Rainwater Collection at Amenawon in Lagos

Statement of Interest

About Us

We are MS students in the School of Design Strategies at Parsons, and have been invited to work with Amenawon Solar School project in Lagos, Nigeria as it is turns a compound into a model for low-cost sustainable living. A central aspect of our program of study is working closely with communities in approaching and overcoming urban issues in a sustainable and equitable manner.

Lagos is the third largest city in the world. Everyday life in Lagos is characterized by lack of access to affordable potable water; open sewers resulting from the absence of a functional municipal waste treatment system; daily electrical outages; and limited access to un-built space and possibilities to cultivate food in the city.

The Amenawon Solar School project seeks to address challenges facing Lagos-dwellers through the development of a sustainable compound. Working with tenants in the compound's building, the Amayo family, and community members in the neighborhood of Ikeja, the project plans to develop a rainwater harvesting system to produce potable water and a green roof that will provide open space and the opportunity to cultivate food; and retrofit the building with solar panels to provide reliable electricity and replace inefficient energy-based generator use. It will eventually seek to address the sewage problem with compound-scale solutions such as compost toilets and neighborhood-scale solutions such as filtering plants and energy production from biowaste.

Mrs. Amenawon Amayo passed away in 2012. She was a central figure in the community, having raised upwards of ten orphans in her compound, and leaving behind an all female basketball team. For many years, Mrs. Amayo gave and sold water from her well to neighbors in Ikeja. Amenawon Solar School project honors her memory, turning her compound into a model for low cost healthy and sustainable life in Lagos, and acting as a space of cultivation of sustainable practices and skills among the community, tenants, and family members.

Central to the Amenawon Solar School project is the cultivation of sustainable ethics, practices, skills and relationships. Amenawon will be partnering with local organizations an those further abroad give workshops to school children attending the elementary school occupying one floor of the building as well as community members, on green building, permacultural practices, and build technical and social skills for developing software and hardware for better functioning sustainable infrastructure and retrofitting techniques.

One of us visited Lagos in 2013. He investigated the compound and conduct preliminary research. He investigated the built structures and infrastructure and discussed and planned project goals with the family,

Background

The need to develop and adopt effective means of collecting potable water is urgent. Nigeria and much of Africa are progressing in terms of development, but face many challenges. A chief challenge remains accessibility to potable water. Lagos faces a sobering potable water crisis that will only worsen as the city's population of about 18 million people continues to soar. The overburdened municipal government infrastructure provides about less than 60% of potable water needed in urban residences..[1] City dwellers must access and store drinkable water through costly means beyond those of most households.

The current and popular systems for collecting water employ **a** heterogeneous mixture of aftermarket plastic tanks held up on stilts with lucid pipes running at length alongside buildings. These tanks can store as much as ten gallons of water and up to 120 gallons, but this is usually non-potable water sourced mainly from borewell extraction. Households faced with little means of extracting and collecting their own water must rely on the benevolence of neighbours or purchase it.

Even those with boreholes must purchase water for drinking and cooking. Due to the nature of local ground water, approximately 60% of borewells are rendered highly or moderately corrosive, making thier undrinkable. Other factors affecting groundwater potability are related to sanitation. Poor sanitation practices and infrastructure, contamination of groundwater from on-site septic systems, and storm runoff and flooding all play a major role in groundwater contamination.

Addressing this urgent need for potable water brings together the goals of Amenawon Solar School project and our learning desires as Parsons Design and Urban Ecologies students. We hope to transfer our professional urbanist knowledge to the local community while learning from the community, as we together craft the future of Ikeja with Amenawon school children and residents. This project is well aligned with the Michael Kalil Endowment for Smart Design's aim to foster understanding of the design intersections between nature and technology, and support a heightened sense of responsibility for increasing the sustainability of built environments.

Project Proposal

The project we propose for the Michael Kalil Endowment for Smart Design Collaborative Team Grant is the development and implementation of a rainwater-harvesting prototype on the Amenawon Solar School compound. Our prototype will function to produce a significant amount of potable water, but also constitute research for a future rooftop system with permanent underground tanks. Building the prototype on site will allow us to draw on locally sourced materials and resources, and to enact the Amenawon Solar Schools' first workshops, in which students, tenants and neighbors, including local craftspeople, can participate in the process.

The tropical nature and geography of Ikeja allows for an average rainfall amount of about 8.29 inches during the rainy season between the months of April through October. The distilled quality of rainwater, free of

[1] 2010. M Ince, D Bashir, OOO Oni, V Ogbechie, K Korve, MA Adeyinka, AA Olufolabo, F Ofordu, and M Kehinde. Rapid assessment of drinking-water quality in the Federal Republic of Nigeria: country report of the pilot project implementation in 2004-2005. Geneva: World Health Organization and UNICEF.

bacteria, lends to harvesting for immediate potable use. [2] We estimate that the capture of rain during Lagos' rainy season can secure approximately eight gallons of water per square foot of capturing roof surface yearly.

We propose to travel to Ikeja to execute the prototype in spring 2014. Our team has already carried out research on rainwater harvesting systems, and a team member visited Ikeja to investigate the infrastructure on the compound and discuss the project with the school and local community. We continue to research local and traditionally used materials and technologies, such as the water purifying moringa seed. We have selected an existing wooden shed in the compound garden to be retrofitted into the rainwater collecting prototype.

To complete our Kalil-funded project, we will replace the existing roof and build a gutter to channel water through a sediment filtration system to the storage tank. We will build this filter with layers of different gravel structures and an active coal filter, to eliminate inorganic particles and organic substances. We will replace the roof, and build the gutter, filter, and water tank on site with community members and local builders across 3 workshops. We will coat these with a white lime wash containing a natural antibacterial agent that prevents growth of algae, a proven practice in island areas that rely on rainwater catchment, such as Bermuda.

The prototype will produce a significant amount of water, but will also serve as the necessary research basis for implementation of a system that we hope to eventually develop on the roof of the Amenawon Solar School building. By our estimates, this system could collect approximately one hundred thousand gallons of drinking water yearly, sufficient to provide the compound and school with reliable source of drinking water, with the remainder going to the broader community. Amenawon Solar School intends for this model to be reproduced throughout the neighborhood and other areas, integrating the system into each roof and creating self-supply of drinkable water.

Kalil funding would allow us to create the prototype and produce an efficient and working model for rainwater catchment, filtration and storage in the context of the Amenawon Solar School project, while pursuing sustainable relationships and skill-sharing with the Ikeja community.

[2] "World Weather Information Service -Lagos." Web. 15 Jan. 2014. <http://worldweather.wmo.int/075/c00258.htm>.

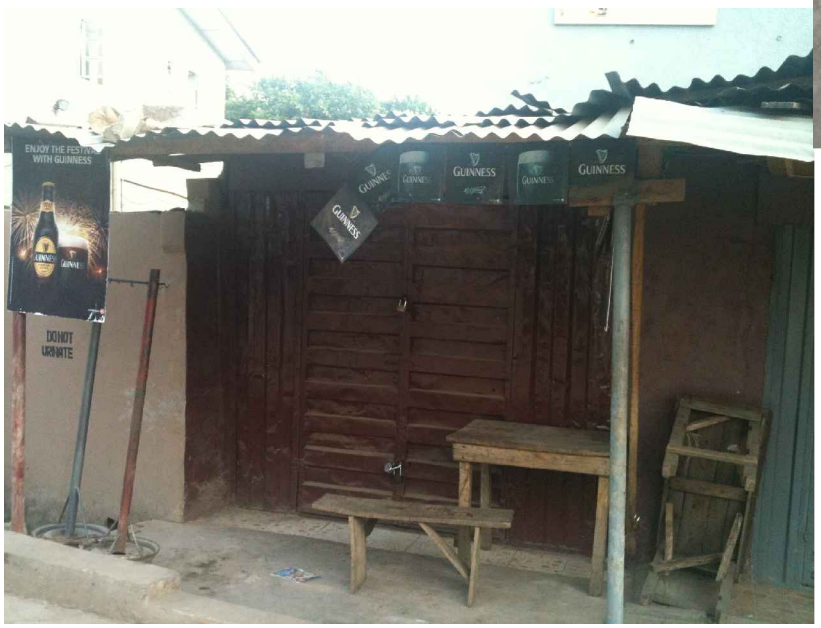
Budget

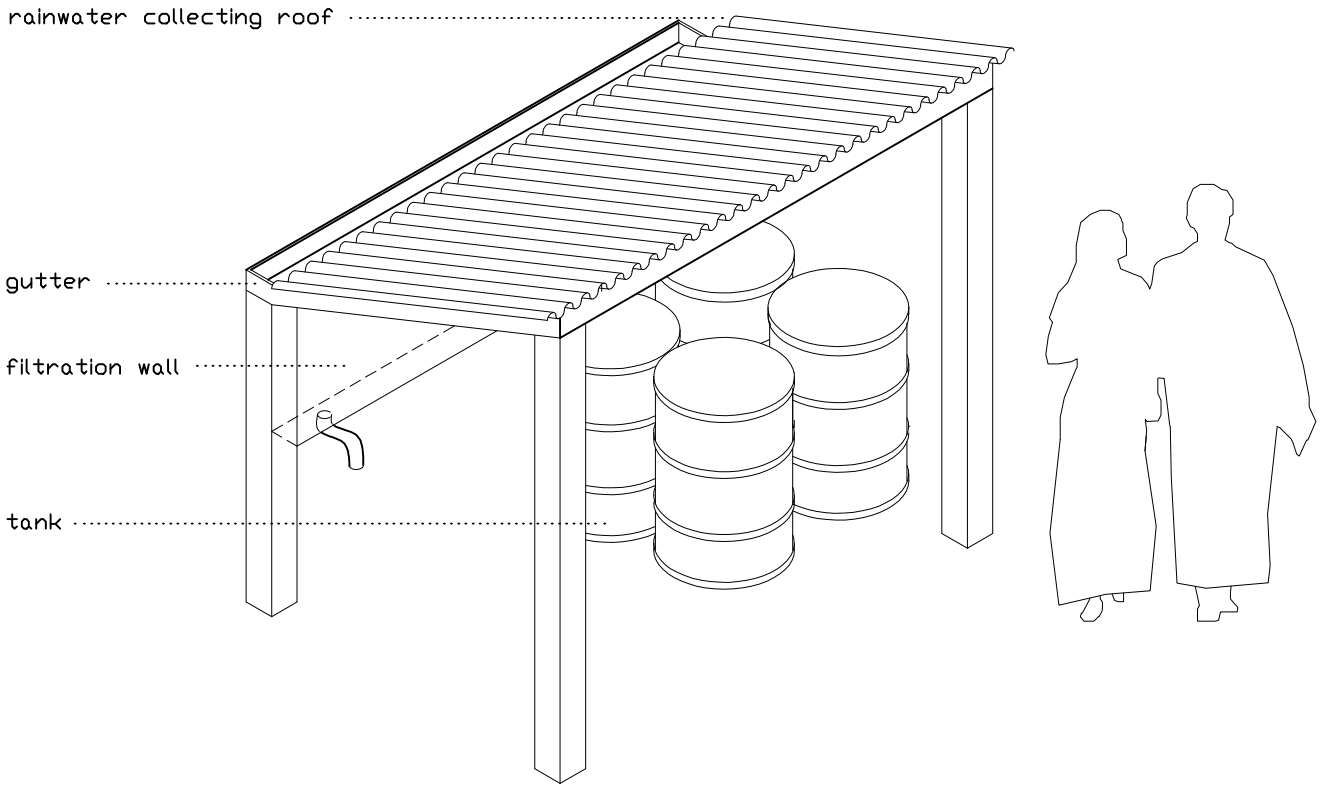
Travel costs	
Air fares for two team members	2 x $ 1,000 = $ 2,000.00
Visa expenses	2 x $ 60 = $120.00
Accommodation (provided by Amenawon Solar School)	$0.00
Food	$130.00
Total for Travel Expenses	**$ 2,250.00**
Costs of Prototype implementation/Retrofitting of existing structure on the Amenawon compound	
Replacement of worn out wooden beams	$ 200.00
Replacement of and proper storing of debris	$ 600.00
Limewash for lining roof, gutter, tank	$ 200.00
Materials for building water tank and gutter	$ 300.00
Materials for sediment filtration wall	$ 500.00
Construction and installation of hand water pump	$ 150.00
Subtotal	**$ 2,050.00**
Costs of Sustainable Community Building/Workshops	
Orientation (printed materials)	$ 50.00
3 building workshops (including cost of safety equipment for participants, compensation for local builders)	$ 350.00
Completion feast (according to local practice)	$ 50.00
Subtotal	**$ 450.00**
Documentation Costs	
Project documentation (filming, photo documentation, building diary)	$ 250.00

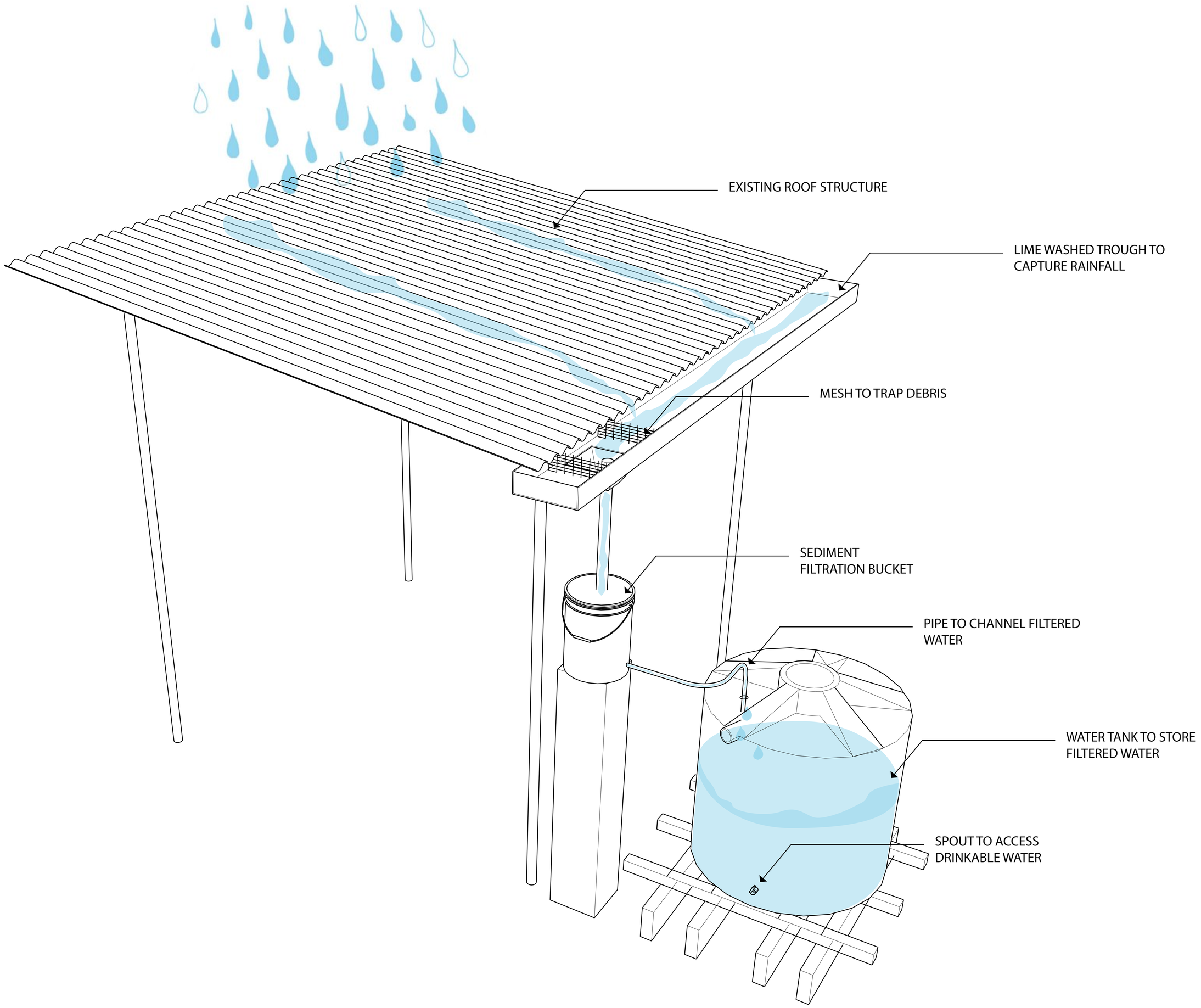
Subtotal	**$ 250.00**
Total cost estimate	**$ 5,000.00**

on a rainy day

shack on Amenawon compound






EXISTING ROOF STRUCTURE
LIME WASHED TROUGH TO CAPTURE RAINFALL
MESH TO TRAP DEBRIS
SEDIMENT FILTRATION BUCKET
PIPE TO CHANNEL FILTERED WATER
WATER TANK TO STORE FILTERED WATER
SPOUT TO ACCESS DRINKABLE WATER