Web Mapping of Ramsar sites of India

(M.Sc. Agriculture Analytics)

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Contents

Abstract

This study aimed to create an interactive web map of Ramsar sites in India by utilizing advanced geospatial technologies such as PostGIS, GeoServer, and OpenLayers. Ramsar sites, designated as wetlands of international importance under the Ramsar Convention, it play a crucial role in biodiversity conservation and sustainable development. This project involved the integration of spatial data into a PostgreSQL database, which enables efficient storage, management, and querying of geospatial information.

GeoServer which served the spatial data as web services, and facilitates data sharing on server. OpenLayers was used to develop the user interface, providing a dynamic and user-friendly platform for visualizing and interacting with the Ramsar site data.

The resulting web map offers a comprehensive and accessible tool for researchers, policymakers, and the public to explore and analyze the characteristics of Ramsar sites across India. This approach enhances the visibility and awareness of these critical wetlands and supports informed decision-making for their conservation and management.

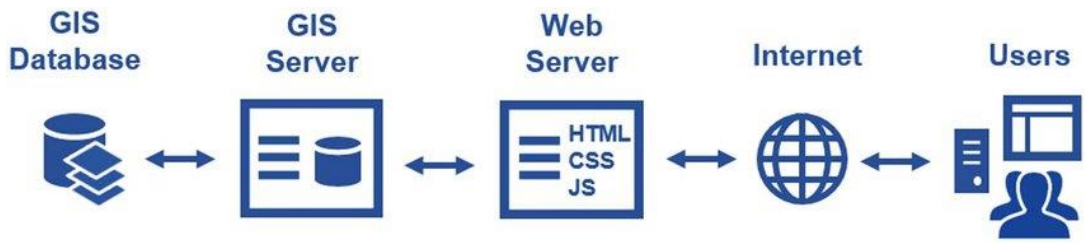
Introduction

Wetlands are among the most productive ecosystems in the world, offering numerous ecological, economic, and social benefits. The Ramsar Convention was established in 1971 to promote the conservation and sustainable use of wetlands globally. Ramsar sites, designated under this convention, are wetlands of international importance, and their protection is vital for ecological balance and sustainable development.

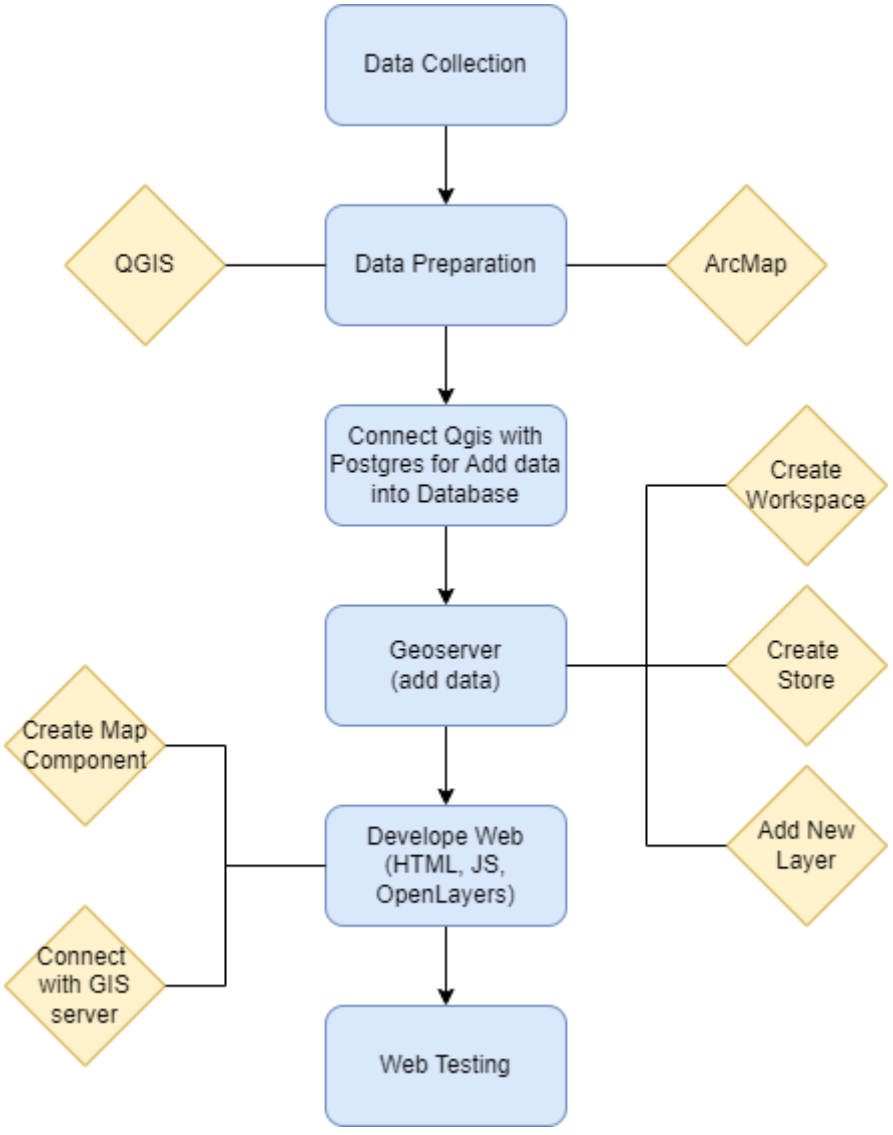
India, with its diverse geographical features and climatic conditions, is home to numerous Ramsar sites that contribute significantly to the country's biodiversity and environmental health. Advanced geospatial technologies offer powerful tools for the storage, management, and visualization of such data, providing a foundation for informed decision-making and sustainable practices.

This project aims to create an interactive web map of Ramsar sites in India by using advanced geospatial technologies. By integrating spatial data into a PostgreSQL database enhanced with PostGIS, the project ensures efficient storage and querying of geospatial information. GeoServer is used to serve this spatial data as web services, facilitating seamless data sharing and access.

OpenLayers, a robust JavaScript library for interactive maps, is utilized to develop a user-friendly interface for visualizing and interacting with the Ramsar site data. The resulting web map provides a dynamic platform for researchers, policymakers, and the public to explore and analyze the characteristics of Ramsar sites across India. This tool enhances the visibility and awareness of these critical wetlands, supporting their conservation and management for future generations.



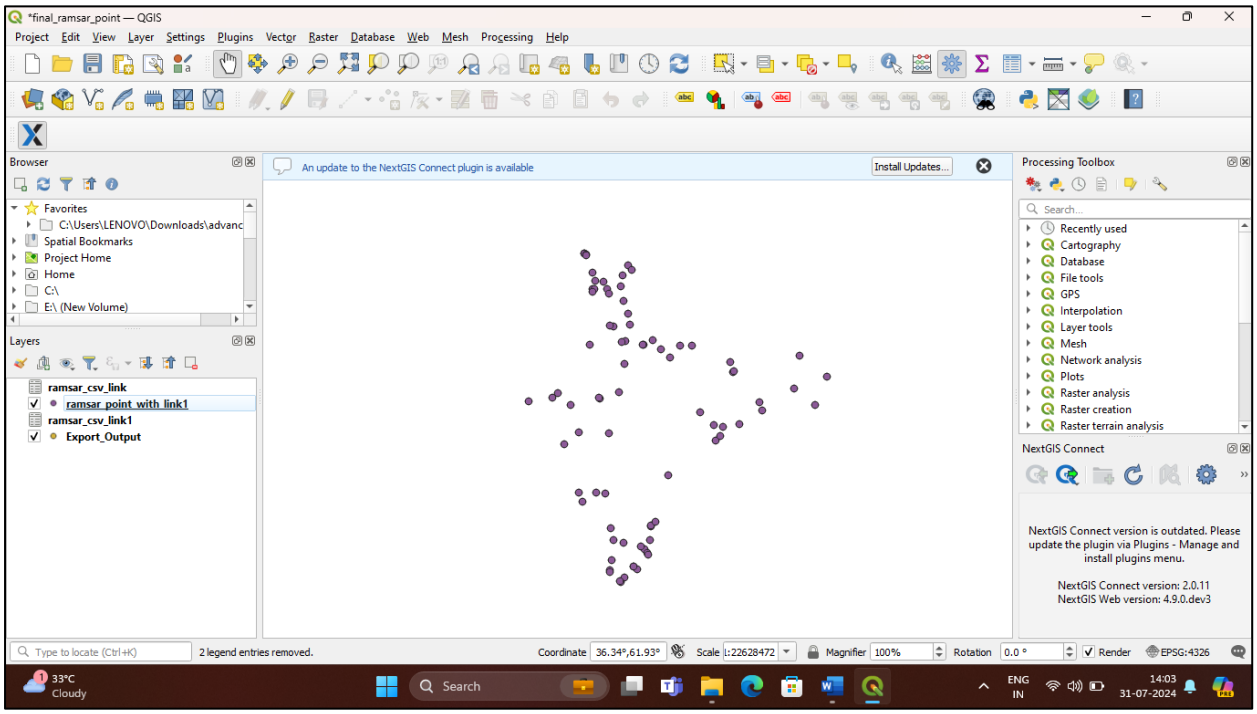
Workflow


Data Collection
QGIS
Data Preparation
ArcMap
Connect Qgis with Postgres for Add data into Database
Create Workspace
Geoserver (add data)
Create Store
Create Map Component
Develope Web (HTML, JS, OpenLayers)
Add New Layer
Connect with GIS server
Web Testing

❖ Data Source :

Data is sourced from the Ramsar Sites Information Service (RSIS), to which we have added state information, descriptions of Ramsar sites, and hyperlinks for each site.The Ramsar Sites Information Service (RSIS) is a vital resource for understanding and managing wetlands of international importance. The RSIS provides comprehensive information on Ramsar sites, including their geographic coordinates, ecological characteristics, conservation status, and the criteria they meet under the Ramsar Convention.

Dataset Link



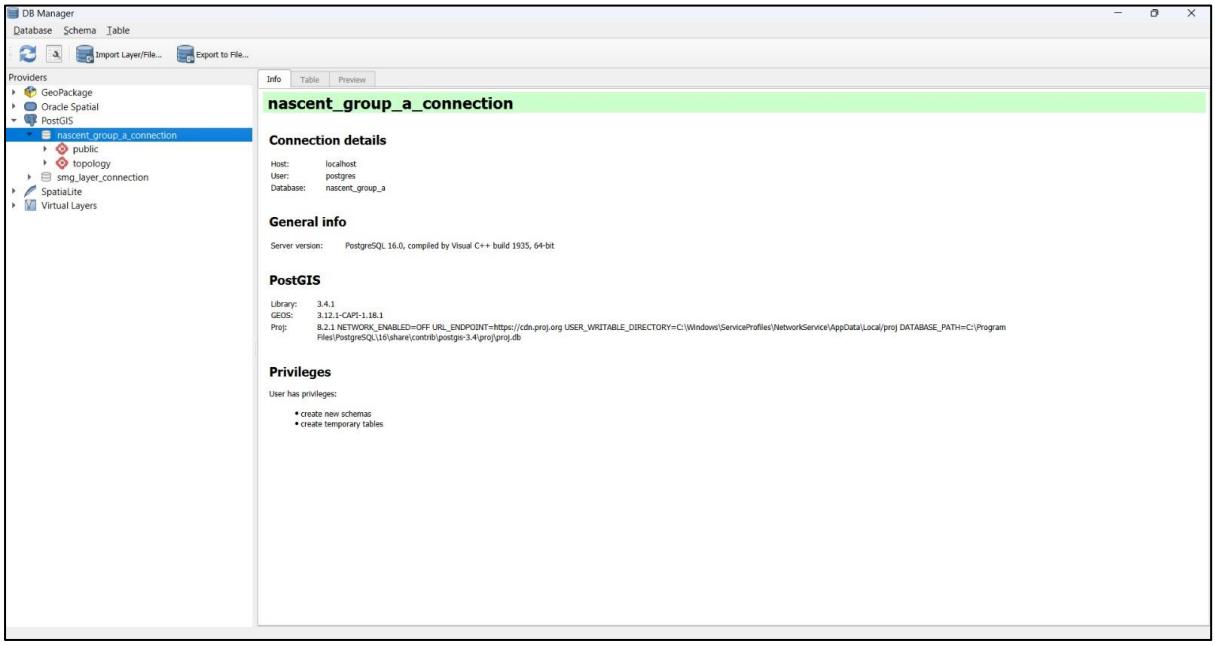
Dataset

❖ Database :

Once the preparation of shapefile (Point shp file of Ramsar sites) is complete, including establishment of their geographic locations, the files need to be imported into the DB Manager. From there, they will be subsequently integrated into the PostGIS database. This process ensures that all spatial data is efficiently stored and ready for advanced geospatial querying and management.

❖ Process to add data in Database

1. Create database in PostgreSQL
2. Add extension of PostGIS in that database
3. add database layer in QGIS
4. connect database in QGIS
5. import layer of shapefile in database
6. Preview the data in PostgreSQL using PostGIS extension



Database connection and import shapefile layer in QGIS

Data Output Messages Notifications

	id [PK] integer	geom geometry	ramsar_sit bigint	site_name character varying (254)	region character varying (254)	country character varying (254)	designatio date
1	1	0101000020E6100000366686 4B56895140C8755B3BB48336...	2464	Khijadia Wildlife Sanctuary	Asia	India	2021-04-13
2	2	0101000020E61000003333333333A35240A74A2922222241...	461	Wular Lake	Asia	India	1990-03-23
3	3	0101000020E610000054A5141111D15640B26AADBBBB7B3...	1572	Rudrasagar Lake	Asia	India	2005-11-08
4	4	0101000020E6100000F53F2BF6B82D56401C6F7E0561C635...	2370	Sundarban Wetland	Asia	India	2019-01-30
5	5	0101000020E6100000AE3E055D4EC8544004EFFD7004E93A...	2465	Bakhira Wildlife Sanctuary	Asia	India	2021-06-29
6	6	0101000020E6100000144B80500D815340CF077890A66A3D...	2463	Haiderpur Wetland	Asia	India	2021-04-13
7	7	0101000020E6100000F217C451C31753406CB64D4C72653F...	2407	Nangal Wildlife Sanctuary	Asia	India	2019-09-26
8	8	0101000020E610000002CB5BBFEA295440C72A29A01E9D3...	2412	Nawabganj Bird Sanctuary	Asia	India	2019-09-19
9	9	0101000020E6100000C8C08DD6892053401590D531D7F933...	2441	Lonar Lake	Asia	India	2020-07-22
10	10	0101000020E6100000C8A85B0BED885540B0798F123F9E39...	2436	Kabartal Wetland	Asia	India	2020-07-21
11	11	0101000020E610000042D1FA63B36B5340586E8A430D6F3E...	2437	Asan Conservation Reserve	Asia	India	2020-07-21
12	12	0101000020E610000042A0E9DBB8695340ADF6D125F38026...	2475	Vellode Bird Sanctuary	Asia	India	2022-04-08
13	13	0101000020E6100000081107F03C9F653409D32D4B4CD1729...	2477	Vedanthangal Bird Sanctuary	Asia	India	2022-04-08
14	14	0101000020E6100000D081A3ECC6755340FD6B79E57A403...	2440	Sur Sarovar	Asia	India	2020-08-21
15	15	0101000020E6100000B86D2931193953403F3157AB1B773C...	2457	Sultanpur National Park	Asia	India	2021-05-25
16	16	0101000020E6100000F3B96634EAF5534045B2ECEEA63229...	2480	Karikili Bird Sanctuary	Asia	India	2022-04-08
17	17	0101000020E6100000B2715004A99E5340CA52AE9A2EB822...	2486	Kanjirankulam Bird Sanctuary	Asia	India	2022-04-08
18	18	0101000020E610000006B98B3045355540AE275F75899234...	2470	Satkosia Gorge	Asia	India	2021-10-12
19	19	0101000020E6100000A23D249DBD3957402F14D12B753236...	2484	Pala Wetland	Asia	India	2021-08-31
20	20	0101000020E61000000401F0579A665540943FCEEAD37534...	2487	Ansupa Lake	Asia	India	2021-10-12
21	21	0101000020E61000004188E08F0DF15440F53D554B5B9C35...	2494	Hirakud Reservoir	Asia	India	2021-10-12

Data preview in database table

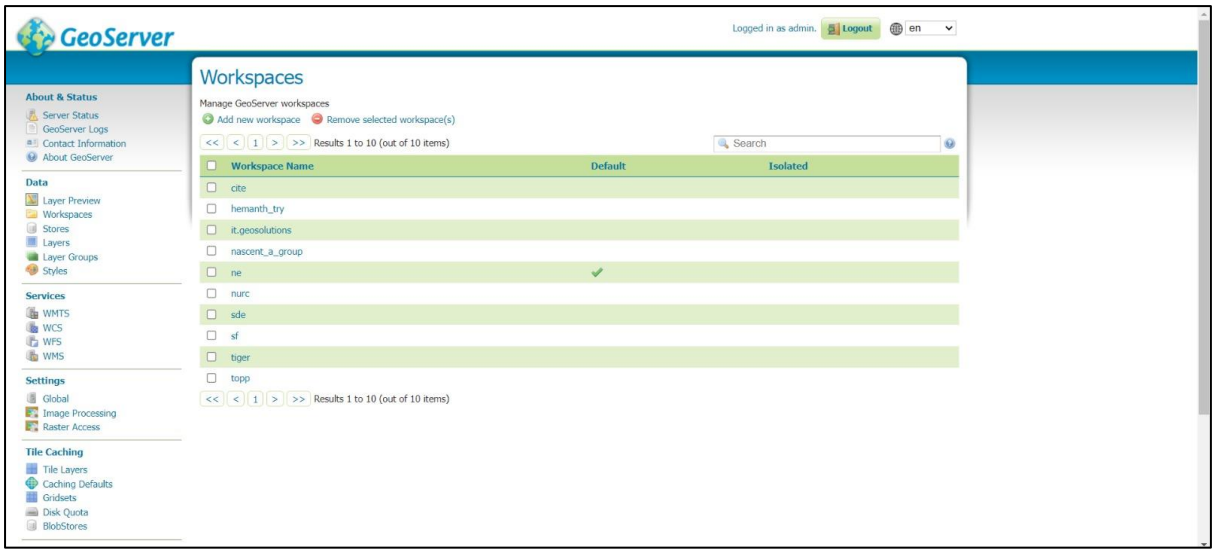
❖ GeoServer :

GeoServer is a powerful open-source server for sharing geospatial data. It allows users to publish, view, and edit geospatial data, making it an essential tool for developing interactive web maps.

❖ Process to publish layer in Geoserver

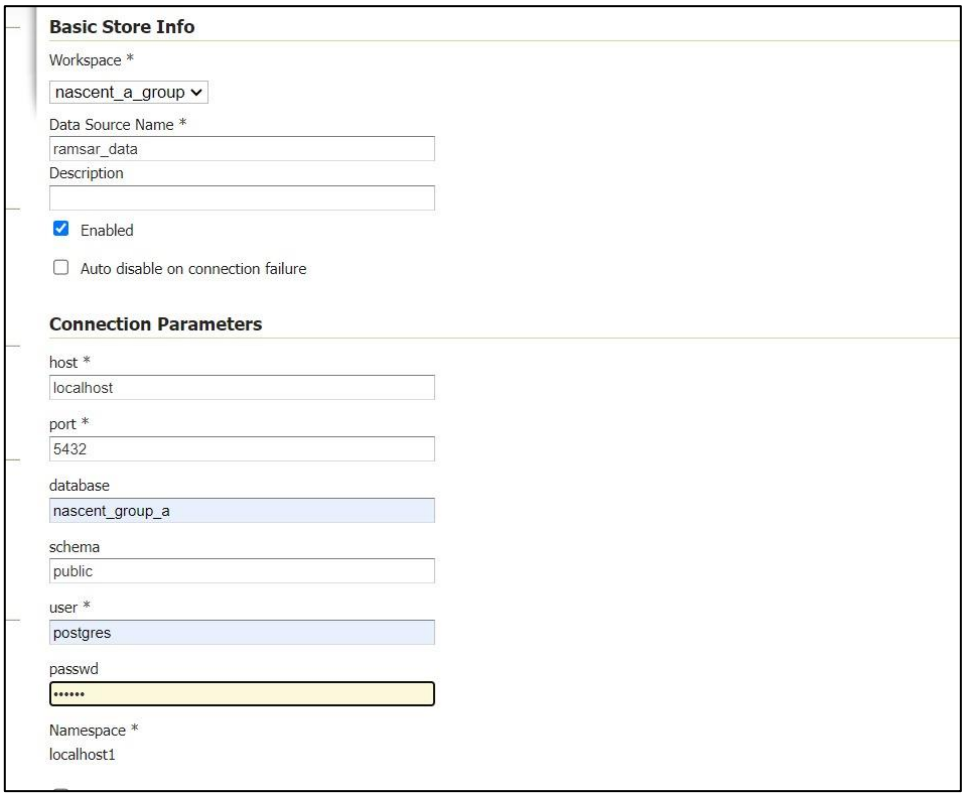
1. Prepare the Point Vector File.
2. Start GeoServer.
3. Create a Workspace.
4. Add a Data Store.
5. Publish the Layer.
6. Style the Layer.
7. Preview and Test.
8. Integrate with Web Application.

Create Workspace:

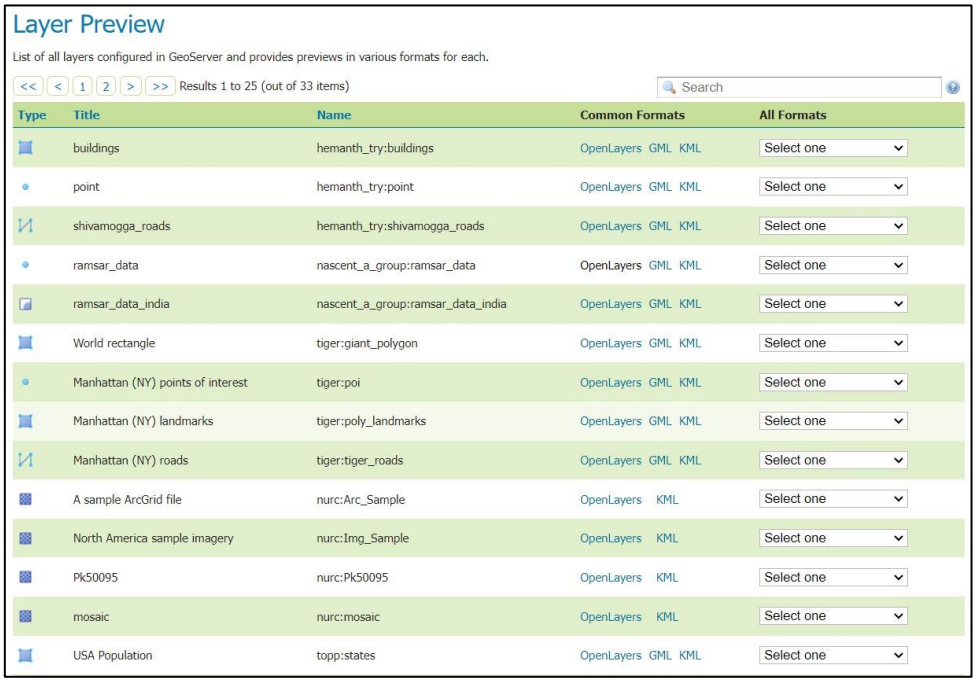


Workspace

Create Store :



Add Layer:



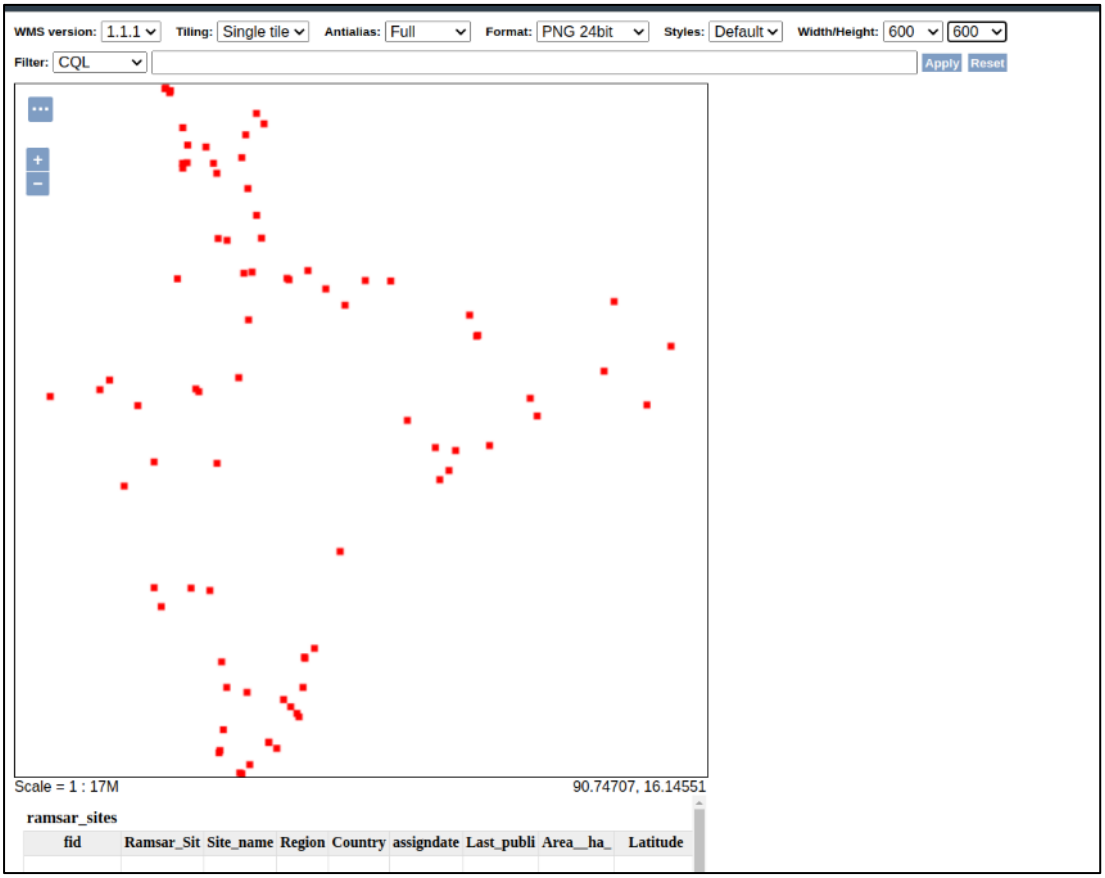
Layer Preview

List of all layers configured in GeoServer and provides previews in various formats for each.

<< < 1 2 > >> Results 1 to 25 (out of 33 items) Search

Type	Title	Name	Common Formats	All Formats
	buildings	hemanth_try:buildings	OpenLayers GML KML	Select one
	point	hemanth_try:point	OpenLayers GML KML	Select one
	shivamogga_roads	hemanth_try:shivamogga_roads	OpenLayers GML KML	Select one
	ramsar_data	nascent_a_group:ramsar_data	OpenLayers GML KML	Select one
	ramsar_data_india	nascent_a_group:ramsar_data_india	OpenLayers GML KML	Select one
	World rectangle	tiger:giant_polygon	OpenLayers GML KML	Select one
	Manhattan (NY) points of interest	tiger:poi	OpenLayers GML KML	Select one
	Manhattan (NY) landmarks	tiger:poly_landmarks	OpenLayers GML KML	Select one
	Manhattan (NY) roads	tiger:tiger_roads	OpenLayers GML KML	Select one
	A sample ArcGrid file	nurc:Arc_Sample	OpenLayers KML	Select one
	North America sample imagery	nurc:Img_Sample	OpenLayers KML	Select one
	Pk50095	nurc:Pk50095	OpenLayers KML	Select one
	mosaic	nurc:mosaic	OpenLayers KML	Select one
	USA Population	topp:states	OpenLayers GML KML	Select one

Layer preview:



❖ Web Page

Install Visual Code studio

Install Visual Code studio and open it where we write a code to add style on each layer and customize the map and provide design to each layer for map visualization.

Write Code to create Interactive Web Map Visualization Application

1.Map Selection

The application supports switching between different base maps, including Open Street Map and satellite imagery, to offer diverse perspectives on geographic data. This feature facilitates better interpretation of spatial information

2. Data filtering

The application provide option to filter data of Ramsar site based on level as state level and national level and second filter allow to filter out Ramsar site in particular state. . Users can also clear all filters to reset the view to the default layer

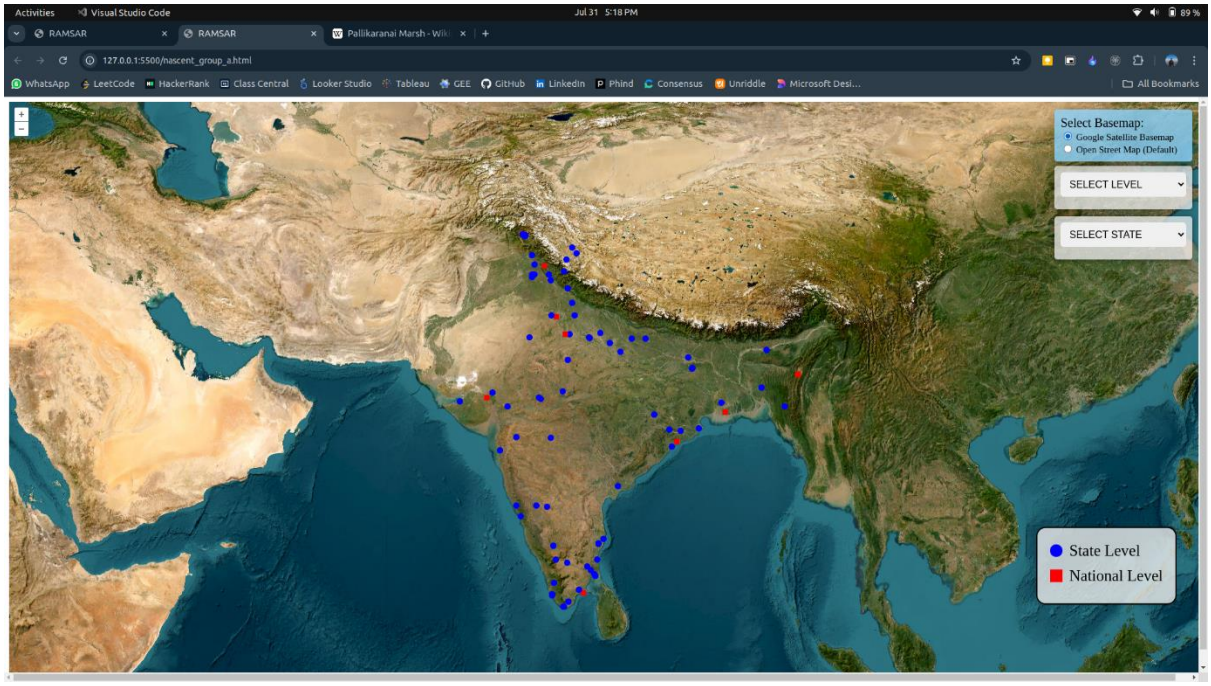
3. Popup

The application provide popup when user click on Point of Ramsar site it provide Name,State,Class Area and weblink of particular site

4.Legend

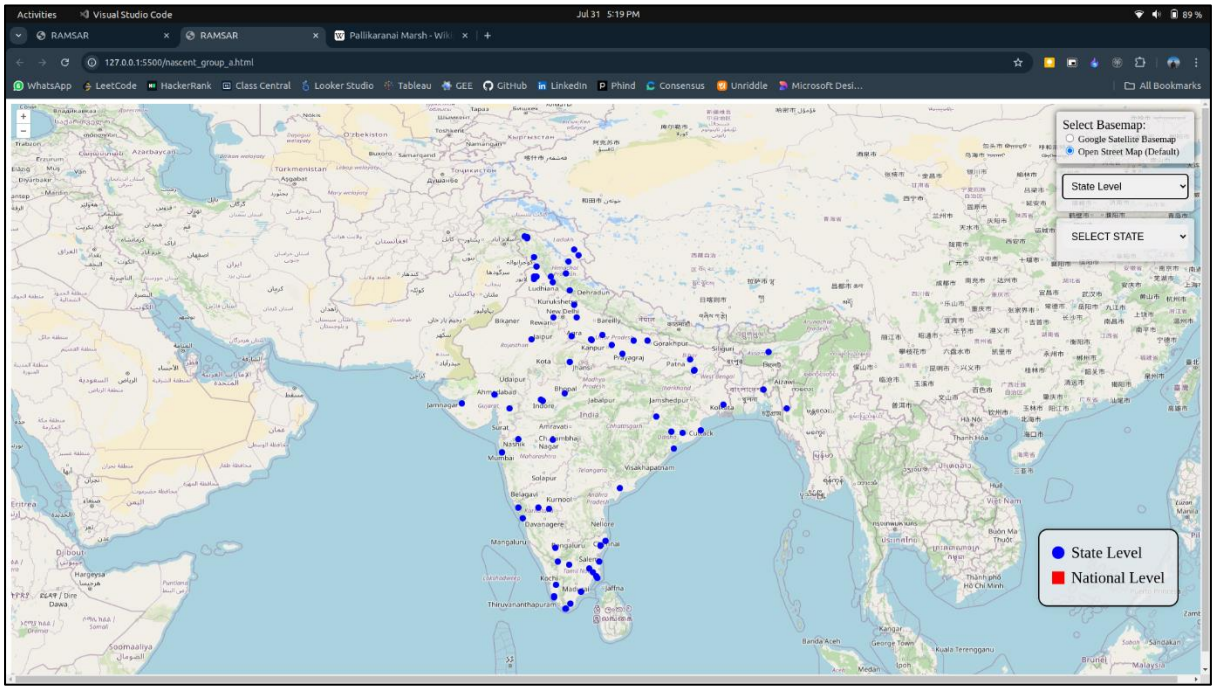
The application also provide legend for better understanding of symbology of point layer

Map selection

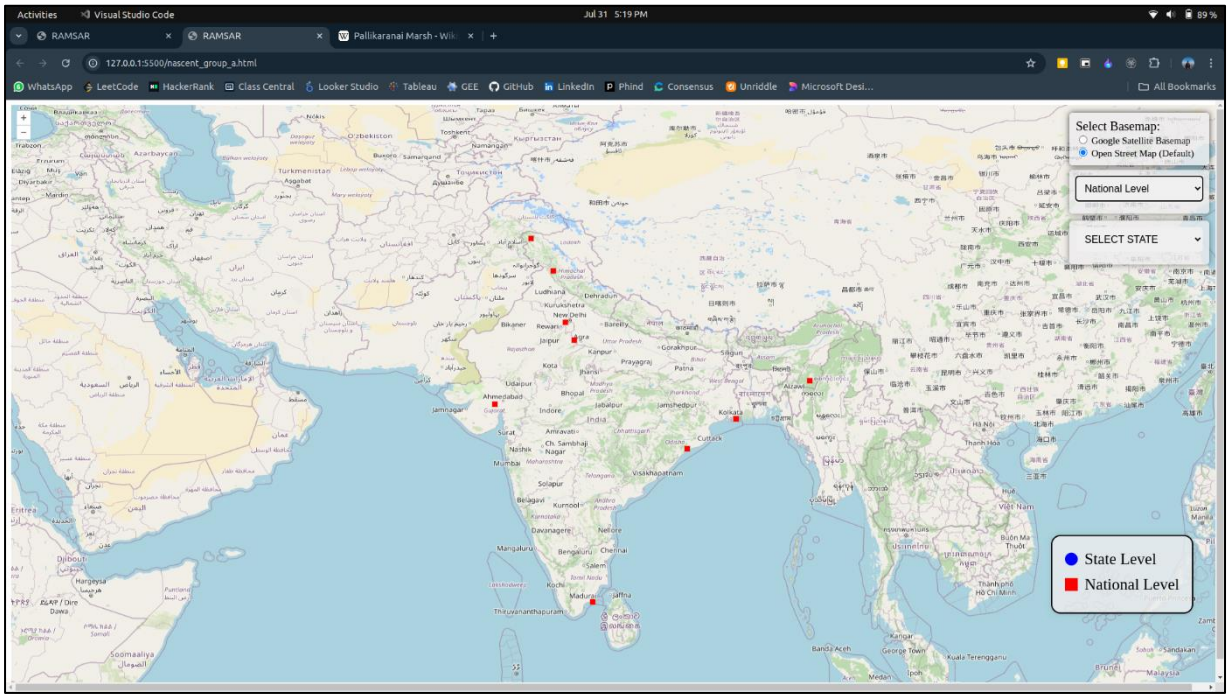


Data filtering

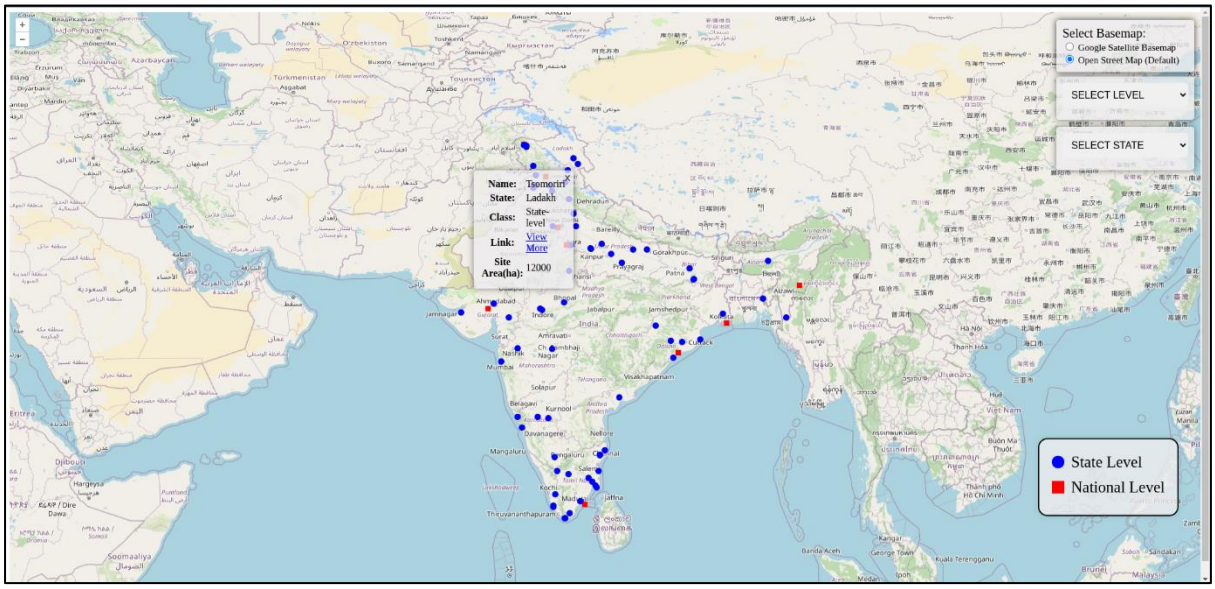
Ramsar site filter based on State level



Ramsar site filter based on National level



❖ Result :



Ramsar Site Web Application demo Video link:

https://drive.google.com/drive/folders/1BJ2OKnXsx8szuhhXbWMsBu1W2wiZLkCo?usp=drive_link

❖ References :

1. **Dataset reference link:** https://rsis.ramsar.org/ris-search/?f%5B0%5D=regionCountry_en_ss%3AAsia&f%5B1%5D=regionCountry_en_ss%3AIndia
2. **Source code link:** https://drive.google.com/drive/folders/1O1BwnHqvpsg7_plgMB728oLJ4liLF2K4?usp=sharing