

CALL FOR PhD CANDIDATE



ENSURING GROUNDWATER RESILIENCY IN THE KUMASI METROPOLIS THROUGH MANAGED AQUIFER RECHARGE

Background

Africa is the fastest growing region in the world. Seven of the ten countries with the fastest projected urbanization rates between 2018 and 2050 are in Africa. This rapid increase in the population puts enormous pressure on water systems as the demand for water grows faster than the population. However, water supply infrastructure development is unable to keep pace with the rapidly increasing water demands. Consequently, reliance on groundwater is steadily increasing as people seek to get reliable source of water supply.

Kumasi in central Ghana is no exception to these urbanisation trends that characterise African cities. The Metropolis has become heavily reliant on ground water use due to its reliability, general good quality, and low-cost development. Many residents and businesses have dug private wells that tap into the aquifer. The trends in urbanisation combined with the increasing abstraction from the aquifer have worrying implications for the sustainable use of the ground water. A recent study in Kumasi showed alarming trends in the recharge rates to the underground aquifer. Due to the increase in the impervious urbanized area and loss of green spaces, much of the rainfall no longer infiltrates into the aquifer but is transported out of the city via large concrete storm drains and into rivers which ultimately flow to the sea. Results indicated that groundwater recharge decreased by 80% from 1986 to 2020¹. The city has lost the ability to naturally replenish its own underground water resources and it is only a matter of time before there is insufficient ground water to serve Kumasi's needs¹.

To enhance the resilience of groundwater resources, Managed Aquifer Recharge (MAR) programmes have been developed and implemented worldwide. Through the MAR approach, water is intentionally harvested and infiltrated to recharge depleted aquifer storage.

The focus of this research project is in two folds. Firstly, to comprehensively understand the groundwater dynamics in the Kumasi Metropolis and secondly to pilot a Managed Aquifer Recharge system aimed at improving groundwater recharge. Based on this, the following questions will guide the research:

1. How much rainwater can be feasibly infiltrated into the aquifer system through MAR and how will this impact groundwater availability?

¹ Potter E.F. (2021). Sustainability of groundwater resources in Kumasi, Ghana. Estimating potential groundwater recharge using a water balance approach and remote sensing data in Google Earth Engine. Masters Thesis. TU Delft, The Netherlands



2. What is the available groundwater resource in the Kumasi Metropolis?
3. What are the spatial and temporal differences in groundwater availability in the Kumasi metropolis – where are the largest and least volumes of groundwater stored and how does it vary throughout the year?
4. How much groundwater is used for domestic and non-domestic purposes?
5. Which major pollution sources threaten the safety of groundwater and where are they located?
6. What is the groundwater flow dynamics in the Kumasi Metropolis?
7. What is the quality of groundwater in selected focus areas i.e. areas with high water tables and widespread pollution sources?
8. How will infiltrated water affect the quality of available groundwater?

The AWC

The African Water Corridor (AWC) is a consortium of partners currently comprising academic institutions, SMEs, engineering consultancies and NGOs led by the Delft University of Technology that acts today to demonstrate solutions that reduce the Water Gap in African cities. For this research project, a team of researchers from Delft University of Technology (TU Delft), Akenten Appiah-Menka University of Skills Training and Entrepreneurship Development (AAMUSTED) and Kwame Nkrumah University of Science and Technology (KNUST) will be involved.

The AWC is interested in finding the solutions that have the largest positive impact on the water gap in rapidly growing African cities. Solutions should have the potential to scale up and address similar challenges in other African cities. Understanding of the local environment and available capacity is also critical, therefore solutions are created with local partners considering local capacity.

Eligibility criteria for PhD candidate

We seek a highly motivated PhD candidate to join our multi-disciplinary and multi-institutional research programme. Through the collaboration of three universities, we will engineer a novel approach for sustainable water management in a rapidly growing city in Ghana which can be replicated in other African cities. The PhD candidate must be a Ghanaian and have:

- at least Second Class (Upper Division) in their first degree;
- completed a Master of Science or Master of Philosophy degree in Water Resources Engineering and Management, Environmental Engineering or related fields;
- strong communication skills;
- excellent written skills as demonstrated by publication in a reputable journal;
- outstanding ability in water quality analysis and Geographic Information Systems;
- skills in project management;

Candidates already enrolled in a PhD programme are not eligible for this scholarship.

What we offer

The PhD candidate shall be given a full scholarship covering tuition and other related fees. S/he shall be enrolled at the Department of Civil Engineering, KNUST as a full-time PhD student for a 3-year period and supervised by researchers from the TU Delft, KNUST and AAMUSTED.

The following are the conditions for the scholarship:

- 1) Monthly stipend for the 3-year period
- 2) Tuition and related fees at KNUST shall be covered for the 3-year period.
- 3) Travel to the Netherlands (1 return ticket) shall be covered for a research visit.
- 4) Visa fee for the Netherlands shall be covered
- 5) Accommodation at the Netherlands (up to 30 days) shall be covered
- 6) A daily fee to cover food costs and transportation in the Netherlands shall be provided in accordance with the regulations of AWC.
- 7) Cost involved in the students' research shall be covered based on a pre-approved budget (travel, accommodation, and materials)
- 8) If the candidate quits his/her education before completing the programme, s/he will be made to reimburse all monies paid to him/her.

How to apply

Eligible and interested candidates are required to submit the following documents via the online application system by clicking on this link: bit.ly/aWCPhd

1. A one-page motivation letter explicitly stating your interest and justification for participation in the programme
2. A research proposal and workplan
3. Proof of journal article publication
4. Proof of Ghanaian citizenship (Ghana card or Passport)
5. Undergraduate and postgraduate certificates and transcripts
6. Two(2) Recommendation letters in support of the scholarship application

Application Deadline: Monday 13th February 2023

For more information, you can contact Ing. Dr. Isaac Monney via email:

imonney@aamusted.edu.gh

Only short-listed applicants shall be contacted for a selection interview.