Nutrient dynamics in mangrove areas of the Red River Estuary in Vietnam


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Abstract

Nutrient dynamics of mangrove in the 107 km² large estuary of the Red River Delta in Vietnam are studied using the existing LOICZ–CABARET budget model. The methodology and assumptions underlying this model are described. Input data for evaporation, rainfall, river discharge, and concentrations of salt, phosphorus and nitrogen are obtained during measurement campaigns in Vietnam. The calculated P-balance of the estuary together with measured data on the C/P ratio of mangroves yield a calculated mangrove biomass growth rate of 80 kg dry matter ha⁻¹ d⁻¹. Direct measurements of mangrove growth show a rate of 31 kg dry matter ha⁻¹ d⁻¹. Considering the uncertainties involved in this study where nutrient exchange with mineral particles is ignored, the nutrient budget model established for the Red River Estuary proves to give acceptable results. The model demonstrates that the mangroves in the estuary act as clear sinks of nutrients and sequester some 26 000 kg N d⁻¹ and some 3100 kg P d⁻¹ for their biomass production. Next the model is used in an explorative way to investigate effects of realistic future scenarios. Increasing river discharge in combination with constant or proportionally increasing river nutrient concentration results in increasing nutrient concentrations in the estuary. Increasing river discharge in combination with decreasing river nutrient concentration results in decreasing nutrient concentrations in the estuary. Constant river discharge in combination with increasing river nutrient concentration results in increasing nutrient concentrations in the estuary. The scenario analysis helps to understand the different interactions in the nutrient dynamics of the Red River mangrove area.

Author Keywords: budget model; nutrient balance; sink; source; biomass