World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:17, No:06, 2023

Evaluation of the Conditions of Managed Aquifer Recharge in the West African Basement Area

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Abstract : Most African populations rely on groundwater in rural areas for their consumption. Indeed, in the face of climate change and strong demographic growth, groundwater, particularly in the basement, is increasingly in demand. The question of the sustainability of water resources in this type of environment is therefore becoming a major issue. Groundwater recharge can be natural or artificial. Unlike natural recharge, which often results from the natural infiltration of surface water (e.g. a share of rainfall), artificial recharge consists of causing water infiltration through appropriate developments to artificially replenish the water stock of an aquifer. Artificial recharge is, therefore, one of the measures that can be implemented to secure water supply, combat the effects of climate change, and, more generally, contribute to improving the quantitative status of groundwater bodies. It is in this context that the present research is conducted with the aim of developing artificial recharge in order to contribute to the sustainability of basement aquifers in a context of climatic variability and constantly increasing water needs of populations. In order to achieve the expected results, it is therefore important to determine the characteristics of the infiltration basins and to identify the areas suitable for their implementation. The geometry of the aquifer was reproduced, and the hydraulic properties of the aquifer were collected and characterized, including boundary conditions, hydraulic conductivity, effective porosity, recharge, Van Genuchten parameters, and saturation indices. The aquifer of the Sanon experimental site is made up of three layers, namely the saprolite, the fissured horizon, and the healthy basement. Indeed, the saprolite and the fissured medium were considered for the simulations. The first results with FEFLOW model show that the water table reacts continuously for the first 100 days before stabilizing. The hydraulic charge increases by an average of 1 m. The further away from the basin, the less the water table reacts. However, if a variable hydraulic head is imposed on the basins, it can be seen that the response of the water table is not uniform over time. The lower the basin hydraulic head, the less it affects the water table. These simulations must be continued by improving the characteristics of the basins in order to obtain the appropriate characteristics for a good recharge.

Keywords : basement area, FEFLOW, infiltration basin, MAR
Conference Title : ICAWR 2023 : International Conference on Advances in Water Resources
Conference Location : Copenhagen, Denmark
Conference Dates : June 15-16, 2023