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THE RESSOURCE WATER, CLIMATE CHANGE AND RESILIENCE AT DOUZLĀKH

(Associated to the SPP 2176)

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Fig.1: Water sampling within the „Water-Project“ in an artificial irrigation channel in June 2018.

LACK OF WATER

Around the ancient Saltmine of Chehrābād Douzlākh the lack of water is visible in the landscape, which is characterised by massive erosion. Naturally the seasonal winter rain provided sufficient water for the growth of the plants. Additionally, the farmers supported the crops by irrigation with water of the Chehrābād river (Fig. 1). The archaeological project in the Talkherud area revealed evidence of irrigation in the region at least since the Sasanian time. Fruit cultivation was already known before.

AN INCREASING EROSION…

The modern vegetation cover of the valley is extremely scarce (Fig. 4). Pastoralism with herds of cattle and, even more invasive, sheep and goat destroyed the vegetation cover during the centuries. Because of the lack of vegetation, the soil is not able to keep the water anymore and erosion starts, increasing the pressure on the remaining vegetation.

… ACCELERATES DECREASING DIVERSITY

Apart from the overgrazed hills and the river valley with few tamarisk trees, the diversity even of the cultivated plants is decreasing in recent times. Farmers from the adjacent Hamzehloo village reported the growths of wheat still in the 20th century, nowadays just barley resists on the rather dry and slightly salty soils. Based on archaeobotanical evidence we can expect a functioning farming subsistence in the region (Fig. 2) and a more intact wood cover for the Achaemenid and Sasanid period than nowadays conceivable.
(NB)

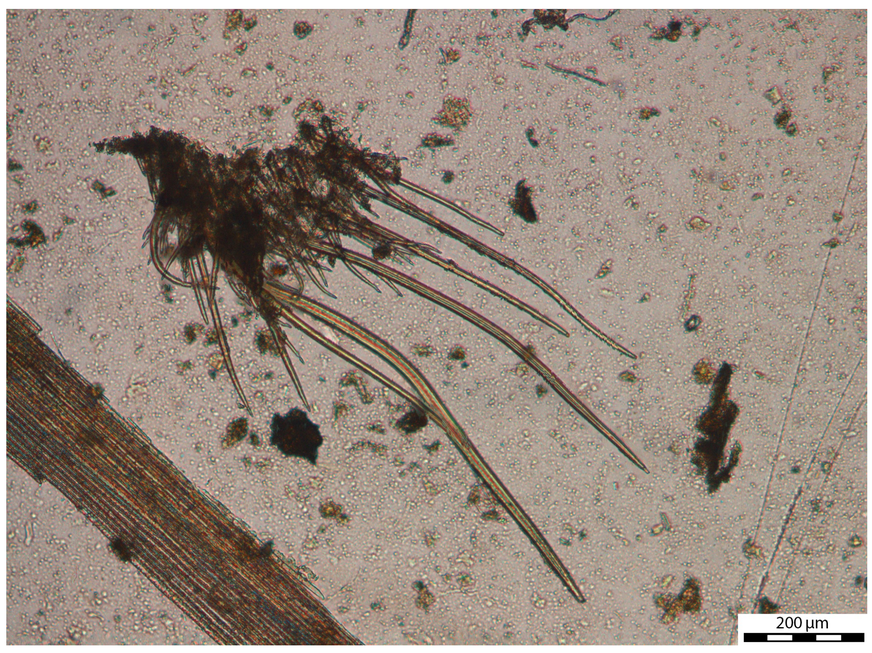

Fig. 2: Grain residues in human faeces from the Douzlākh salt mine. Apex of a wheat grain.

GEOLOGY AND GROUND WATER RESOURCES

The area around the Douzlākh is made up mainly by alternating layers of greenish and brownish marls with intercalated evaporites which probably have been formed in a shallow marine environment. They belong to the Upper Red Formation of Upper Miocene age.[1] These layers are intensively folded and weather easily, generating fine grained (silt and clay) sediments in the small valleys around the Douzlākh (Fig. 3).

USAGE OF SURFACE WATER

Due to their fine-grained nature these sediments can’t be used for ground water extraction. In these areas the population is dependent on the usage of surface water. Ground water resources are mainly located in the valley of the Talkherud River where coarser sediments have been eroded and transported from upstream areas and sedimented in the bed of the Talkherud River forming lenses of sand and gravel with good ground water storage possibilities. (RH)

1 Geological Survey of Iran. Geological Map of Iran 1:100.000, Sheet No. 5563, n.d.

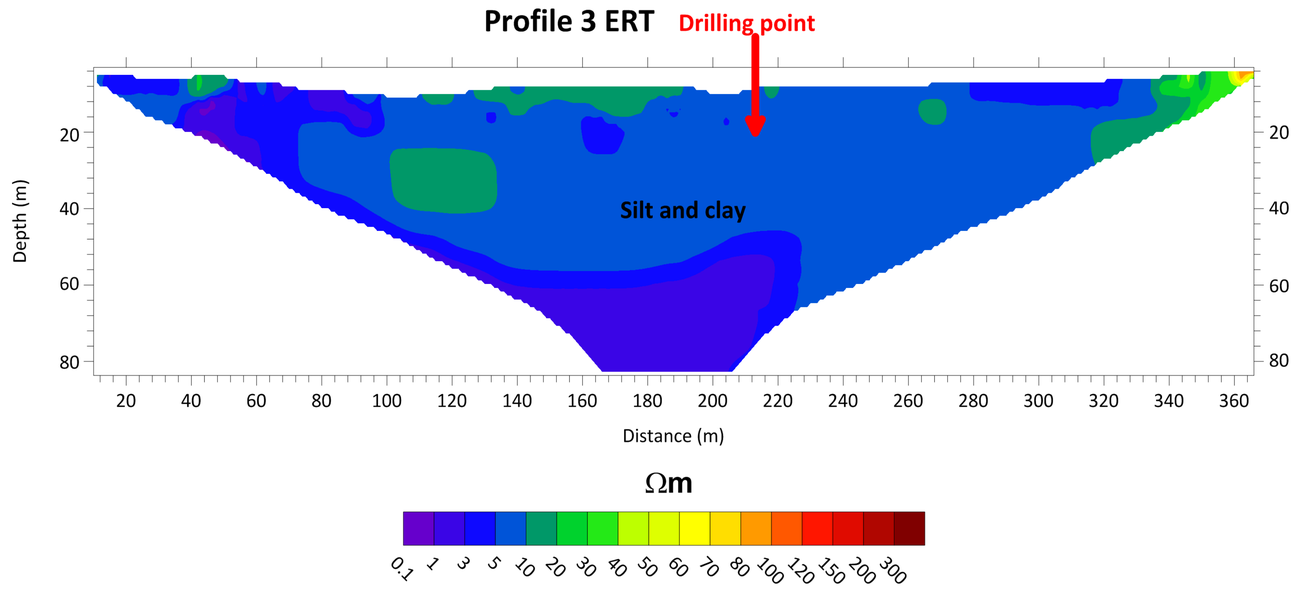

Fig. 3: Result of a geoelectric measurement (ERT) in the Chehrābād River valley south of the Douzlākh showing mainly fine-grained sediments in the underground which were also confirmed by a drilling. Due to a higher salinity of the ground water the resistivities of the sediments are lower than in typical freshwater environment.

Fig. 4: Landscape around the saltmine of Douzlākh in spring 2016.

SCIENTIFIC INTERVENTION IN PRACTICE

Geological, archaeobotanical and cultural observations, as well as climate studies, allow scientists to understand how active action by ancient societies can have an impact. The knowledge also helps to understand today's natural environment and living conditions. Ideally, these insights can also be used in real life. Without the presence of archaeological and geological scientists, little attention would have been paid to the needs of local people. The data on geology, surface water and groundwater collected in the scientific projects create the basis for improving groundwater use through well construction and desalination. Since 2019, the so-called "Water-Project" has been working together with hydraulic engineers from the IWAR Institute, TU Darmstadt, to develop a sensible water supply concept at a geologically very complex site.

CONCLUSION

The observation of the real time effects shows positive changes for the population after only a short time. People are trying to re-establish their living space in the village instead of migrating completely to the big cities. Just with the announcement of the return of drinking water, the motivation to renovate or build new houses also increased. The example shows us how sometimes small but decisive changes influence people's lives and enable "resilience" against adverse living conditions. (NBK)

Institutions involved:

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- Ruhr-Universität Bochum (NB)
- Institut IWAR, Technische Universität Darmstadt (Prof. Dr. Wilhelm Urban, Dipl. Ing. Chrisitian Eichhorn, Jakob Hummel, BA)
- Lehrstuhl Rohstoff- und Ressourcenwirtschaft, Brandenburgische Technische Universität Cottbus-Senftenberg (RH)
- Achäologisches Museum Frankfurt (NBK)
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