MAIA
Mapping and Assessment for Integrated ecosystem Accounting

# Water balance modelling for monitoring groundwater storage and valuing groundwater recharge, a case-study for Flanders

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## Introduction

Especially during dry periods there is a high demand for data that gives insight in the status of the phreatic groundwater system.

Current indicators are primarily based on scattered groundwater head observations and provide only limited insight in the regional availability of groundwater. Although groundwater head observations are crucial for groundwater management, individual head observations are often difficult to interpret.

## Methods: Straightforward water balance calculation on catchment scale

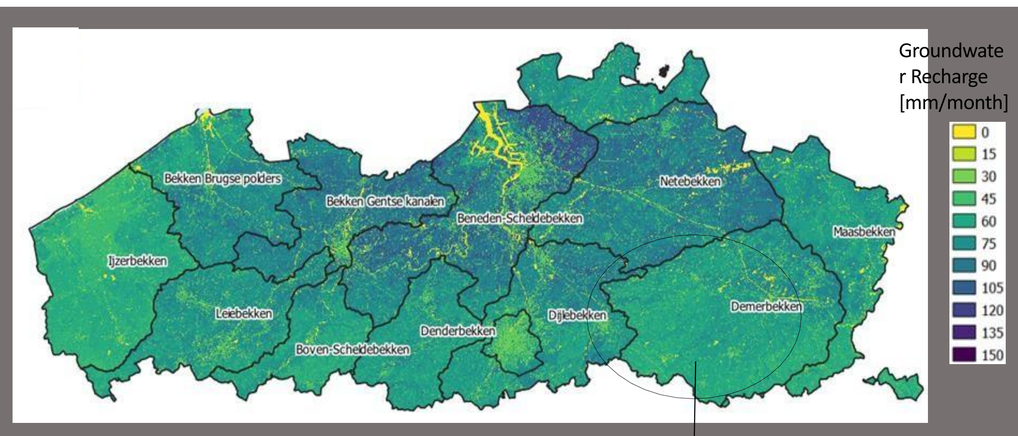
To provide additional information about the groundwater storage dynamics we propose a water balance approach based on:

- catchment scale groundwater recharge simulations using the WetSpass-M model (Abdollahi et al. 2015),
- river discharge measurements at the outlet,
- groundwater abstraction data.

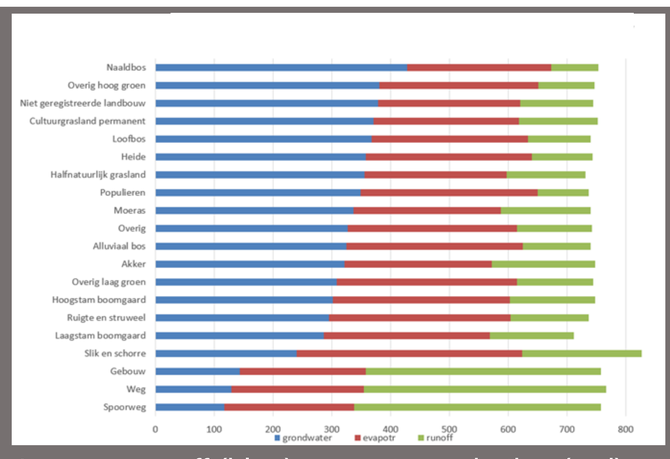
Additionally, a groundwater flow model could be used to allow validation of the simulations based on observed groundwater heads.

## Results

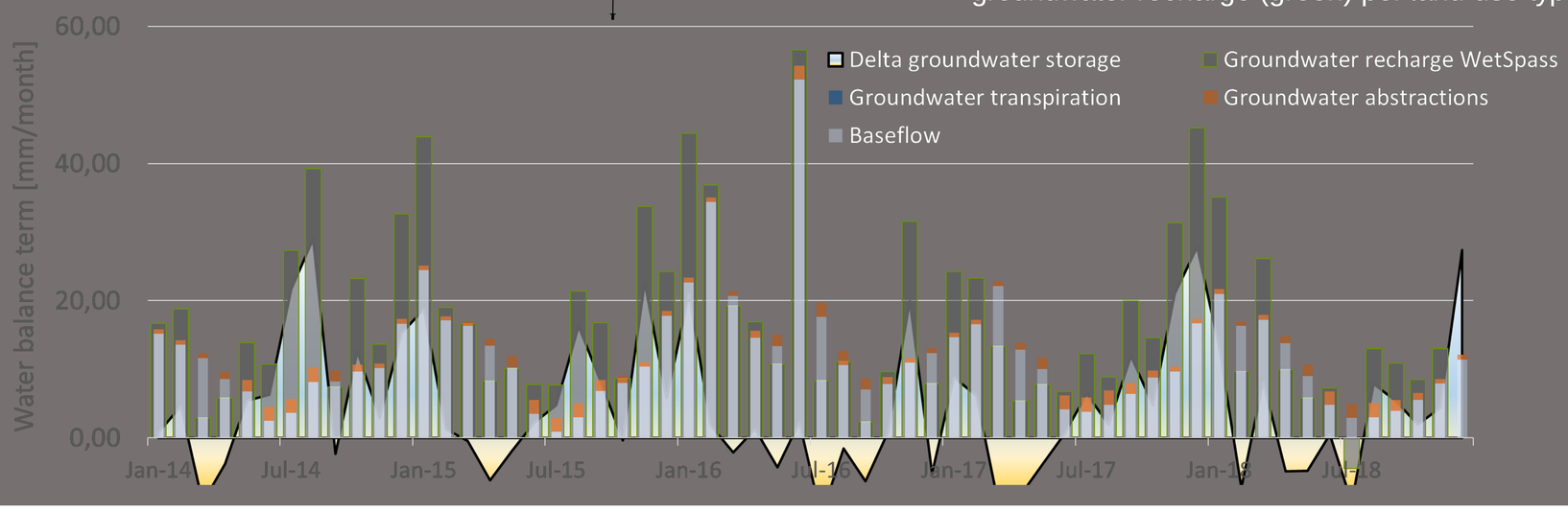
- Monthly maps of actual evapotranspiration, runoff and groundwater recharge
- The relative importance of certain land-use types for groundwater
- Insight in the dynamics of groundwater stored in the phreatic aquifer in different catchments in Flanders. . Fig. shows the temporary output of the calculations for the Demer sub-catchment.




**Groundwater recharge for Flanders simulated for January 2016**




Average runoff (blue), evapotranspiration (red) and groundwater recharge (green) per land-use type




**Monthly water balance for the phreatic groundwater system of the Demer catchment. The bar plots show the different components of the water balance. The monthly dynamics in groundwater storage is shown by the filled line. A positive change in groundwater storage represents a net replenishment of the groundwater storage while a negative value represents a depletion of the groundwater storage.**

## Analysis and conclusion

This study shows that the proposed groundwater balance simulations could provide relevant insights in both the dynamics of the groundwater system. The temporary results however indicate that more information is required on local parameters (e.g. effect of soil sealing and local drainage systems..) to correctly simulate the groundwater recharge.

The spatially distributed groundwater recharge simulations also allow to evaluate the impact of the land-use on the groundwater recharge and as such also the relative contribution of the land-cover to water storage in the sub-surface.


## Authors

Dams J.[1], De Nocker L. [1], Beckx C. [1], De Smet L. [2], Bronders J. [1] and Broekx S. [1]

## Affiliations

1Environmental Modelling Unit, Flemish Institute for Technological Research (VITO), Boeretang 200, 2400 Mol, Belgium
2Nature and Society, Research Institute for Nature and Forest (INBO), Havenlaan 88 bus 73, B-1000 Brussels, Belgium