303/C

Impacts of sea level rise on the salinity level in the Negombo lagoon

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The research reported here presents an analysis of the impacts of sea level rise (SLR) on salinity level in the Negombo lagoon which is one of the most productive shallow coastal water bodies situated in the west coast of Sri Lanka (7.16^0 N, 79.85^0 E) interconnecting with the Muthurajawela marsh. A hydrodynamic model was set up for the Negombo lagoon using the surface water modeling suite Delft3D to simulate the hydrodynamic and salinity transport behavior in the lagoon. The depth of the entire model domain was increased by 71 cm to characterize the SLR at the end of the 21st century anticipated for A2 emission scenario by the Inter Governmental Panel on Climate Change (2007). To analyze the SLR impacts on salinity level of the lagoon, the model was run under present and future sea levels with dry (3.52 $m^3 s^{-1}$) and wet (57.03 $m^3 s^{-1}$) stream flow conditions.

The results reveal an increment of salinity level in the entire lagoon due to the effects of SLR. The salinity level in the lagoon will vary between 16 and 26 ppt in future during the wet season surpassing the present level of 8 and 19 ppt. During the dry season, the salinity level in the lagoon will exceed 35 ppt in future surpassing the present level of 33 to 35 ppt. The salinity level in the lagoon varies between 8 and 35 ppt at present according to the results for both stream flow conditions. In future, following a SLR, the minimum salinity level in the lagoon is indicated as 16 ppt and the maximum as 36 ppt. The effect is identified to be higher for the wet condition than the dry condition. The salinity level is increasing in an order of 1 and 8 ppt under dry and wet conditions respectively. Further, the variation of salinity level due to the SLR is observed to be amplified towards the tail of the lagoon from the head of the lagoon indicating an inland salinity intrusion. The overall result indicates an increase in salinity level in the entire Negombo lagoon due to the effects of SLR. Especially, the minimum depth averaged salinity level in the Negombo lagoon will be increased to 16 ppt from the present minimum level of 8 ppt. Such variations of salinity conditions in the lagoon could severely harm the lagoon ecology. Thus, further study of the SLR impacts on the Negombo lagoon and other coastal water bodies is essential to protect those productive natural resources.

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