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Sustainability of groundwater resources versus Life Cycle Assessment (LCA) of water: challenges and lessons

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The renewability of freshwater can only be assessed at a local(regional) scale. Water consumption should not be confused with water production or withdrawals. Globally, about 30% of the available and renewable freshwater is 'used' while less than 15% is actually 'consumed'. Water shortages are due to the uneven spatial and temporal distributions of freshwater conjugated to inadequate local management. Water issues are not only quantity problems but also a quality problem. Groundwater reserves are 77 x surface-water reserves. Rigorous LCA analysis and water footprint assessments remain challenging. 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.

Then, terminology aspects are addressed defining among others, LCA of water and 'Water footprint'. Both assessment methods can be seen as complementary even if 'Water footprint' seems largely biased as it does not consider any recycling of water (i.e., all used water is assumed consumed). LCA is more detailed and takes into account local environmental impact, but can thus be considered less robust because including subjective decisions.

First calculations about the order of magnitude of future groundwater drainage flow rates by the Einstein Telescope infrastructures during the 'exploitation phase' are showing that the withdrawal of groundwater would stay relatively limited with respect to current aquifer recharge rates in the EMR area.

The main concluding messages are the following:

- renewability of freshwater can only be assessed at a local (regional) scale
- water 'consumption' = evapotranspiration not to be confused with 'use', 'production', or 'withdrawals' (e.g. high withdrawals do not automatically imply high consumption and even less induced water scarcity)
- in terms of 'water footprint' and LCA: very important to distinguish rain-fed from irrigation products
- in terms of water balance, rain-fed agriculture should be encouraged as irrigation is the main driver of increasing evapotranspiration
- water issues are not only a quantity problem but also a quality problem

- water shortages are due to the uneven spatial and temporal distributions of freshwaters and inadequate management
- groundwater is not easy to manage (including the fight against undeclared illegal wells and hidden withdrawals)

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