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Influence of climate conditions and lake characteristics on the former lignite mining pit Lohsa I

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In 2018 a mass death of fish occurred in the storage basin Lohsa I which is located in the Upper Lusatia, Germany. Lohsa I is a former lignite mining pit, which is now mainly used for industrial water supply, flood defence and fishing. It was assumed that an inflow of anaerobic groundwater could have been the cause for this event as groundwater inflow was observed before. Additionally, the input of fresh water from the river Kleine Spree was missing in summer 2018. In the project RoBiMo (robot assisted inland water monitoring) at the TU Bergakademie Freiberg there is a focus on collecting and analysing water quality data and climate data with the aim to quantify groundwater - surface water interactions and identify the influence of climate change in Saxony.

With an annual mean temperature of 12.4°C the year 2018 was +1.3°C warmer than the former period from 2010 to 2017. Total precipitation in 2018 was 398 mm, only 61% of the average precipitation of the period between 2010 and 2017 (648 mm). These data were used to quantify the amount of groundwater inflow to the storage basin Lohsa I and the effect of climate change.

For 2018 a positive value of groundwater flow was determined which implies an inflow of groundwater. A calculation from 1996 to 2019 shows an overall net inflow of groundwater. The calculation figures out a strong coherence between the groundwater flow, precipitation and sea water level. Until 2018 groundwater inflow and outflow were balanced but since then it became more deficient. The model BOWAHALD was used to determine evapotranspiration and storage change. The linear trend of precipitation is decreasing whereas the trend for evapotranspiration is increasing. As a result, the storage basin Lohsa I experiences a net loss of water.

Based on the results from storage basin Lohsa I the water budget for Upper Lusatia is calculated. Less precipitation, heavy rainfall events and decreasing groundwater levels are predicted for this area. The Lusatian lakes with 23 post mining lakes and a water surface area of more than 14,000 hectares will be heavily affected by climate change. For 2018 a loss of water to the atmosphere through evapotranspiration of $1.18 \times 10^8 \text{ m}^3$ was calculated. It can be assumed that such warm and dry years as 2018 will occur more frequently in the future.