

Global Modification of Riverine Nitrogen Fluxes by Damming

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Anthropogenic activities have not only altered the riverine nitrogen (N) transport from land to coastal areas by increasing N loadings to aquatic ecosystems, but also by the construction of dams. Dams are known to enhance denitrification and sedimentary N burial, but few studies have assessed the global importance of nitrogen fixation in dam reservoirs. To quantify the effect of damming on riverine N fluxes, a reservoir N mass balance model was developed. Processes included in the model are primary production and mineralization, as well as denitrification and burial. Moreover, N fixation was considered as an external source adding N to the reservoir system. The model was scaled up using a Monte Carlo analysis and a relationship was derived between total nitrogen (TN) elimination in reservoirs and the hydraulic residence time. This relationship was then combined with N loads to rivers obtained from the Global-NEWS model. According to the results worldwide N fixation in reservoirs accounts to 120 Gmol y⁻¹ (year 2000 estimation). We further estimate that reservoirs eliminated 6% of the total N loading to river systems in year 2000. This percentage is predicted to increase to 9% by year 2030. Globally however, the elimination of N by dams is significantly less efficient than for phosphorus (P)¹ which tends to enhance P limitation in coastal areas.

¹ Maavara T *et al.* (2015) PNAS 112, 15603-15608