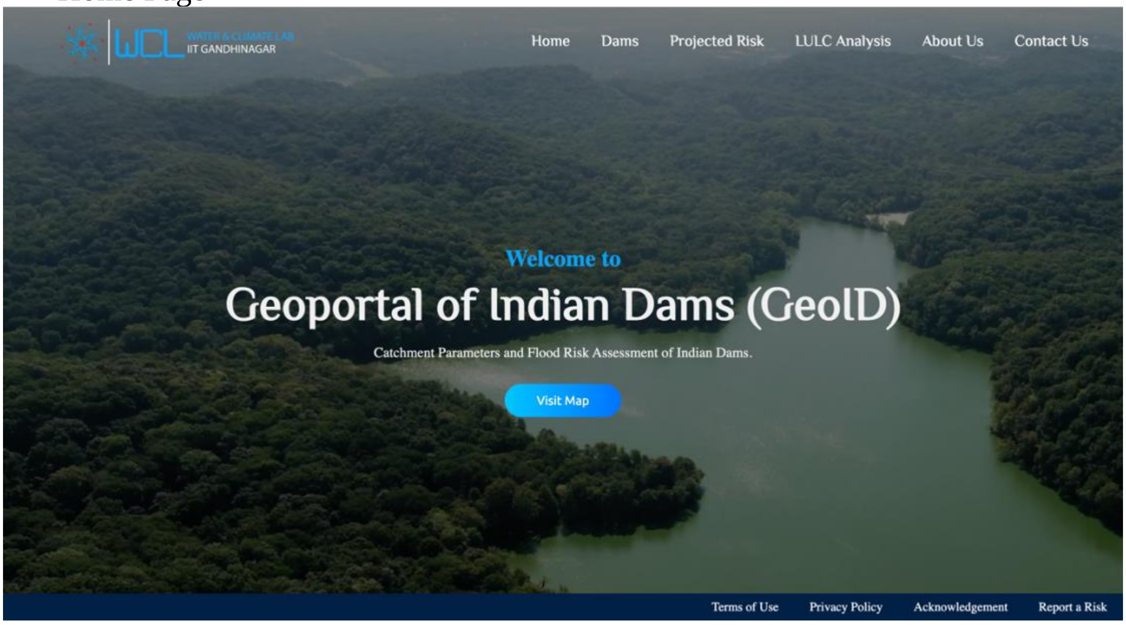
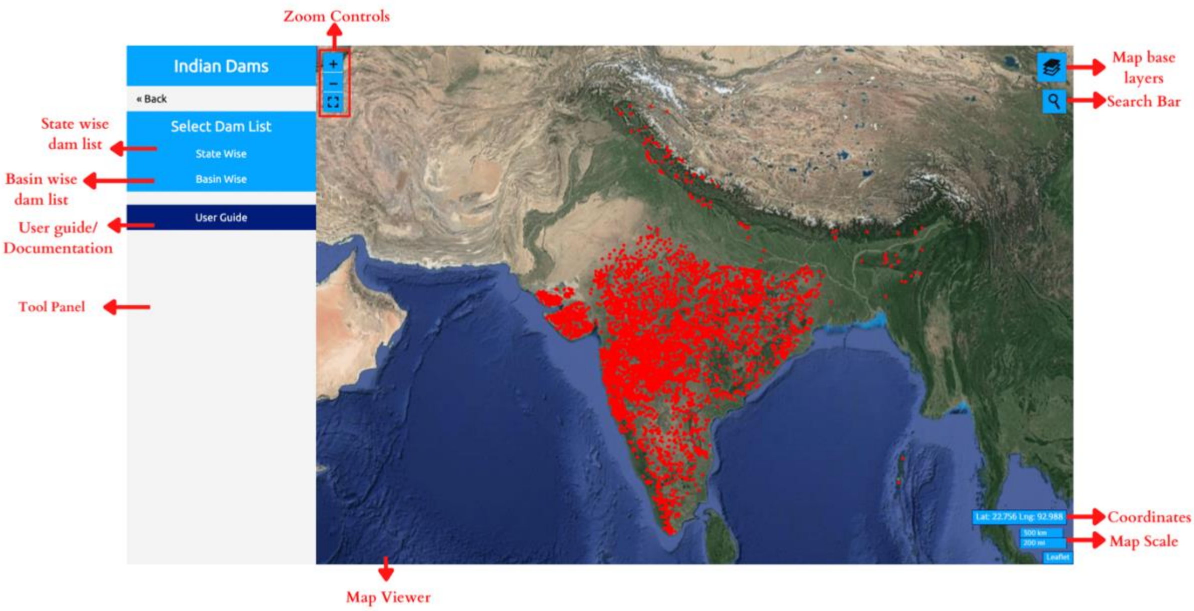
USER GUIDE AND DOCUMENTATION

In this guide, you will know how to use different tools, features, and functions of this geoportal for easy access to the data.

- Home Page

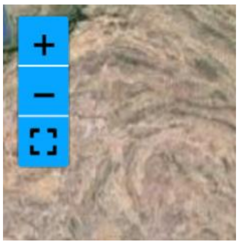


- Dams Page

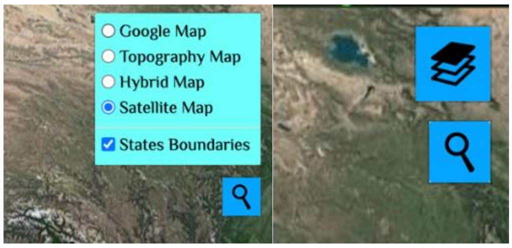


Different tools in this tab are as follows:

1. **Zoom controls:** The options are + and - symbols, displayed on the left on the map viewer. By clicking on these options, you can zoom in and out of the map and on clicking the full screen button, you can full screen the map view.

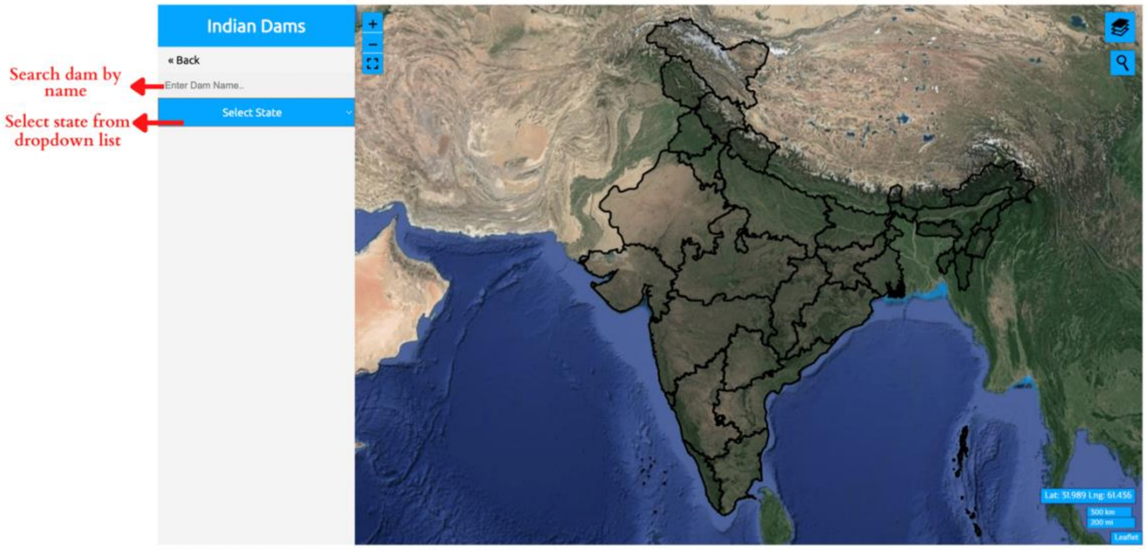


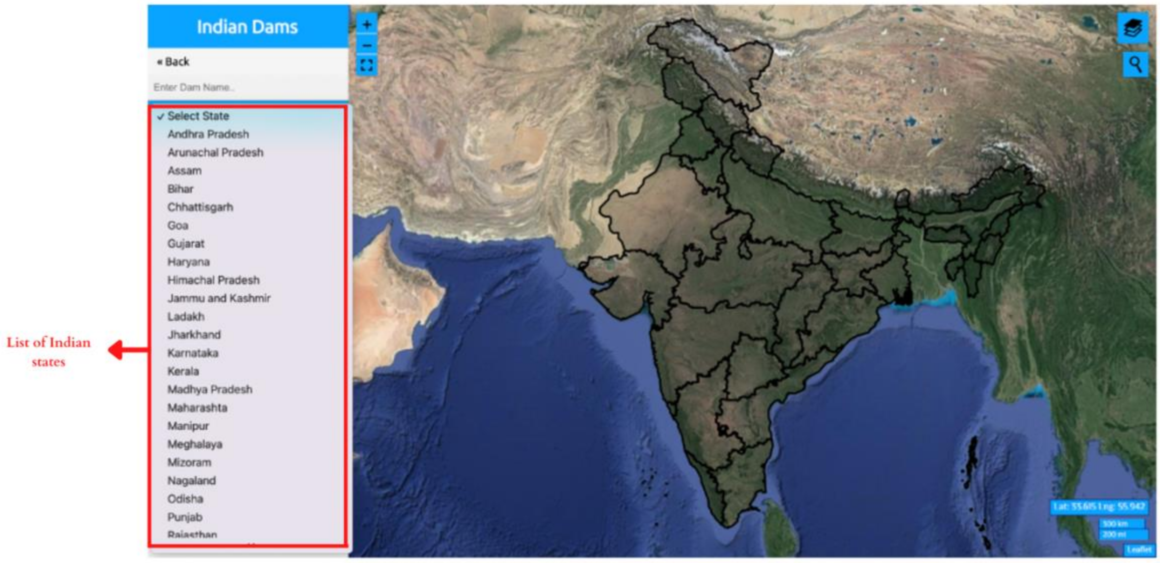
2. **Base maps/layers:** This tool displays a collection of base maps and layers (Google Map, Topography Map, Satellite Map, Hybrid Map). When a new base map is selected from the base map layers, the default base map layer is removed and replaced with the layer of the associated base map selected. This tool is available on the top-right side of the map panel.
3. **Search:** On the top-right side of the map viewer, there is a search bar option where users can find any address on the map.

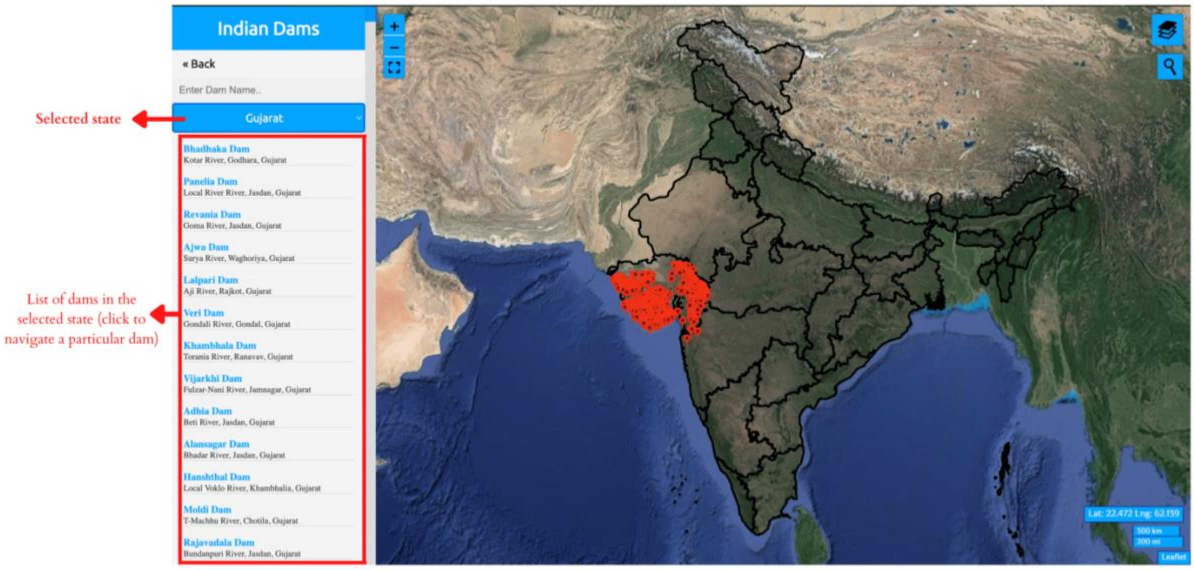


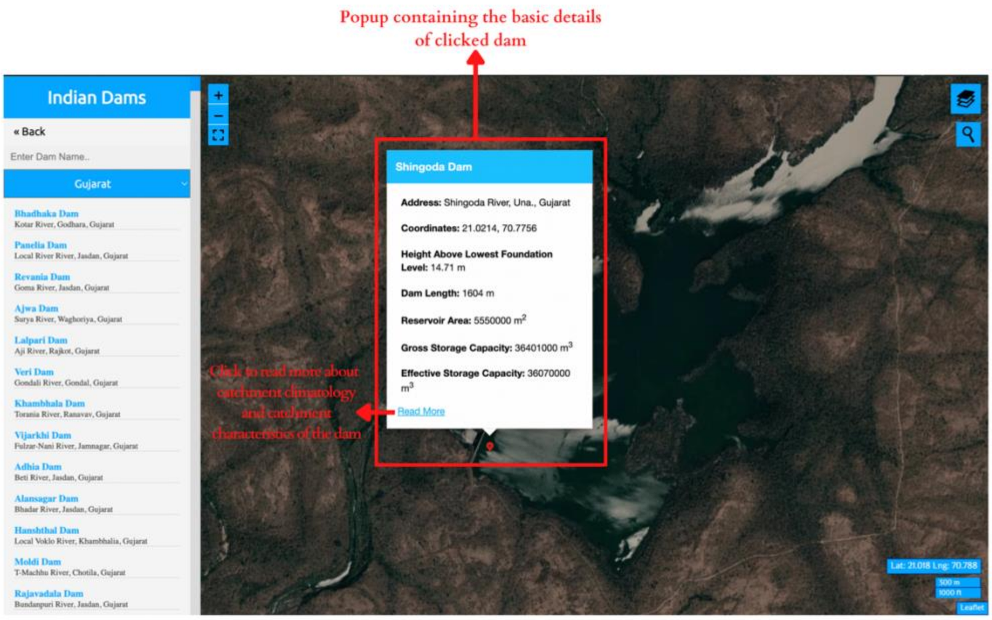
4. **Pointer Coordinates:** This feature is on the right bottom side of the map viewer, this represents the mouse pointer coordinates [Lat, Lng] on the map.
5. **Map Scale:** This feature provides the scale of the map.

- State wise dam list

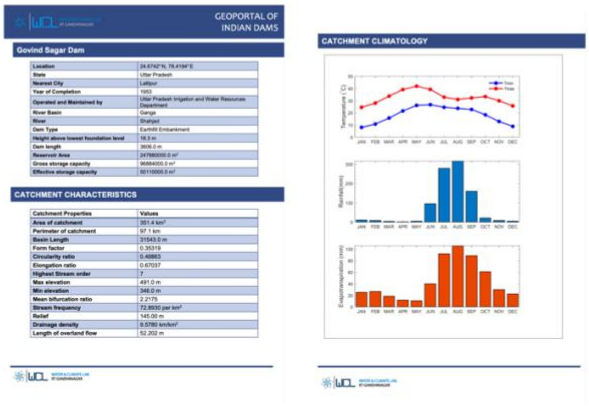




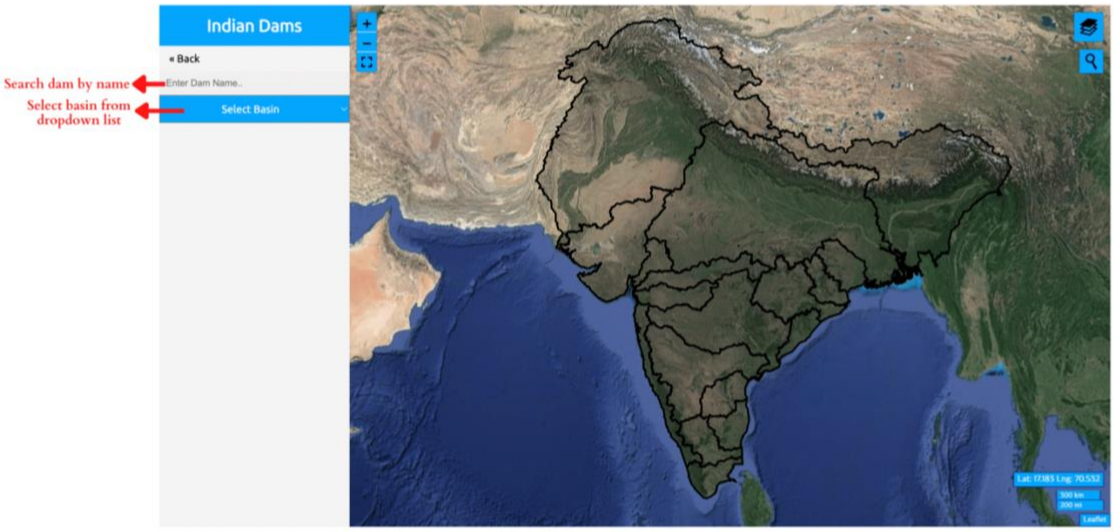

Indian Dams
« Back
Enter Dam Name..
Selected state
Gujarat
List of dams in the selected state (click to navigate a particular dam)
Bhadhaka Dam
Kotar River, Godhara, Gujarat
Panelia Dam
Local River River, Jasdan, Gujarat
Revania Dam
Goma River, Jasdan, Gujarat
Ajwa Dam
Surya River, Waghoriya, Gujarat
Lalpari Dam
Aji River, Rajkot, Gujarat
Veri Dam
Gondali River, Gondal, Gujarat
Khambhala Dam
Torania River, Ranavav, Gujarat
Vijarkhi Dam
Fulzar-Nani River, Jamnagar, Gujarat
Adhia Dam
Beti River, Jasdan, Gujarat
Alansagar Dam
Bhadar River, Jasdan, Gujarat
Hanshthal Dam
Local Voklo River, Khambhalia, Gujarat
Moldi Dam
T-Machhu River, Chotila, Gujarat
Rajavadala Dam
Bundanpuri River, Jasdan, Gujarat
Leaflet


Popup containing the basic details of clicked dam
Indian Dams
« Back
Enter Dam Name..
Gujarat
Bhadhaka Dam
Kotar River, Godhara, Gujarat
Panelia Dam
Local River River, Jasdan, Gujarat
Revania Dam
Goma River, Jasdan, Gujarat
Ajwa Dam
Surya River, Waghoriya, Gujarat
Lalpari Dam
Aji River, Rajkot, Gujarat
Veri Dam
Gondali River, Gondal, Gujarat
Khambhala Dam
Torania River, Ranavav, Gujarat
Vijarkhi Dam
Fulzar-Nani River, Jamnagar, Gujarat
Adhia Dam
Beti River, Jasdan, Gujarat
Alansagar Dam
Bhadar River, Jasdan, Gujarat
Hanshthal Dam
Local Voklo River, Khambhalia, Gujarat
Moldi Dam
T-Machhu River, Chotila, Gujarat
Rajavadala Dam
Bundanpuri River, Jasdan, Gujarat
Shingoda Dam
Address: Shingoda River, Una., Gujarat
Coordinates: 21.0214, 70.7756
Height Above Lowest Foundation Level: 14.71 m
Dam Length: 1604 m
Reservoir Area: 5550000 m^2
Gross Storage Capacity: 36401000 m^3
Effective Storage Capacity: 36070000 m^3
Read More
Click to read more about catchment climatology and catchment characteristics of the dam
Leaflet

- Generated PDF: When you click on read more, a PDF of that particular dam will generate.



- Basin wise dam list



Catchment characteristics

The catchment characteristics that are included in the study for all the dams are

1. **Area of catchment:** The catchment area is calculated by delineating the watershed considering the pourpoint at each dam and then calculating the area using GIS.
2. **Perimeter of the catchment:** The perimeter is also calculated following the same process as described above. The area and perimeter of the catchment are crucial for estimating further morphological parameters.
3. **Basin Length:** Basin length is the longest distance from the pour point to the boundary of the catchment. The study used near the analysis of ArcGIS to get the distance of all the points from the pour point. The maximum of these lengths was considered as the basin length for the watershed.
4. **Relief:** Relief is the difference between the maximum and minimum elevation in a specific area. Using the raster statistics of the DEM data, one can access the information about the maximum and minimum elevation of that area. Relief is a useful parameter to understand and study the denudational characteristics of an area, i.e, removal of mainland through erosion, leaching, stripping, etc. from higher to lower areas.
5. **Stream order:** The stream order of different streams is calculated as per Strahler (1964). The smallest streams have designated the order one. Two first-order streams join and form the second-order stream and so on. The highest order of the stream in a catchment (say n) is used to define the basin as n^{th} order basin. This parameter is dependent on the delineation and thus is limited by the resolution of the DEM data. The resolution of the DEM data considered in this study is 90m and thus is capable of capturing the small permanent streams.
6. **Mean Bifurcation Ratio:** The bifurcation ratio is the ratio of the number of streams of n^{th} order to the number of streams of $(n+1)^{th}$ order.
7. **Circularity ratio:** Miller (1953) defined the circularity ratio as the ratio of the area of the basin to the area of the circle having the same perimeter as the basin. The mathematical formula derived from this definition is available in Table1.
8. **Elongation ratio:** Schumm (1956) defined the elongation ratio as the ratio of the diameter of a circle having the same area as the basin to the basin length. The mathematical expression is given in Table 1.
9. **Form factor:** Horton (1932) suggested form factor as the ratio of the area of the basin to the square of the basin length. The greater value of the form factor indicates a circular basin while less value means an elongated basin.
10. **Stream frequency:** Horton (1964) defined stream frequency as the number of streams per unit area. The main factor influencing the stream frequency is the lithology which indicates the texture of the drainage network in the basin. Stream order calculation in GIS gives the count of streams of each order. We can thus get the total number of streams in a basin.
11. **Drainage density:** Drainage density is the ratio of the length of streams in the basin to the area of the basin (Horton, 1945). Many studies have indicated the relation of drainage density to climatic and environmental parameters. In this study, streams

generated in ArcGIS were converted to vector polyline data to calculate the geometry and the total length of streams was found.

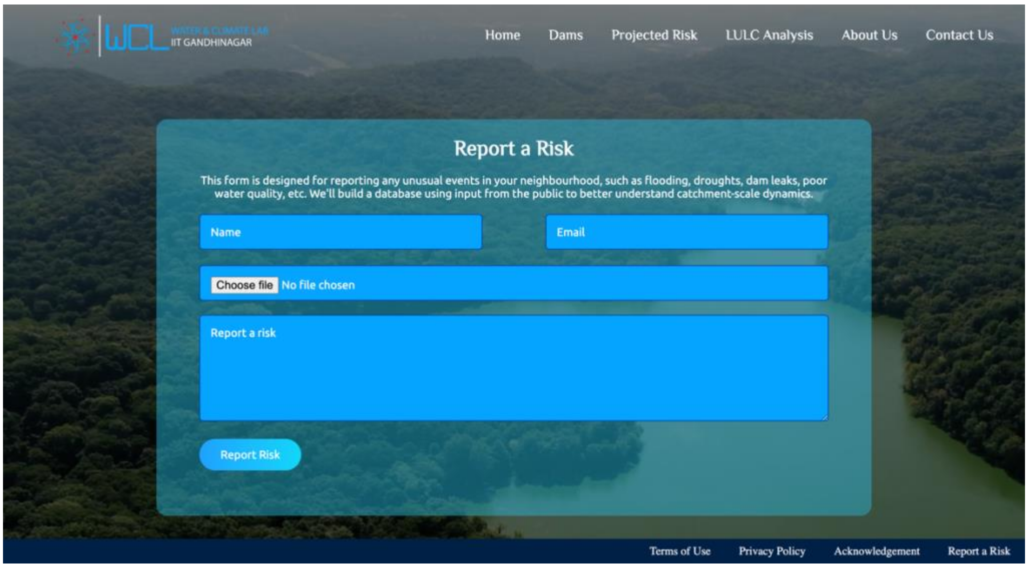
12. **Length of overland flow:** The length of overland flow is the length of flow over the ground before the water joins certain streams or channels. Horton (1945) gave a mathematical dependence of the length of overland flow with the drainage density that can be seen in Table 1.

Table 1: Summary of the catchment parameters considered in this study

Sr No.	Parameter	Definition/Formula	Reference
1	Basin Length (L)	Maximum length from the pour point to the boundary of the catchment.	-
2	Relief (R)	Difference between maximum elevation and minimum elevation of the catchment area. R = Max. elevation - Min elevation	Hadley and Schumm (1961)
3	Highest stream order	Two first-order streams join and form the second-order stream and so on. The highest order of the stream in a catchment is used to define the stream order.	Strahler (1964)
4	Mean Bifurcation ratio (R_b)	The mean of the ratio of the number of streams of n^{th} order to the number of streams of $(n+1)^{th}$ order.	Strahler (1957)
5	Drainage density (DD)	The ratio of the length of streams in the basin to the area of the basin. $DD = \frac{\sum Li}{Area}$ where L_i is the length of i^{th} order channels.	Horton (1945)
6	Length of overland flow (L_f)	The length of flow over the ground before the water joins certain streams or channels. $L_f = \frac{1}{2DD}$	Horton (1945)

7	Stream frequency	The number of streams per unit area. $$F_s = \frac{\sum Ni}{Area}$$ where N_i is the number of streams of i^{th} order	Horton (1945)
7	Circularity ratio (R_c)	The ratio of the area of the basin to the area of the circle having the same perimeter as the basin. $$R_c = \frac{4\pi Area}{Perimeter^2}$$	Strahler (1964)
8	Elongation ratio (R_e)	The ratio of the diameter of a circle having the same area as the basin to the basin length. $$R_e = 1.128\sqrt{\frac{Area}{L}}$$	Schumm (1956)
9	Form factor (F_f)	The ratio of the area of the basin to the square of the basin length. $$F_f = \frac{Area}{L^2}$$	Horton (1932)

- **Report a Risk**: This form is designed for reporting any unusual events in your neighborhood, such as flooding, droughts, dam leaks, poor water quality, etc. We'll build a database using input from the public to better understand catchment-scale dynamics. In choose file section you can upload images related to reporting risk.



<u>Dam risk analysis</u>

Method of projected change in risk calculation:

1. Monthly streamflow data for large stations (catchment area > 3800 sq. km), simulated by the VIC model, was used for return period analysis. The meteorological forcing data for the VIC model was generated by using the CMIP6 SSP585 scenario for four GCMs: BCC-CSM2-MR, MIROC6, NorESM2-MM, and TaiESM1.

2. For each GCM and each dam: The streamflow data from 1985 to 2014 was used to find discharge levels Q1, Q2 and Q3 corresponding to 10, 25 and 50-year return periods respectively. The projected streamflow data from 2071 to 2100 was used to find the return periods T1*, T2* and T3* corresponding to discharge levels Q1, Q2 and Q3.

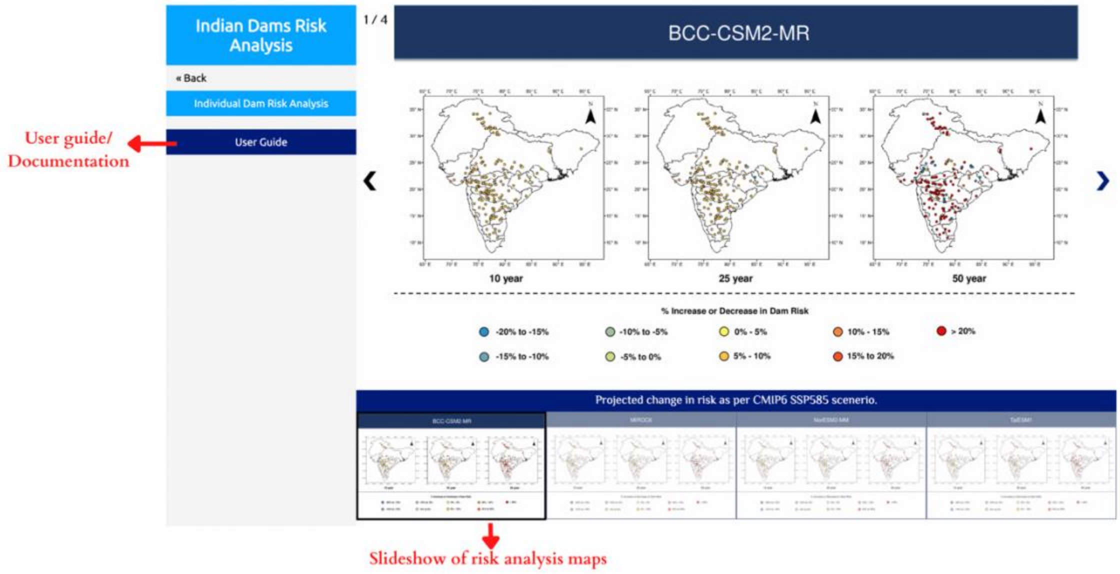
   Risks R1*, R2* and R3* were calculated corresponding to T1*, T2* and T3*-year return period using formula:
   $Ri* = 1 - (1 - \frac{1}{Ti*})^n$
   where i = {1, 2, 3}
   n = 100 years (lifespan of each dam)

   Risks R1, R2 and R3 were calculated corresponding to 10, 25 and 50-year return period using formula:
   $Ri = 1 - (1 - \frac{1}{Ti})^n$
   where i = {1, 2, 3}
   n = 100 years (lifespan of each dam)
   T1 = 10 years, T2 = 25 years, T3 = 50 years

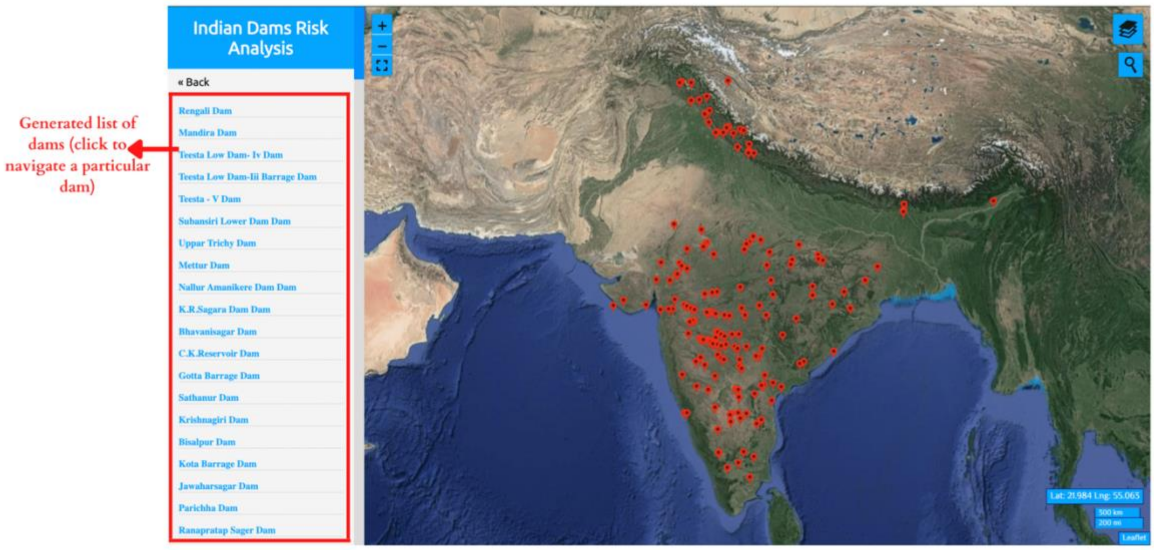
   Change in risk was calculated as:
   $\Delta R_{10} = R1^* - R1$
   $\Delta R_{25} = R2^* - R2$
   $\Delta R_{50} = R3^* - R3$

3. For each dam, ensemble mean of change in risk for all the four GCMs was taken and shown on the website.

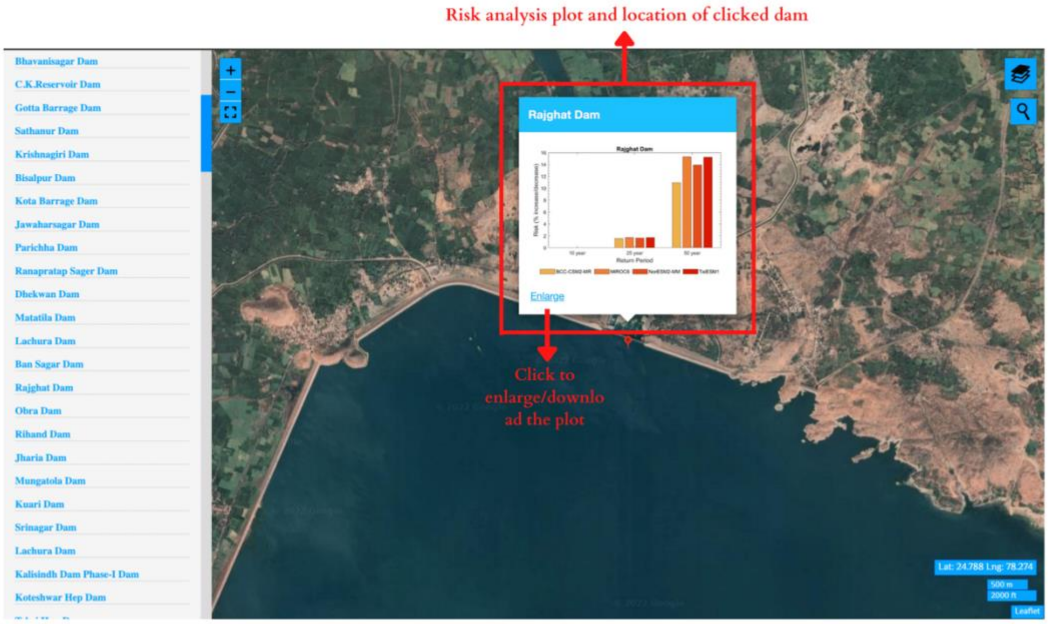
- Projected risk page

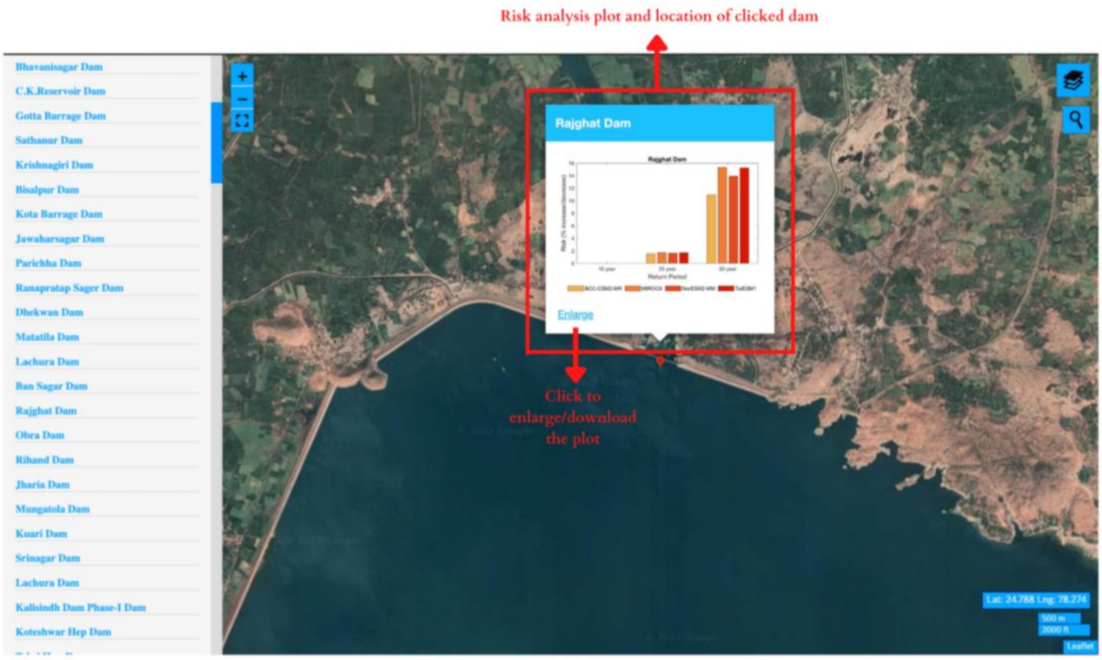


Indian Dams Risk Analysis
« Back
Individual Dam Risk Analysis
User Guide
User guide/ Documentation
1 / 4
BCC-CSM2-MR
10 year
25 year
50 year
% Increase or Decrease in Dam Risk
-20% to -15%
-15% to -10%
-10% to -5%
-5% to 0%
0% - 5%
5% - 10%
10% - 15%
15% to 20%
> 20%
Projected change in risk as per CMIP6 SSP585 scenerio.
Slideshow of risk analysis maps



Indian Dams Risk Analysis
« Back
Generated list of dams (click to navigate a particular dam)
Rengali Dam
Mandira Dam
Teesta Low Dam- Iv Dam
Teesta Low Dam-Iii Barrage Dam
Teesta - V Dam
Subansiri Lower Dam Dam
Uppar Trichy Dam
Mettur Dam
Nallur Amanikere Dam Dam
K.R.Sagara Dam Dam
Bhavanisagar Dam
C.K.Reservoir Dam
Gotta Barrage Dam
Sathanur Dam
Krishnagiri Dam
Bisalpur Dam
Kota Barrage Dam
Jawaharsagar Dam
Parichha Dam
Ranapratap Sager Dam
Lat: 21.984 Lng: 55.065
500 km
200 mi
Leaflet





LULC Analysis

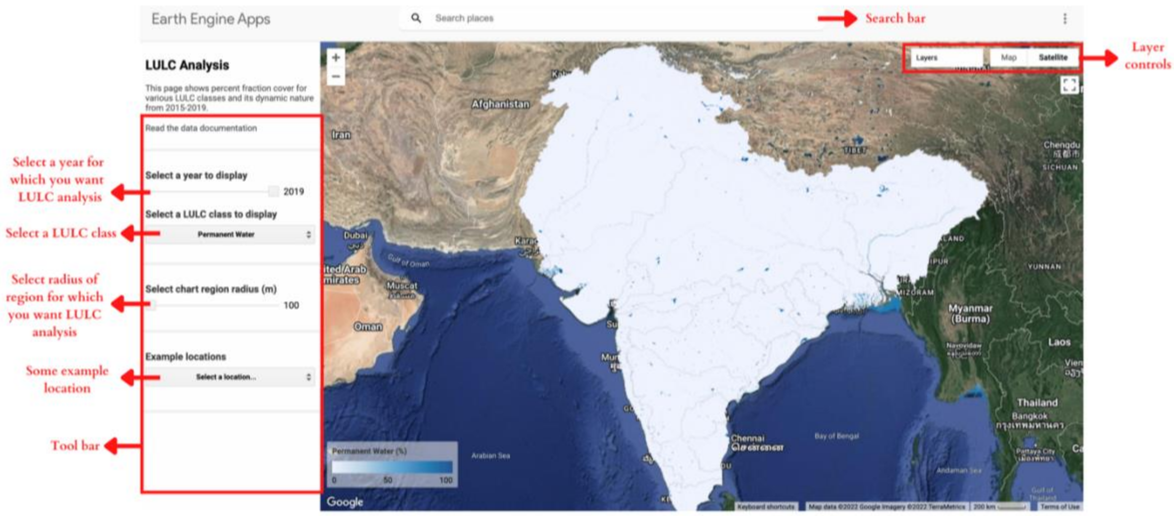
The term "Land Use/Land Cover" (LULC) refers to the categorization or classification of human activities and natural elements on the landscape throughout a certain time period based on established scientific and statistical methods of analysis of pertinent source materials. So basically, what is on the earth and how humans are using it is referred as Land Use and Land Cover (LULC). The term "land cover" describes the different types of materials that make up the landscape (such as forests, crops, water, urban, wetland areas, and asphalt constructed by humans). What people do on the ground surface is known as "land use" (e.g., agriculture, commerce, settlement).

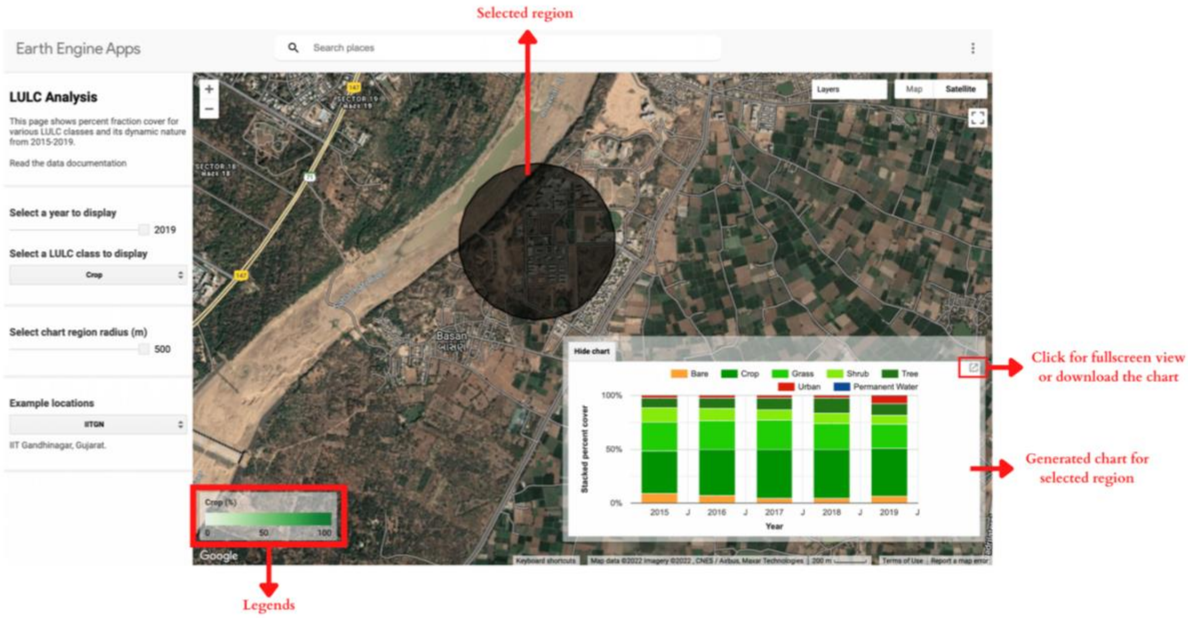
These LULC classes have significant impact on runoff generation process. Hence, it is necessary to understand dynamic nature of this classes.

This earth engine platform helps you to identify LULC classes present in the catchment which will help to understand catchment scale processes.

LULC data of various classes were collected from Copernicus Global Land Cover Layers: CGLS-LC100 Collection 3. (Read more about dataset)

- LULC analysis page




Selected region
Earth Engine Apps
Search places
LULC Analysis
This page shows percent fraction cover for various LULC classes and its dynamic nature from 2015-2019.
Read the data documentation
Select a year to display
2019
Select a LULC class to display
Crop
Select chart region radius (m)
500
Example locations
IITGN
IIT Gandhinagar, Gujarat.
Layers
Map
Satellite
Hide chart
Bare
Crop
Grass
Shrub
Tree
Urban
Permanent Water
100%
50%
0%
Stacked percent cover
2015
2016
2017
2018
2019
Year
Crop (%)
0
50
100
Google
Click for fullscreen view or download the chart
Generated chart for selected region
Legends