ABSTRACT

The present diploma thesis was performed within the framework of obligations stemming from the undergraduate curriculum of the Civil Engineering Department of the Faculty of Engineering in the Aristotle University of Thessaloniki. The main objective of this work is to contribute in the study of the development procedures and the application results of the numerical models that have been generated to simulate the complex hydrodynamic procedures, which govern the occurrence and evolution of saline wedges in river estuaries. In a consequent level, a presentation of the applied-to-date systems (both experimental and practical ones) that have been implemented to control the phenomenon is being attempted.

As far as the structure of the main body of the dissertation is concerned, it could be considered consisting of two sections: the first one includes chapters one to six, whereas the second is comprised of the following three chapters.

More precisely, within the first introductory chapter, a general presentation of the phenomenon takes place. The overall study is conducted within the general scope of the natural environmental processes, the character of the identified problems and the need for a thorough investigation, which incorporates acknowledged means and methodologies developed by the scientific community.

Next, within the second thematic capital, a brief review of the body of scientific literature is presented. Further analysis of selected projects follows within the next chapters.

In details, after an introduction to the modeling procedures of natural phenomena that is presented within the third chapter, emphasis is placed on the study of the governing equations describing the flow of two-layered stratified fluids in one, two and three dimensional aspect. Moreover, the investigation of the two and three dimensional cases is accompanied by the analysis of the numerical model applications tested in field conditions.

After this point, the commencement of the second part of the thesis commences. Within its frames, an extensive record of existing experimental and practical solutions towards controlling the dynamics of the phenomenon is documented (chapters seven

and eight). The study encompasses the operation principles of the systems and the required qualifications that ensure their proper function. Furthermore, the efficiency assessment of the foregoing devices is examined in conjunction to the potential of their applicability in a broader scope.

Finally, the last chapter provides a summary of the conclusions that have been derived during the various stages of the elaboration of the present dissertation.