

## ASSESSMENT OF THE WATER QUALITY OF LAKE PLASTIRA THROUGH MATHEMATICAL MODELLING FOR ALTERNATIVE MANAGEMENT SCENARIOS

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### EXTENDED ABSTRACT

In the context of a research program regarding water quality management and protection plan for Lake Plastira, one of the main tasks was the establishment of a sound relationship between the minimum water level and the trophic state of the lake.

The study involves the application of mathematical modelling. The mathematical model used is an eutrophication-dissolved oxygen model (EUTRO-SEL), which has been developed in the Sanitary Engineering Laboratory of the National Technical University of Athens and applied to the particular case of Lake Plastira. The mathematical model describes various physical, chemical and biological processes taking place in a water body, through suitable terms in mass balance equations for each chemical biological and physical parameter examined.

Three water management scenarios were examined in the context of the study, based on alternative minimal operating water levels. The three alternative scenarios are related to the operation of the lake Plastira at minimum water levels of: a) 782m, b) 784m and c) 786m.

The modelling application showed notable differences in the expected maximum annual summer chlorophyll-a concentrations for the three alternative management scenarios. Lower values (0,3-3,6 µg/l) corresponding to the minimum operating level of 786 m and maximum summer chlorophyll-a concentrations for the 784 m and 782 m scenarios (between 1,0-6,0 µg/l and 3,2-6,0 µg/l respectively).

According to the results of the mathematical modelling and the classification of the water bodies according to the recent standards and trends within the European Commission, the operation of Lake Plastira at a minimum water level of 786 m ensures very good water quality characteristics, resulting in the classification of the lake to the Category I. The operation of the Lake Plastira at lower water levels between 782-784 m, results in acceptable water quality that classify the lake into Category II.

Since in all three management scenarios the water quality is acceptable and describes a water body with at least good water quality, acceptable minimum operational water level, can be determined by other considerations (e.g. elasticity of demand, landscape aesthetics, etc).

**KEYWORDS:** chlorophyll-a; eutrophication; lake Plastira; water management; water quality modelling