Summary

Work package WP 5.2 “Combination of Managed Aquifer Recharge (MAR) and adjusted conventional treatment processes for an Integrated Water Resources Management“ within the European Project TECHNEAU (“Technology enabled universal access to safe water”) investigates bank filtration (BF) + post-treatment as a MAR technique to provide sustainable and safe drinking water supply to developing and newly industrialised countries. One of the tasks of WP 5.2 is to develop a Decision Support System (DSS) as a first qualitative tool to assess the feasibility of bank filtration for drinking water supply in developing countries.
The Bank Filtration Simulator (BFS), which is the subject of this report, is a sub-model used within the DSS to compute steady-state solutions for a two dimensional groundwater flow field in the horizontal plane for BF settings.
Input parameters are required for aquifer, bank and well characteristics to calculate the BF share analytically. In addition the minimum travel time between bank and well is computed numerically.
The sensitivity analysis yielded that the analytical calculated BF share is the most reliable output parameter, since its value is grid-independent. The most sensitive input parameters for the BF share calculation are the hydraulic conductivity of the aquifer and the clogging parameter, which both are the most uncertain ones to estimate. The accuracy of the numerically computed minimum traveltime of the BFS was cross-checked against a MODFLOW model, which produced only a very small discrepancy below 5%.
Due to the lacking time-dependency of the BFS model its application is only appropriate on a management horizon for which the system’s boundary conditions (e.g. baseflow, clogging parameter and pumping rates) do not change significantly over time. In a nutshell it is therefore highly recommended to use the BFS only as a qualitative assessment tool in a first planning step to evaluate the feasibility of BF systems. Nevertheless the qualitative outputs give a valuable physically based insight of the system’s behaviour for distinct operational scenarios (e.g. minimal/maximum pumping rates) in order to add transparency and reproducibility to the decision making process.

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