DukeEngage
Challenge yourself. Change your world.

**DUKEENGAGE IN GHANA**
Improving health and environment through education and awareness

**Dates:** May 23 – July 17, 2020
(Dates subject to change up until the point of departure.)

**Service Themes**

- Science & Engineering
- Environment & Conservation
- Health & Human Services
- Community Development & Outreach

**Program Focus**
Interacting with youth and auto mechanics to raise awareness about the toxicity of used motor oil and its impact on human health and the environment

**Program Leader**

- Fred Boadu, Dept. of Civil and Environmental Engineering. Dr. Boadu's research interests focus on geo-environmental engineering and human health in underdeveloped nations.

**Program Overview**
In Ghana as in Africa as a whole there are thousands of auto-mechanic shops set up for the repair and maintenance of automobiles. At these shops, used motor oil – which contains high concentrations of toxic and carcinogenic heavy metals – is improperly disposed of, onto the bare soil. This practice results in the heavy metals finding their way into streams and drinking water aquifers, degrading soil quality and the ecosystem, and posing a threat to human health. Food crops grown on land near these shops have the potential to uptake and accumulate the heavy metals from the contaminated soil, and can adversely affect food safety. In addition, mechanics often work with no protective gloves or mask, which poses a serious threat to their health: heavy metals beyond certain concentration levels are known to cause kidney, liver and brain damage; diminished learning ability in children; birth defects; psychological disorders and more.

Prof Fred Boadu and a Duke Bass Connections team visited mechanic shops in Ghana in 2017/2018, interviewing over 100 mechanics, collecting hair and nail samples, and recording blood pressures to analyze for heavy metals content and *establishing* correlation with blood pressure. The team found that mechanics who have worked more years tend to have higher concentrations of Cr in their system, with attendant higher blood pressure. During the interviews, it became clear that the mechanics were not aware of the dangers their practices pose to the environment, groundwater resources, food security and their health. Thus, there is an urgent need to create awareness, educate, and promote behavioral changes with regards to the mismanagement of used motor oil by the mechanics, in an effort to protect the environment, valuable groundwater resources, food safety, and human health.

**Goals for Students**
The project provides a great opportunity for students to appreciate the usefulness of their education at Duke in a global and societal context, apply their knowledge, and see an impact. Information gathering and interviews will allow students to think creatively and critically about the long-term solutions to the groundwater contamination, food security, and health problems, in a culturally sensitive manner. It will also allow students to witness how poverty influences human behavior, e.g., protection of the environment in a societal context. The education and awareness campaign is expected to result in behavioral changes and potentially save human lives, protect the environment, groundwater resources and

the ecosystem. This culturally engaging experience will help students expand their understanding of cultures very different from own, and prepare them to be globally competent citizens of the world.

**Partnership Opportunities**
Duke students will be engaged in an educational and awareness campaign effort pertaining to the destruction of the environment, health of the auto-mechanics, and possible food security threat. We propose to visit over 200 shops, each with 6-9 apprentices. Presently, there are no enforced regulations on the disposal of used oil. The objectives are to educate and create awareness that:

1. Used motor oil contains toxic substances that can be concentrated in drinking water, plants and animals, and serve as health threat to humans who consume them.
2. Mismanagement and misuse of waste motor oil can seriously affect human health, compromise food security, contaminate groundwater and degrade the ecosystem.
3. Used motor oil can be recycled, re-refined and processed for re-use.
4. Direct skin contact with motor oil over extended period of time can cause cancer, thus, skin should be protected with gloves, masks and long sleeves.

The above objectives will be achieved by executing the following tasks:

- *Task 1*. Meet and talk with representatives of the mechanics' village, local government officials to announce the visit of Duke Team with the mission to educate, create awareness and share their knowledge with them with regards to impact of mismanagement and misuse of motor oil on human health, groundwater, environment and food security.
- *Task 2*. Visit nearby high schools and engage pupils in classroom discussions to educate them on the impact of used motor oil on human health, environment and food security. We will encourage them to talk to their parents about the knowledge gained.
- *Task 3*. Interact with auto-mechanics in a culturally sensitive manner to share knowledge about protection of groundwater, environment, and health. Students will engage in shop-to-shop visits. The team will be split into two to execute these tasks.
- *Task 4.* Discuss waste management plans and introduce the idea of proper disposal of used motor oil via recycling, re-refining and process recovery for re-use.

**Program Requirements**
No specific requirements or coursework. Interest in less advantaged socio-economic groups, and how their daily practices affect the environment and their health will be useful.

**Program Details**
Description of community: Ghana is a democratic and politically stable nation, and presently serves as a role model for emerging democracies in sub-Saharan Africa. Kumasi is the second-largest city in Ghana and is known as a center for Ashanti culture. Located on north-south trade routes, Kumasi became a major commercial center. Today the city is zoned into commercial, industrial, and residential areas. Students will work in Suame Magazine, an industrialized area of the city with many auto workshops for vehicle maintenance and repairs, employing an estimated 200,000 workers.

Housing and meals: Students will likely stay in university housing. There are several universities and colleges in Kumasi that can host students, e.g., Kwame Nkrumah University of Science and Technology, Winneba College University. Breakfast and dinner will be provided at the residence, and students will take packed lunch to their work sites.

Local Safety, Security, and Cultural Norms: If you have special needs related to health, cultural, or religious practices, please contact the DukeEngage office, dukeengage@duke.edu, to discuss whether or not your needs can be reasonably accommodated in this program.

For information related to how your religion, race, sexual/gender identity, ability or other aspects of your identity might impact your travels, we recommend starting with the Diversity, Identity and Global Travel section of the DukeEngage website.

We encourage students who have questions or concerns about health or safety in international programs to check Duke's International SOS (ISOS) portal for relevant information.

Reflection and Enrichment: Students will have the opportunity to learn from the research of Prof Boadu and his Bass Connections teams on health impact, groundwater protection, and food security issues. Prof. Boadu will also provide a two-day training on commonly used phrases and sentences in the local language. There will be evening and weekend commitments, and opportunities for cultural enrichment.

**Curricular Connections**
While all students are welcome to apply, this program might especially appeal to students in Engineering, pre-health, environmental sciences, or cultural anthropology.