ESA · SeBS Case Study

# Lake Water Quality Management in Germany

## LUBW & EOMAP – SeBS Testimonial

How Sentinel satellite data is transforming lake monitoring through EOMAP's services and the LUBW value chain

EOMAP a Fugro company

GERMANY,
Seefeld (HQ)

USA

UAE
(Dubai)

AUSTRALIA

- Private High-Tech Company
- Specialized in data analytics, IT solutions, web apps and APIs
- Focus on aquatic habitats, broad portfolio in various earth observation services
- International team of around 60 employees
- Solutions for water authorities, engineering companies, academia, coastal management, environmental planning

# EOMAP: Capabilities and Evolution in WQ analysis

EOMAP
a Fugro company

## EOMAP Water Quality Capabilities

### Sensors

- Sentinel-2 (10 m), Landsat-8/9 (30 m)
- PlanetScope, SPOT, Pléiades (commercial HR)
- MODIS, MERIS/OLCI (synoptic / global scale)

### Water Quality Parameters

- Chlorophyll-a (Chl-a), Phycocyanin
- Turbidity / TSS, Secchi depth
- Coloured dissolved organic matter (CDOM)
- Water surface temperature, HAB indicators

### Analysis Capabilities

- Synoptic spatial analyses across entire water bodies
- Sensor-agnostic processing (cross-sensor consistency)
- Multi-temporal trend & anomaly detection

### MIP – Full-Physics Retrieval

- Rigorous atmospheric correction (AC)
- Adjacency effect correction
- Bio-optical inversion for inland & coastal waters

## eoLytics | Expert Processing Software

2015 – 2023

**Deployment** Desktop / on-premise installation for expert users
**Use case** Retrospective batch processing of multi-spectral imagery
**Workflow** Manual parameter configuration by trained/experiences end users
**Output** Processed rasters / time-series for offline analysis
**Licensing** Software provided to expert clients for self-operated processing

→ *Expert tool for retrospective processing*

## eoapp AQUA | Web-Based Information Platform

2024 →

**Deployment** Cloud-based web platform — no installation required
**Use case** Near-real-time (NRT) monitoring & retrospective baseline analyis
**Workflow** Automated processing — ready-to-use information products
**Output** Interactive maps, time-series, alerts, dashboards
**Users** Water managers, authorities, non-expert stakeholders

→ *Turnkey web service for NRT Monitoring and Baseline Analysis*

# LUBW — The Primary User

# The Monitoring Challenge in Baden-Württemberg

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## 400 +

**Lakes > 5 ha**

Only ~25 larger lakes monitored per year using traditional in-situ sampling due to resource constraints.

## 3 - 6 yrs

**Monitoring cycle**

Most lakes physically inspected just once every 3 - 6 years — a critical gap for early HAB detection.

## > €3.5k

**Per lake per year**

Cost of outsourced in-situ measurements, limiting how many lakes can be covered under current budgets.

## Climate Change & HABs

**Hidden threat**

Exterme weather events, pollution incidents and Harmful Algal Blooms alter water quality within days — events can bemissed entirely between scarce in-situ visits.

# How LUBW Adopted Satellite Water Quality Data

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**2000–02**

### Early Trials

First discussions with DLR to pilot satellite lake monitoring. Project stalled when DLR shifted focus to radar.

**2015**

### Internal Research Project

LUBW initiates collaboration with EOMAP; eoLytics licence acquired. Barriers remain: limited satellite data, no formal reporting mandate.

**2016–18**

### WASMON-CT Project: PoC

Federal Ministry-funded project formally validates satellite water quality. Results positive — but follow-on budget not initially secured.

**2019**

### SAMOSEE-BW Project: Digitization Agenda Breakthrough

Project provides political backing and budget to integrate EO-based lake monitoring into operational workflows for the first time.

**2021**

### Operational Annual Reporting

Satellite data included in LUBW's official annual report for the first time — 50 lakes. Further GER authorities PoC and adopt the same approach.

**2022–23**

### State-wide Scale-up

Retrospective monitoring expanded to 200 lakes (2023) and > 400 lakes (2024). Process of establishing a State-wide, methodically uniform assessment kicked-off

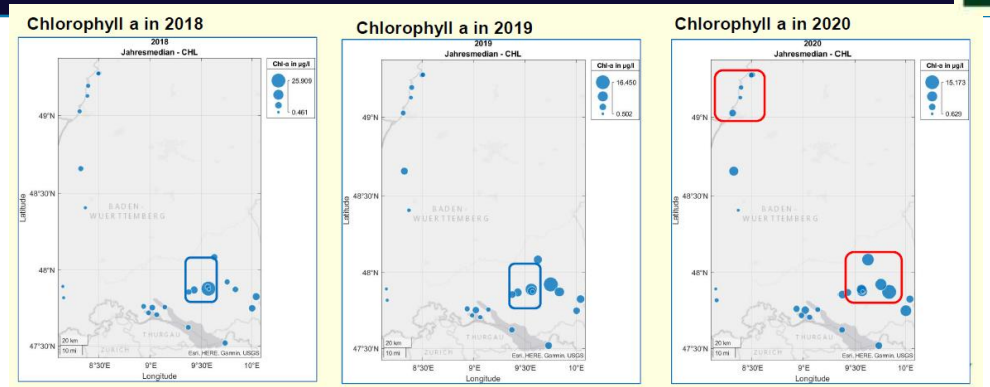
**2024 -26**

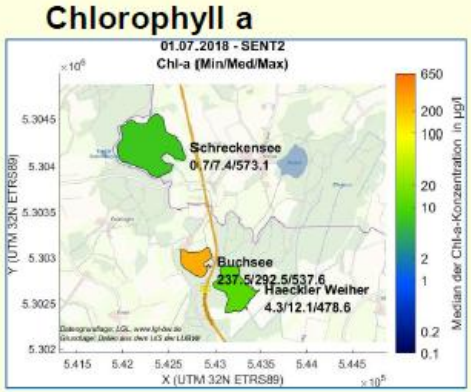
### Near Real-Time + Baseline analytics: eoApp AQUA

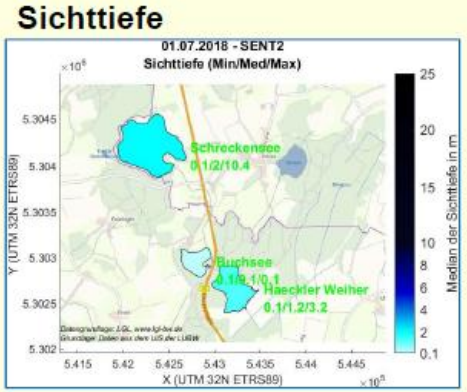
NRT system launched: Additionally, 50 priority lakes processed NRT within hours of each satellite overpass. Alarm thresholds, email alerts and monitoring dashboards now operational.

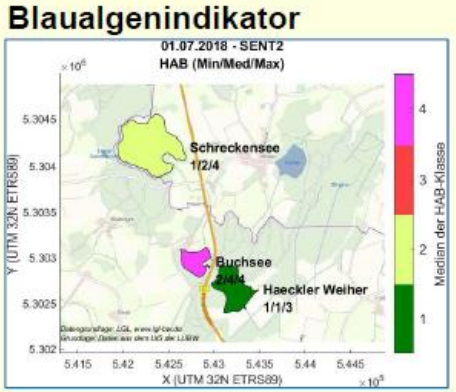
# Results and Data products (until 2023)

- Retrospective annual data sets
- Analysis end of the year
- User generated data using EOMAP's eolytics
- User analyzes data with in-house software



# Today's NRT implementation with eoapp AQUA

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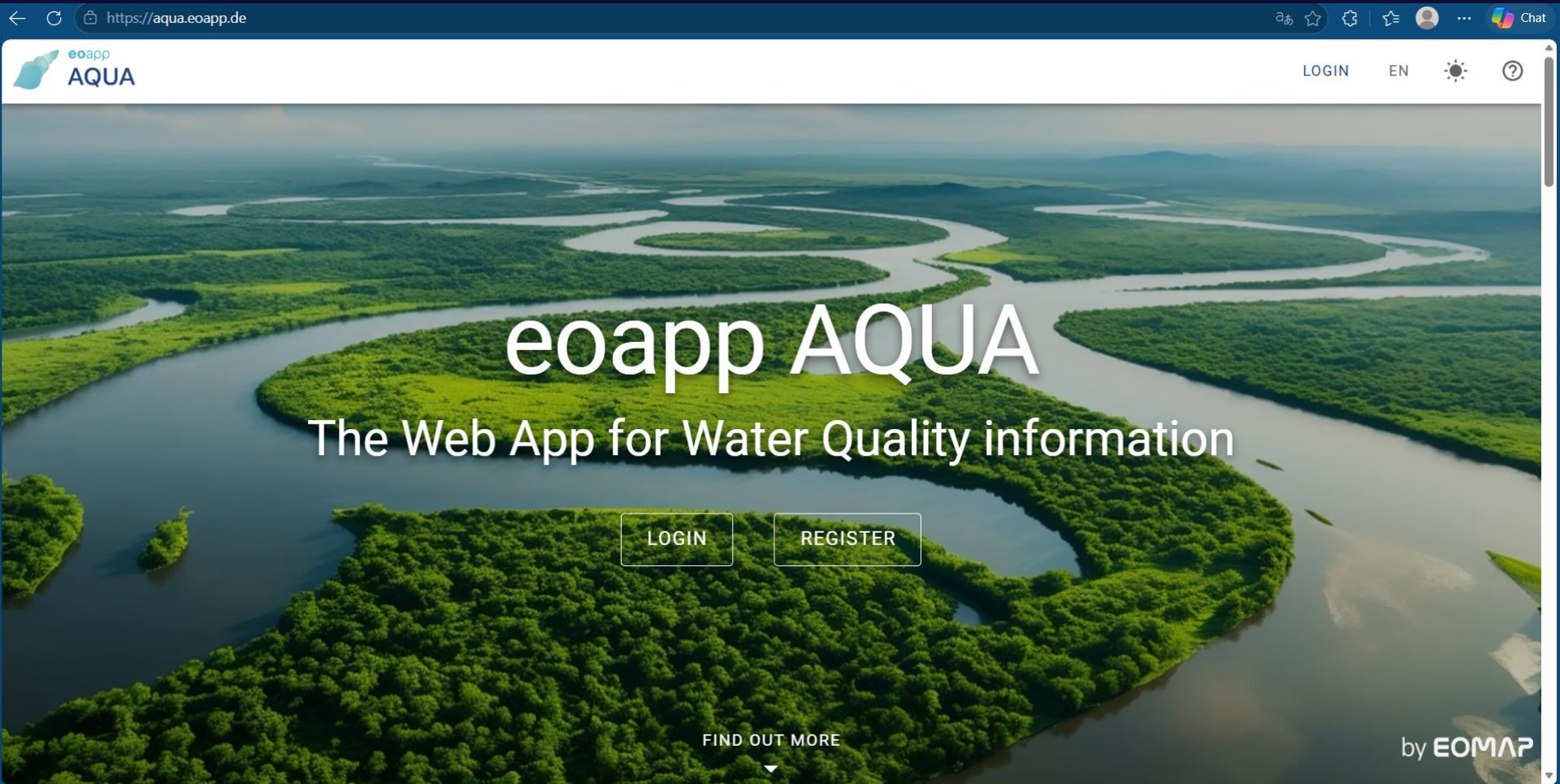

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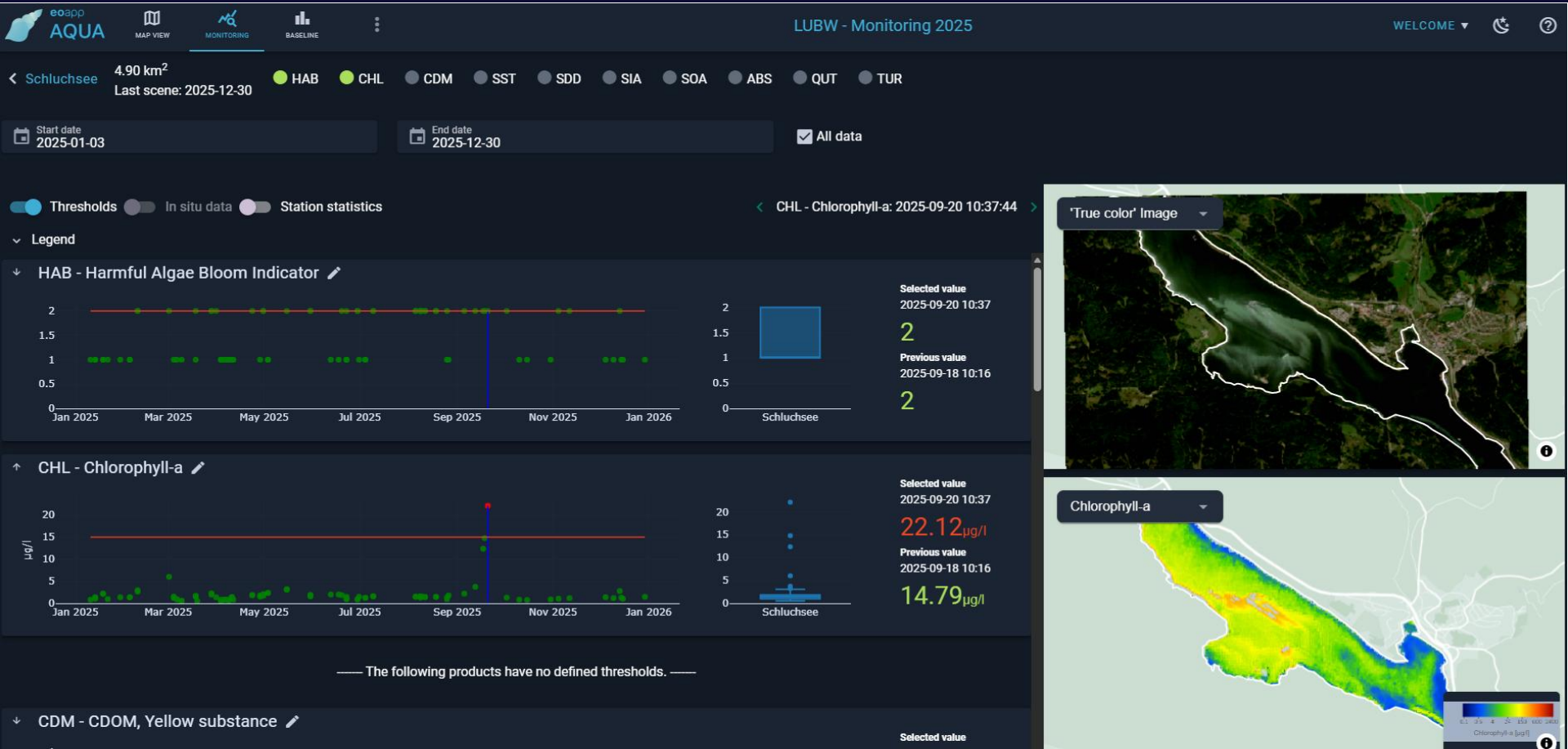

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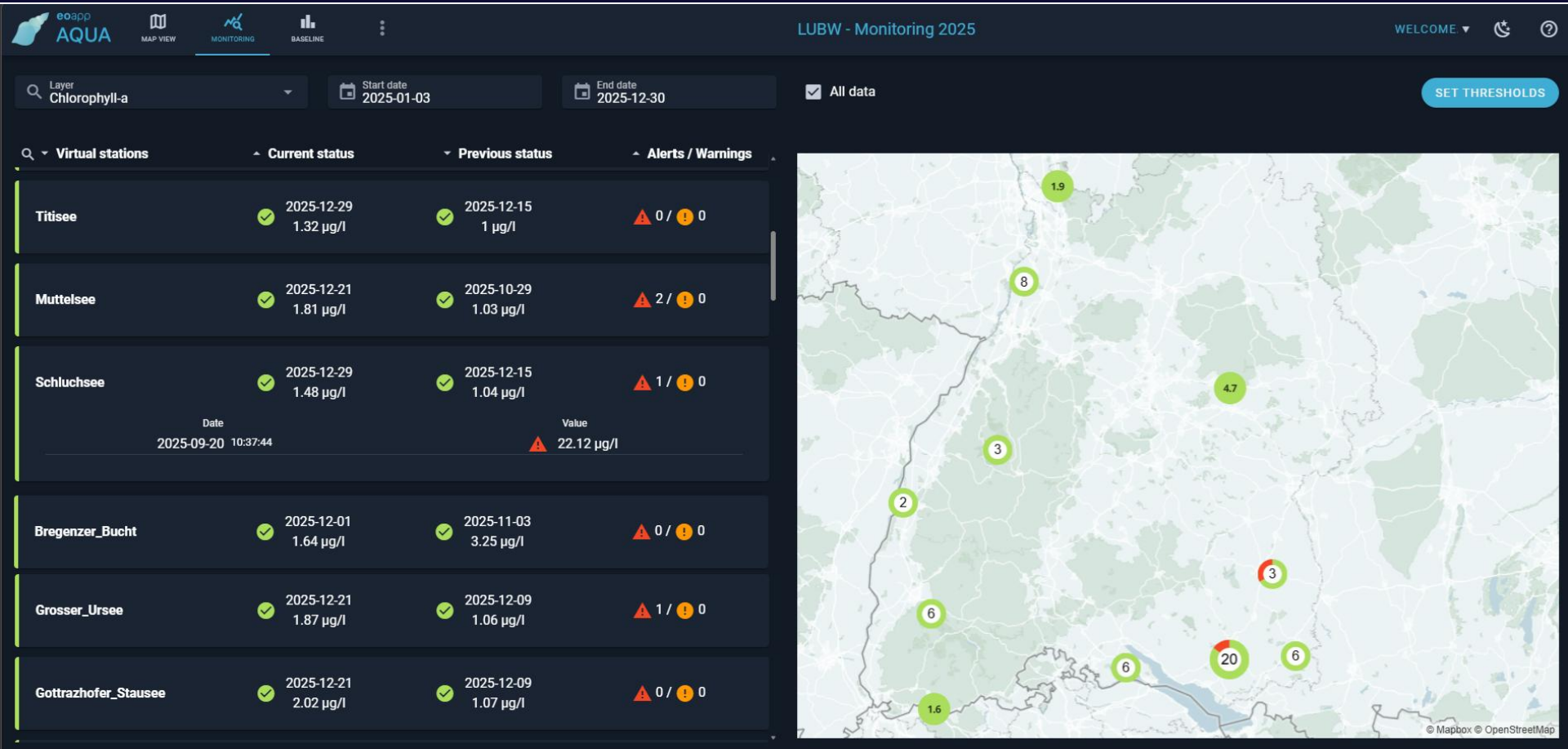

# Scale, Growth & today's Workflow

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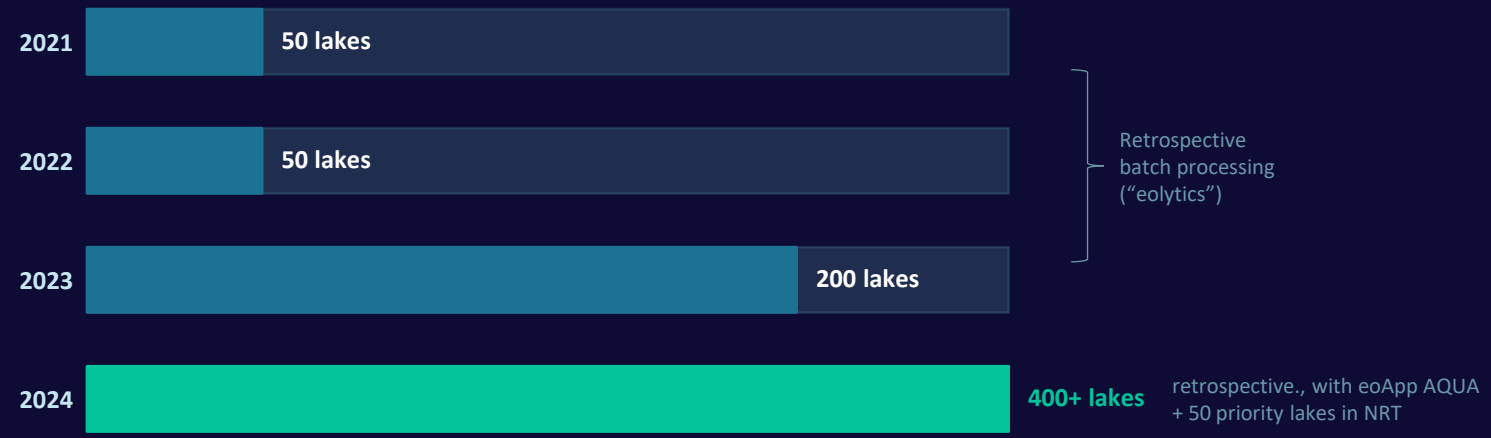
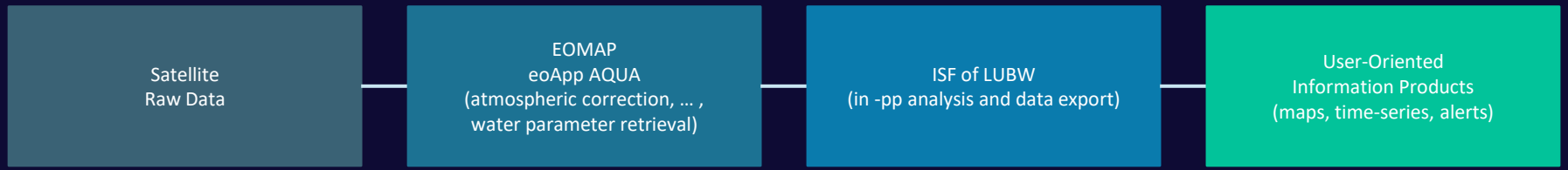
## Lakes monitored state-wide (Baden-Württemberg)




*Target: 1,300 lakes (> 1 ha)*

## The Hybrid Workflow (ISF LUBW + EOMAP)



# Next Steps & Key Takeaways

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## NEXT STEPS

### Adoption to Bathing Water Monitoring

- Align LUBW satellite monitoring with the State Health Office (LGA) bathing water stations. Combine cyanobacteria data from in-situ and satellite sources to strengthen public health warnings and organization of monitoring programs/management measures.

### Establish Multi-Scale Remote Sensing

- Integrate VHR Sensor Platforms (e.g. Planet SuperDoves to complement and refine Sentinel and Landsat based information. PoC with Planet SuperDoves in 2026 running
- Expand application portfolio to riparian strip and aquatic plant (macrophyte) monitoring

## KEY TAKEAWAYS

01 Sentinel-2 data enables uniform, state-wide monitoring of 400+ lakes — impossible with in-situ methods alone within existing budgets.

02 EOMAP's evolution from retrospective data driven to SaaS near-real-time eoApp AQUA closes the gap between overpass and operational alert, now delivering ready to use data within hours.

03 LUBW's uptake spanned 20+ years — from stalled 2002 pilot to 2024 NRT system — with digitisation policy and proof-of-concept research as decisive enablers.

04 The hybrid SME + public agency model (EOMAP + LUBW) is replicable: Applied in various German States: Rhineland Palatinate (2019-2024), Mecklenburg Vorpommern (2022, 2025 - ), Berlin (2025 -), Pilots in further states (Hessen, Bavaria) ongoing