



מכון ויצמן למדע
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המחלקה להוראת המדעים
קבוצת מדעי כדור הארץ והסביבה

The Dead Sea: Risks, Resources and Geoethics

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**4th GOAL workshop
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The learning stops and expected schedule

- 12:45 – Stop1: The evaporation pools observation point.
- 13:15 – Lunch break at the Dead Sea mall
- 14:00 – Stop 2: The elevated beach
- 15:30 – Stop 3: The dancing varves
- 17:00 – Stop 5: The sinkholes

Stop 1: A view of two industries



1. Below, you can observe two profitable industries. What are they? _____
2. How do the different Earth systems affect the Dead Sea Potassium industry?
 - a) Geosphere: _____
 - b) Hydrosphere: _____
 - c) Atmosphere: _____
 - d) Biosphere: _____
3. How do the different Earth systems affect the Tourism industry?
 - a) Geosphere: _____
 - b) Hydrosphere: _____
 - c) Atmosphere: _____
 - d) Biosphere: _____

4. After the drying of the Dead Sea's shallow southern basin, the Dead Sea Industry turned this area to evaporation ponds. The Dead Sea Industry pumps Dead Sea water from the northern (deep) basin and transport it to these evaporation ponds. The water stays in these evaporation ponds until all the Halite crystallizes and participate on the pools' floor.

- Look at the piles crossing the pools. What in your opinion is the reason for the building of these piles? _____

5. How does the process in the ponds affect the hotels built on the beach?



Stop 2: The elevated beach

1. Notice, that while walking from the shopping center to the shoreline, you have to go up and then to go down to the beach.

- Do you have an idea why was the shopping center built beneath the water level of the ponds?

2. How does the Dead Sea Potassium industry influence the water level of the evaporation ponds? _____

3. Notice the pump house (ask the teacher to show you). There are many pump houses like this along the beach. What do you think is the reason for those pumps houses? _____

4. Each year, hundreds of thousands of visitors spend the night in hotels along the Dead Sea coast. Do you think that continuous rising of the water level puts them at risk?

Explain: _____

5. Do you think that the visitors of the hotels are aware of the possible risk here?

6. Do you think that the geoscience community should actively update the public about the possible risks of staying at the Dead Sea's beach hotels, or is it only the responsibility of the Ministry of tourism to update the public? Explain: _____

Stop 3: The dancing varves



1. Look at the exposure and pay attention to the thin white and gray layers.
 - Try to drip a few drops of hydro-chloric acid on a white layer.
 - **Observation** (circle): *fizzes / not fizzes* - **Conclusion:** _____
 - **External information:** Under the microscope, it is possible to identify that the white layers consists of the mineral Aragonite.
 - Test the malleability of the grey layer.
 - **Observation** (circle): *malleable / not malleable* - **Conclusion:** _____

External information: The alternating layers reflect seasonal changes in the lake that covered this area, in which these layers were deposited.
2. Which of the layers precipitated in the summer (circle): *the grey layers / the white layers*
Explain: _____
3. Which of the layers precipitated in the winter (circle): *the grey layers / the white layers*
Explain: _____
4. According the seasonal model, in how many years, a 10 cm of the exposure were piled up?

5. Try to identify in the exposure sets of wild folded layers (verify your observation with the teacher).
 - Are the layers beneath the folded set, folded as well? _____
 - are the layers above the folded set, folded as well? _____
6. According to your field observations, could you suggest a model for the formation of these disconnected sets of "dancing folds" (*hint: the superposition and the initial horizontality principles*)? _____

7. Do you think that the disconnected sets of "dancing folds" phenomenon might be related to geothics issue of the hotels on the shoreline of the evaporation ponds? _____



Stop 4: The geomorphological terraces

1. Observe geomorphological terraces on the Dead Sea beach. Can you suggest a model for the formation of these terraces? _____

2. Each terrace indicates a year. Can you estimate, following your observation, when the current shrinking of the Dead Sea started?

- **External information 1:** There are two reasons for the shrinkage of the Dead Sea (a) Drying the Jordan River that use to bring water to Dead Sea. (b) Pumping Dead Sea water to the evaporation ponds of the Dead Sea Industry.

- **External information 2:** Beneath the upper gravel layer of the Dead Sea exposed shore, in depth of 7 meters there a 2 meters thick layer of Salt.



Stop 5: The sinkholes

1. We are walking now on what used to be the main highway from Jerusalem and the North to the south. It was closed due to the sinkholes that had no engineering solution.

2. To the east of the sinking road, you can see the remains of a holiday village that sank into sinkholes.

3. To the west of the sinking road, you can see the remains of a palm orchard that sank into sinkholes.

4. What is the reason for the appearance of the sinkholes in the recent years? _____

5. Do you think that the huge damage of the sinkholes is a geoethical issue? Explain: _____

Summary question: In what university courses would you include these field trip stops, to cover the geo-ethical issues touched upon here?
