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Modeling and water quality assessment during realisation of the coastal projects in Sochi region (Black sea coast of Russia)

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Sochi region is the unique subtropical resort on the Black Sea coast of Russia. Nowadays due to Sochi is the capital of the Olympic game 2014, the government of the Russian Federation accepts the special federal program of Black Sea coast development. Program foresees the existing and creation of new coastal recreational and touristic complexes along the Russian Black Sea coast, such as complex of yacht harbors, water centers (aqua-centers), network of port localities and etc.
These coastal projects are different, but the main problems of the environmental impact assessment are the same. The environmental impact and the relative damage should be assessed at the stage of construction as well as at the stage of operation. The key problem for the recreation coastal zone is water quality management. The port localities network as example is considered.
To increase the accuracy and informative of forecasts for the coastal zone conditions the system-dynamic model has been developed, what allows to estimate the quality of the sea water, including that in the semi-enclosed coastal water areas with the limited water exchange. The model of water quality in the coastal zone includes the equations of deposit concentration changes and chemical substances evolution in the studied areas. The model incorporates joint description of cycles of two biogenic elements - nitrogen and phosphorus. The system is completely defined by the biogeochemical reactions. The sizes of such water areas allow the applying the full mixing and zero-dimensional models of water quality. The circulation of water inside the area is taken into account additionally. Water exchange in the semi-enclosed coastal water areas is defined by the discharge through the open parts of area border. The novelty of the offered model is its adaptation to the specific conditions of semi-enclosed coastal water areas. At the same time, the model contains details of the biogeochemical processes to complete modelling of the water quality. The developed system dynamics model is realized in the «PowerSim Studio» media. The data of natural measurements of water quality are applied for the model verification, and the correlated numerical results for the Russian Black Sea coast are presented.
The main objective of the present paper is to present the actual examples, and to generalise the problems and to discuss the possible approaches of their solution.