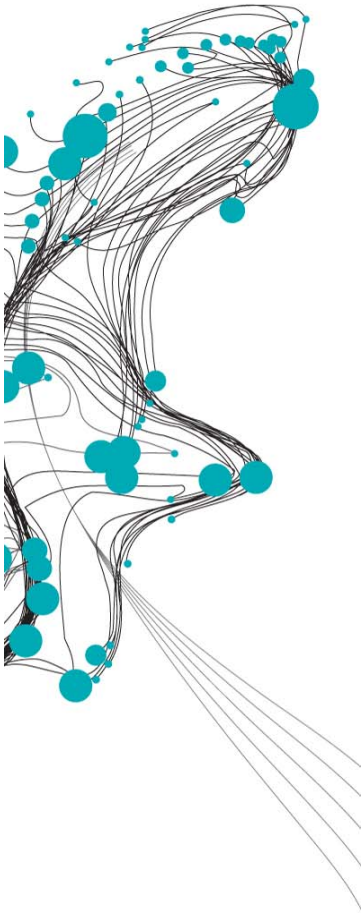
USING REMOTE SENSING DATA OF ACTUAL EVAPOTRANSPIRATION IN STRATEGIC AND OPERATIONAL WATER LEVEL MANAGEMENT



One of the main tasks of regional water authorities is water level management. Using remote sensing data to identify drought conditions can improve water level management to create better conditions for crop growth. To make better decisions in water level management it is important to know how ET_a is distributed over the area to know exactly how much water shortage there is in different areas and to find out how to optimize water allocation. In this research, remote sensing data of ET_a are used to assess long-term drought conditions in the area of regional water authority Groot Salland and find out which area characteristics have the most effect on drought. Also the short-term drought conditions were compared to the current water level management for several fixed drainage areas (FDAs) to find out if and how remote sensing data can be used to improve operational water level management. This research makes use of the Evaporative Stress Index (ESI), this index is a measure for the reduction in evapotranspiration from the potential evapotranspiration (ET_p). An ESI of 0.10 indicates that ET_a is 10 % less than ET_p.

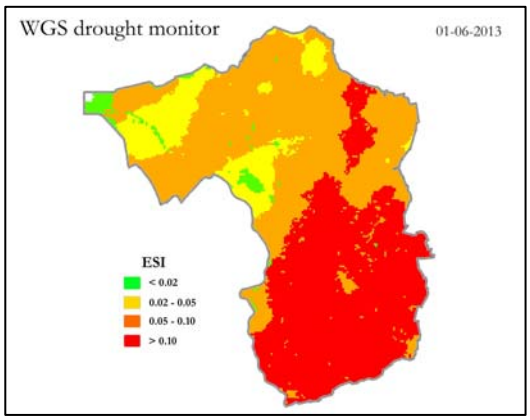


Figure 1: Introduced drought monitor, ESI for 01-06-2013.

The three year average ESI over the growing season of 2011, 2012 and 2013 was analysed to find out which area characteristics are explaining factors in the drought conditions seen. Four area characteristics were looked at: land use, soil type, altitude and freeboard (which is the difference between surface water level and ground surface level). The assessment shows that sandy soils and forested areas suffer the most stress. Altitude and freeboard both show a weak positive correlation with ESI. This information has led to the creation of a drought vulnerability map, which can be used to determine new water levels or to assess if water supply is going to the most vulnerable areas in times of need or to give these areas priority.

Assessment of the water levels in 2013 shows that RS data of ET_a can help to make better decisions in operational water level management. The information can also be used to inform farmers about drought conditions and help them to take decisions to irrigate. To compensate for the total evapotranspiration deficit by irrigation in 2013, the regional water authority would have had to supply almost double the amount of water than they did. To help district managers in their decision making, the WGS drought monitor is introduced (Fig. 1). The drought monitor shows, by using an easy to understand colour coding system, how critical the drought condition in a certain area is.

This research has shown that RS data can be very useful in improving water level management, it can be used to determine long-term drought conditions and determine drought vulnerability according to certain area characteristics. This research gives an indication of expected long-term drought vulnerability, for better and more accurate results a longer data record should be used. Operational water level management can be improved if ESI would be available on a day to day basis, the drought monitor that has been introduced is a first step in what could be the development of an operational drought monitoring tool for WGS and other water authorities.

This research suggests that water level management might not have as much effect on ESI as we would think, this indicates that ESI is very dependable on water input on land (i.e. precipitation or irrigation). To find out how much effect water level management has, further research is suggested to find out how much the difference in average growing season ESI through adaptive water level management will be. If the drought monitoring tool were to be used to give irrigation advice, further research should be done on the relationship between ESI and water input (through precipitation or irrigation).

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