Climate change impact on seawater intrusion in the coastal region of Benin

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Abstract

Recent decades have seen all over the world increasing drought in some regions and increasing flood in others. Climate change has been alarming in many regions resulting in degradation and diminution of available freshwater. The effect of global warming and overpopulation associated with increasing irrigated farming and valuable agricultural lands could be particularly disastrous for coastal areas like the one of Benin. The coastal region of Benin is under a heavy demographic pressure and was in the last decades the object of important urban developments. The present study aims to roughly study the general effect of climate change (Sea Level Rise: SLR) and groundwater pumping on Seawater intrusion (SWI) in Benin's coastal region. To reach the main goal of our study, the region aquifer system was built in numerical model using SEAWAT engine from Visual MODFLOW. The model is built and calibrated from 2016 to 2020 in SEAWAT, and using WinPEST the model parameters were optimized for a better performance. The optimized parameters are used for seawater intrusion intensity evaluation in the coastal region of Benin

The simulation of the hydraulic head in the calibration period, showed groundwater head drawdown across the area with an average of 1.92m which is observed on the field by groundwater level depletion in hand dug wells mainly in the south of the study area. SWI area increased with a difference of 2.59km^2 between the start and end time of the modeling period. By considering SLR due to global warming, the model was stimulated to predict SWI area in 2050. IPCC scenario IS92a simulated SLR in the coastal region of Benin and the average rise is estimated at 20cm by 2050. Using the average rise, the model is run for SWI area estimation in 2050. SWI area in 2050 increased by an average of 10.34% (21.04 km^2); this is expected to keep increasing as population grows and SLR.

Keywords : SLR, Seawater intrusion, SEAWAT, WinPEST, model calibration

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