Danube Delta-Romanian-Bulgarian Black Sea Coastal Zone

CASE STUDY Varna Bay

Virtual & Real systems of Varna Bay

Extend model - constructed to represent water transparency (a proxy of WQ) as a function of TSS and phytoplankton biomass. In response to the formulated scenarios, primarily having to do with nutrient discharges. This involves predictive simulations of the phytoplankton biomass and TSS and their impact on the Secchi depth as a result of the WWTP and the SS options

The output of the ecological component - water transparency (Secchi depth) feeds the socio-economy component, which is based on the assumption that the loss of aesthetic values and amenities will level down the recreation and leisure attractiveness of the destination (loss of reputation) resulting in reduced tourist visits and related loss of direct municipal income, loss of investment (interest), unemployment and community welfare

Comparison between the modeled results and the respective measured values

Policy Issue

How to maintain a good quality of bathing waters in Varna Bay?

1. Optimization of management options. A supply chain analysis employed illustrates the potential of an increase of 3 m in Secchi depth in Varna Bay, optimizing the carrying capacity of bathing waters in Varna Bay.

2. Potential to increase tourist visits. A supply chain analysis illustrated the potential of an increase of 3 m in Secchi depth in Varna Bay, optimizing the carrying capacity of bathing waters in Varna Bay.

3. Application of sewerage system (SS) options in addition to improvement of WWTP (denitrification) reducing the TSS input to the system (by 50%)

4. Adjustment of wastewater treatment plants (WWTPs) and sewage treatment plants (CSOs) reducing the TSS input to the system (by 30%), resulting in the total TSS being 65% lower than in the case of Secchi depth never <3 m.

5. The Deltia-Bulgarian-Romanian national institute for science and technology for the protection of the Danube Delta river systems, will contribute to improvement of WQ with at least doubling the capacity of sewage treatment plants (WWTPs) and the respective measured values - red and black symbols over the test years 2001. The black line is the 3 m Secchi depth - a tourist perception value in the scenarios.

6. The model indicates that at the current state of direct release, at least doubling the capacity of sewage treatment plants is necessary along with the WWTPs upgrade in order to maintain the Secchi >3m in summer. Although the model simulations could not provide precise quantitative assessment, it demonstrates that the technological upgrade of the WWTPs in the resorts should not be neglected (now postpone for after 2015) and good bathing WG could be achieved only if in addition the TSS input is reduced at least by 50%.

Baseline Scenario: Business as usual, nothing changes - How the system is working under standard conditions and projections for the socio-economic indicators for the period 2007-2015

For the period after 2015 till 2015, the model calculates the possible cumulative revenue from the tourist sector in the case of Secchi depth never <3 m, to be 1,327,407,243 € (for 5 yrs), and the losses to the SSA 18-154,654 € (for 9 yrs).

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Comment

All the simplicity (especially in the socio-economic component) and the various assumptions, the selected scenario illustrates the feasibility of SAF methodology and its relevance to the formulation of management options. A supply chain analysis employed illustrates the conversion of the linkage variable water transparency (environmental component) to direct economic link (component) and the consequences to the local community welfare (social component) depending on the success/failure of the management strategies to optimize the ecological carrying capacity of Varna Bay.