

---

# Tapping groundwater resources under severe environmental constraints: the innovation of Iron Age spring tunnels, in the southern Levant

Azriel Yechezkel\*<sup>1</sup>

<sup>1</sup>Hebrew University – Israel

## Abstract

Israel is geographically a part of the Fertile Crescent, where several evolving ancient civilizations, practiced utilization of water resources. Both Egypt and Mesopotamia - the Nile, Euphrates and Tigris regions, derived their waters from distant, wetter regions. Centralized powers developed these water resources and regulated their use. However, in Israel, and particularly in the central mountain range, there are certain harsh environmental conditions: Mediterranean to semi-arid climate; Significant climate changes, and mainly the absence of large stable water sources. The only perennial water source available to man in the Israel mountains are springs, discharging from small, perched aquifers.

These conditions limited the development of large agricultural economies, and seem to have promoted hydrogeological and engineering innovations which overcame the scarcity of water. One of the most important hydro-tech-innovations was the excavation of a sub-horizontal tunnel at the outlet point of a spring. This water installation is called 'Spring tunnel' (*Niqba*). In Israel, earliest Spring Tunnels discovered, date back to Iron Age period (~1000 BCE), and predates similar installation found in other regions of ancient world.

In the last few years, a thematic survey of this water installation was conducted by the author, documenting more than 210 Spring Tunnels, from which more than 130 were mapped in detail. The lecture will describe the preliminary results of this survey, and specifically the characteristics of Iron Age tunnels from the technological and social aspects.

**Keywords:** Spring tunnels, Iron Age, ancient Israel, water extraction systems

---

\*Speaker