Benioff Ocean Initiative/Coca-Cola Foundation Project
Reducing River Plastic Waste in Kenya.

Year 1 Report

The start of the project coincided with the beginning of the global COVID-19 pandemic and as a result, its gruesome effects overshadowed the whole first year. In Kenya, for most parts of the year, travel restrictions, curfews and social distancing measures were in force, and international travel bans meant that SVRG were unable to visit the Chemolex team on-site since the start of the project.

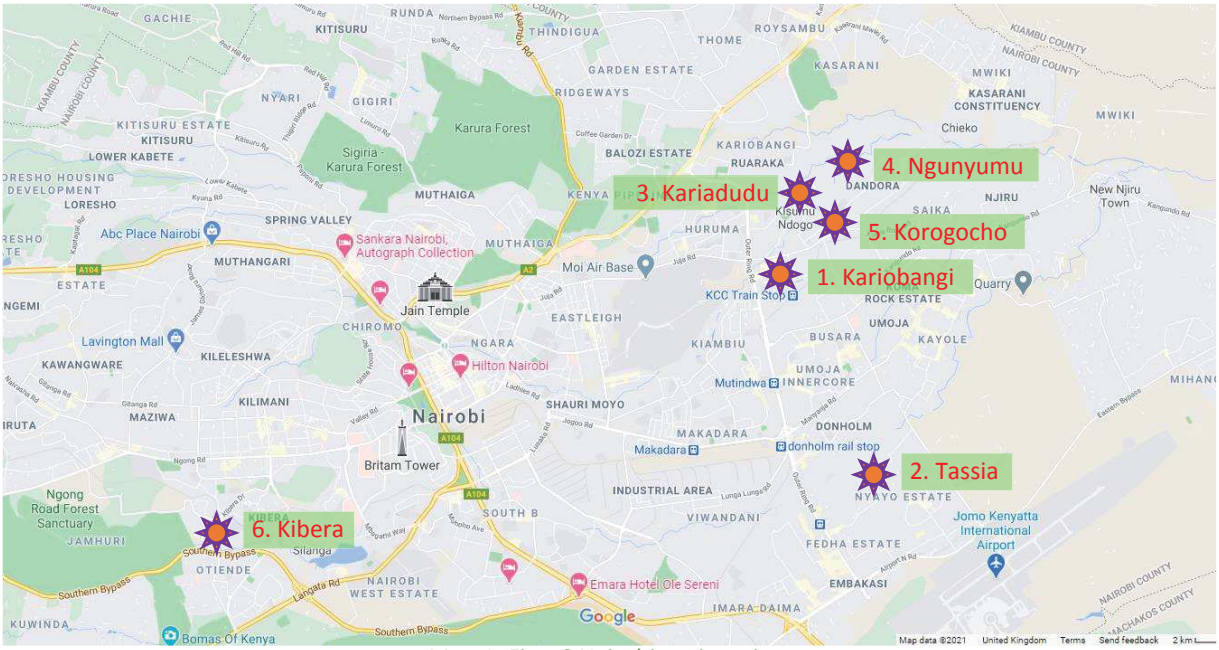
Nevertheless, the project is largely on-track. Volume of plastic extracted from the rivers is slightly below the original target (though total waste collected is above the target figure). Due to COVID restrictions, numbers of household recycling sites and youth groups trained are below the target figures for year 1. On the other hand, people reached through outreach and awareness programmes, and direct employment created are above target.

We consider the project well positioned to enter year 2 despite the adverse global circumstances.

Detail

1.0 Site Survey & Evaluation

The Chemolex team surveyed and evaluated the first six sites for River Plastic Capture Systems. We partnered with Earthcare Solutions (NEMA accredited firm) to undertake an elaborate survey of the sites. The site survey involved identifying the GPS locations of the sites, hydrological analysis of the river sections, community surveys and environmental impact assessment of the project.



Map 1: First 6 Nairobi project sites

2.0 Equipment Design and Development.

The team has designed and tested a number of alternative designs of passive plastic trapping technology, suitable for both small and medium-sized river environments, as well as electrically powered mechanical extraction systems. We have made iterative design improvements to make these systems more resilient to flooding and adverse weather conditions. However, current designs are for urban settings where grid electricity is available. We have outlined plans for possible off-grid remote site systems, which will be fully tested in the following year.

2.1 Physical Plastic Capture Devices.

Plastic Capture Systems have been installed in five different river locations in Nairobi, both of the passive variety where the extraction from the river is done by hand with the help of community groups, and the active variety where plastic is extracted mechanically. The different locations include:

LOCATION 1: KARIOBANGI PROJECT SITE (-1.263348, 36.880363)

This is the first project site that is along river Nairobi in the Eastern part of Nairobi County. The site within Kariobangi South which is one of the largest informal settlement in Kenya. Chemolex Company in partnership with Smart Villages Research Group(Project Administrator) developed and installed the first plastic waste capture device in this project site in June 2020. Before installing the Plastic Capture Device, Chemolex conducted an elaborate hydrological survey of the Nairobi River at this particular section. Factors such the security of the device, the amount of plastics and other wastes that flows along the river section and presence of an active women and youth group were taken into consideration.

Chemolex company has trained and partnered with ***Kiyambea Youth group*** to assist in operating and managing the plastic capture device. The group which consist of 15 members are responsible for operating the device during the day, rehabilitating the river ecosystem along Kariobangi South and constantly educating the sorrounding riparian communities on the importance of integrated waste management in addressing marine pollution.

Through the intensive training by Chemolex Company, ***Kiyambea Youth Group*** has established an effective waste management system that has enabled them to collect and segregate various wastes from the surrounding households. The youth group currently generate an average weekly revenue of US$750 through the waste management; an initiative that they currently run.

Image 1: Geo Map of Kariobangi Project Site

Image 2: Image of the Plastic Capture System at the Kariobangi Project Site.

LOCATION 2: TASSIA PROJECT SITE (-1.302278, 36.898152)

This project site is located along River Ngong': one of the tributaries of river Athi. The site is also on the eastern part of Nairobi city and is close to highly populated residential areas such as Embakasi, Pipeline, Tassia and Quarry.

The project site also experiences vast influx of plastic and other wastes that comes from the surrounding Embakasi illegal dumpsites. Bridgestone women operate the device at this project site and youth group (35 members including 17 male and 18 female). In addition, the group also generates revenue from curving artistic items and decorations from the single use plastics.

Image 3: Geo Map of the Tassia Site

Image 4: Plastic capture system at the site.

LOCATION 3: KARIADUDU PROJECT SITE (-1.249707, 36.883521)

Kariadudu is the third site where Chemolex has installed the third device. The site is located at the downstream section of River Mathari as it flows into the Athi River. This site is also close to major informal settlements such as Mathari, Kariadudu and riverside that contributes to significant amount of plastics and other wastes. The installation of the plastic capture device at this particular river section has controlled the disposal of household wastes in more than three illegal dumpsites that were close to the project site. Currently, the device captures and collects an average of 400kg of plastic wastes from this site daily.

Chemolex Company has collaborated with ***Kariadudu Youth group*** to operate and secure the device. The group consists of 14 members, four of whom are women and 10 are men. The group works on maintaining the device and providing security for it. The sorting of captured plastic is done on site weighed and transported to the recycling facility. Before fostering the partnership, the group was trained on waste segregation, operation of the device and sustainable management of river riparian ecosystem.

Apart from operating the device, Chemolex team has helped the ***Kariadudu Youth Group*** set up mobile toilets, a business that is leased during different events within Nairobi.

Image 5: Geo Map of the Kariadudu site.

LOCATION 4: NGUNYUMU PROJECT SITE (-1.244212, 36.891093)

The Ngunyumu project site is located along River Mathari as it joins river Nairobi. It is the fourth project site for the organization and strategically surrounded by many informal settlements that acts as the major source of plastic wastes deposits. The Ngunyumu area has significantly undergone transformation as the youth group that assist in this project has rehabilitated many dumpsites.

Chemolex currently collaborates with ***Migingo Frontiers*** to operate the device as well as rehabilitate the river ecosystem in this particular project site. The Migingo Frontier group consists of 43 members, 13 of whom are women and 30 are men. The capture device at Ngunyumu is one of the latest device that has been installed by the Chemolex team.

The group has other initiatives that Chemolex has helped boost such as Video arenas, increased garbage collection from the surrounding households and recycling of organic wastes.

Image 6: Geo Map of the Ngunyumu site.

Image 7: Plastic capture system at the site.

LOCATION 5: *KOROGOCHO PROJECT SITE -1.253331, 36.890716*

This site is located at the heart of Korogocho slums along River Nairobi. The massive amounts of plastic and other wastes that flow along this river sections comes from the nearby Korogocho market as well as the surrounding informal settlements.

Komb-Green Youth Group are currently in-charge of operating the plastic capture device at this project site. The group consists of 50 members, 23 of which are women and 27 are men. The group has conducted a number of initiatives involving river clean ups and tree planting along the river in efforts of rehabilitating it.

Image 8: Geo Map of the Korogocho site.

Image 9: Plastic capture system at the site.

LOCATION 6: *KIBERA PROJECT SITE (-1.313564, 36.775029)*

This is our sixth and one of the first sites we established in the initial phase of the project. Kibera is the largest slum in Nairobi and the largest urban slum in Africa. One of the tributaries of river Ngong passes through this labyrinth of iron houses and heaps of waste. Deep in the heart of the slum is the ***Clean-Ghetto Youth***, a team of 15 young men who are eager to ensure the slum is cleaned starting with their immediate environment. Helping them is ***the Mto-ini Women group*** consisting 13 strong and focused women.

Due to the nature and width of the river, we were unable to construct a plastic capture device, however, we have continuously worked with the two groups to manually clean, trap and remove any plastic and other solid waste from the river.

Image 10: Geo-map of the Kibera area site

Image 11: Manual River cleaning and rehabilitation.

Image 12: Manual River cleaning and rehabilitation at Kibera.

Device Operation and Security.

Community engagement has been carried out more rapidly than anticipated in the project, so operation and security of the plastic extraction sites has been largely carried out in collaboration with community groups rather than by Chemolex staff. This engagement of the community has so far protected the sites from vandalism.

Device maintenance, including servicing and spare parts

So far, the installed devices have required little or no maintenance at all, however, some have been damaged by unseasonal heavy rains and floods, and thus have required more extensive repair activity.

Continuous Device R&D

We continue to observe the performance of each device in situ, and optimize each design based on real-life use feedback.

Plastics Reprocessing Facility

In order to recycle and repurpose the waste material, we have both reached manufacturers of value-added products (such as floor tiles) and begun to work with women's organizations to produce crafts, as well as direct sales of sorted, cleaned waste plastic to third parties.

In order to begin the manufacture and marketing of the value added products, we are awaiting appropriate regulatory clearance and product quality assurance. Nevertheless, we have already invested in a high quality plastic shredder to facilitate all the above activities.

Image 13: Different designs of the pavement blocks produced by Chemolex Company from the Plastic waste

Plastic Waste Transportation Infrastructure

At this stage in the project, our requirement for transportation has involved taking the unrecyclable/ non-repurposed waste materials to landfills. We continue to research alternative uses for this material, to keep as much from landfill as possible.

Technical and Political Advice

We have benefitted from appropriate technical and political advice during the first year of the project. In addition to this, the team in Kenya had to deal with the adverse consequences of threats and legal action from a former advisor, with whom settlement was finally reached.

Communications and Outreach

The communications and outreach activity of the project has been a considerable success during the first year, and is ahead of schedule. Social media and other online activity has been initiated, and public events have been held, at a city-wide as well as community level.
The schools outreach program has not been launched yet. However, youth, community and women's' groups have been trained and sensitized to engage in recycling, waste reprocessing and managing the plastic collection devices.
In the course of 2020, a total of 10 community outreach programs were organized in six different project sites. The community outreach programs were organized in collaboration with other government agencies such as National Environmental Management Authority, Kenya Defense Forces and the local county government.

Image 14: Youths lining up for masks and tools before the clean-up exercise.

Image 15: Chemolex Partnered with Youth Groups to sensitize residents of Kibera using music.

Image16 : Chemolex`s Sensitization team during an outreach and awareness program in Tassia Project Site

Image 17: Clean up and Sensitization Programme that was organized in collaboration with the Kenya Defense Forces and the County Government of Nairobi

Data Collection and Analysis

Now, the team is manually collecting data from each site, reporting and analyzing it monthly. More work needs to be done in the coming year to automate this capability.

Licensing and Permits

Chemolex has obtained the necessary permits for the first six operating sites. We have also obtained necessary permits for transporting and managing wastes within Nairobi County.

Management and Operations

The project has been managed by Chemolex's senior management team of 8 people, responsible for management, operations, communications and finance.

Project Management and Oversight

SVRG has been overseeing project and financial management and contributing technical expertise where necessary, although it has not been possible to visit colleagues in Kenya due to adverse travel rules under COVID.

Travel

See above.

Metrics

Broad impact category	**Indicator**	**Target**	**Year 1 achievement**
Environmental	1. Plastics and other organic wastes captured in Nairobi-Athi river system	1.1. In Y1 - 3,120 tons of waste captured 1.2. In Y2 - 13920 tons of waste captured 1.3. In Y3 - 14440 tons of waste captured	Total plastic wastes removed from the river sections is **60.4 tons** The total amount of wastes removed from the 6 project sites however is **3,456** tons (These are organic wastes plus other non-repurposed wastes that was disposed in the government dumpsite, and also includes waste collected from riverbank community cleanup exercises)

Broad impact category	Indicator	Target	Year 1 achievement
Environmental	2. Increase in neighbourhood recycling in areas bordering Nairobi and Athi rivers	2.1 100 neighborhood recycling points created by first year project 2.2. 600 households recycle plastics by the end of the third year of the operation 2.3. 200 tons/month of direct recycling collected by these households in year 3	**12** recycling points created in Kibera slums along River Nairobi **8** Recycling points created in Mathari along River Mathari **5** Recycling Points created in Kariobangi South along River Ngong **6** Recycling Points Created in Tassia along River Ngong **5** Recycling sites created in Baba Dogo **2** Recycling Points Created in Ngomongo **3** Recycling Points created in Kariadudu **TOTAL: 41 Recycling Points**
Economic	3. Creation of direct employment opportunities	3.1. Create 150 direct employment opportunities in Yr1 3.2. generated up to 200 direct employment positions ourselves and in subcontractors by end of Yr3	**10 Youths** directly employed at the Recycling Facility **6 Youths** directly employed at Kariobangi Project Site **35 Youths** directly employed at the Tassia project sites (We have 8 members working per turn every week) **14 Youths** directly employed at Kariadudu project site(6 members working per turn every week) **43 Youths** directly employed at Ngunyumu(8 members working per turn every week) **50 Youths** directly employed in Migingo(8 members working per turn every week) **TOTAL: 158 directly employed in the project currently**
Social	4. Creation of awareness on waste management and proper recycling techniques	4.1. 10,000 participants in outreach and awareness programs by the end of year 1 4.2. 30,000 youths and school going children sensitized on proper waste management by the end of year 2 4.3 Further 100,000 people sensitized by social media and other indirect methods	We have conducted **10** outreach programs with the least participants of **500** and the highest participants of **3000.** The average participants for the total outreach programs therefore is **17500 people.**