



# The Global Environmental and Occupational Health (GEOHealth) Hub for Eastern Africa

## Quarterly Report: June - August 2025

### Launch of new BAM-1022 monitors

The GEOHealth Hub has been monitoring ambient air pollution through the establishment of a continuous central monitoring site for PM<sub>2.5</sub> using the MetOne Instruments, Inc. (USA) Beta Attenuation Monitor (BAM-1022). The BAM-1022 was installed during the first cycle of the GEOHealth Hub project in the capital cities of each of the partner institutions, in Addis Ababa (Ethiopia) in 2016, in Kampala (Uganda) in 2017, and finally in Nairobi (Kenya) and Kigali (Rwanda) in Spring 2019. The instruments provided some of the first reference monitor grade data for these cities.

Since installation, the BAMs have provided impactful data over the last 5-7 years that has contributed both to the GEOHealth Hub research aims and to broader policy discussions related to air pollution control in each of the Eastern Africa GEOHealth Hub cities. To maintain the continuous monitoring of ambient air pollution and collection of critical data, each of the GEOHealth Hub teams at the three partner institutions have acquired a new BAM-1022. This summer, each team worked with Mr. Solomon Teffera, an air quality monitoring consultant who worked with the GEOHealth Hub to install the original BAM, to install the new BAMs. The installation and launch of the BAM in each country are detailed below.

#### Addis Ababa University (AAU), Ethiopia

The Ethiopia team installed the new BAM at the original monitoring site at Tikur Anbessa Specialized Hospital.

The team held an event to launch the new BAM and was attended by Professor Andualem Deneke, Interim Chief Executive Director of the AAU College of Health Sciences, members of the AAU School of Public Health, the AAU Communication Directorate, AAU Community Radio, as well as delegates from Environmental Protection Authority (EPA), HISP-Ethiopia, Ethiopia's Ministry of Health, and Addis Ababa Transport Bureau. The launch was covered by the AAU Community Radio FM 99.4 as well as posted on the AAU College of Health Sciences Facebook page.

#### University of Nairobi (UoN), Kenya

The Kenya team installed the new BAM at the original monitoring site at UoN's Parklands Campus. The original BAM will be moved to the premise of the Nairobi City County City Hall once all of the necessary approvals are granted. A pedestal has already been built on the premise on which the new BAM will be installed.



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## Launch of new BAM-1022 monitors continued

### Makerere University (Mak), Uganda

The Uganda team installed the new BAM at the original monitoring site on the rooftop of the Makerere School of Public Health. Together with Mr. Teffera, the team assembled the BAM at the GEOHealth Hub office. The new BAM was run overnight to ensure that there were no issues before it was transferred to the study site on the rooftop on Sunday, 3rd August 2025.



The original BAM is still running alongside the new BAM due to an issue that requires troubleshooting. Once the issue is resolved, the original BAM will be installed on the premise of the Kampala Capital City Authority.



## Professor Otienoh Oguge selected as IPBES Second Global Assessment Co-Chair

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) announced co-chairs for the Second Global Assessment of Biodiversity and Ecosystem Services. Professor Otienoh Oguge (University of Nairobi) was selected as one of the three co-chairs. The Second Global Assessment will be a follow-up report to the 2019 IPBES Global Assessment, which warned that ‘a million species of plants and animals now face extinction, identified and ranked the most important direct drivers of biodiversity loss, and provided the state of knowledge underpinning subsequent agreement on global ambitions for biodiversity.’ The Second Global Assessment will review new knowledge that has emerged since the 2019 report, evaluate progress toward various global sustainability goals, and strengthen the science-policy interface on biodiversity by providing knowledge and evidence for more informed decisions from local to global levels. Press release is available here: <https://www.ipbes.net/media-release/ga2-co-chairs>.



## Wellcome Climate and Health East Africa Science & Policy Center’s Planning Workshop

A three-day workshop was convened in July 2025 by the African Population and Health Research Center (APHRC) to advance the planning and coordination efforts for the establishment of the Wellcome Climate and Health Science and Policy Centers in Africa. The meeting brought together representatives from APHRC (lead), University of Nairobi (UoN), and Addis Ababa University (AAU). AAU is participating as a sub-grantee under APHRC’s leadership. The workshop focused on 1) defining research priorities, 2) outlining Center governance and design, and 3) discussing cross-cutting areas, including data system, research uptake, policy influence, and capacity strengthening. Participants were divided into five key working groups:

### Three Thematic Research Groups:

1. Agriculture, Food Systems, and Nutrition
2. Urbanization, Climate Change, and Health
3. Climate-Sensitive Diseases and Health Systems Preparedness

### Two Cross-cutting Groups:

1. Policy uptake and Capacity Building
2. Data Systems

Each group worked to define draft goals, objectives, activities, and thematic areas. After the concept notes are finalized for each thematic area, the three regional centers (East, West, South Africa) will work on the full proposal.

## CLEAN Air Forum 2025

CLEAN-Air Forum 2025, held in Nairobi this past July, was organized by AirQo, a pan-African air quality research initiative at Makerere University, and hosted in collaboration with Nairobi City County Government, WRI Africa, and the Health Effects Institute. This year’s theme, ‘Partnerships for Clean Air Solutions’ sought to strengthen cross-border transdisciplinary partnerships, evidence generation, and capacity for advancing clean air solutions in Africa. Professor Otienoh Oguge (University of Nairobi) attended the Forum and gave a talk on ‘Eastern Africa GEOHealth Hub: Advancing Research and Training in Environmental Health’ during the Open Science and Data Governance session.



## ISEE 2025

Several GEOHealth team members attended ISEE 2025 in Atlanta, Georgia. Samuel Etajak (Makerere University) put together an accepted poster on 'The status of ambient PM<sub>2.5</sub> concentrations in public schools' environment in Kampala City, Uganda: Preliminary findings from the Eastern Africa GEOHealth Hub Child Health Study.' The poster was presented by Professor Lynn Atuyambe (Makerere University). Dawit Siraw (Addis Ababa University) presented a poster on 'Occupational Heat Stress Exposure and Associated Factors among Workers at Omo Kuraz Sugar Estate, Ethiopia'. Professors Belay Simane (Addis Ababa University), Otienoh Oguge (University of Nairobi), Darby Jack (CU), and Kiros Berhane (CU) also attended.



## Publication

One paper was accepted for publication this quarter.

A paper led by Professor Otienoh Oguge (University of Nairobi), titled 'East African City Centers Show Lower PM<sub>2.5</sub> Levels than Their Suburbs', was published in Environmental Science & Technology Letters. This study examined air quality in three major East African cities, Kampala, Nairobi, and Dar es Salaam by integrating low-cost air sensors with satellite data to produce 1 km × 1 km resolution daily PM<sub>2.5</sub> (particulate matter smaller than 2.5 μm in aerodynamic diameter) maps from 2019 to 2023. Average PM<sub>2.5</sub> concentrations were 31.4 ± 6.6 μg/m<sup>3</sup> around Kampala, 21.7 ± 2.8 μg/m<sup>3</sup> around Nairobi, and 33.1 ± 7.4 μg/m<sup>3</sup> around Dar es Salaam, indicating moderate to unhealthy levels of air quality. Unexpectedly, urban centers exhibited lower PM<sub>2.5</sub> levels than surrounding suburban area. This discrepancy is likely due to combustion-related activities that occur in the suburbs. Such results suggest that air quality mitigation efforts must extend beyond urban centers to suburban areas, where seasonal vegetation loss and combustion processes may drive pollution spikes. Beyond presenting a scalable approach for monitoring air quality in data-scarce regions, this study highlights the importance of localized strategies for urban air quality management.

### Citation:

Chua SD, Oguge O, Oliewo CA, Sserunjogi R, Okure D, Adong P, Manyele A, Hussein T, Yang Y, Lu X, Lehtipalo K. East African City Centers Show Lower PM<sub>2.5</sub> Levels than Their Suburbs. Environmental Science & Technology Letters. 2025 Jun 9. <https://pubmed.ncbi.nlm.nih.gov/40951865/>



## Update on GEOHealth-sponsored graduate students

Training opportunities for Cycle II include those at the graduate degree level (both Masters and Doctoral) at each of the three partner institutions in Eastern Africa. Training progress of the current students is detailed below.

### *ETHIOPIA*

#### **Sisay Shine** (PhD student)

- Dissertation title: Examining Maternal Exposure to Fine Particulate Matter (PM<sub>2.5</sub>) and Pregnancy Outcomes in Rural Butajira, Ethiopia
- Sisay completed data collection and finalized two manuscripts, which have been submitted to his advisors for review. He is waiting for the UPAS PM<sub>2.5</sub> mass concentration results from Kenya for validation. Once he receives and validates the PM<sub>2.5</sub> data, he will prepare manuscripts for submission to a journal.

#### **Dawit Siraw** (PhD student)

- Dissertation title: Occupational Heat Stress in the Sugar Estates, Exposure and Health Risks in Ethiopia
- Dawit is working on the proposal and has shared the draft with his supervisors for review. Questionnaire administration and wet bulb globe temperature (WBGT) data collection for the cold season at the two sugar estates is ongoing.

#### **Belay Gezahegn** (MPH student)

- Thesis title: Assessment of Heat Exposure, Heat-Related Illness, and Associated Factors among Workers at the Lemi Injera Baking Center, Addis Ababa: A Comparative Cross-Sectional Study
- Belay graduated with an MPH in June 2025

#### **Beimnet Fitawek** (MPH student)

- Thesis title: Analysis of pattern and trends of hospital admissions from infectious diseases using predictive modeling
- Beimnet will defend his thesis in October 2025

#### **Gezehagn Gutema** (MPH student)

- Thesis title: Prediction and Comparative Analysis of Heat Stress in Four Sugar Estates of Ethiopia Using Machine Learning
- Gezehagn is working on the modeling and machine learning component of his research. This includes data preprocessing, feature engineering, and training predictive models to estimate heat stress levels using environmental and meteorological data. He is also comparing the performance of different algorithms to identify the most suitable one for this context. He plans to finalize the project by the end of September

#### **Eyerusalem Tesfaye** (MPH student)

- Thesis title: Assessment of Chronic respiratory symptoms, reduced lung function and associated factors among traffic police personnel of Addis Ababa, Ethiopia
- Eyerusalem graduated in June 2025 and is working on a manuscript

### *KENYA*

#### **Noah Adera** (PhD student)

- Dissertation title: Time Series Analysis of Ambient Air Quality and Cause-Specific Hospitalization and Mortality in Nairobi County
- Noah has received approval for his proposal and has commenced data cleaning. He has drafted the initial sections of his first manuscript and shared them with his supervisors for their review and feedback.

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## Update on GEOHealth-sponsored graduate students

### KENYA

#### Joshua Nyamondo (MPH student)

- Thesis title: Characterization, Seasonal Variation and Health Risk Assessment of Black Carbon in Nairobi City
- Joshua is still working on his proposal as he simultaneously collects data by analyzing the BAM filter tapes

#### Odiver Dancan (MPH student)

- Thesis title: TBD
- Odiver is currently taking his first-year coursework and has also started to write his research topics in preparation for his thesis

#### Maurice Kawai (MPH student)

- Thesis title: Monitoring of Particulate Matter (PM2.5 and PM10) in Selected Early Childhood Education Centers, Nairobi City County, Kenya
- Maurice is working on data collection

## Breathe Kampala, Breathe Africa!

Kampala's 2025 World Environmental Health Day celebrations were marked by activities led by the Makerere University Environmental Health Students Association (MUEHSA), including a hybrid pre-event on September 25th at Makerere University. The theme for the pre-event was "Youth, Science and Health in the Fight for Clean Air." Dr. Samuel Etajak was invited as a keynote speaker. He gave another keynote address on September 26th to the Environmental Health Workers Associate Uganda (EHWAU).

**BREATHE KAMPALA, BREATHE AFRICA:**  
YOUTH, SCIENCE AND HEALTH IN THE FIGHT FOR CLEAN AIR™

Pre-World Environmental Health Day Celebration

KEYNOTE SPEAKERS

 DR. SAMUEL ETAJAK Research Scientist, Makerere University School of Public Health Co-Investigator, NH-Funded Eastern Africa GEOHealth Hub Project.	 MS. RUTH MUBIZI Lecturer, Department of Disease Control and Environmental Health, Makerere University School of Public Health Patron- MUEHSA	 DR. DAVID MUSOKE Associate Professor, Makerere University School of Public Health President-elect, FEH	 ALLAN DAVID WAMBOKO Demography and Reproductive Health Student, Vice president, KUDRHA, Kyambogo University
 SIBONGOKUHLHE MSIMVU Environmental Health Student, University of Johannesburg South Africa	 UNAM FUDUMELE Environmental health student, University of Johannesburg South Africa	 NANDAWULA GLORIA LIZ Project Coordinator, KIU- Public Health Society Kampala International University	 MPHETHI KATEGO Environmental Health Student, University of Johannesburg South Africa

25<sup>TH</sup>. SEPT. 2025  
12:00PM - 2:00PM

MAKSPH SEMINAR ROOM

FOR HEALTH, PREVENTION IS OUR PRIORITY

## Feedback

Please email the Program Coordinator, Haruka Morita, at [hm2487@cumc.columbia.edu](mailto:hm2487@cumc.columbia.edu) with questions. For more information on the GEOHealth Hub, please visit our website: <https://geohealth-hub.org/>