



## **ASUD2- DECISION SUPPORT SYSTEM FOR DNEIPER RESERVOIRS OPERATION TAKING INTO ACCOUNT ENVIRONMENTAL PRIORITIES**

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On the European continent the Dnieper is the third largest river basin (509000 sq.km). The Ukrainian part of the drainage basin is 291 400 sq.km. The cascade of 6 reservoirs, that have capacity from 2.5 to 18 cub.km comprises the entire reach of Dnieper River in Ukraine, redistributes the water regime in time. As a result, 17-18 cub. km water can be used, 50% for hydropower production, 30% for agriculture and up to 18% for municipal water supply. The water stress, the pollution load, the insufficient technical conditions require a lot of effort in the water management development.

In order to achieve optimal use of water resources in the Dnieper River basin, it is essential to develop strategies both for the long-term perspective (planning) as well as for the short-term perspective (operation). The Dnieper River basin must be seen as complex of the natural water resources, as well as the human system (water use, social and economic intercourse). In the frame of the project, supported by the Swedish International Development Cooperation Agency (SIDA) the software tool **ASUD2** is developed to support reservoir operations provided by the State Committee of Ukraine on Water Management and by the Joint River Commission. **ASUD2** includes multicriteria optimization engine that drives the reservoir water balance models and box models of water quality. A system of supplementary (off-line) tools support more detailed analyses of the water quality parameters of largest reservoirs (Kachovka and Kremenchug). The models **AQUATOX** and **WASP** ( in the developed 3-D version) are used for these purposes. The Integrated Database **IDB-ASUD2** supplies the information such as state of the all reservoirs, hydrological observations

and predictions, water demands, measured water quality parameters.

ASUD2 is able to give the following information on an operational basis. :

- recommended dynamics of the water elevation during the water allocation planning period in all reservoirs calculated on the basis of the different optimisation criteria Ÿ minimum of the distance to the trajectory of the water level given by decision of the Joint River Commission, minimum value of the water contamination parameters (DO, nutrients, phosphorus), maximum energy production, taking into account limitations from fishery, water intakes of irrigation and transport channels etc;

- water releases from the reservoirs to maintain the recommended dynamics in the whole Dnieper Cascade;

- integrated water quality parameters for all reservoirs and distributed water quality parameters for the two largest reservoirs (Kremenchug and Kachovka).

The analyses based on economical criteria provides the cost-benefit evaluation for different reservoir management alternatives. The assessment takes into account energy production, industry, agriculture as well as the costs associated with ecological damages.