Google.org

Global Water Watch

eit Climate-KIC

Deltares

WORLD RESOURCES INSTITUTE

WWF

THE PROBLEM

HIGH-RESOLUTION DATA ON WATER RESOURCES ARE FREQUENTLY NOT AVAILABLE

Example: Reservoirs / Dams

- Critical infrastructure
- Anticipate water resources trends
- Data-driven management
- Peace and security (facts)

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Open Source

Water Datasets

Water Analytics

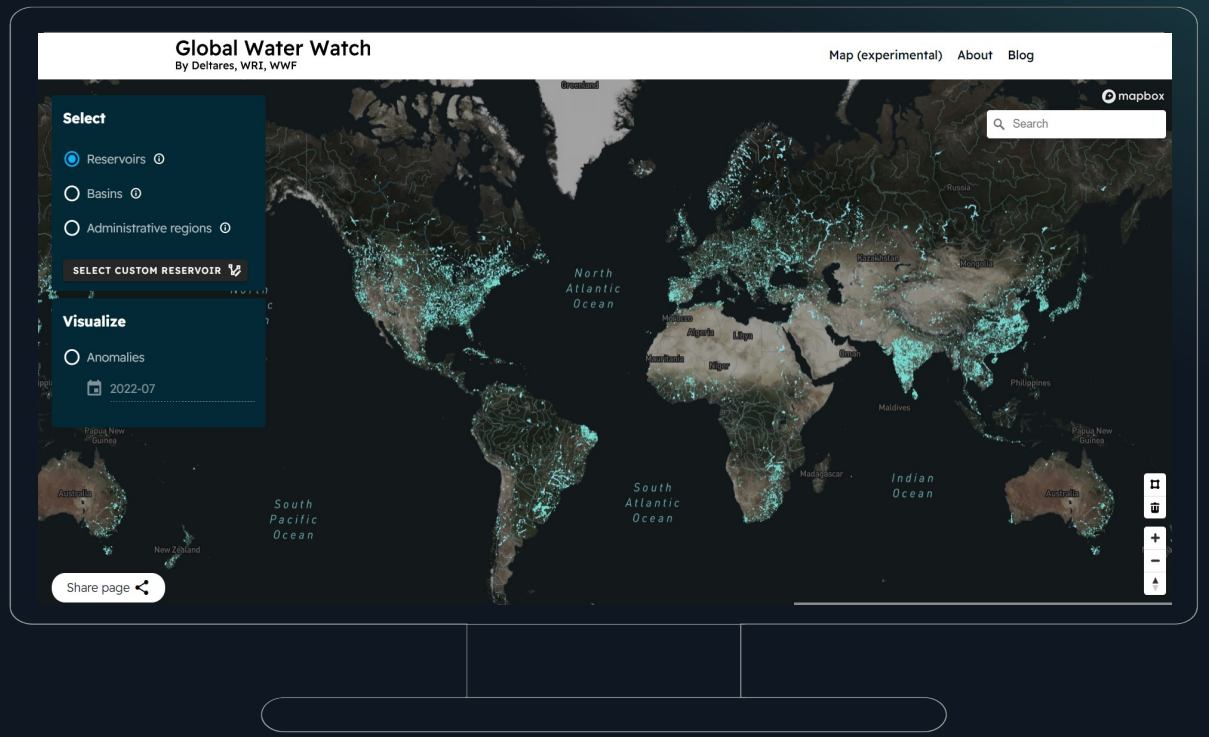
Water Stories

OUR SOLUTION

SUPPORT THE DEMOCRATIZATION OF INFORMATION ON WATER RESOURCES

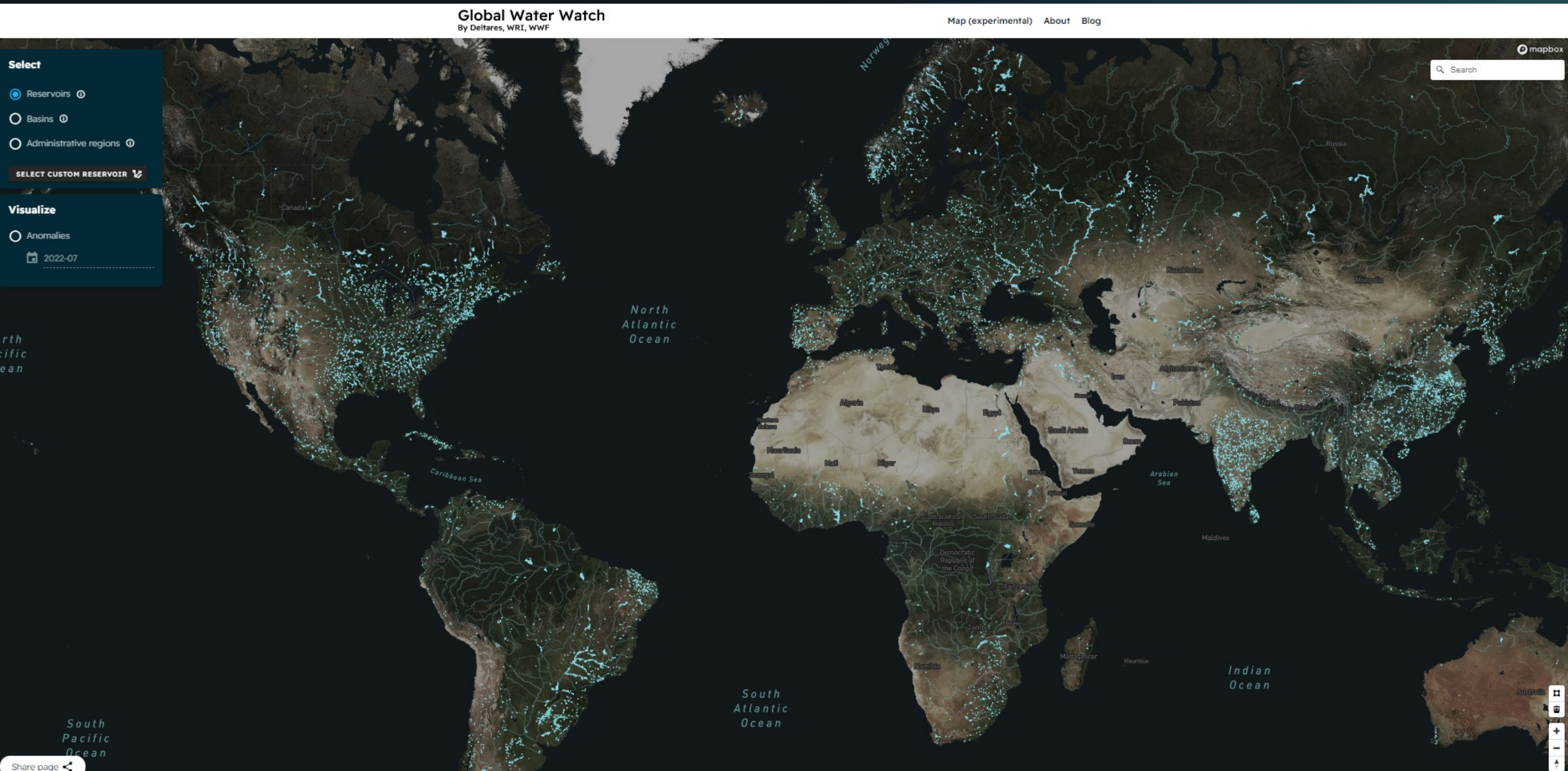
- Near Real-time methods to estimate reservoir area and volume dynamics
- Access to global datasets through a hosted web application (and API)

GLOBAL WATER WATCH



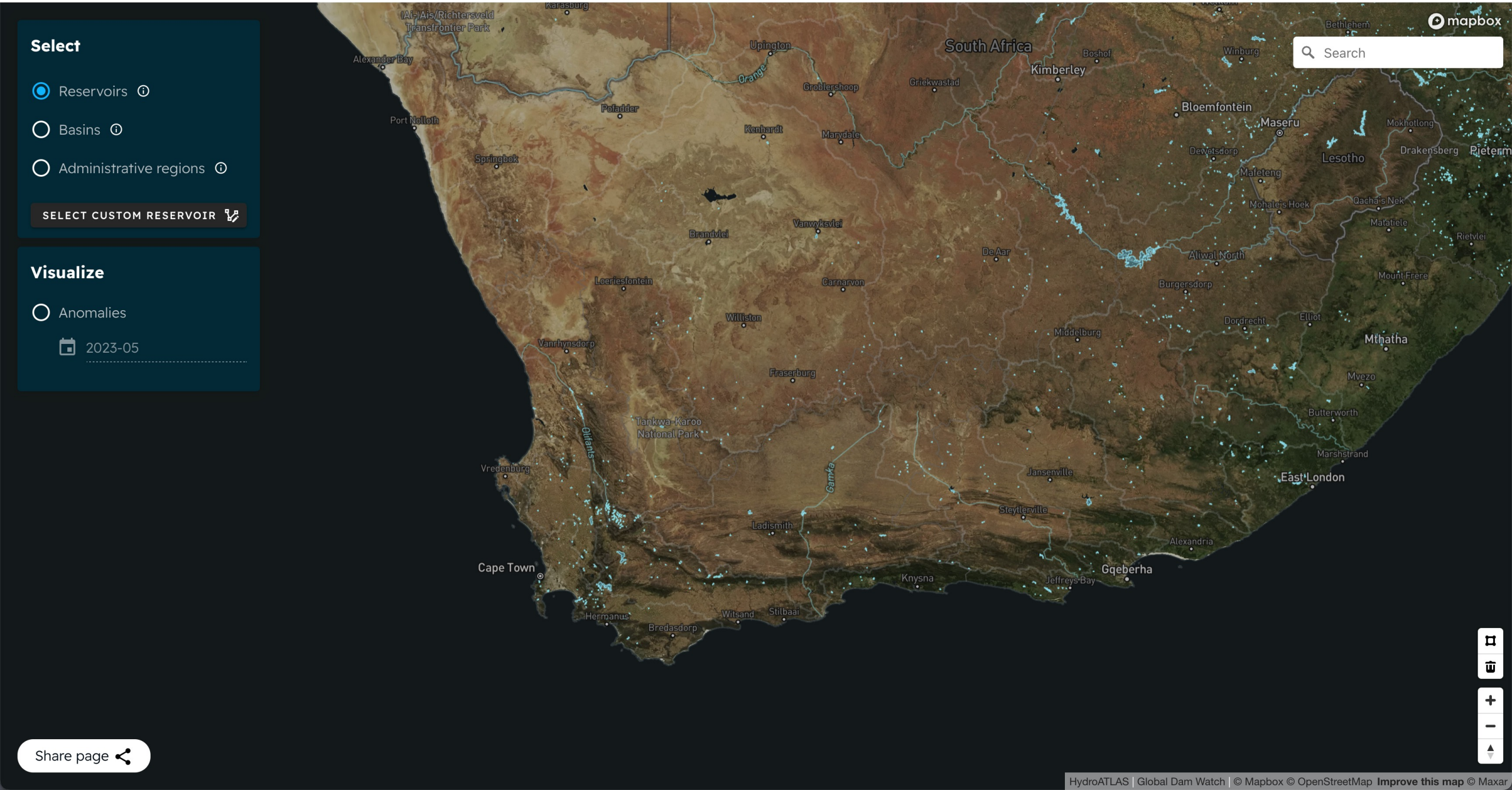
The global water watch platform

Our current reservoirs time series database (1984-2023) includes 71 208 reservoirs



Global Water Watch

By Deltares, WRI, WWF



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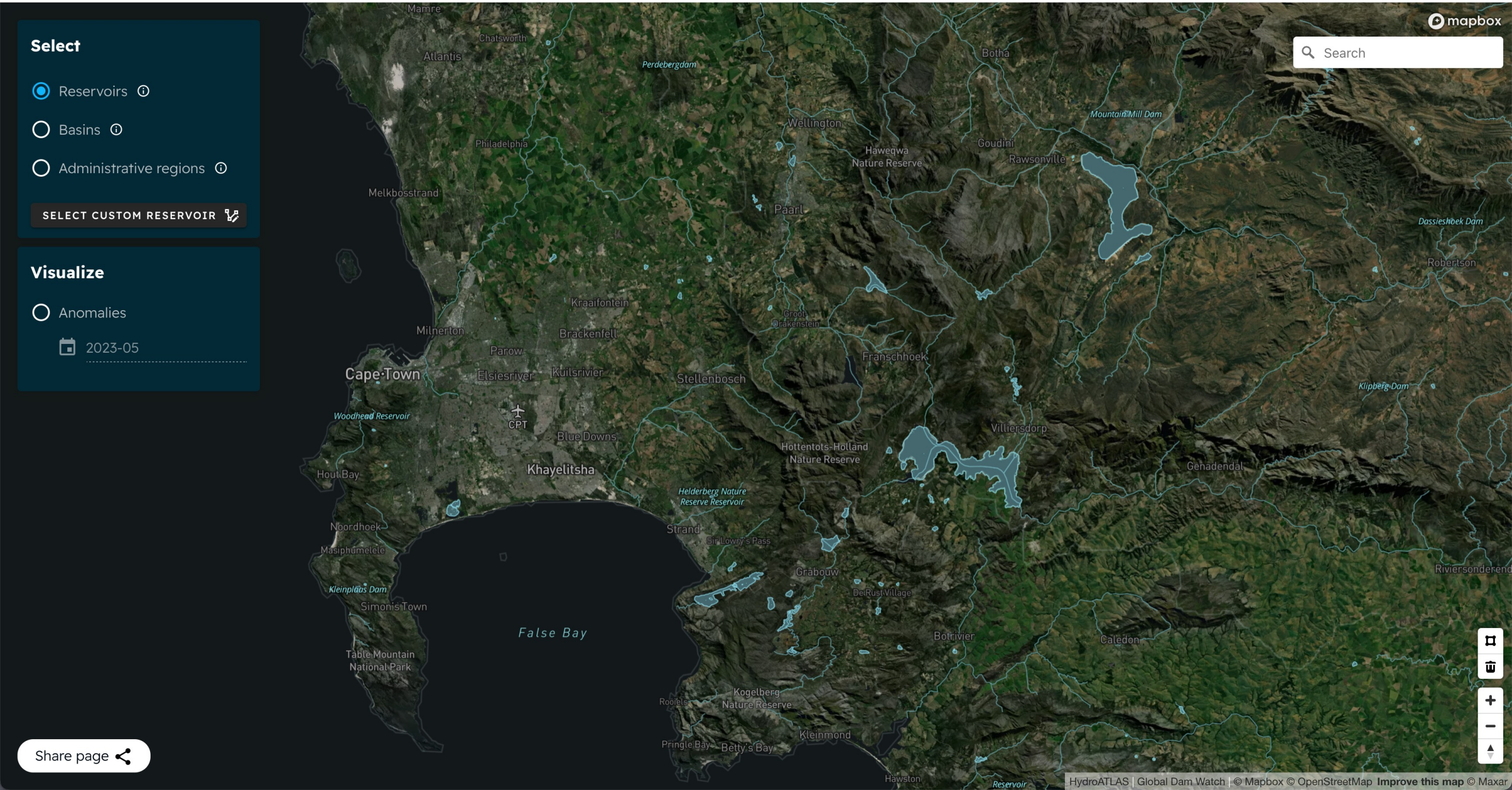

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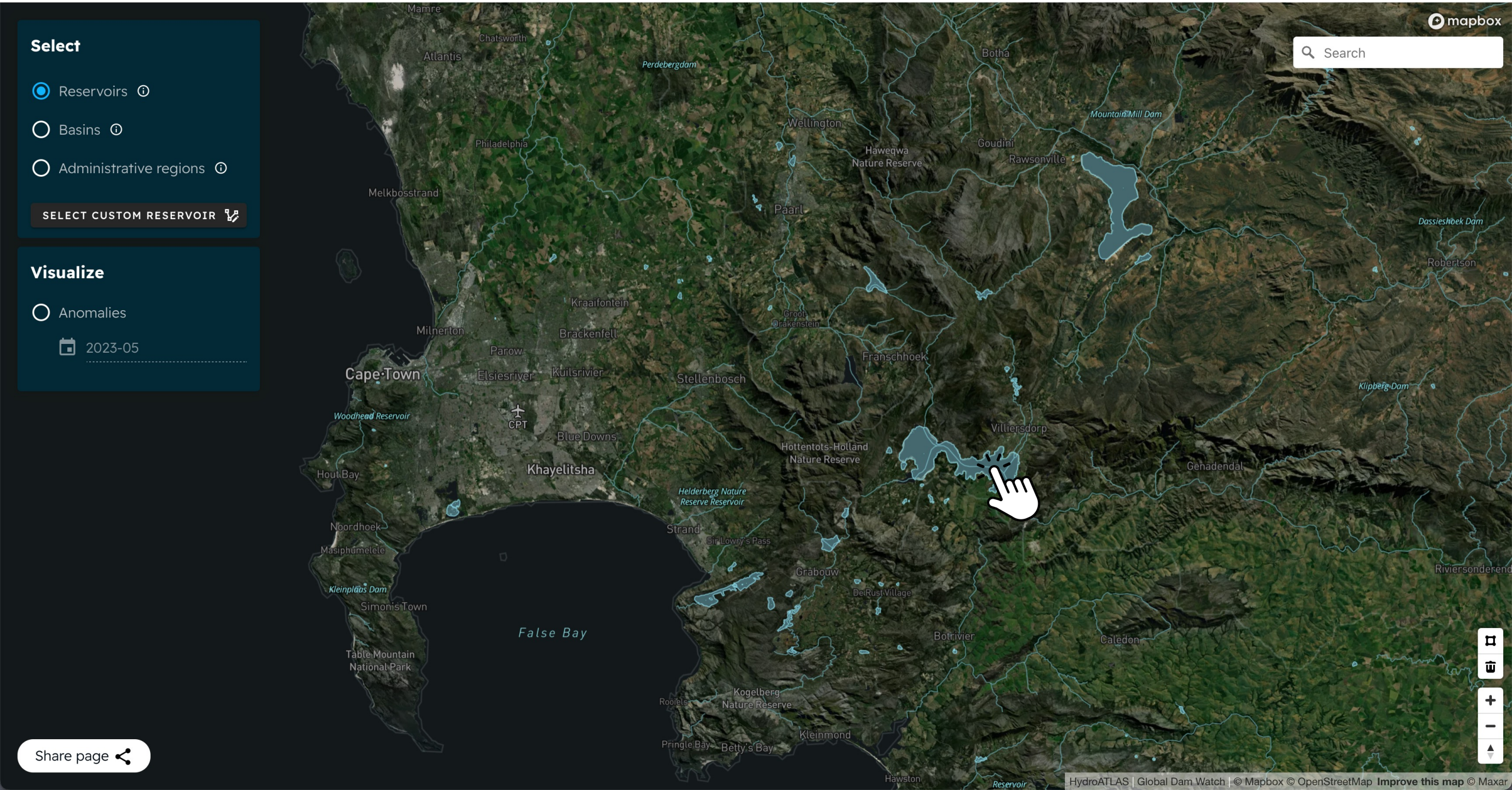
Global Water Watch

By Deltares, WRI, WWF



Nameless reservoir

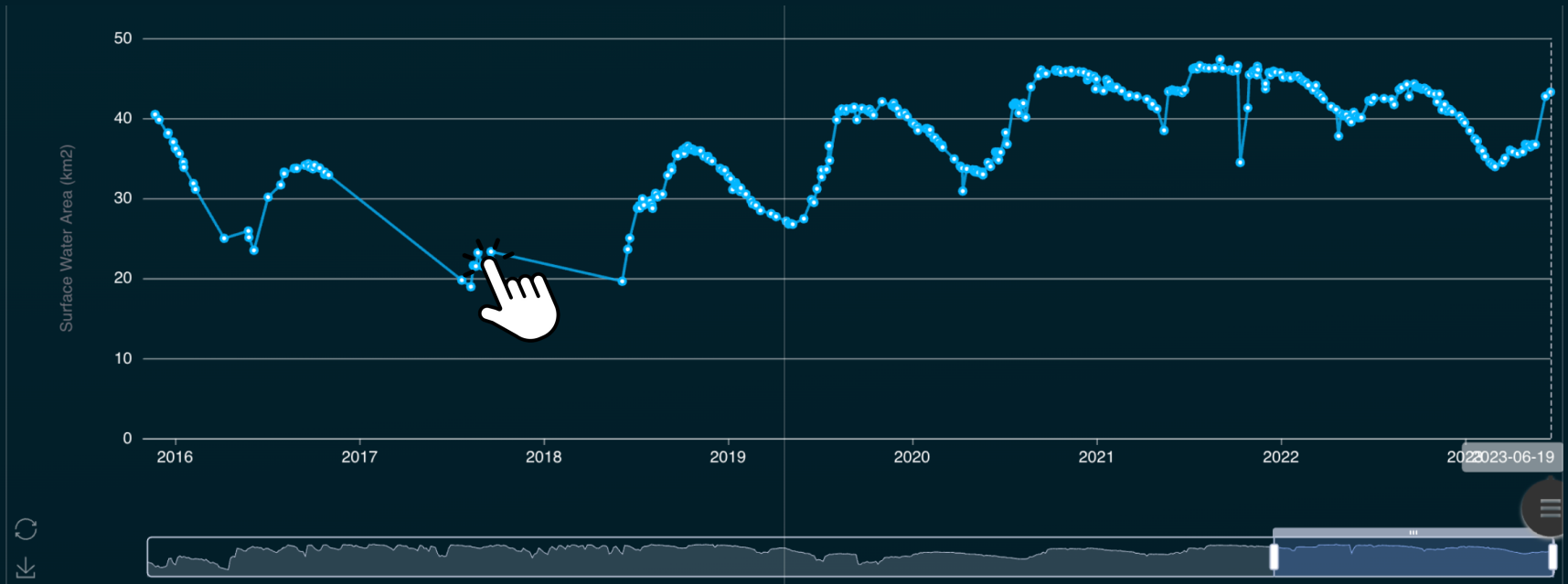
#87663

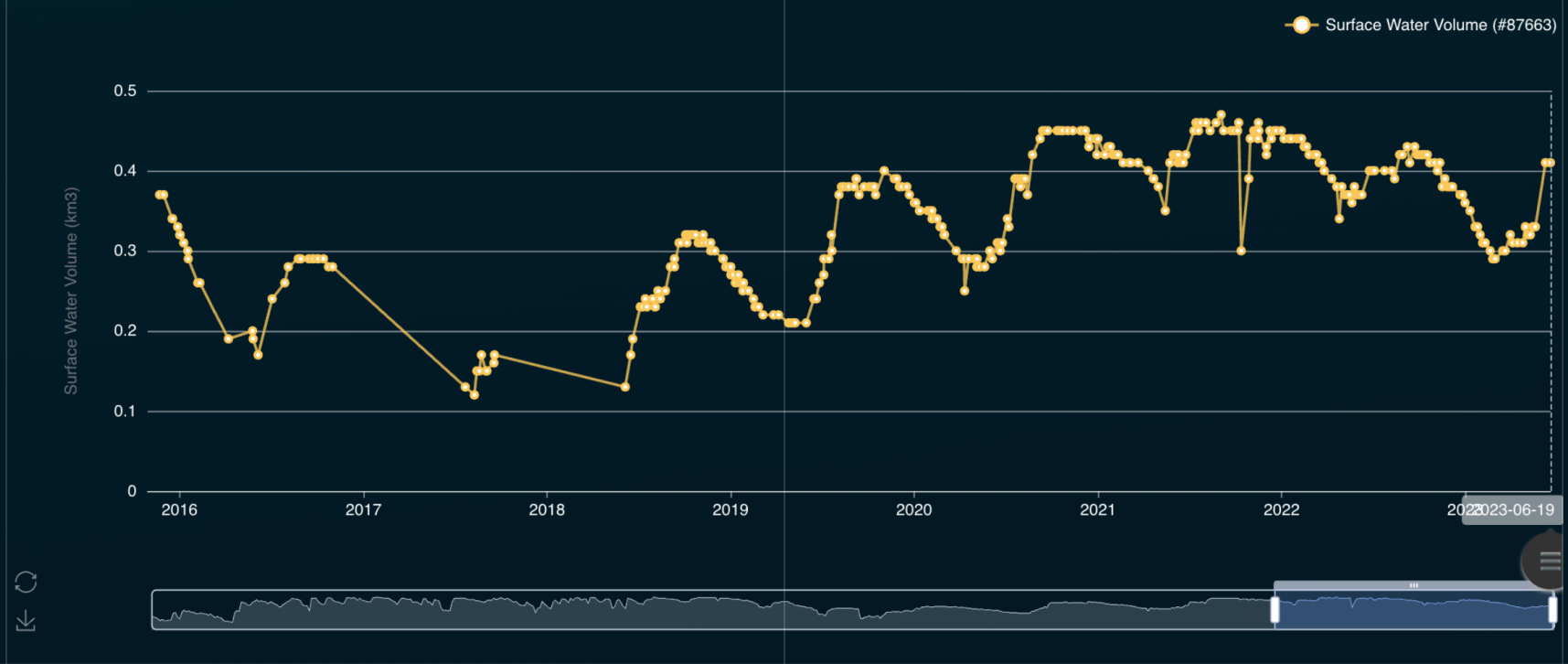
This reservoir was curated by Global Dam Watch (based on the GRAND database).

Select a data point in the graph to generate a satellite image

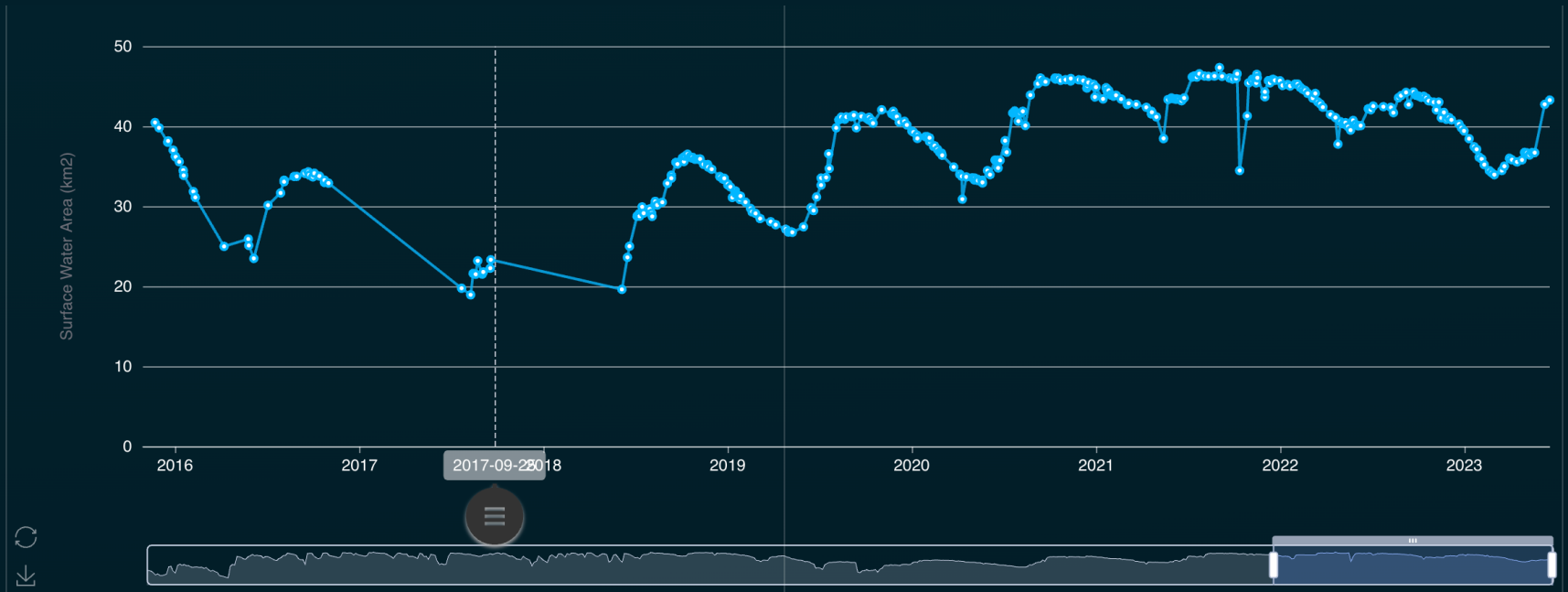
Share page

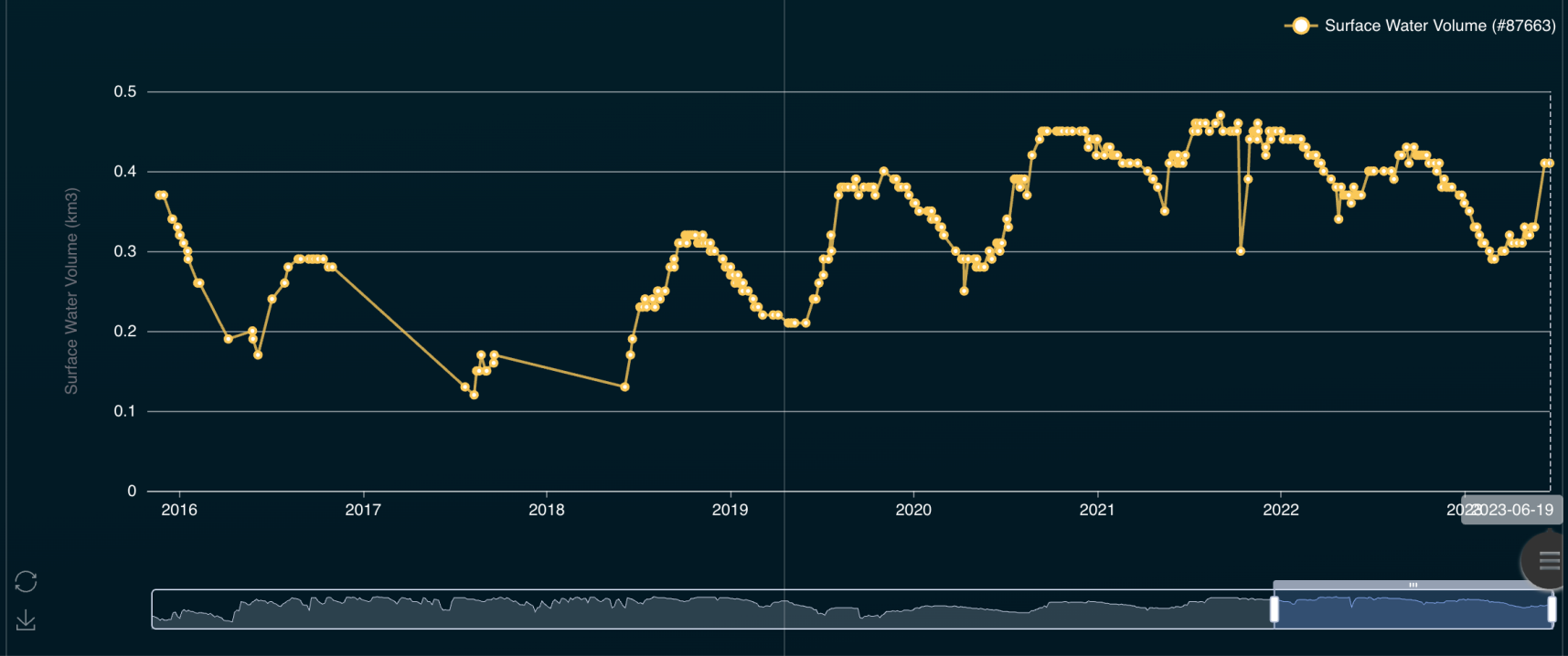
Surface Water Area (#87663)


Surface Water Area (km2)
50
40
30
20
10
0
2016
2017
2018
2019
2020
2021
2022
2023-06-19


Surface Water Volume (#87663)
Surface Water Volume (km3)
0.5
0.4
0.3
0.2
0.1
0
2016
2017
2018
2019
2020
2021
2022
2023-06-19

Share page


Surface Water Area (km2)
50
40
30
20
10
0
2016
2017
2017-09-25
2018
2019
2020
2021
2022
2023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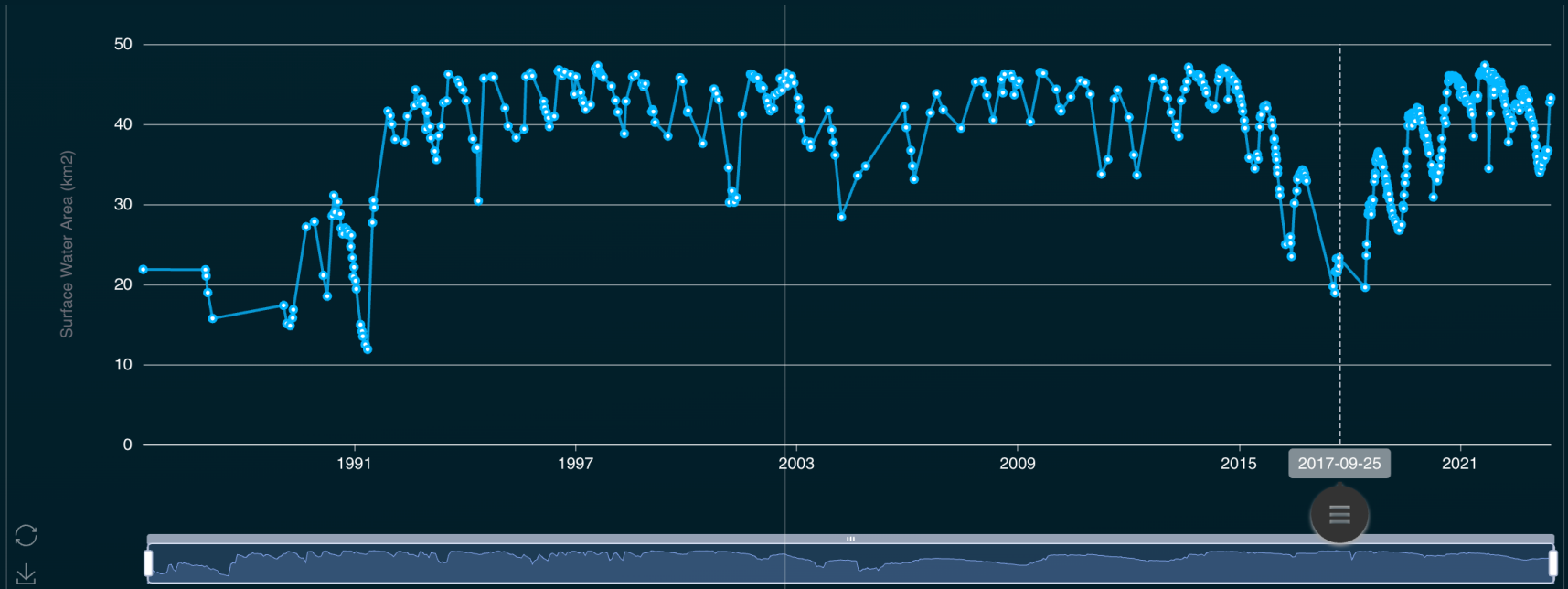
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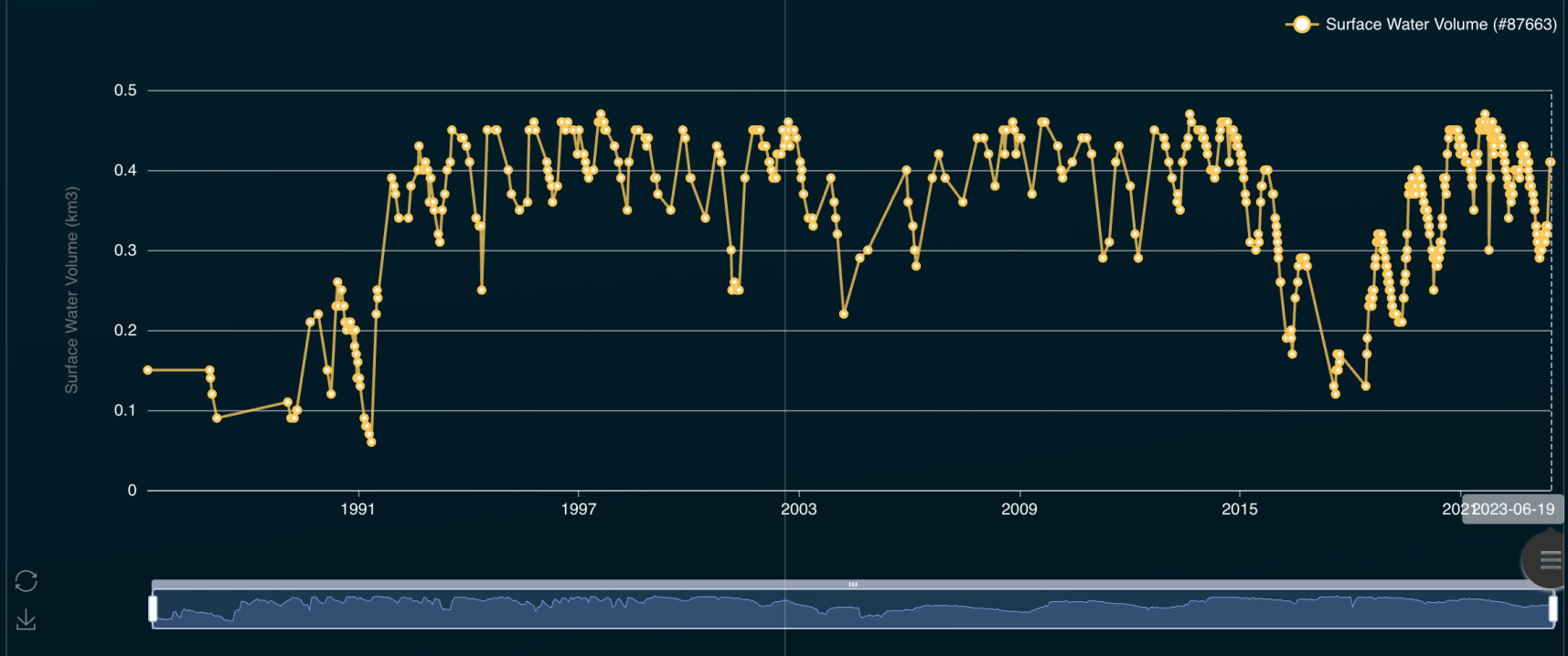
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Share page

Comparison map

Here we represent the state of the reservoir at the selected "before" and "after" times. We do this by creating a composite image of different satellite missions (Landsat 4, 5, 7, 8, 9 and Sentinel-2). The composite is constructed using images from the selected date, going back 30 days to gather enough images . The more recent images are displayed on top.

Interact with the map

Click on the date at the bottom left to change the "before" date, and the date on the bottom right to change the "after" date. You can use the slider on the plot to compare the situation at the "before" date, shown on the left of the slider, and the "after" situation of the reservoir on the right of the slider.

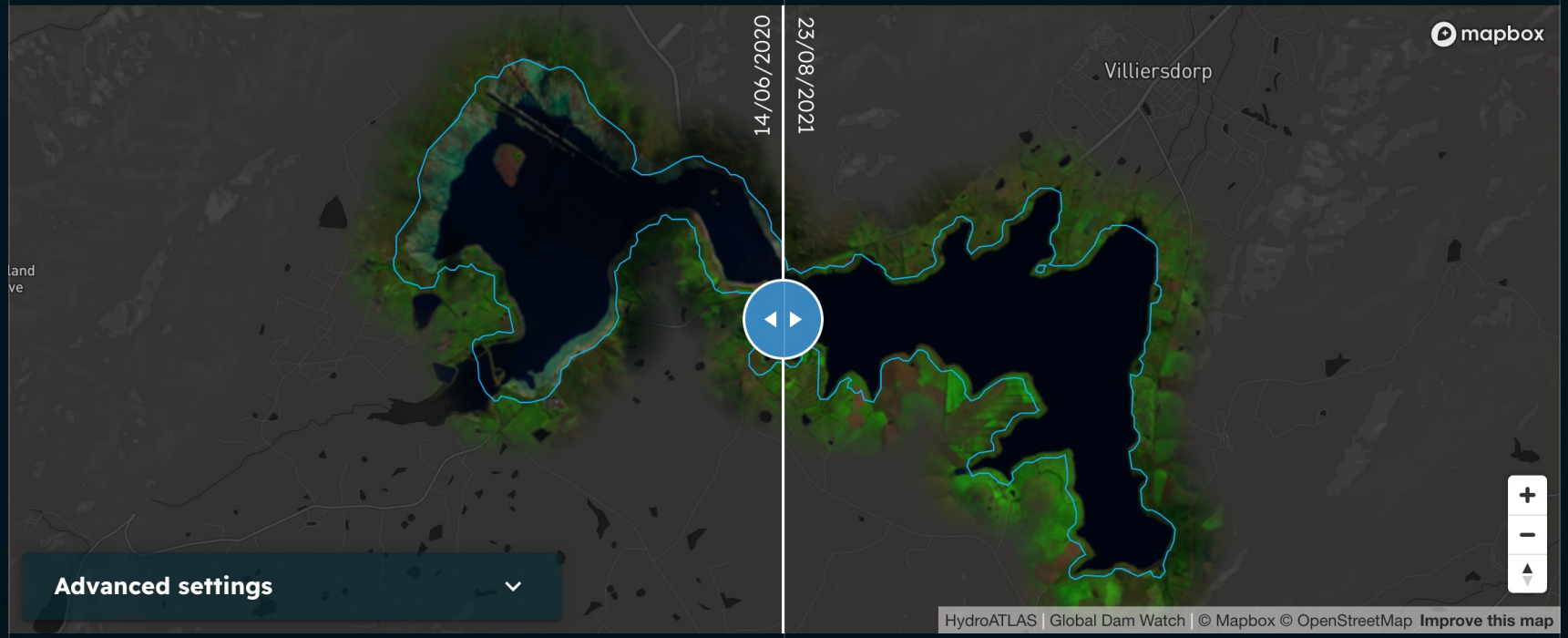
On the advanced settings panel, on the bottom left corner of the map, you can change the buffer size of the satellite images. This will allow you to see more or less of the surrounding area of the reservoir. The default value is 300m. The bigger the buffer size, the longer it will take to load the satellite images.

Embed the map

You can embed the comparison map on your website by copying the code below. The dates will be fixed to the ones currently selected, same for any advanced settings.

COPY IFRAME

<iframe src="https://www.globalwaterwatch.earth/comparison-map?reservoir=87663&date=2021-08-23&oldDate=2020-06-14&extraBuffer=



Select date
14/06/2020

Select date
23/08/2021

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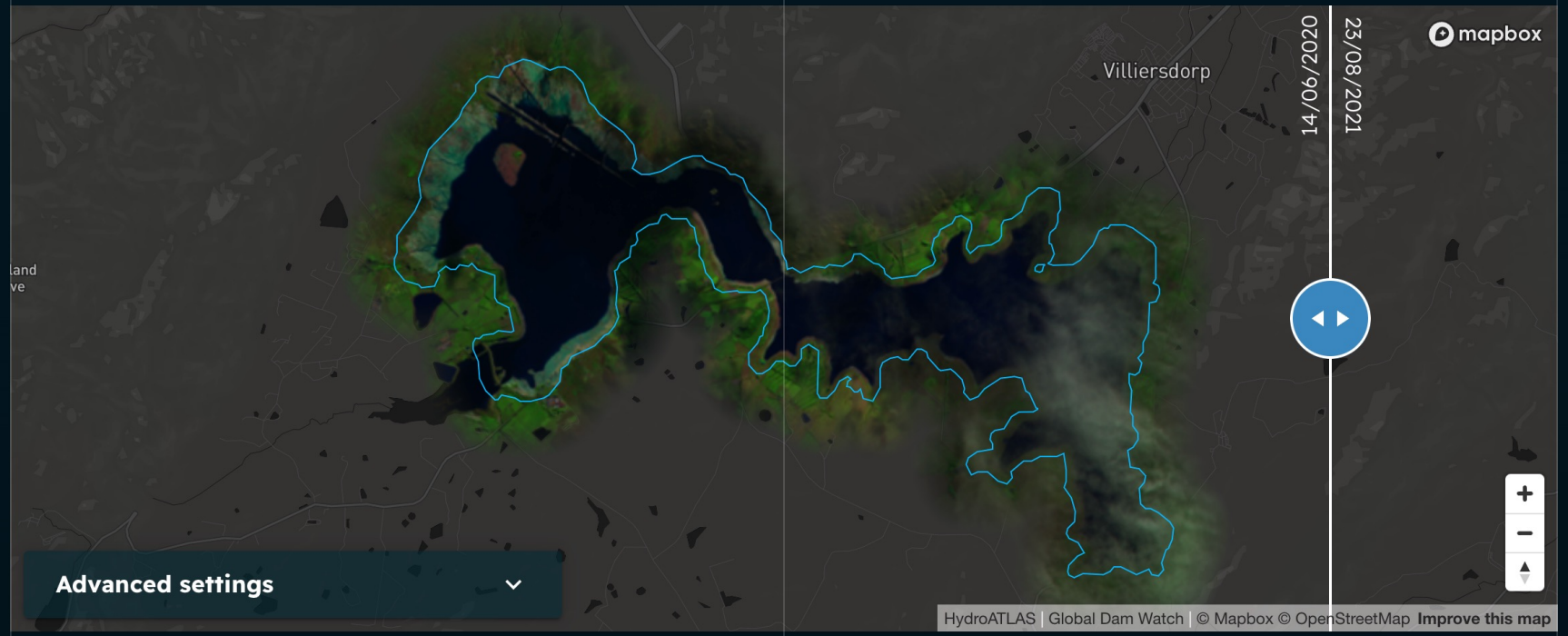

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Select date
14/06/2020

Select date
23/08/2021

Share page

Export options

COPY URL https://www.globalwaterwatch.earth/reservoir/87663

DOWNLOAD .CSV(S) DOWNLOAD .GEOJSON

Give feedback

Reservoir name suggestion

Reservoir name

Notes

Any additional notes about this reservoir

SEND

Global Water Watch

Democratizing earth's data on water resources

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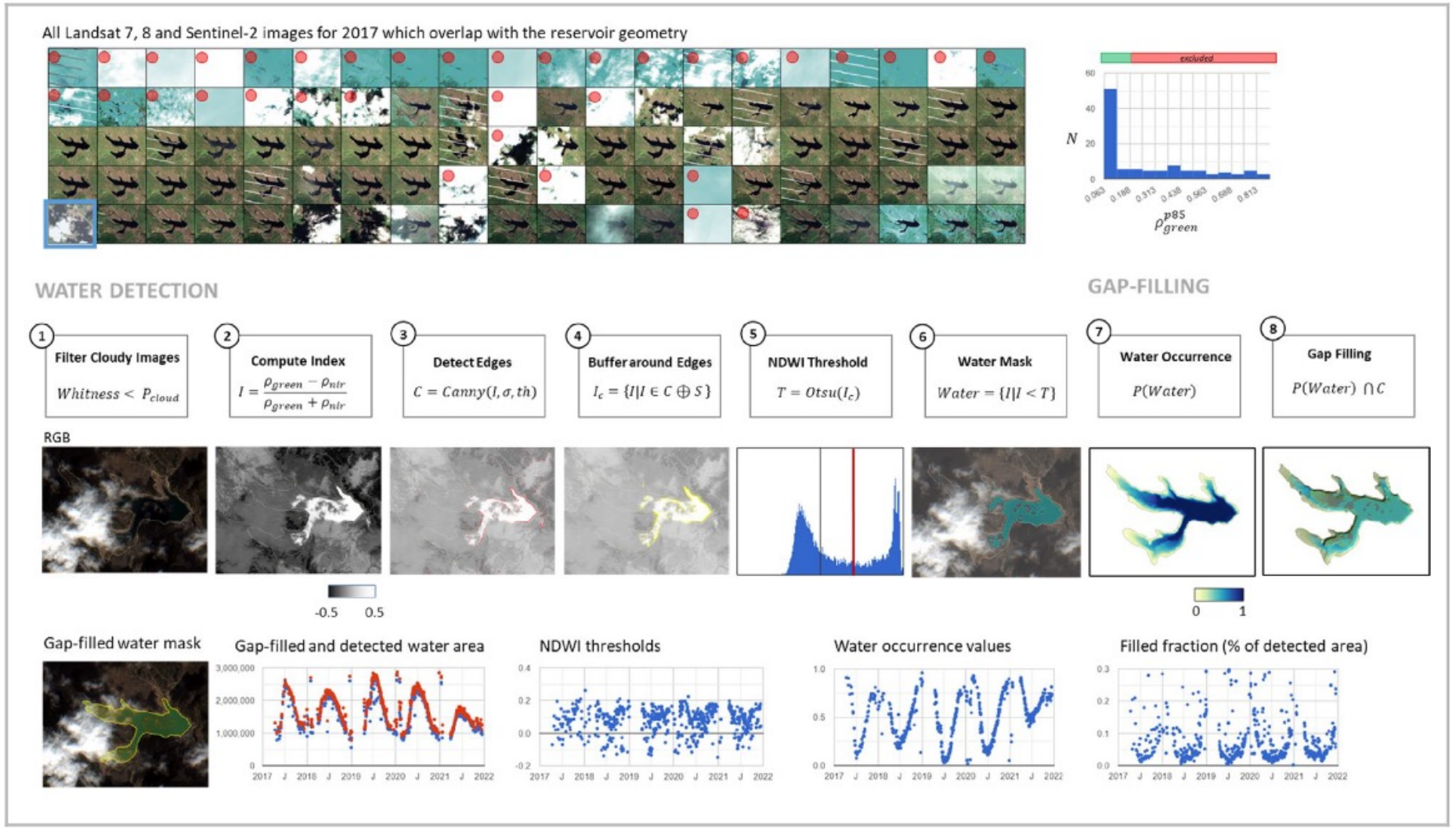
Method



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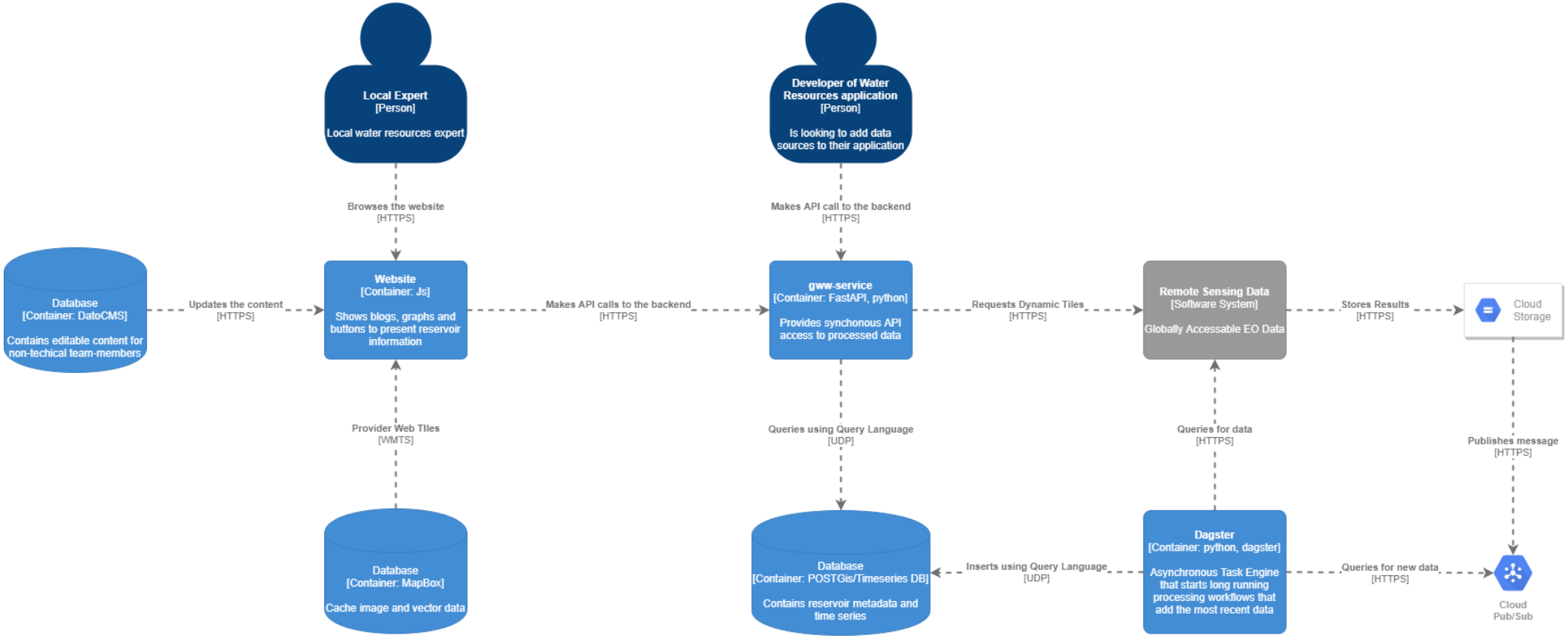
Challenges

- Multi-mission global data from 1985 until “real-time”
- Web Mapping Tile Service that can serve a derived product
- Quick response times
- Real-time (so far monthly) updates
- A dynamic reservoir database

GWW - Architecture



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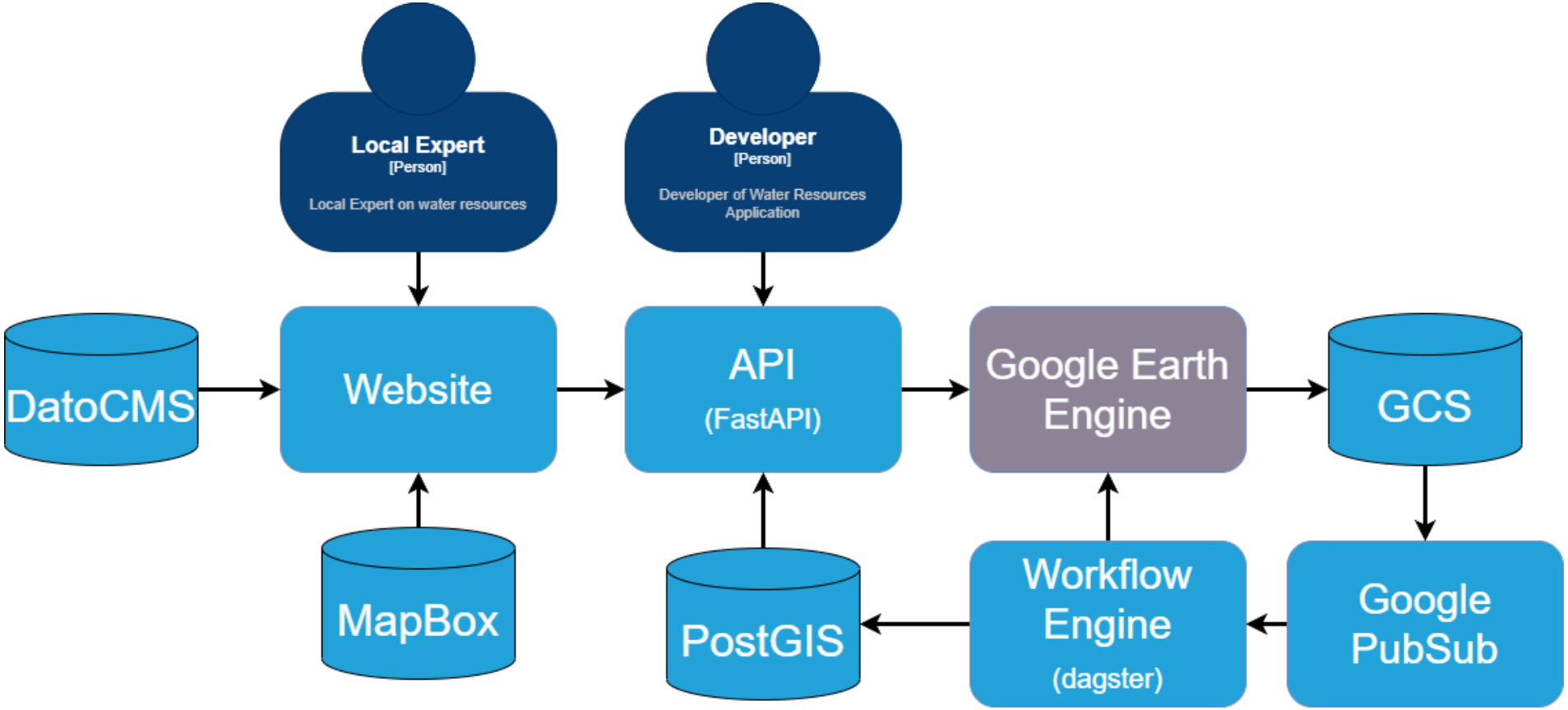
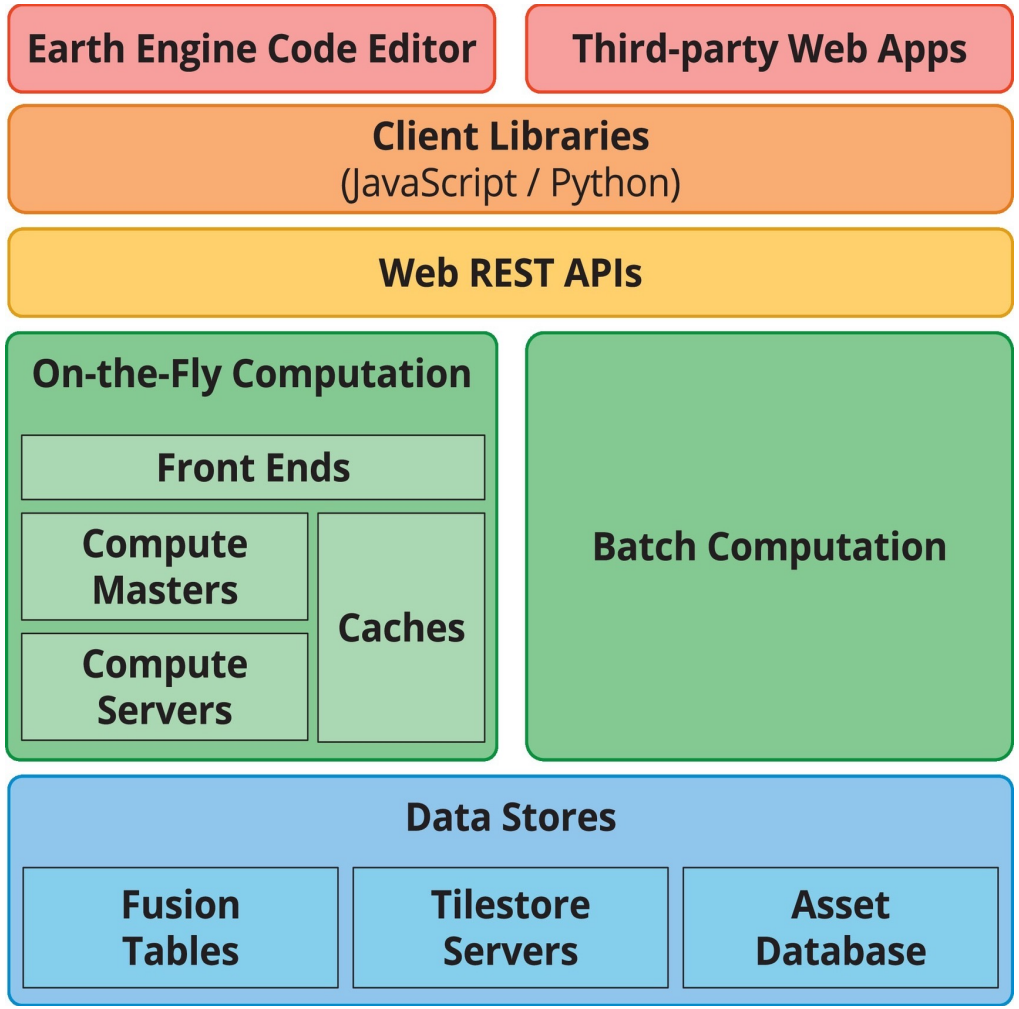


Google Earth Engine

+ multi-petabyte datasets
+ great caching layer
+ build in code-editor and visualizations
+ free for research purposes
+ very fast raster operations
+ in general a mature product

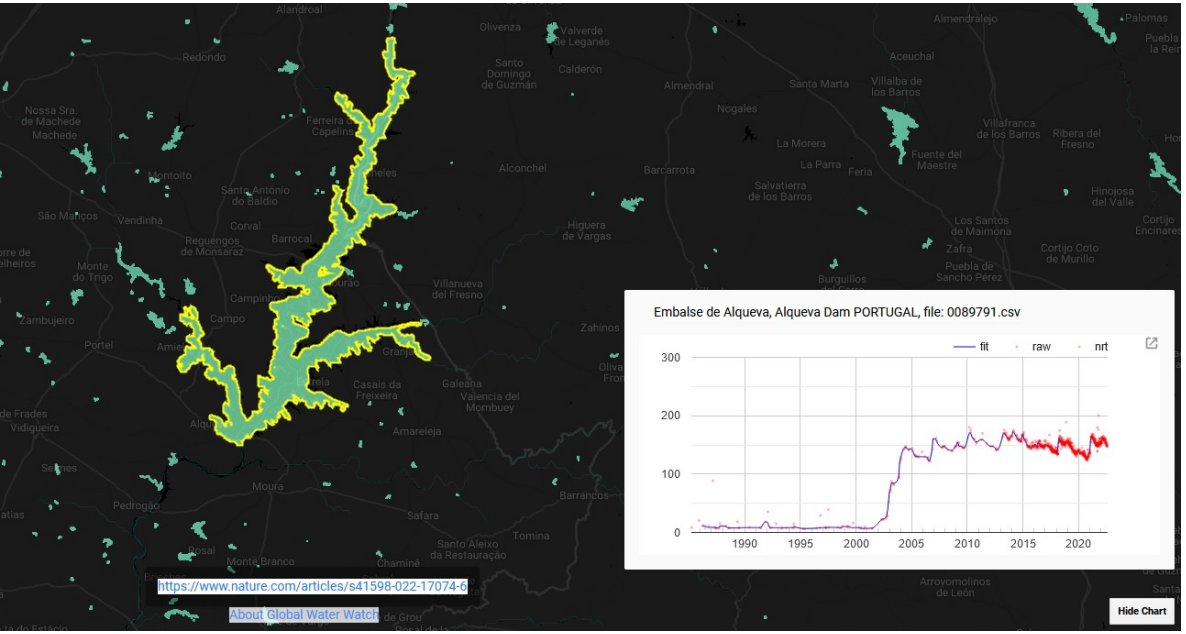
- closed source
- only built-in operations
- memory limits unstable
- optimized for raster operations
- not all data in their storage

? Paid version



Examples of the pro's and cons

- Very fast prototyping
  - Prototype app created in weeks time
  - New algorithms or parameters scaled to a global level
- 0 effort in making data "Analysis Ready" or "Cloud Ready"



- Undebuggable "Out of Memory" exceptions
  - Eventually solved by moving calculation out of start of month
- "Forced" version upgrades causing production failures
- Random hanging connections
- Support for custom vector data (ICESAT) for volume extract
  - Still not scaled to all reservoirs

PostGIS database

- Hosted on Kubernetes together with the workflows and the API
- Using the TimescaleDB + PostGIS extensions for spatiotemporal queries

+ Automatic scaling / backups using open source “operators”

+ Fetches aggregated spatiotemporal queries in a second

+ Very easy to safely update records in a “dynamic dataset”

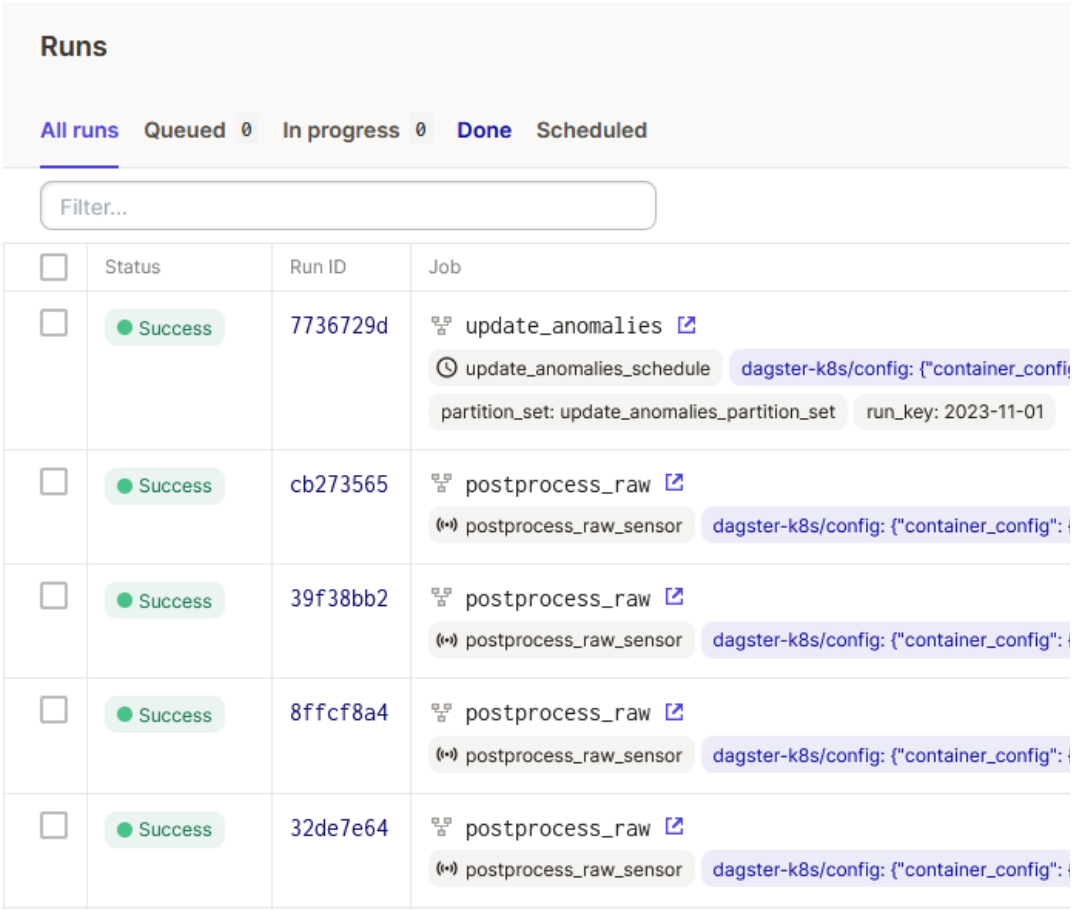
- Migrations take time

```
gwwdb=# SELECT count(*) FROM time_series;
  count
----------
 66257861
(1 row)
```

Workflow Engine

Dagster Because of:

- Kubernetes Integration
- Python-native tool
- Rich feature support
- Good documentation



For in the breakout session

Alternatives for Eartheninge:

- OpenEO
  - Data access
  - Scaling uncertain
- Microsoft Planetary Computer
  - Uncertainty about maturity of Dask-based tools
  - Does it scale globally?
  - How much more work is it to make it scale?
- GeoBeam?
- …

Why are these platforms important for our future work?

- Climate pressure will increase – water resources seem undervalued
- EO derivatives as input for Digital Twins
- Scalable Machine Learning is still a challenge
- Global-to-local modeling
- Connection to model runs
- Citizen Science – interaction (UI/UX!)

Contact

www.deltares.nl

@deltares

linkedin.com/company/deltares

info@deltares.nl

@deltares

facebook.com/deltaresNL