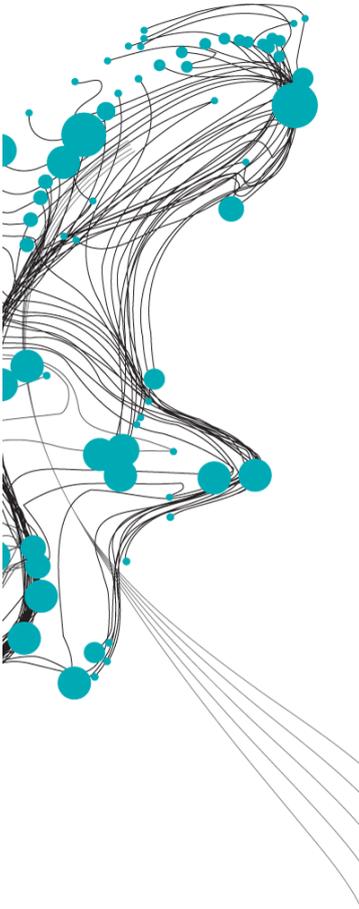


EFFECTS OF HUMAN LANDSCAPE INTERVENTIONS ON GROUNDWATER DROUGHT



Groundwater drought is an unwanted phenomenon with multiple negative effects on society and is defined as a decrease in groundwater levels compared to normal conditions. Due to climate change and growing water demands, it is receiving increasing attention. Groundwater levels, and therefore groundwater droughts, are influenced by nature-based human interventions, which can be described as water-related anthropogenic adjustments in landscapes. These interventions are constructed with various objectives and in spatially different environments in terms of area characteristics.

The purpose of this study is to investigate the effects of three different types of nature-based human interventions on groundwater drought in the Netherlands. The first intervention was a peat restoration project for the nature area Korenburgerveen near Winterswijk. The second intervention was a newly constructed waterway called De Doorbraak near Almelo and the last intervention was a newly constructed side channel and lowered flood plains known as the Scheller and Oldeneler buitenwaarden near Zwolle. Analysing the effects of such interventions provides relevant information to decision-makers for future interventions or adjustments to existing ones.

To achieve the objective of this study, a data-driven model technique was used based on transfer function noise modelling. This model is applied with the open-source Python package Pastas, which is widely used to perform time series analysis. For this study, Pastas is implemented to model groundwater levels before and after the implementation of the intervention. Comparing these two time series for various locations near the intervention provides information about the temporal and spatial impact of the intervention on groundwater levels and drought.

The research showed varying impacts on groundwater droughts between the different interventions. First, the peat restoration resulted in a strong decrease in the duration and intensity of groundwater droughts inside the area, and a smaller decrease outside the area. Second, De Doorbraak resulted in increased and decreased groundwater droughts close to the new stream, further away no impact was observed, as shown in Figure 1. Third, the Scheller and Oldeneler buitenwaarden increased the groundwater recharge which decreased the duration and intensity of groundwater drought in general. However, the impact varied spatially.

Overall, it is highly recommended that decision-makers perform detailed preliminary investigations on hydrology, geology and other area characteristics to increase the understanding of the area. This positively contributes to accuracy in forecasting the effects of interventions on groundwater droughts.

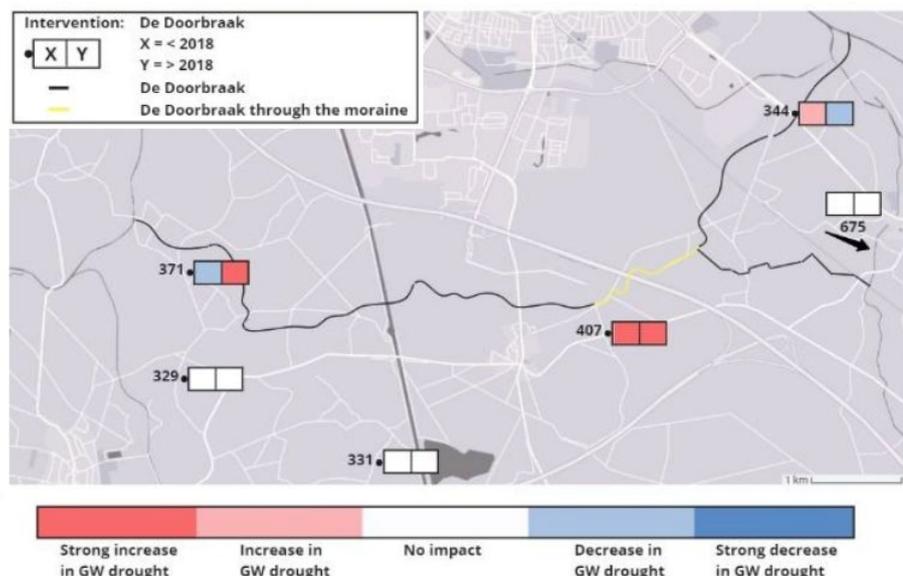


Figure 1: Spatial impact De Doorbraak on short-term groundwater drought

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