Nutrient Budget in the Pangani Estuary, Tanzania by using a box model

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Eutrophication is a world wide problem in aquatic ecosystems. Nutrient budgets have been used as tool for management in estuaries. They are used as tools for quantifying the magnitude of key nutrient pools and gives the feedbacks associated with natural and anthropogenic processes coastal systems. Given the large spatial scales and diversity of processes involved in biogeochemical cycles, it is difficult to make these computations through direct measurement. The LOICZ program developed a nutrient budget model for use in estuaries with limited data. The Pangani estuary is a tropical estuary located in the East coast of Tanzania, Africa. A single-layer box model was applied to estimate the nutrient budget. Nutrients data was obtained by using standard methods according to APHA (1995) while the budgetting was done by following the LOICZ guidelines as directed by Gordon et al (1996). The estuary was divided into two boxes. The water residency time was estimated to be about 2-8 days while the residual flow (m$^3$/day) ranged between 750,880.0 to 6,892,066.40 for box 1 and 737,269.33 to 6,878.022 for box 2 respectively. The salt balance was 21,349,703.72 moles box 1 and 1,775,157.72 moles for box 2. DIP net productivity was -4.096 and 2.02 mmol/m$^2$/month for box 1 and 2 respectively, DIN net productivity was -87.7 and 68.047 mmol/m$^2$/month for box 1 and 2 respectively. The average DIP advection exchange for box one was 6,702,871 while for box 2 was 2,176,346. The average Net Ecosystem Metabolism was -65.54 mmol Pm$^{-2}$/day. The study showed that the estuary changed between a source and sink for DIP and DIN. The estuary looks oligotrophic but it is changing to eutrophic.