

ecoTech Case Study

Water quality

Monitoring the water quality and meteorological conditions of Lake Constance

Source of the future project from the Lake Constance Water Supply Association (ZBWW)

'Water for generations' is the vision of the Lake Constance Water Supply, whose remit is to supply clean drinking water to the approximately four million inhabitants of the Lake Constance/Odenwald catchment.

To achieve this in a climatically uncertain future, weather and water quality data are important considerations when planning new water extraction points.

"It is extremely important to us to ensure the best drinking water quality in the long term," explains Alexander Frey from Lake Constance Water Supply.

"That is why we and the State Institute for the Environment (LUBW) have a common scientific interest in the conditions of Lake Constance". (Source: BWV)

Commissioned to develop and install two measuring buoys, the ecoTech team commenced project planning in January 2021.

Using a [YSI EXO 2 multi-parameter probe](#), turbidity, dissolved oxygen, pH and redox potential, as well as the development of cyanobacteria, are permanently monitored. A [precision temperature measuring chain](#) is used to collect data on the temperature conditions at various depths of Lake Überlingen. The temperature is measured with an accuracy of +/- 0.1 °C with 15 measuring sensors, distributed over a depth of 80 m. Detailed information on the conditions above the water line is captured using a [pyranometer](#) to analyse solar radiation, and a [weather station](#), which collects precipitation, and wind speed and direction data, among other information.

Data is collected using the ecoTech [enviLog Maxi data logger](#) and transmitted at regular intervals via remote data transmission. All measured values can then be retrieved and further processed by the customer from the company's own monitoring server [enviWatch](#).

The information obtained is used to improve the existing *BodenseeOnline* model system. Bodensee Online is an information system that calculates three-dimensional lake currents in Lake Constance and is operated by the State Agency for Environmental Protection. The information can be accessed at www.bodenseeonline.de. (Source: BWV).

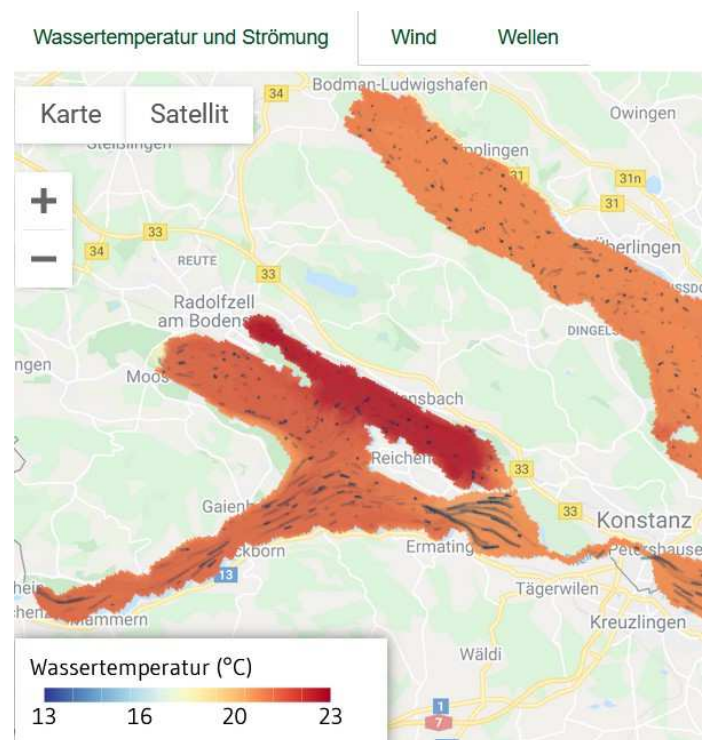


Image 1: Water temperature (°C) and current (cm/s) in Lower Lake Constance and Überlingen. Source: LUBW / bodenseeonline.de

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All instrumentation is housed in buoys especially developed by eco-Tech. With a diameter of 1400 mm, the buoys protect sensitive technology even on stormy days with waves up to two meters high. A sufficiently large solar system, with three panels and a battery capacity of 30 Ah, ensures guaranteed operation, even on cloudy days and during the winter months.

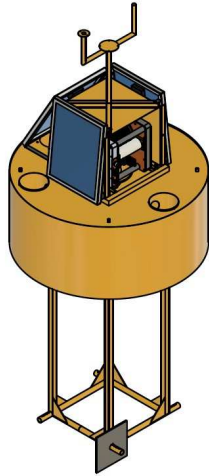


Image 2: ecoTech measuring buoy on Lake Constance (or Lake Constance model)

Four guy lines at a depth of up to 100 meters anchor the buoys at fixed positions and secure them against drift. Particular attention is paid to protecting the lake bed.

A system of underwater floats prevents ropes and chains from dragging on lake bed.

To ensure compliance with shipping law guidelines, the buoys have a signal light that flashes at night and is clearly recognizable by its RAL 1023 paint (traffic yellow). To prevent ships colliding with the anchor lines, four marker buoys are placed above the anchor stones within a radius of approx. 60 m.

The buoys with the enclosed instrumentation were installed and ready for operation by ecoTech in June 2021.



Image 3: Measuring buoy in action on Lake Überlingen

On day 1 of installation, the buoys were assembled in the dock of the Langenargen Institute for Lake Research and equipped with the instrumentation. The buoys were then loaded onto the "Kormoran", the research vessel of the institute, ready for placement on the following day.

The Institute for Lake Research supported the entire project with its experienced team and assisted in deploying the buoys at precisely defined GPS positions.



Image. 4: Research vessel "Kormoran" deploying the measuring buoy on site

Once the buoys were successfully deployed and anchored at their locations in Süßenmühle and Pfaffental on Lake Überlingen, ecoTech managed the final installation of the instrumentation and the establishment of remote data transmission. This was followed by a two-week test run.

Once all data has been checked, ecoTech train and hand-over to those responsible for the ongoing management of the buoys. One final visit to Lake Constance ends the project for ecoTech.

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Instrumentation used

ecoTech data logger enviLog mobile

ecoTech data server enviWatch

EXO2 YSI probe 100m depth sensor with:

- EXO conductivity / temperature sensor
- EXO pH / REDOX sensor
- EXO turbidity sensor
- EXO oxygen sensor, optical
- EXO total algae / PC sensor
- EXO central wiper

Meteo MS multisensor

- wind speed
- wind direction
- temperature
- humidity
- air pressure

Pyranometer / global radiation transmitter CMP3

ecoTech precision temperature measuring chain

Acknowledgments:

Many thanks to the Institute for Lake Research Langenargen for the expert support in deploying and installing of the buoys, and all involved employees of the Lake Constance Water Supply. We are also grateful to the staff at the engineering company Prof. Kobus und Partner GmbH, who were involved in the project planning.

Learn more:

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