

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

IAH national committees, IAH members and non members from all around the world involved in SWI and SGD research and management are kindly asked to fill in the questionnaire in this page with as many details as possible.
A world database will be set up and made available, with basic coastal aquifer main characteristics.
We expect to gather standard and comparable information on the knowledge level and hopefully the state of the art of the research on SWI and SGD, and coastal aquifer management methods adopted around the world.

1)	Location of aquifer (country, more specific location):	Coastal strip of Jifarah plain, NW Libya
2)	Reported by:	Suleiman Salah El Baruni, General Water Authority and a member of National Association of Water Science and Technology Tripoli-Libya
3)	Type of medium (karst, porous, fracture)	Porous medium
4)	Type of aquifer (phreatic or confined)	The upper aquifer is phreatic (Mio-Quaternary aquifer). The Lower aquifer is confined (Miocene aquifer).
5)	Main lithology - (e.g. gravel, sand and clay)	The Mio-Quaternary aquifer consists of sandstone and sandy limestone intercalated with limestone, clay, silt and marl. The Lower Miocene aquifer is composed of intercalation of limestone, sandy limestone, dolomitic limestone, sandstone and clay.
6)	Hydrochemistry: fresh or saline	Fresh and saline water
7)	Saltwater intrusion: lateral from sea or lakes - upconing	Lateral from sea and upconing in deep wells
8)	Aquifer geometry: hydraulic characteristics	The Mio-Quaternary aquifer transmissivity is in the order of 1.2×10^{-3} to 1.0×10^{-1} m ² /sec. The storage coefficient is estimated to be in the average of 2% to 15%. The Lower Miocene aquifer has a transmissivity of 2×10^{-3} to 2×10^{-2} m ² /sec, storage coefficient is estimated to be in the order of 1×10^{-4}
9)	Aquifer parameters: storage - annual water pumping - (in MCMa - millions cubic meters, annually)	The rate of abstraction in 2010 is estimated at 1236 Mm ³ /yr. The agricultural sector is the main user of water; it represents about 80% of the water consumption. About 19% of available water is used for domestic supply. Industry is the least water consumer sector in Jifarah plain with about 1% of the total consumption.
10)	Depth of aquifer (water level and bottom) - water level 5- 30 m - aquifer depth - 50-200 m	Upper aquifer: Depth to water varies from 10 to 90m, aquifer depth varies from 60 to 160m. The Lower aquifer: Depth to water varies from +50 to -30m, aquifer depth varies from 250 to 500m.
11)	Major chemistry (anions - ?; Cations - ?):	NaCl, Mg Cl, CaCl, Ca SO ₄
12)	Major salinity sources:	due to deterioration by sea water intrusion. The occurrence of saline water in the western zone of Jeffara plain is due to the presence of gypsum and anhydrite or due to deterioration by sea water intrusion and sabkats.
13)	Population:	Jifarah plain is considered as more densely populated areas, its population according to the census for the year 2006, is estimated to be 2.2 millions (about 39% of the total population of Libya).
14)	Aquifer status: special features - e.g. thermal springs, major faults,...	The temperature of water pumped from the Lower Miocene aquifer in the Jifarah plain area ranges between 40 to 65°C, especially in the areas located north of the coastal Fault. The major faults are Al Aziziyah and coastal (east-west) faults.
15)	Investigation methods - e.g. water level measurements, EC (electrical conductivity profiles), TDEM (geophysical),	Investigation methods include: drilling of exploratory wells, data collection (water level measurements, water quality, available geological and hydrogeological data)
16)	Numerical hydrological modeling, chemical and isotopic methods, age determination, IR survey, seepage meters (for Submarine Groundwater Discharge, SGD)	The following studies include groundwater modeling: Jifarah plain water management plan project under taken by FAO in the period of 1978 – 1982, study to determine appropriate use of water imported into Tripoli region along the Man-Made River water phase-II prepared by National Consultant Bureau and Mott MacDonald 1993, a detailed study of seawater intrusion along the coastal belt of Jifarah plain from Sabrahat to Al Khums prepared Engineering Research and Consultation Bureau – Tripoli University. a study of Libyan – Tunisian Jifarah aquifer system as a part of the North-western Sahara Aquifer System Conducted by the Observatory of Sahara and Sahel (OSS). Isotopic sample analysis have been made by GEFLI (1974-1976), Zuppi (1980) and Bahadur (1981). These analysis include: Oxygen-18 (O18), Carbon-14 (C14), Deuterium (D) and Tritium (H3). Recently, 30 water samples were collected during 2003 for isotopic analysis.
17)	Monitoring methods applied and duration - water level measurements, EC (electrical conductivity profiles - seasonal)	A number of Seawater intrusion studie were carried out since 1960. Cederstrom, Bertiola (1960) and Stuart (1960), GEFLI (1971 – 1972), Navarro (1975), Floegel (1979), National Consultant Bureau and Mott MacDonald (1993), and Engineering Research and Consultation Bureau – Tripoli University (2002), water samples were collected and analysed. Water level data obtained from periodical monitoring of the piezometric network in the Jeffara plain.
18)	Management methods:	National strategy for water security 2015-2050 was prepared. A program has been prepared to increase the efficiency of desalination plants and to improve the performance level of these plants. In order to meet the future water demand for domestic supply, General Company of Desalination was adopted a plan to construct new desalination plants (15 plants). Modeling techniq used as a tool for groundwater management. The legislations concerning the water sector are well developed. The most important law is the Law no. 3 (1982), which sets out the general principles to regulate the utilization of water resources and defines controls preservation and protection operations. Law no. 7 (1982) regarding the protection of the environment. Chapter 4 deals with the protection of water resources. This Law was amended by Law No. 15 of 2003 concerning the protection and improvement of the environment.
19)	Aquifer management actions:	The conveyance of groundwater from south to the suffering areas in the north through the Man-made River Project. Achievement of the maximum use of available surface water resources by the construction of dams and ground reservoirs in order to collect and preserve rainfall and surface runoff water. Areas suffering from over-exploitation and deterioration of groundwater have been put under restrictive water use or complete ban of groundwater extraction.
20)	Identification of existing or potential problems:	Continuous lowering of the groundwater table, Deterioration of groundwater quality and Seawater intrusion.
21)	Annexes:	Seawater Intrusion Report - Jifarah plain, NW Libya
22)	Observations:	In order to update the study of seawater intrusion periodically a network of observation wells to monitor the water quality change laterally and vertically should be established. Dam's water, treated sewage effluents and rain water that accumulating in the streets of large cities can be used for the artificial recharge of coastal aquifers or aquifers suffering from continuous decline in water levels. Further actions should include upgrading of water use efficiency, improvement of irrigation systems and agricultural practices, introduction of water pricing, application of legislative measures, and public awareness.