



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

Quarterly Report: June-November 2024

Nairobi City County Government training on air pollution monitoring

In support of the Nairobi City County Government's (NCCG) goal of establishing an air quality sensor network across the county's 85 wards, a comprehensive training program was initiated for their Green Nairobi Team. Prior to the training, the GEOHealth-Kenya team conducted a needs assessment for the NCCG staff to evaluate baseline knowledge, skills, and training needs in air quality management to inform the development of a targeted training curriculum. The findings revealed critical gaps in foundational knowledge, technical skills in air quality monitoring and data collection, familiarity with data interpretation techniques, and the use of standardized data analysis platforms. These results emphasized the need for tailored capacity-building efforts to address these deficiencies and equip the NCCG team to meet Nairobi's air quality management goals.



Informed by the needs assessment, the GEOHealth-Kenya team designed and conducted a 5-day training program for NCCG staff to build their expertise in air pollution control. The training, held on October 14-18, 2024, was supported by the Clean Air Fund (CAF) and attended by 25 participants from NCCG's Green Nairobi Team. The training aimed to build essential capacity in air quality monitoring techniques, enabling Nairobi County City staff to accurately assess pollution levels and understand data collection methodologies. A key focus was on introducing sensor networks and data management processes to provide a comprehensive approach for tracking and analyzing air quality across Nairobi. Additionally, the training emphasized fostering stakeholder engagement to support data-driven initiatives, encouraging collaborative efforts among government bodies, academic institutions, community organizations, and other stakeholders for effective air quality management. Lastly, participants explored the health impacts of pollutants specific to Nairobi's population, focusing on how pollution affects public health, particularly respiratory and cardiovascular issues, and identifying ways to mitigate these effects for a healthier urban environment. The training concluded with a closing ceremony, where participants were awarded certificates of completion.

...continued on page 2

NCCG training continued

A post-training assessment was conducted with the NCCG staff to evaluate the effectiveness of the air quality training on their knowledge, skills, and confidence in air quality management. The post-training assessment employed structured surveys, knowledge tests, practical evaluations, and focus group discussions to evaluate the training's impact and identify areas for improvement. Key findings indicate significant progress in participants' understanding of core air quality concepts and practical skills, particularly in operating air quality monitors and performing real-time data analysis. However, gaps remain in advanced data interpretation and visualization, highlighting the need for more specialized training. The report recommends introducing advanced modules, providing regular refresher courses, and continuing to align training content with real-world applications.



Meeting with Addis Ababa City Government Environmental Protection Authority (EPA)

On behalf of the GEOHealth-Ethiopia team, Dawit Siraw attended a meeting organized by the Addis Ababa City Government EPA on June 3, 2024. He gave a presentation on 'Pattern and trends of PM_{2.5} pollution over 6.5 years in Addis Ababa' and participated in a panel discussion. The presentation included an introduction of the GEOHealth project, findings from the data collected using the BAM monitors, and recommendations on ways to improve air quality. Participants suggested ideas to be considered in future GEOHealth work, such as adding monitoring sites for better representation of the city, studying the level of vehicular emissions with recent introductions of electric vehicles in the city, economic impact of air pollution, the need for developing vehicular emission control regulation by the city, and publicly sharing of GEOHealth data.

ISEE 2024

Several GEOHealth team members attended ISEE 2024 in Santiago, Chile. Samuel Etajak (Makerere University) gave a presentation on 'Personal Exposure assessment to Particulate Matter among school children in Kampala Capital City in Uganda.' Dawit Siraw (Addis Ababa University) presented two posters, one on 'The Impact of Covid-19 lockdowns on Particulate Matter (PM_{2.5}) Pollution in Addis Ababa' and another on 'Pattern and Trend of Particulate matter (PM_{2.5}) Pollution Over the past 6.5 years in Addis Ababa, Ethiopia.'



Training workshops in Uganda

Two workshops were organized for the GEOHealth-Uganda team to conduct training on their research projects that will launch in Year 4 of this project. The first was a four-day workshop on ‘Designing the Children’s/Mother’s Health Study and Ambulatory Blood Pressure Monitoring Study’, held in June 2024 and led by Dr. Kiros Berhane. Another workshop was on ‘Air Pollution Exposure Monitoring, Respiratory Health, and Ambulatory Blood Pressure Monitoring’, held in July 2024 and led by Drs. Darby Jack and Jonathan Samet. Sessions included review of protocols and study materials, site visits at primary schools as well as hands on training for spirometry and exposure monitoring.



In the News

A paper led by Dr. Lynn Atuyambe (Makerere University) on ‘Air quality and attributable mortality among city dwellers in Kampala, Uganda: results from 4 years of continuous PM_{2.5} concentration monitoring using BAM 1022 reference instrument’ was featured in [Monitor](#). Samuel Etajak was quoted in another news article (image below) featuring the same paper. The featured study provides primary data on the levels and trends of fine particulate matter air pollution over four years from 2018-2021 and is the first to estimate air pollution attributable deaths in Kampala city against the WHO annual guideline value for PM_{2.5} of 5 µg/m³. The data shows that PM_{2.5} levels in Kampala are above the WHO Air Quality Guideline value and likely resulted in substantial adverse health effects and premature deaths.

AIR POLLUTION TOP CAUSE OF SICKNESS IN KAMPALA

By Agnes Nyatangaire

Air pollution has hit Kampala, with experts saying the pollution levels are now eight times higher than the World Health Organisation (WHO) recommended annual average level of five microgrammes per cubic metre.

According to survey findings from the Eastern Africa GEO-Health Hub Project at Makerere University School of Public Health, the air quality level in Kampala currently stands at 42.0 microgrammes per cubic metre.

Air pollution is the release of one or more pollutants or contaminants into the atmosphere, in such quantities and durations that are detrimental to human, animal or plant life and the environment.

DEATHS LINKED TO AIR POLLUTION

7 million people die prematurely every year from air pollution both household and outdoor.

Among these deaths:

- 21% are due to pneumonia
- 20% from stroke
- 54% from ischemic heart disease
- 19% from chronic obstructive pulmonary disease
- 7% from lung cancer

Household air pollution

3.8 million die prematurely every year from household air pollution (2016)

CONTRIBUTORS:

- Kerosene
- Wood
- Stoves
- Lamps

HEALTH IMPLICATION

Health experts have raised an alarm, noting that the over two million people who commute to Kampala, Wakiso and Mukono districts face an imminent health danger due to high city pollution levels. The three districts form the Kampala Metropolitan Area.

The Kampala Central division medical officer, Dr Richard Walyomo, said air pollution is the top-ranked cause of sickness in the capital city.

If these high pollution levels are not tamed, Walyomo said the impact on several people's health will lead to unexplained deaths.

"Due to high air pollution levels, health facilities are registering cases of children with cough, flu, sore throats and pneumonia. If not treated early, these signs can progress to lung cancer," Walyomo said.

Explaining the impact of pollution on the health of human beings, Etajak said: "The city atmosphere is saturated with particles, such as smoke, dust and some particulate matter (smallest particles that cannot be seen with the naked eye). Once people inhale the particles, they enter the body through the lungs. Some penetrate the circulatory system and are carried in the blood to different body parts, exposing people to stroke or heart-related conditions."

"When the particles get to the lungs, exposed individuals may develop lung cancer. Those with lung diseases will end up getting more attacks of chronic obstructive pulmonary diseases. When particulate matter enters the lungs, it causes the airways to produce a lot of mucus and narrow them. As a result, individuals start wheezing or breathing with difficulty. When not managed properly, a person may end up suffocating," Etajak added.

Etajak said there should be a deliberate policy to propel alternative clean affordable fuel and technologies for cooking, heating and lighting.

"Reducing the cost of gas and electricity will also enable people to prepare meals for sh10,000 or less," he said.

Currently, a 2kg cylinder of cooking gas costs about sh270,000, while a unit of electricity costs sh1,000.

In July 2022, the Government launched a shoop project to supply one million households with free cooking gas cylinders. Many families complained that they could not refill them. A refill costs about sh30,000 for a 6kg cylinder and sh25,000 for a 2kg can.

Dr Akankwash

US, told *New Vision* that for now, the Government can issue a policy for car importers to bring only eco-friendly vehicles into the country. She also floated cycling as a means of transport.

BIOMASS FUEL

Industrial emissions and the use of firewood and charcoal for cooking are the other threats facing pollution.

Data from NEMA indicates that about 66% of the Ugandan population uses biomass, such as firewood, charcoal and cow dung for cooking.

Recently, President Yoweri Museveni issued an executive order banning charcoal burning. However, the presidential directive is largely ignored for lack of an affordable cooking alternative.

Researchers said the areas in the city that are the most hit by pollution are Kawempe, Makindye and Kampala central business district.

CAUSES

Experts said old vehicle emissions, especially during traffic jam peak hours, contribute the largest part of urban pollution when they release carbon monoxide.

Dorothy Loto, a PhD candidate at the University of Wisconsin-Madison in the



Update on GEOHealth-sponsored graduate students

Training opportunities for Cycle II include training at the graduate degree level (both Masters and Doctoral) at each of the three partner institutions in Eastern Africa. Below is training progress on the current students. All three countries are also working towards selecting additional students to sponsor in the coming months.

ETHIOPIA

Sisay Shine (PhD student)

- Title of dissertation: Examining Maternal Exposure to Fine Particulate Matter (PM_{2.5}) and Pregnancy Outcomes in Rural Butajira, Ethiopia
- Sisay received ethical clearance from the IRB and AAU for his dissertation project and the pilot study is underway. He will begin training data collectors on the use of the Atmotube air monitor and will follow with pretests. Following this, he will start recruitment of study participants and actual data collection.

Dawit Siraw (PhD student)

- Title of dissertation: Occupational Heat Stress in the Sugar Estates, Exposure and Health Risks in Ethiopia
- Dawit is currently taking second-year coursework and will complete it by Feb 2025. He started writing his research proposal

Eden Teshome (MPH student)

- Title of thesis: Assessing spatio-temporal trend of ambient PM_{2.5} concentration and association with respiratory disease among preschool children, Addis Ababa, Ethiopia
- Graduated in July 2024

KENYA

Noah Adera (PhD student)

- Title of dissertation: Time series Analysis of Ambient Air Quality and Cause-Specific Hospitalization and Mortality in Nairobi County
- Noah finalized his proposal after feedback from his supervisors were incorporated. He will submit the proposal to the Ethical Review Board for ethical approval next.

Joshua Nyamondo (MPH student)

- Title of thesis: Characterization, Seasonal Variation and Health Risk Assessment of Black Carbon in Nairobi City
- Joshua submitted his research concept to the University department for review

Feedback

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