

Review of the thesis submitted as the basis for the award of the Doctor Degree:

**Future groundwater development in the Jifarah Plain, Libya
and possible environmental impacts: regional approach**

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Subject of the present review

The above mentioned thesis is the subject of the present review. This thesis was available to the reviewer as a hard-copy for the purposes of the review. This thesis consists of seven chapters (about 65 pages) and it is supplemented by the references and by eight appendices.

Description and evaluation of the thesis

In the first chapter authors introduces relatively briefly the main motivation of the thesis. The main objectives of the present thesis are to summarize and analyze natural conditions of groundwater flow and to assess in a regional scale quantitative and qualitative environmental and water related impacts of past and present day heavy groundwater pumping. For these purposes the model approach using the conceptual and numerical models will be implemented.

The second chapter is entitled “Methods of study”. Due to my opinion this title is not in harmony with contents of the chapter and which is more another chapter “Methods of study” is involved into the thesis. The present composition is not clearly arranged and is it rather confusing.

The third chapter is dedicated to the general information describing Libya while the fourth chapter deals with the description of the area of interest, i.e. Jifarah Plain region. These two relatively extensive chapters are well prepared and represent valuable and instructive part of thesis. Unfortunately I have not found the list of abbreviations and their explanation (that is valid for the whole work), furthermore some of them are not used uniformly (e.g. TDS vs T.D.S., hydraulic conductivity is written both k and K, etc.). I would also greatly appreciate and recommend the use of chemical formulas of compounds in Tables 4.6 and 4.7 instead of their verbal description. What is “solvate”?

The fifth chapter is devoted to the methodology and used models. Although this chapter should represent together with results and conclusions main and the most important parts of the work it is due to my opinion – too brief and especially the model tools and their

implementation should be described more better and carefully. I suppose that the attention should be also paid to the theoretical background of the water movement and matter transport in the porous media under the saturated conditions (i.e. flow of groundwater). This part complemented by the relevant bibliography is missing in the reviewed work at all. One paragraph on the page 37 is presented two times. It is a great pity that the author did not pay more attention to the finalization of the thesis, e.g. to the elimination of the typing errors, etc. In Table 5.11 the author present for the area No. 13 the same values both for estimated and simulated ground water volumes. What is an explanation for this?

The sixth chapter discusses the obtained results using very instructive both graphical and tabular form. I suppose there are some discrepancies in described horizontal fluxes in the text, in figures 6.5 and 6.6 and Tables 6.1 and 6.2. Furthermore the mentioned Tables 6.1 and 6.2 are chaotic and not clearly arranged (the units in the captions do not agree with the units in tables, the sums are incomprehensible and the names of the layers are not in harmony with the same on the page 44 in Table 5.2,).

The seventh chapter summarizes the conclusions and brings the suggestions. The conclusions proved the importance of the presented topic of research and especially the importance of groundwater storages in the examined territory.

The presented thesis is supplemented by the list of references and by enclosures. As the references are concerned the literature citations are not adequate. I suppose they should be extended by the citations focussed on the theoretical background of the solved problem and especially by the articles describing the similar research in the other places of the world. I also feel the lack of the citation of any contribution published by the author of the reviewed thesis. Unfortunately also the references are chaotic, a lot of citations in the list of references are not mentioned in the text (85 pieces), on the other hand 11 citations in the text are not involved in the list of references and 10 citations have different version in the text compared to the list of references.

Concluding evaluation

The present thesis contains new and significant information to justify its submission as the basis of the award of the Doctor Degree despite the facts of my numerous comments and recommendations. The solved problem is significant and concisely stated and especially the experimental methods are described comprehensively. Also the interpretations and conclusions are justified by the results. From the reasons mentioned above I consider that the thesis prepared by Mr. Yousef Mohamed Elgzeli is acceptable as the basis of the award of the Doctor Degree.

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