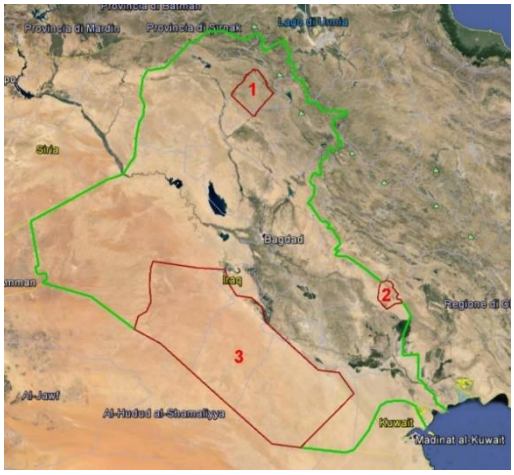
# Advanced survey of hydrogeological resources in Iraq, Phase 2–ASHRI 2

## Project summary

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| Client: | UNESCO |
| Year: | 2016 |
| Site: | Iraq |
| Partner: | T-Zero srl |
| Service: | Computer Modelling |
| Sector: | Water Resource Engineering |
| Geological setting: | - |
| Mathematical model: | Groundwater flow in a saturated and unsaturated porous medium |
| Project in numbers: | + 100,000 dof |


## Abstract

The ASHRI-2 project, funded by UNESCO, aims to identify and study the most promising shallow aquifers in Iraq for freshwater withdrawal. The M3E team has developed and applied a numerical model for each aquifer system, jointly identified by the Iraqi Government and UNESCO, to evaluate the potential capability in supporting the characterization of aquifer resources, helping the decision process and planning MAR (Managing Aquifer Recharge) scenarios.


## Project description

The activities within the project “Managed Aquifer Recharge” aim to identify deep and shallow fresh-water aquifers of Iraq, and describe their extent, recharge areas and the recharge ratios.

According to the Scope of Work of the project, the following activities have been completed:

- Development of preliminary remotely-sensed derived products, which entails essentially the sub-activities:
  - AET-coded image interpretation
  - Regional hydrogeologic interpretation
  - Preliminary siting of micro-dams for MAR
- Prioritization of aquifer systems, including:
  - Cross-validating preliminary remotely sensed derived products with observed data


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- Evaluating aquifer criteria, ranking and weighting these for each aquifer system

Three case studies have been addressed to demonstrate the capability of numerical models in supporting the characterization of aquifer resources and planning MAR scenarios. The three selected areas are:

1) Erbil Basin;
2) Bai Hassan System;
3) Western Desert.

Three different management scenarios have been simulated, one for each pilot site:

1) Erbil Basin: groundwater pumping for potable use from the confined Pila-Spi formation;

2) Bai Hassan System: groundwater pumping for agricultural use from the confined Bai Hassan formation;

3) Western Desert: recharge through an infiltration basin of the phreatic Dammam and partially confined Um-Er-Radhuma systems.

In each site the pumping / MAR scenario has been anticipated by a preliminary calibration of the model in order to reproduce a reasonable natural regime. A sensitivity analysis on the most uncertain (and effective) parameter, i.e. the saturate hydraulic conductivity Ks has been performed to mitigate the lack of piezometric records.

## Project outcome

The outcome of the project was the development of three numerical models for the management of groundwater resources in Iraq. Potential activities, like aquifer recharge and groundwater withdrawal for agricultural or potable use, have been analysed and discussed in different configuration scenarios.