

CSE-583 Final Project

PyWRIS

A Python Package for India Water Resource Information System (WRIS) Data

Team Members:

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11 December 2014





India-WRIS

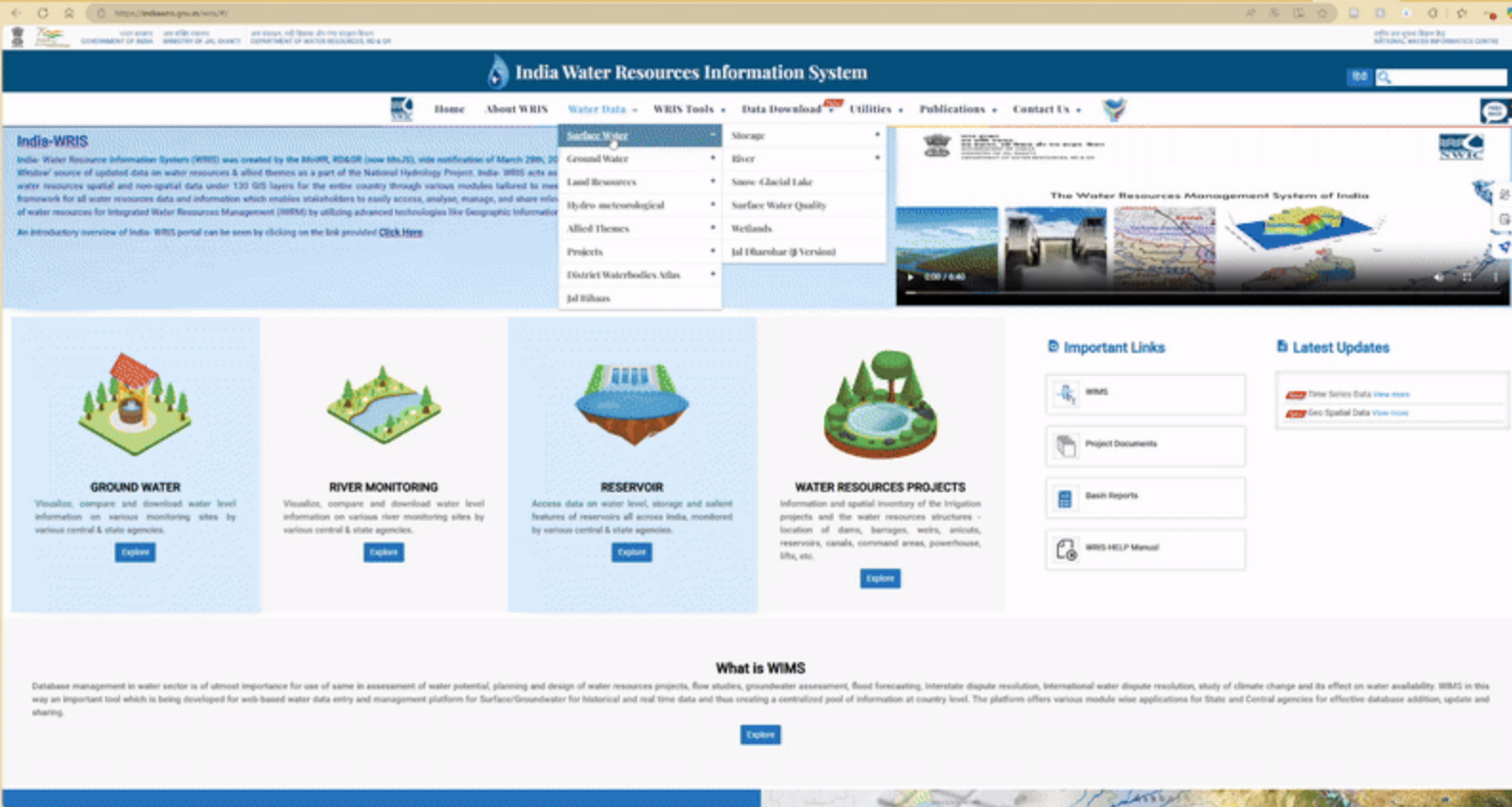
India- Water Resource Information System (WRIS) was created by the MoWR, RD&GR (now MoJS), vide notification of March 28th, 2018, to be a repository of nation-wide water resources data, providing a 'Single Window' source of updated data on water resources & allied themes as a part of the National Hydrology Project. India- WRIS acts as a data dissemination platform for hosting static, dynamic, and semi-dynamic water resources spatial and non-spatial data under 130 GIS layers for the entire country through various modules tailored to meet users' requirements. This platform is based on standardized National GIS framework for all water resources data and information which enables stakeholders to easily access, analyse, manage, and share relevant data. This will help in assessment, monitoring, planning, and development of water resources for Integrated Water Resources Management (IWRM) by utilizing advanced technologies like Geographic Information System (GIS) and Remote Sensing.

An introductory overview of India- WRIS portal can be seen by clicking on the link provided [Click Here](#)



Problem Statement

- **India WRIS** (Dept. Water Resources, Govt. of India) hosts a rich variety of **Hydrological Data related to India** – e.g. Reservoir, groundwater, rainfall, soil moisture data etc.
- However, its GUI heavy interface **is slow, not ideal for research applications.**
- **Objective:** Create **a solution for accessing India WRIS data** that is **open-access, programmatic, fast, and scalable.**



<https://indiawris.gov.in/wris/#/>

Data retrieval time:

30s - 5mins +

India WRIS Issues:

- Extremely rich, **heavy GUI** - slow load times
- **Multiple steps** to access and download data - including **survey form**.
- **Not possible to automate** data download for research (e.g. for daily cron jobs).



<https://github.com/SarathUW/PyWRIS>

- A **python package** for intuitive, fast access to India WRIS data.
- Uses **Web Scraping** for data retrieval.
- **Query directly with** the India **WRIS database** to retrieve data.
- Eliminating delay caused by front-end GUI.
- **Optimized for Jupyter** – supports rich hypertext formatting.
- **Easy plotting, filtering** and comparison functionality.
- Automated unit tests, conda deployment (under works)

The screenshot shows the GitHub repository for PyWRIS. At the top, the repository name 'PyWRIS' is displayed with a 'Public' badge. Below this, there are navigation links for 'main', '5 Branches', and '0 Tags'. A search bar and buttons for 'Add file' and 'Code' are also present. The main content area shows a list of files and folders, including '.github/workflows', 'docs', 'mkdocs', 'src/pywrisk', 'test', '.gitignore', 'LICENSE', 'README.md', 'environment.yml', and 'pyproject.toml'. The right sidebar contains sections for 'About' (Python package for India WRIS), 'Releases' (No releases published), 'Packages' (No packages published), 'Contributors' (4 contributors), 'Deployments' (1 deployment), and 'Languages' (JavaScript 57.1%, Python 21.1%, HTML 19.3%, CSS 2.5%).

PyWRIS

Python package for India WRIS

sarathuw.github.io/PyWRIS/

Readme

MIT license

Activity

3 stars

2 watching

0 forks

Releases

No releases published

[Create a new release](#)

Packages

No packages published

[Publish your first package](#)

Contributors 4

iambrish

SanchitMinocha Sanchit Minocha

SarathUW Sarath Suresh

shahzaib1007

Deployments 1

github-pages 17 hours ago

Languages

JavaScript 57.1% Python 21.1% HTML 19.3% CSS 2.5%

main 5 Branches 0 Tags

Go to file

Add file

Code

SarathUW Update README.md 3dc9850 · 9 hours ago 98 Commits

.github/workflows	Create python-package-conda.yml	last week
docs	Update user_stories.md	last month
mkdocs	rebuilt mkdocs	yesterday
src/pywrisk	Added GeoDataFrame support for reservoir data. .explore() c...	9 hours ago
test	updated pytest stuff, started adding teammate contributions...	last week
.gitignore	Cleaned reservoir.py	4 days ago
LICENSE	Initial commit	2 months ago
README.md	Update README.md	9 hours ago
environment.yml	created environment.yml file	last week
pyproject.toml	Cleaned reservoir.py	4 days ago

README MIT license

PyWRIS

WORK IN PROGRESS

A Python package for accessing India Water Resource and Information System (IndiaWRIS) data

India WRIS is a rich collection of nation-wide water resource data provided by the Ministry of Water Resource, Government of India. It provides valuable information on various aspects of water resources, including data on river basins, dams, reservoirs, groundwater levels, water quality, and meteorological data. However, accessing this data can be challenging due to the platform's web-based, graphic-heavy front-end. Downloading bulk data for research purposes through this front-end framework is often time consuming and problematic due to slow load times.



Human Centric Use Cases:

PyWRIS requires some knowledge of coding, but we will include thorough documentation

- **Water researchers:** fetch country-wide data quickly, create interactive plots on changes over time
- **Agriculture professionals:** predict trends for water storage over seasons, plan for water shortages
- **Government (water management):** generate periodic reports, track real-time reservoir levels, communicate across states



PyWRIS - Technologies:

Data Handling



Visualisation



Documentation



MKDOCS



GitHub Pages

Web Scraping

Requests package.

Jupyter Support:

Rich Hypertext

Challenges:

- **Structuring** PyWRIS in a modular, scalable format.
- **India WRIS has over 20** different **data products**, with different types of data.

PyWRIS - Documentation: Diátaxis framework

PyWRIS

Search docs

Home

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Commands

This page lists all available functions. For example usage, please see the [Tutorials](#) page.

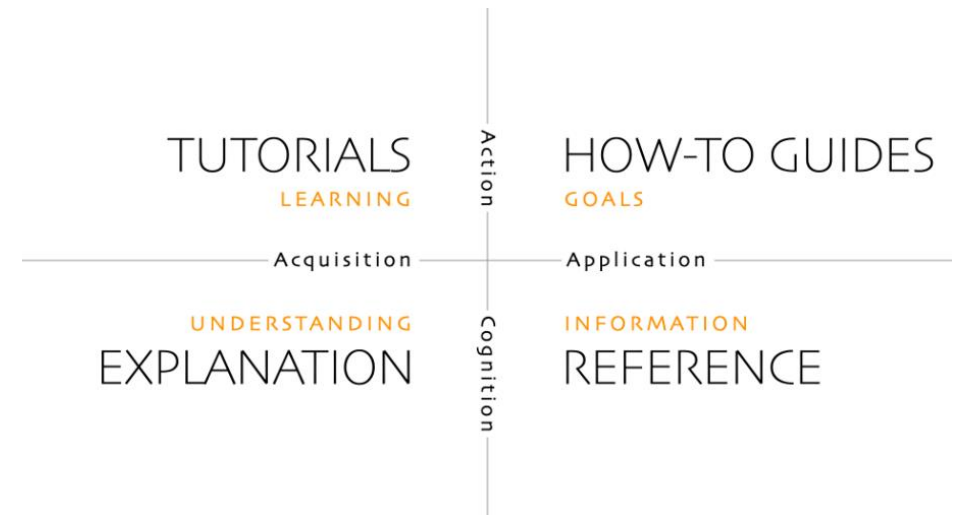
Checking Validity

- `check_valid_states(selected_states)` - Check if all listed states are valid
- `check_valid_date_range(start_date, end_date, valid_date_range)` - Check if given date range is valid
 - `start_date`: start date of the data to fetch, formatted as YYYY-MM-DD or as a timestamp
 - `end_date`: end date of the data to fetch, formatted as YYYY-MM-DD or as a timestamp
 - `valid_date_range`: a list or tuple containing two elements (valid start and end dates) as strings or timestamps

Fetching information

- `get_districts(selected_states)` - Get a dictionary of districts in given states
- `get_reservoirs(end_date, start_date, timestep, selected_states, selected_districts, selected_basins, selected_reservoirs)` - Get a list of reservoirs and their time series data based on the given arguments
 - `end_date`: end date of the data to fetch (YYYY-MM-DD)
 - `start_date` (optional): start date of the data to fetch (YYYY-MM-DD). If left empty, will default to 1991-01-01
 - `timestep` (optional): the temporal resolution of the data. If left empty, will default to Daily
 - `selected_states`: list of state names to filter reservoirs. If no `selected_basins` are specified, this is required
 - `selected_districts`: list of district names to filter reservoirs. Use "all" to include reservoirs from all districts
 - `selected_basins`: list of basin names to filter reservoirs. If no `selected_states` are specified, this is required
- `get_reservoir_data_valid_date_range()` - Get the available date range for reservoir data
- `get_reservoir_info(reservoir_name_str)` - Get information for specific reservoirs
 - `reservoir_name_str`: reservoir names, separated by commas, formatted with single quotes

4 main sections:



We currently have **Tutorials** and **Reference**

Next steps: **Explanation** and **How-to Guides**

PyWRIS - Functionalities

1 hf1

✓ 3.5s

PyWRIS HydroFrame

Downloaded Data: **Reservoirs**
Reservoir count: 18

States: (3)

► Kerala

► Tamil Nadu

► Uttar Pradesh

Quick help:

Reservoir data:

- HydroFrame.reservoirs: Dictionary of Reservoir objects

- HydroFrame.reservoir_gdf: GeoDataFrame of static reservoir data

- HydroFrame.reservoir_rawData: DataFrame of complete reservoir data

- Preset Plots:

- HydroFrame.reservoir_gdf.explore(): Interactive map with reservoir data

- HydroFrame.reservoirs['Reservoir Name'].plot(): Time Series plots of individual reservoir data

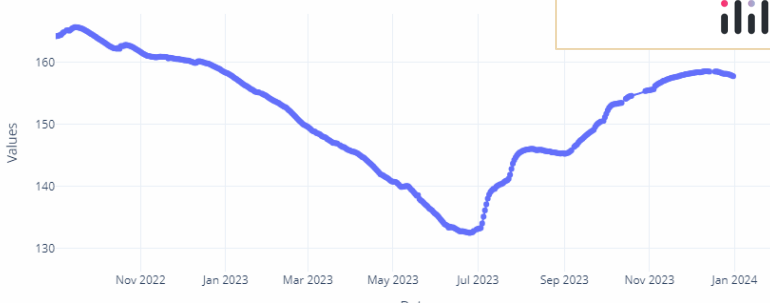
Click for PyWRIS documentation

Rich HyperText support for Jupyter

1 hf1.reservoirs['Idamalayar Reservoir'].plot(columns = ['Level'])

✓ 0.3s

Time Series Data for Reservoir: Idamalayar Reservoir



Preset Interactive plots using plotly

1 hf1.reservoir_gdf

✓ 0.0s

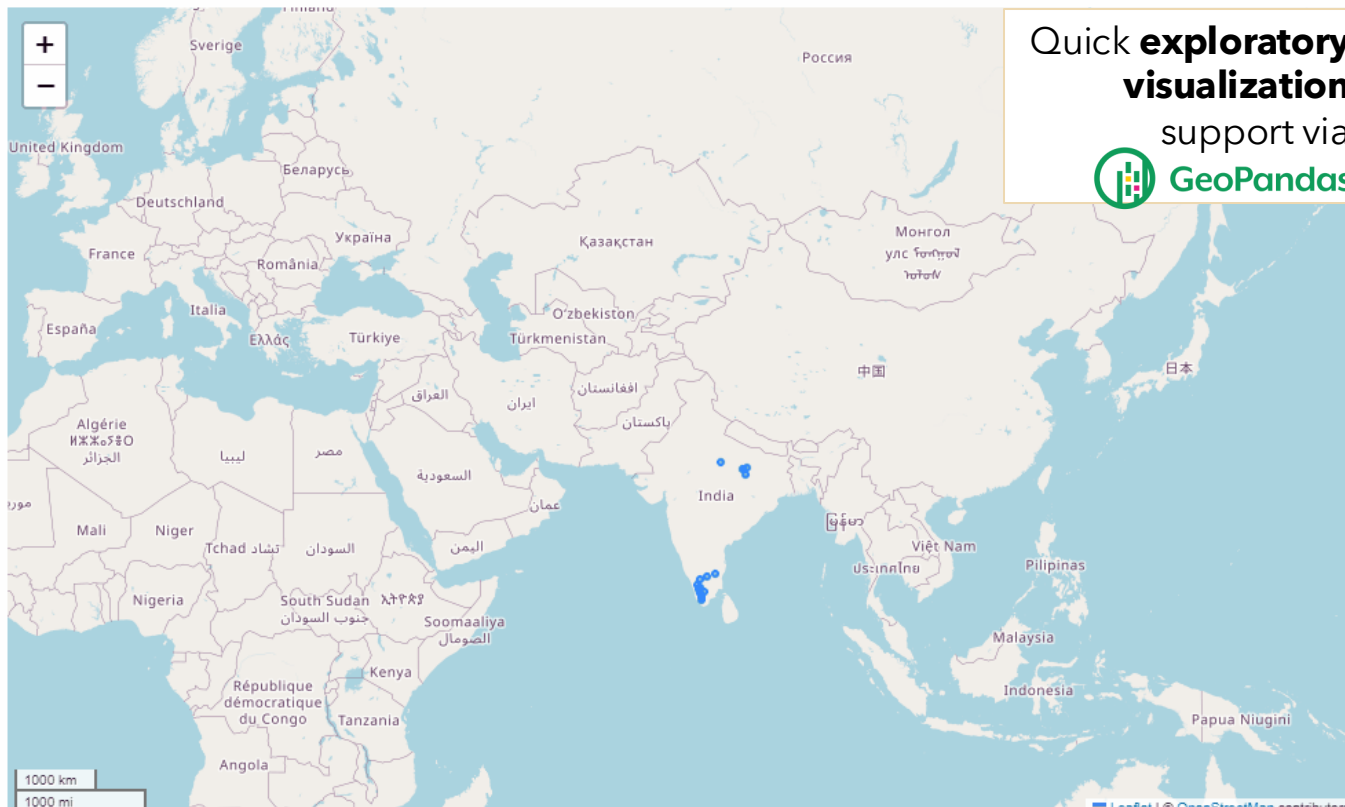
	reservoir_name	latitude	longitude	agency	state	state_code	district	block_name	basin	sub_basin	dam_code	fri	live_cap_fri	geometry
0	Idamalayar Reservoir	10.245455	76.746903	CWC	Kerala	KL	Ernakulam	Kotamangalam	West flowing rivers from Tadi to Kanyakumari ...	Periyar and others	D03183	169	1,018	POINT (76.7469 10.24545)
1	Idukki Reservoir	9.788474	76.974747	CWC	Kerala	KL	Idukki	Idukki	West flowing rivers from Tadi to Kanyakumari ...	Periyar and others	D03331	732.43	1.46	POINT (76.97475 9.78847)
2	Parambikulam Reservoir	10.384451	76.807336	CWC	Kerala	KL	Palakkad	Chittur	West flowing rivers from Tadi to Kanyakumari ...	Periyar and others	D00874	556.26	0.38	POINT (76.80734 10.38445)
3	Aliyar Reservoir	10.472668	76.974597	CWC	Tamil Nadu	TN	Coimbatore	Anamalai	West flowing rivers from Tadi to Kanyakumari ...	Vannar and others	D00390	320.04	0.095	POINT (76.9745 10.47267)
4	Kakki Reservoir	9.304659	77.167540	CWC	Kerala	KL	Pattanamthitta	Konni	West flowing rivers from Tadi to Kanyakumari ...	Periyar and others	D03369	981.46	0.447	POINT (77.1675 9.30466)
5	Kallada Reservoir	8.920001	77.124597	CWC	Kerala	KL	Kollam	Punalur	West flowing rivers from Tadi to Kanyakumari ...	Periyar and others	D03104	115.82	0.507	POINT (77.1246 8.92)
6	Lower Bhawani \ Bhavanisagar Reservoir	11.443478	77.068631	CWC	Tamil Nadu	TN	Erode	Satyamangalam	Cauvery Basin	Cauvery Middle	D01078	278.89	0.792	POINT (77.06863 11.44348)
7	Mettur Reservoir	11.886289	77.805044	CWC	Tamil Nadu	TN	Salem	Mettur	Cauvery Basin	Cauvery Middle	D00842	240.79	2.647	POINT (77.80504 11.88629)
8	Periyar Reservoir	9.534959	77.191606	CWC	Kerala	KL	Idukki	Piramed	West flowing rivers from Tadi to Kanyakumari ...	Periyar and others	D00820	867.41	0.173	POINT (77.19161 9.53496)
9	Sholayar Reservoir	10.320471	76.902715	CWC	Tamil Nadu	TN	Coimbatore	Valparai	West flowing rivers from Tadi to Kanyakumari ...	Periyar and others	D00314	1002.79	0.143	POINT (76.90272 10.32047)
10	RIHAND RESERVOIR	24.136551	82.833914	CWC	Uttar Pradesh	UP	Sonbhadra	Dudhi	Ganga Basin	Sone	D00726	268.22	5.649	POINT (82.83391 24.13655)

Full Data provided as DataFrames for easy analysis

pandas

1 hf1.reservoir_gdf.explore()

✓ 0.0s



Quick exploratory visualization support via GeoPandas



Way Forward

- **Add more WRIS modules:**
PyWRIS currently only supports Reservoir data.
- **Add more plotting options:**
More quick preset plots such as GeoSpatial scatter plots, comparison plots between station points etc.
- **Create Conda Package pipeline:**
Publishing PyWRIS package to conda-forge for easy downloads.
- **Add more Documentation:**
Keep adding to documentation website. Migrate from GitHub pages to ReadTheDocs.
- **Outreach - Improve Visibility, Publication**
Improve public visibility of PyWRIS package and aim for a publication once all modules are completed.