Intra-ACP Climate Services and Related Applications Programme – ClimSA

WORKSHOP - SADC Region

WEFE NEXUS, Climate Variability, and Environmental Monitoring

South Africa, Johannesburg, June 10th – 13th 2024

WATER DATA MANAGEMENT, ANALYSIS AND VISUALISATION

Ezio CRESTAZ, Roman SELIGER, Luigi CATTANEO, Gunther UMLAUF

South Africa, Johannesburg, June 10th – 13th 2024

European Commission
Joint Research Centre

Presentation overview

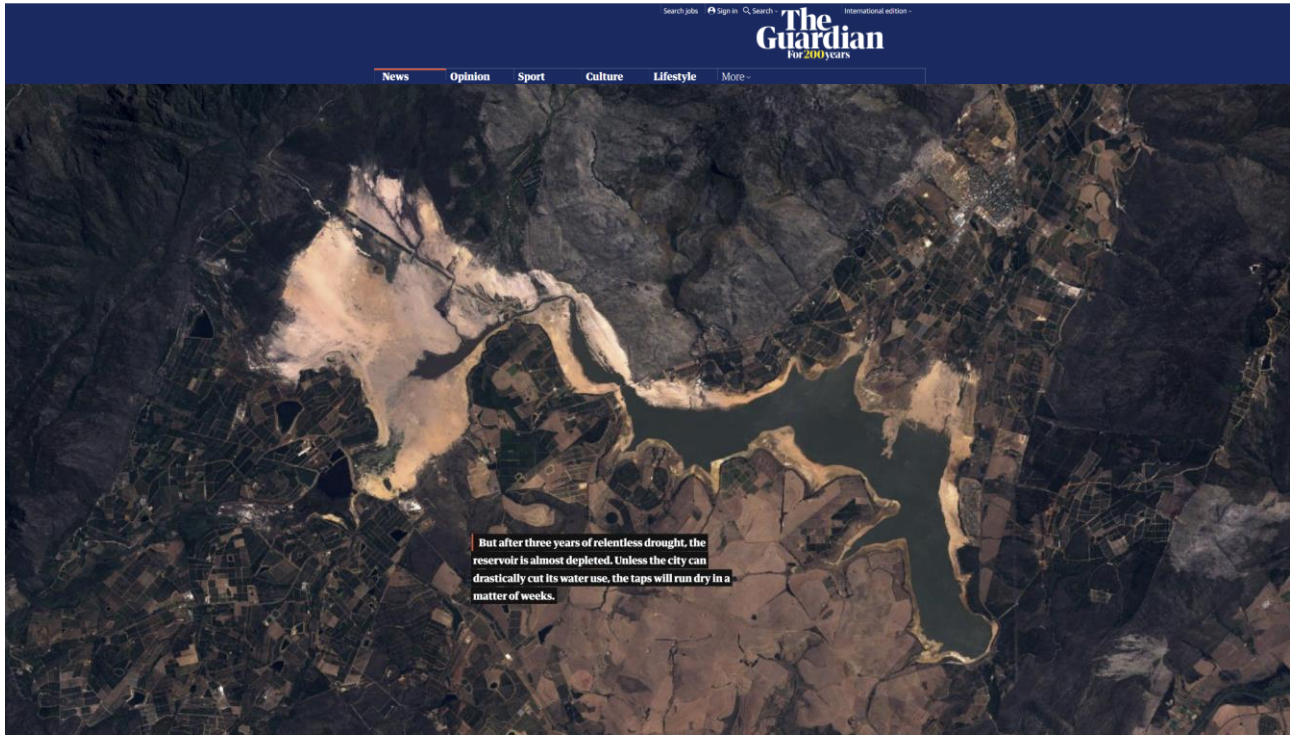
Presentation from JRC on Cape Town region case study:

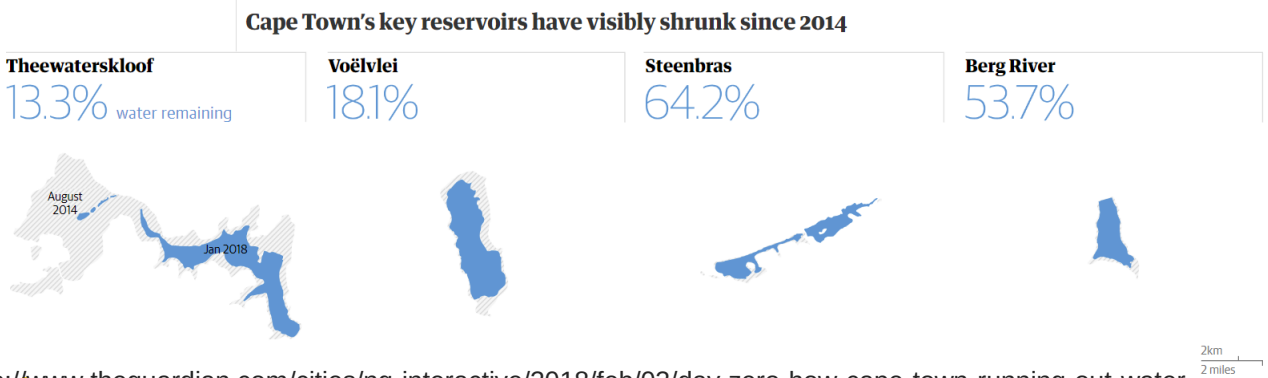
- ❑ Remote sensed products review addressing water extent analysis
- ❑ Water mapping and extent dynamics analysis: Pros and cons of existing RS products
- ❑ River discharge data management and exploratory spatio-temporal analysis in EMS

Q&A and discussion session - Sharing experiences and views on adopted data management strategies and tools, key features and major bottlenecks

Wednesday	
9:00 - 09:45	Intoduction to WEFE
9.45 - 12:30	Case study: CV and agriculture in Southern Africa - Agriculture and WEFE - Bioenergy and Cropland allocation
12:30 - 14:00	*Lunch break*
	The EMS tool
14:00 - 17:30	Introduction: Environmental Management system
	Water data management, analysis and visualisation

Cape Town 2018 water crisis



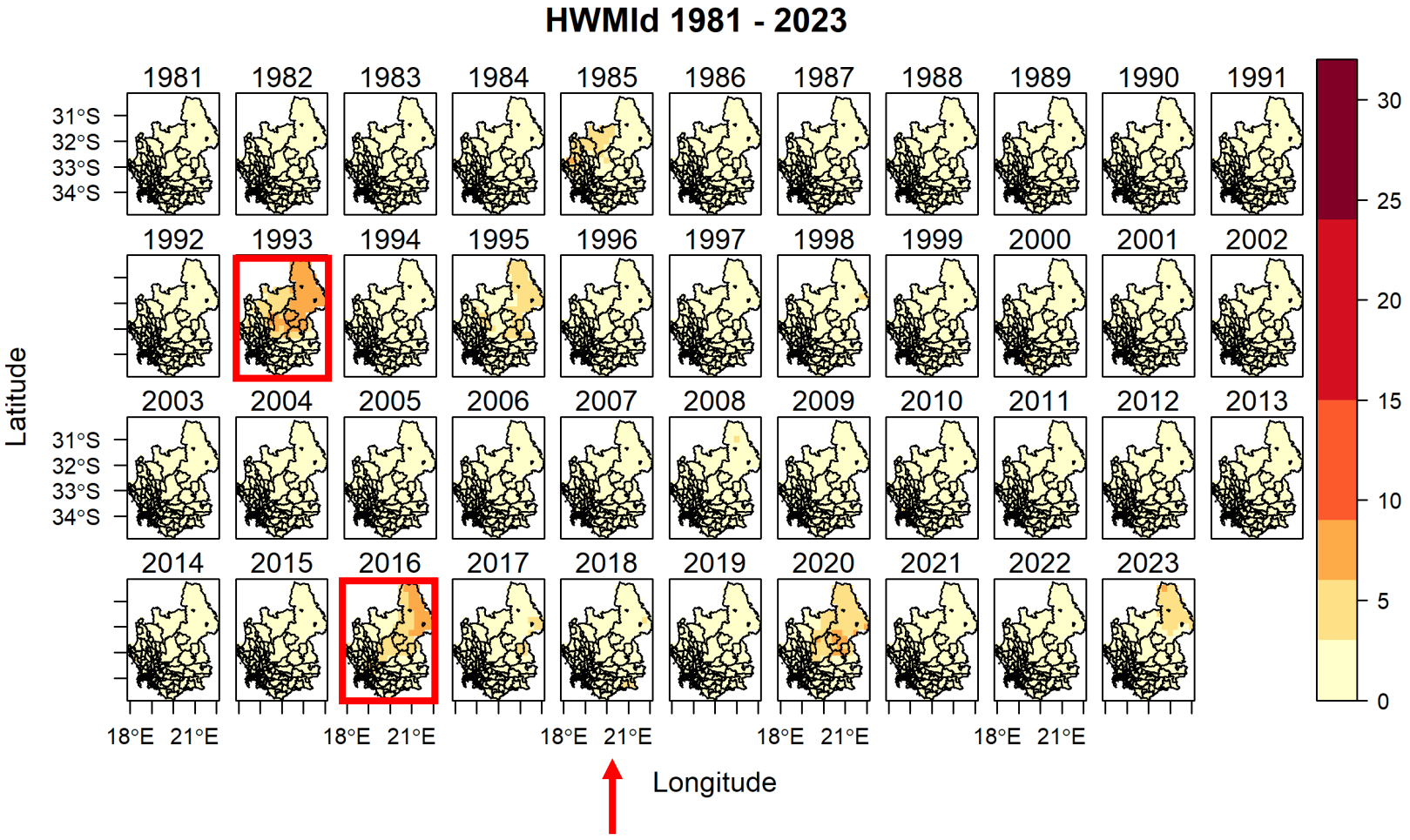


© https://www.theguardian.com/cities/ng-interactive/2018/feb/03/day-zero-how-cape-town-running-out-water

© https://www.ft.com/content/8a438352-fc76-11e7-a492-2c9be7f3120a

European Commission

Heat waves | CapeTown region



As from the E-Nexus analysis:

- Heat waves anomalies must be noted in 1993 and 2016
- 2016 heat waves anticipate the February 2018 water tap crisis in Cape Town

SPI analysis | CapeTown region

Cape Town water tap crisis

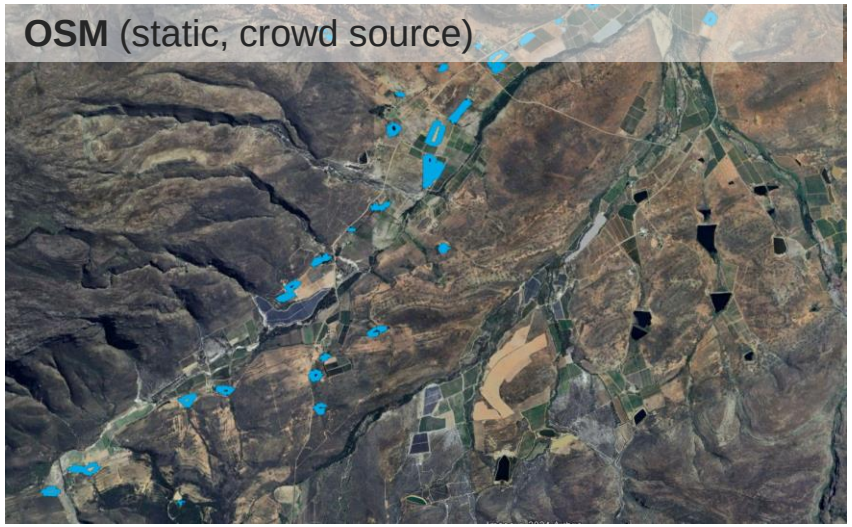
As from the E-Nexus analysis:

- Cape Town water crisis occurs after an entire year (2017) characterized by continuative SPI (at 3 months) anomaly, highlighting strong and continuous rainfall deficit
- Crisis pick at Feb 2018 highlighted in the extract from 2013 to 2020

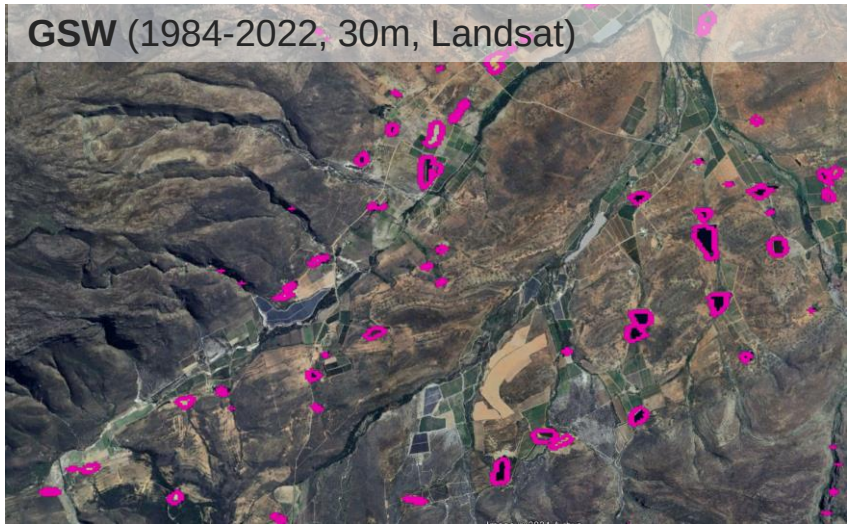
Water Mapping | Data products & assessment

Aerial photo

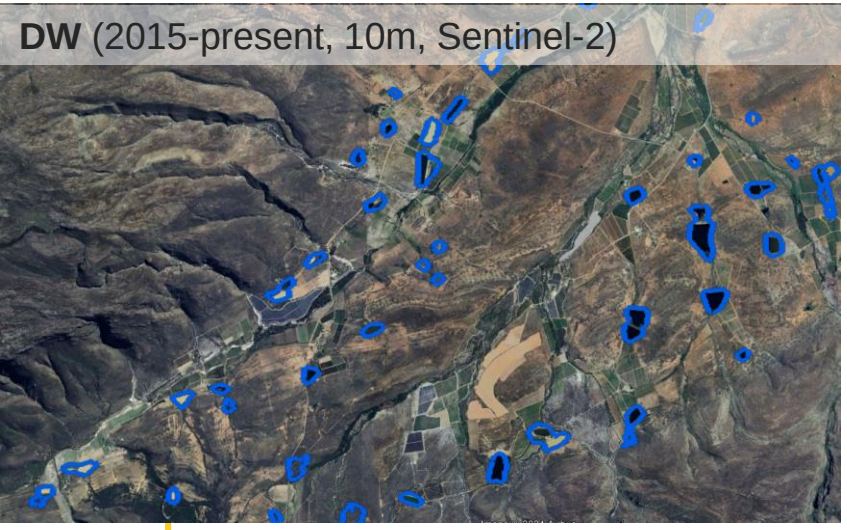
OSM (static, crowd source)



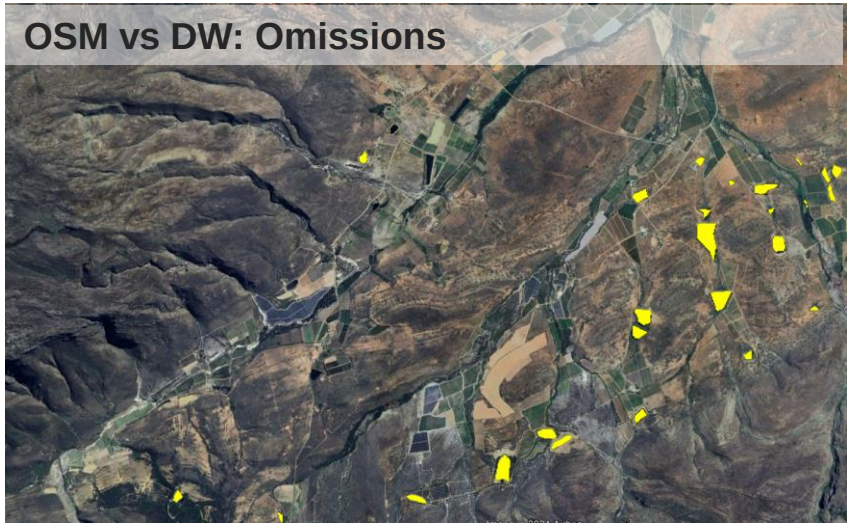
GSW (1984-2022, 30m, Landsat)



DW (2015-present, 10m, Sentinel-2)



OSM vs DW: Omissions



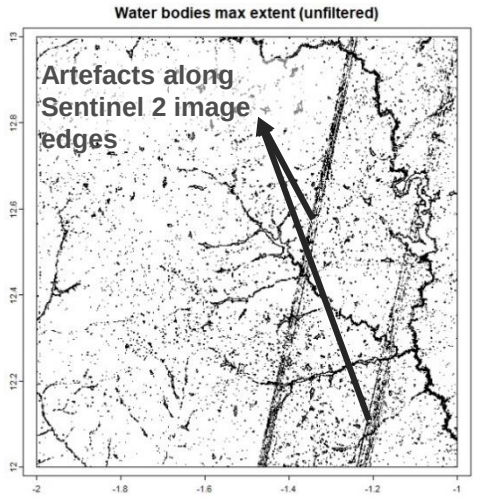
- Region (e.g. climate: clouds and cloud shadow; topography: shadow on slopes; sensor failures)
- Spatio-temporal resolution

European Commission

Water Mapping | Misclassification errors

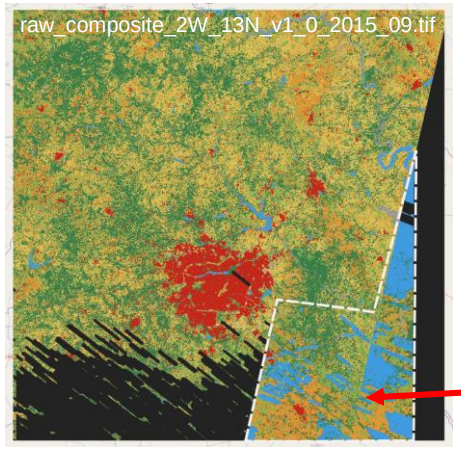
Classification errors related to shadow and DW classifier

Image edges as water



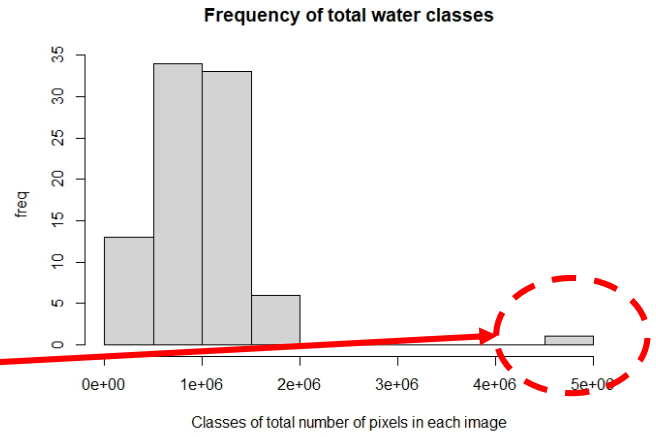
Remove areas <0.1km²

NoData as water



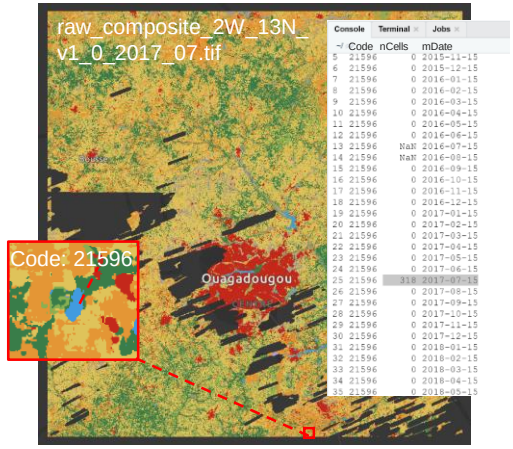
Set mis-classified data as NoData

Spot erroneous images



Check plausibility using histogram

Artefacts as water

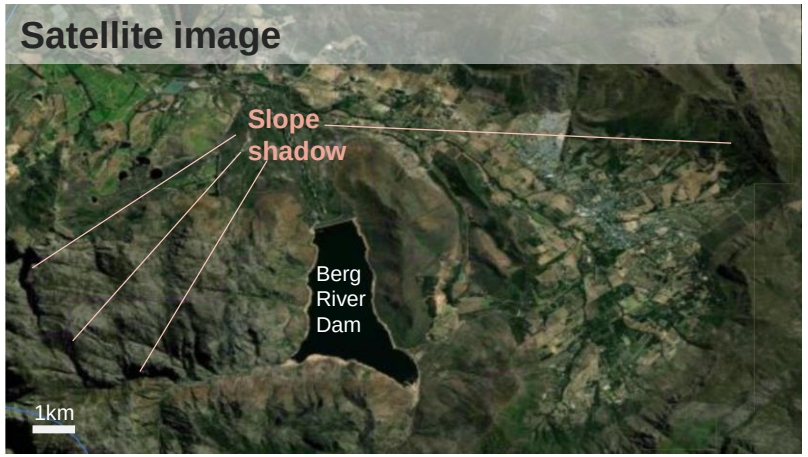


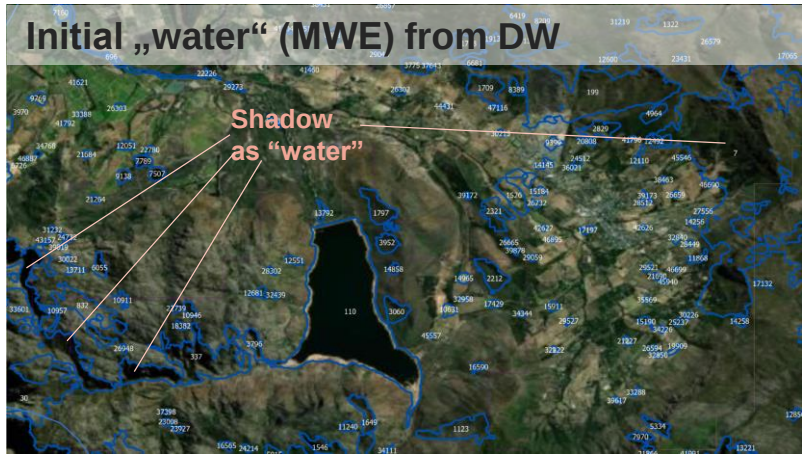
Remove reservoirs of water frequency <2%

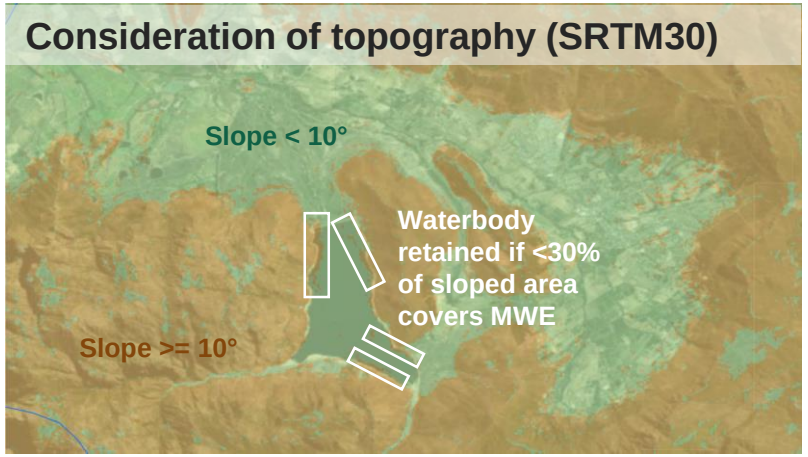
European Commission

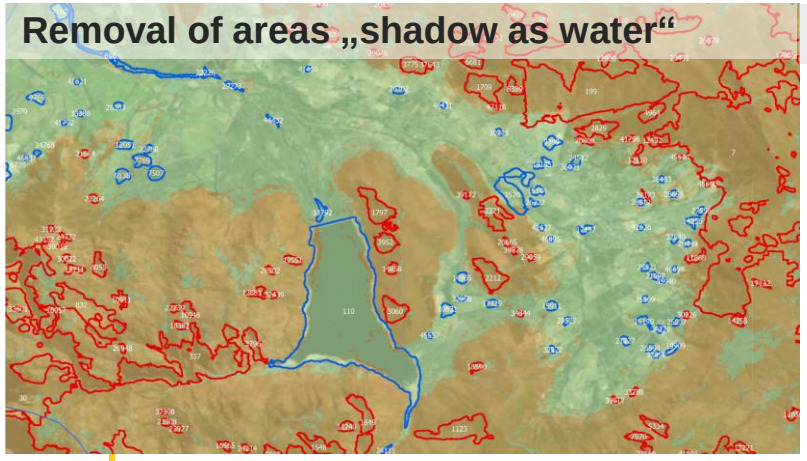
Water Mapping | Misclassification errors

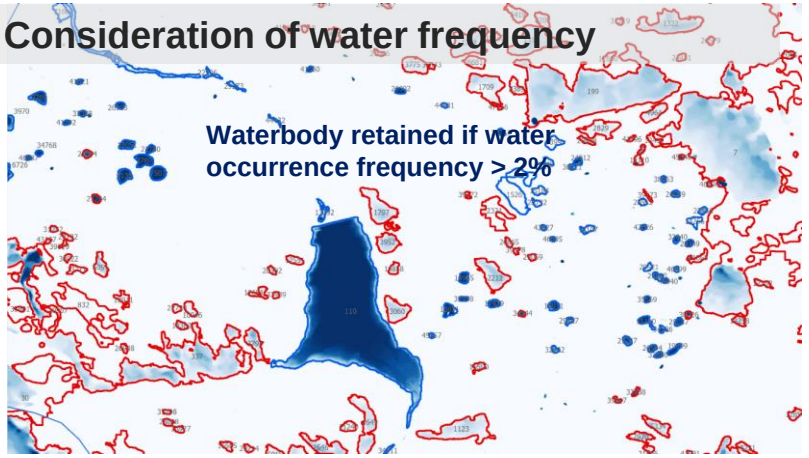
Classification errors related to shadow and DW classifier

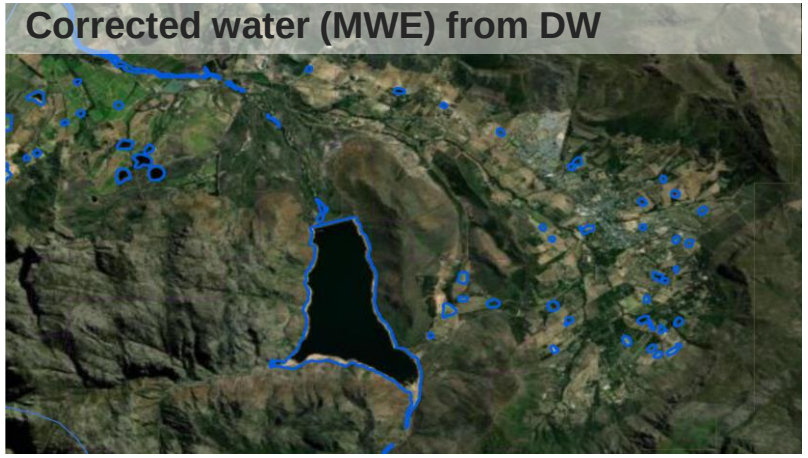






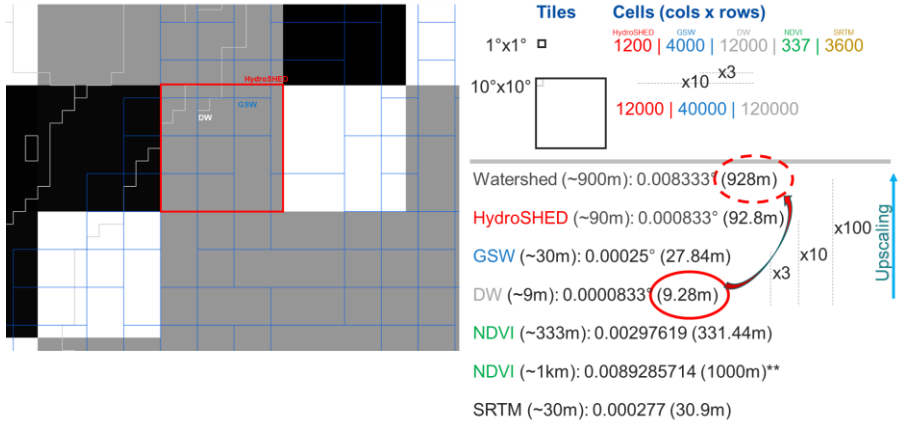






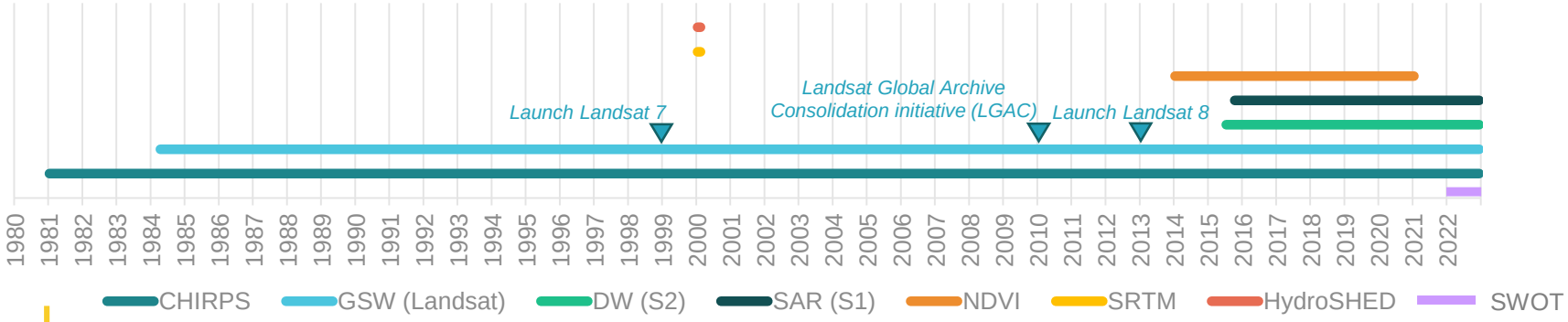
RS products resolution, frequency and coverage

Spectral component: resolution



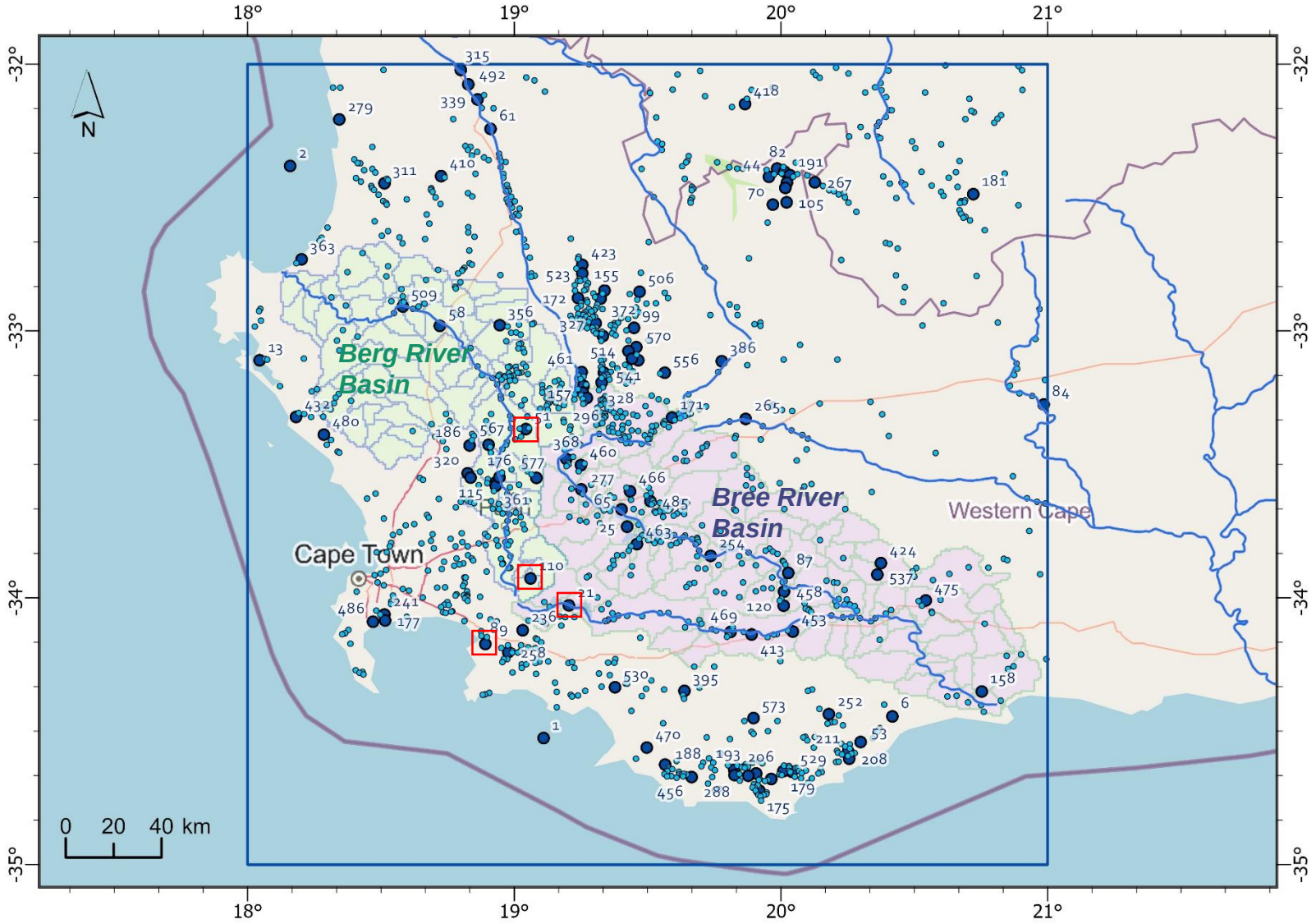
Data Product	Examples
Remote Sensing	DW (S2), GSW (Landsat), SAR (S1), HydroSHED (SRTM), SWOT
Ground station	GRDC, DSW
Crowd Source	OSM

Temporal component



European Commission

Water Mapping from Google Dynamic World (DW)



- Waterbody surface > 1km2
- Waterbody surface 0.1- 1km2

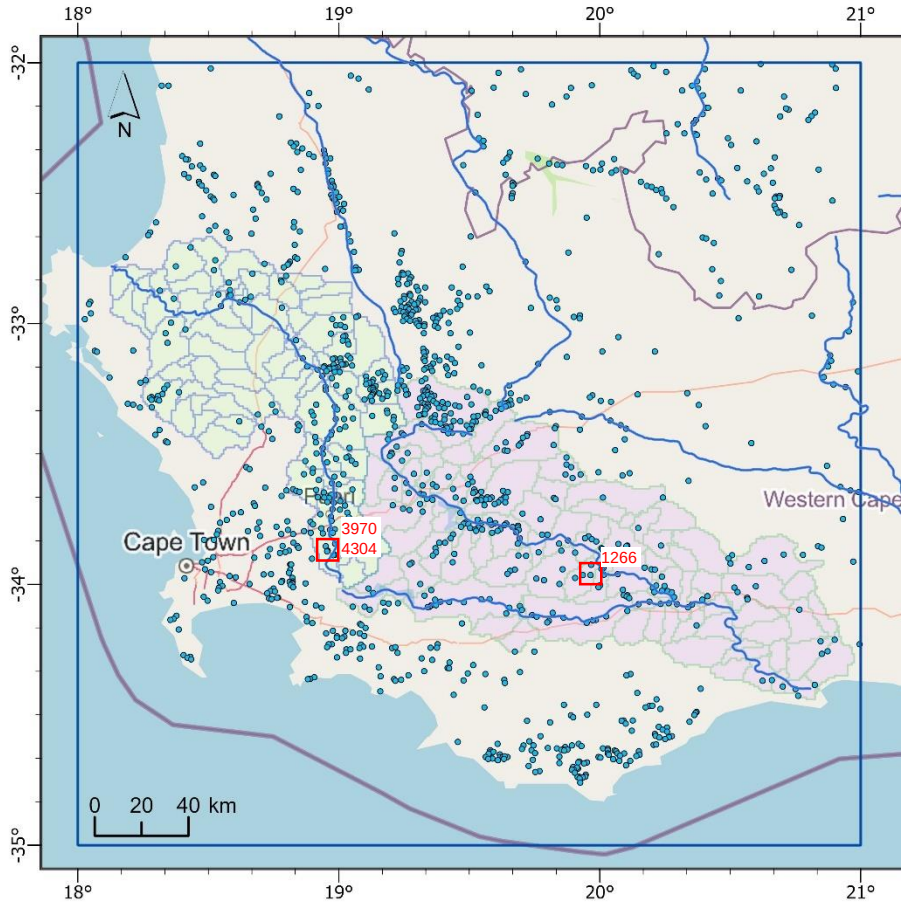
Code | Waterbody | Basin

21. Theewaterskloof Dam | Bree
51. Vöelvlei Lake | Berg
89. Steenbras | Steenbras
110. Berg River | Berg

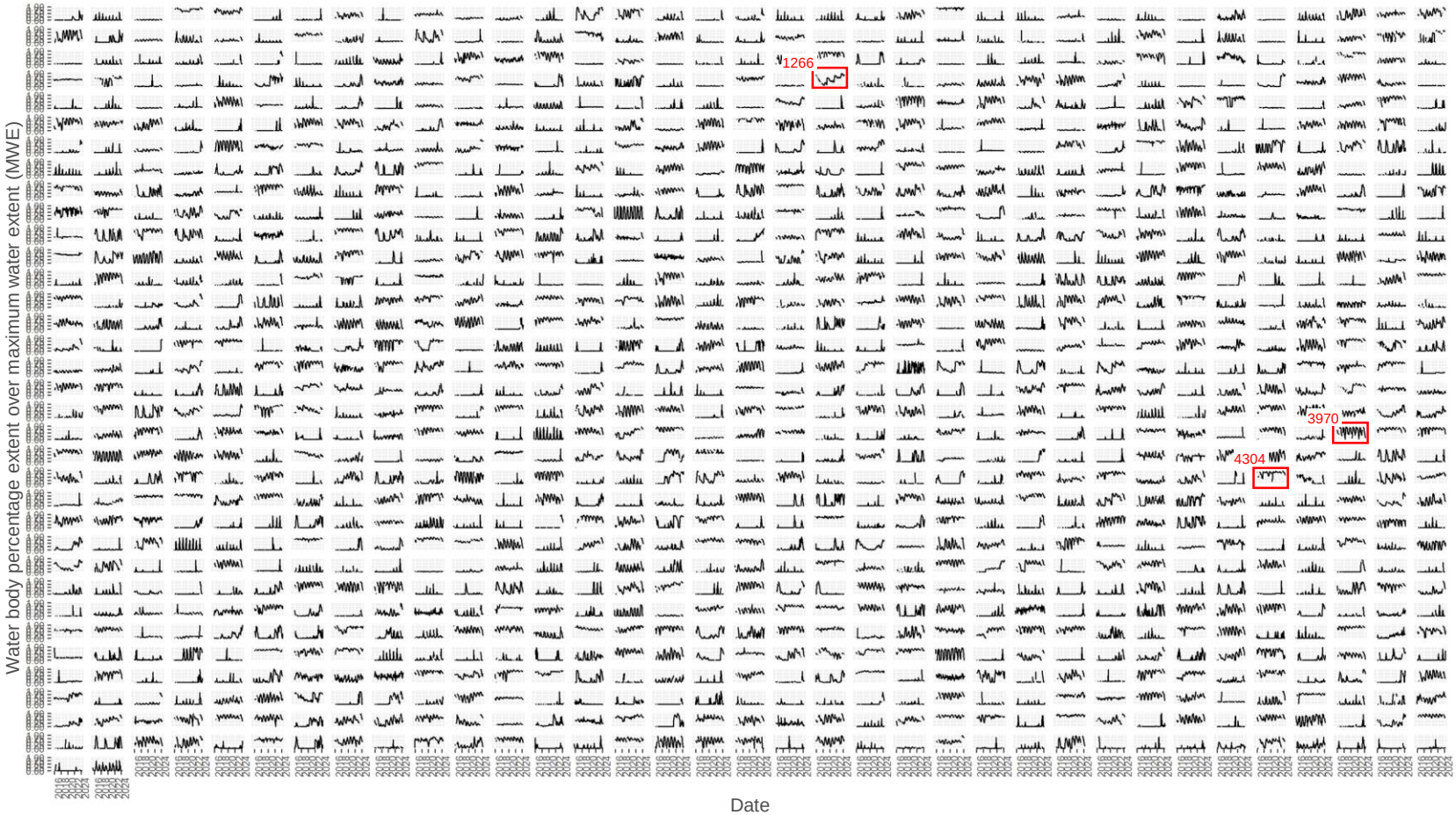
European Commission

Water Dynamics | Waterbodies 0.1-1km²

Mapping of waterbodies > 0.1-1km² (n=1992)

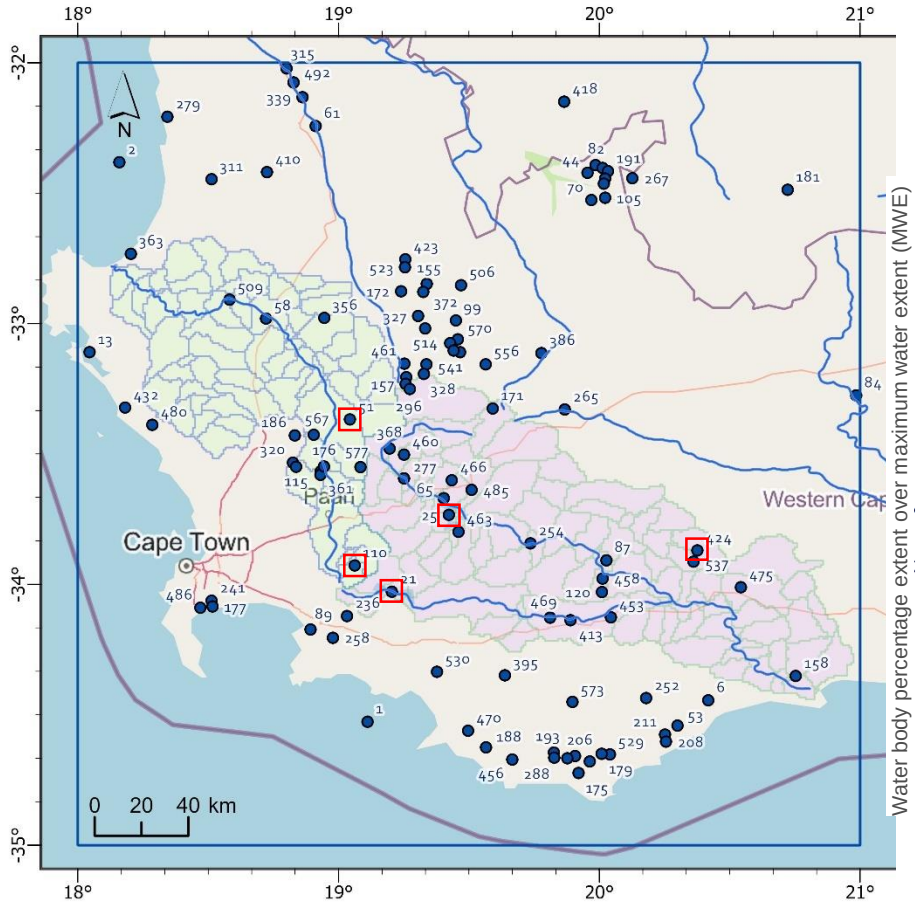


Water surface dynamics based on DW normalized to MWE of waterbodies 0.1-1km² (n=1992)



Water Dynamics | Waterbodies > 1km²

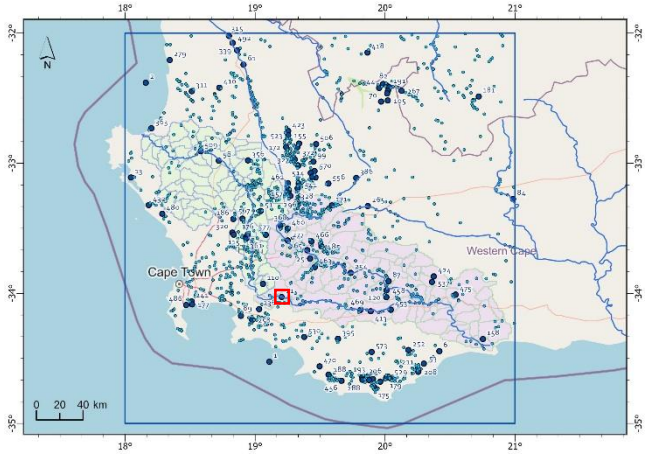
Mapping of waterbodies > 1km² (n=106)

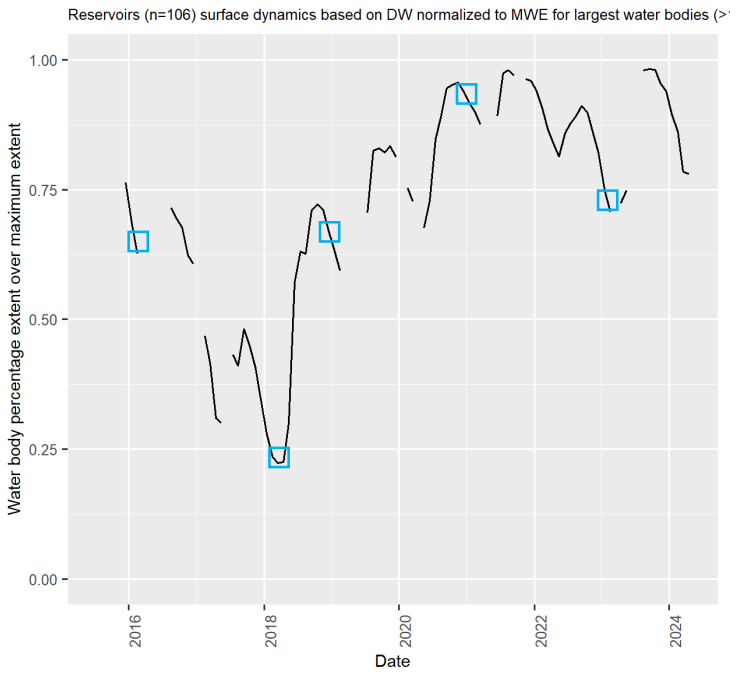


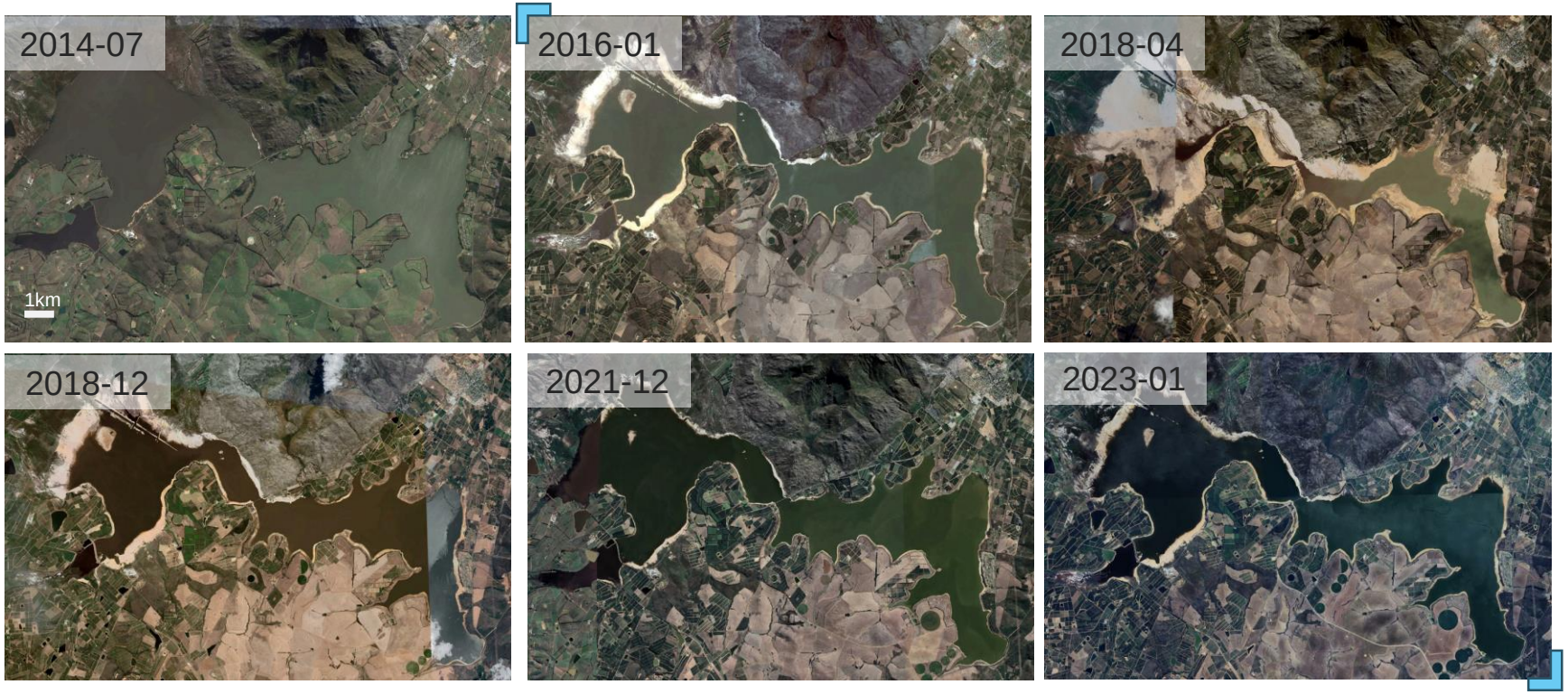
Water surface dynamics based on DW normalized to MWE of waterbodies > 1km² (n=106)

Water Dynamics | Theewaterskloof Dam

Bree watershed | Waterbody surface > 1km² | Area (mwe): 53.00km²



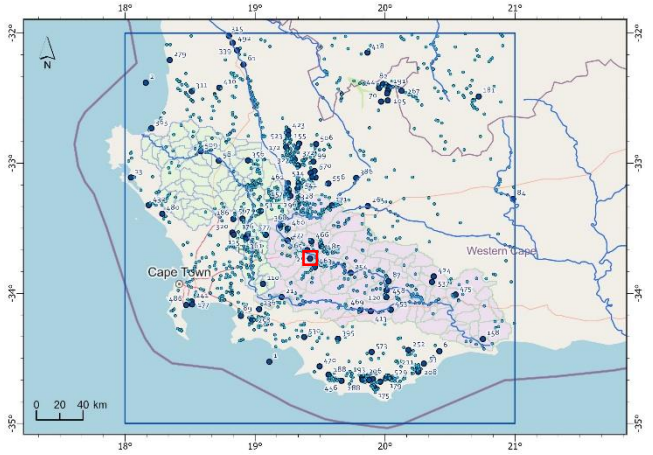


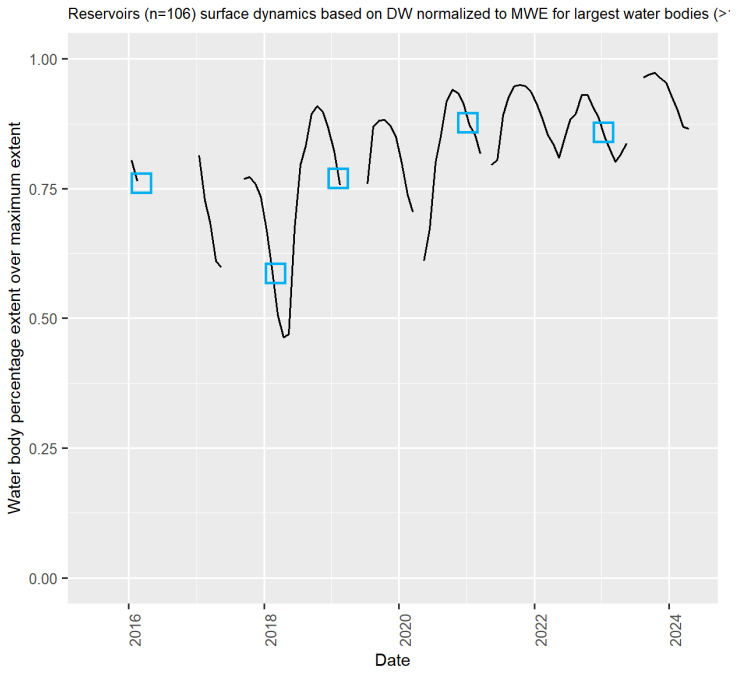


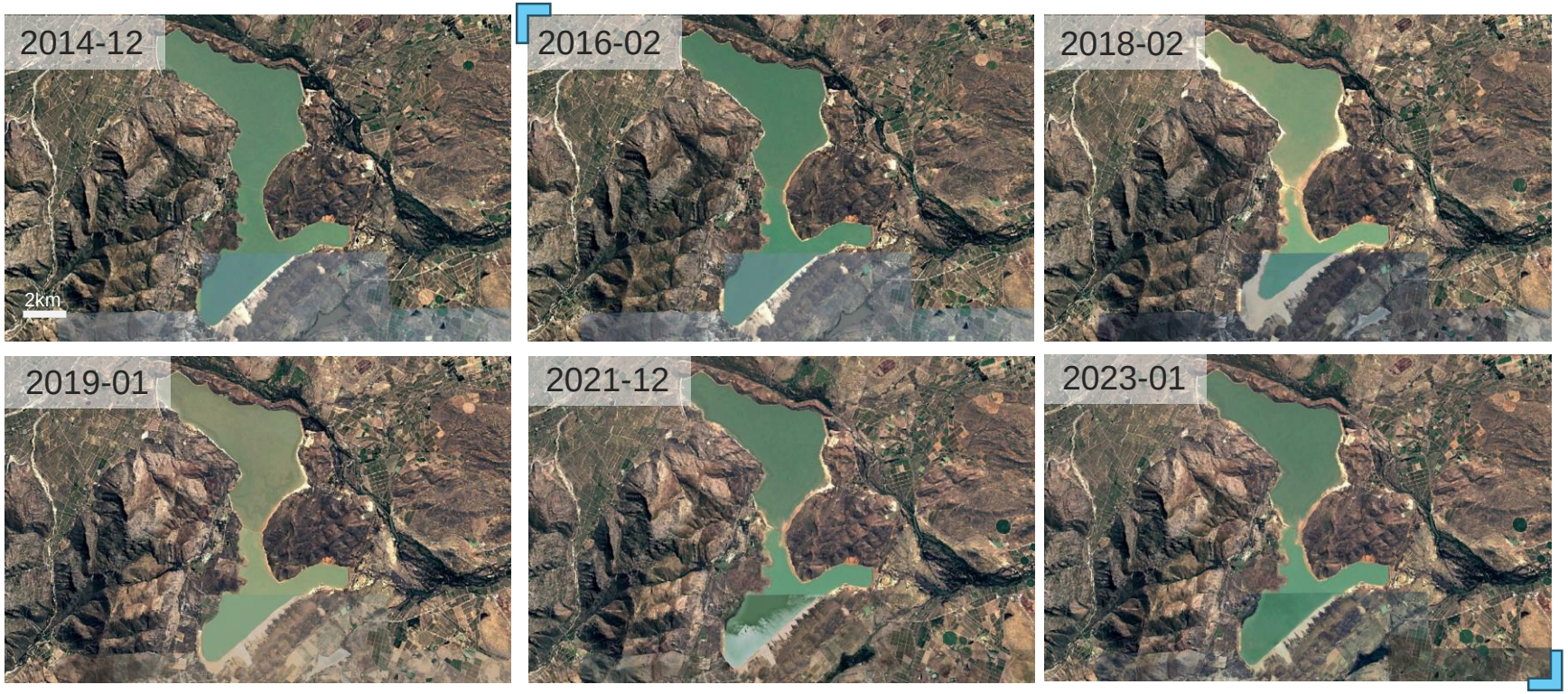
European Commission

Water Dynamics | Brandvlei Dam

Bree watershed | Waterbody surface > 1km² |
Area (mwe): 40.22km²



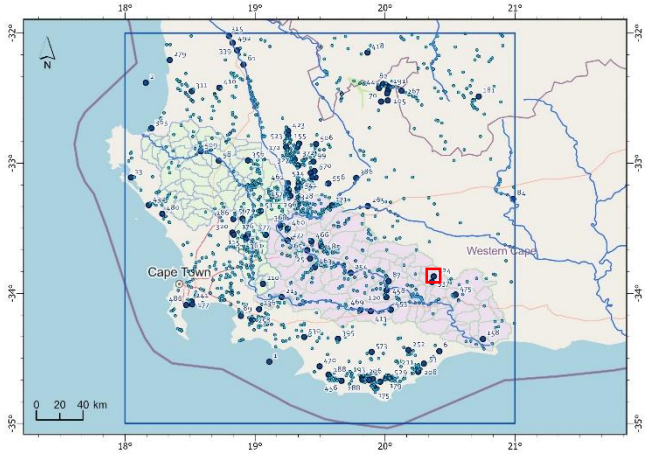


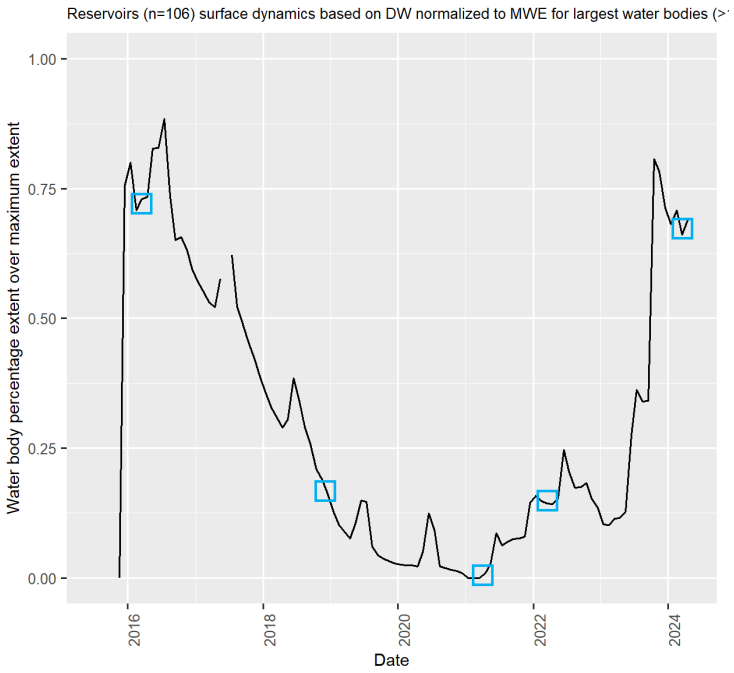


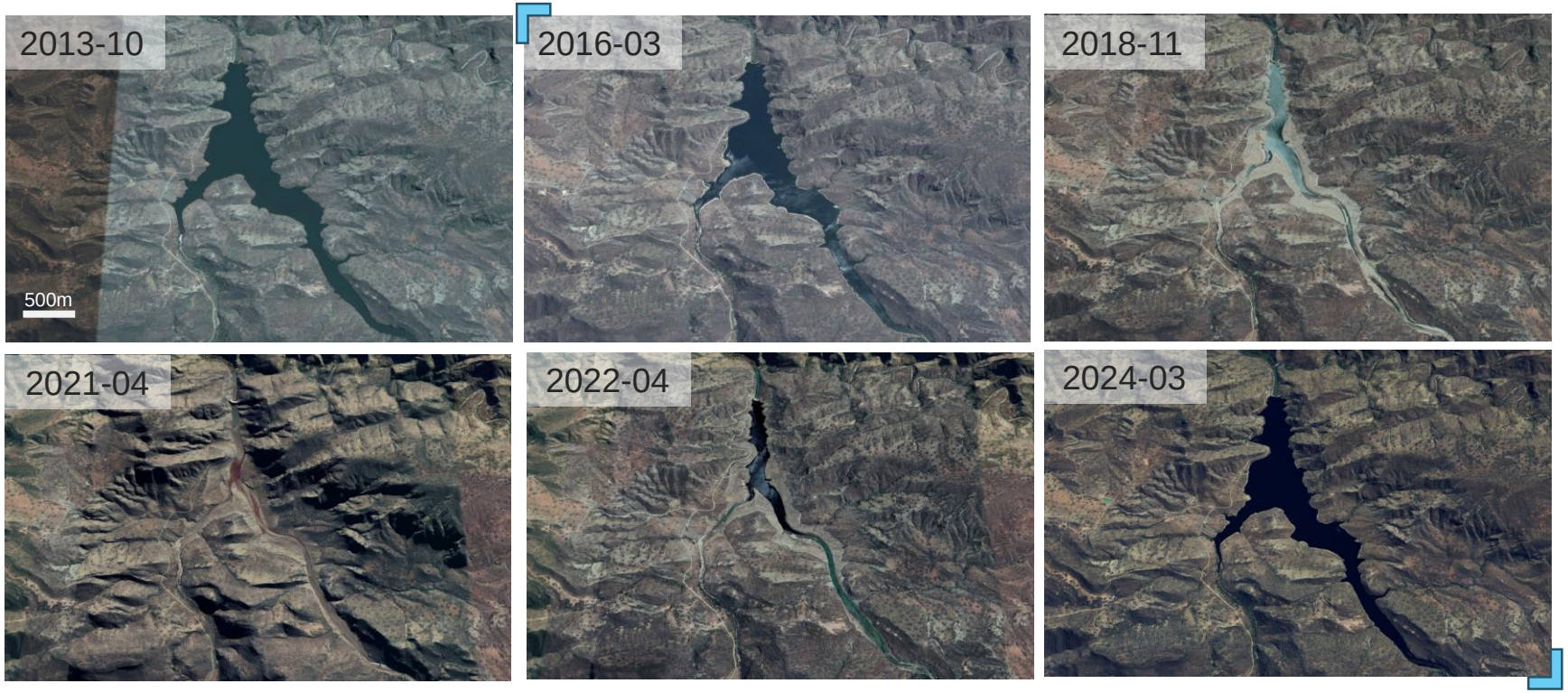
European Commission

Water Dynamics | Portjeskloof Dam

Bree watershed | Waterbody surface > 1km² | Area (mwe): 1.42km²



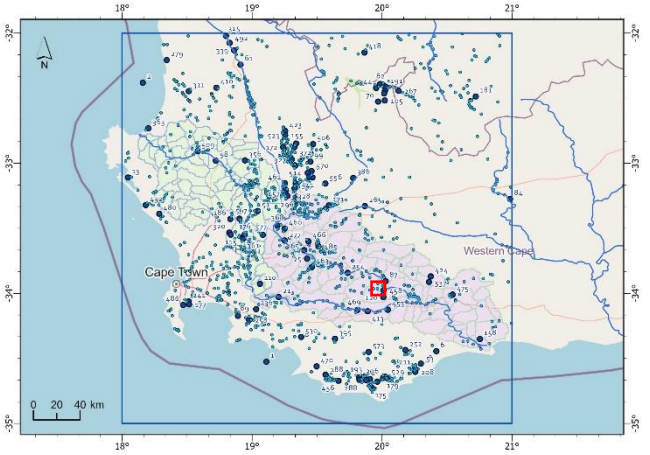


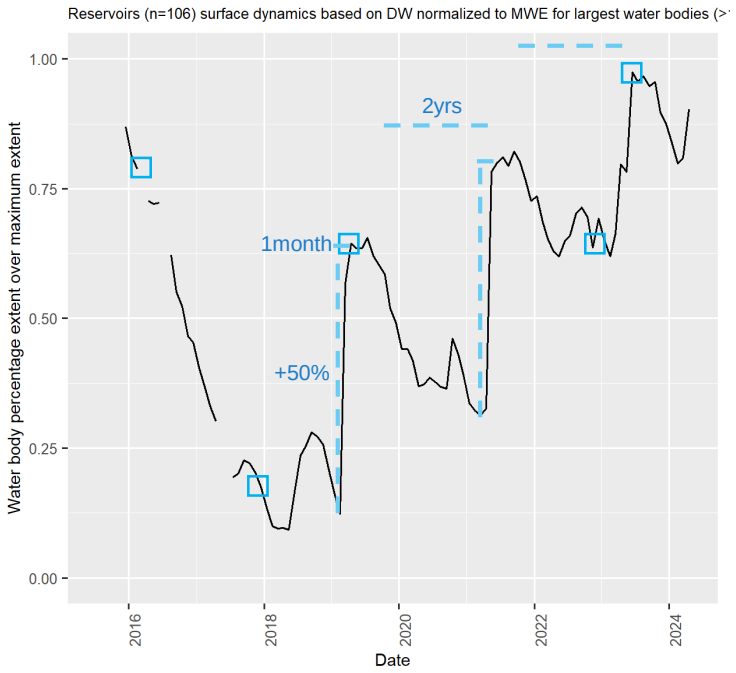


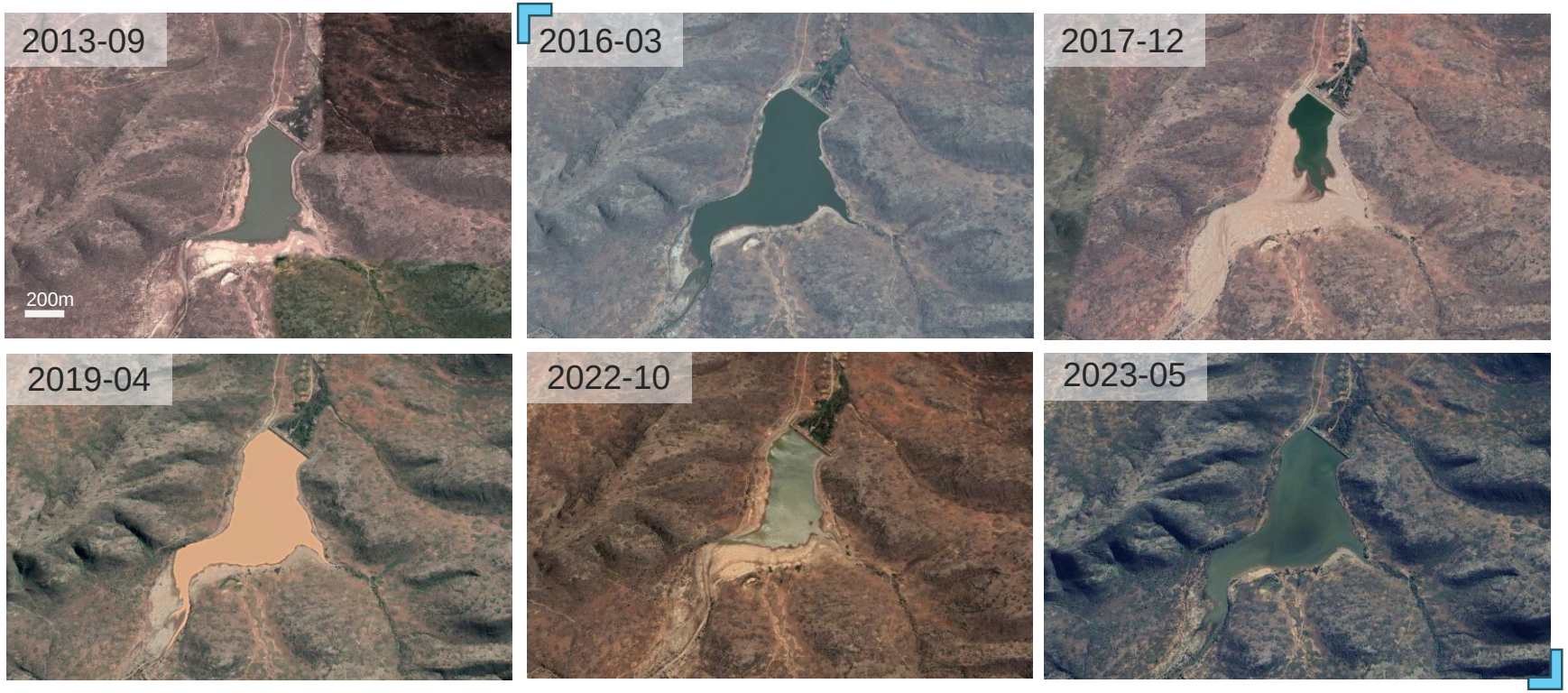
European Commission

Water Dynamics | Reservoir 1266

Bree watershed | Waterbody surface 0.1-1km² | Area (mwe): 0.47km²



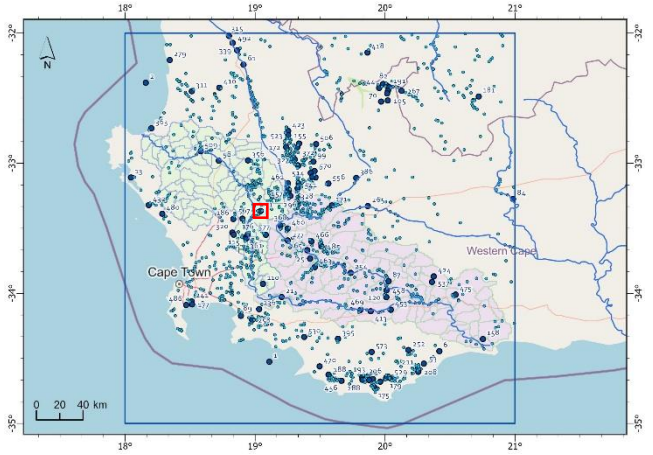


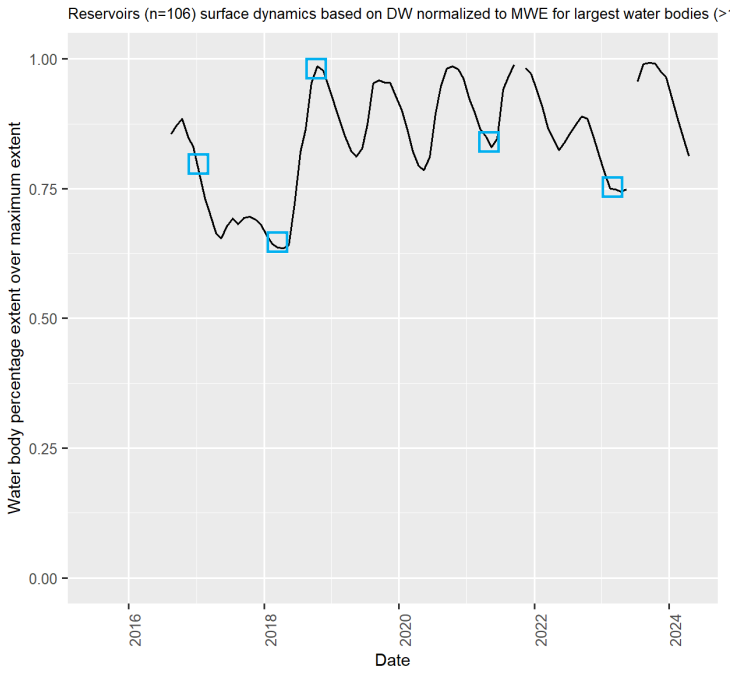


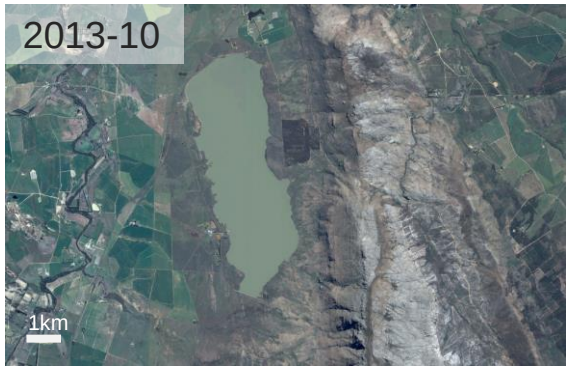
European Commission

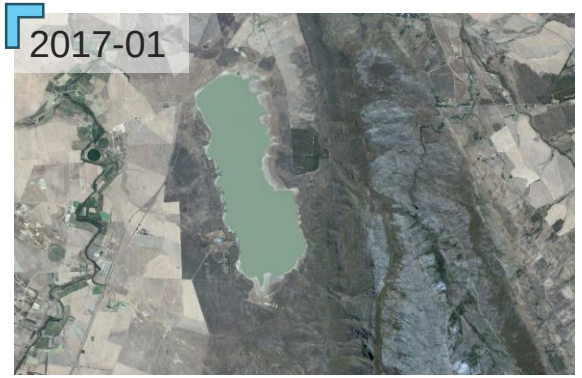
Water Dynamics | Voëlvlei Lake

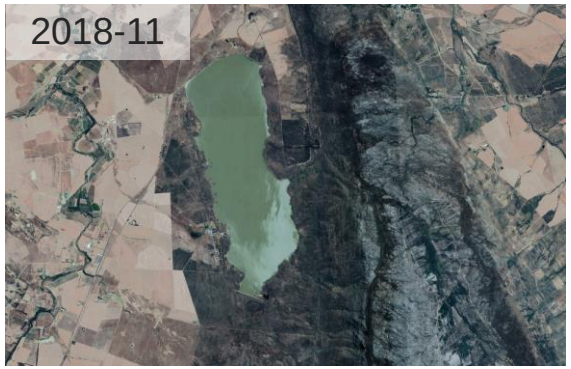
Berg watershed | Waterbody surface > 1km² | Area (mwe): 16.13km²







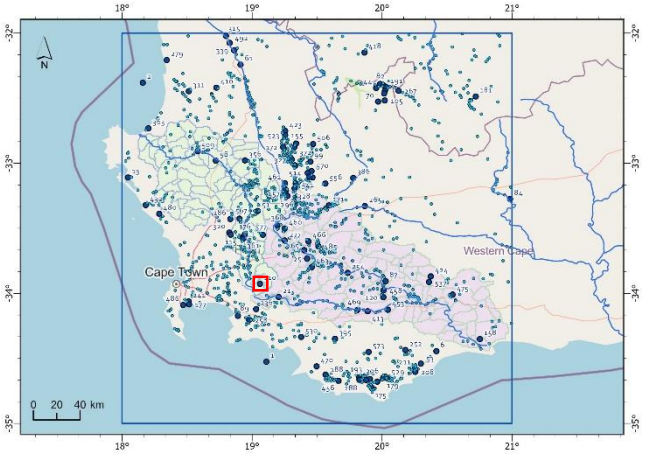


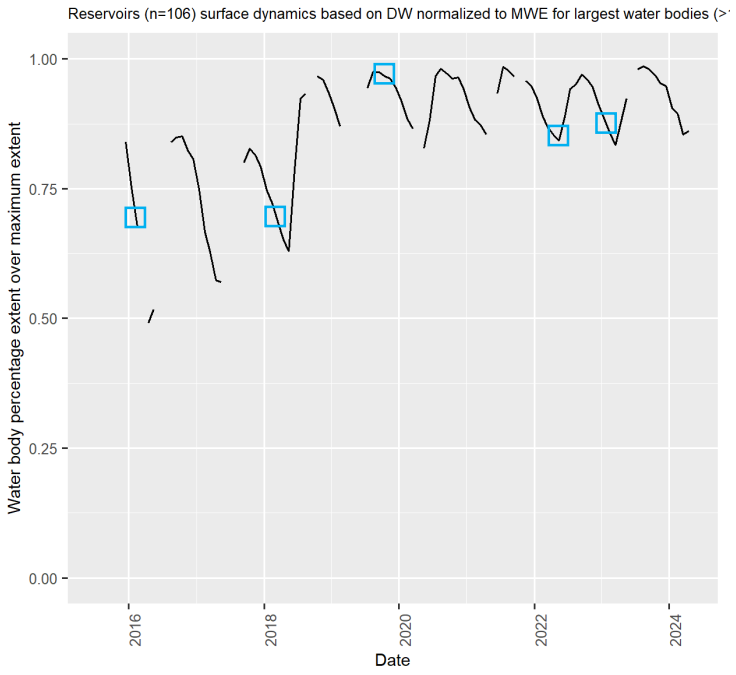


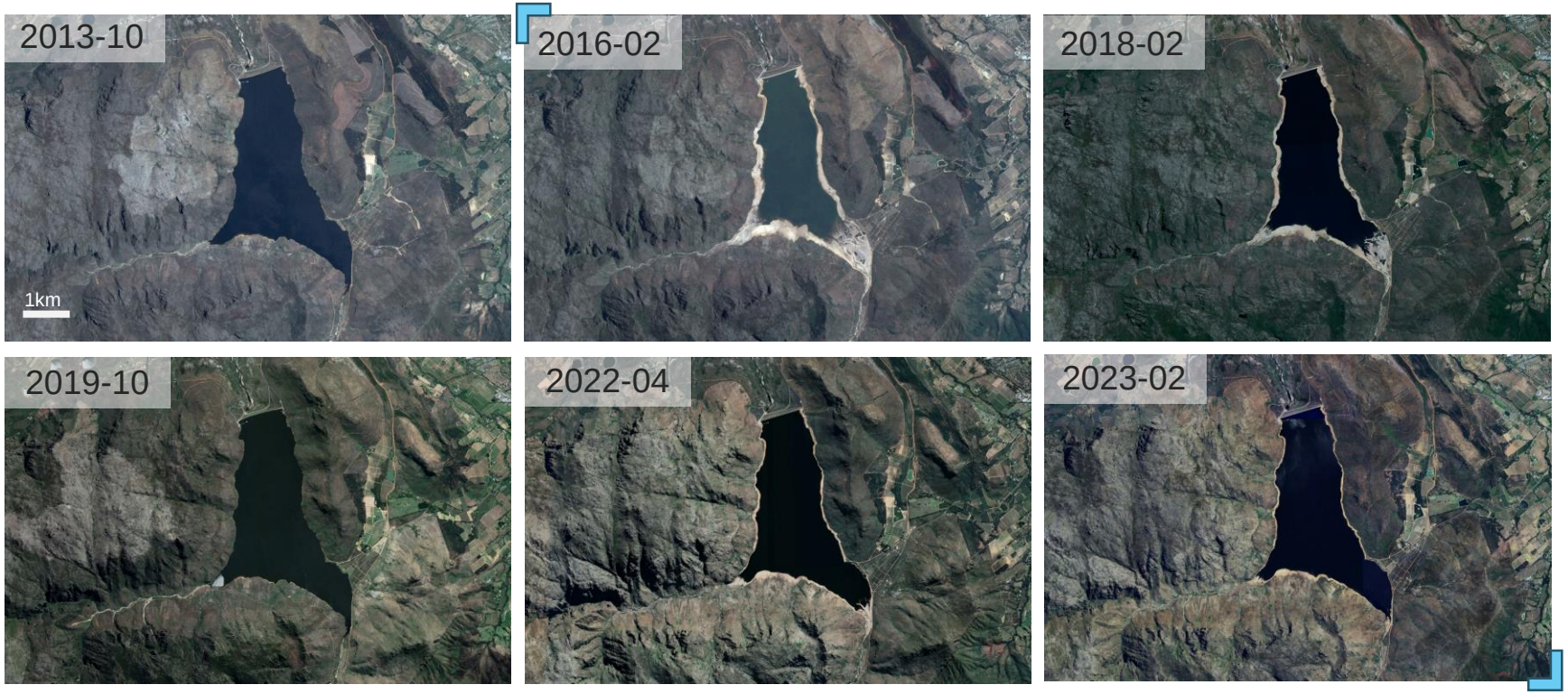
European Commission

Water Dynamics | Berg River Dam

Berg watershed | Waterbody surface > 1km² | Area (mwe): 5.79km²

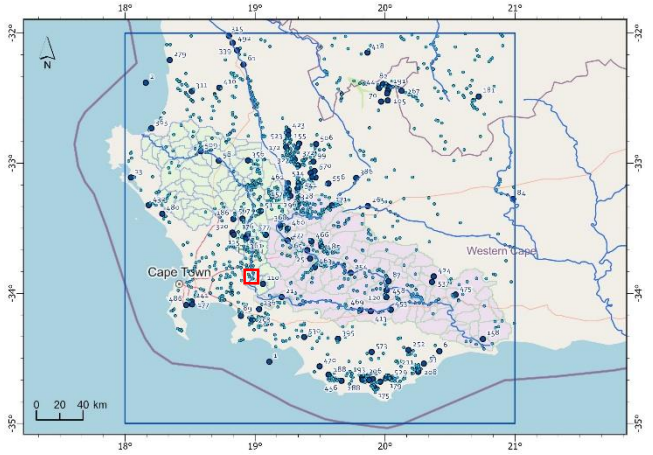




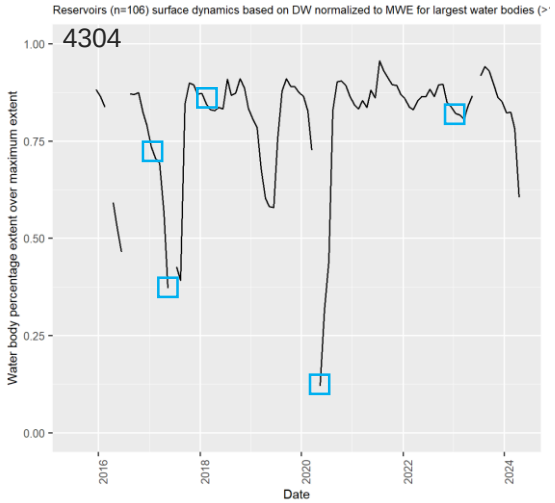


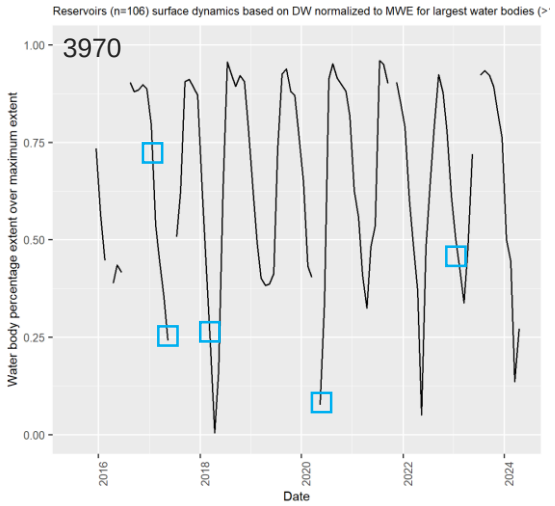
European Commission

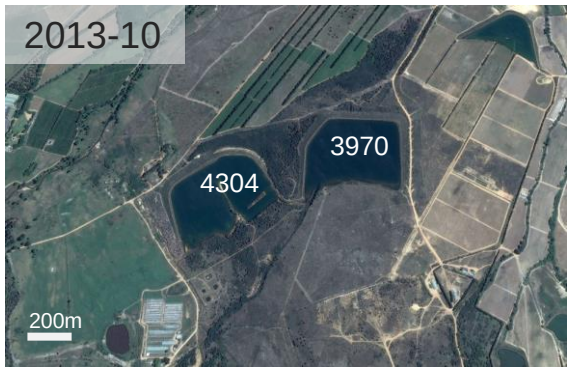
Water Dynamics | Reservoirs 4304 & 3970



Berg watershed | Waterbody surface 0.1-1km² | Area (mwe): 0.15 & 0.16km²

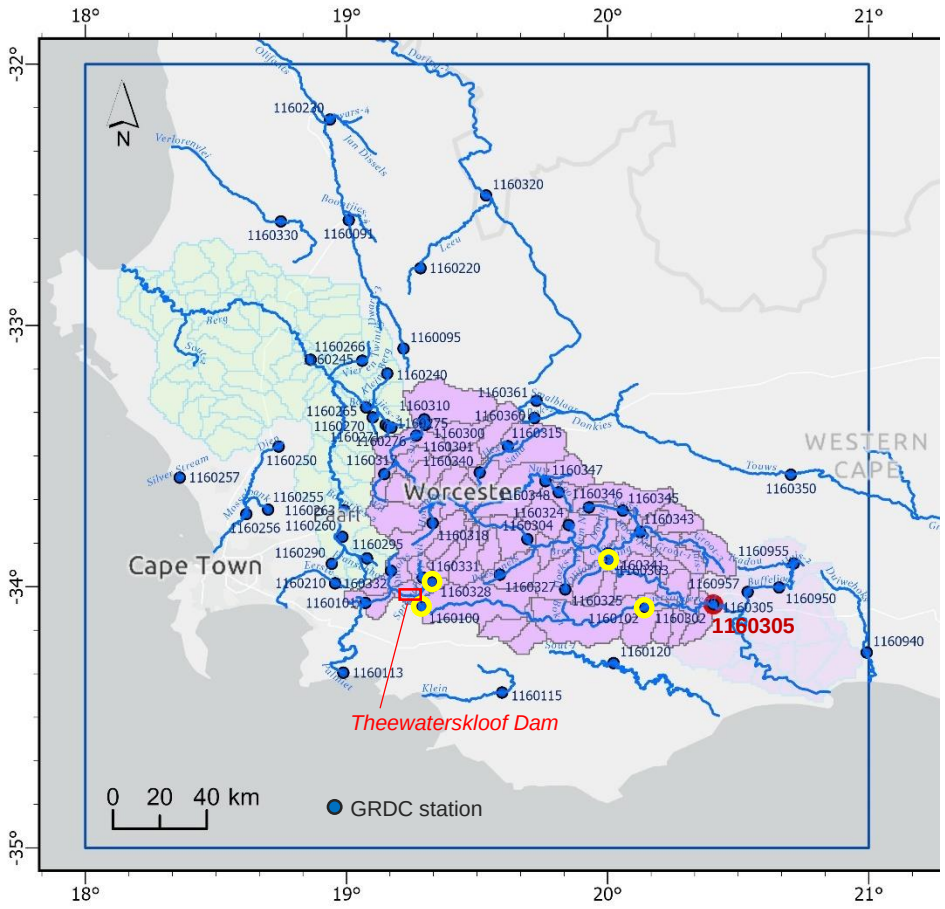




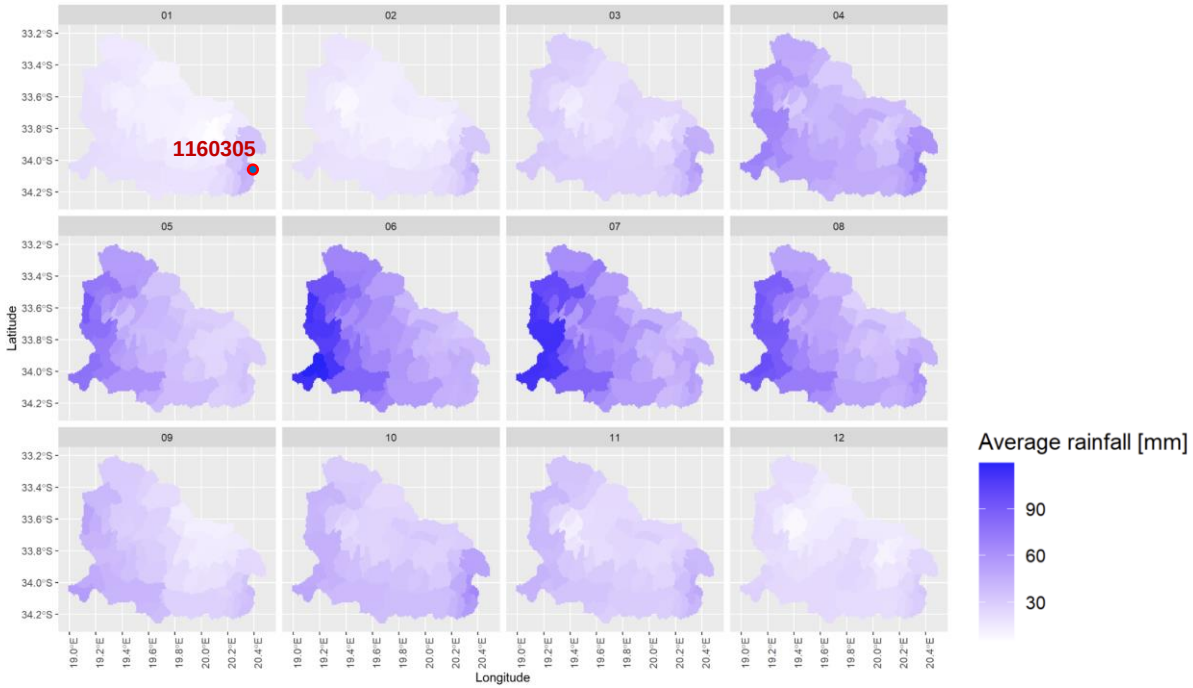


European Commission

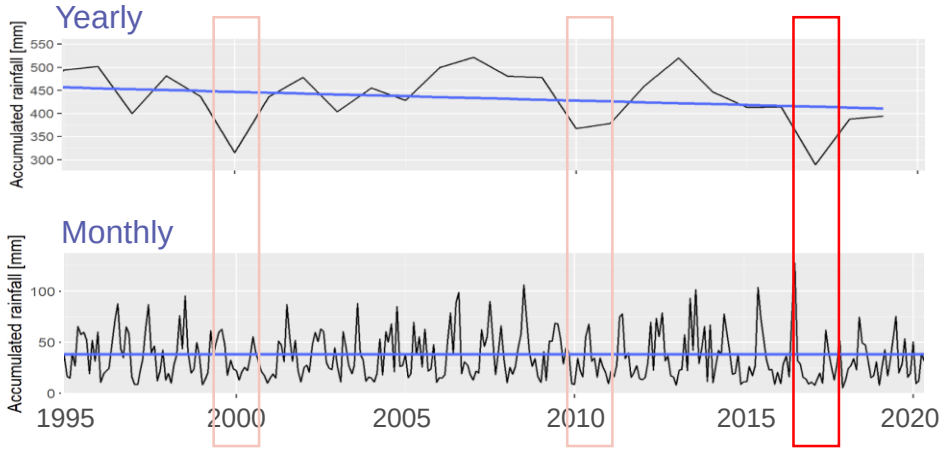
Rainfall | Bree Basin



Average rainfall (CHIRPS) per month and sub-watersheds upstream GRDC station 116305



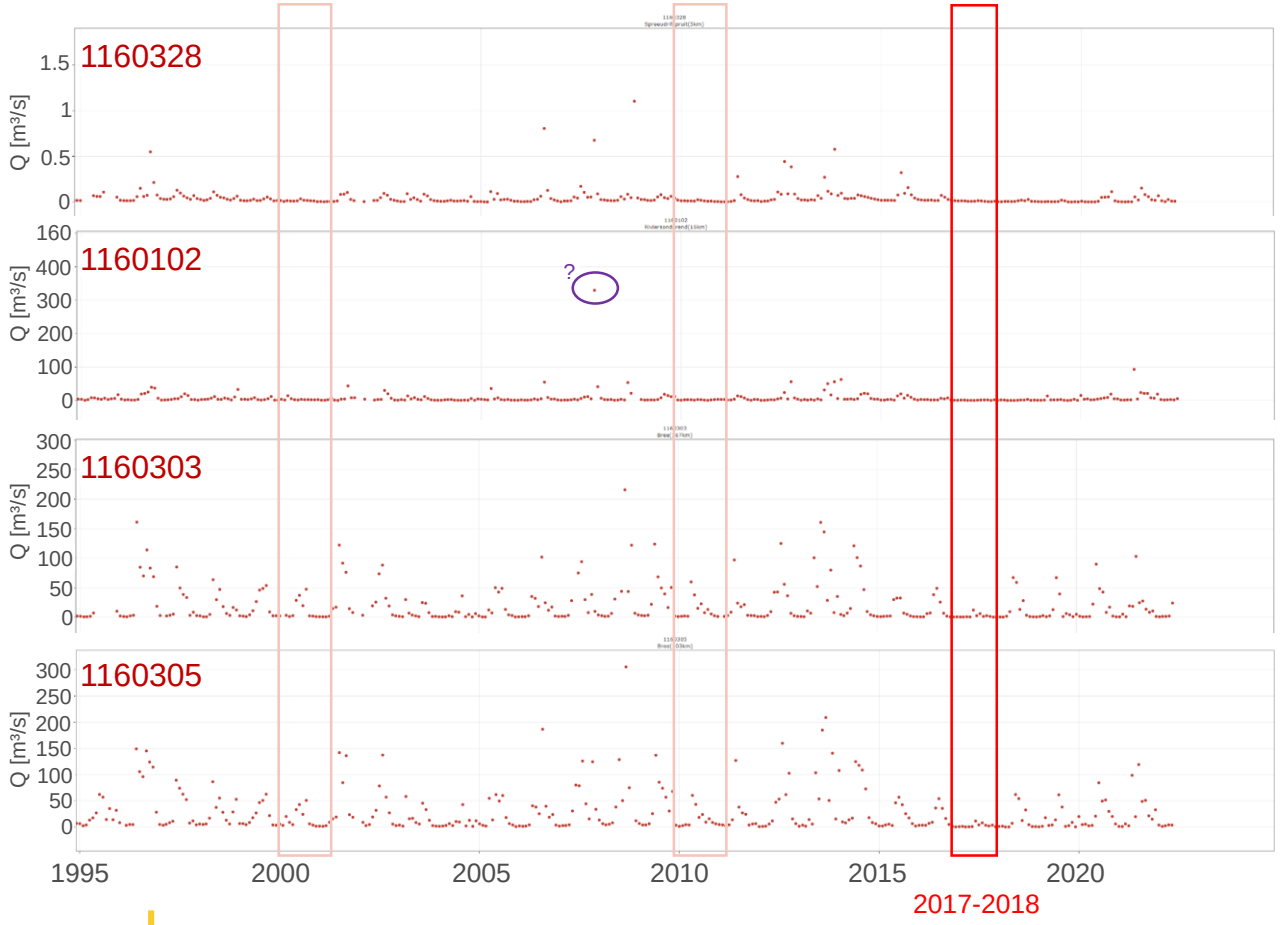
Rainfall timeseries (CHIRPS) for watershed upstream GRDC station 116305



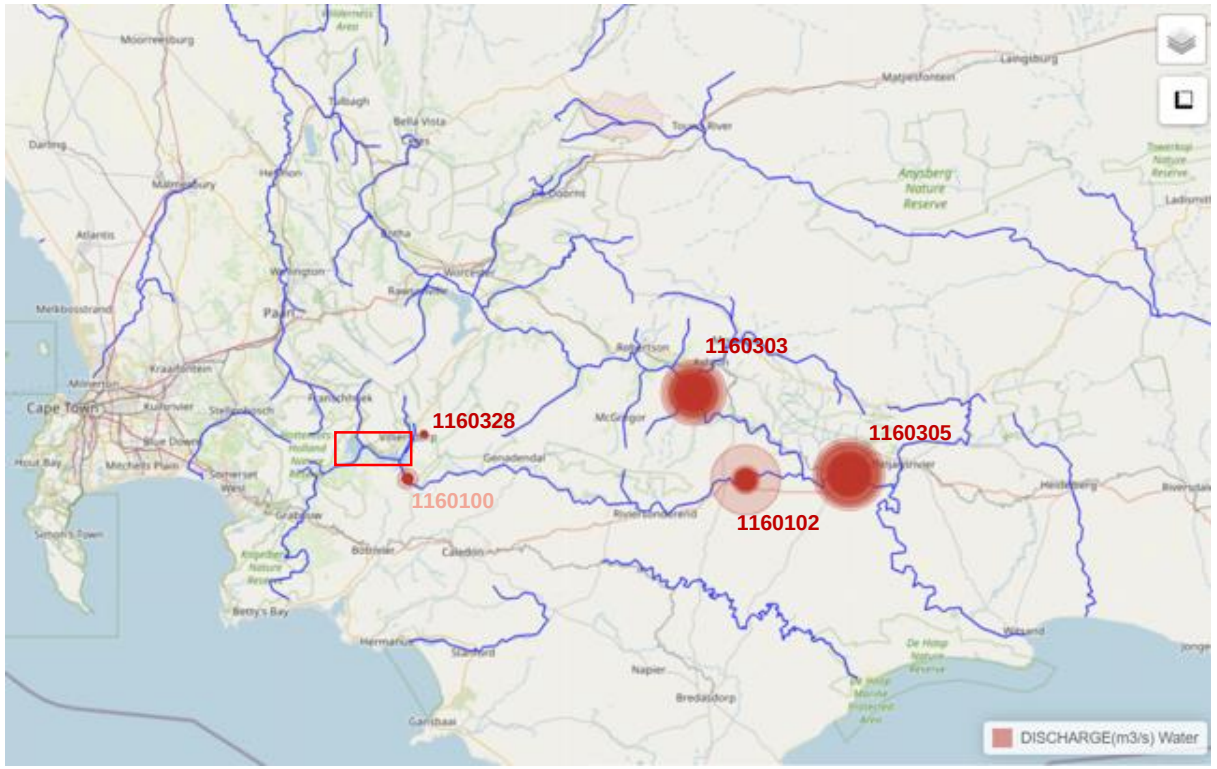
European Commission

River discharge | Bree Basin

River discharge timeseries (GRDC-DWS)

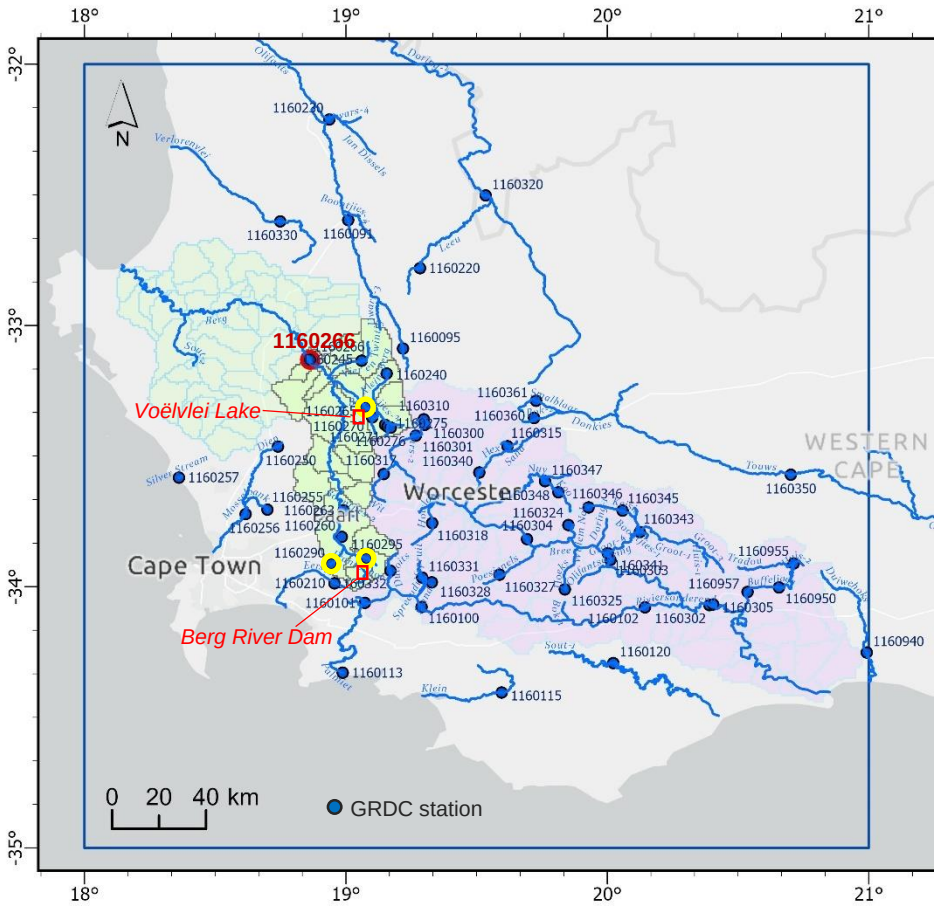


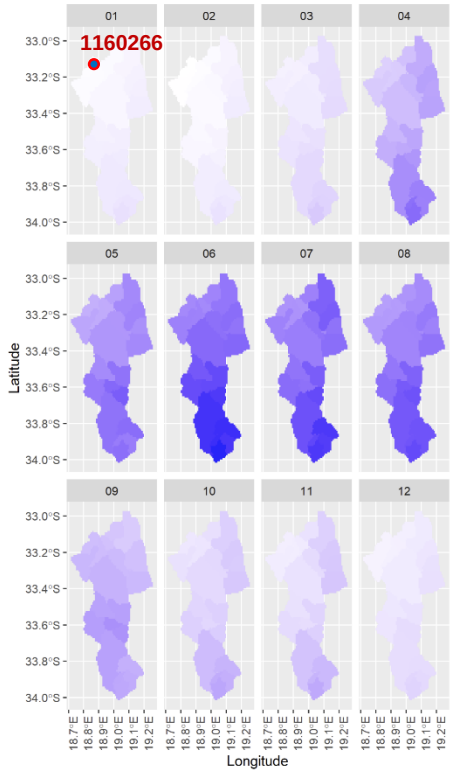
River discharge stations along Spreeudrifspruit, Riviersonderend and Bree River



European Commission

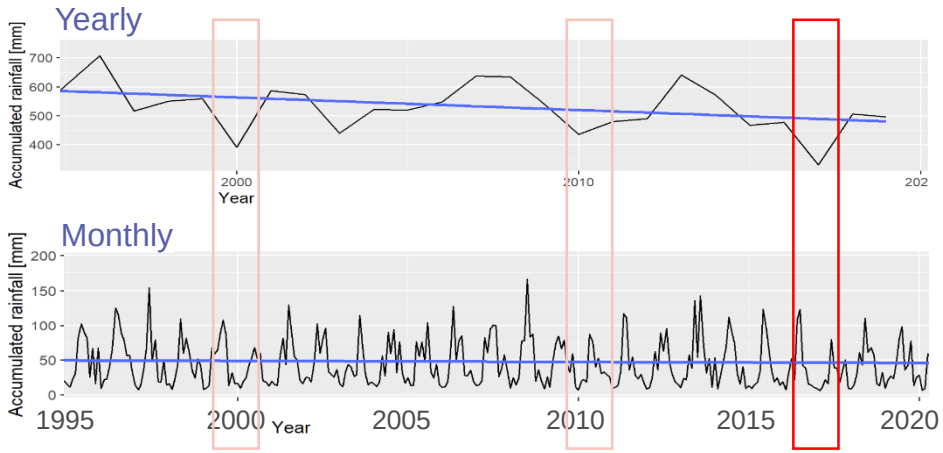
Rainfall | Berg Basin





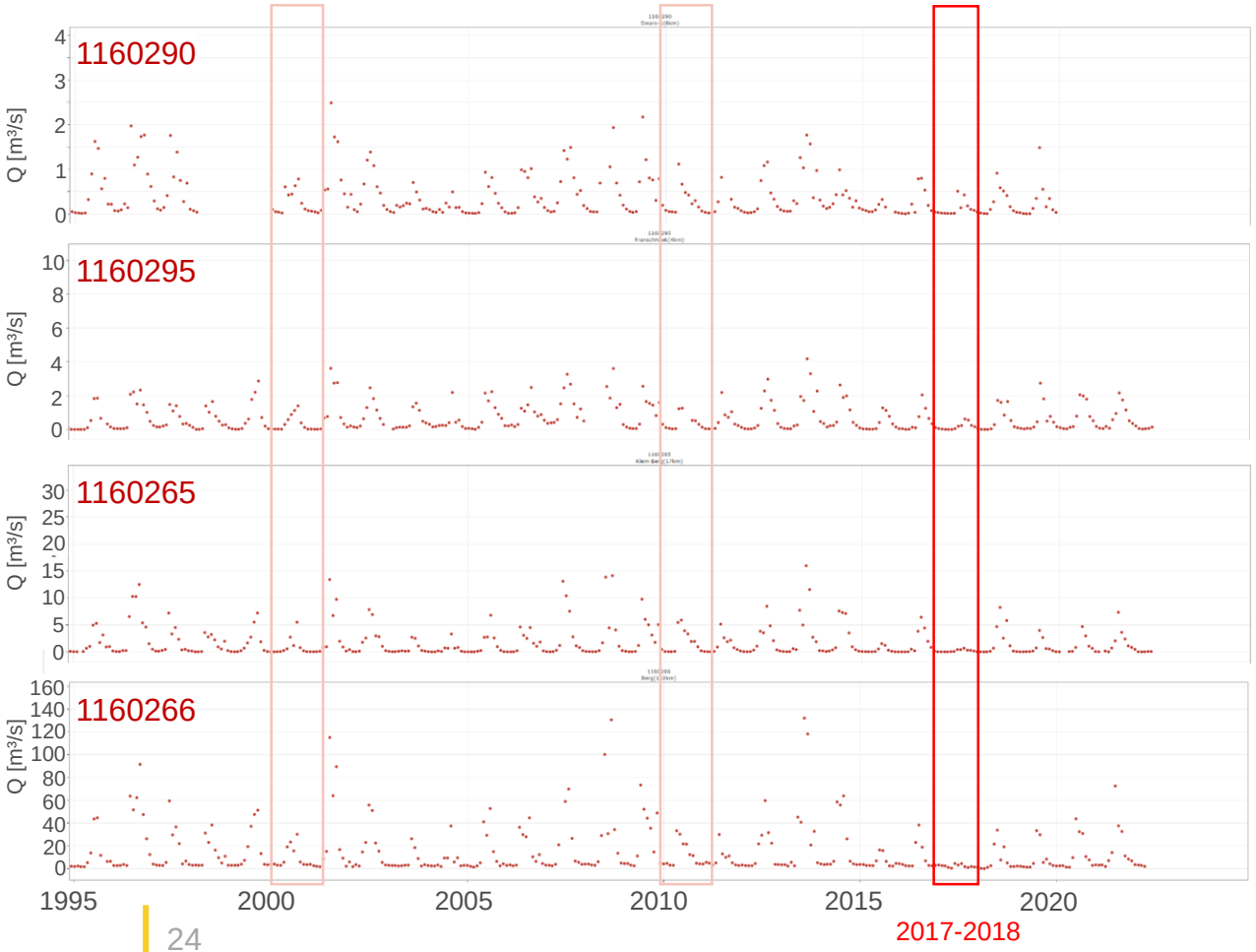
Average rainfall (CHIRPS) per month and sub-watersheds upstream GRDC station 1160266

Rainfall timeseries (CHIRPS) for watershed upstream GRDC station 1160266

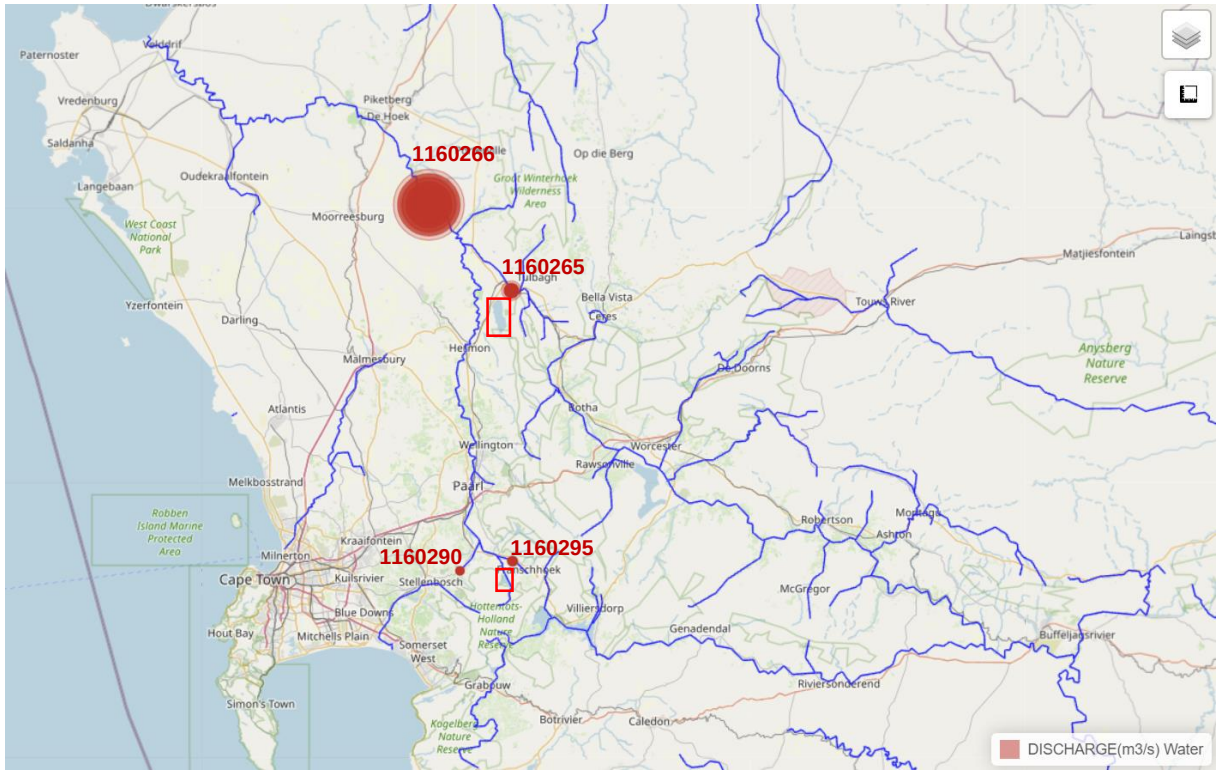


River discharge | Berg Basin

River discharge timeseries (GRDC-DWS)



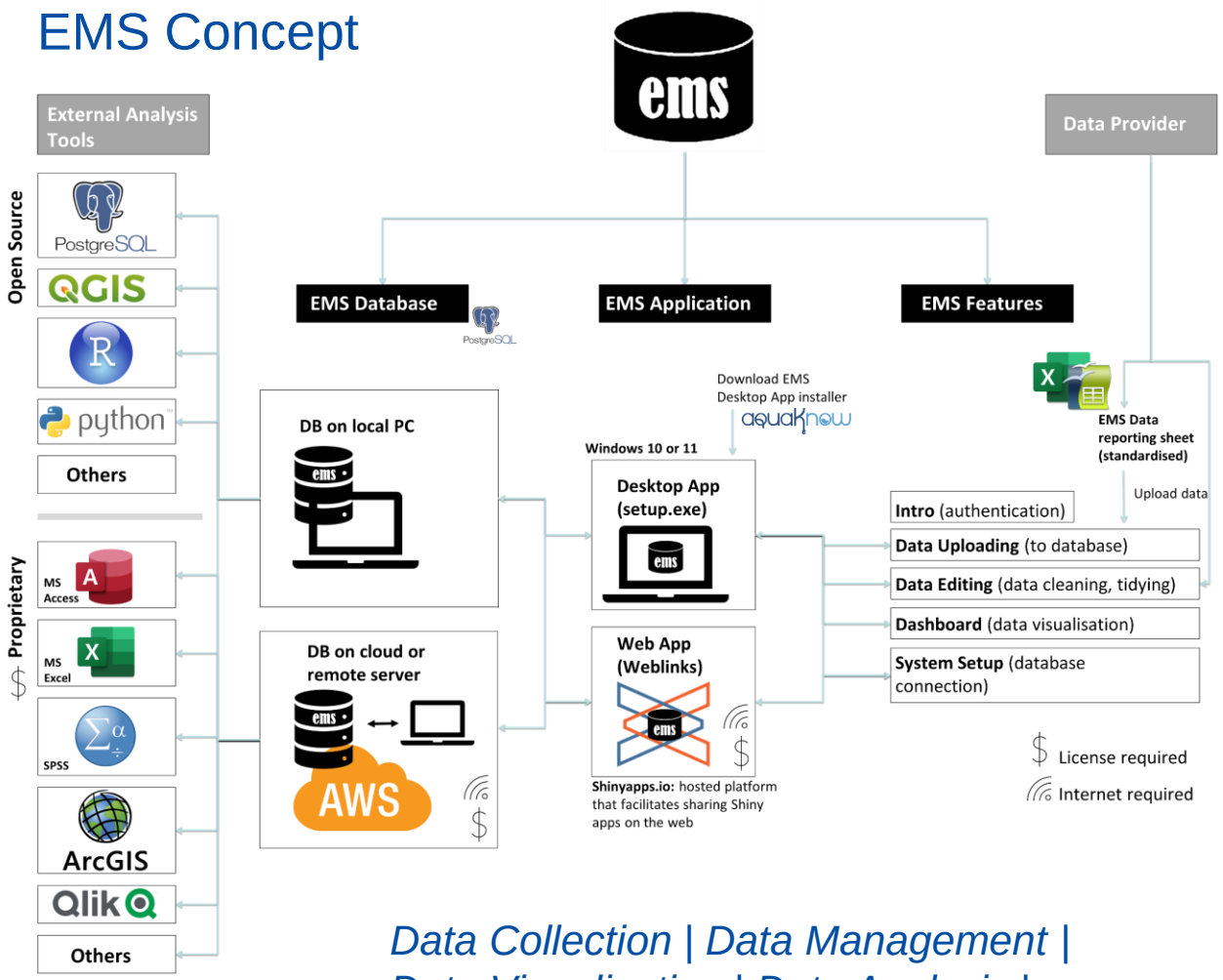
River discharge stations along Dwars, Franschhoek, Klein Berg and Berg River



European Commission

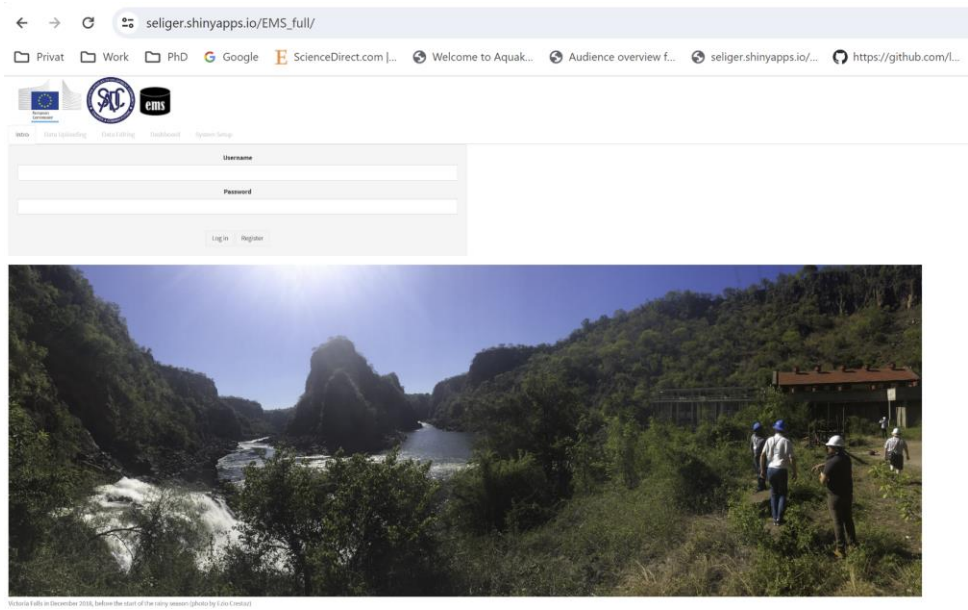
Data Management | EMS

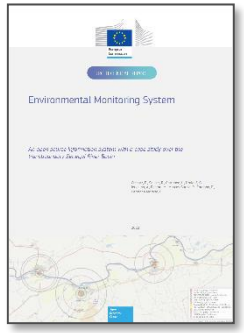
EMS Concept



Data Collection | Data Management | Data Visualisation | Data Analysis | Decision Support

EMS Landing Page (workshop version)





EMS Report, 2023

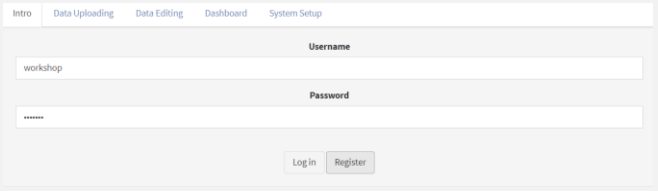
Available on aquaknow

European Commission

Data Management | EMS Desktop App Access

- Download the latest *EMS Desktop Setup.msi from Aquaknow (https://aquaknow.jrc.ec.europa.eu/)*, ***available from July 2024***
- Run the *EMS Desktop Setup.msi* to install *EMS Desktop* on your PC (Windows10 or 11)
- Open EMS Desktop, register, login with new credential
- Start exploring the EMS (by default, EMS is delivered with a demo dataset)
- Alternatively: *Under System Setup*: connect to your own (localhost) or external (remote) database

Download EMS → *Run Installer* → *Open EMS* → *Register & Login* → *Explore the EMS*



Thank you

EU Science Hub
joint-research-centre.ec.europa.eu

European Commission