

# Sustainable groundwater resources: how to quantify them, why is it so 'location-dependent' ?

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Groundwater resources seen in the frame of the LCA concept: it is not so easy.

First, groundwater occurrence, reserves and resources must be explained. Then the advantages and drawbacks are described with a quick overview of the Belgian situation. The place of groundwater in the hydrological cycle and in the way of calculating water balance is discussed. Over which catchment, basin, hydrological or hydrogeological basin is it done? A description of how geological complexity can play a role on the availability of groundwater is following. So, 'thinking green' is more complex than expected when dealing with groundwater resources. An example is given (from Switzerland, Minnig *et al.* 2018)) where transformation of natural landscapes into less pervious areas leads to a considerable increase in groundwater recharge due to the reduction of evapotranspiration that more than compensates for the increase in runoff and due to the contribution of water main leakages. Indeed, irrigation induces a lot of negative consequences for groundwater quantity and quality aspects.

The concluding messages are the following:

- the renewability of freshwater can only be assessed at a local (regional) scale
- water 'consumption' = evapotranspiration not to be confused with 'use', 'production', 'withdrawals' (e.g. high withdrawals do not automatically imply high consumption and even less induced water scarcity)
- water issues is not only a quantity problem, but also a quality problem
- in terms of water balance, rain-fed agriculture should be encouraged wherever possible as irrigation is the main (but not the only one) driver increasing evapotranspiration
- globally, in 2000, about 30% of the available and renewable freshwaters are 'used', about 15% are 'consumed'
- water shortages are due to the uneven spatial and temporal distributions of freshwaters and inadequate management
- globally groundwater reserves = 77 x surface water reserves
- in terms of LCA ? Clearly it is probably very important to distinguish rain-fed products from irrigation products.

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