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IMPACTS OF SEA LEVEL RISE AND BED LEVEL ACCRETION ON RESIDENCE TIME OF NEGOMBO LAGOON, SRI LANKA

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Water quality of an aquatic system is highly influenced by residence time (RT), which indicates how long a constituent is retained inside the system. This paper focuses on the effect of climate change induced future sea level rise (SLR) and associated bed level variations on RT of Negombo lagoon, Sri Lanka. The hydrodynamic behaviour of the lagoon was numerically simulated using Delft3D surface water modelling suite. The time required to drop the concentration of a constituent to 1/e (≈ 0.37) of its original value was calculated as the RT of the lagoon. Anticipated maximum SLR of 79 cm at the end of the 21st century, predicted by the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, was considered as the future sea level of the lagoon. Three bed level accretion conditions, namely, no bed level accretion, accretion of the lagoon bed level by 50% of the SLR (partial bed level accretion condition) and accretion of the lagoon bed level similar to the SLR (full bed level accretion condition), in response to the anticipated SLR were considered. RT was calculated for each bed level variation under low (5.64 $m^3 s^{-1}$) and high (41.93 $m^3 s^{-1}$) streamflow conditions.

Model predicted RTs of the lagoon at present are 22.4 days and 12.4 days under low and high streamflow conditions, respectively. Under the absence of bed level accretion, RT is increased up to 32.2 days (+43.7%) and 17.8 days (+43.5%) due to SLR in low and high streamflow periods, respectively. Under partial bed level accretion, RT is decreased up to 18.1 days (-19.2%) and 12 days (-3.2%) in low and high streamflow periods, respectively. RT is decreased up to 13.4 days (-40.2%) and 8.5 days (-31.5%), under full bed level accretion, in low and high streamflow periods, respectively. The results reveal that the climate change induced future SLR and the associated bed level accretion influence the RT of the lagoon altering the lagoon water quality.