

Project: Drainage in Nouakchott – nature-based solution

Starting date: November 11th, 2025

Finish date (delivery): December 09th, 2025

***** IMPORTANT *****

In groups of 2 people, present the results of the project in a report-style document with a maximum of 10 to 15 pages (written in English). Hand in the Excel sheets associated with your simulations.

Questions:

1. Introduction and conceptualization (11/11/2025) – 10%

Establish a conceptual map of the mean annual water fluxes for the city in the current state and with a tree-planting solution by identifying the variables of the water budget. Is this water budget in steady-state or transient state? When possible, quantify the fluxes.

2. Groundwater flow modelling (18/11/2025) – 40%

2.1. Considering a steady state, establish a simple 2D planar hydrogeological model to map the groundwater levels in Nouakchott in the current situation. Using the simplified shape of Nouakchott, only represent a “strip” of Nouakchott that is 2 km long in the north-south axis.

Describe the boundary conditions that you used.

Compute the mean error and the mean absolute error of your model and comment if this error is acceptable for the model to be further used.

2.2. Plot a piezometric map of the current situation and describe the groundwater flow. Identify which neighborhoods are dealing with flooding.

2.3. Quantify the fluxes of the water budget for the simulated area. Is the water budget balanced?

3. Long term scenario: planting strategy (25/11/2025) –25%

3.1. List the benefits that the different tree species could bring to the city, and more generally the benefits from a tree-planting program in hot desert climates and in urban environments. Be inventive and broad, you can document your discussion based on scientific literature.

3.2. Using the transpiration rates estimated from the in-situ monitoring (**Table 2**), simulate the impact of tree-planting scenarios on the groundwater levels. Present the impacts of the best performing scenario (optimistic) and a more pessimistic scenario. Explain what motivated your choice in the scenarios.

Discuss your results in planar view (drawdown) and cross-section.

3.3. To which extent do you believe that the proposed scenarios are feasible considering that the city is already densely populated and the available space is

limited? What are the limitations of these tree-planting scenarios (engineering, funding, time frame, legal, social, political)? Suggest long-term implementation strategies that could increase the success of a tree-planting project. Pay particular attention to the social acceptance of the project (how to involve citizens in such a tree-planting program, where would be the ideal places to plant trees, why?).