

## IAH network on “Coastal aquifer dynamics and coastal zone management” QUESTIONNAIRE

in the questionnaire in this page with as many details as possible.

- 1) Location of aquifer (country, more specific location): the coastal aquifer of Malia, located on the Greek island of Crete
  
- 2) Reported by: George P. Karatzas & Zoi Dokou
  
- 3) Type of medium (karst, porous, fracture) Karst
  
- 4) Type of aquifer (phreatic or confined) unconfined
  
- 5) Main lithology - (e.g. gravel, sand and clay) The aquifer is developed in limestones of the Tripolis zone. Under these rocks, a series of alternating chloritic schists, phyllites and quartzites belonging to the Phyllite-Quartzite zone acts as the impermeable substrate of the extended region. The Tripolis series consists of faulted and karstified limestones, dolomites and calcareous dolomites. The stratigraphy includes Neogene deposits that consist of bioclastic Messinian limestones and Quaternary clastic sediments. Along the coast, alluvial deposits and beach sand deposits are found (Quaternary deposits)
  
- 6) Hydrochemistry: fresh or saline fresh
  
- 7) Saltwater intrusion: lateral from sea or lakes - upconing lateral from sea
  
- 8) Aquifer geometry: hydraulic characteristics Transmissivity varies from 0.78 to 61.02 m<sup>2</sup>/h for limestone formations
  
- 9) Aquifer parameters: storage - annual water pumping - (in MCMA - millions cubic meters, annually) For the estimation of the percentage of rainfall that represents recharge for each geological formation, these values are 44 % for the limestone formations, 21.5 % for the neogenic sediments, 15 % for Quaternary deposits and 5 % for phyllites.
  
- 10) Depth of aquifer (water level and bottom) - water level 5- 30 m - aquifer depth - 50-200 m aquifer's depth of 100 m below sea level; the hydraulic head of the freshwater at the interface should be hf=2.5 m
  
- 11) Major chemistry (anions - ?; Cations - ?):
  
- 12) Major salinity sources:
  
- 13) Population:
  
- 14) Aquifer status: special features - e.g. thermal springs, major faults,... Three brackish springs are located in the area
  
- 15) Investigation methods - e.g. water level measurements, EC (electrical conductivity profiles), TDEM (geophysical), Information for 49 shallow wells with depths from 2 to 20 m, 8 private and 24 public wells was available (a total of 81 pumping wells).
  
- 16) Numerical hydrological modeling, chemical and isotopic methods, age determination, IR survey, seepage meters (for Submarine Groundwater Discharge, SGD) Princeton transport code (PTC) is a three-dimensional (3D) groundwater flow and contaminant transport simulator that uses a combination of finite element and finite difference methods to solve a system of partial differential equations that represent the groundwater flow, velocity and contaminant mass transport of the simulated physical system
  
- 17) Monitoring methods applied and duration - water level measurements, EC (electrical conductivity profiles - seasonal) Water level measurements for more than five years
  
- 18) Management methods: two optimal management scenarios for mitigation of the saltwater intrusion phenomenon were considered. The first scenario allowed all pumping wells in the area to extract water with an upper bound equal to the current extraction rates. For the second scenario only the wells that are located outside the saltwater-affected areas are considered, given the fact that the water extracted from wells located inside the affected zones provide water of questionable quality.
  
- 19) Aquifer management actions:
  
- 20) Identification of existing or potential problems: Sea-water intrusion
  
- 21) Annexes: Diamantis, Petalas C, Tzeveleki Th, Pliakas F (1994) Investigation for the possibility of water supply of coastal settlements of Thrace from coastal aquifers). Technical Report for the Region of Eastern Macedonia and Thrace, Greece, 4, p 393 [In Greek]  
Kallioras A, Pliakas F, Diamantis I (2006) Conceptual model of a coastal aquifer system in northern Greece and assessment of saline vulnerability due to seawater intrusion conditions. Environ Geol 51:349–361  
Kallioras A, Pliakas F, Diamantis I, Kallergis G (2010) SWOT analysis in groundwater resources management of coastal aquifers: a case study from Greece. Water Intern 35:425–441  
Petalas C, Lambrakis N (2006) Simulation of intense salinization phenomena in coastal aquifers—the case of the coastal aquifers of Thrace. J Hydrol 324(1–4):51–64
  
- 22) Observations: The groundwater-flow modelling results show that under the current pumping strategy, the saltwater intrusion front will continue to move inland posing a serious threat for the groundwater quality used for drinking and irrigation purposes.