FIT TO EXTENT

Click on *"Fit to Extent"* icon to display the map on full screen as shown in Figure 2-25.

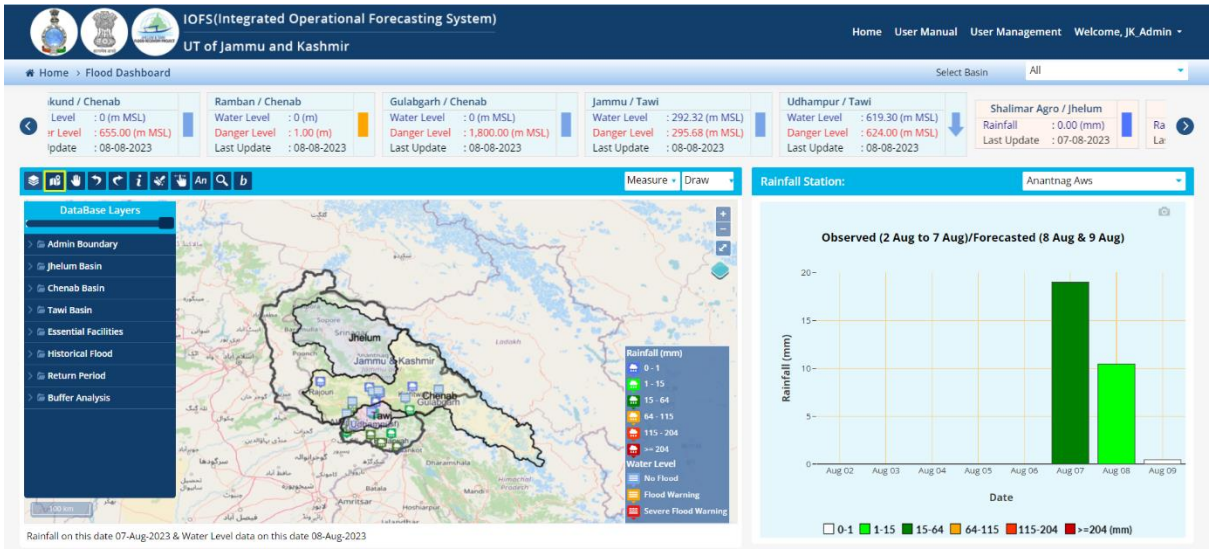


Figure 2-25: Fit to Extent screen.

2.1.14 PAN

Click on *"PAN"* icon to move the mouse pointer over the map display as shown in Figure 2-26.

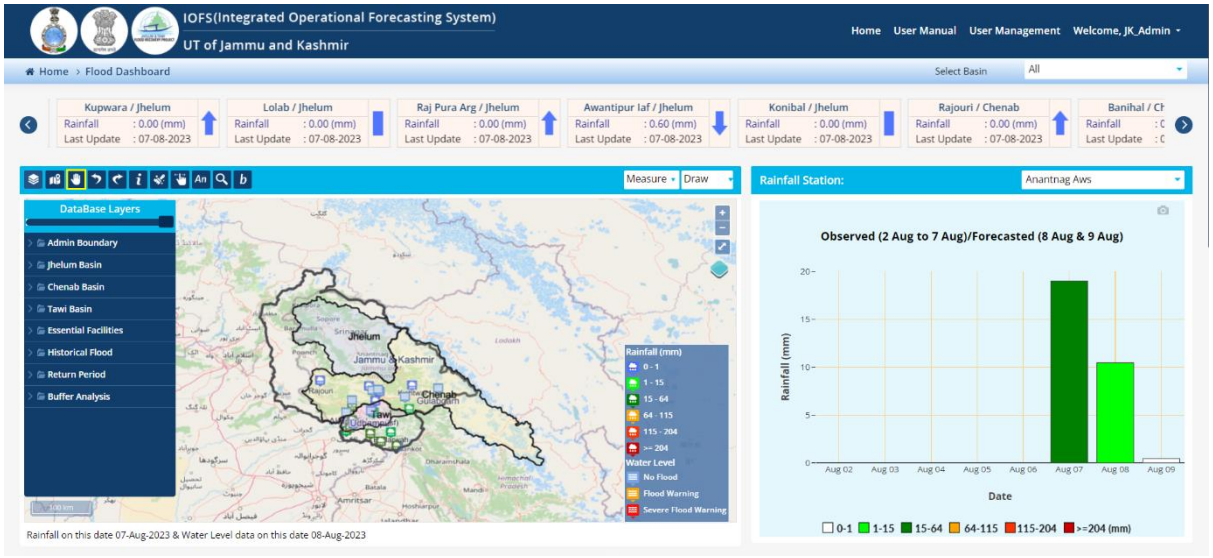


Figure 2-26: PAN screen.

2.1.15 UNDO

Click on *"Undo"* icon to undo the most recent single action.

To draw any polygon or circle on the map

- Click on the *"Draw"* tool in the map window.
- Select any one of the options *"Polygon"* or *"Circle"*.
- Right click & drag the pointer to cover the required area as shown in Figure 2-27

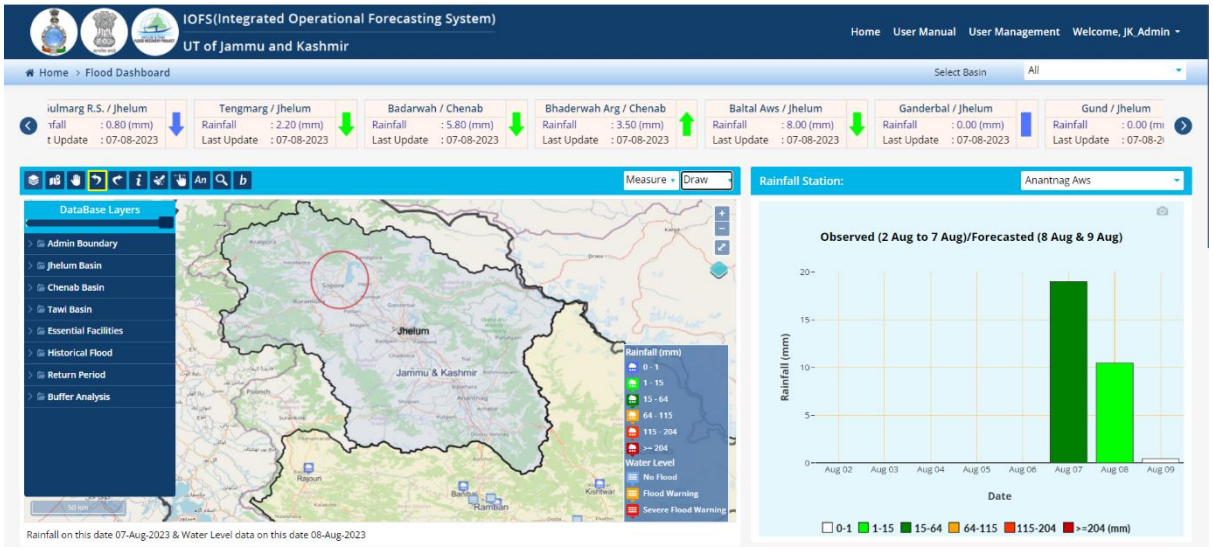


Figure 2-27: Circle screen.

- To clear the map window click on *"Undo"* icon as shown in Figure 2-28

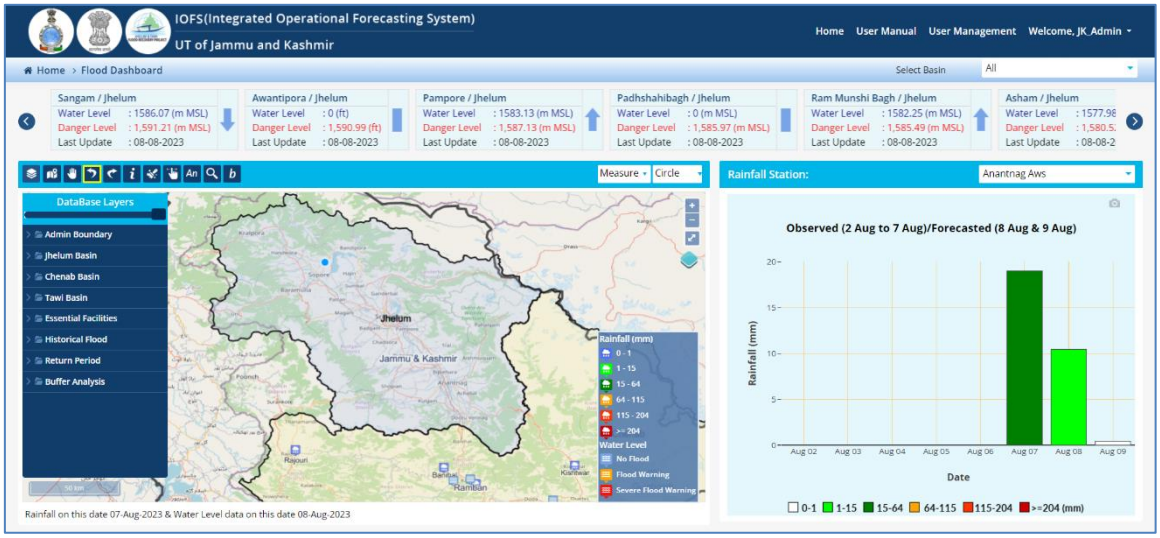


Figure 2-28: Undo screen.

2.1.16 REDO

Click on *"Redo"* icon to redo something you have undone as shown in Figure 2-29.

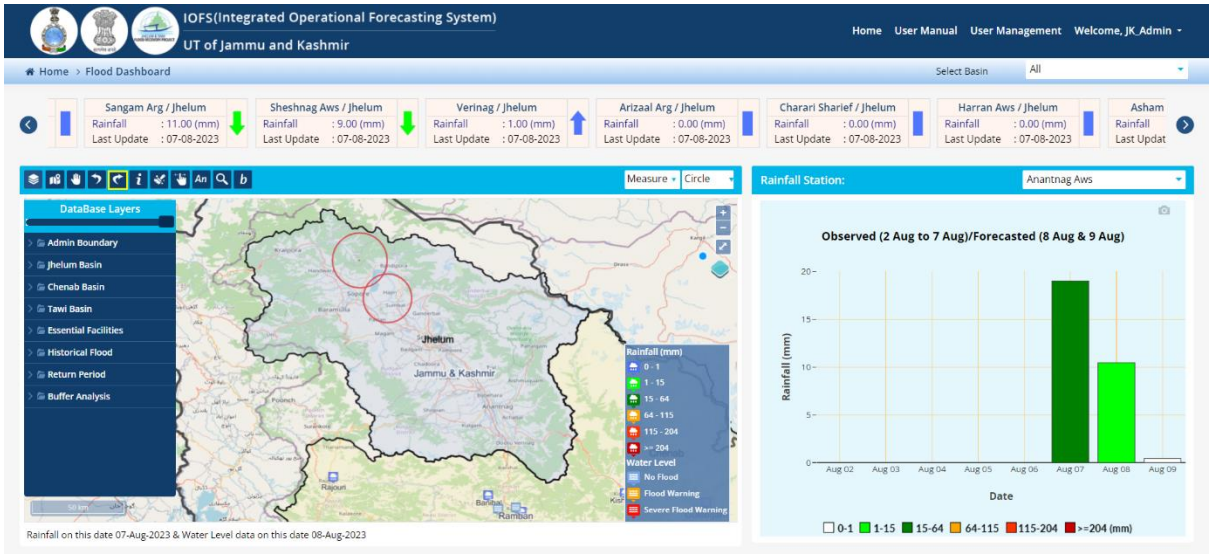


Figure 2-29: Redo screen

2.1.17 INFORMATION

The *"Information"* icon provides the information about the layers, which are mapped, on the map window as shown in Figure 2-30.

- Click on the *"Information"* icon.
- Then click on any layer on the map to get the information about that layer.
- This displays a small window showing the various attributes.

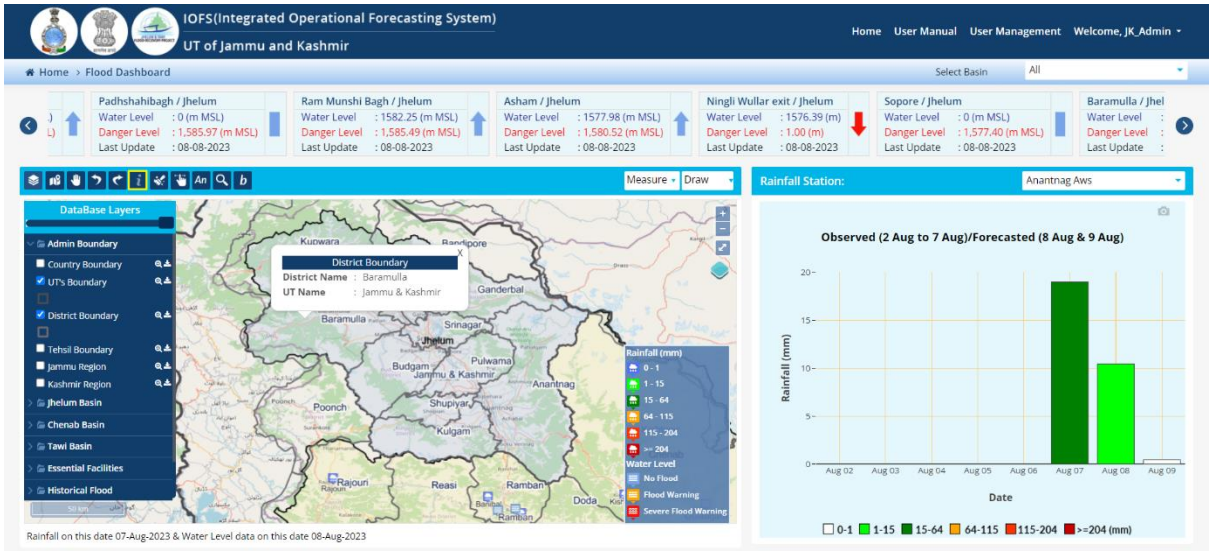


Figure 2-30: Information screen.

2.1.18 RESET

Click on the *"Reset"* icon to clear the map window as shown in Figure 2-31.

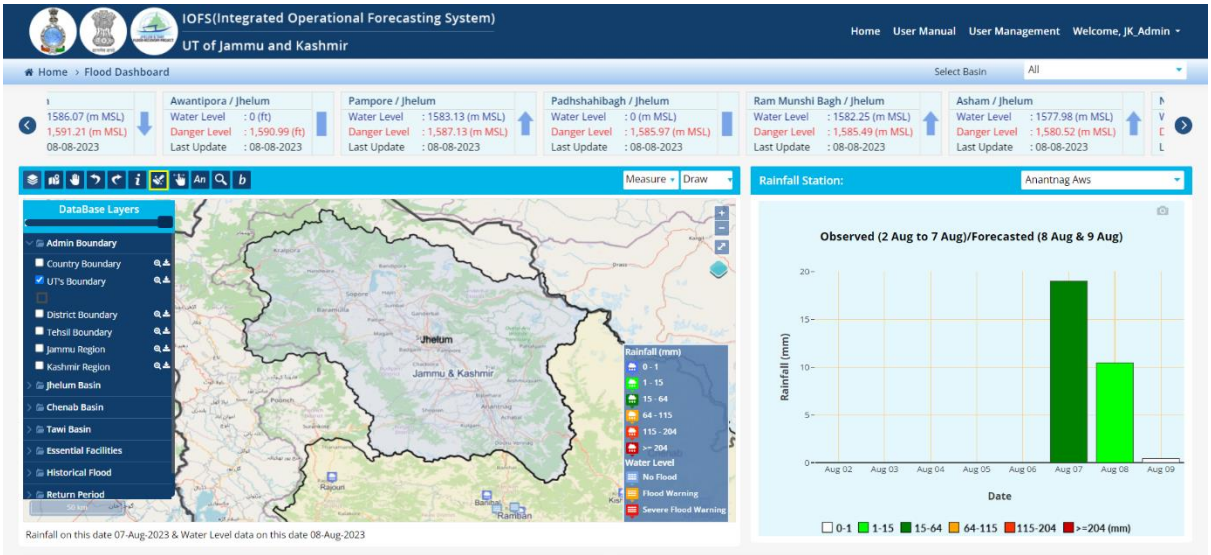


Figure 2-31: Reset screen.

2.1.19 LAYER SWIPE TOOLS

You can use the *"Layer Swipe tools"* to interactively compare two maps within the same area by revealing a layer underneath the map. As you drag and move the vertical bar between the two maps, the selected swipe layer is revealed on one side of the map and hidden on the other.

The swipe layer can either be an image or map layer.

- Click on the *"Layer Swipe Tools"* icon as highlighted in yellow.
- Click on and drag the swipe bar left and right to reveal a layer on the left side of the map.
- An example of Rainfall grid & Rainfall Catchment layer is shown in Figure 2-32.

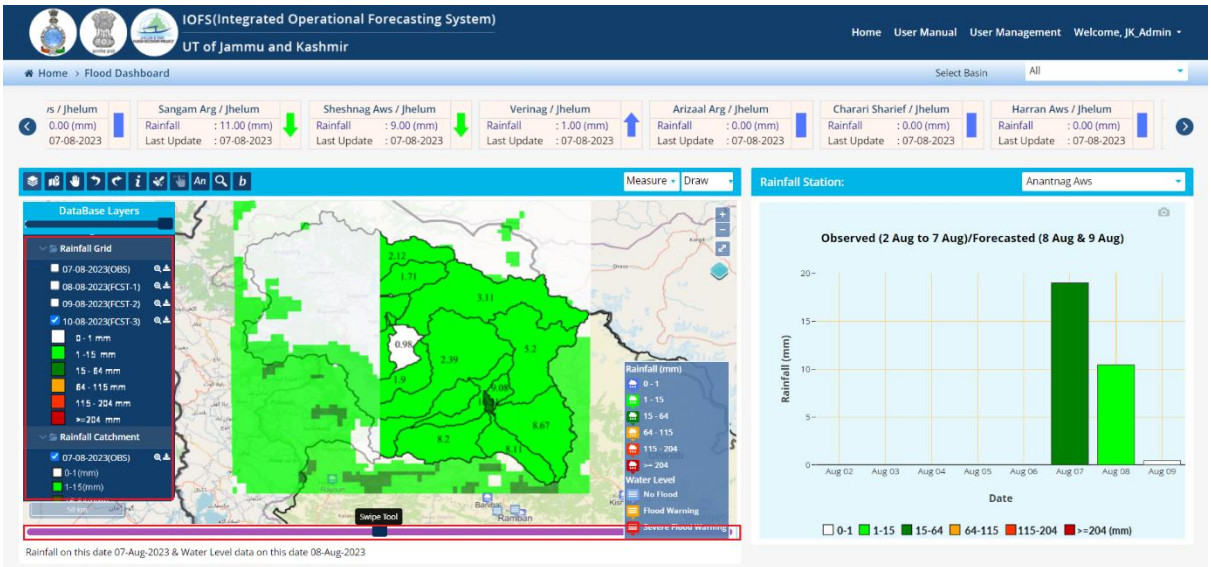


Figure 2-32: Layer Swipe Tool screen.

2.1.20 DEPTH ANIMATION

Animations allow you to effectively visualize and analyze your data by changing display properties of layers.

- Click on the *"Depth Animation"* icon as highlighted in yellow.
- Select a Basin using the drop down menu as shown in Figure 2-33 and press OK.

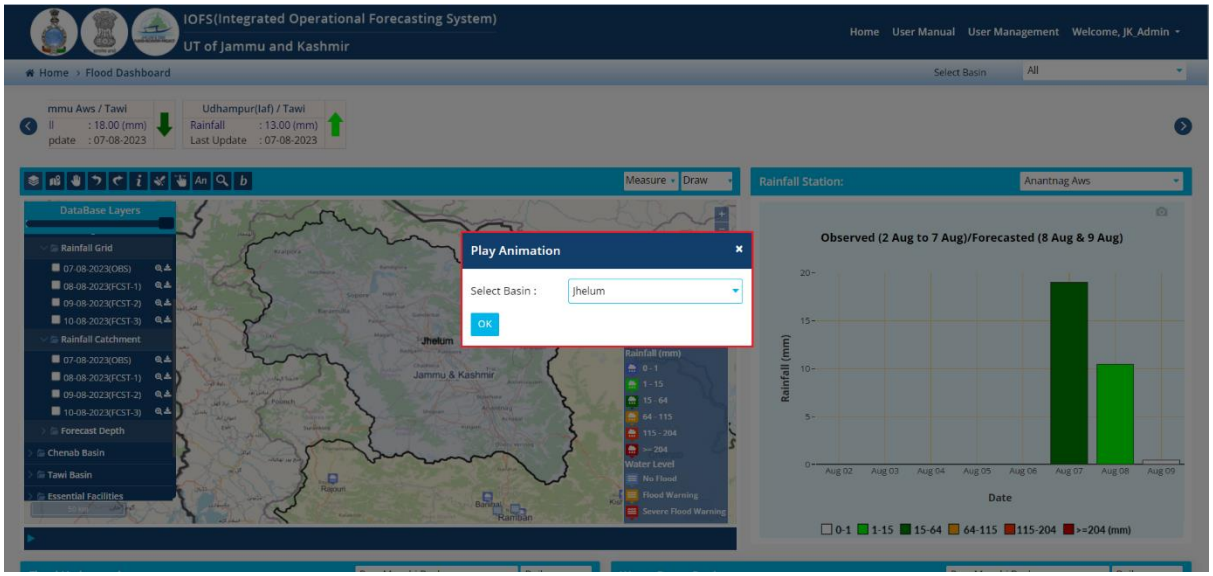


Figure 2-33: Depth Animation basin screen.

- The *"Depth Animation"* viewer is visible at the bottom of the map window as shown in Figure 2-34.
- Finally, press Start to run the *"Depth Animation"*.

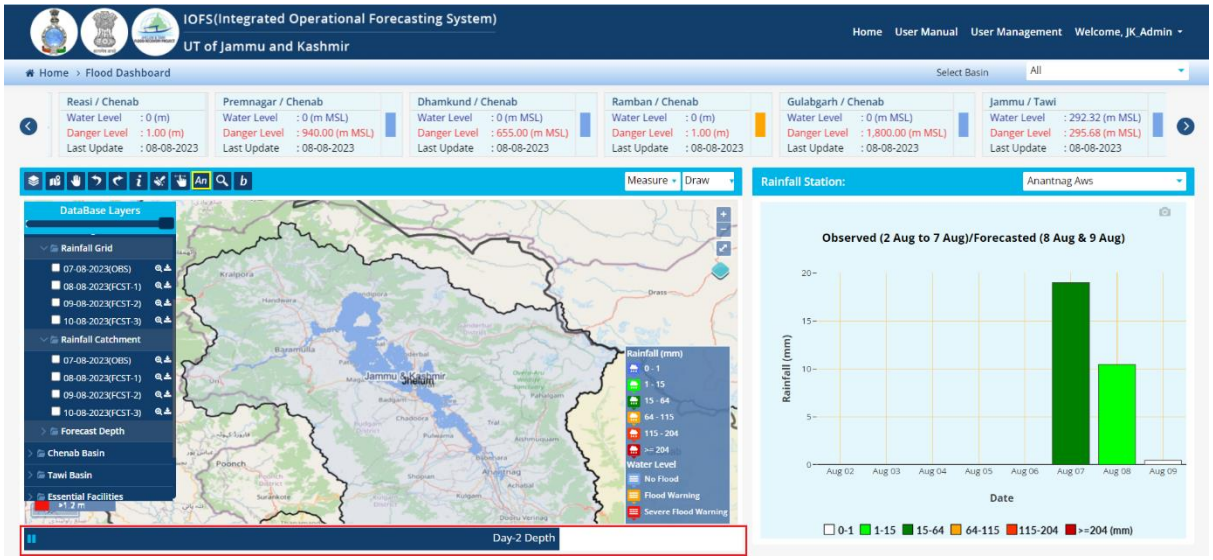


Figure 2-34: Depth Animation screen

2.1.21 DISTRICT SEARCH

Users can click on the *"District Search"* icon to analyze the flood levels in any particular district of the UT.

- Click on the "*"District Search"* icon as highlighted in yellow.

- Select the *"Flood Level"* option using the drop down menu as shown in Figure 2-35 .

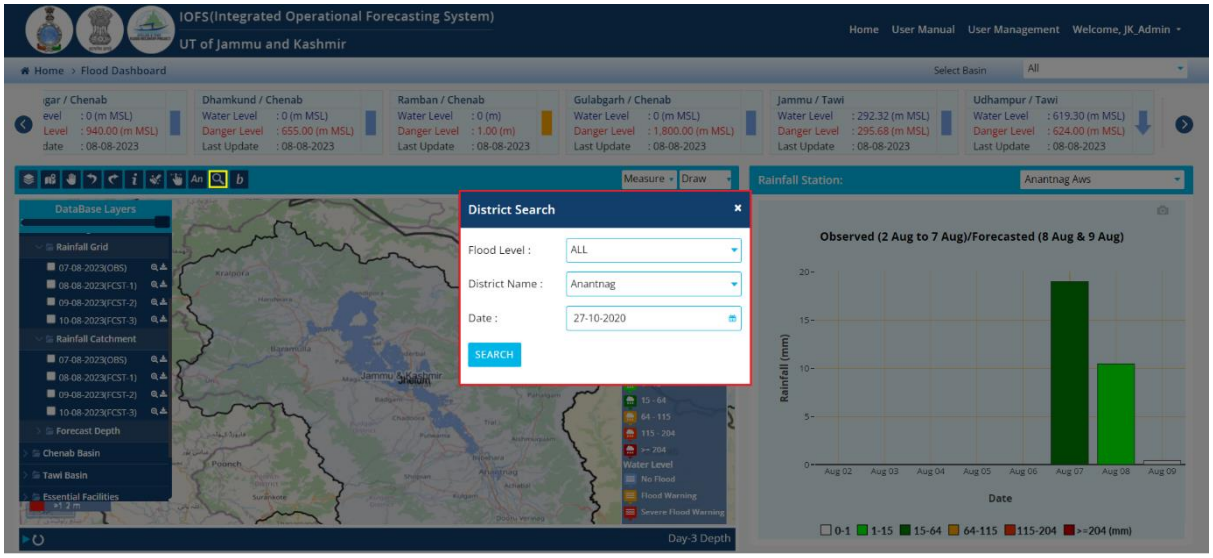


Figure 2-35: Flood Level screen.

- Click on the *"District Name"* and select the *"Time"*.
- Finally, press Search.
- User can also download the *"Tehsil Depth Info"* by clicking on the *"Export Report"* button on the bottom of the map window.as shown in Figure 2-36.

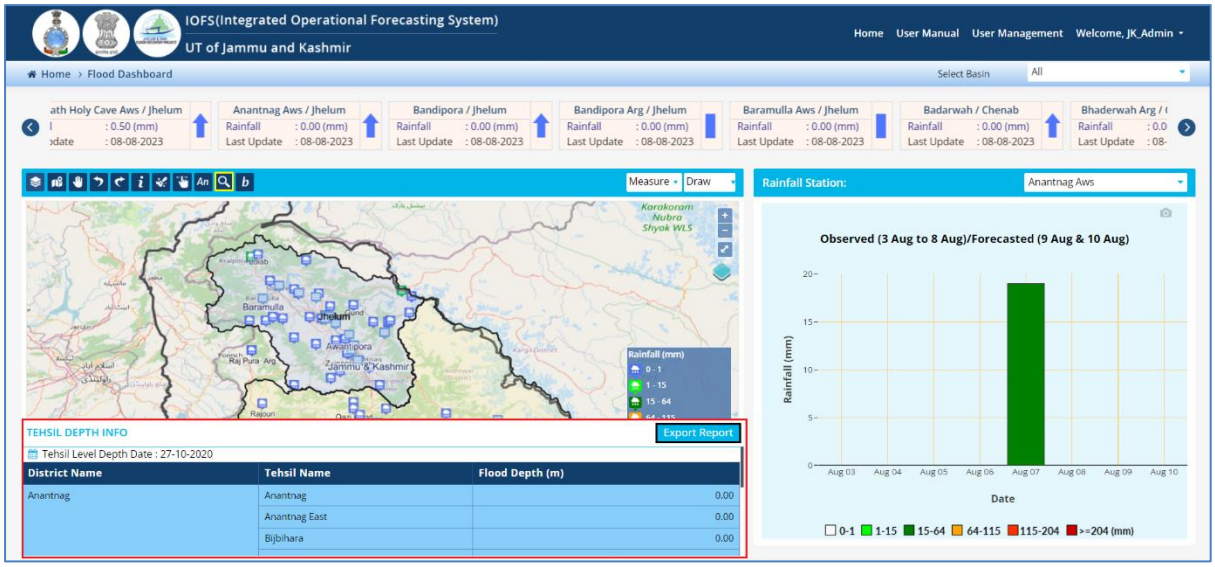


Figure 2-36: District Search screen.

2.1.22 CREATE BUFFER AREA

- Click on the *"Create Buffer Area"* icon as highlighted in yellow.
- Select the location by clicking on the map window
- A small window will pop up with default *"Latitude"* & *"Longitude"* as shown in the Figure 2-37.

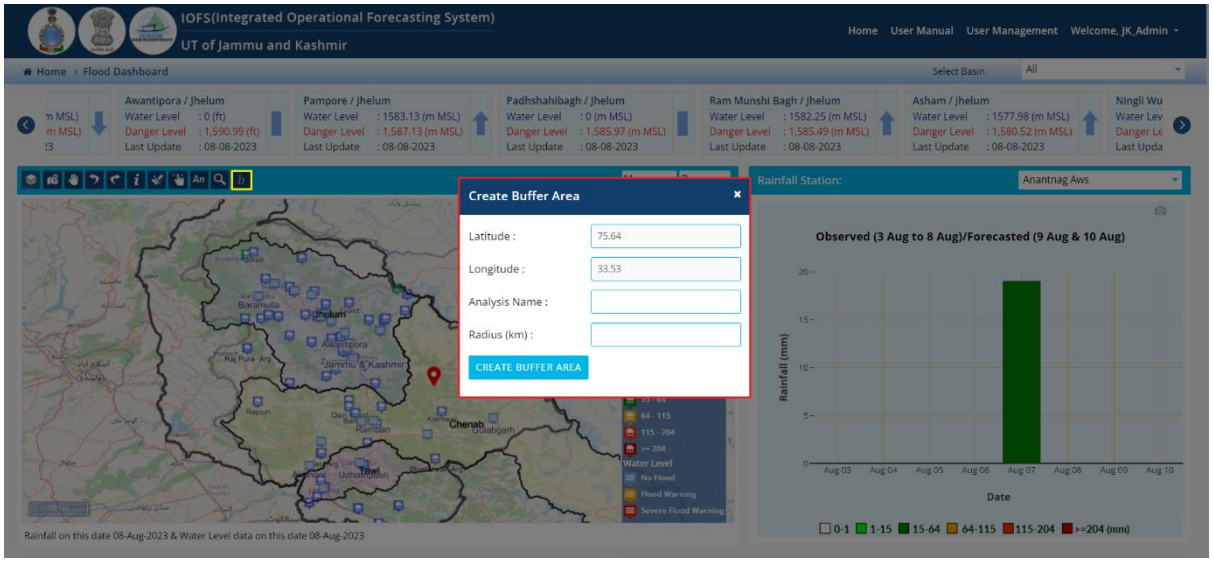


Figure 2-37: Create Buffer Area screen.

- Enter the *"Analysis Name"* e.g. Test & "Radius (km)" e.g. 10.
- Finally click on the *"Create Buffer Area"* to generate the detailed *"Buffer Area Analysis Report*" as shown in Figure 2-38.

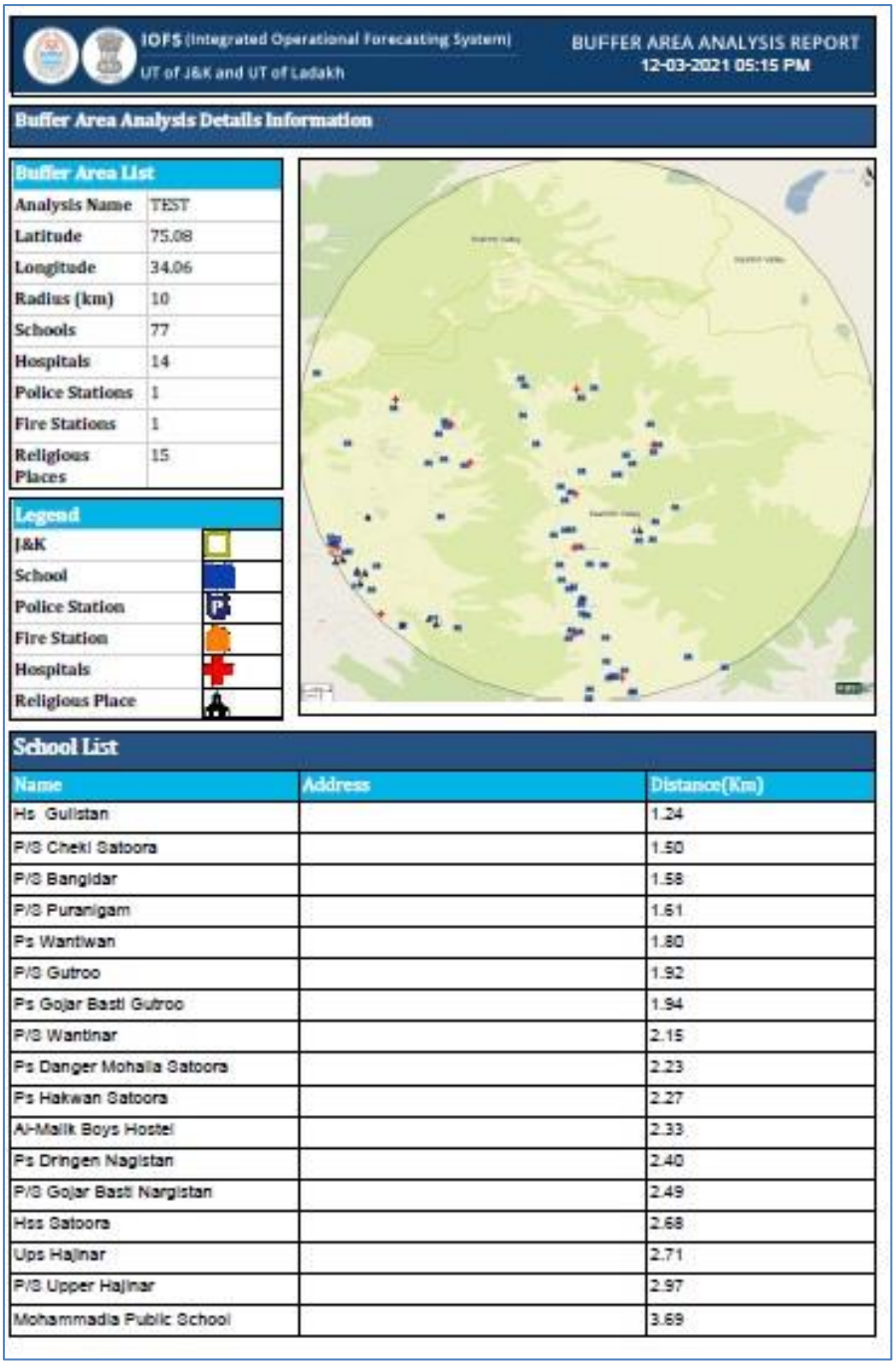


Figure 2-38: Buffer Area Analysis Report screen.

2.1.23 GENERATE MAP

- Click on the *"Generate Map"* icon as highlighted in yellow.
- Select the location by clicking on the map window
- A small window will pop up as shown in the Figure 2-39.
- Input *"Map Title"* e.g. Test.
- Select *"Date"* .e.g. 12-03-2021.
- Select "Report Format" i.e. PDF or PNG.
- Finally, click on "Generate Map"

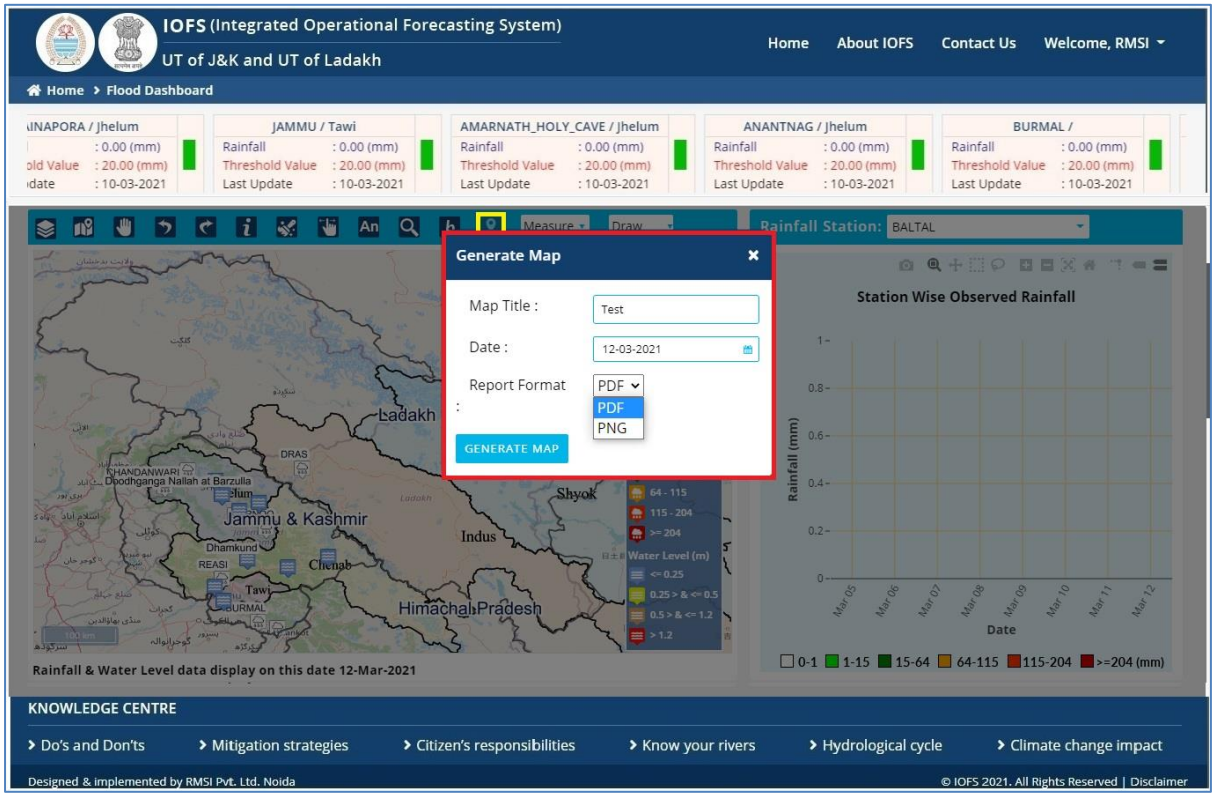


Figure 2-39: Generate Map screen.

2.1.24 MEASURE

This tool helps in measuring distances and area on the map. Marking two or more points on the Map and double-clicking gives the distance and area between the two or more points.

- Click on the "Measure" icon as highlighted in yellow on the Map window.
- Users can select any one of the option i.e. Line or Area.
- Click on the map window to select initial and final marking points (see Figure 2-40).

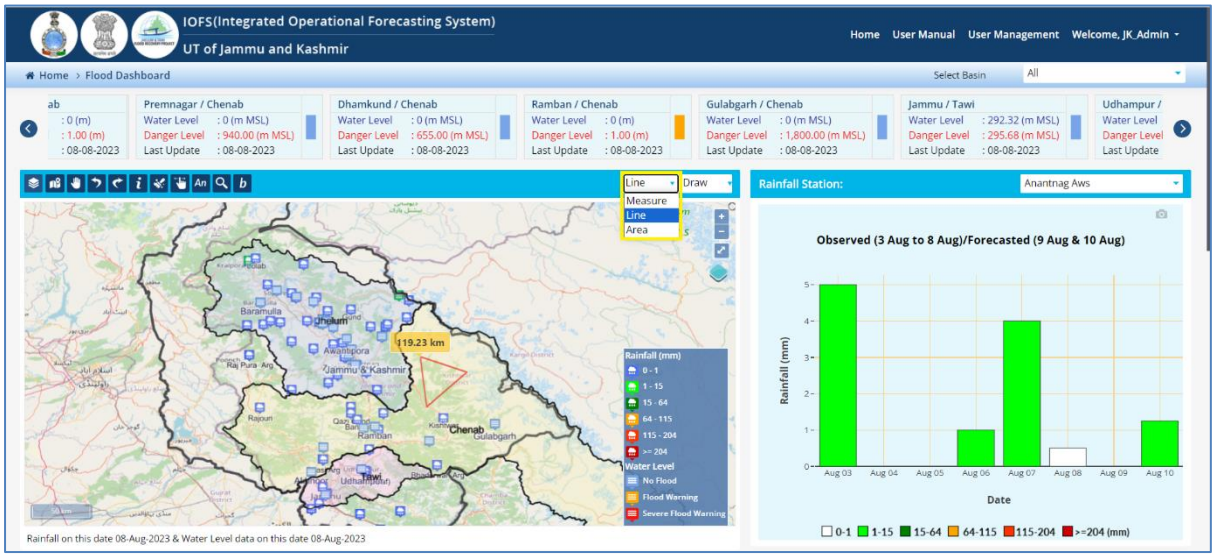


Figure 2-40: Measure screen.

2.1.25 DRAW

To draw any polygon or circle on the map

- Click on the *"Draw"* tool in the map window.
- Select any one of the options *"Polygon"* or *"Circle"*.
- Right click & drag the pointer to cover the required area as shown in Figure 2-41.

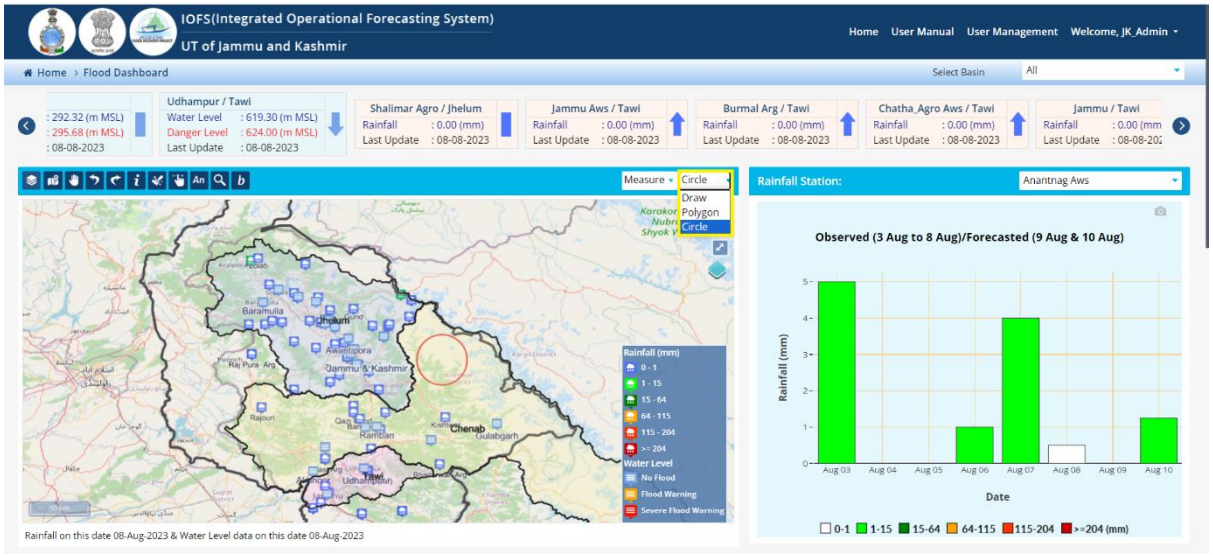


Figure 2-41: Draw screen.

2.1.26 ZOOM TOOL BAR 

Default *"Zoom tool bar"* is highlighted by the numerical value [15] in the Map window dashboard shows the user the zoom in/out options (see).

2.1.27 TOGGLE FULL SCREEN 

Default *"Toggle Full Screen"* bar is highlighted by the numerical value [16] in the Map window dashboard gives the user the option of full screen mode (see 42).

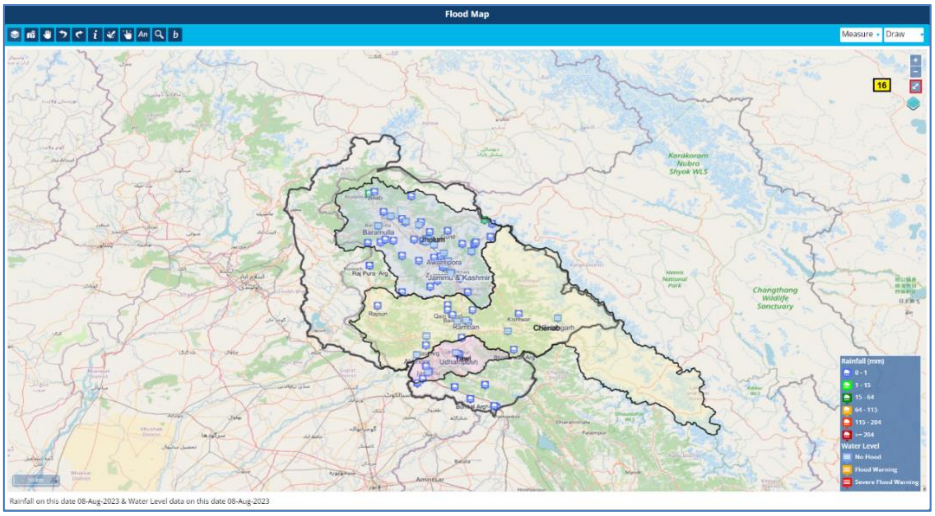


Figure 2-42: Toggle Full screen.

2.1.28 CHANGE BASE MAP LAYER

- A base map is a layer with geographic information that serves as a background. A base ma provides context for additional layers that are overlaid on top of the base map. Base maps usually provide location references for features that do not change often like boundaries, rivers, lakes, roads, and highways.
- The *"Change Base map layer"* option is highlighted by the numerical value [17] in Map Window dashboard (see Figure 2-43)
- By default, IOFS allows users to analyze the data using different background maps. Some of them are listed below:

1. Google Road Map.
2. Google Terrain.
3. Google Satellite.
4. Google Hybrid.
5. Open Street Map.

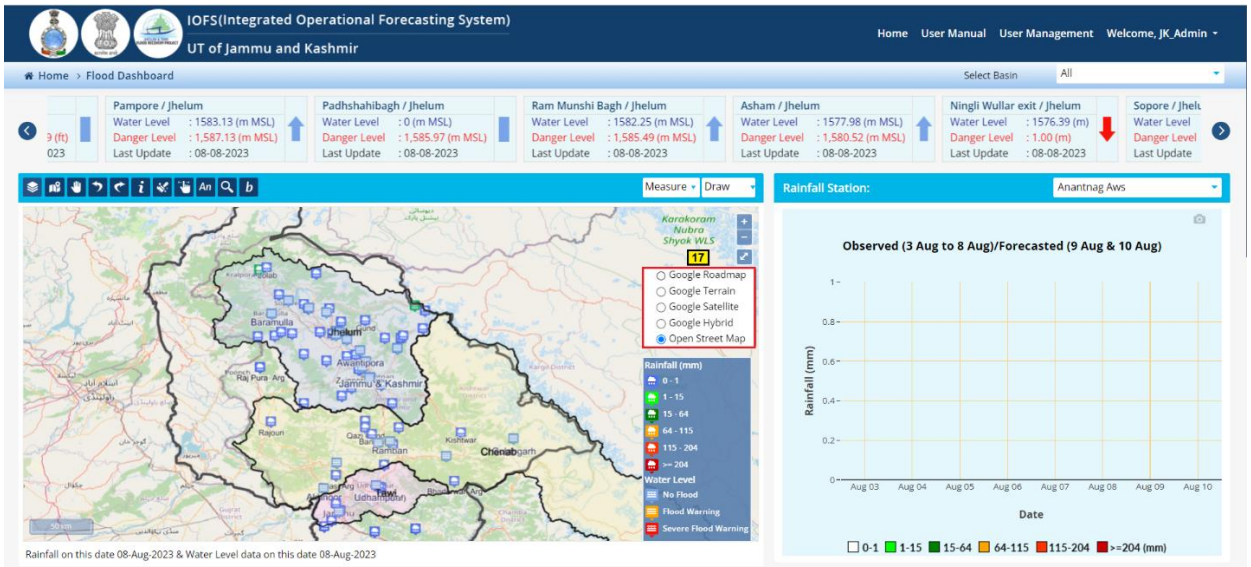


Figure 2-43: Change Basemap screen

2.1.29 OBSERVED (3AUG TO 8 AUG)/FORECASTED (9AUG & 10 AUG)

Select the Rainfall station from the dropdown and the graph of Observed and Forecasted rainfall will be displayed as per the selection as shown in Figure 2-44.

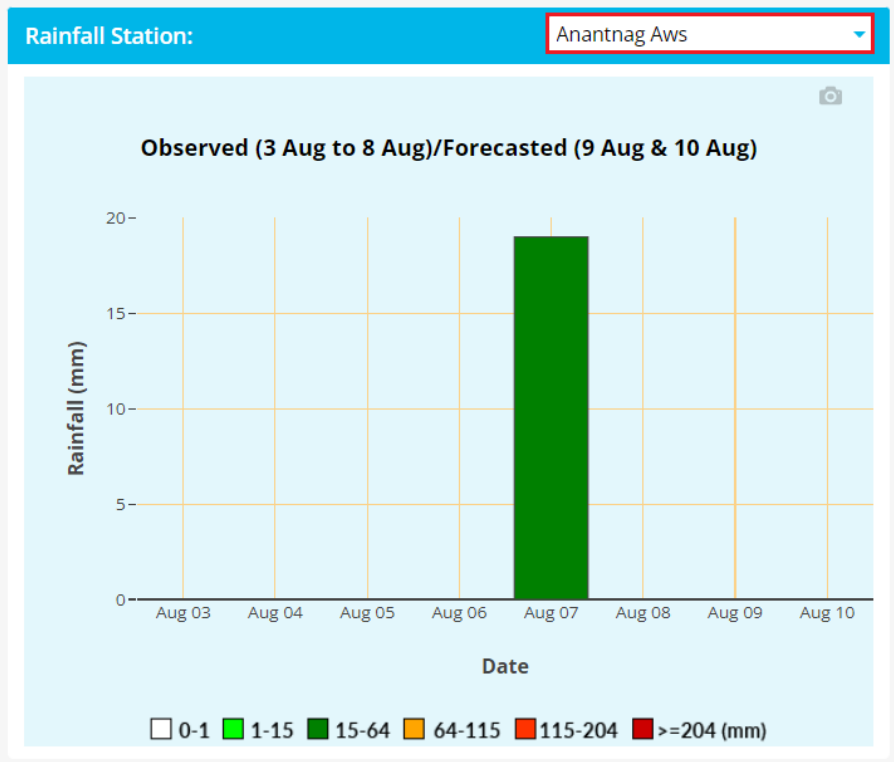


Figure 2-44: Observed and Forecasted screen

2.1.30 FLOOD HYDROGRAPHS AND WATER LEVEL GRAPHS

Select the Water Gauge Station and Daily/ Hourly from the dropdown of Flood Hydrograph and the Discharge data will be displayed in graphical format as shown in Figure 2-45.

Flood Hydrograph and Water level graph are inter related; selection of water level station will change on both Flood Hydrographs and Water Gauge Station.

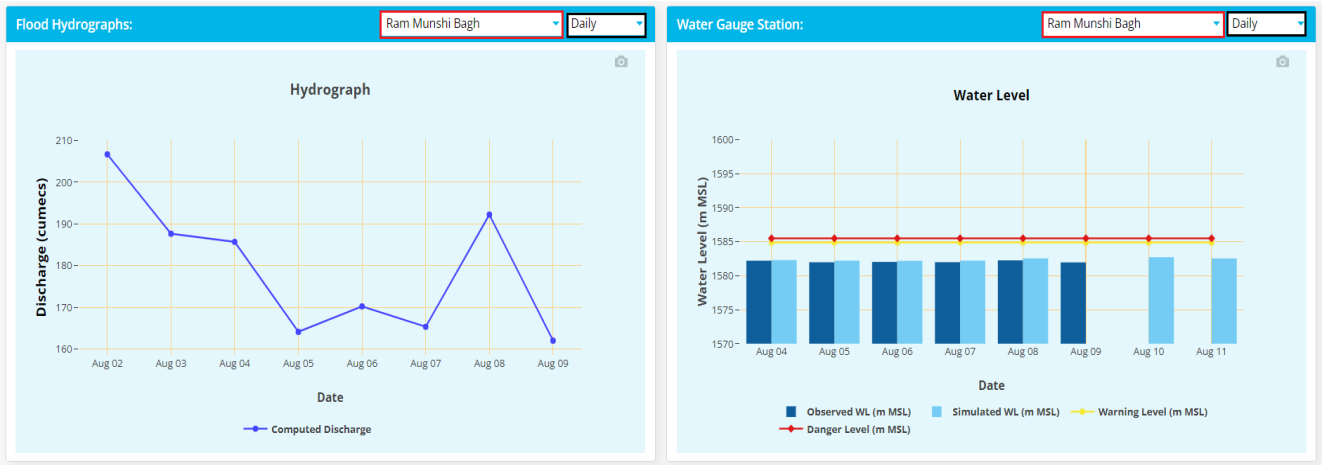


Figure 2-45: Hydrograph and Water level screen

2.1.31 FLOOD INFORMATION

Select the division and click on Current Date button to download the Flood Bulletin of the selected date of the selected division as shown in Figure 2-46.

Select the date and click on Download button to download the Archive bulletins.

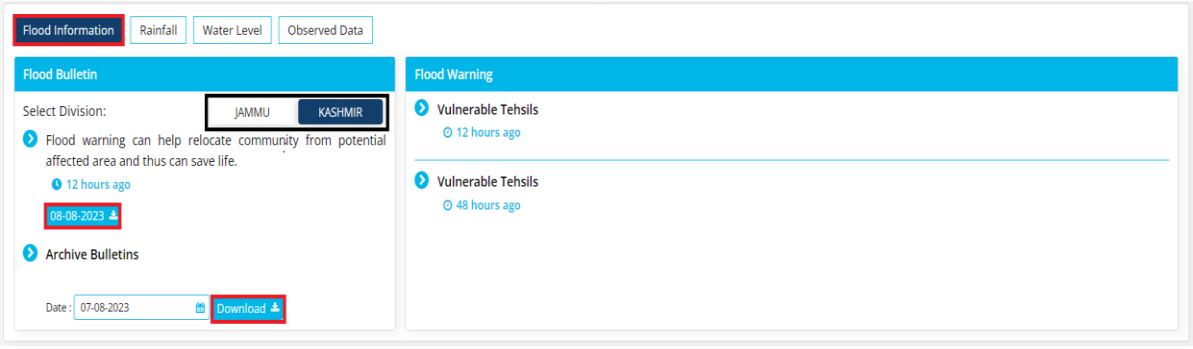
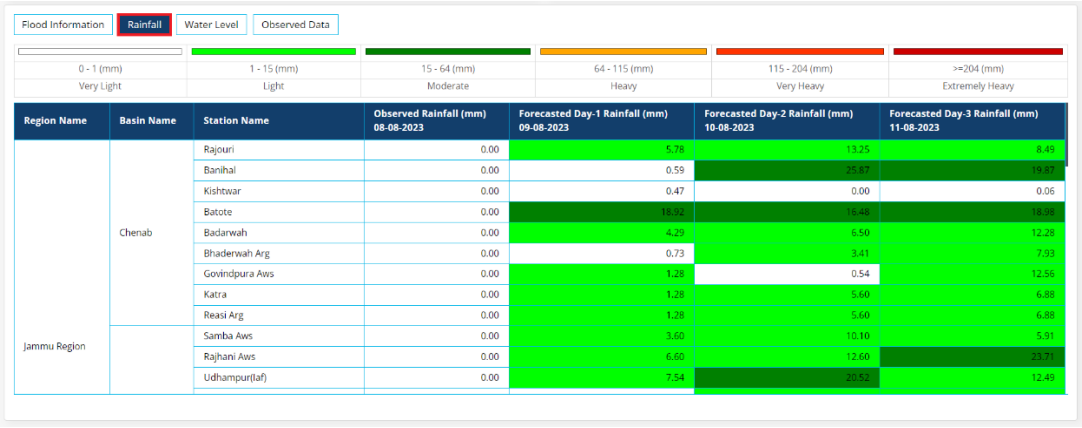


Figure 2-46: Flood Information

2.1.32 RAINFALL

Click on the Rainfall tab at the Flood Dashboard to view the rainfall data as shown in Figure 2-47.

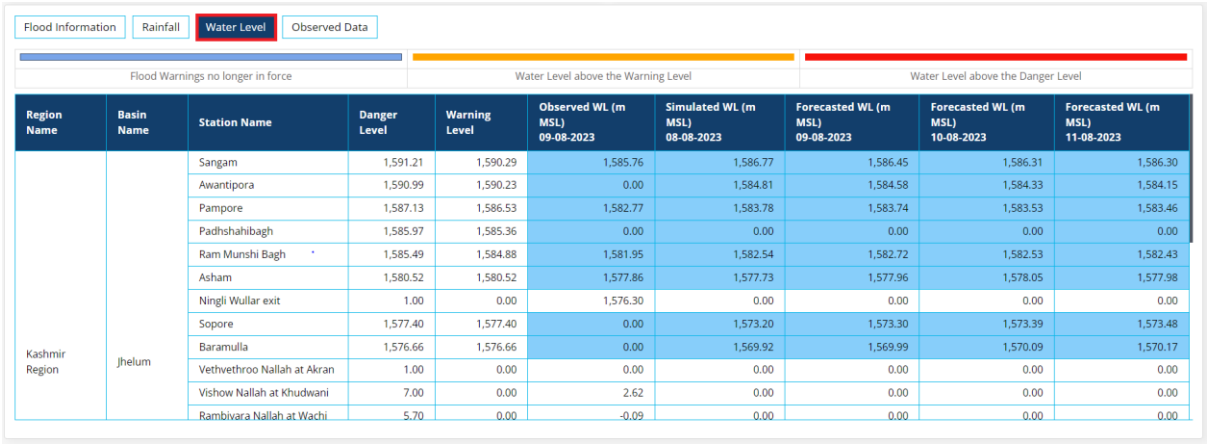


Region Name	Basin Name	Station Name	Observed Rainfall (mm) 08-08-2023	Forecasted Day-1 Rainfall (mm) 09-08-2023	Forecasted Day-2 Rainfall (mm) 10-08-2023	Forecasted Day-3 Rainfall (mm) 11-08-2023
Jammu Region	Chenab	Rajouri	0.00	5.78	13.25	8.49
		Banihal	0.00	0.59	25.87	19.87
		Kishtwar	0.00	0.47	0.00	0.06
		Batote	0.00	18.92	16.48	18.98
		Badarwah	0.00	4.29	6.50	12.28
		Bhaderwah Arg	0.00	0.73	3.41	7.93
		Govindpura Aws	0.00	1.28	0.54	12.56
		Katra	0.00	1.28	5.60	6.88
		Reasi Arg	0.00	1.28	5.60	6.88
		Samba Aws	0.00	3.60	10.10	5.91
		Rajhani Aws	0.00	6.60	12.60	23.71
		Udhampur(Iaf)	0.00	7.54	20.52	12.49

Figure 2-47: Rainfall Data

2.1.33 WATER LEVEL

Click on the Water Level tab at the Flood Dashboard to view the rainfall data as shown in Figure 2-48



Region Name	Basin Name	Station Name	Danger Level	Warning Level	Observed WL (m MSL) 09-08-2023	Simulated WL (m MSL) 08-08-2023	Forecasted WL (m MSL) 09-08-2023	Forecasted WL (m MSL) 10-08-2023	Forecasted WL (m MSL) 11-08-2023
Kashmir Region	Jhelum	Sangam	1,591.21	1,590.29	1,585.76	1,586.77	1,586.45	1,586.31	1,586.30
		Awantipora	1,590.99	1,590.23	0.00	1,584.81	1,584.58	1,584.33	1,584.15
		Pampore	1,587.13	1,586.53	1,582.77	1,583.78	1,583.74	1,583.53	1,583.46
		Padhshahibagh	1,585.97	1,585.36	0.00	0.00	0.00	0.00	0.00
		Ram Munshi Bagh	1,585.49	1,584.88	1,581.95	1,582.54	1,582.72	1,582.53	1,582.43
		Asham	1,580.52	1,580.52	1,577.86	1,577.73	1,577.96	1,578.05	1,577.98
		Ningli Wullar exit	1.00	0.00	1,576.30	0.00	0.00	0.00	0.00
		Sopore	1,577.40	1,577.40	0.00	1,573.20	1,573.30	1,573.39	1,573.48
		Baramulla	1,576.66	1,576.66	0.00	1,569.92	1,569.99	1,570.09	1,570.17
		Vethvethroo Nallah at Akran	1.00	0.00	0.00	0.00	0.00	0.00	0.00
		Vishow Nallah at Khudwani	7.00	0.00	2.62	0.00	0.00	0.00	0.00
		Rambivara Nallah at Wachi	5.70	0.00	-0.09	0.00	0.00	0.00	0.00

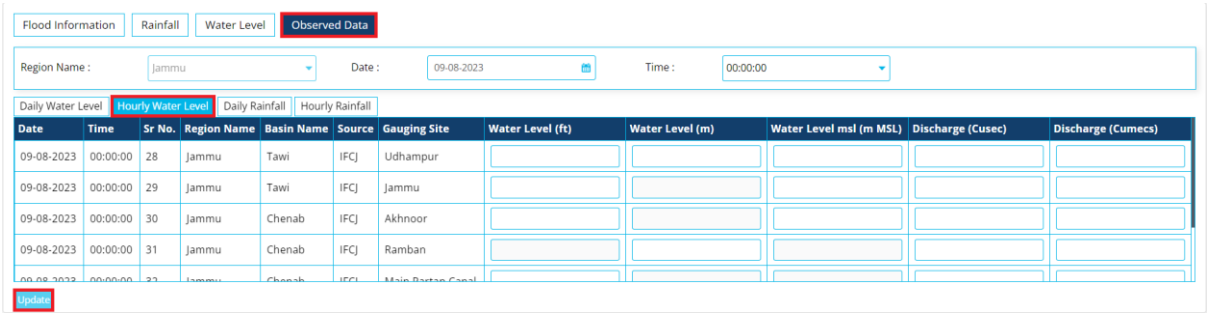
Figure 2-48: Water Level Data

2.1.34 OBSERVED DATA

Click on the Observed Data tab, select Daily Water Level, and click on Update button to update the data as shown in 49 to Figure 2-52.

Date	Sr No.	Region Name	Basin Name	Source	Gauging Site	Water Level (ft)	Water Level (m)	Water Level msl (m MSL)	Discharge (Cusec)	Discharge (Cumecs)
09-08-2023	28	Jammu	Tawi	IFCJ	Udhampur	4.4	1.32	619.30	527	14.92
09-08-2023	29	Jammu	Tawi	IFCJ	Jammu	6	1.83	292.32	14000	396.38
09-08-2023	30	Jammu	Chenab	IFCJ	Akhnoor	24.5	7.44	312.26	62000	1755.38
09-08-2023	31	Jammu	Chenab	IFCJ	Ramban					

Figure 2-49: Observed Data- Daily Water Level screen



Date	Time	Sr No.	Region Name	Basin Name	Source	Gauging Site	Water Level (ft)	Water Level (m)	Water Level msl (m MSL)	Discharge (Cusec)	Discharge (Cumecs)
09-08-2023	00:00:00	28	Jammu	Tawi	IFCJ	Udhampur					
09-08-2023	00:00:00	29	Jammu	Tawi	IFCJ	Jammu					
09-08-2023	00:00:00	30	Jammu	Chenab	IFCJ	Akhnoor					
09-08-2023	00:00:00	31	Jammu	Chenab	IFCJ	Ramban					

Figure 2-50: Observed Data-Hourly Water Level screen

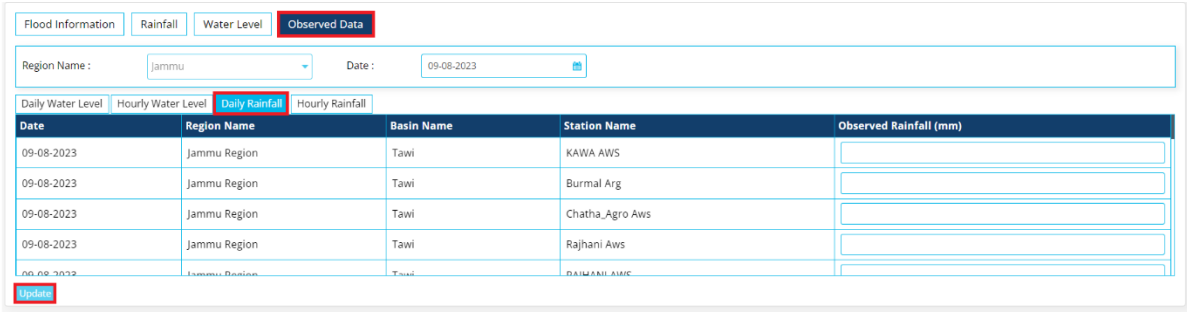


Figure 2-51: Observed Data- Daily Rainfall screen

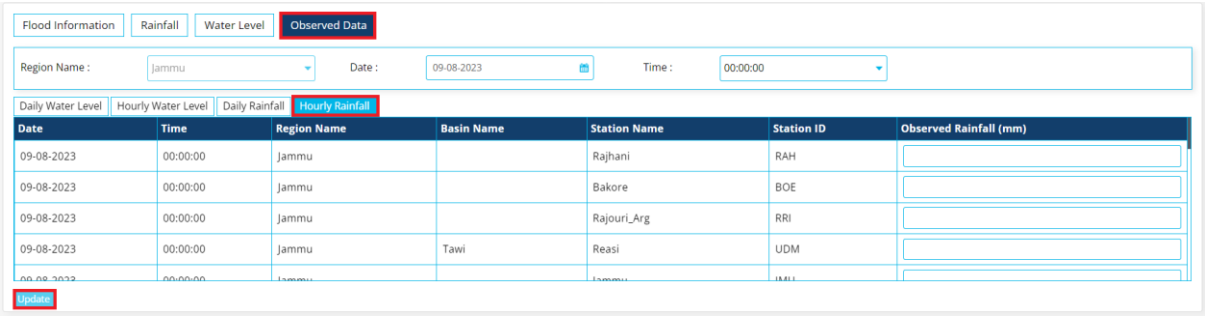


Figure 2-52: Observed Data- Hourly Rainfall screen

3 Flash Flood Forecast

The IOFS (Integrated Operational Forecasting System) has been developed with the aim to provide potential users with easy to use software, able to predict potential Flash Flood events. As each year UT of J&K witnesses' loss of life and property due to these events, this functionality can greatly help in reducing such losses.

The Flash Flood module at second number at the dashboard is shown in Figure 1-14 provides detailed study and information about the area like visualization of various database layers and toolbar menu, which provides access to various informative icons.

Click the Flash Flood icon to visit Flash Flood Dashboard. The detail info's homepage is displayed as shown in show in Figure 3-1

User can access the Bulletins and weeks alerts for Flash Flood model and also generate reports.

Toolbar menu on homepage shows different icons and every icon have different features:

- Database layers Icon
- Fit to Extent Icon
- Pan Icon
- Undo Icon
- Redo Icon
- Information Icon
- Reset Icon and
- Layer Swipe Tool Icon
- Measure
- Draw
- Map window

3.1 Database Layers

Database Layers window displays the Admin Boundary layer and Flash Flood layer as shown in Figure 3-1. When a user clicks on the various checkboxes, corresponding to the layers, their thematic representation is displayed in the map window.

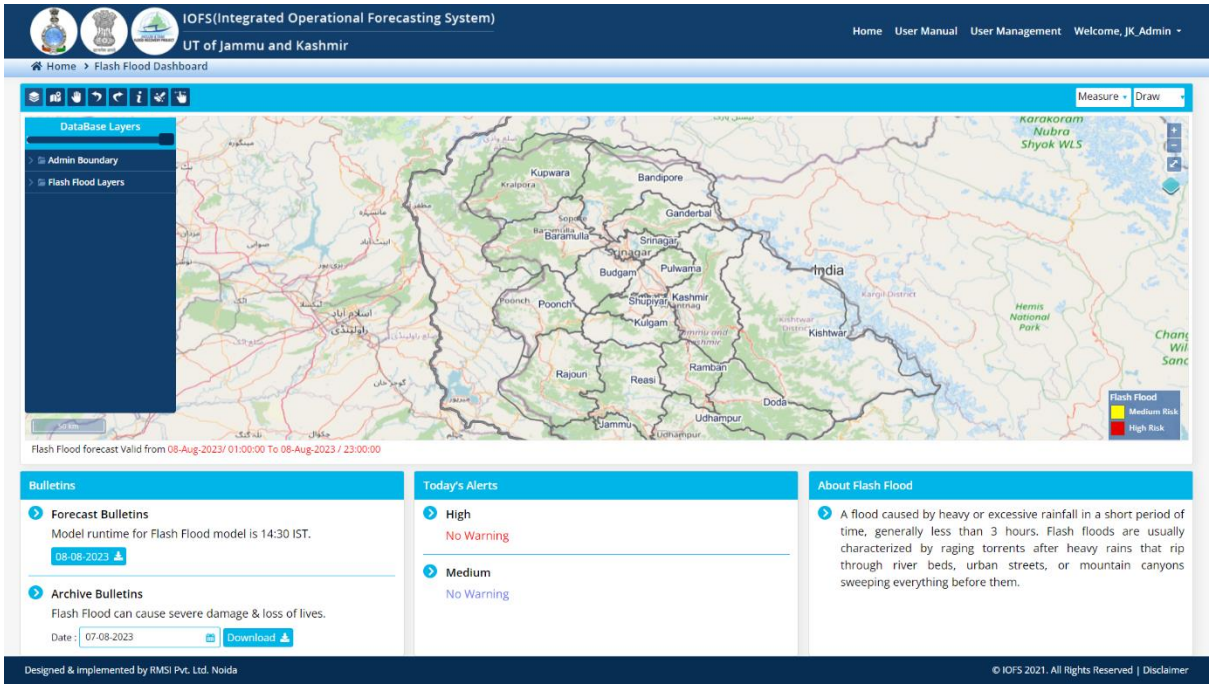


Figure 3-1: Picture shows different features of database layer

3.1.1 VIEWING ADMINISTRATIVE LAYERS

Users can select single or multiple checkboxes under Administrative Layers as shown in Figure 3-2 to display the corresponding layers (World Boundary, Country Boundary, UT Boundary, District Boundary, etc. User can also download the report by clicking the download icon.

The map in the map window with Country Boundary layer, District Boundary layer checkbox has been selected as indicated in the below image. Click– or + buttons to reduce or increase the zoom ratio of the map displayed in the Map Window by using the zoom control.

Alternately, users can also place the cursor on the map area and use the toggle full screen button to display the screen on full page. New features are also included to change the base map in Google Roadmap, Google Terrain, Google Satellite, Google Hybrid and Open Street Map.

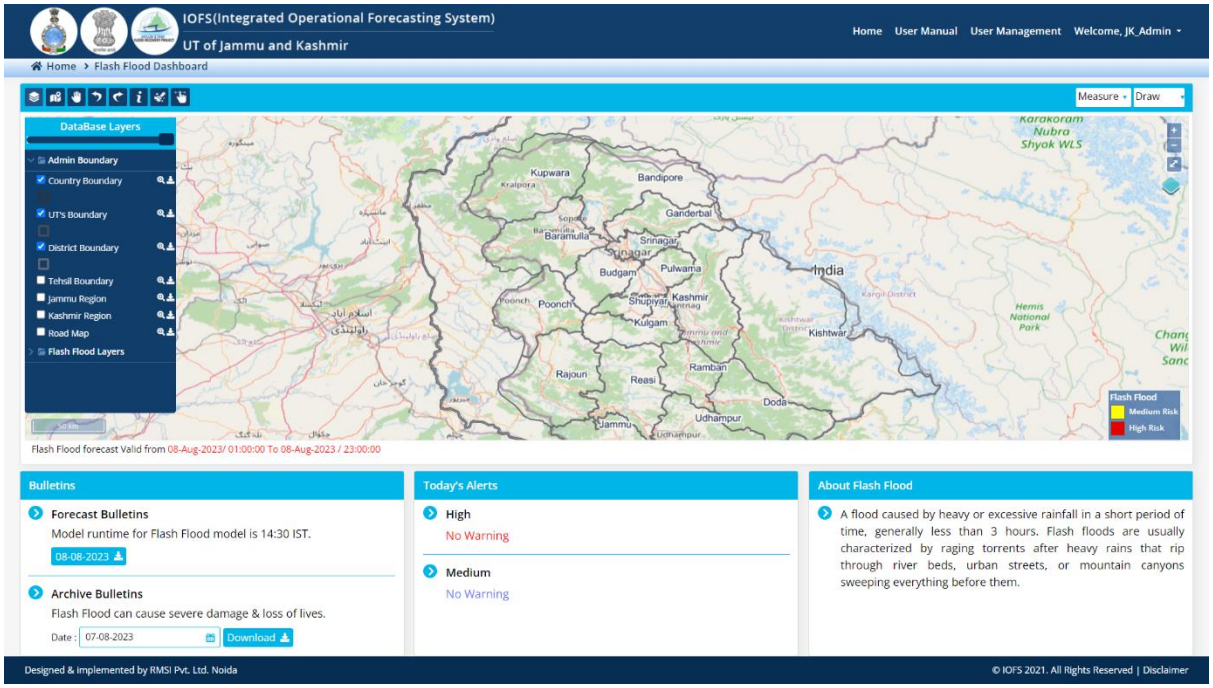


Figure 3-2: Picture shows Administrative boundaries

3.1.2 VIEWING FLASH FLOOD DATA

By clicking on Flash Flood layer, different layers can be selected as per the need of the user by clicking on the check boxes. Depending upon the selected layer cells on the map represents the Real time or Forecasted Flash Flood data for two days of J&K in different colors i.e., , yellow for medium and red for high as shown in Figure 3-3

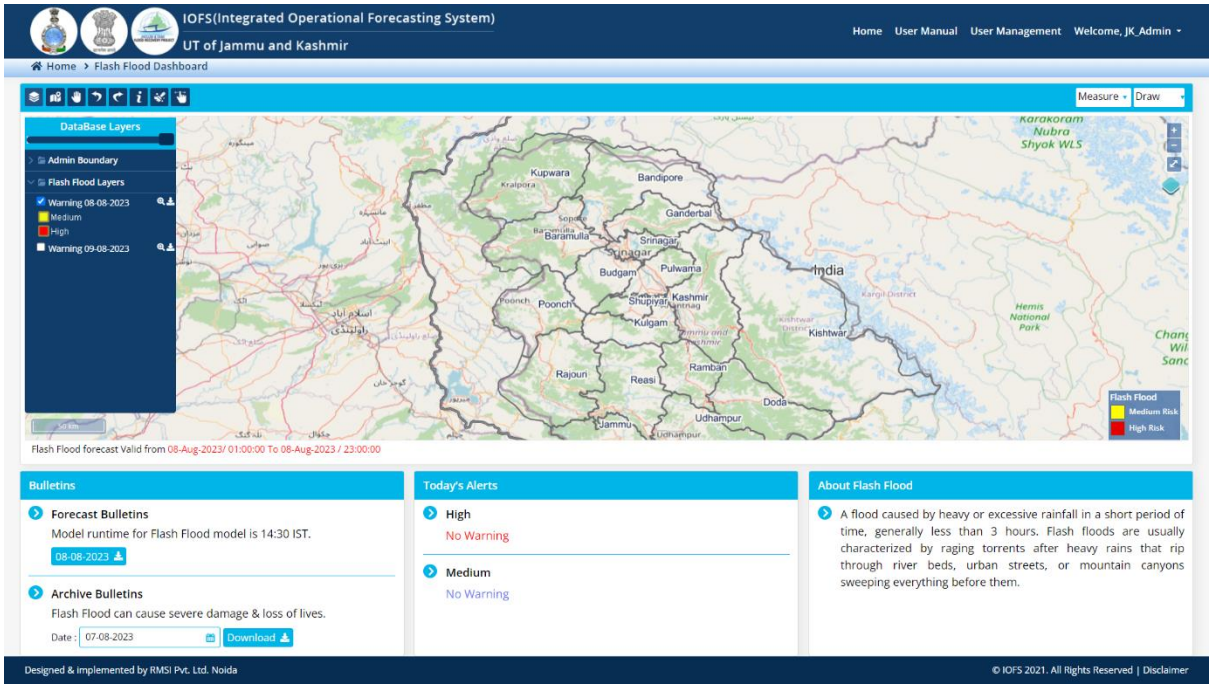


Figure 3-3: Picture shows Flash Flood data

3.1.3 FIT TO EXTENT

In this feature, users can reach back to the default position of the map by clicking the fit to extent icon.

3.1.4 PAN

Pan is use for navigating a Map in any direction and tilt around any view.

3.1.5 UNDO AND REDO

The undo function is used to reverse a mistake, and the redo function restores any actions that were previously undone using an undo

3.1.6 INFO

The info icon in toolbar provides the information about the layers, which are mapped, on the map window.

Click on the info icon.

Then click on any layer on the map to get the information about that layer. This displays a small window showing the information of that layer as shown in Figure 3-4

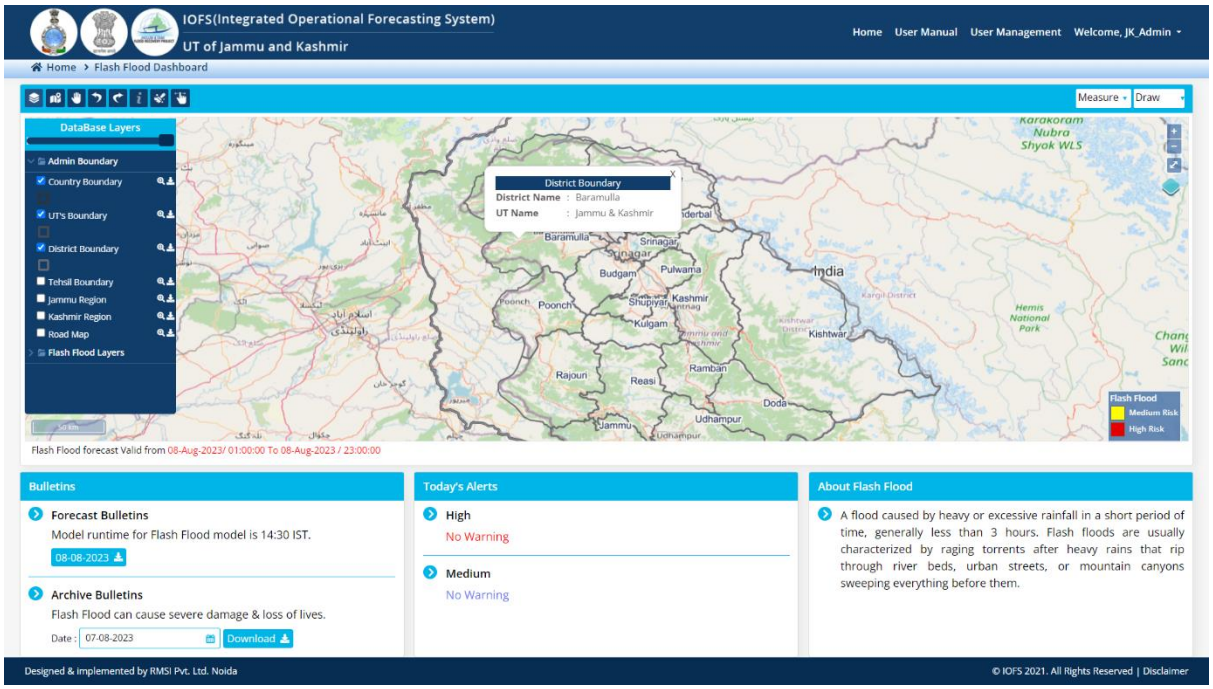


Figure 3-4: Picture shows Information

3.1.7 RESET

By clicking on the Reset button, the default view of the map will be restored.

3.1.8 LAYER SWIPE TOOL

The Swipe Layer tool works with any of the layers in IOFS. You can use the tool to compare a layer with a raster, vector, or base map layer. Using the Swipe Layer tool is easy. Just add the layer you want to swipe, access the Effects toolbar, and use the tool.

3.1.9 MEASURE

By clicking on the Measure dropdown user can access two options i.e., line and area.

By clicking on Line option and simultaneously clicking on the map user can draw a line between any two given points on the map and the distances between two points will be automatically displayed as shown in Figure 3-5

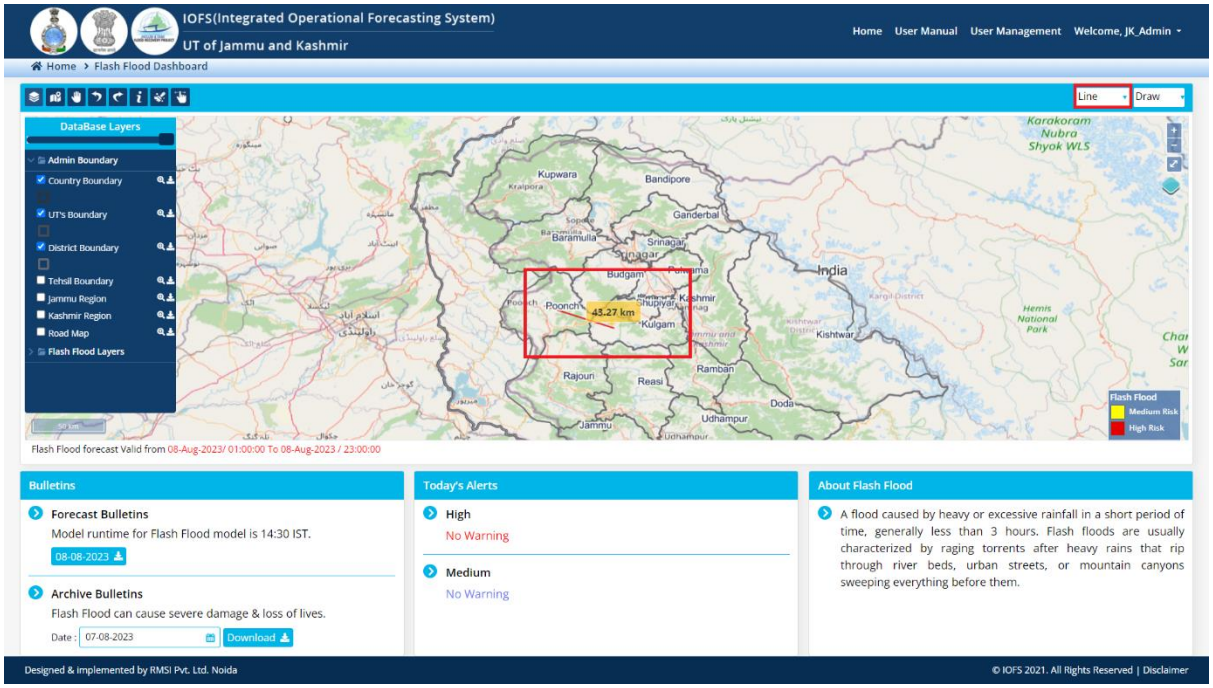


Figure 3-5: Measure line screen

Similarly, by clicking on Area option and simultaneously clicking on the map user can draw polygons around the area of interest and the area will be automatically displayed.

3.1.10 DRAW

By clicking on the Draw dropdown user can access two options i.e., polygon and circle.

By clicking on the polygon option and simultaneously clicking on the map, user can draw a polygon as shown in .

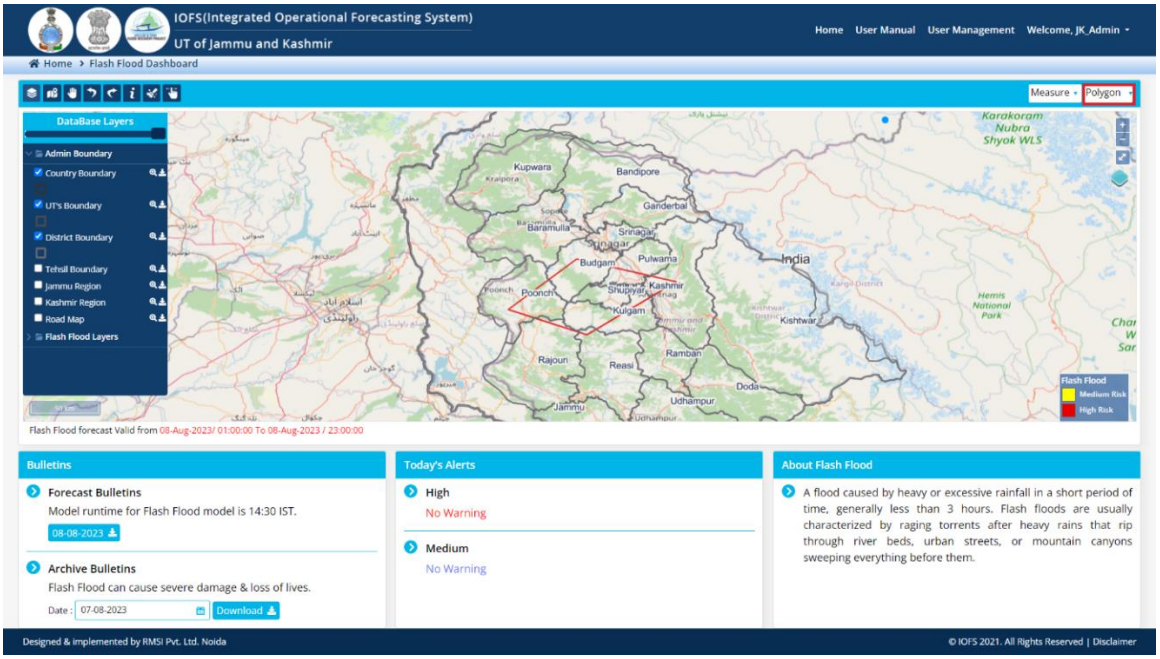


Figure 3-6: Draw Polygon screen

Similarly, by clicking on circle option and simultaneously clicking on the map user can draw circle.

3.1.11 BULLETINS

Click on Current Date button of the Forecast Bulletin section to download the Flash Flood Bulletin of the selected date as shown in Figure 3-7.

Select the date and click on Download button to download the Archive bulletins.

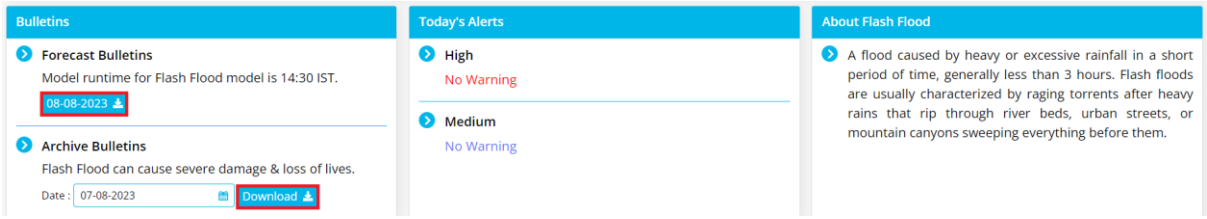


Figure 3-7: Flood Information

4 Avalanche Forecast

The IOFS (Integrated Operational Forecasting System) has been developed with the aim to provide potential users with easy to use software, able to predict potential Avalanche events. As each year UT of J&K witnesses' loss of life and property due to these events, this functionality can greatly help in reducing such losses.

The Avalanche Forecast icon on the corner of right side shown in Figure 4-2 provides detailed study and information about the area like visualization of various database layers and toolbar menu, which provides access to various informative icons.

Click the Avalanche Forecast Info icon to visit Avalanche Dashboard. The detail info's homepage is displayed as shown in show in Figure 4-2.

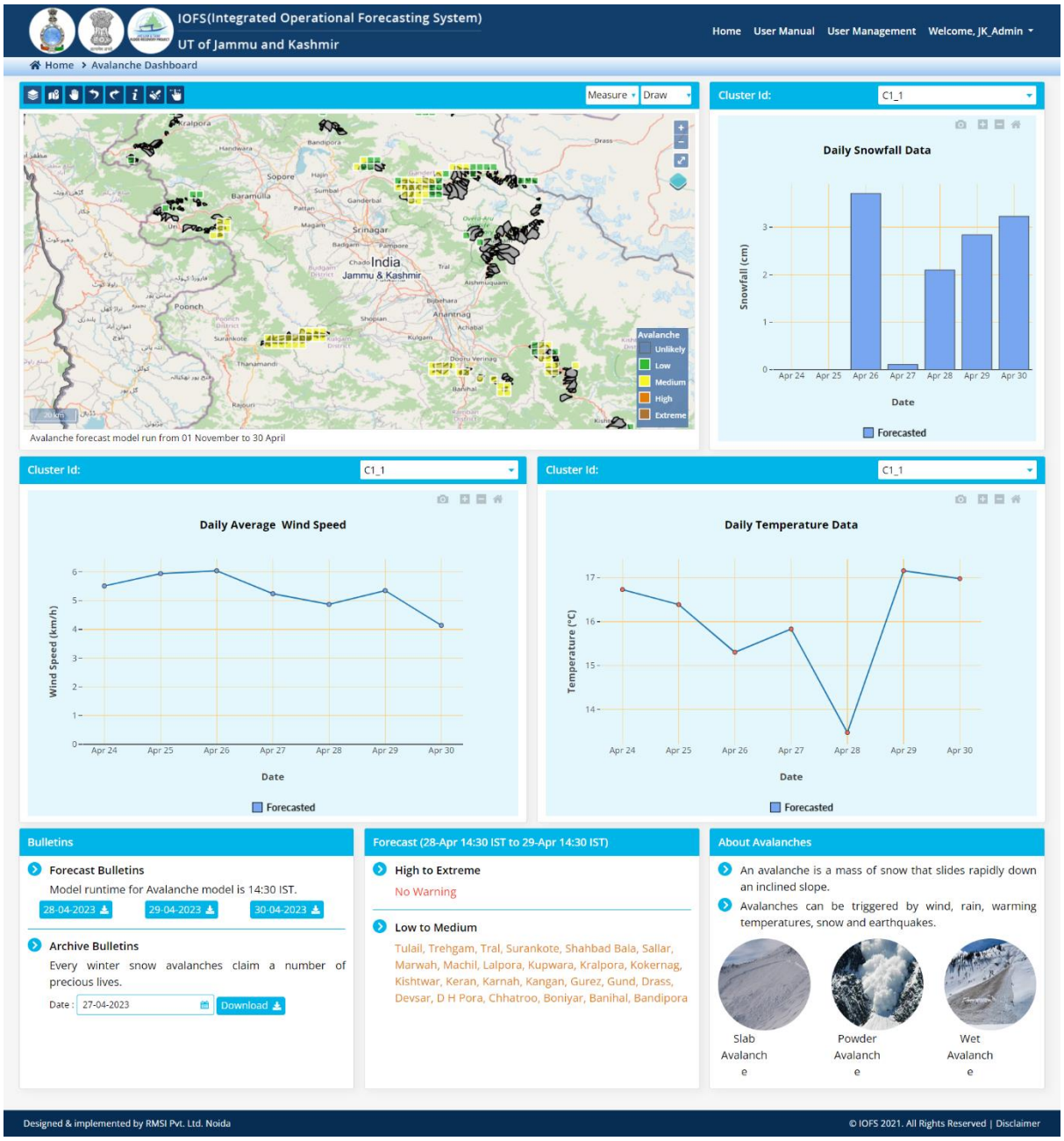


Figure 4-1: Avalanche Dashboard screen

A graph is displayed on the right side of the window showing historic and forecasted daily snowfall data. User can also select the dropdown option to get the data of any cluster of UTs of J&K as shown in Figure 4-2.

User can also access the Bulletins and weeks alerts for Avalanche model and also generate reports.

Toolbar menu on homepage shows different icons and every icon have different features:

- Database layers Icon
- Fit to Extent Icon
- Pan Icon
- Undo Icon
- Redo Icon
- Information Icon
- Rest Icon and
- Layer Swipe Tool Icon
- Measure
- Draw
- Map window

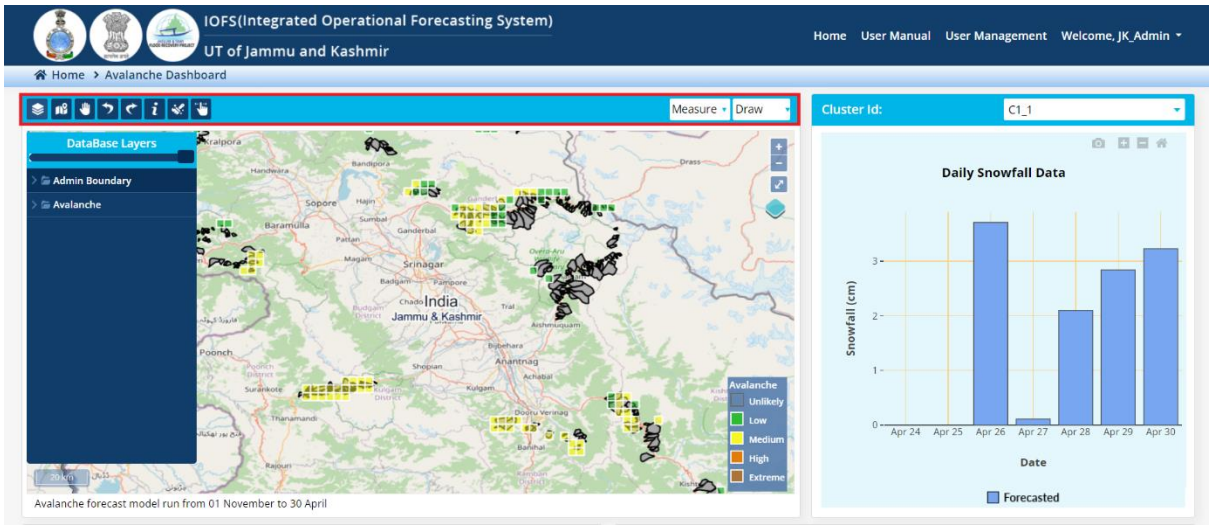


Figure 4-2: Picture shows the toolbar menu

4.1 Database Layers

Database Layers window displays the Admin Boundary layer and Avalanche layer as shown in Figure 4-3. When a user clicks on the various checkboxes, corresponding to the layers, their thematic representation is displayed in the map window.

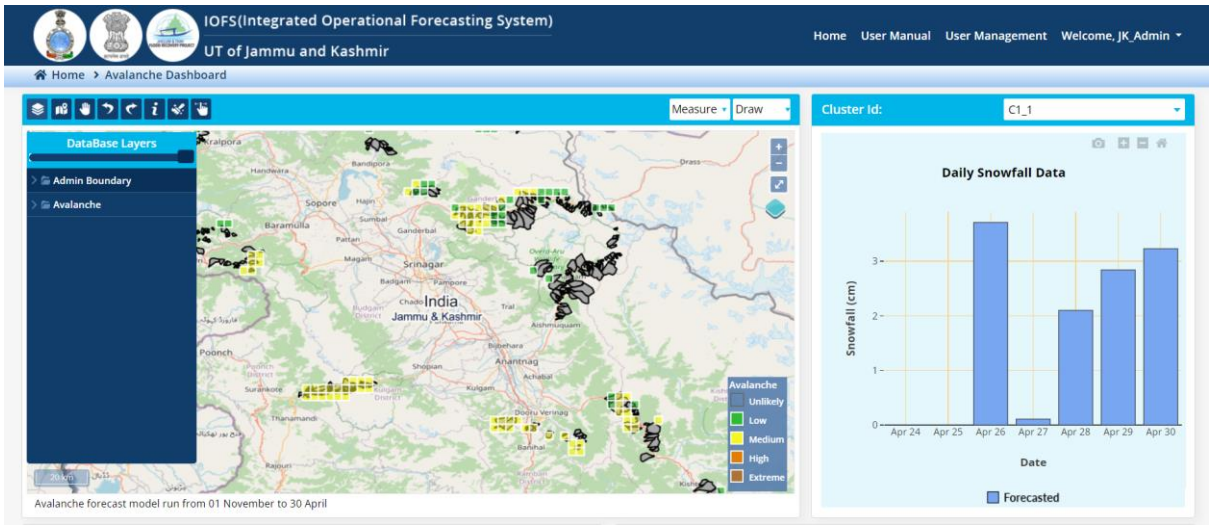


Figure 4-3: Picture shows different features of database layer

4.1.1 VIEWING ADMINISTRATIVE LAYERS

Users can select single or multiple checkboxes under Administrative Layers as shown in Figure 4-4 to display the corresponding layers (World Boundary, Country Boundary, UT Boundary, District Boundary, etc. User can also download the report by clicking the download icon.

The map in the map window with Country Boundary layer, District Boundary layer checkbox has been selected as indicated in the below image. Click– or + buttons to reduce or increase the zoom ratio of the map displayed in the Map Window by using the zoom control.

Alternately, users can also place the cursor on the map area and use the toggle full screen button to display the screen on full page. New features are also included to change the base map in Google Roadmap, Google Terrain, Google Satellite, Google Hybrid and Open Street Map.

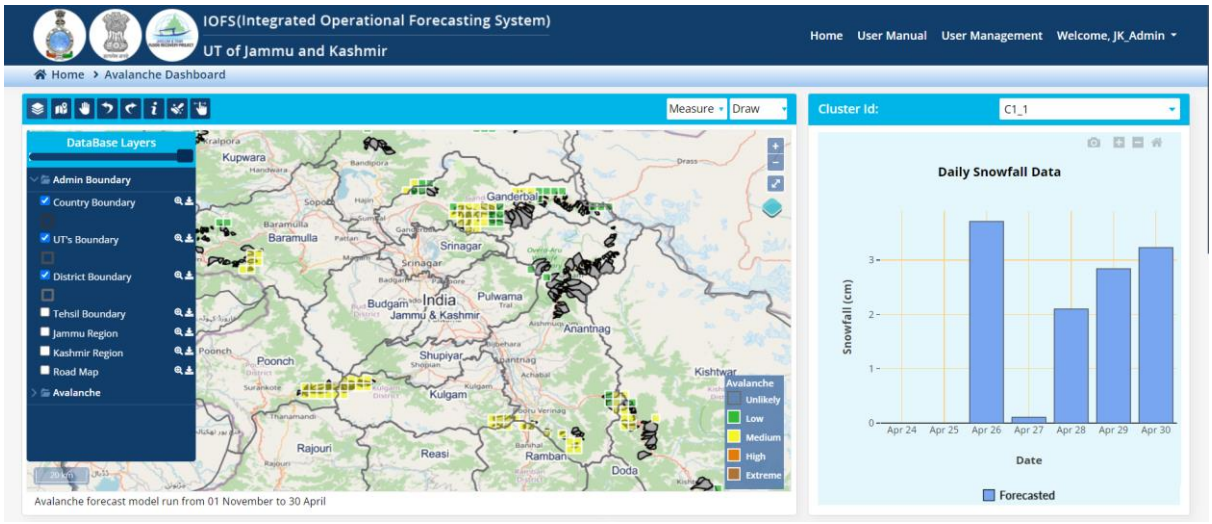


Figure 4-4: Picture shows Administrative boundaries

4.1.2 VIEWING AVALANCHE DATA

By clicking on Avalanche layer, different layers can be selected as per the need of the user by clicking on the check boxes. Depending upon the selected layer cells on the map represents

the Real time or Forecasted Avalanche data for two days of both UT's in different colors i.e., blank cell for unlikely, green for low, yellow for medium, orange for severely high and brown for extreme.

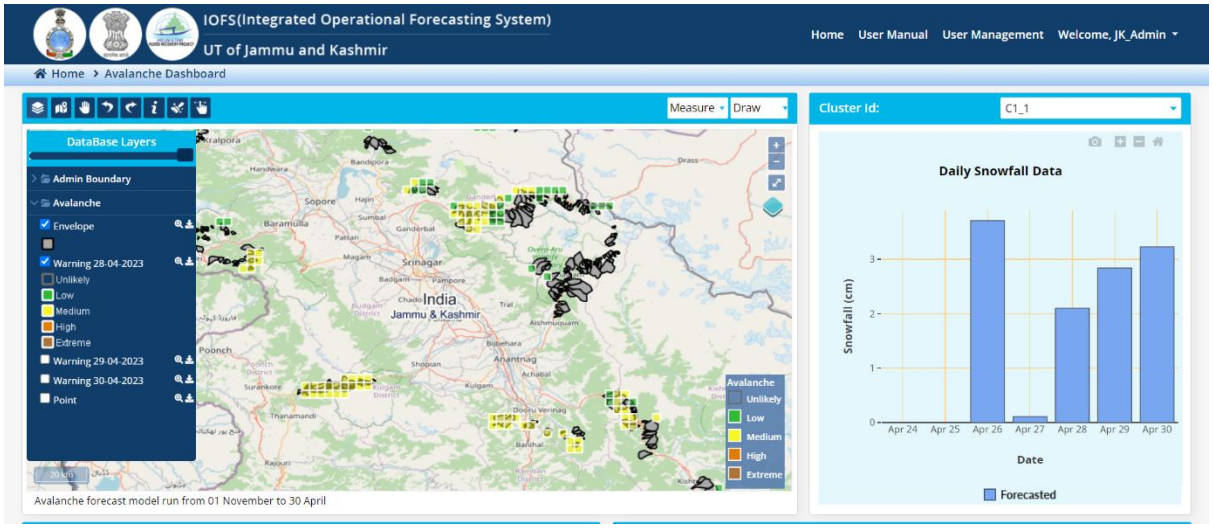


Figure 4-5: Picture shows avalanche data

4.1.3 FIT TO EXTENT

In this feature, users can reach back to the default position of the map by clicking the fit to extent icon.

4.1.4 PAN

Pan is use for navigating a Map in any direction and tilt around any view.

4.1.5 UNDO AND REDO

The undo function is used to reverse a mistake, and the redo function restores any actions that were previously undone using an undo

4.1.6 INFO

The info icon in toolbar provides the information about the layers, which are mapped, on the map window.

Click on the info icon.

Then click on any layer on the map to get the information about that layer. This displays a small window showing the information of that layer as shown in Figure 4-6.

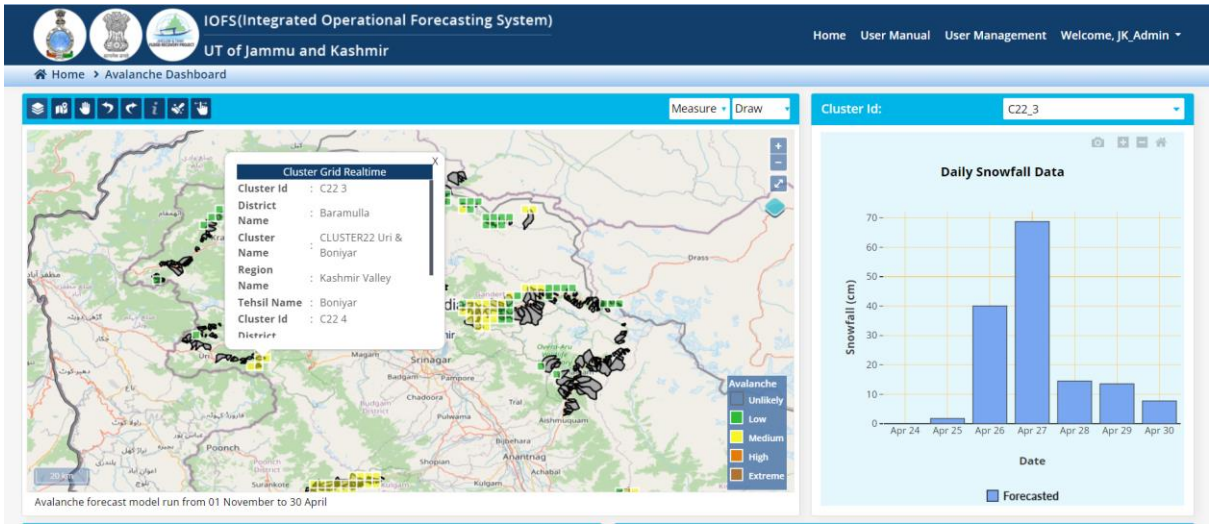


Figure 4-6: Picture shows Information

4.1.7 RESET

By clicking on the Reset button, the default view of the map will be restored.

4.1.8 LAYER SWIPE TOOL

The Swipe Layer tool works with any of the layers in IOFS. You can use the tool to compare a layer with a raster, vector, or base map layer. Using the Swipe Layer tool is easy. Just add the layer you want to swipe, access the Effects toolbar, and use the tool.

4.1.9 MEASURE

By clicking on the Measure dropdown user can access two options i.e., line and area.

By clicking on Line option and simultaneously clicking on the map user can draw a line between any two given points on the map and the distances between two points will be automatically displayed as shown in Figure 4-7.

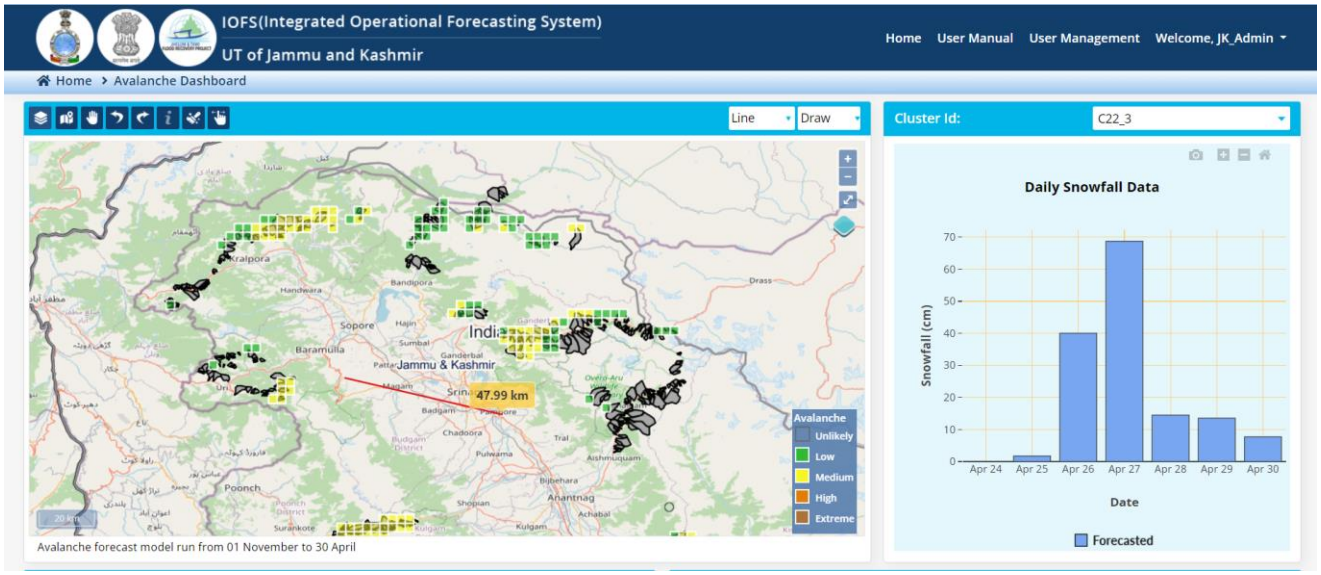


Figure 4-7: Measure line screen

Similarly, by clicking on Area option and simultaneously clicking on the map user can draw polygons around the area of interest and the area will be automatically displayed.

4.1.10 DRAW

By clicking on the Draw dropdown user can access two options i.e., polygon and circle.

By clicking on the polygon option and simultaneously clicking on the map, user can draw a polygon as shown in Figure 4-8

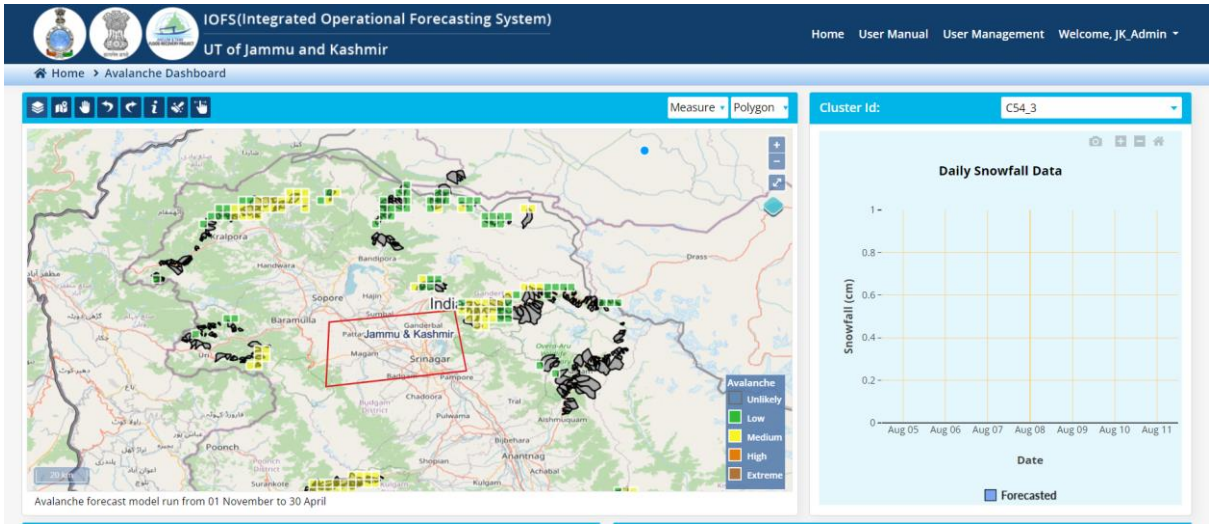


Figure 4-8: Draw Polygon screen

Similarly, by clicking on circle option and simultaneously clicking on the map user can draw circle.

4.1.11 GRAPHICAL VIEW OF AVALANCHE DATA

The three most critical and dynamic parameters, which play key role in triggering an Avalanche, are considered for graphical view in case of Avalanche Dashboard and they are (Figure 4-9 and Figure 4-10):

- Daily Snowfall Data
- Daily Average Wind Speed
- Daily Temperature Data

All three graphs are inter-related, changing the Cluster ID will effect on all of the three graphs.

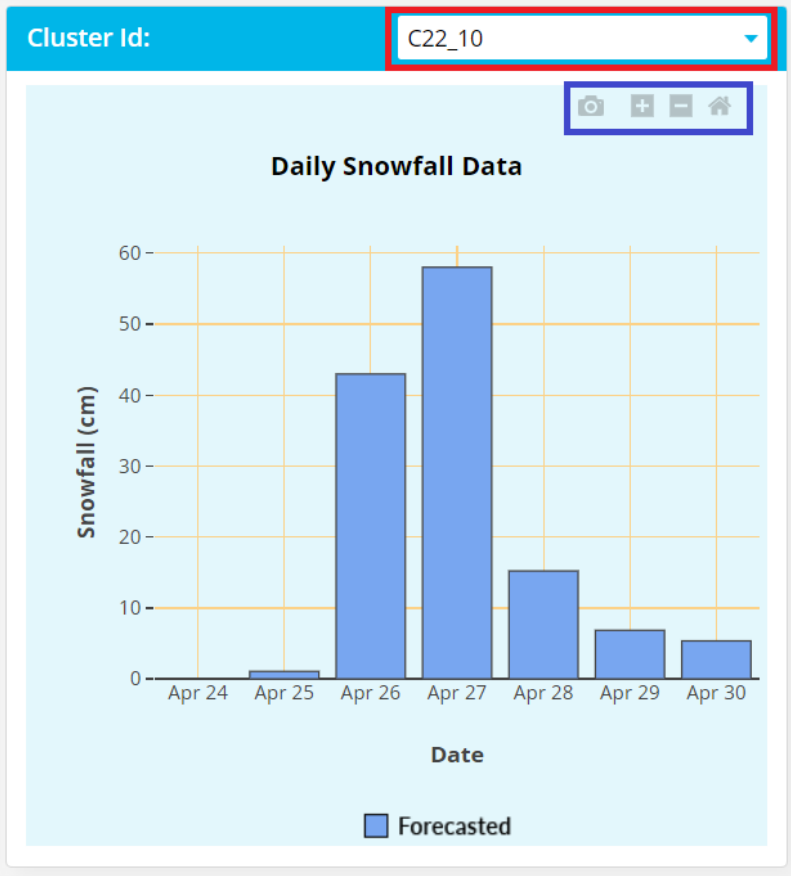


Figure 4-9: Daily Snowfall Data screen

Toolbar menu on graph window shows different icons and every icon have different feature:

- Download plot as a png icon
- Zoom-in icon
- Zoom-out icon
- Reset Axes

4.1.11.1 Download plot as a png icon

By clicking on Download plot as a png icon the png file of the graph gets downloaded on the local machine.

4.1.11.2 Zoom in icon

By clicking on the zoom in option user can select and particular area on the graph for zooming.

4.1.11.3 Zoom out icon

By clicking on the zoom in option user can select and particular area on the graph for zooming out.

4.1.11.4 Reset Axes

By clicking the Reset Axes option user can reset the axes to normal.

Figure 4-10: Daily Average Wind Speed and Daily Temperature Data screen

4.1.12 BULLETINS

Click on Date button of the Forecast Bulletin section to download the Avalanche Bulletin of the selected date as shown in Figure 4-11.

Select the date and click on Download button to download the Archive bulletins.

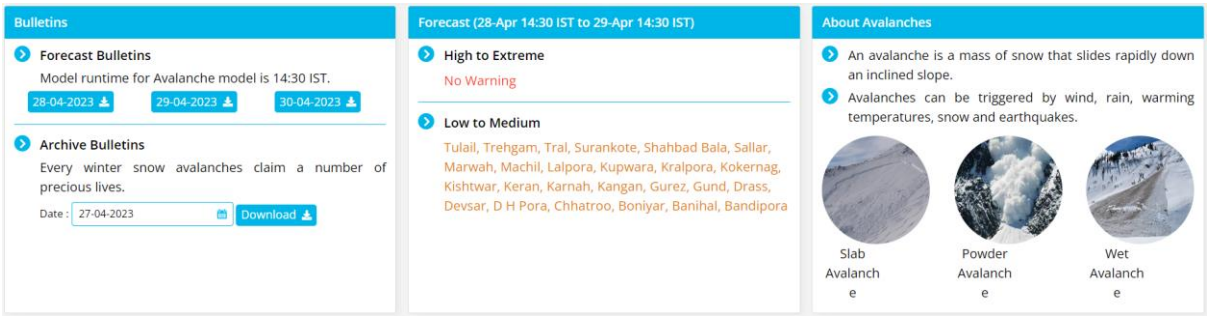


Figure 4-11: Flood Information

5 Drought Forecast

5.1 Drought Dashboard

1. Click on Drought Forecast Module Interface [4] on the homepage screen of the application as shown in Figure 5-1. The Drought Forecast can be broadly divided into four different parts
2. Toolbar Menu .
3. Map Window
4. Monthly Extended Rainfall Forecast.
5. Bulletins

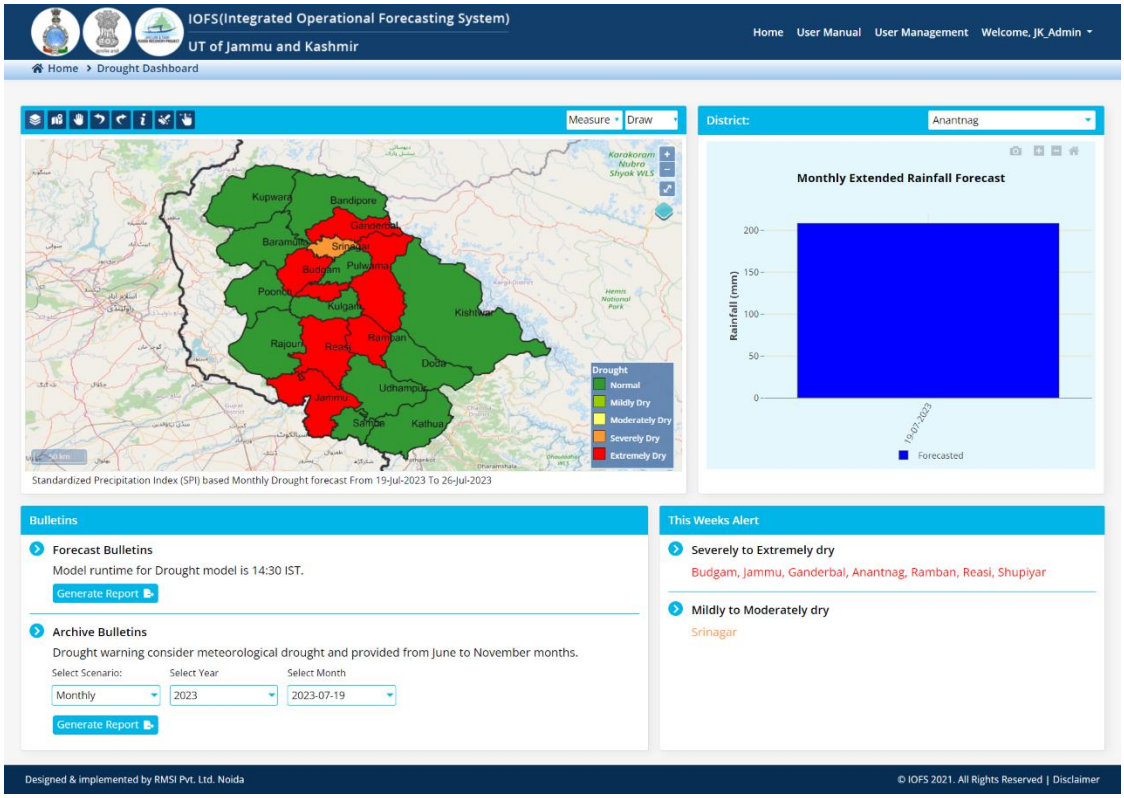


Figure 5-1: Drought Dashboard screen

5.1.1 TOOLBAR MENU

By default, "*The Toolbar Menu"* [1] is divided into following components

Database layers Icon	
Fit to Extent Icon	
Pan Icon	
Undo Icon & Redo Icon	
Information Icon	
Rest Icon	

Layer Swipe Tool Icon	
Measure & Draw	

5.1.2 DATABASE LAYERS

Database Layers are further divided into 4 components - Admin Boundary Layer, Drought Layer, Historical Events Layer & Biophysical layer as shown in Figure 5-2. When user clicks on the various checkboxes, corresponding to the layers, their thematic representation is displayed in the map window.

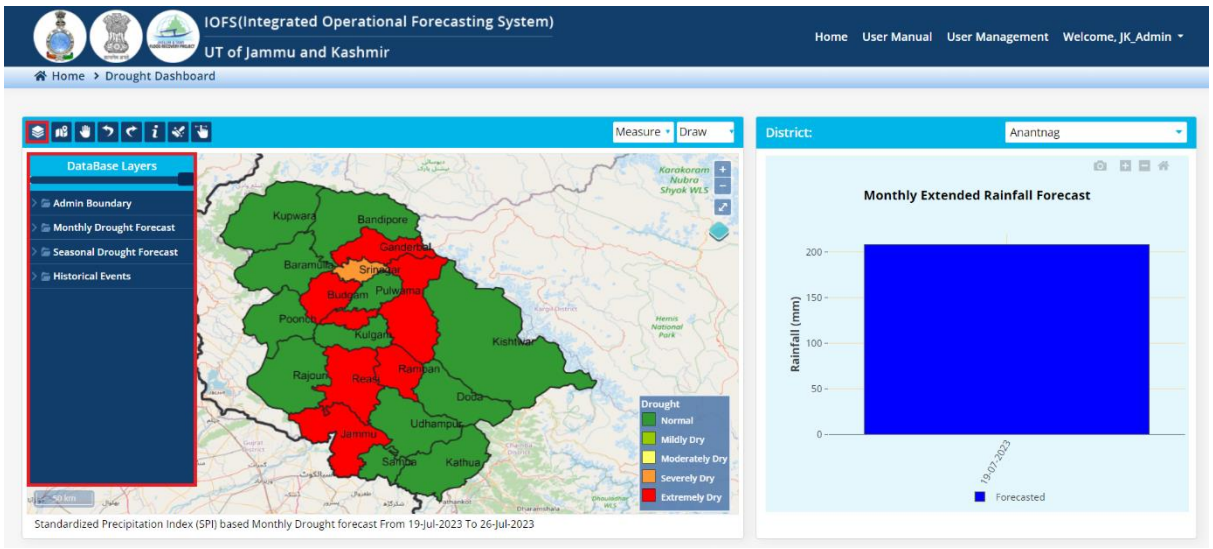


Figure 5-2: Database Layer screen

5.1.3 ADMINISTRATIVE LAYERS

Users can select single or multiple checkboxes under Administrative Layers as shown in the to display the corresponding layers (Country Boundary, UT Boundary, District Boundary etc.)

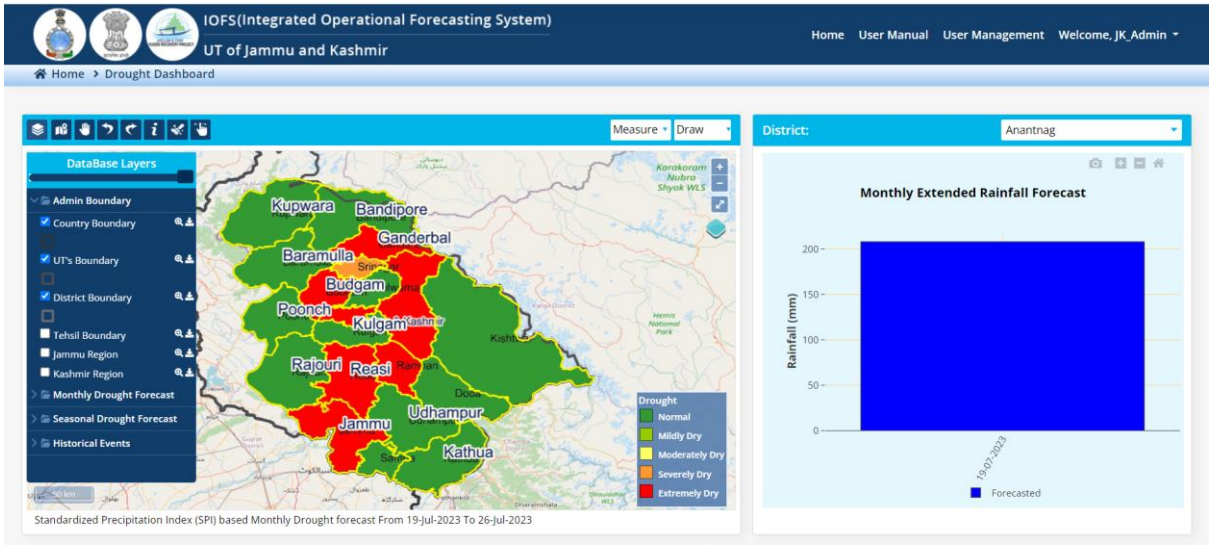


Figure 5-3: Administrative Boundary Layer screen

5.1.4 DROUGHT DATA LAYER

Click on Monthly Drought Forecast layer checkbox, the map displays the Monthly Drought Forecast of major districts of J&K in different colors - green for normal, light green for mildly dry, yellow for moderately dry, orange for severely dry and red for extremely dry as shown in Figure 5-4.

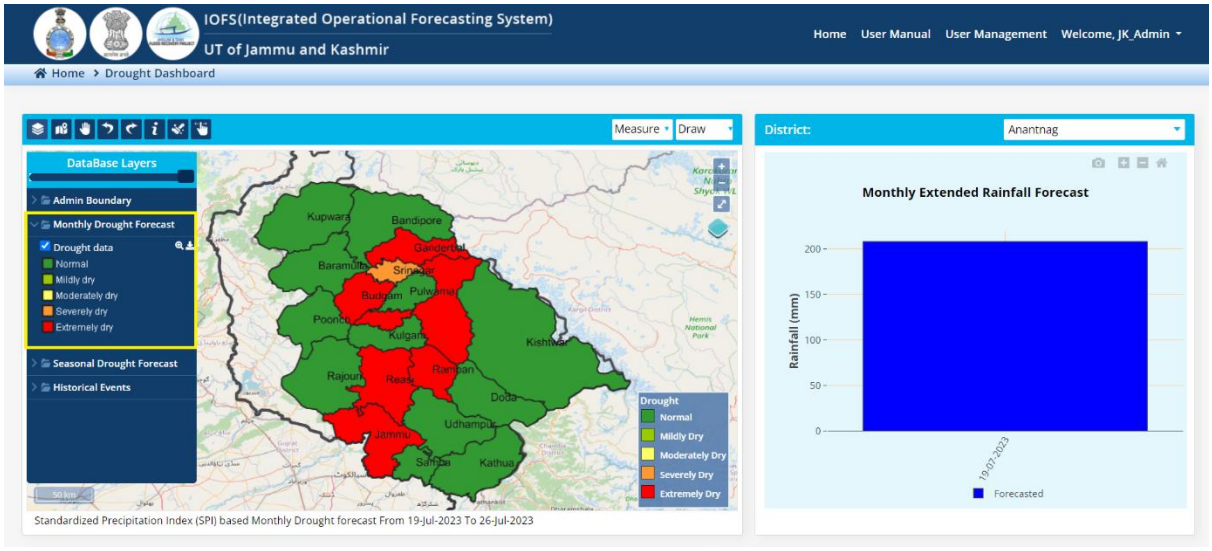


Figure 5-4: Monthly Drought Forecast

5.1.5 SEASONAL DROUGHT FORECAST LAYER

Click on Seasonal Drought Forecast layer checkbox, the map displays the Seasonal Drought Forecast of major districts of J&K in different colors - green for normal, light green for mildly dry, yellow for moderately dry, orange for severely dry and red for extremely dry as shown in Figure 5-5.

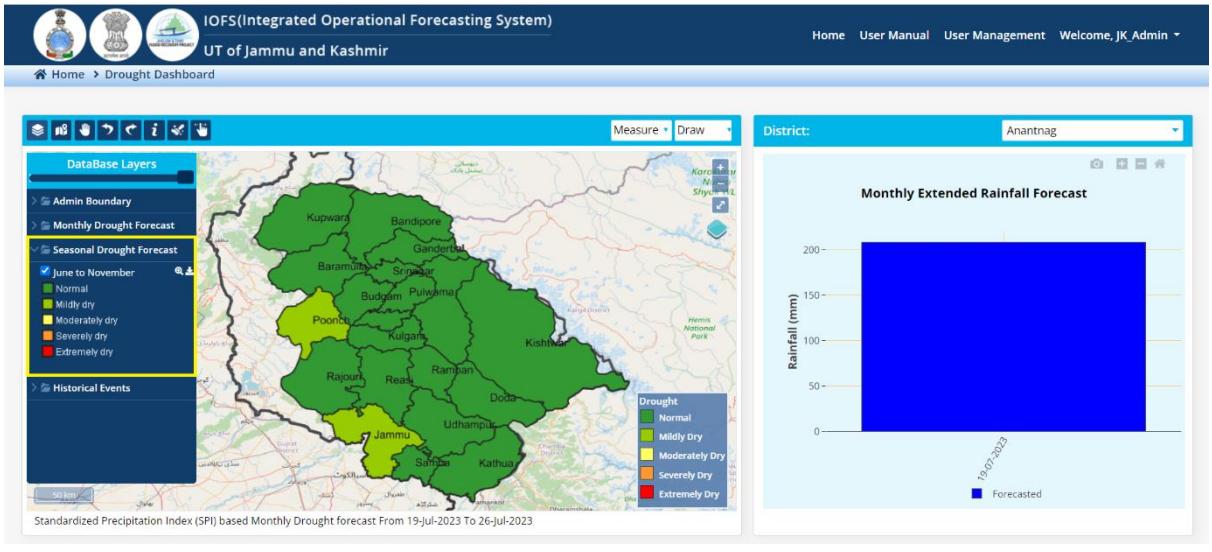


Figure 5-5: Seasonal Drought Forecast

5.1.6 HISTORICAL EVENTS LAYER

By clicking on historical events under database layer, users can select single or multiple checkboxes under Historical Layers to display the corresponding layers. Figure 5-6 shows the map with 2015 Events layer.

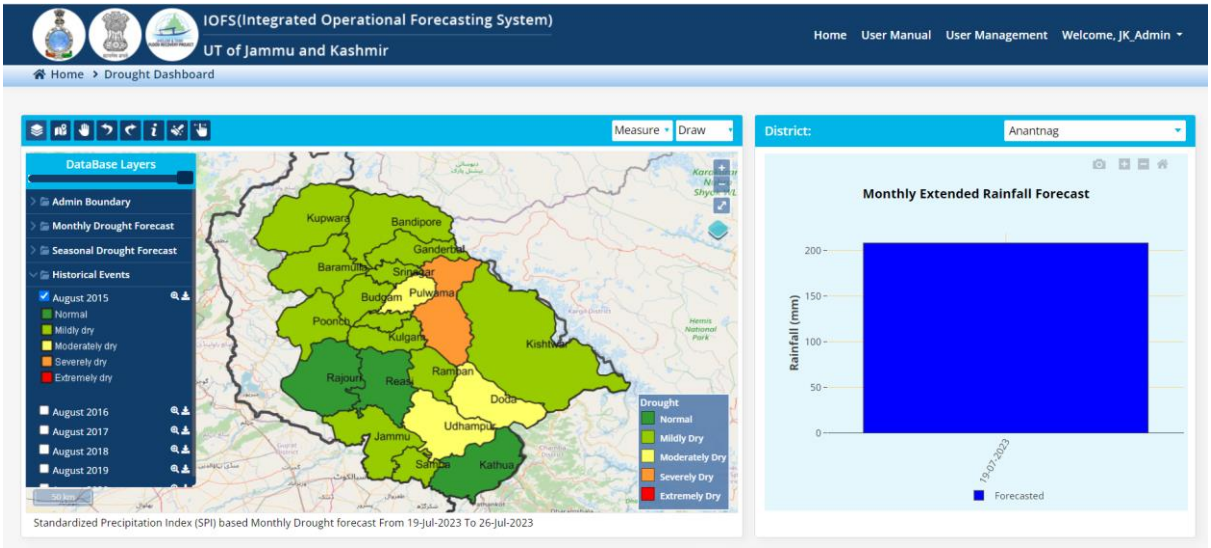


Figure 5-6: Historical Event layer for August 2015

5.1.7 MAP WINDOW

- The "*Map window"* [1] provides a map view of the area of interest.
- By default, the Map window displays the Open Street map view in the window.
- The Map window has the following components:

Click the – or + buttons to reduce or increase the zoom ratio of the map displayed in the Map Window by using the zoom control.	
Toggle full-screen button to display the screen on full page.	
Change Base Map layer is use to change the base map in Google Roadmap, Google Terrain, Google Satellite, Google Hybrid and Open Street Map.	

5.1.8 MONTHLY RAINFALL FORECAST

A graph is displayed on the right side of the window shows monthly extended rainfall forecast. User can also select the dropdown option to get the data of any district of J&K shown in Figure 5-7.

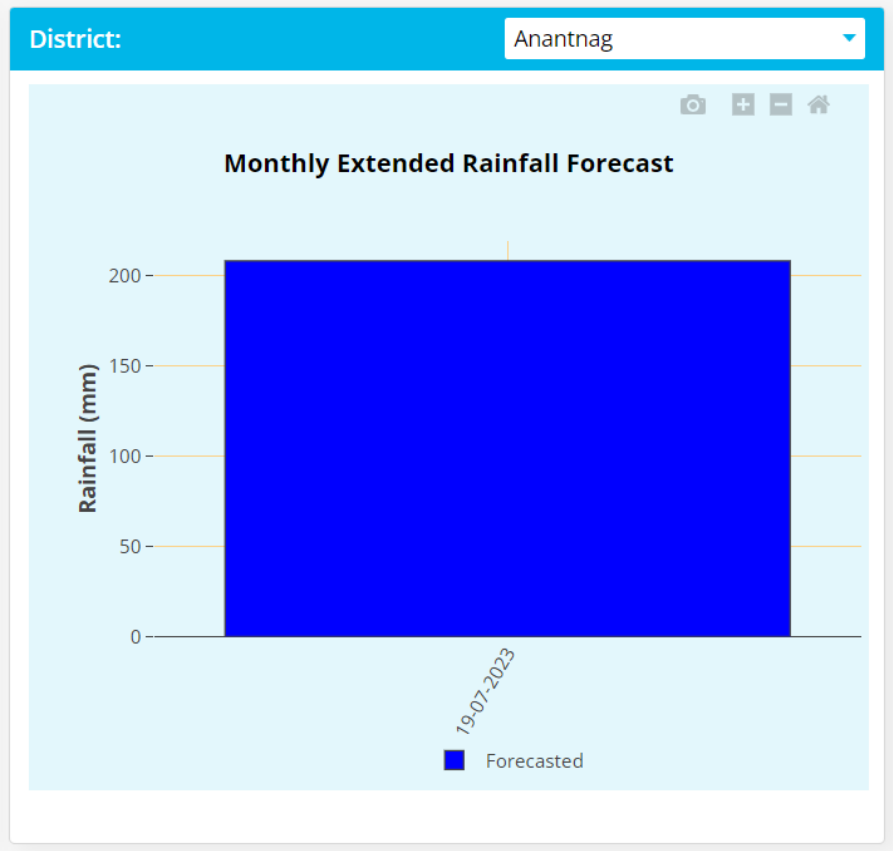


Figure 5-7: Monthly Extended Rainfall Forecast

5.1.9 BULLETIN & ALERTS

Users can view the following links in the Bulletin section of the Dashboard screen as shown in Figure 5-8.

- Bulletins: User can see the current Forecast and Archive bulletins on model runtime for drought for UT of J&K and also generate reports accordingly.
- Weekly Alerts: User also can see the weekly alerts warnings from Mild to Moderate Dry conditions and Severely to Extremely dry conditions.

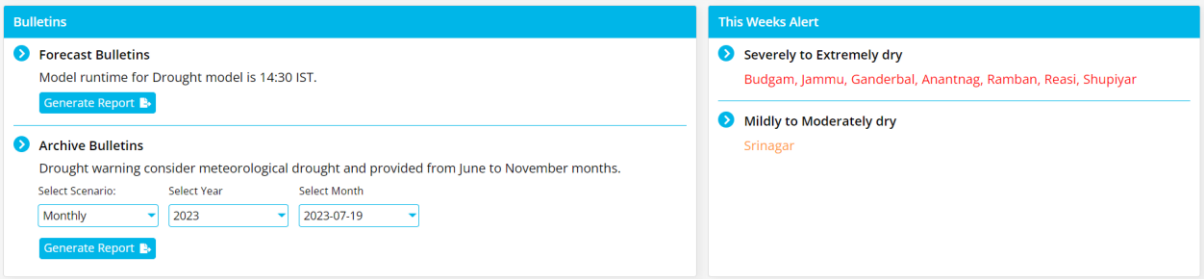


Figure 5-8: Bulletin & Alerts screen

6 Landslide Forecast

6.1 Landslide Dashboard

1. Click on Landslide Forecast Module Interface on the homepage screen of the application as shown in Figure 6-1. The Drought Forecast can be broadly divided into four different parts
2. Toolbar Menu .
3. Map Window
4. Daily Rainfall Data.
5. Bulletins

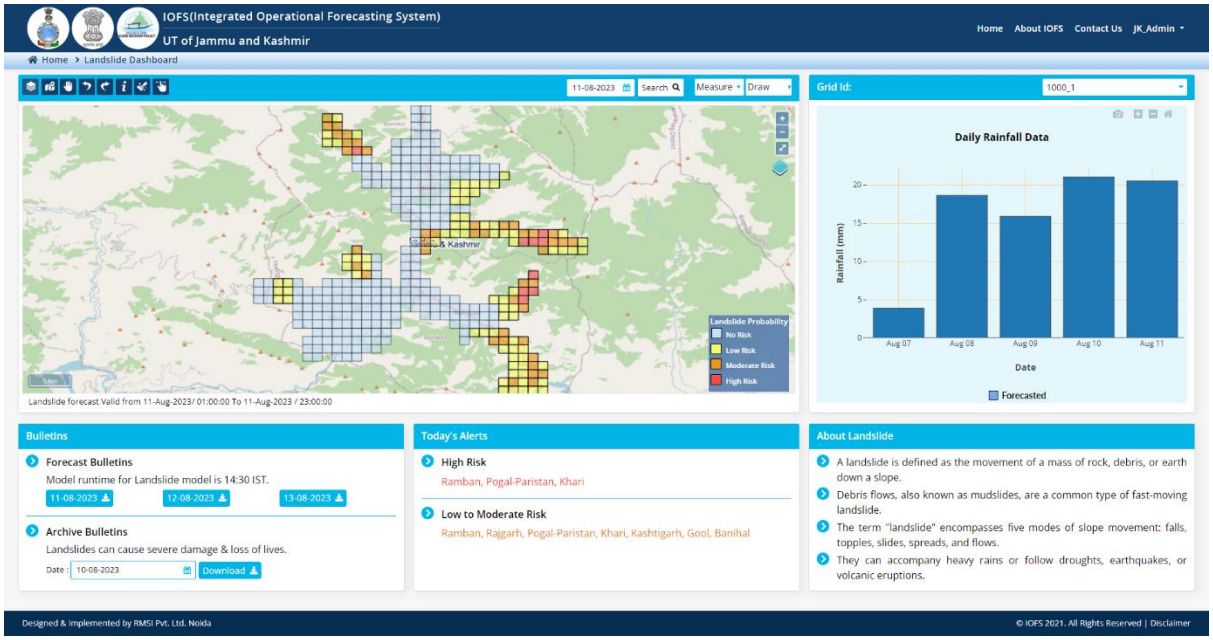
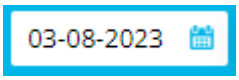
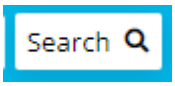


Figure 6-1: Drought Dashboard screen

6.1.1 TOOLBAR MENU

By default, "*The Toolbar Menu"* [1] is divided into following components

Database layers Icon	
Fit to Extent Icon	
Pan Icon	
Undo Icon & Redo Icon	
Information Icon	
Rest Icon	
Layer Swipe Tool Icon	
Date	

Search	
Measure & Draw	

6.1.2 DATABASE LAYERS

Database Layers are further divided into 2 components - Admin Boundary Layer and Landslide layer as shown in Figure 6-2. When user clicks on the various checkboxes, corresponding to the layers, their thematic representation is displayed on the map window.

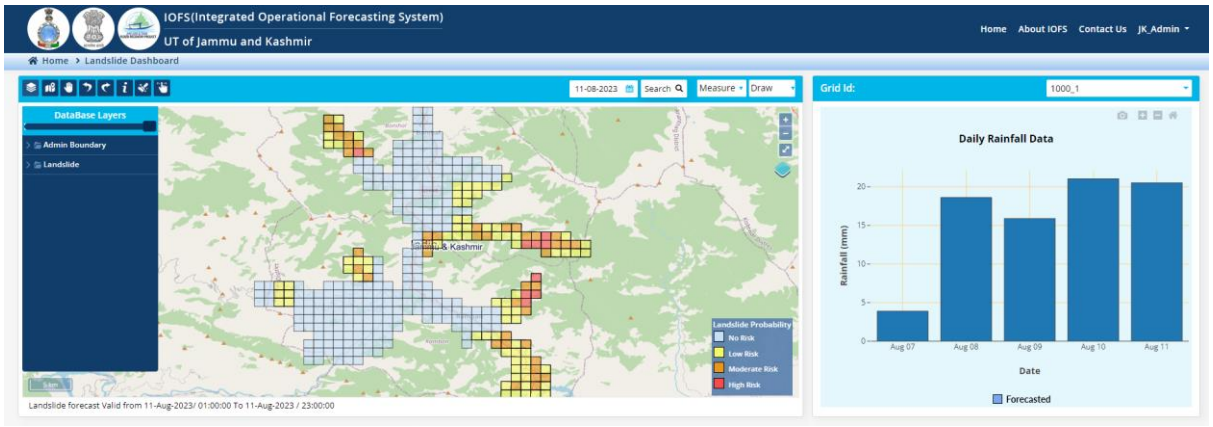


Figure 6-2: Database Layer screen

6.1.3 ADMINISTRATIVE LAYERS

Users can select single or multiple checkboxes under Administrative Layers as shown in the Figure 6-3 to display the corresponding layers (Country Boundary, UT Boundary, District Boundary etc.)

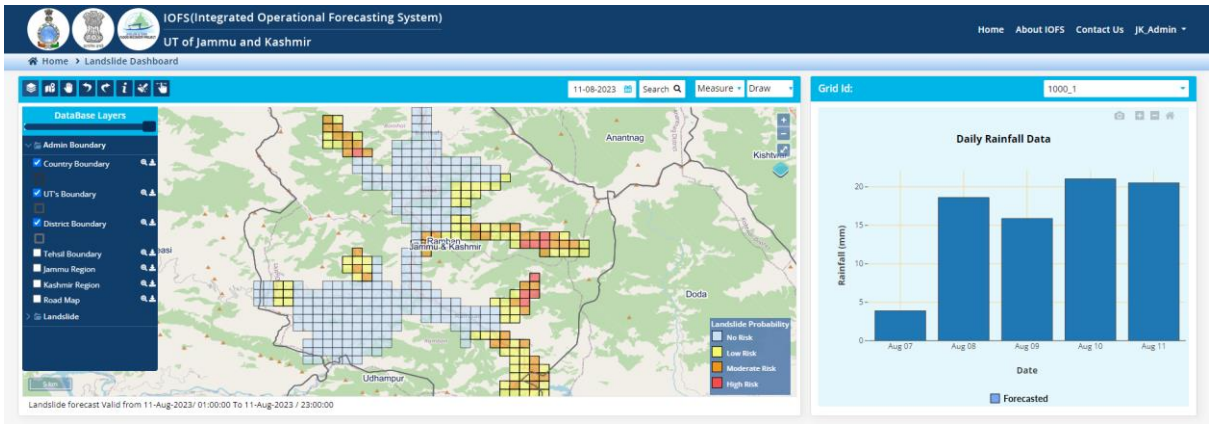


Figure 6-3: Administrative Boundary Layer screen

6.1.4 LANDSLIDE LAYER

Click on the Landslide Warning layer of the current date, the map displays the Landslide Warning of major districts of J&K in different colors - sky-blue for no risk, yellow for low risk, orange for moderate risk and red for high risk as shown in Figure 6-4.

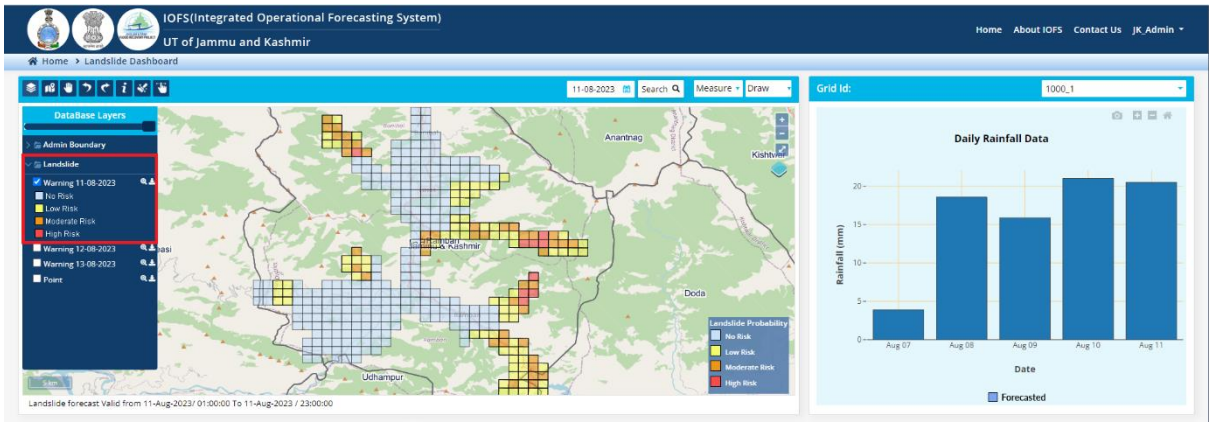


Figure 6-4: Landslide Layer screen

6.1.5 MAP WINDOW

- The "*Map window"* [1] provides a map view of the area of interest.
- By default, the Map window displays the Open Street map view in the window.
- The Map window has the following components:

Click the – or + buttons to reduce or increase the zoom ratio of the map displayed in the Map Window by using the zoom control.	
Toggle full-screen button to display the screen on full page.	
Change Base Map layer is use to change the base map in Google Roadmap, Google Terrain, Google Satellite, Google Hybrid and Open Street Map.	

6.1.6 DAILY RAINFALL DATA

A graph is displayed on the right side of the window shows Daily Rainfall Data. User can also select the dropdown option to change the grid ID of J&K as shown in Figure 6-5.

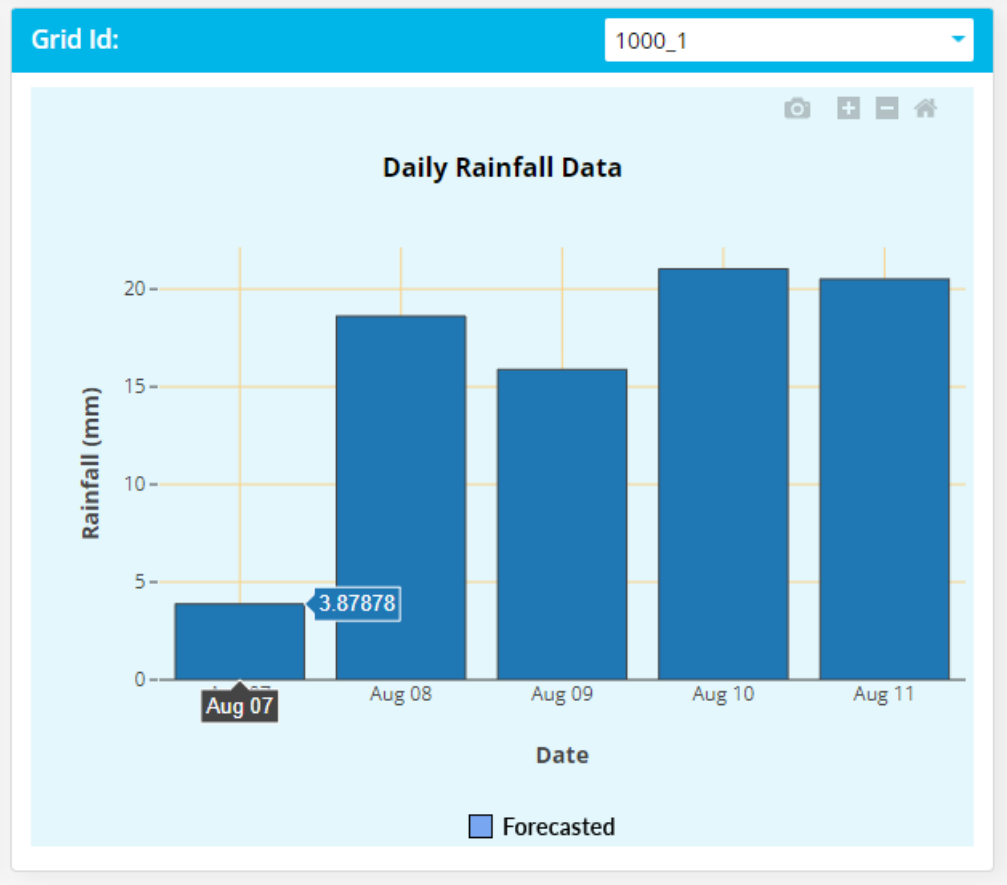


Figure 6-5: Monthly Extended Rainfall Forecast

6.1.7 BULLETIN & ALERTS

Users can view the following links in the Bulletin section of the Dashboard screen as shown in Figure 6-6.

- Bulletins: User can see the current Forecast and Archive bulletins on model runtime of Landslide for UT of J&K and also generate reports accordingly.
- Weekly Alerts: User also can see the Today's alerts warnings from Mild to Moderate Dry conditions and Severely to Extremely dry conditions.

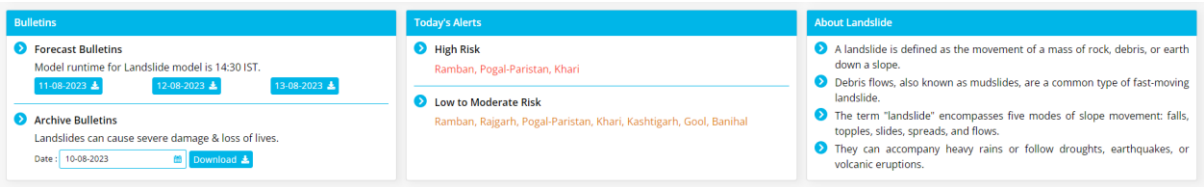


Figure 6-6: Bulletin & Alerts screen