

The Significance of the River Input of Nutrients in Relation to Coastal Eutrophication: Spatial Zoning Examples from the Northwest Pacific

Shulkin V.M.

Pacific Geographical Institute

Russian Academy of Sciences

Vladivostok, Russia

E-mail Address: shulkin@tig.dvo.ru

The basis of the Integrated Coastal Area and River Basin Management (ICARM) is an understanding of the close interrelation of the processes and problems at the coastal sea areas and on the adjacent watersheds. Proper spatial zoning is an important procedure of ICARM. It is obvious that for some coastal areas ICARM methodology is mandatory, but more a simple approach could be applied for other water bodies.

Eutrophication is one of the main multi-sectoral problems of the coastal waters. The excessive input of nutrients from the land-based sources is believed to be a main reason for this phenomenon. Therefore the reduction of the excess nutrients in the sewage, storm and river run-off and other nutrient inputs to the sea seems to be the high priority countermeasure against eutrophication. However, there are some examples when the very costly programs have led to the decrease of nutrient inputs from rivers and other point and non-point sources, but not to the proportional improvement of the ecological status of the coastal waters. Whatever the reason, this discrepancy indicates the necessity to assess the spatial scale of the coastal water bodies where the relationships between nutrients inputs from the land-based sources and plankton productivity are well-defined and significant.

The simple model is suggested for the determination of the size of the coastal sea area where the river run-off and other inputs of nutrients could influence the phytoplankton primary production. The model is based on the relationship between riverine and other land-based fluxes of nutrients and the quantity of nutrients consumed by plankton community within the given sea area.

The assessments were carried out for the different areas along the Russian Far East coast with distinct features of nutrients inputs and different levels of the plankton productivity. It was shown that even such simplified model allows to distinguish the sea areas where ICARM approach is strongly recommended from the areas where influence of the land-based point sources of



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nutrients is less probable. Besides, the model allows to determine the areas with domination of river, atmospheric or internal inputs of nutrients in the triggering of eutrophication events. The disadvantage of this approach is the use of the steady state model and omission of the hydrodynamic features of the sea areas.

The comparative assessment was made for the coastal areas from some other countries: Bohai Sea and Jiaozhou Bay in China, Seto Inland Sea and Toyama Bay in Japan, Masan Bay in Korea. The importance and, in some cases, the dominance of the non-point sources of nutrients in the control of the eutrophication issues will be demonstrated by the suggested model.