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The effect of Landscape on Riverine Dissolved Inorganic Nitrogen Yield in populous watershed in the Danshui River in Taiwan

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This study combines the observed riverine DIN (dissolved inorganic nitrogen) export and the controlling factors (land-use, population and discharge) to inversely estimate the effective DIN yield factors for individual land-use and DIN per capita loading. A total of 16 sub-catchments, with different land-use compositions on the Danshui River of Taiwan, were used in this study. Observed riverine DIN concentrations and yields varied from 20 - 450 μM and 400 - 10,000 kg-N km^{-2} yr^{-1} corresponding to the increase of urbanization gradient (e.g. building and population). Meanwhile, the transport behaviors changed from hydrological enhancement to dilution with increasing urbanization as well. Our method shows that the DIN yield factors, independent of discharge, are 12.7, 63.9, and 1381.0 μM, for forest, agriculture, and building, respectively, which equals to 444.5, 2236.5, 48,335 kg-N km^{-2} yr^{-1} at the given annual runoff of 2,500 mm. The agriculture DIN yield only accounts for 10% of fertilizer application indicating the complicated N cascade and possible over fertilization. The DIN per capita loading ($\sim$0.49 kg-N Capita^{-1} yr^{-1}) which is lower than the documented human N emission (1.6 - 5.5 kg-N Capita^{-1} yr^{-1}) can be regarded as an effective export coefficient after treatment or retention. A conducted scenario experiment supports the observations demonstrating the capability for assessment. We therefore, can extrapolate all possible combinations of land-use, discharge, and population density for evaluation. This can provide a strong basis for watershed management and supplementary estimation for regional to global study.