



# HYDROGEOLOGICAL MAPPING

The Barbados Experience



Global Water  
Partnership  
Caribbean

## Case Study

# Hydrogeological Mapping for Barbados

## BACKGROUND

Barbados is one of the most water scarce countries in the world, with an average renewable water volume per person of 280 cubic metres/year. The lack of sound scientific information such as hydrogeological maps, has in part led to unsustainable management practices.

This has resulted in high salinity levels in wells close to the coast, and the need for the island to explore water importation as a short-term measure. This project was implemented by the **Centre for Resource Management and Environmental Studies (CERMES)**, from October 2021 to March 2022, and funded by the **Small-scale Integrated Water Resources Management (IWRM) Grants** from the **Global Water Partnership-Caribbean (GWP-C)**. The project addressed a latent knowledge gap through a combination of data gathering and analysis to generate a preliminary hydrogeological map of the island of Barbados.

## ACTIONS TAKEN

The overall objective of this project was to develop a preliminary hydrogeological map for Barbados that significantly improved understanding of the occurrence, distribution, and driving factors of groundwater flow on the island. This objective was achieved through the implementation of the following actions:

1. Collection of topographical, geological, and hydrogeological information for the entire island.
2. Digitisation of the data collected, creation of layers in ArcGIS, and assignment of properties to the layers based on the relevant hydrogeological properties.
3. Generation of a preliminary hydrogeological map and preliminary numerical model that is representative of the extent of the Pleistocene limestone aquifers, underlying aquitards, and provides a sound representation of Barbados' hydrogeology.

## OUTCOMES

The specific results achieved are the following:

1. Data have been collected including: topographic data, soil data, limestone basement geology data, and hydrometeorological data.
2. The raw data have been digitised and analysed in ArcGIS (See Image 1).
3. The ArcGIS data have been post-processed and entered into the hydrogeological modelling software using the tools purchased under the project (MATLAB & FEFLOW).
4. Preliminary simulations of 3D flow are representative of the regional groundwater flow dynamics on the island (See Image 2).
5. Sensitisation training was done with twelve (12) Environmental Protection Department Officers to highlight the importance of hydrogeological mapping and modelling tools for Barbados, as it is both water-scarce and the aquifers are vulnerable to climate change and contamination.
6. A GWP-C IWRM Youth Ambassador was awarded a one-week internship at CERMES (during the period March 7<sup>th</sup> - 11<sup>th</sup>, 2022) and was trained on using the software purchased.

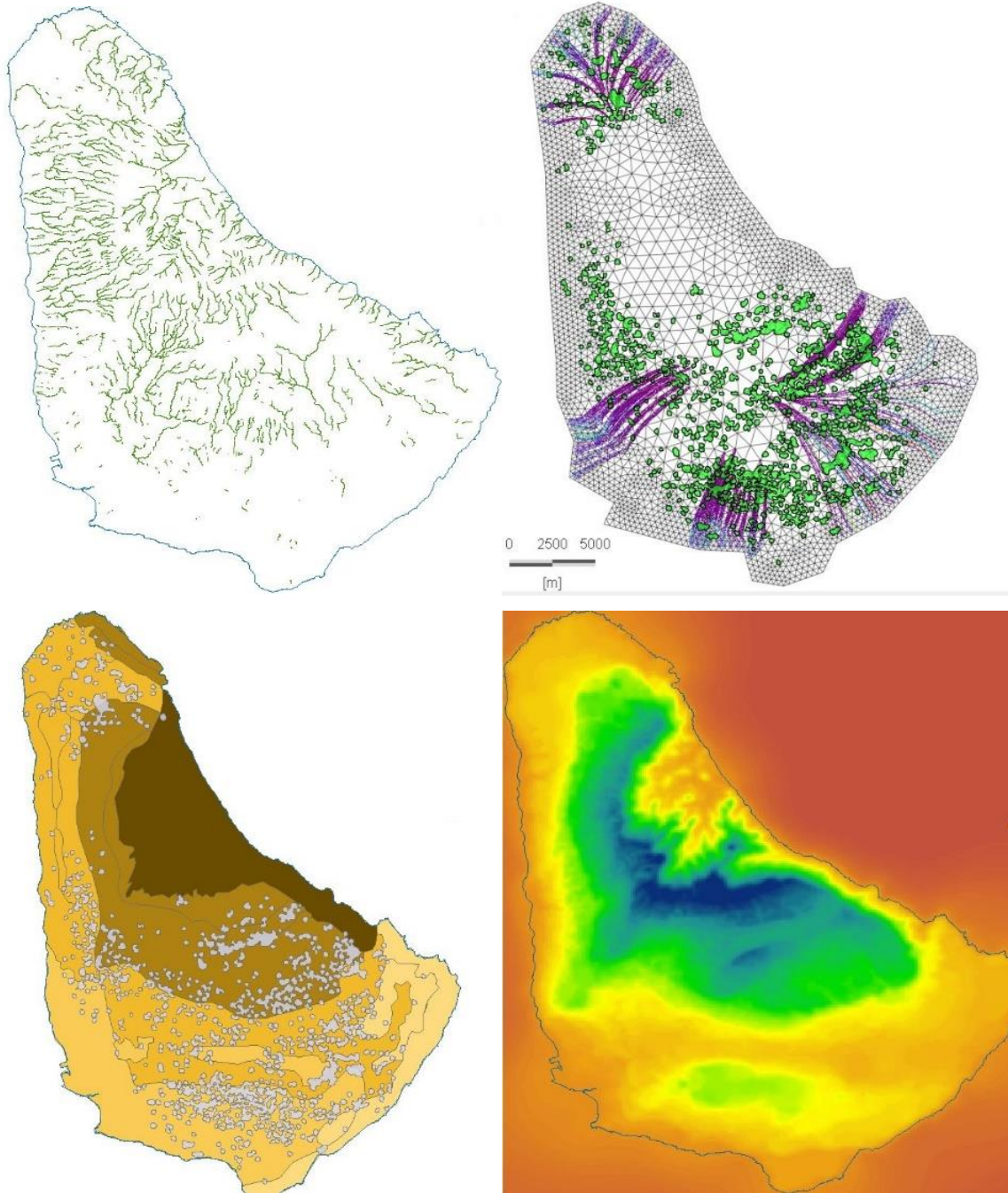


Image 1: Top left: capture streams; top right: flow sinkholes, bottom left; soils sinks; bottom right: DEM - developed by Dr. Karl Payne (Lecturer in Water Resources Management at CERMES).

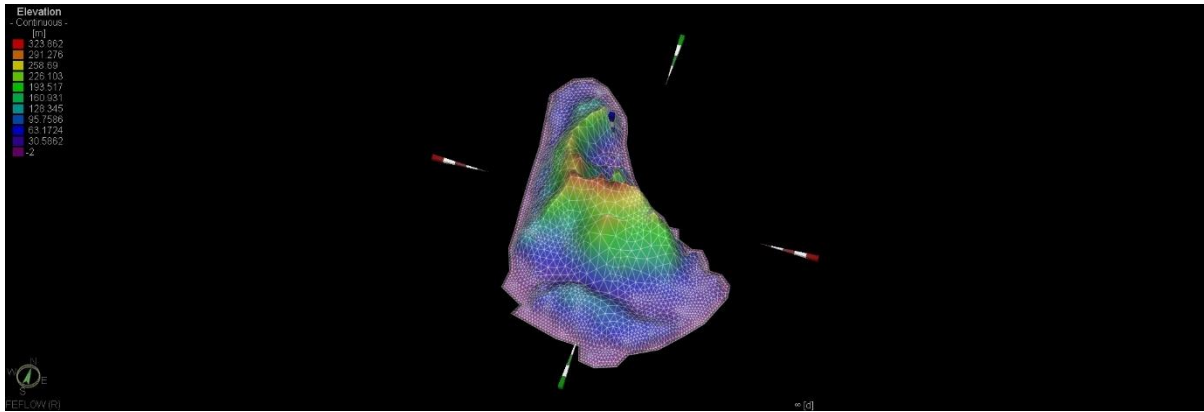


Image 2: Snapshot 3D modelling Barbados developed by Dr. Karl Payne.

## LESSONS LEARNED

The main long-term benefit is that the hydrogeological maps and models developed will assist the **Barbados Water Authority (BWA)** and **Environmental Protection Department (EPD)** to manage the island's aquifers more sustainably under a changing climate. This will be critical in ensuring that the problems of acute water shortages and nitrate contamination of aquifers are reduced. Additionally, having a visual representation of the island's flow dynamics help non-water experts (especially critical stakeholders such as decision-makers) to understand the vulnerabilities of Barbados' aquifers.

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**Key Themes:** Hydrogeological mapping - Integrated Water Resources Management (IWRM) - Groundwater Management - Hydrology