An island without land... is?

Science Film Festival — Knowledge Through Entertainment

An introduction to soil-water dynamics, geological subsidence, soil liquefaction, and how it is linked to land subsidence and soil liquefaction. This activity will focus on the concept of soil and water dynamics in the context of human community safety and hazards. An experiment that can easily be replicated at home will be demonstrated by the facilitator to show the effects of aggressive groundwater extraction, reclamation, and unregulated coastline developments. Proceeding discussion can open the topic directed towards awareness, environmental (water) conservation and mindfulness, and ultimately, policy and regulation reviews.

QUESTIONS

1. **When it rains - where do you think the water goes?**
2. **Do you think much seeps into the ground - is there much water in the ground under our feet?**
3. **Do you think the water in the ground has any effects?**
4. **What happens when you mix water and soil? Does it change the soil - does it change slowly as you add water, or does it change suddenly.**
5. **What makes up our soil - how are soils similar or different? How is sand different from pebbles? What about the difference between rocks, mud, clay and loam? What do they feel like to touch?**
6. **How is wet sand different from dry sand (visual and tactile)? How is wet loam different to dry loam?**
7. **Is water infinite? Where does groundwater come from?**
8. **When water is rapidly taken from underground, what happens to the land mass on top of it?** Note: Facilitator can compare this to drinking milkshake with whip cream on top through a straw.
9. **What happens if you put sand and soil on top of an existing body of water (i.e. reclamation)?** Note: Facilitator can use a sponge and water setup to demonstrate this.

TIME REQUIRED

15-20 min.

MATERIALS

- PET bottles, plastic cups, or any transparent plastic containers
- Water
- Sand and sand scooper
- Spoon or Pen or any rod-like elongated material
- Toy house or toy blocks or any heavy material that can represent a building or a house that would fit in the container
- (Optional) Mung beans, coconut husks, cottons, fiber threads, straws, scissors

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PROCEDURE

DEMONSTRATION

1. Fill the container with water (around 3-4 cm).
2. Add sand into the tray then start mixing it with water using the scooper. The sand-water ratio is critical**. There should not be 'puddles' or 'patches' of water when the sand is leveled. The sand should be not too wet and not too dry also.
3. Put the toy house or block on top of the sand-water mixture inside the tray.
4. Using a spoon or pen, gently but quickly tap the side of the pan and observe how the water slowly rises to the surface. Alternatively, the facilitator can put the tray on top of a skateboard and move the skateboard side-to-side gently but quickly (or shake it using hands only) to produce the same result.
5. Discuss the activity with the learners.

****The facilitator can test the liquefaction beforehand. They can check for liquefaction by using the above procedure and see if water rises. If it does, the facilitator can easily reset the set-up by re-mixing the water-soil slurry until no puddles of water are visible.**

EXPERIMENT

1. Using the guide questions above, allow the learners to play around with the sand and water mixture. Allow them to discover the effects of water-sand through experimentation. Ask their insights about differences in tactile and visual terms of varying soil-sand ratio.
2. The learners now have a stronger grasp of the soil-sand dynamics, the facilitator can build a stronger foundation on the topic of water-soil dynamics by momentarily demonstrating the procedure in 4.1.
3. The facilitator can now introduce the learners to the topic's extensions by allowing the learners to test the same procedure using different soil types and water volume. Guide the learners to aim in observing conditions when liquefaction happens and when it does not.
4. Using the optional materials stated in this module (e.g., mung beans, coconut husks, cottons, etc.). Use the following additional guide questions:

   a. What happens to the water level when we mix cotton and husks in the soil-water mixture?

   b. Does liquefaction occur? Where does the water go? What do these materials represent? If we add mung beans to the slurry, and allow them to grow, what will happen to the water?

   c. Does water level change (mark water level using a marker and observe)? What happens when we keep water level constant, did the consistency of the slurry change? What happened to the mung beans? What do these materials and conditions represent?

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The facilitator can use the guide questions before/during the demonstration to pique the curiosity of the learners. Once the demonstration is over, the facilitator can use the questions again and see if there were changes in the learners' answers. Ask learners if they have experienced or heard about land subsidence or soil liquefaction before.

The facilitator can then lead the learners into online communities, websites, and groups that advocate on water and community sustainability. This can be localized to the participants' area.

The facilitator must search for water and/or environment conservation groups in their country/locality and give the learners access to these online communities and contents. This will further nurture their curiosity and enhance their drive to follow through with the message of the activity. International groups like Greenpeace, the WHO, and the SDG Youth Force 2020 can be a good jump off point too.

VARIABLES

This demonstration/experiment can be extended to buoyancy experiments. Using the same setup, buoyant materials (like a ping pong ball) will be buried in the sand-water slurry. Repeating the same procedure would result into the buoyant material to 'float up' to the surface. This may be representative of the possible consequences of management actions that involved burying tanks or waste materials in underwater sediments. Water table experiments can also be introduced as an extension (or a primer), wherein learners would test water table levels depending on soil type, ratio, and thickness.

Authors/Source

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