

Contents

1	Introduction	1
1.1	Scope and goals	1
1.2	Regional setting	3
2	State of the Art.....	15
2.1	Geology	15
2.2	Hydrogeology	55
2.3	The hydrochemical history of the Rift.....	75
3	Research Studies	83
3.1	Hydrochemical aspects	83
3.1.1	Characterization of aquifer environments by major and minor elements and stable isotopes of sulfate	83
3.1.2	Characterization of recharge areas by rare earth elements and stable isotopes of H ₂ O	123
3.1.3.	Regional hydrochemical and hydrogeological aspects of groundwater in the Jordan-Dead Sea Rift system	149
3.2	Specific regional hydrological aspects	181
3.2.1.	Geophysical investigations of the hydrogeological basins in the central Jordan Valley	181
3.2.2	Hydrogeology and flow pattern along the Fazael-E-Salt cross-section.....	199
3.2.3	Lake Tiberias and its dynamic hydrochemical environment.....	219
3.2.4	Retreat of the Dead Sea and its effect on the surrounding groundwater resources and the stability of its coastal deposits.....	247
3.3	Aquifers in the western Jordan Valley	265
3.3.1	The Uppermost aquifer in the Wadi Qilt area	265
3.3.2.	3-D Hydrogeological model of the Marsaba-Feshkha region.....	287
3.3.3	Groundwater flow and transport model of the Jericho area.....	313

3.3.4 Hydrochemistry and isotope hydrogeology in the Jericho area/ Palestine	325
3.3.5 A GIS based hydrosystem model for the Jericho Plain, Palestine	349
3.4 Aquifers in the eastern Jordan Valley.....	361
3.4.1 Hydrogeology and hydrochemistry of Wadi Waleh and Wadi Zarqa Ma'in catchment, central Jordan	361
3.4.2 GIS based model for groundwater flow and heat transport in Zarqa Ma'in and Jiza area, central Jordan	371
3.4.3 Groundwater conditions of the Jordan Rift escarpment northeast of the Dead Sea.....	385
3.4.4 Protective potential of soils, ground-water vulnerability and hazards in the Wadi Shueib, Jordan	413
3.4.5 An integrated approach for the hydrogeological investigation of unconsolidated aquifers in the lower Jordan Valley	447
4 Groundwater Management.....	465
4.1 Overview of available water resources and uses in the Jordan Rift Valley.....	465
4.2 Sustainable management of groundwater resources	473
4.3 State of water strategy and policy.....	481
4.4 Future water demands.....	505
5. Summary and conclusions.....	511
Subject Index.....	521