

## 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

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|-----|---|---|
| 1)  | Location of aquifer (country, more specific location):  | Borkum, Germany, North Sea island   |
| 2)  | Reported by:  | Helga Wiederhold  |
| 3)  | Type of medium (karst, porous, fracture)  | Porous medium   |
| 4)  | Type of aquifer (phreatic or confined)  | Unconfined  |
| 5)  | Main lithology - (e.g. gravel, sand and clay)   | sandy aquifer with leaky clay layers  |
| 6)  | Hydrochemistry: fresh or saline   | Fresh and saline  |
| 7)  | Saltwater intrusion: lateral from sea or lakes - upconing   | lateral intrusion from sea  |
| 8)  | Aquifer geometry: hydraulic characteristics   | An aquifer roughly divided into four parts, each separated by more or less leaky aquitards  |
| 9)  | Aquifer parameters: storage - annual water pumping - (in MCMA - millions cubic meters, annually)  | Precipitation is about 780 mm/yr;<br>Annual water pumping of drinking water 1 MCMA  |
| 10) | Depth of aquifer (water level and bottom) - water level 5-30 m - aquifer depth - 50-200 m   | Water level: 0.5 - 3.0 m mean sea level<br>aquifer depth: 180 m (below 50 m saline)   |
| 11) | Major chemistry (anions - ?; Cations - ?):  | hydrogencarbonate   |
| 12) | Major salinity sources:   | Sea water   |
| 13) | Population:   | Borkum's population counts 5,500<br>Additional 220,000 tourists / 2.2 Mio. guest-nights per annum   |
| 14) | Aquifer status: special features - e.g. thermal springs, major faults,...   | Freshwater lens   |
| 15) | Investigation methods - e.g. water level measurements, EC (electrical conductivity profiles), TDEM (geophysical),                                       | Water level measurements, EC, airborne electromagnetics, electrical resistivity, Georadar, direct push  |
| 16) | Numerical hydrological modeling, chemical and isotopic methods, age determination, IR survey, seepage meters (for Submarine Groundwater Discharge, SGD) | Density dependent hydrological modeling   |
| 17) | Monitoring methods applied and duration - water level measurements, EC (electrical conductivity profiles - seasonal)                                    | Water level measurements<br>automated vertical electrical chain since 2010  |
| 18) | Management methods:   | The island of Borkum was pilot area of the European INTERREG IVB project CliWat which was focussed on the development of adaptation strategies to meet the ground water situation in a future climate   |
| 19) | Aquifer management actions:   | Monitoring of water levels and groundwater chemistry  |
| 20) | Identification of existing or potential problems:   | Due to a rising sea level and increasing ground water recharge in the North Sea region, significant changes of the fresh-salt water distribution are expected leading to the demand of a future adaptation of the management of ground and surface water in these areas |
| 21) | Annexes:  |   |
| 22) | Observations:   |   |