Nutrient loads and sources in Greek running waters – An overview

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Since heavy industry is restricted in a limited number of large cities, seasonal food industries and untreated municipal wastes of small cities and villages (commonly disposed into permeable cesspools) and intensive agriculture are major nutrient sources in Greece. Large rivers (> 1000 km2) generally show high nutrient levels, especially the interregional ones. These rivers are usually marked by high nitrate and phosphate concentrations during autumn floods as a result of agricultural land flushing and high ammonia and organic phosphorous levels during the dry season due to the prevalence of point sources. In contrast, small/medium rivers (<1000 km2) present a satisfactory nutrient status, besides a minority that is affected by significant point sources of pollution. In small/medium rivers, agricultural land is the main nitrate source, while ammonia, total phosphorous and phosphate correlates with urban areas. Precipitation comprises a significant nutrient source. In a "pristine" catchment bulk precipitation was several times enriched with all nutrients, especially ammonia (28 times), compared with river water (Skoulikidis & Amaxidis 2007). Even in intensively cultivated areas, precipitation was more enriched with ammonia and phosphate than river water (Skoulikidis et al. 2006). In clean rivers, a major component of N and P is organic. For example in the headwaters of a "pristine" forested river the organic N and P portions were 82 and 92% respectively. In contrast, in cultivated basins, the inorganic portion increases (Skoulikidis et al. 2006) while in heavily polluted rivers dissolved N is found predominately in the inorganic form (Kouimzis 1998, 1999, 2000). In order to assess the impact of human activities on running waters, it is essential to define nutrient reference conditions and develop classification systems. Ideally, reference conditions should be type-specific. For example as a result of leaching and mineralization, "pristine" wet forested basins may present higher nutrient levels than respective basins with dry climatic conditions and scarce forest coverage (Skoulikidis et al. 2006).

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