

GOAL EDUCATIONAL RESOURCE

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TITLE OF THE CASE	Integration of geoethical aspects of georesources within field trips of Earth sciences academic courses
SHORT CASE DESCRIPTION	<p>One of the geoethical subjects of the GOAL project is Earth resources. Aspects of this subject could be included in several academic geoscience courses. For example, introduction to geoscience, geological mapping, mining, Earth resources, natural resources, etc.</p> <p>Many geoscience courses include field trips as an integral part of the course. This educational resource presents examples of using geoscience field trips to raise geoethical dilemmas that appear while the mining of earth resources interacts with geoheritage and/or with the economical resource of geotourism.</p>
KEYWORDS	Educational resource; Field trip; Geoheritage; Georesources; Geotourism; Natural resources; Outdoor learning environment.
PRIOR KNOWLEDGE	Geoethics; Geoheritage; Georesources; Geotourism; Outdoor learning environment.
AIM	Promotion of the integration of geoethical values (ethical, cultural and social) within geoscience academic courses.
OBJECTIVES	<ul style="list-style-type: none"> • To present concrete examples of field trip activities related to Earth science phenomena that appear worldwide. • To present concrete examples of field activities that can be easily modified for teaching in various academic courses in any country. • To defend geoethical values to preserve the Earth system (social value). • To present concrete examples of field trip activities that raise ethical, social and cultural dilemmas that appear everywhere. • To boost geoethical education in schools and in higher education (social values).

CASE

Field trips are still a common teaching environment for many geoscience academic courses. Moreover, the outdoor environment enables exposing students to concrete geoethical dilemmas that arise directly from their field observations.

However, to fulfil the educational strengths of the outdoor environment, lecturers have to change their teaching method in the field. In the outdoor, they should focus on active learning instead of their lecturing habit. They should use worksheets with instructions and questions that would direct the students to a concrete interaction with the phenomena and not with the lecturer (GOAL's eBook).

The following are two examples of the suggested method of raising geoethical dilemmas concerning the exploitation of Earth resources:

Case 1: Makhtesh Hatira – The interaction of mining with social and cultural values.

The Israeli Makhteshes are a unique geological phenomenon (Fig.1).

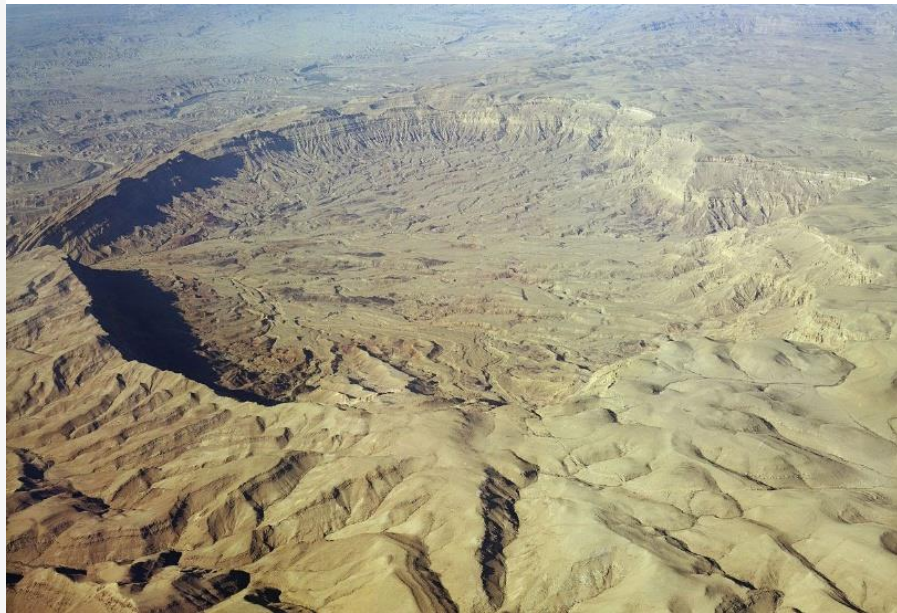


Fig. 1 – Areal view of Makhtesh Hazera, Northern Negev, Israel.

Makhtesh is an erosional crater formed by the unique stratigraphy, structure, and geological history of Israel's Negev Desert. Erodible sandstones that were overlain by brittle limestone and dolomites were folded to anticlines that emerged as islands above the Thetis sea. Abrasion and truncation of those island anticlines started the erosion processes that led to the formation of the Makhteshes (Fig. 2).

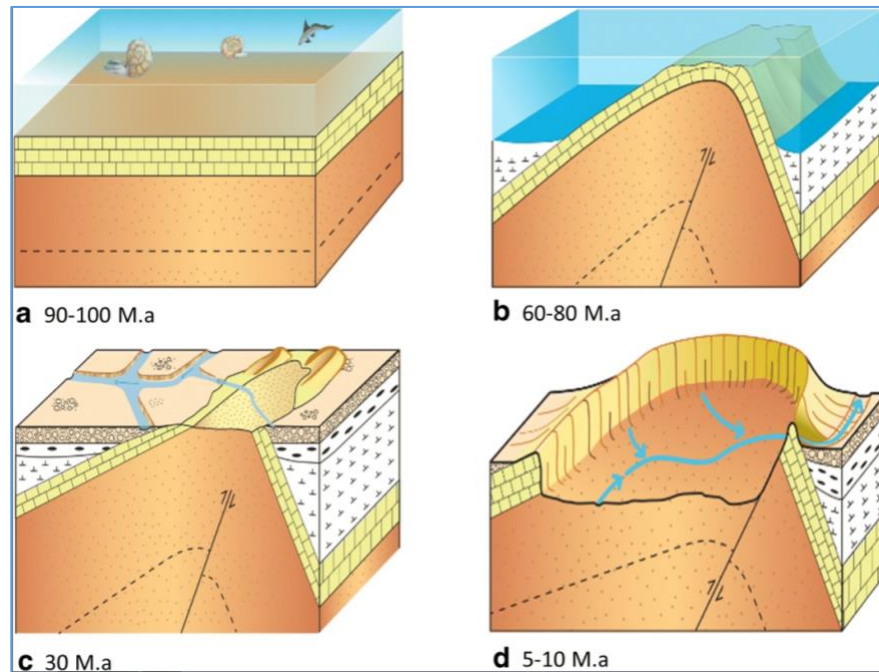


Fig. 2 – Evolution of a Makhtesh in 4 stages (retrieved from Finzi and Ryvkin, 2016).

Makhtesh Hatira is a popular site for tourism as well as for a variety of geoscience academic courses and each geoscience student visit this site at least once during his/her academic studies.

Makhtesh Hatira was designated as a National Reserve. However, in the hurt of this unique geological/geomorphological phenomenon, a big sandstone quarry that mines the colorful Nubian sandstone, which is one of the main attractions of Makhtesh Hatira (Fig.3, Fig. 4).



Fig. 3 – Sandstone quarry in the heart of Makhtesh Hatira.



Fig. 4 – Colorful sandstone in Makhtesh Hatira.

This conflict between mining and geotourism is a well-known and very common all over the world. Therefore, the "quarry" activity in the procedure section (appendix 1), is applicable worldwide.

Case 2: The Dead Sea – The interaction of the Dead Sea industry with the tourism industry

The Dead Sea is a unique Earth systems phenomenon (Fig.5).



Fig. 5 – The Dead Sea North basin.

The Dead Sea has two basins. The deep northern basin of about 400 m depth and southern very shallow basin. The Potassium industry took over of the southern basin and converted it to evaporation ponds. Many hotels were built along the coastline of the biggest pond for the hundreds thousands of tourist who come to experience the leisure and medical attractions of the Dead Sea. However, following the sedimentation of halite crystals on the bottom of the evaporation pond, the Dead Sea

	<p>industry raises the pool walls every year. Consequently, the water level of the pool continuously rises and already reached level of the ground floors of the hotels. To prevent the flooding of their lobbies, the hotels have to pump the water. The hotels asked the Dead Sea industry to deepen the ponds instead of raising the ponds' walls. The Dead Sea industry refused and this case went up to the court.</p> <p>This conflict between earth resources industry and geotourism is common all over the world. Therefore, the activity "The story of two industries" in the procedure section (appendix 2), is applicable, with the needed modification worldwide.</p>
<p>QUESTIONS</p>	<ol style="list-style-type: none"> 1. In what conditions, if at all, is it right to mine earth resources at a unique geoheritage site? 2. What will be the social and economic implications, if the mining was stopped at the Makhtesh or at the Dead Sea? 3. What are the consequences of not informing the public about the unique geology of the Makhtesh? 4. How can we avoid the risk of not preserving these geoheritage sites?
<p>PROCEDURE</p>	<p>Procedures concerning georesources - https://goal-erasmus.eu/wp-content/uploads/2020/02/IO4E-The_Rock_Cycle_of_Makhtesh_hatira.pdf</p>
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