The Tyne, UK and the Adyar, South India: A Tale of Two Estuaries

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Two physically similar estuaries in Temperate (UK) and Sub-Tropical regions (South India) are compared in the context of production and emission of the climatically active trace gases Methane (CH_4) and Nitrous Oxide (N_2O) which collectively account for ~ 18% of enhanced greenhouse forcing. The Tyne behaves as an annual minor atmospheric source of both CH_4 and N_2O (~ 350 kg yr^{-1}). The principal production mechanisms include sediment processes and inputs from a large sewage treatment located near the mouth of the estuary. In contrast the Adyar is a major source of atmospheric CH_4 with the actual field concentrations recorded amongst the highest shown in contemporary literature for aquatic environments. Paradoxically, concentrations of N_2O in the Adyar are generally low and can exhibit undersaturation with respect to atmospheric equilibrium. These data suggest that the Adyar may act as a sink for atmospheric N_2O. The underlying mechanisms of trace gas production/consumption in the Adyar are discussed in the context of biogeochemical processes and population pressures. Recent models have suggested that tropical and subtropical coastal zones may be major sources of both N_2O and CH_4 but have large degrees of uncertainties associated with emission estimates. These data reinforce these model estimates however it is clear more data are required to accurately constrain fluxes of trace gases from sub-tropical and tropical coastal zones.