# Dar Soils Investigation

**Syllabus Topic 3.4.2**

**Objective**

You will design and carry out an independent investigation of soil properties and quality in and around Dar es Salaam, Tanzania. You may also compare soils in Dar es Salaam to those in another part of Tanzania, if you are traveling out of town during the term. Students will compare & contrast soils in 2 different locations (NOT the IST campus) and attempt to explain the factors causing differences, if any, in the 2 sites' soils.

**Background Information**

- 5 Factors of Soil Formation
  1. Weather/climate
  2. Underlying geology
  3. Biological organisms
  4. Topography
  5. Time - soil forms at rate of 1 cm per 250-2,500 yrs
- Soil composition:
  - 45% Minerals (how do rocks break down to soil?)
  - 5 % Organic matter = decomposed plants & animals (how does this happen?)
  - 25% Water (where does this come from?)
  - 25% Air (how do you know this is there?)
- Minerals or rocks break down due to air and water erosion; chemical breakdown due to lichen and weathering (freeze-thaw action).
- Organic matter may be the smallest % but it is extremely important. OM is the result of the decomposition of dead plants and animals by many organisms. Organic matter adds nutrients to soil:

  worms bacteria protozoa snails slugs
  slime crickets sow bugs millipedes ants
  fungi (mushrooms are fruiting bodies of fungus. Penicillin was derived from a soil fungus)
- Ants are the major mechanical modifiers of world's soils.
- Worms provide most soil fertility.
- Water comes from precipitation (rainfall and snowfall)
- Air fills the spaces between particles, until forced out by water.

**Helpful Websites:**

http://www.nscss.org/content/pennsylvania-manual-site-specific-soil-investigation

http://test.teachengineering.org/view_lesson.php?url=http://test.teachengineering.org/collection/cub_/lessons/cub_rock/cub_rock_lesson05.xml

http://soil.gsfc.nasa.gov/touchtheearth/backyard.htm

http://wupcenter.mtu.edu/education/Forest_Education/lesson_plans/forest3.htm

Also check out the notes for ESS Topic 3.4 - Soil Systems, available on www.mrkremerscience.org

**Due Dates:**

Due dates for your written proposal, completed data tables, and the full lab will be posted on the ESS class calendar. Please check the website.

## Assessment Criteria:

This is a *full lab*, meaning your work will be assessed under the PL, DCP, and DEC criteria described in the student handbook and listed below.

| **PLANNING (PL): Total Marks _____ out of maximum 6** | | | |
|---|---|---|---|
| **Levels/marks** | Aspect 1 | Aspect 2 | Aspect 3 |
| | **Defining the problem and selecting variables** | **Controlling variables** | **Developing a method for collection of data** |
| **Complete/2** | States a focused problem/ research question and identifies the relevant variables. | Designs a method for the effective control of variables. | Describes a method that allows for the collection of sufficient relevant data. |
| **Partial/1** | States a problem/research question that is incomplete or identifies only some relevant variables. | Designs a method that makes some attempt to control the variables. | Describes a method that does not allow for the collection of sufficient relevant data. |
| **Not at all/0** | Does not state a problem/ research question and does not identify any relevant variables. | Designs a method that does not allow for the control of the variables. | Describes a method that does not allow for the collection of any relevant data. |
| **DATA COLLECTION AND PROCESSING (DCP): Total Marks _____ out of maximum 6** | | | |
| **Levels/marks** | Aspect 1 | Aspect 2 | Aspect 3 |
| | **Recording data** | **Processing data** | **Presenting processed data** |
| **Complete/2** | Systematically records appropriate quantitative and/or qualitative data*, including units. | Processes primary and/or secondary data correctly. | Presents processed data appropriately and effectively to assist analysis. |
| **Partial/1** | Records appropriate quantitative and/or qualitative data but with some mistakes and/or omissions. | Processes primary and/or secondary data but with some mistakes and/or omissions. | Presents processed data appropriately but lacks clarity or with some mistakes and/or omissions. |
| **Not at all/0** | Data is not recorded or is recorded incomprehensibly. | No processing of data is carried out or major mistakes are made in processing. | Presents processed data inappropriately or incomprehensibly. |
| **DISCUSSION, EVALUATION AND CONCLUSION (DEC): Total Marks _____ out of maximum 6** | | | |
| **Levels/marks** | Aspect 1 | Aspect 2 | Aspect 3 |
| | **Discussing and reviewing** | **Evaluating procedure(s) and suggesting improvements** | **Concluding** |
| **Complete/2** | Discussion is clear and well reasoned, showing a broad understanding of context and the implications of results. | Identifies weaknesses and limitations and suggests realistic improvements. | States a reasonable conclusion, with a correct explanation, based on the data. |
| **Partial/1** | Discussion is adequate, showing some understanding of context and implications of results. | Identifies weaknesses and limitations but misses some obvious faults. Suggests only superficial improvements. | States a reasonable conclusion or gives a correct explanation, based on the data. |
| **Not at all/0** | Discussion is inadequate, showing little understanding of context and implications of results. | The weaknesses and limitations are irrelevant or missing. Suggests unrealistic improvements. | States an unreasonable conclusion or no conclusion at all. |