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Nutrient budgets for European seas: a measure of the effectiveness of nutrient reduction policies

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Socio-economic development in Europe has led to an increasing pressure on marine environment. In particular a large number of anthropogenic activities have led to a large increase in nutrient discharges, with consequent eutrophication of part of all European seas. The severity of eutrophication varies, but dystrophic crisis has occurred in all basins with consequent impacts on ecosystems and economic activities. Nutrient reduction policies have been implemented in the last 20-30 years first by single countries and now collectively by EU directives. This work, carried out within the EU-sponsored ELME (European Lifestyle and Marine Ecosystems) project, aims, in part, to evaluate the effectiveness of these policies in terms to reduce nutrient inputs to regional seas. Nitrogen and phosphorus budgets have been constructed for three different periods (contemporary, under eutrophication conditions and before the beginning of eutrophication) to evaluate how the relative importance of different nutrient sources has changed in four selected areas of European seas (Baltic proper, coastal North Sea, Northern Adriatic and NW Black Sea Shelf). Contemporary source apportionments of anthropogenic inputs have been also evaluated to highlight major drivers. Substantial success is evident for point sources, but reduction of diffuse nutrient sources has been more problematic. Moreover, differences have emerged in the relative importance of sources in the different seas, because of their different hydromorphology and catchment characteristics. This raises the issue of regional differences in reduction policies under a common European Framework.