URBAN RESILIENCE,

DRIVING INNOVATION FOR BETTER CITIES.

HACKATHON LESSON LEARNT.

Kenya Red Cross

UN HABITAT
FOR A BETTER URBAN FUTURE

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The Hackathon was organised in coordination amongst UN-Habitat, Kenya Red Cross Society, and the International Centre for Humanitarian Affairs.

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Group photo, BOMA Hotel.

Introduction

Kenya Red Cross Society (KRCS) is a humanitarian relief organization created through an **Act of Parliament, CAP 256 of the laws of Kenya on December 21st, 1965** and operates through a network of county offices all over the country. KRCS mission is to work with vigor and compassion through networks and with communities to prevent and alleviate human suffering and save lives of the most vulnerable during emergencies. The organization runs a youth program under the organizational development with a vision to empower, educate and create an enabling environment for youth engagement in the humanitarian action.

The United Nations Human Settlements Programme (UN-HABITAT) is the United Nations agency for human settlements and sustainable urban development with a mission to promote socially and environmentally sustainable human settlement developments and the achievement of adequate shelter for all. It was established in 1978 as an outcome of the First UN Conference on Human Settlements and Sustainable Urban Development held in Vancouver, Canada, in 1976. UN-Habitat, headquartered in Nairobi, Kenya, has been supporting the Kenyan Government on urban planning and design and enhanced urban governance and management capacity levels, and the establishment of more effective tools to achieve sustainable urban development.

In early 2018, KRCS and UN-Habitat signed a Memorandum of Understanding to collaborate on urban resilience and regeneration. As part of the MoU, they embarked on programmes for scoping studies in specific areas in Mukuru informal settlement, speaking and brainstorming with people from vulnerable groups, such as youth and women on potential risk reduction solutions and strategies. Building on this initial collaboration, in 2019, KCRS and UN Habitat worked together, and with the International Centre for Humanitarian Affairs to organize an urban resilience hackathon targeting youth from informal settlements and ASAL areas to brainstorm for solutions to pressing issues in Mukuru informal settlement.

Background

With increasing global populations and greater influxes of urban to rural migration, cities are facing unprecedented demographic, environmental, economic, social and spatial challenges that were previously unprecedented. By 2030, it is estimated that six out of every ten people in the world will be expected to reside in urban areas. Over 90% of this growth will take place in the global south, Africa, Asia, Latin America, and the Caribbean, and across existing secondary cities which will expand significantly within the time.

In the absence of effective urban governance, management and tools, such as adequate legislative, financial and planning modalities, consequences of global rapid urbanization will result in greater inequalities, suffering and inadequate distribution of resources for all. Within global expanding cities, the growth of informal settlements and poor residential neighborhoods remains a challenge, seeing as an estimated 25% of the world's urban population live in informal settlements, and with 213 million informal settlement residents adding to the global population since 1990. In informal settlements, inhabitants often have no security of tenure, land, or housing rights - for example, they may squat or rent informally. These neighborhoods usually lack basic services and city infrastructure and housing may not comply with planning and building regulations, often situated in geographically disadvantaged areas. Numerous interrelated factors have driven the emergence of informal settlements, such as high and sporadic population growth, rural-urban migration, lack of affordable housing, weak governance (particularly in policy, planning and urban management), economic vulnerability and low-paid work, marginalization and displacement caused by conflict, natural disasters and climate change related influences.

The humanitarian impacts of disasters, both natural and man-made, are increasingly concentrated in cities as much as it is in traditional Arid and Semi-Arid Land (ASAL) areas (which often face critical perennialwater shortages). Cities are now experiencing greater rates of urban crises, such as through greater social and environmental risks - flooding, fire outbreaks, disease epidemics, infrastructural collapse, road accidents; whose impacts include not massive damage to properties, loss of life and injuries, but also damage to critical infrastructure, such as roads, sewers, water lines, electrical supply networks, hospitals,institutions, and communities. Given the density of cities, and interconnected nature of its infrastructures, the impact from urban crises can be magnified and at dangerous rates causing greater resultant complexities. In addition, in poorer or developing countries and cities, solutions for more sustainable urban resilience and development, such as effective waste management, public and open space distribution, adequate standards for land and housing development, conservation and sustainable water use in urban areas are often overlooked and underutilized.

Project Description

The Urban Resilience hackathon organized by KRCS in collaboration with UN-Habitat was a 3-Day event for youth innovators from Nairobi and ASAL areas, held across 28th to 30th May. The chosen focus site for the Hackathon study was in Mukuru informal settlement, one of the largest slums in Kenya. The innovation was to hack for solutions (specific to urban challenges) for the three thematic areas as follows, which are elaborated in the next section:

1. Environmental conservation and water use;
2. Open and public spaces;
3. Innovative business solutions for livelihood and youth employment.

The event began on Day 1 in BomaHotel, where a panel discussion took place to discuss the three thematic areas, including a site visit to Mukuru informal settlement. Mukuru informal settlement is one of the largest of over 150 informal settlements in Nairobi, Kenya. Land tenure challenges common to informal settlements throughout Nairobi have impacted the growth and development of Mukuru. Present conditions in Mukuru pose a unique challenge for residents who are facing issues of rapid densification, lack of urban basic services, critical environmental and health risks, lack of integration to the urban fabric, and growing disconnect with the formalized areas of Nairobi County.

This day activities aimed to achieve the following:

- Create a platform for inter-generational dialogue between youth and experts in urban development regarding Environmental conservation and water uses, Livelihoods and public/open space.
- Sensitize youth on climate driven risks and hazards facing urban/peri-urban areas focusing on their environs and their potential contribution to risk reduction, prevention and recovery;
- Promote meaningful youth engagement on sustainable urban development as key players in planning, designing and managing urban spaces;
- Strengthen the inclusion of young people in urban development processes including city planning by collaboration with relevant authorities.

From Day 2, the hackathon took place in Mathare Environmental Conservation Youth Center (Mlango-Kubwa,) which is a UN-Habitat and Samsung C&T funded youth self-help center. This days activities involved deep dive into the solutions proposed by the youth innovators and working in teams to make them innovative and sustainable in line with the three thematic areas. Mathare is an informal settlement located on the eastern side of Nairobi and has a population of 600- 800,000 people, Mlango-Kubwa being aconurbationwithin Mathare with a population size of 40,000. The Youth Center is the only

Public Space in the community which is now being used as a meeting place, sporting field, community garden and community center for youth.

This day activities aimed to achieve the following:

- Prepare, engage and empower young people with the cognitive, social, and cultural skills needed to solve challenging urban problems;
- Develop sustainable solutions to urban challenges through youth innovation in Environmental conservation and water uses, Livelihoods and open/ public spaces;
- Provide a platform for engagement, networking, nurturing and incubating great youth urban solutions that may be eligible for implementation and potential upscaling;
- Facilitate capacity building for young people on solutions for safe and sustainable urban development;
- Identify innovative public space intervention designed by youth for implementation;
- Provide forum to sensitize young people on the power of entrepreneurship/business solution as key livelihood drivers that can tackle youth resilience/ unemployment.

The finale of the hackathon on Day 3, involved the youth innovators pitching their innovations to a panel of judges who graded their innovations based on a judging template prepared in advance. Afterwards in the evening, the participants visited the United Nation Offices of Nairobi (UNON) in Gigiri where they were given a chance to interact with delegates present for the UN-Habitat Assembly. The three winning groups also received the opportunity to present on their respective innovations.

THEMATIC AREAS

Environmental Conservation and Water Use

Amid a changing climate, increasing population growth, rapid development and pervasive urbanization, an unprecedented threat to the environment in Kenya, and its existing is more apparent than ever before. The over-exploitation of natural resources, lack of conservation efforts, and the resultant drawn out impacts of climate change, has resulted in greater rates of land degradation and large-scale pollution. The impact of such has led to poor social and economic performance of communities, water scarcity problems greatly affecting many parts of Kenya.However, research shows that with forward-looking policies and the utilization of adequate management and technologies, this phenomenon can be improved.

A dump-site in Mukuru kwa Rueben.

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Ngong River.

Informal settlements in Kenya, which lack adequate urban infrastructures and resource allocation, face the challenges and consequences of extensive environmental degradation which include untreated industrial effluent, uncollected garbage and flooding. Lack of access to safe water, coupled up with flooding and poor sewerage systems or contaminate piped water, expose the communities to risks of outbreaks of epidemics mostly of cholera, malaria and other waterborne diseases. In addition, improper garbage disposal in informal settlements continue to pose as an immense health risk. Residents who live in informal settlements also face risks in their homes due to the utilization of highly flammable building materials, illegal electricity connections and more preferred use of paraffin and charcoal for cooking in congested houses. The urban resilience hackathon aimed to find solutions, such as newtechnologies and designs, that provide out of the box insights to waste management, water purification systems, environmental conservationand management as well as water use for communities in such fragile urban settings.

Open/Public Space Innovation

Land is a finite resource and competition for it is intensifying because of rapid urbanization, growing populations, economic development, persistent insecurity of food, water, energy and the effects of conflicts and disasters. The utilization of and land-use distribution of specific areas result in direct impacts on the well-being of residents who live within. Public spaces have historically often been overlooked and undervalued by urban authorities but is increasingly being considered the backbone of urban settlement, including informal settlement. Public spaces are sites that are accessible and enjoyable by all without a profit motive and takes on various spatial forms, including parks, streets, sidewalks, markets and playgrounds. People Centered public spaces enhance community cohesion and promotes health, happiness and well-being for all citizens. A key importance is to design and build high-quality public spaces in partnership with local government. These physical spaces act as catalysts for improving public spaces in the whole city, help improve the capacity of local institution and communities and contribute to long-term change.

Football field, Mukuru kwa Reuben.

Besides SDG Goal 11,"Make cities and human settlements inclusive, safe, resilient and sustainable" that UNHABITAT is championing, land is also implied in several other proposed goals that relate to the sustainable use of natural resources and several depend on the use of additional land resources.The urban resilience hackathon aimed at innovative public/ open space solutions/designs that would socially enrich and revitalize the economy of their surrounding communities as well as gain insight on how open space should be just more than an amenity for cities but rather for allto achieve healthy lives.

Public space, Mukuru kwa Reuben.

Innovative Business Solution for Livelihood and Youth Employment

In Kenya, high unemployment rates have affected youth more compared to other age groups, with the youth in urban informal settlements being particularly hard hit. Moreover, the youth in the informal settlements are faced with numerous challenges that make them

Mukuru kwa Reuben.

vulnerable to crime and insecurity, dropping out of school, teenage pregnancy, drug and substance abuse, radicalization among others. There have been various interventions by the Kenyan government to address the challenge of youth employment through human capital development like the Youth Enterprise Development Fund (YEFD). Despite this, youth unemployment remains high and a big problem, resulting in the youth increasingly becoming more susceptible to practices of crime, loitering and social unrest. Urban youth unemployment in Nairobi's informal settlement has led to higher rates of prostitution, school dropouts, radicalization, rape, HIV/AIDS infections, as well as drug and substance abuse.

In a bid to create more livelihood opportunities within an enabling environment for youth in urban areas, innovation and entrepreneurship are fundamental priority focus areas. Kenya is experiencing large opportunities in terms of new products and technologies driven by youth innovators, who are tapping into avenues within the growing economy.

Such ventures of entrepreneurship and innovative practices present a multiplier effect for job creation of local communities, contributing to increased local economic growth opportunities, and eventually the potential for greater capital development. KRCS is championing innovation through the International Federation of Red Cross and Red Crescent Societies (IFRC) framework for resilience and is implementing urban resilience programs in Nairobi's informal settlement, which target young men (Young Men Resilience Project) ravaged by a sense of hopelessness and involved in drugs and crimes. The Hackathon aimed at promoting unique solutions and technologies/designs for businesses that can be scaled by KRCS and UN-Habitat to create greater local youth employment and income avenues.

Mukuru kwa Reuben Center.

HACKATHON ELIGIBILITY CRITERIA

The hackathon involved a host of different partner organizations and 40 Kenyan youth innovators; 21 male and 19 females. All submitted concepts were evaluated on a rolling basis against the selection and eligibility criteria outlined below:

01 IMPACT

Demonstrates ability to substantially solve inherent community problem in the informal settlements and can significantly improve quality of life and/or contribute a relatively large increase in behavior change.

02 PROOF OF CONCEPT

Demonstrates evidence showing that the design, business concept or technology has a clear and practical application.

03 INNOVATION

Demonstrates clear differentiation of product, process, and technology or business model from current standard practice.

04 SUSTAINABILITY

Demonstrates viability of business model that does not require ongoing funding for long term sustainability.

05 SCALABILITY

Demonstrates potential for replicability of the business model/ innovation across different geographies and market and/or expansion of existing model to serve more communities within the same context.

06 POSITIVE EXTERNALITIES

Demonstrates positive externality i.e. how the impact of the project will go beyond private commercial interests and may be serve social interest.

07 ADDITIONALITY

Demonstrates need for support funding i.e. it should be evident that the innovation would not otherwise take place (at all, or in the same way, extent or time) without a funding support.

08 CO-INVESTMENT

Demonstrates level of co-investment from the grantee. This can include in-kind investments.

The participants who expressed interest to submit their innovation concept also had to meet the following requirements:

- Participants should be between 18-30years.
- Participation will be through a registered team of 2-5 people.
- The team should submit a concept design; urban solution on solving existing challenges within informal settlements related to the themes, accompanied with a 350 character write up of the idea prior to the application deadline.

Event Breakdown

DAY 1: **28th May 2019**

The innovators convened for a conference in Boma Hotel to introduce and discuss issues surrounding the three Hackathon thematic areas: Environmental conservation and water use innovations, Open/ Public spaces innovations and innovative business solutions for livelihood and youth employment in relation to some of major challenges that affect their cities and urban areas.

The conference opened with introductory remarks, followed by presentations from invited speakers and experts from different organizations including community and civil representatives. The process also involved panel discussions with panelists being experts from UN-Habitat, Kenya Red Cross Society, County Government of Nairobi, National Government of Kenya, Slum Dwellers International and Akili Dada. The Guest Speaker was the County Executive Committee Member for Environment and Water Ms. Veska Kangogo who spoke on what was required to achieve greater environmental sustainability.

Field Visit, Mukuru kwa Reuben.

In the afternoon, after the presentations and panelist discussions, a site visit to Mukuru (MuYI hub, Rueben Stadium, Ruben Center and Ngong river) was conducted to introduce the selected youth innovators to the site. The visit served to increase the capacity of the youth to understand the urgent need of sustainable urban development, as well as to provide the platform for brainstorming of innovative perspectives to contribute to sustainable solutions.

Field Visit, Mukuru kwa Reuben.

Field Visit, Mukuru kwa Reuben.

DAY 2: **29th May 2019**

The day's Hackathon session was hosted at the Mathare Environmental Conservation Youth Center. It aimed to develop sustainable solutions to the urban challenges identified in the presentations from the day before, and site visit to Mukuru informal settlement. Facilitators from KRCS, UN Habitat, Mukuru Youth initiativeand Mathare Youth center; guided the youth innovators through the process. Nine groups of youth participants were present for the hackathon, and three groups were assigned to brainstorm and further develop their innovative solutions within each of the thematic area. The groups were distributed as captured on the next page.

GROUP TITLE	NO. MEMBERS	IDEA
Hubble-view	3	Using GIS application to tackle issues surrounding traffic, parking and drainage.
Green-pap	2	Smart greening initiatives in environmental conservation by growing trees and continuously monitoring of ecological zones.
Agri-innovators	5	Application of hydroponic farming to solve environmental pollution.
Eco-burn	4	Creating job opportunity and ensuring sustainability by using waste products to make organo-briquette.
Young Men Community Changers	2	Conservation of water by adopting storage innovations that conserve rain water and flood control measures.
Eco-Jenga	2	Environmental conservation by reusing available inorganic waste to build affordable and disaster resistant housing solutions.
Ganadores	4	Creating a safe socio-cultural spots in market spaces for infants, toddlers and breastfeeding mothers.
Empowered	2	Urban Agriculture as key to a sustainable future focusing on re-growing groceries and providing skills/ capacity building for better livelihoods.

Figure 11 Participants Group Distributions and Ideas during the hackathon

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Participants in the Hackathon

Participants in the Hackathon

Facilitators and Youth calligrapher from Mathare Informal Settlement.

Participants engaging during the hackathon.

Participants group discussion during the hackathon.

Participants pitching their ideas to the judges.

Judges during the pitching session.

DAY 3: **30th May 2019**

On the morning of the last day, the different groups presented their innovative solutions to a team of expert judges who included members from development organizations, corporate leaders and potential investors namely: **Suada Ibrahim (KRCS), Bob Ndubi (Silver Hill Capital), Toru Arai (JICA), Dorothy Nkonge (Danish Red Cross), Joseph Oliveros (IFRC) and Maryanne Thande (NETFUN).**

The groups were marked against an evaluation framework and criteria developed by KRCS and UN-Habitat, and the best performers in each theme were selected as the winners. At the end of the pitching session, the three winning groups were; Eco-burn, Ganadores, and Agri-Innovators.

- Eco-burn won under the category of Environmental Conservation and Water Use with their innovative idea of 'Empowering and Powering a Clean Environment Through the use of Organo-Briquettes '.
- Ganadores won under the category of Open and Public Space with their idea being 'Developing Safe, Social-Cultural Child Spots in Market Places'.
- Agri-innovators won under 'Business Solution for Livelihood and Youth Employment withacupunctureHydroponic Farming.'

In the afternoon, the winning groups were given the opportunity to present their solutions to delegates in the United Nations Office of Nairobi, at the Youth Tent as part of the 1st UN-Habitat Assembly. The event concluded with all participants receiving certificates for their participation in the hackathon. In addition to the conclusion of the hackathon, the winning groups were advised by KRCS to follow up with potential partner organizations and fundraising avenues to incubate their solutions, to help them improve and receive financial support to implement and make real impacts on society.

Group Photo, Youth Tent at United Nations Office of Nairobi.

HACKATHON LESSON LEARNT.

Judges during the pitching session.

Awarding of participants certificates, United Nations Offices.

Lessons Learned

Project Successes

Successful and creative innovative solutions were pitched as part of the Hackathon

The key objective of engaging and providing a platform for youth to brainstorm and present innovative solutions targeting urban issues in informal settlements was well achieved. Many of these innovations were also economically viable, with several ideas involving the use of minimum capital and an element of reuse and recycling to generate new products. The sustainable element allowed the ideas to contribute as a multiplier effect to the community thereby resulting in better living conditions.

Significant number of Interested Applicants

The hackathon received 81 interested applicants, and after critical reviews and evaluation by KRCS, 40 participants (9 groups) qualified to take part in the Hackathon. The significant number of applicants within the short broadcasting period showed that there is interest amongst youth to participate, and improvise using viable innovation solutions necessary to make lives better, embracing new technologies and solving issues in their societies. In addition, it also encourages investors from different sectors to gain interest to mentor and facilitate youth as abled bodies to fulfil these innovations for sustainable living.

Thematic areas for discussion were well received

The three thematic areas were deeply discussed by several speakers from different sectors who were engaged during the panel discussion on day 1, which provided the participants a clearer insight to the real issues in the community, and helped to guide them through the hackathon process the next day in Mathare Environmental Conservation Youth Cente. The opportunity was ripe to allow leaders to nurture the young participants on the importance of solutions for safe and sustainable urban development, and also made them aware of the power of entrepreneurship as a driver to bring about change and create employment for youth.

Project support from many major development agencies like KRCS, UN-Habitat, ICHA, Partner for resilience

A significant portion of the success of the hackathon was the large presence of development agencies supporting back office processes and planning. These institutions have co-led the hackathon planning, and provided the platform for dialogue and exchange of experience, funding and facilitators to offer technical support to guide the participant throughout the hackathon.

Communication between organizations, and with participants were well coordinated

Communications between hosting organizations were conducted using through weekly meetings. Communication groups on WhatsApp were also set up both for the organizers and the participants with regular updates to ensure information sharing to all. This improved dissemination of information to all persons and made the sharing of documents easy and effective to make the hackathon event successful.

Creating connections for participants to interested partners and agencies

During the hackathon, especially on the 1st and the 3rd days, participants received opportunities to interact with speakers, corporate leaders, judges and potential investors. They also received the opportunity to present their innovations during the UN Habitat Assembly and met with several leaders and businesses who can be potential donors.

The hub team who were using GIS to tackle issues arising with transit, traffic and parking, and drainage issues caught the interest of a Japan International Corporation Agency (JICA) representative who was also a panel judge during hackathon. JICA primarily supports in economic infrastructure, private sector and human resource development and has a significant presence in influencing development in Kenya. The team received the chance to have a meeting with the JICA office where they pitched their idea again, and also received the opportunity to attend a 3-Cities Forum: organized by JICA and UN Habitat, welcoming authorities and government from Nairobi, Mombasa and Kisumu to find ways to move forward in collaborations for Transit Oriented Development (TOD) and Mobility Strategies.

JICA and UN-Habitat have supported the respective countries for the last few years - UN-Habitat has supported Kisumu in the development of Integrated Strategic Urban Development Plans, including priority planning projects and Quick-Win Solutions such as the Lake Front Redevelopment Project, and Nairobi in its expansion of transportation planning facilities, advocating for pedestrian friendly zones and streets. One recent example unleashed during the 1st UN-Habitat Assembly was the conversion of Luthuli Avenue into a pedestrian friendly walkway. During the Forum, after key presentations on ongoing and future projects by different the three different counties, the youth participants commented by sharing perspectives of local citizens, transport users, and most importantly youth, highlighting existing gaps in the planning systems which might not adequately consider the needs of these most vulnerable groups.

Project Challenges

Lack of sufficient facilitators to ensure control of security of participants while moving about

As Day 2 and 3 of the Hackathon was hosted in Mathare informal settlement (characterized by informal settlements characteristics which according to the UN Expert Group include inadequate access to clean water, inadequate access to sanitation and other infrastructure, poor structural quality of housing, overcrowding and insecure residential status etc.), greater attention should have been paid to ensure participants security while moving through the location, for instance, to look out against potential for mugging cases and to keep an eye on vehicles for the hackathon that were parked in the area.

Short time duration for procurement of materials resulted to a rush on the last days and also during the event. The procurement process was a bit slow resulting to last minute decision making and change of plans. This greatly affected the smooth implementation of the event as earlier planned. The impromptu switching of roles and responsibilities between organizations, although successful, were also unprecendented and had to be managed to ensure the hackathon would run as planned.

Way Forward

Potential for the replication. The success of the collaboration has created a strong need for similar projects in other locations and regions. In addition, the process allows the targeting of several different youth in the community. It also highlights and promotes the transfer of knowledge and experiences which is crucial in mentoring youth to help them realize their fullest capacity and potential, and to foster the spirit of innovation within them which eventually results in a more vibrant and productive generation.

Moving forward, follow up of the winning groups will be done to link them with partners and organizations That will be critical and help the groups not only to improve on the innovations, but also to receive potential seed funding or financial support to incubate the project and make real impacts to the society.

Future plans for a hackathon in Daadab. Daadab is a town located approximately 110km northeast of Garissa town and approximately 1000km from the border of Garissa Town. It is a cluster of five camps, that has hosted both host and refugee populations in the last few decades. Currently, the repatriation of Somali refugees in ingoing as the Government of Kenya has planned to close a few camps. The hackathon would be organised with a specific focus on spatial planning aspects and living conditions in the camps after closure.

Annexes

THEME

INNOVATIVE BUSINESS SOLUTIONS FOR LIVELIHOOD AND YOUTH EMPLOYMENT

TITLE

FOSTERING ECONOMIC RESILIENCE THROUGH URBAN ARGRICULTURE

VISION

SUSTAINABLE AGRI-INNOVATION FOR ECONOMIC DEVELOPMENT AND IMPROVED NUTRITION

AGRI-INNOVATERS

Victoria Banchiri | Charles Nyangena | George Mbatha | Sydney Satsiru | Alex Mutemi

Introduction

The growth of the urban population, which has resulted from both natural population growth and rural-urban migration, has led to an increased demand for resources. Statistical analysis shows that the rank size distribution of the urban places that comprise this urban population is and will be well distributed, corresponding to what regional geographers would consider as balance. This rapid urbanization has resulted to food insecurity as there too many mouths to feed and very few farmers in urban areas. With food shortages in urban areas, the prices for available food is hiked and the poor end up suffering. With this situation there is need to enhance urban agriculture in innovative ways in urban areas and cities. A very sustainable and good method is hydroponic farming.

The term “hydroponic” was first introduced by William Frederick Gericke of the University of California through publicly promoting solution culture to be used in agricultural crop production, back in 1929. Previously he used to refer to this kind of farming as ‘aquaculture’ but the term was already taken to refer to aquatic organisms.

However, hydroponic farming was there before, dating back to 17th century as published in the 1627 book Sylva Sylvarum (A Natural History) by Francis Bacon. It was referred at the time as water culture, and research techniques afterwards followed about this new method of farming. The hydroponic farming was not common (even today) due to skepticism from various responders and especially in 20th century, whereby various agricultural scientist such as Gericke, were denied research facilities and even faced criticism from their fellow scientists.

The earliest success of hydroponic farming was in Wake Island (1930’s), which was a refueling stop for Pan American Airlines. This island was characterized by rocky topography, thus not conducive for agricultural practice. However, since it was a stopover, there was a need for enough food to feed the travelers. Hydroponic farming thus became a necessity on Wake Island, and because it was very expensive to airlift in fresh vegetables.

In later years, NASA did extensive research on hydroponic farming for its Controlled Ecological Life Support System (CELSS), mimicking Martian environment. However, the most recent success of hydroponic farming was from Eurofresh farm, which sold 200million pound of hydroponically grown tomatoes back in 2007.

In Kenya and Africa as large, hydroponic farming became popular as early as in 1990's. However, at the time of its introduction, it faced a lot of critics from locals and especially it was against the conventional traditional soil farming. The success of its adoption in Kenya came after the effects of unreliable rainfall patterns, new soil- borne diseases and continuous deteriorating of soil productivity in early 21st century. It was either practiced by private bodies/ entities or resourceful farmers because its initial cost and management is very expensive and requires expert skills in its running.

Lately, it has become a very common practice to farmers and it is in high rise, especially because of its advantages compared to the conventionally soil faming. Raw materials are now easily accessible compared to previous years and new technologies are coming up in ensuring this method remain sustainable, cheap and economical through using locally available materials.

FUTURE SCOPE OF THIS TECHNOLOGY

Hydroponics is the fastest growing sector of agriculture, and it could very well dominate food production in the future. As population increases and arable land declines due to poor land management, people will turn to new technologies like hydroponics and aeroponics to create additional channels of crop production

Hydroponics also has been used successfully in Israel which has a dry and arid climate

Advantages

- It can be used in places where in-ground agriculture or gardening is not possible (for example, dry desert areas or cold climate regions).
- More complete control of nutrient content, pH and growing environment.
- Lower water and nutrient costs associated with water and nutrient recycling.
- Faster growth due to more available oxygen in root area.
- Elimination or reduction of soil related insects, fungi and bacteria.
- Much higher crop yields.
- No weeding or cultivation required.
- Recycling and reusing - Involves use of plastics
- Eliminate soil borne disease and pest
- Its cost effective.
- Environmentally friendly -

Disadvantages

- Initial and operational costs are higher than soil culture.
- Skill and knowledge are needed to operate properly.

Problem statement

Agriculture is dismally practiced in urban areas due to competition with other land uses e.g. residential, industrial, commercial etc. In addition, the few areas which are practicing agriculture use traditional methods of farming which does not meet the current and future demand of food and of food. Slums is continually characterized by food insecurity because of high population and also there is no land allocated for agriculture. Mukuru slums is unexceptional and suffers from myriads of problem i.e. inadequate food supply, stale vegetables due to long distance covered to reach Mukuru residents among others.

Therefore, there is a real need for adapting new farming system that stimulates plants to grow faster. This system should cover the fast-growing demand with less cost and minimum consumption of natural resources. Hence, the main goal of the study is to find an alternative system that covers the current and future demand with less cost and minimum consumption of natural resources. Hydroponic farming is suitable as it will take a limited space. Hydroponic farming is the fastest growing sector of agriculture, and it could very well dominate food production in the future (Butler & Oebker, 2006). Practice of hydroponic farming will also create job to the youth which makes about 75% of the population in Mukuru slums.

Objectives

1. To develop a strategy for environment conservation through reusing and recycling bottles.
2. To increase food production in slums
3. To create employment opportunities to youth and women which contribute to economic development in slums.
4. To come up with sustainable system of farming which not only use limited space but also have no adverse effect to the environment.
5. To develop local resource management by using them to facilitate hydroponic farming.
6. To facilitate capacity building in people living by gaining skills on hydroponic farming

Justification

- Adoption of hydroponic farming will enhance development of sustainable system of farming which does not rely on irregular rainfall experienced in many parts of Kenya Mukuru included hence food supply will be spread through out the year.
- The project will contribute to the economic development ie the profit got from hydroponic farming can be used to develop other sectors of economy eg transport and communication sector.
- The project when implemented will enhance economic opportunities for youth and women and improve the quality of life in the slums and create empowerment of community in the slums.
- The project will also enhance hydroponic research at public institution especially in learning institution and provide valuable experience to the students which can lead to self-employment after school.

Hydroponic farming uses locally available materials e.g. pebbles, used plastic bottles thus contributing to keeping environment clean.

SITUATION ANALYSIS.

Area: **Mukuru Slum**

Population: A population over 350, 000 people lives in Mukuru slums and this number is likely to increase by the year 2030.

MUKURU SLUMS

Mukuru slum was declared a special planning area in the year. Urban agriculture/ farming in slum is inevitably, it has its complication like space, food security, in availability of clean water as well pollution, however farming in these areas are feasible.

LEGAL FRAMEWORK

The legal frameworks that are aligned to the program includes the following:

- The Kenyan Constitution
- Big Four Agenda
- Sustainable Development Goals, and Agenda 2030

Goal 1 (No poverty) – target by 2030, to eradicate poverty for all people everywhere and ensure that the poor and the vulnerable (youth) have equal right to economic resources as well as basic services.

Goal 2 (Zero hunger) – by 2030, double the agricultural productivity and incomes of small-scale food produces as well ensure sustainable food production systems and implement resilient agricultural service.

Goal 8 (promote decent work and economic growth) – to achieve full and productive employment and decent work for all women and men including young people and persons with disability and equal pay for work of equal value.

Goal 12 (Responsible consumption and production) – by 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.

- Urban agriculture promotion and regulation bill in 2015-urban agriculture has experienced a lot of challenges in the past where the local authority would use nuisance of public health laws to prohibit the activities with the city but wit effectiveness of thus bill, urban agriculture is promoted .The bill seek also to integrate urban farming land use strategies to county planning while also providing extension and regulation services .

Project Planning and Design

Hydroponic system facilitates continous flow of nutrient solution runs over the plants roots. This type of solution is on a slight tilt so that the nutrient solution will flow with the force of gravity.

This type of system works very well because the roots of a plant absorb more oxygen from the air than from the nutrient solution itself. Since only the tips of the roots come in contact with the nutrient solution, the plant is able to get more oxygen which fascilitates a faster rate of growth.

Our proposed system is unique as it uses locally available materials that have been recycled in turn protects the environment. The materials used include recycled plastic bottles, pebbles and saw dust.

Economic Analysis

The proposed innovation is quite economical especially for small scale operators. Apart from buying the recycled bottles and saw dust, supplemented nutrients are bought. The nutrients go for 800ksh for 7ltrs and 120ksh for 1liter.

With an initial investment of about 500 shillings a small scale farmer can be able to cultivate vegetables and get back his/her investment in a month's time.

This innovation establishes a chain of employment starting from people who will be collecting the dumped water bottles to carpenters providing saw dust and suppliers of pebbles. It allows for value addition of the saw dust and bottles as they could have been disposed carelessly.

Recommendations

Financial institutions that offer formal credit should be encouraged to stop categorizing urban agriculture as risky, costly and difficult investment venture that involves high transaction costs and unpredictable returns. Farmers should be encouraged to take loans while the government needs to provide farmer support services to the urban farmers. Urban farmers should be encouraged to irrigate their farms and modern irrigation methods like drip irrigation should be availed to them to avoid water wastage.

TITLE

ECO JENGA INNOVATION

The word "JENGA" comes from a Swahili word meaning "BUILD"

Building safe houses with Waste Bottles, waste paper and plastic, soil and other inorganic materials: We offer an effective solution for reusing the diverse inorganic waste materials such plastics, waste paper and waste construction materials to build affordable and disaster resistant housing solutions for the middle income economies.

VISION:

TO BE THE LEADING INVESTMENT COMPANY IN OFFERING SAFE AND AFFORDABLE AND GREEN HOUSING SOLUTIONS AND INVESTMENT RETURNS TO SHAREHOLDERS

MISSION:

WE EXIST TO OFFER TIMELY, INNOVATIVE, RELIABLE, SAFE, SUSTAINABLE AND AFFORDABLE HOUSING SOLUTIONS.

MOTTO:

BRINING SUSTAINABILITY TO YOUR DOORSTEP

CORE VALUES:

- Sustainability
- Safety
- Creativity and Innovation
- Transparency
- Reliability
- Efficiency
- Customer focus

EXECUTIVE SUMMARY AND EXPECTED IMPACT

ECO JENGA is an affordable housing solution focusing on lower income groups and our vision is to make affordable housing and safety a reality to every human being.

A plastic bottle is filled with waste soil or with other clean unrecyclable waste, which then gets compacted tightly. The plastic bottles are then laid down in rows like bricks and can be cemented together with clay mud or cement.

A sand-filled bottle makes a great for a brick; an excellent low cost resource which has insulation properties – they can be used to build houses, water tanks, cisterns, greenhouses and more. Plus the shape of the bottle makes a beautiful design feature.

We also plan to engage the community by incentivizing them to swap plastic bottles tightly packed with non-recyclable rubbish for good donated from local shops and businesses. In return we also plan to build a number of community buildings using eco bricks.

The technology can also be used for housing and construction, fencing, public parks to communicate environmental

sustainability amongst others. This minimizes the cost of building materials in addition the use of timber based products thus reducing deforestation and mitigating climate change.

This alternative, reliable and cheap technology will incorporate the normal building techniques from the past and minimize environmental damage.

We aim to seek partnerships and tackle youth unemployment and the prevalence of waste disposal in town areas. The solution is to take advantage of plastic waste, glass waste, various waste construction materials, waste paper and the abundant soil we have to build strong, affordable and beautiful structures for shelter which are safe for settlement.

We want to partner and involve with the youth population and offer them employment opportunities to serve as bottle collectors. We will buy the bottles depending on the weight of the plastic waste deposited. We are also open to donations of bottles and inorganic waste materials from organizations. Another social advantage is the continual construction of buildings thus offering youth a source of employment where they can earn a living.

Affordable housing is a major problem here in Kenya particularly in most major towns like Nairobi. Informal settlements such as congested slums have continued to grow and a large percentage of the urban population lives here. The slums are characterized by mud houses. At the moment rents are scary in Nairobi, the number of low cost houses is reducing, and land prices are increasing over the years together with the high cost of construction materials. These are just some of the root causes of this problem. We are talking about the thousands of informal structures and lives at risk in Kibera, Mukuru and Mathare among others. Unfortunately, Loss of lives and properties due to fire and floods are everyday phenomenon with the many fire accidents we have been hearing over the breaking news and reports over the past years. It is possible to solve this problem and come together in solidarity to save the lives of our fellow brothers and sisters. Every life counts.

MATERIALS NEEDED

- Plastic bottles
- A few bags of cement
- Earth soil
- Other inorganic waste materials e.g. glass , paper, among others

MARKET OPPORTUNITY

When President Uhuru Kenyatta announced that provision of decent and affordable housing was one of the items in the Big Four Agenda, raised considerable expectations in the hearts of more than two million people who live in slums across the country. Meaning it's one of the gaps we have in the Kenyan market. The high cost of rents and manufacturing costs are on our favor. The Nairobi area where we have spotted a potential gap which we intend to partner with the youth and the relevant stakeholders to scale our impact. We plan to make good use of the uncollected inorganic material like plastics in bins outside the city.

WHY US?

- Low cost and cheap
- Disaster and Fire resistant (Fire and floods) Every life counts. We care
- Non-Brittle - (Unlike bricks)
- Absorbs abrupt shock loads - Since they are not brittle, there can take up heavy loads and build taller houses without failure.
- Environmental friendly
- Re-usable
- Less construction material
- Easy to build
- Green Construction

TITLE

POWERING A CLEAN ENVIRONMENT THROUGH THE USE OF ORGANO- BRIQUETTES

LOCATION

MUKURU SLUMS

DURATION

1 YEAR

CONTACT PERSONS: Kevin Mumu Karwigi | Kezia Khisa | Betty Chemutai | Ruth Njengi

PROJECT SUMMARY

We as the ECO-BURN solutions group came up with an idea for conserving the environment through production of briquettes and wood gas from organic materials. This project was identified to be the priority for the support of environmental conservation. One of the top most problems affecting Mukuru slum thus leading to outbreak of diseases and floods. The main objective of this program is to address degradation of the environment. The project will help in finding out of the solution. With the project, the community will benefit directly and indirectly considering the benefits that it would create such as provision of affordable and better fuel to the community.

PROJECT DESCRIPTION

Problem statement

The area in mukuru slum is affected by outbreak of diseases and blockages of sewages. When we visited the area, we noticed that organic materials had been thrown aimlessly and this lead pollution (water, air and land pollution)

Rationale

The project is very important as it will build capacity of local people to prepare, mitigate and recover. It helps in taking action to provide an affordable source of fuel for the community and a better one that will help in keeping of the environment clean. The project will further improve the issues of sanitation among the community.

Project goal and objectives

The main goal of the project is to provide a good and suitable environment to the community through production of briquettes.

The specific objectives of the project include:

1. To provide an affordable fuel to the community
2. To conserve the environment and make it suitable for the community.
3. To provide a source of income for the community members.

Project outcomes/results

- The primary outcome is that the community will have a safe environment which help to save lives
- The production of briquettes and wood gas will promote conservation of environment and hence making it affordable to the community.
- The community will discuss and come up with measures of avoiding destroying of environment and measures will be stamped at strategic places in the community.
- The community will have ground where the organic will be collected and dried for the purpose of making the briquettes and providing of wood gas.

Projects output

- Over 10,000 community members sensitized

Project activities

- The project activities will include collection of organic waste from the community.
- Drying them up.
- Carbonization of the organic material and making of the organo- briquettes.

Target beneficiary

- The project will be implemented in the area of Mukuru slum, Group village.
- The direct beneficiaries are people living in Mukuru slum.
- The indirect beneficiaries are the people or the community that live near Mukuru slum.

Project budget

Item	Unit	Price per unit in KSH	Total cost in KSH
Piston Briquette machine	1 machine	170,000	170,000
Cement	7 bags	850.00	5,950.00
Clay bricks	350 pieces	30.00	10,500.00
shovel	2 pieces	700.00	1,400.00
Galvanized pipes	10 pieces	500.00	5,000.00
Labor for masons	2 people	2000.00 per day	10,000.00
Metal drums	5 units	500.00	2,500.00
Sand	1 tone	2,000.00	2,000.00
ballast	1 tone	1,500.00	1,500.00
Wheel barrow	2 items	6,000.00	12,000.00
Total cost			**220,850.00**

Risk and assumption.

- The project will be a failure if the community will not help in conserving of the environment.
- We assume that the community know their problem and that development comes from within the community. This will contribute to a successful project.

Project sustainability

The project will be managed by Kenya red cross (ECO-BURN GROUP) and the community members. To ensure sustainability of the project, the beneficiary community will make a contribution of providing the organic waste and collecting them, provision of a public space where the project will take place. The providing of the briquettes will also be used to generate income to the group through selling of the briquettes at a cheaper and affordable price to the community members.

Consideration of crosscutting issues.

- This project will assist in youth development in that most of the youth will take part during the project example by collecting of the organic waste.
- The project will be disability friendly so that the right to access and contribute is granted to every member of the community.

Monitoring and evaluation

The project will be monitored monthly by CEC minister for environment and quarterly by greening initiatives. Implementation will be done by the eco-burn group. The eco-burn group will monitor every activity of the project throughout the project life. It is anticipated that the community will be able to keep the conserve the environment beyond the end of the project.

TITLE

SAFE SOCIO-CULTURAL CHILD SPOT IN MARKET PLACES
"INFANTS, TODDLERS, CHILDREN AND MOTHERS"

LOCATION

MUKURU SLUMS

INTRODUCTION

Investing in the safety, development and growth of children in open market places through safe socio-cultural child spots is necessary in facilitating their well-being. A child's early years are a very important part of their development. The Child-Friendly space is an intervention to provide infants, toddlers and pre-school children with protected environments in an open market context in which they participate in organized activities to play, socialize, learn, and express themselves as they develop away from their homes but within their mothers' workplaces in the market. Children tend to embrace things at an early age enhancing their skills, which is a part of their formation. The socio-cultural spots will generate engagements and experiences for the children for a profound impact on their physical, cognitive, linguistic, and socio-emotional development, learning abilities and behaviour change.

The centre will provide the mothers with lactation and feeding booths for their children as well as a rest space for expectant mothers and centre for menstrual health management away from the bustle of the open market system. Health, safety and learning opportunities are the factors considered when re-designing the safe socio-cultural child spots in the market spaces near their mothers. The safe re-designed socio-cultural spots will be accessible and enjoyable by all the children (infants, toddlers and pre-school children), as well as mothers.

These urban safe re-designed child spots will go a long way in promoting community cohesion, health and wellness. The safe socio-cultural child space for the children and mothers aims on integrating play-based learning, mother-to-child attachment in the market workplace, generating human capital through an enabling environment with a focus on building learning and play engagements of the children, enhancing safety and security for the children, improving quality of life through social cohesion, sustainability and development in the community.

The Safe Socio-Cultural Spots is a key programmatic interventions to protect children from physical harm and psychosocial distress in the Market context and to help them learn and develop within the reach of their mothers. Its activities are designed to build on children's natural and evolving coping capacities, and proactively involve children in the selection of activities to ensure that the activities are relevant to children while providing a child-focused and child-friendly environment in which children continue their cognitive development and can give them opportunities to learn on a variety of levels. They help children establish a sense of security. The centre is a supervised environments in which mothers can drop their children while working in the market. They provide opportunities for the mothers to be actively involved, share information, provide input and guidance, and increase their own self-confidence to protect and care for children.

BACKGROUND INFORMATION

Many young mothers in Gikomba market have to juggle with immense difficulties between attending to their children and their businesses in the open air market at the same time. This is often occasioned by the fact that they can hardly afford house-helps or nannies to take care of their children while they are working and neither can they afford to take their children into privately-owned daycare centres in their communities. Inaccessibility to safe, affordable, healthy and child-friendly play spaces for children and lactating mothers in market-place contexts is an issue leading to restricted economic engagements of the mothers who are traders in the market while taking care of their children. The safe space will also act as an emergency centre with safe entry point for life-saving emergency services and referrals alongside access to critical health information

The informal settlements have inadequate housing without infrastructures, such as, playgrounds, streets and accessible open and public spaces. Most young mothers living in the informal settlements in Nairobi are mainly market traders and casual labourers in the Gikomba market amongst other market places due to economic stress to fend for themselves and their families in providing for good sources of food, clean drinking water, health care services, sanitary services , adequate shelter, security and educational opportunities.

An indoor safe play, learning and engaging area in the open Gikomba Market of cleaned, floored prefabricated containers of 40-foot redesigned and surfaced with soft lining to reduce the risk of injuries from falls, with mats made of safety-tested rubber or rubber-like material, ideal plastic seats and tables, soft bean bags for children with mobility issues, cartoons, letters, or colours for the children to relate with, writings on the safe space where the children can relate to, toys for play-based learning. A well-lit socio-cultural child space with maximum supervision with caregivers and child-minders for precaution against risk of accidents and emergencies.

This concept aims at changing this narrative through the provision of safe re-designed socio-cultural open spots for children and women in the open market contexts. The re-designed spots will provide a safe space for children and women.

OBJECTIVES

1. To create an urban safe re-designed socio-cultural child spot for learning, playing, building and strengthening resilience, growth and development and positive engagement of vulnerable children and women in the open market contexts.
2. To foster effective engagements of children and women in sustainability and development and generating human capital.
3. To generate experiences for children and youth on their physical, cognitive, linguistic, and socio-emotional development, behaviour change.
4. To build a strong mother-to-child attachment

EXPECTED OUTCOMES

1. Children engagement and development in the communities
2. Strengthened platform and network for learning and playing to drive economic livelihoods amongst women
3. Increased commitment of the community towards facilitation of development of the children

ACTIVITIES/ COMPONENTS

1. Breast-feeding and Feeding booths for the lactating mothers,
2. Changing areas for the women and the children
3. Rest space for the expectant mothers and the women
4. Play-centre and Sleep areas for the children
5. Emergency Centre with safe entry point for life-saving emergency services and referrals alongside access to critical health information
6. Menstrual Health Management for the women and mothers.

BUSINESS MODEL

- The Safe Socio-Cultural Child Spot in Gikomba Market will be opened for the children and mothers as from 0600 hours- 2100hours
- Payment will be through
    i. In-kind service at the child spot and
    ii. Voluntary commitment by the parents
    iii. Monetary value,
- 20 bob per child for 5-hours admission of the child in three cycles: 0600-1100 hours, 1100-1600 hours and 1600-2100 hours
- 25 infants, toddlers and pre-school children admissions at ago at the Safe Socio-Cultural Child Spot

SUSTAINABILITY

Digital to Physical

- Accessibility
- Participation- Engagement
- Innovation
- Reputation

Direct connection- donations (bring what you can)

Interconnection with other facilities and services
e.g. toilets and bathrooms.

Engagement with other companies for resource income
e.g. selling the wall space of the socio-cultural child spot to companies dealing with children and women to advertise their services per wall

Value-added Customized Services- open

- Maintenance – especially in low-income areas
- Accessibility
- Enabling exploratory play over safety regulations
- Planning for parent & child – together and separately

RESOURCES

Activities	Human Resource	Role/ Responsibility of Human Resource	Financial Resources	Timeline
ACTIVITY 1				
Play-based centre	Technical personnel Volunteers		Stipends for Resource persons Sports/ Games materials Toys	
ACTIVITY 2				
Breast-feeding and Feeding booths for the lactating mothers, Changing areas for the women and	Technical personnel Volunteers		Stipends for Resource persons Materials	
ACTIVITY 3				
Emergency Centre with safe entry point for life-saving emergency services and referrals alongside access to critical health information	Technical team Volunteers		First Aid Kit	
ACTIVITY 4				
Menstrual Health Management			Materials Resource persons	

SAFE RE-DESIGNED OPEN SOCIO-CULTURAL SPOTS

Solution to the Addressed Challenge

Safe Socio-Cultural Child Spot integrated in the market-place for Physical, Social, Mental, Psychological, Emotional and Cognitive development of children through mother-child attachment, formation of playgroups and play-based learning.

Re-designed Prefabricated portable containers in the Gikomba market place;

- Pilot Market place- "Gikomba"
- Target group:
  - Children aged 6weeks- 4 years.
  - Mothers economically engaged in the market for their livelihoods

1. Breast-feeding and Feeding booths for the lactating mothers,
2. Changing areas for the women and
3. Rest space for the expectant mothers and the women
4. Play-centre and Sleep areas for the children
5. Emergency Centre with safe entry point for life-saving emergency services and referrals alongside access to critical health information
6. Multi-functionality of the Safe Socio-Cultural Child Spot
7. Inter-connection with the other facilities: WASH, Healthcare and Economic Livelihoods
8. Safety and Security of the children against risks and hazards in the market place
   - Accessibility of the Child Spot
   - Economic and Social value of the Child Spots to the mothers and the children
   - Replicability to other market spaces and places of work

OUTPUT

Rate (Ksh) per Child	Hours	Numbers of Children	Total	Cycles (5-hour) in a Day	Total (Daily)	Total (Monthly)	Total (Quaterly)	Total (Annualy)
20	5	25	500	3	1,500	45,000	135,000	540,000

BUDGET

CALL TO ACTION

Serial Numbers	Items	Description	Rate (Ksh)	Unit	Total
1	Prefabricated Containers	40-Foot	200000	4	800000
2	Paint; • Oil-based • Water-based	2 Litres	300	4	1200
3	Toys	Assorted	-	-	8000
4	Children Books	Assorted	-	-	12000
5	Well-Equipped First Aid Kits	Occupational Kits	8000	2	16000
6	Chairs	Plastic chairs	700	15	10500
7	Tables	Plastic tables Wooden tables	700	4	2800
8	Playing/ Sleeping Mats	Assorted	300	30	9000
9	Cartoon Stickers	Assorted	100	30	3000
10	Crayons and Stationaries	Assorted			1500
11	Curtains	Assorted	1200	7	8400
Total					**872,400**

TITLE

FOLDABLE WATER TANK FOR RAIN WATER HARVESTING AND FLOOD CONTROLL IN MUKURU

Innovative way of Rain Water Harvesting, minimizing wastages so as to increase access to clean water for households and create employment

LOCATION

MUKURU SLUMS

INTRODUCTION

The ever-increasing population, driven by high birth rates and immigration, has outstripped residential and social amenities, water resources, and the capacity of sanitation and hygiene infrastructure in slums. This has led to an overall deterioration in the quality of the surrounding environment. The facilities including water are quite unsatisfactory for the slum dwellers .Efforts directed towards water management, waste management, sanitation and hygiene have not translated into ensuring sustainable availability and access to sufficient water of good quality. In Nairobi, slum dwellers live in a much more densely populated area than other cities in Africa. This population density has contributed to the quest for communal water access and sanitation facilities which are largely poor. Kenya Red Cross society has come up with an idea of foldable water tank; an innovative low-space utilizing water storage facility is a unique choice for slums to deal with water collection as well as temporary storage of potable or non-potable water. It will be designed to fit in a crowded slum homestead, easing the process of storage by fitting in the otherwise wasted spaces. It has a component of water filtering converting dirty, rusted water into clean water.

BENEFICIARIES

The immediate beneficiaries will be women and children in Mukuru slums. This group of people will use this tank to make money for a living by selling the excess stored water to homes or institutions. It is estimated to have bulk storage of up-to 210,000 gallons. The tank will help collect otherwise wasted water, reduce flush flooding in slums and improve the drainage in the slums. The next beneficiaries will be all homesteads who use the tank to collect water for home use. It will have a zipper to allow for easy cleaning.

THE IDEA IN CONTEXT OF URBAN COMMUNITY RESILIENCE AND CLIMATE CHANGE

Conventional rainwater harvesting technologies for homes and institutions have been tried in other areas and have proved successful. The innovation of a foldable water tank for slum communities with limited space will foster community engagement where the youth and women who participate in collecting rain water/running water storage facility to earn a living by selling water. When communities are involved in an activity that directly benefits them it fosters ownership and adoption of the technology. Mukuru Slum dwellers have over the years been involved in and mobilized for cleaning and sanitation exercises by KRCs, If mobilized to collect water this will immensely contribute to Nairobi waters endeavors in encouraging households to tap rain water as a supplement to water that the Government channels through Taps which is frequently rationed during dry seasons owing to drastic climate change.

Another advantage of this system is that it will be designed to be operational not only for rain water harvesting but also connected to Nairobi water lines for continuous refilling and storage purpose with operational benefits of filtration utilizing the least space possible around houses.

Once the idea is designed and prototype is developed then maximum capacity of the tank can be ascertained to determine if different sizes of the foldable tank can be built for piloting and eventual commercialization.

The idea is in line with one of our thematic areas of focus in building Urban Resilience through Innovation and private sector engagement.

UNIQUE ADVANTAGES

We recognize different initiatives that have been attempted to solve the challenge of water in urban slums like mobile water points. However, a good number of these innovations have been communal and so have only solved the issue of water availability leaving storage to the portable facilities, whose major hindrance stays on the low amounts of water they store and high space requirements necessitated for larger water amounts. The Foldable water tank is an affordable storage facility that can be quickly and easily deployable for water harvesting in a congested and space constrained environment like a slum. The Tank is made of readily available materials on the local market and communities with attached components like a water filter to ensure clean and safe water, a funnel, and zipper to aid cleaning.

Although solutions for water harvesting have been in existence over time, to a large extent most of these previous technologies are expensive and not suitable for the target communities living in slums. Therefore the idea of a foldable water tank in a slum is unique and because of the affordability of the technology, it will be easy for every household to own this tank that can store large quantities of water and when not in use the tank can be deflated and safely stored in very small space just like inflatable child bouncing castles. The proposed idea has a business model where the collected/stored water can be sold for a living which will make the tank attractive and sustainable for households.

CHALLENGE

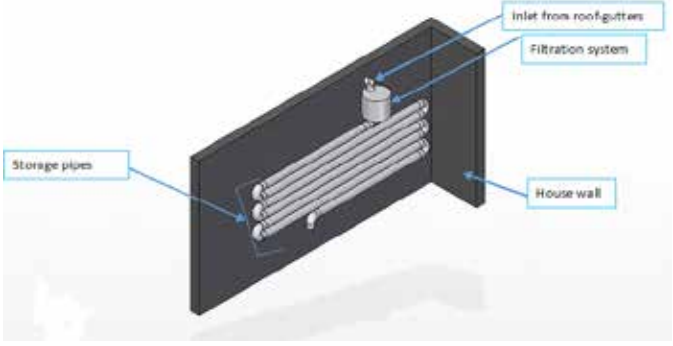
Some of the challenges to be ironed out may entail extending the longevity of the foldable tank with constant use. Let's say after five years of constant use by a household, how can we capacity build them so that they can replace filters on their own.

In some instances, the existing structures may be weak which means the foldable water system needs to be self-supporting as supporting them on walls might be impractical. Additionally incorporating the pipe storage in the wall structures might be an option worth exploring.

Most houses in Mukuru are ten feet by ten feet on average and hence may be too congested from inside. In such circumstance the system can be attached to the houses from the outside.

EXPECTED OUT COME

The idea will improve access to clean water by availing a foldable water tank to every household in the slum. The first step is to build a physical prototype which will be tested in Mukuru. Before producing on large scale KRCs wish to ascertain the maximum capacity of the tanks that can be targeted to homesteads. Bigger tanks can be targeted to schools and hospitals that have adequate space as well as households that want to engage in this as a business to sell the harvested water to neighboring communities like markets and homes who are eligible customers for this water.



TITLE

URBAN RESILIENCE HACKATHON- 2019

"Driving Youth Innovation for Better Cities"

LOCATION

MUKURU SLUMS

DURATION

1 YEAR

GROUP MEMBERS: Stella Nthenya | Wokiri Joe | Kenneth Ronnoh

Kenya faces notable challenges in the spheres of housing and public space management in the urban centers—the consequence of which subjects many poor citizens to unclean environments and deplorable living conditions. According to the United Nations, Kenya is one of the countries in Africa with the highest rates urban population growth due to people's movement from rural to urban setups in search of better paying jobs and better access to opportunities (United Nations Human Settlements Programme, 2015). Today, Nairobi experiencing sprawl of informal settlements making up slums with Nairobi city harboring the largest in Africa. Unfortunately, going by trends and daily observations, this phenomenon is not getting better anytime soon. The continual vigorous search for means of sustenance in the city is on the rise which effectively results to congestion and struggle for limited resources. The issue here therefore is lack of space or a limited existence of the same. Various aspects of human life are then subject to despair, three of which we have hereby pointed out; Transport sector, Drainage and Space Utility. It is no doubt that these things have the implication of hampering economic growth, compromising safety, limiting access to services and trivializing efforts for a cleaner environment.

This proposal focuses on the foregoing situation in Nairobi city to demonstrate a prototype of a thought of interactive web map project involving the application of GIS (Geographic Information Systems). Through GIS, we are able to give a fact-based view of spatial phenomena on demography and resource positioning, perform weight analysis and by these components to identify strategic areas for specific establishments, to establish trends, and to provide timely technological solutions to curb the menace in real time.

Idea

Largely, this proposal attempts innovation on open space challenges through;

I. Thematic Mapping of phenomena of interest- traffic congestion hot points, parking spaces, etc.

II. Identification of best location positions for given idea implementation, after spatial analyses, and

III. Digitization or simulation of an agreeable resettlement plans, repatriation and setting up strategic infrastructure to given ends.

Tram System

The challenge in transport sector is very often traffic snarl-ups during peak hours that congest both link roads and highways. Using GIS, we propose a redefining of routes and design a Light Commuter Railway System and terminuses- both proposals which factors in peoples transit requirements and the current land use. A good analysis will see to it that the least resources are utilized, yet with the highest possible public gain.

Deducing from optimum route analysis, Light Commuter Rail system routes will traverse very specific, well-identified routes with their corresponding termini serving satisfactorily as per consumers' expectations concerning timeliness, scheduling, security and accessibility. The process of transitioning passengers from busses to the commuter trams is to be as agreeable to the users as much as possible. This will mean a very efficient transit system for the people of Nairobi.

Smart Parking

On Open Space Management, guided by GIS, we are able to design an up to task public parking lots that serves both to the comfort of the private drivers, reducing traffic and greatly curbing motor vehicle-caused pollution in the CBD to extents that motor entry in the central business district is concerned.

Drivers who would require a parking service should promptly identify parking lots in a manner easier than physically cruising through the CBD. In a web platform, drivers should readily pinpoint parking space having compared the attributes of the spaces, including occupancy status.

The smart parking concept will employ sensor technology with strategic installation of vehicle proximity sensors at designated newly designed parking spaces; consequently, this project also aims at giving right of way to special emergency vehicles such as ambulances, and fire extinguisher trucks.

Drainage

Drainage systems in Nairobi has been a major issue due to poor structural construction. Strategic areas may be identified by employment of GIS and proper areas for water channeling and garbage dumping identified. Aspects of elevation and terrain, and blockages are also contributing factors in the issue and with a decent professional attention to the matters, a lasting solution may be arrived at.

These three are our major focus areas, and if well implemented through Red cross humanitarian coordination with the local communities, interested companies and both National and Local governments and the public, we would see a transformation in Investments levels, accessibility of services, convenient and improved safety. This would see and efficient economy and satisfied community.

TITLE

GREEN PAP

#SioBoraMitiNiMitiBora

LOCATION

MUKURU SLUMS

DURATION

1 YEAR

GROUP MEMBERS: Stella Nthenya | Wokiri Joe | Kenneth Ronnoh

Problem Matrix

Kenya's forest cover currently stands at **7.4 %** which is way **below the 10%** constitutional requirement.

According to a report by Green Africa, Kenya loses an astonishing **5.6 million trees daily,** despite relentless campaigns on environmental conservation.

The **Kenya Forestry Working Group (KFWG)** has estimated that Kenya will lose **US$300 million** each year by deforestation from the tourism, tea and energy sectors.

KENYA FOREST SERVICE (Gazetted Forests)

ECOLOGICAL VIEW OF KENYA

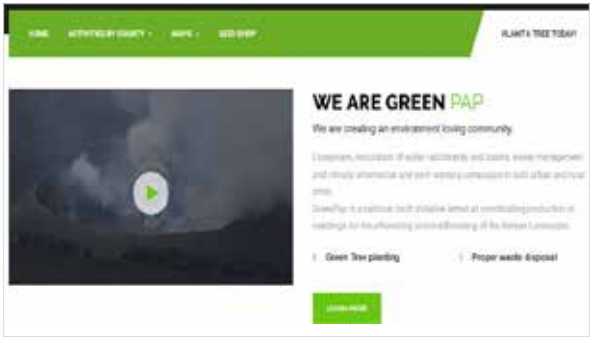
What is Greenpap?

Green PAP is a duly registered mobile application under the Laws of Kenya that coordinates smart greening by incorporating green initiatives and stakeholders in environmental conservation through tree growing and continuous monitoring, evaluation & conservation of ecological zones.

We use a complex algorithm which shows the real-time forest cover in each of the counties, the ecological zone of the region, the tree species most likely to survive in that ecological zone and the process to start.

Home Page

This is the start page of the we app which shows the purpose of Greenpap and a brief overview of what we are capable if we work together.

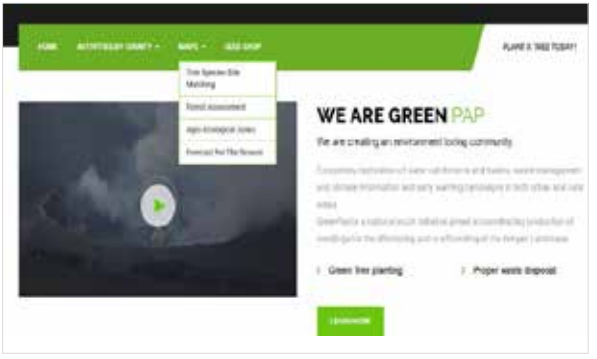


Activities by Counties

Activities by counties button shows the forest cover by region and gives you the opportunity to choose which region would you like to increase forest cover.

Maps, Tree Species Matching, Forrest Assessment, Agro-ecological zones and Weather Forecast

Tree species matching is important to plant the right type of tree to the right ecological zone to improve forest assessment and indigenous tree cover.



Plant a Tree Initiative

Plant a tree initiative lets you plant a tree by just clicking the button to initiate the process, then a tree ambassador will contact you on how you want to go about the process. It brings you closer to the evironment you want to protect.

Become a Tree Ambassador

Tree Ambassador is one of the most important roles in our system since it is the one that actually connects you to your tree. After initiating a tree planting event, this is the person who will contact you on the information of the tree you've planted and how the process is going to take. Be part of this exciting community in our journey to a cleaner and eco-consious country.

Report Card

Dashboard

Socio-economic benefit of Greenpap

- Solution to mitigate Global Climate Change and promote **Environmental Resilience**
- Entrepreneurship and financial literacy (eg. Sale and transportation of seedlings through the app)
- Knowledge transfer. Greenpap will be used in education to empower the youth, students other citizens to be the ***environmental change agents.***

We want to make Tree Growing a **FUN ACTIVITY!**

Value Chain.

RESOURCE	ORGANISATIONS	SCOPE/DELIVERABLES
Knowledge Transfer	Kenya Forest Service	• Capacity building training for green ambassador on tree seedling management. • Boost tree seedling production through training. • On the ground coordination for smart tree growing techiques. • Hand over of the planted trees for protection after three years.
Tree Seeds	Kenya Forest Research Institute	• Certified Tree Seed
Policy & Land for Tree Nursery Setup	County Governments Ministry of Education	• Facilitate official access to schools and learning institutions. • Facilitating environmental and climate change curriculum. • Collaboration on resources for tree nursery setup and care taking.
Finance/Grants	Corporates, Parastatals, World Bodies	• Funding for tree nursery setup.
Water	County Government, Water Parastatals	• Provide water for the growth of tree seedlings
Water Storage	ROTO TANKS, ICRAF	• Provide expertise in water storage and/or rain water harvesting.
Caretaking	Registered Youth Groups, NYS, Prisons,	• Watering weeding, pruning and general husbandry of the tree seedlings.

Guidelines

Our SDGs

In view of the United Nations Sustainable Development Goals (SDGs), Meforest will ensure that it aligns to:

"IT ONLY TOOK 30 MINUTES TO CLEAN KIBERA."

HACKATHON LESSON LEARNT.

Who we have worked with

REPUBLIC OF KENYA
MINISTRY OF DEVOLUTION & ASAL
STATE DEPARTMENT OF ASAL AREAS

REPUBLIC OF KENYA PARLIAMENT
OFFICE OF THE SENATOR
(MACHAKOS COUNTY)

NAIROBI CITY COUNTY

KENYA
Forest Service

GreenArava
The Best Crops From The Desert

UNEP

TITLE

SCORING SHEETS

Briquettes machine ?

16

JUDGE NAME:

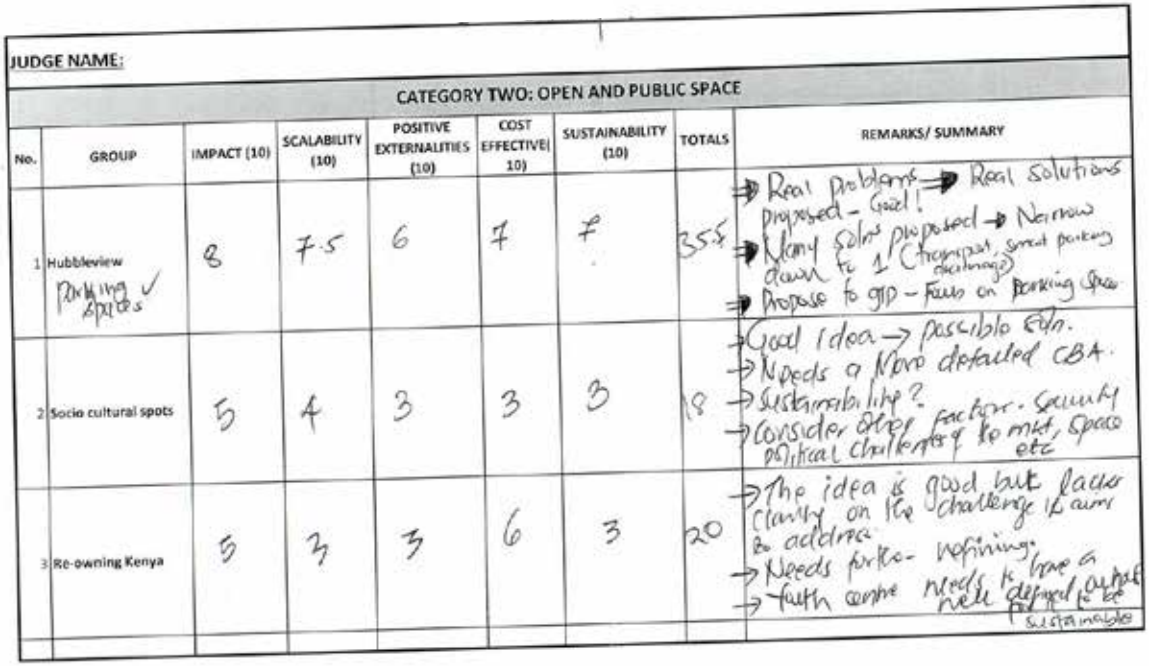
CATEGORY ONE: ENVIRONMENTAL CONSERVATION AND WATER USE

No.	GROUP	IMPACT (10)	SCALABILITY (10)	POSITIVE EXTERNALITIES (10)	COST EFFECTIVE(10)	SUSTAINABILITY (10)	TOTALS (out of 50)	REMARKS/ SUMMARY
1	✓ Greenpap App-Miforest Initiative	✓	✓	✓	✓	✓	30	- Sustainable development goals - Employment - Specified trees according to the environment needs and nutrients - Excess usage → manure * introduce to tree initiative → Halima
2	✓ Rain Water Harvesting	✓	✓	✓	✓	✓	40	- Foldable water tanks - Remove stagnant water issues - durable - 5 years → Affordable → ? → Where is water collected from? → from dirty roof sheets → Folding - due to movement (Rearrangement)
3	Branch? Eco-Burn	✓	✓	✓	?	✓	48	→ Briquettes, charcoal dust? → wood gas - clean air → organic waste → Dried → Briquettes

JUDGE NAME:

CATEGORY ONE: ENVIRONMENTAL CONSERVATION AND WATER USE

No.	GROUP	IMPACT (10)	SCALABILITY (10)	POSITIVE EXTERNALITIES (10)	COST EFFECTIVE(10)	SUSTAINABILITY (10)	TOTALS (out of 50)	REMARKS/ SUMMARY
1	Greenpap App-Miforest Initiative	[illegible] 8	[illegible] 7	[illegible] 6	[illegible] 4	[illegible] 7	32	[illegible]
2	[illegible] Rain Water Harvesting [illegible]	[illegible] 7	[illegible] 4	[illegible] 5	[illegible] 4	[illegible] 4	24	[illegible]
3	Eco-Burn	[illegible] 9	[illegible] 8	[illegible] 7	[illegible] 7	[illegible] 6	37	[illegible]



JUDGE NAME:

CATEGORY TWO: OPEN AND PUBLIC SPACE

No.	GROUP	IMPACT (10)	SCALABILITY (10)	POSITIVE EXTERNALITIES (10)	COST EFFECTIVE (10)	SUSTAINABILITY (10)	TOTALS	REMARKS/ SUMMARY
1	Hubbleview Parking Spaces ✓	8	7.5	6	7	7	35.5	→ Real problems → Real solutions proposed - Good! → Many gaps proposed → Narrow down to 1 (Transport, smart parking challenge) → Propose to go - Focus on parking space
2	Socio cultural spots	5	4	3	3	3	18	→ Good idea → possible eth. → Needs a more detailed CBA. → Sustainability ? → Consider other factors - Security political challenges to mist, Space etc
3	Re-owning Kenya	5	3	3	6	3	20	→ The idea is good but focus clearly on the challenge it aims to address → Needs further refining. → Forth come needs to have a new defined output to be sustainable

HACKATHON LESSON LEARNT.

URBAN RESILIENCE,

DRIVING INNOVATION FOR BETTER CITIES.

HACKATHON LESSON LEARNT.

UN HABITAT

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