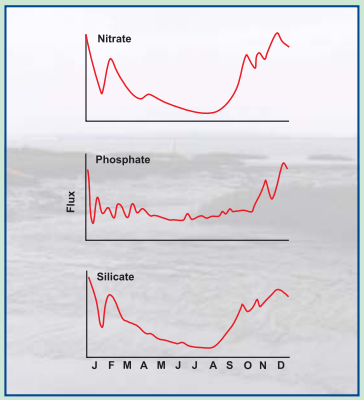
NUTRIENT INPUT FROM RIVERS - NUTRIENT RETENTION IN ESTUARIES - NUTRIENT INPUT TO THE SEA



The input of nutrients from UK east coast rivers is greatest in the winter when the flow of water is greatest.

The UK Harmonised Monitoring Scheme (HMS) provides the most comprehensive survey of inputs to the marine environment. Measurements are made of both river flow and nutrient content at points in rivers where there is no influence from the tides. The HMS data, together with information about direct discharges to the marine environment, is regularly reported to the OSPAR Commission.

JoNuS - the Joint Nutrient Study

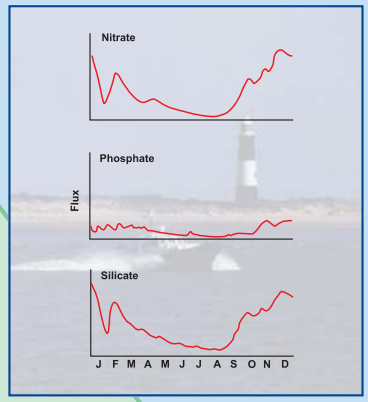
The JoNuS project sought to quantify the input of nitrogen, phosphorus and silicon from UK estuaries to the sea through a good understanding of the important estuarine processes that control the flow of these nutrients. The work programme involved some of the best scientists in the UK working as a multi-disciplinary team in an intensive study of the Humber, Wash and Thames estuaries[3]. The project has also examined the biological impact of nutrient input to the coastal sea.

Si. Silicon retention depends on the right conditions for the growth of diatoms (a type of plant with a silica skeleton). These conditions occur in the rivers entering estuaries and in the outer parts of estuaries where the amount of sediment in the water is sufficiently low to allow enough light for diatoms flourish. This process modulates the timing of silicon input to the sea.

P. Phosphorus is adsorbed to particles in the turbid regions of estuaries, especially where fresh and salt water meet. This can lead to an apparent loss of up to 90% of the river's dissolved phosphorus. The extent of sediment accumulation in the estuary will determine the degree of phosphorus storage. Estuaries where reclamation and flood defences have limited the area of sediment deposition will export fine sediment to coastal waters where the adsorbed phosphorus will be released. The behaviour of phosphorus can be described by a simple geochemical model[1].

The retention of nitrogen and phosphorus in estuaries, by storage or loss, depends on the extent of intertidal sediments. As a result of land reclamation and flood defence, the amount of intertidal sediment in many estuaries has been reduced to a point where the ability of the system to retain nitrogen and phosphorus has been minimised. The extent of intertidal area before reclamation is shown on the map[2] of the Humber (- - - -).

N. Nitrogen can be retained in estuaries via burial of organic nitrogen in sediments or can be lost to the atmosphere via the process of denitrification. Retention due to burial is often not significant due to the rapid biogeochemical processing of nitrogen and the lack of sediment accumulation in managed estuaries. Denitrification contributes to a significant loss of nitrogen but the extent is critically dependant on the available area of intertidal sediment[4].



The input of nutrients to the sea is modulated by the extent of different processes in the estuaries. This leads to changing ratios between the different nutrients, especially N:P, which may lead to changes in the phytoplankton community in coastal waters.

The UK National Marine Monitoring Programme undertakes measurements at fixed points in estuaries and in coastal and offshore waters. Spatial surveys of winter nutrient concentrations have been carried out since 1992, future surveys will seek to detect trends in nutrient concentration. A key element in achieving this will be the use of continuous automated instrumentation (e.g CEFAS Smart Buoys).

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The multi-disciplinary team was co-ordinated by the Centre for Environment, Fisheries and Aquaculture Science (CEFAS), an executive agency of the MAFF

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