A combined GIS and remote sensing approach with social participation for monitoring groundwater to support climate change mitigation and adaptation measures in Armenia

PhD student
Lilit Aram Minasyan

PhD program
Climate Change and Sustainable Development Policies
(ICS, University of Lisbon)

Supervisor
Teresa Condesso Melo (CERIS, IST, University of Lisbon)

Co-supervisor
João Guerra (ICS, University of Lisbon)

Period
2022-2025

Funding
AGBU scholarship (2022)

Summary

As the global community grapples with the multifaceted challenges of climate change, the sustainable management of groundwater resources emerges as a crucial element in mitigating its impacts. Groundwater is a lifeline for millions, particularly in arid and semi-arid regions. This thesis deals into the integration of Geographic Information Systems (GIS) in groundwater monitoring and registration, emphasizing its significance in addressing climate change consequences. Furthermore, it scrutinizes the social inclusion aspects of this process to ensure equitable access and benefits for all communities.

The utilization of GIS technology in groundwater management has revolutionised data collection, analysis, and visualization. GIS facilitates informed decision-making for resource allocation and conservation by providing a comprehensive spatial understanding of aquifer dynamics. This abstract underscores the pivotal role of GIS in enhancing the efficiency and accuracy of groundwater data management and promoting proactive climate adaptation measures.

This thesis also investigates the social dimensions of groundwater monitoring and registration. Climate change disproportionately impacts marginalized communities, making social inclusion imperative. The study examines strategies for ensuring the equitable participation of marginalized groups in decision-making processes related to groundwater management. It assesses how GIS can serve as a tool to empower vulnerable communities, foster stakeholder engagement, and promote adaptive strategies that are socially inclusive.

The next step of the work will be environmental monitoring and field data collection. By using the remote sensing technologies, we will review the main assumptions and challenges that govern the process of the development of the land cover, land use, vegatation, water resurses, and anthropogenic pressure maps, including but not limited to:

- Meteorological conditions and seasonality (access to the site, ordering of on-demand satellite imagery with necessary characteristics of vegetation growth and cloud cover);
- Availability and fitness for use of archival imagery, where new acquisition is not a possibility;
- Compatibility of imagery with with land cover classification system with review of the Copernicus Land Monitoring Service
- Use of a combination of sources: recent archival (2010-2024) Sentinel-2, Landsat-8: Modis collection; auxiliary checks with publicly available mapping resources.

Next, using different methodologies, we will try to understand the physical properties of soil and groundwater distribution, groundwater flow patterns, and then combine them to make a spatio-temporal dynamic analysis.

Keywords

GIS, groundwater, climate change, sustainable management, social participation.