SOLAFRICA.CH
Verein zur Förderung von Solarenergie in Afrika
Association for promotion of solar energy in Africa

KIBERA YOUTH SOLAR PROJECT (KENYA)

Winner of Swiss award for sustainability
Prix-Nature 2010

A report on the Solar Energy Pilot Project

" Production of Solar LED Lamps in Kenya"

August 2009 - February 2010.

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REPIC
Renewable Energy & Energy Efficiency Promotion in International Cooperation

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss State Secretariat for Economic Affairs SECO
Swiss Agency for Development and Cooperation SDC
Swiss Federal Office for the Environment FOEN
Swiss Federal Office of Energy SFOE

The four interns who work for the solar project in Kibera.

Elizabeth Otieno
Team coordinator

Judy Wandia

Fredrick Oginga

Johanes Orieny

Acknowledgements

Solafrica.ch want to sincerely thank all the people who worked hard for the successes of this project. We are grateful for the generous support we received from donors, partners, and sponsors from various organisations. There contributions in material, know-how and financially made us together realize this project. Here are some of the donors and sponsors we wish to mention: -

1. REPIC (Renewable Energy and Energy Efficiency Promotion in International Cooperation) for their advice and the generous financial support.

2. Megasol Technik for the know-how in developing the lamp and providing materials and logistics support.

3. Greenpeace Switzerland, Jugend Solarprojekt, and Solar Generation of Greenpeace International for their materials and financial support.

4. Solarspar for financial support.

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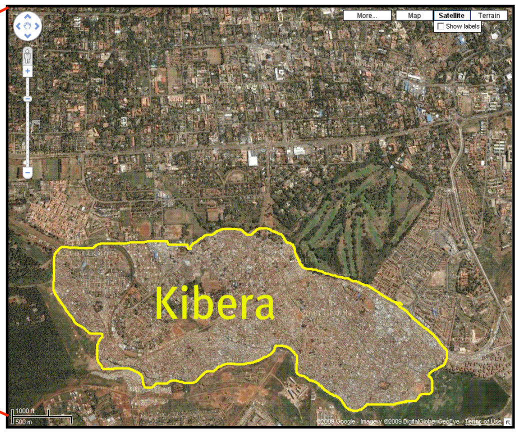
Project Location

The project is located within Kibera slum in Nairobi where 28 youths received an intensive training on solar technology for a period of 20 days. The trainees were taught to assemble solar lamps and to install solar home system. After the training one group assembled the solar lamps in Kibera, while another group had the opportunity to install solar systems in Kisumu (the red point on the map) as part of training.



Kenyan map[1]
Kibera map[2]

General information

Year 2009	Kenya	Switzerland
Area	580,367 sq Km	41,277 sq Km
Population	39 million	7.8 million (2009)
GDP	$ 61.51 billion	$ 492.6 billion
Economic activity	Tourism, export coffee, tea	Financial, pharmaceuticals, tourism, machines, manufacturing, services
Currency	70 KES =1 CHF (09)	1 CHF
Unemployment	40%	4.4% (Feb 2010)
Population below poverty	50%	NA
Mobile phone Users	19 million	*8.78 million (2008)
Labour force	17 million	4 million

* Some people have more than one mobile phone

[1] http://www.worldmapnow.com/images/2009/11/Kenya_map2.jpg
[2] http://slumdata.lifeof80.com/wp-content/uploads/2009/08/kibera-nairobi-type.gif

Achievements and Milestones (6 months)

1. Outcomes of the project in Kenya

⇒ The first solar lamp production of its kind in Kenya.
⇒ 300 solar LED lamps produced.
⇒ 28 trained young solar technicians.
⇒ 5 Solar home installations for private people.
⇒ 2 schools installed with solar light for education.
⇒ One solar powered computer laboratory for 20 laptops for teachers and students.
⇒ 4 green jobs created to produce the lamps.
⇒ First solar email communication possible from students of Senator Obama primary school in Kenya to President Barack Obama in United States.
⇒ Developed two new products, a solar mobile phone charger modified out of the solar LED lamp and a solar box for home systems or schools. (Still being tested)

2. Outcomes of the project in Switzerland.

⇒ Officially founded solafrica.ch as an association in July 2009.
⇒ Creation of one fulltime and part time job in Switzerland for the coordination of the project and market build-up. The part time job created is for the solar teacher who facilitates the workshops.
⇒ Launched the website of the association (www.solafrica.ch).
⇒ Database with contacts of stakeholders and a working structure.
⇒ Quality management system with weekly telephone conference and bi-monthly report.
⇒ Agreement with Tropenhaus Frutigen and Kandersteg International Scouts Centre (KISC) to offer solar learning workshops starting in Mai and July 2010 respectively.
⇒ Winner of "Prix-Nature" award in the category "Generation Zukunft" in Switzerland.
Prix Nature award is a Swiss sustainability prize awarded to outstanding people and organizations working on projects that will change lives and make world a better place to live in. (www.natur.ch)

In overall the pilot project achieved the expectations that were defined in the beginning of the first phase. However, more time is needed to make a more realistic conclusion. Some tasks took a little longer due to unforeseen circumstances but in general the first achievements and outcomes are more than satisfactory.

Besides providing clean light, the project has empowered young people in the slum to be useful people in the society and stay away from criminal activities. The key to success is to provide a first time help, in know-how, materials, market build-up and capacity building to be self-sustainable in long run. The principle of „Help for self-help".

A. Project overview

The objective of this project was to train young people living in Kibera slum (Kenya) to assemble portable solar lamps and then test them for daily uses with the intention of starting a small production centre if the pilot phase is a success. The solar lamps will then be produced by these trained young solar technicians and first sold to the local market. A part of the production will be exported to Switzerland and sold as fair-trade. Pre-fabricated lamps will be used as solar energy learning sets in schools and workshops in Switzerland. The youths were also trained to install solar home systems.

Over 70% of Kenya's population are not connected to grid electricity and therefore use kerosene, firewood and dry cell batteries for their lightening needs. The existing solar products in the market are till now mostly of poor quality, expensive, and are not adapted to the needs of the users in the slum.

A Kenyan family uses a minimum of 1 litre of fuel per week and spends an average of $10 per month on fuel for lighting. Kerosene lamps have insufficient light, expensive to run and are health hazards. Kibera solar lamp as it is now known has a bright light, is smokeless and has no or only little running cost (accumulators), since it is charged by solar energy. The Kibera lamp is a portable solar Light Emitting Diodes (LED) that can be used as a flashlight or a house lamp when hanged.

A kibera lamp provides an ideal solution to customers who have suffered using kerosene lamps and low-cost battery driven flashlights. The lamp is charged with an integrated solar panel for six hours and gives a very bright light up to 6 hours and less bright for another 3. The wooden casing is strong and does not need recycling. The casing has been varnished to protect the wood and keep off water.

During the in-depth market tests, technical and socio-economic aspects were evaluated. On the technical aspects, the lamp performed much better than we had expected. The lamp proved successful at providing superior lighting enough for a typical room in Kibera, than the common lamps there. The wooden casing makes the lamp robust and the design is acceptable to customers and easy to handle and carry around. Nonetheless it emerged that the initial switches were not performing well. New, better and smaller switches that fit on the side have replaced the older ones. The new switches even show if the lamp is turned on or off. Above all they improve the appearance of the lamp. The customers who use the lamp now save on fuel expenses and dry cell batteries, hence less pollution. Four, youths have now been contracted to make the lamps thereby earning a living.

The Kibera lamp is still expensive, compared to other light sources available on the market. More customers are willing to pay cash for the lamps as by instalment as there are additional costs. There is a local micro credit financing organization in Kibera that helps to makes it affordable to people with low income and cannot afford to pay cash for the lamp. We will provide customers with two years warranty for the lamp. This gives them confidence and assurance that the lamps are of good quality. We also try to differentiate the product by made with Swiss technology and not from China in our communications. The customers are thrilled to note that the lamps are made locally in Kenya and in case of any problem can be fixed unlike the Chinese products. More awareness campaign to demonstrate the lamp through road shows and educating customers will improve product awareness and bring in new customers.

In Switzerland, workshops at Tropenhaus Frutigen and Kandersteg International scout centre will begin in Mai and July respectively. Workshop will be held with the theme Solar Learning once per week. The lamp will also be offered for sale in fair-trade shops and on our website. Greenpeace will also promote the lamp as a learning kit during their school visit. The project received a major publicity boast when the initiator of the lamp Mr. Andreas Wirz who is one of the founding members of solafrica.ch won the first prize of "Prix-Nature" award in the category "Generation Zukunft" in February 2010.

The primary objectives were fulfilled in the market test. We therefore recommend as a next step, a full rollout to up-scale the production of the lamps to 3,000 this year. The youths in Kibera will produce and sell the lamps to the people there and export some to Switzerland. With this initiative Solafrica.ch will be a step closer to achieving its main goals of having solar lamp production centres in Kibera and other parts of the country. A more conclusive result of the performance and best payment system will be evaluated after one year.

B. Initial Situation

A typical kerosene lamp used in Kibera slum

Kibera is the largest slum in Africa with a population of about one million people. It is situated about 7 km from Nairobi city centre. It is home to poor working people mostly in the informal sectors like housekeepers, security guards and other low paying jobs. The houses in Kibera are made of mud and corrugated iron sheets. They are predominantly one roomed with no water or electricity. The bathrooms and toilets are detached and shared with several people. Houses are packed close together with narrow dingy streets.

The proximity of Kibera to the city centre makes it attractive to people who come from the rural areas looking for jobs in Nairobi. The jobseekers and low paid workers can walk to the city centre or work and save expensive bus fares. The houses are affordable and therefore attractive to newcomers in the city.

Many people who live here use kerosene everyday thereby exposing tonnes of carbon dioxide (CO_2) emissions. Used dry cell batteries are disposed off in landfills thus creating environmental hazards to animals, soil and ground water. Kerosene fumes contribute to various health issues like cough, asthma and eyesight damage due to poor light when used for longer periods. Kerosene lamps have caused fires, which destroy life and properties. Lack of adequate supply of reliable source of light has affected education of children in slum areas. Often the children are unable to do homework or read at home in the evening and hence poor performance in school.

Kenya gets an average of 6 hours a day of sunshine, with energy equivalent to about 1800 kWh/m^2. Very little of this sunlight is directly used as a source of energy. A lack of appropriate devices suitable for local people has led to a sluggish embracing the use of solar technology.

C. Aims and Objectives

The objective of this pilot project was to expose the solar lamps to technical and operational tests on daily uses. The outcome is to improve the fabricating, promoting and marketing of the lamps to millions of people who rely on kerosene lamps now.

The goals of the pilot phase were as follows:-

- Train 10 or more youths to assemble, repair and handle solar LED lamps.
- Test production quality and handling. (Select type of suitable wood and good finishing like varnishing)
- Test lamp production capacity in Kibera.
- Test the reliability of the lamps on daily uses like, quality of light, LEDs, batteries, and issues of theft.
- To determine the possible payment systems to make the lamps affordable to people with low income.
- Collect information on the experiences from the users.
- Explore the possibilities of climate change instruments. (Gold Standards)

D. Technical Description

1. Baseline lamps

The most common lamps and flashlights in Kibera and Kenya in general are Nyangile, Kiroboi lamp, dry cells flashlights and low-cost LED rechargeable. See the pictures below.

			
Nyangile kerosene lamps (Handmade lamp)	Koroboi Lamp (For middle class)	Metal dry cell battery torch	Low-cost rechargeable torch

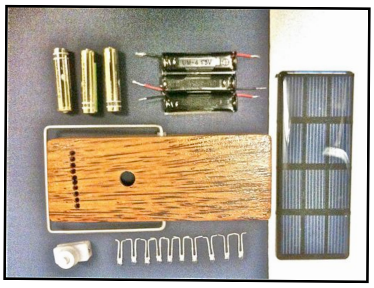
A Nyangile kerosene lamp is handmade from local material and is the most common with the poor people. It is made either with a tin with a wig or a bottle with a wig. They are inefficient, produce smoke and have very poor light quality of about 2-4 lumens. The battery driven torches are imported from China or India. They are made of very low quality material and sell for between CHF1.00 - CHF 4.00 with very high running cost. One dry cell cost CHF 0.20 and to charge a rechargeable torch with electricity will cost CHF.0.40. The torches are mainly used as a source of light for walking in the dark streets or going to the toilets at night.

2. Project Solar lamps

Component of Kibera Lamp

A Kibera lamp is composed of loose parts with minimal electronic components to make it as robust as possible. It consists of 10 LEDs, one diode, a small panel (13 cm by 5 cm), three 1100mAh battery (accumulators) type AAA and battery holders, a switch and a wooden casing.

The solar panels have a warranty from manufacturer of at least 35 years that means they have been made to work efficiently within this lifespan. Accumulators are of good quality and have a lifetime of between 2-3 years. The LEDs are brighter, more efficient and last longer than normal bulbs.



Assembling kit

Assembled lamp

E. Training of solar technicians

A Swiss and Kenyan Trainer   Solar Training   Drilling wood cases

There were two solar training sessions during the pilot phase. The first training was between the 3rd - 31st August 2009 with 28 participants. The second training was with a smaller group of 15 participants, between 1st - 28th February 2010.

There was a huge interest from young people in Kibera to be trained as solar technicians. Over 40 applications were received, out of which 15 were selected for the training from the kibera youth group. The other trainees came from Kogelo, Rarieda, Enermap youth groups and two foreign students from DR Congo and Cameroon.

Youth organizations that participated in the first training

Youth group	Number of participants
KCYP	15
Kogelo	5 including 2 teachers
Rarieda	4
Enermap-Kenya	2
DR Congo	1
Cameroon	1

The youths from other regions outside Kibera gained skills that enable them maintain solar systems that were later installed in there regions. Besides they gained insight of activities that KCYP undertake and had the opportunity to network and share experiences. For example Kogelo youths are now responsible for the maintenance of solar system at Senator Obama two schools and at Mama Sarah Obama (Grandmother of President Obama). Enermap-Kenya youth group are responsible for installations in parts of South Nyanza. The intention is to have the youths maintain and fix systems and not rely on KCYP youth from Kibera. This will encourage sustainability as the youths are included and are part of such projects.

The training included, the theoretical and practical parts. The theoretical section introduced solar technology to the trainees. It also covered areas of climate change and global warming. In the practical part, trainees assembled solar lamps and installed solar systems. Hands-on approach.

1. Theory courses

Climate change and global warming and their relation to CO_2 emissions. This was taught in form of a workshop, where trainees discussed human activities that contributes to CO_2 emissions, adaptations and mitigations aspect.
The students were divided into several groups, where they discussed various topics and presented them to class. Various solutions for CO_2 reduction especially for local, national communal and individual levels were discussed.

Theory on solar photovoltaic systems. Included general information on solar panels, from there function, to how they are manufactured to ways of differentiating them. Furthermore, they also learnt how to calculate the power and the loading requirements. More importantly they where taught how to plan, design and install a solar home system.

Brief introduction on ways to market and sell solar products in Kenya. Two local marketing experts, lectured the trainees on ways to introduce solar products in the market. They were taught best practices in sales and marketing through role-plays and simulations.

2. Practical courses

2.1 Assembling of Kibera lamp

Assembling of solar LED lamps involved soldering of parts and the making of the wooden cases. The soldering part was mastered quickly unlike the making of the wood cases. All the trainees did not have any carpentry and joinery knowledge or background. Handling of machines and tools was difficult and needed more time as originally planned. Besides, power was available at the centre only 3 days a week due to power rationing.


Learning soldering techniques


Making groves for solar panels


Quality check by Robert the director of KCYP

2.2. Learning installation of solar home systems

They first learnt planning, designing and installations on a table and how to connect various components. Then the knowledge was transferred to a larger board where they made actual connections of wires and components. As part of learning on the job, the trainees planned, designed and installed a solar system at KCYP centre. After the training they had the opportunity to install other solar system in 4 homes and two schools. Thereby gained more insight of the job.

2.3. Test production capacity and daily uses of the lamps

The trainees had to learn to produce quality lamps in sizeable quantities. The second factor was the quantities that could be produced per month. Other aspect that was considered is the availabilities of local material like wood to produce the cases. The trainees tried various methods of specialization and make the production faster and efficient as possible.

a. Examples of the lamp casings and switches produced.

Coconut tree wood solar LED Lamp (Old switch)

back side

side view

Neem tree wood solar LED Lamp (New switch)

front view

side view

	
Camel bone solar LED Lamp	back side

b. Features of casing of the Kibera lamp.

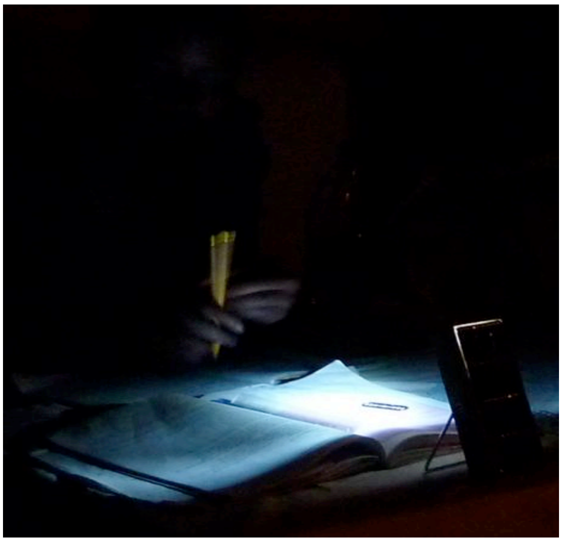
	Casing type	Advantages	Disadvantages	Recommendation
1.	Coconut tree wood	+Unique and looks special +Readily available +Strong wood. +FSC	- Not easy to process	Swiss market and sold as fair trade product
2.	Neem tree wood	+Readily available +Easy to handle +Affordable +Easy to label	-Not special, resembles other soft woods	Kenyan Market and Education market in Switzerland
3.	Camel bone	+Elegant and shinny +Exclusive product +Recycling of bones	-Not everybody's taste -Bones are limited -A lot of time to make -Might cause problem with animal campaigners -Expensive	High end product for Swiss market or just limited editions.

c. Technical and socio-economic aspects of the Kibera lamp

Below is a table of the technical and socio-economic benefits and impediments of the Kibera lamp. This is helpful in further improvement of the lamp and for marketing purposes.

	Positive aspects	Negative aspects	Recommendations
Technical aspects	+Bright light +Easy to operate and handle +Reliable +Multipurpose uses +Does not attract insect or flies	-Insulation of the wooden casing against water is not yet perfect. -Batteries (ACC) may be easily replaced with poor quality thus abuse of the lamps. -Confusing as customers think it is only a flashlight.	+To put a seal on the batteries and when removed owner looses warranty. +Advice customers to protect the lamps from water. +Teach customers about solar energy and accumulators.
Social aspects	+Kibera lamps have been accepted as a good product. +Improves social standing in society and living conditions +Produce better light for children to do homework and read books +Customers feel secure when they go out at night with the lamp and family spend more time together in the evening.		+To promote lamps to many people.
Economic aspects	+Money savings from reduced fuel consumption can be used to buy food or other items. +Creating business and employment opportunities for young people who otherwise had nothing to do.	-Initial costs are still too high for many people.	+More promotion to create awareness for more people to buy the lamps, thus will reduce cost.

d. Comparison between Kibera lamp and Nyangile kerosene lamp



Kibera lamp used as a reading lamp

Nyangile used as a reading lamp

The difference between the two lamps can clearly be seen. On the left is the Kibera lamp, very bright while on the right the book can hardly be seen.

e. Comparing the lamp when on the table and when suspended on the wall.

Kibera lamp on the table as reading lamp

Kibera lamp suspended on the wall in a hut

The lamp when hanged produces light for a wider area. The light is enough for illumination of a typical kibera house. When the lamp is placed put on a table, light is more focused and good for reading or for walking in the dark streets.

f. Charging of the lamps

Charging the lamp on a roof in Kibera

Charging in front of a hut in Kibera

The lamps were either exposed on the roofs or placed in front of the house. Since the houses are constructed in a way that a group of houses are attached to each other and have only one exit. All the belongings in the courtyards are safe. The lamps could be placed outside for charging without fear of theft.

F. Findings

1. Technical aspects

There are no technical problems or malfunction so far reported and all the lamps function well. The first customers are happy the lamps are working and recommended them to other people. Customers have two-year guarantee on the lamp. That means any faulty part will be replaced at no cost as long as it is not a physical damaged but a technical.

The lamp takes six hours at Kenyan conditions to fully charge. With the charge it produces six hours of bright light and another 3 hours of less bright light. The lamp has 70 lumens and when hanged at a height of 2 meters it lights up an area of about 36 m^2. A kerosene lamp produces about 2 to 3 lumens, with very poor illumination of a room. Temperatures of 40 degrees and high humidity did not affect the light quality or the function of the lamp.

The lamps are displayed for charging out in the sun either on the roof or in front of the huts (houses) for the whole day. These huts are attached houses that are enclosed in a courtyard and have one exit only. This design is normal for most of the housing structures in the slums. People living in such a courtyard know each other and take care of neighbours belongings like cloths and utensils. Therefore solar lamps as displayed as shown in the pictures above should not get stolen. Security within the courtyards is good and rarely is there any theft. Nonetheless, outside the courtyards there are high security risks of mugging or rape for people walking in the dark dingy streets without streetlight.

2. Payment systems

A total of 300 lamps have been produced for the pilot phase. Out of these, 200 lamps are being tested in the local market and 100 for Switzerland. One hundred pieces have been sold on cash basis and 50 lamps have been given out to our micro-credit partner Lomoro to test the payment system. Customers who cannot afford to pay cash for the lamps are offered micro-credit facilities to make the lamps affordable. The lamps were sold for CHF 30 but the recommended sales price is CHF 40. After the pilot phase, the lamps will be sold for CHF 40 and it is possible to convince customers to buy them for this price. The remaining 50 lamps have been reserved for leasing. There are high potential in leasing the lamps out to security companies but more resources is needed in promotion and marketing to popularize the idea amongst these companies.
There is a procedure that a potential customer has to fulfil to qualify for the micro-credit loan. Potential customers must become a member of Lomoro micro-credit and save money regularly with the

organization for at least 3 months. He or she must be well known or vetted with some group members before joining the organization. Some members of Lomoro micro-credit do not have permanent employment and rely on survival jobs or are self-employed. Members need guarantors within the group to get a loan. Lomoro micro-credit offers the lowest interest of 10% compared to other financial institutions that offer from 20% and some even 30% of the capital.
Lomoro micro-credit sells the lamps whereby the customers pay a first time deposit and the rest in equal amounts. The minimum deposit is CHF 5 and then the rest in equal monthly payment for one year.

	Deposit (CHF)	Monthly Rate (CHF)	Duration in months	Total cost of the Kibera lamp (CHF)
1.	5	3.30	12	44.6
2.	10	2.85	12	44.2
3.	Kerosene cost in one year			
	*1 litre per week x 52 weeks x 1.20 (CHF)= 62.40			

*Price of 1 litre of Kerosene in Aug.2009

The customer using a solar lamp will save a minimum of CHF 17 in the first year and following year enjoy free light. In the third year they will replace the three accumulators, at a cost of CHF 10. We offer a warranty of 2 years on the lamp. A sticker is put on the batteries to avoid the customers from removing them. If the sticker is removed then the customer loses the warranty. The accumulators will be collected and at the centre after there life span. Already we are exploring means of recycling the accumulators there and not disposing them anyhow.

The results from micro-credit scheme so far show that customers pay regularly and are happy with the lamps and the payment system. The number of solar lamps available for micro-credit system will be increased to 200 soon after evaluating the repayment rate of the first 50 lamps. It is foreseen that in future we could also have internal financing system within KCYP but after training our staff and equipping them with the necessary skills. Lomoro micro-credit still will play an important part in financing the lamps since they have a large customer network within Kibera and other parts of the country.

3. Possibilities of climate change instruments

If many people can be in a position to use solar lamps in Kenya, they will save many litres of kerosene fuel. The saved kerosene will in turn save tons of CO_2 and this is an opportunity for CO_2 compensation. In our middle and long-term objective is to work with CO_2 compensation organization to facilitate and subsidize the prices of the lamps with at least CHF 10 to make it affordable to many people. KCYP is collecting information on actual litres of kerosene saved per lamp. The data will be analysed after one year for a possible CO_2 compensation. Already a first contact has been made with myclimate and Compensate about this project. Myclimate will consider the project under their small project portfolio for a possible funding.

Rough estimates thou that most of our customers use a minimum of 1 litre of Kerosene/week. Below is a rough calculation.

According to chemical calculations. 1 litre of Kerosene produces 2.6 kg of CO_2

20 households we interviewed used a minimum of one litre a week therefore:-

1 litre per week/household x 52 weeks x 2.6 kg = 135.2 kg of CO_2 per year

Estimates:-

1’000 kibera lamps = 135’200 kg CO_2 per year = 135.2 tons

5’000 kibera lamps = 676’000 kg CO_2 per year = 676 tons

10’000 kibera lamps = 1352’000 kg CO_2 per year = 1’352 tons

G. Challenges

The major difficulty in the first training was to get the large number of trainees accustomed to available tools and machines. Besides, there was inadequate time allocation and planning for the first training. This however changed in the second training where there was adequate time for training and installation.

The other unforeseen inconvenience was the frequent power shortage in Kibera. Electricity supply was available only three days in a week. Training was interrupted especially the practical work where electricity was required for the machines and for the soldering. The second training consisted of a small group of 15 youth from KCYP only. The team was easy to handle and furthermore there were no power shortages.

There are only two Forest Stewardship Council (FSC) certified tree plants in Kenya namely, neem and coconut trees. Both of them are suitable for making wooden casings for the solar lamps. The coconut tree wood has unique grains and it is not widely known whether in Kenya or in Switzerland. There are three types of coconut timber wood. The best among them is brown and has a firm texture, while the black one is not hard enough to make good cases. Neem tree wood is easy to work with but it resembles the local soft woods. However, customers in Kenya do not care what kind of wood is used as long it does not break easily. They just want good functioning lamps with an appealing finishing. In Switzerland, the coconut tree wood is preferred because it is unique and not common and this is an advantage as a unique selling preposition. However, neem tree wood is ideal for lamps intended for educational kits.

H. Results and Discussions

A total of 28 youths have been trained as solar technicians. They can assemble a Kibera lamp, install a solar system and do maintenance work. The training equipped the youths with life skills that they can now earn a living as solar technicians to make their lives better. Some four youths are now assembling solar lamps and installing and maintaining solar systems.

A small assembling unit has now been put in place in Kibera Centre and it is the first of its kind to produce (assemble) solar lamps in Kenya. It is capable of producing about 300 good quality finished lamps every month. Four youths have been contracted to work for the next six months as interns with intention for permanent employment. The production capacity can be improved with hiring more workforce and more machines.

Kibera lamp has superior light quality with multipurpose uses. That means it can be used as a torch or a lamp in a house. It is small and easy to handle and carried around. All the customers who bought the lamp and those who saw it like the design and the size. Often many people confuse the lamp for a torch but after explaining and trying it out they understand. What is needed is road shows with demonstration will assist to illustrate how to use the lamp and to show its advantages.

The Kibera solar lamps will provide a clean bright source of light to many homes. This will improve the education and health of many children. Families will no longer be exposed to indoor pollution or risk of fires. The lamps will also be a source of security for people living in slum when they have to use detached toilets or move about in the streets at night. At a large scale, the project will help reduce tons of CO_2 emissions, while promoting renewable energy sources and in that way creating green jobs and protecting our fragile environment.

The lamps have to be well positioned depending on the casing to maximise profits. The neem wood is suitable for local uses and as educational kit. The wood also offers a surface for advertisement for companies. It could be used as a give away lamp with a company logo. In Kenya such a space on the lamp would be used for advertisement to promote products or for advertisement for companies. The revenue generated should be used to subsidize the lamps or offer reduced prices for lamps with logos on them. A marketing strategy and plan will therefore be developed as a next step.

There are possibilities for local sponsorship and donors in Kenya. KCYP has contacted three organizations and in the process of contacting others to sponsor lamps to children and people from very poor background that need these lamps. The lamps will provide light to enable children to do their homework and to improve their health conditions.

There is a great opportunity for carbon dioxide compensation with the lamps. Already first contacts have been established with myclimate and Compensate for a future CO_2 compensation with the lamps. Such an instrument will help to reduce the price of the lamp and make it affordable to many people. It will also offer prospect for expansion with the additional funds.

The trained solar technicians have in the short time been able to develop two new products. A solar box which is a simple plug and go power station and a solar LED lamp cum mobile phone charger. A solar box is where accumulators and charge control are enclosed in a box with inlet for solar panels and out lets for plug in systems for direct current (DC) or alternating current (AC). The KCYP solar technicians also modified a solar LED lamp, to charge mobile phones. They managed by adding one extra accumulator and a USB port. The mobile phone charge has to undergo test first in Switzerland before it can be available for sale.

The project is empowering young people in the slum to be useful people in society and stay away from criminal activities. The key to success is to provide a first time help, in know-how, materials, and market build up to be self-sustainable in long run. „Help for self-help.“

I. Recommendations and the Next Steps:

After the successful training and testing of the solar lamps, it is now time for full rollout to scale-up production.

- Additional machines and materials are therefore required to produce more lamps.
- There is need to construct a workshop and a showroom at Kibera centre. Already a piece of land has been identified where the workshop will be built. Currently most of the work is done out in the open and in a small room formally used as a library. This cannot continue for a long time because during rainy season, the production will be slow.
- A good marketing strategy is required to market the lamps in Kibera and not rely only on mouth-to-mouth propaganda. But to have road shows where the lamp is demonstrated to potential customers and other organizations within the slum area.
- Solar home systems will become popular especially with schools and middle-income people. KCYP have received several inquiries from potential customer who have visited Senator Obama schools. Such request came from Ombogo Academy school board who would like their computer laboratory to run by solar because electricity is expensive and unreliable. There are similar situations across the country. Awareness campaign strategy is necessary to sensitize other school administrations of the available solutions.
- There were 19 million mobile phone subscribers in Kenya today. Mobile phone is an essential communication and banking device for many there. Mobile phone is also used to send and receive money, a service called “M-Pesa”, which means “mobile money”. It is a revolution in banking industry in Kenya and in the East Africa region. A mobile user can deposit or withdraw money from money points or agents. The agents are found in kiosks, shops or normal banks. Money is transferred through short messaging service (SMS) to recipients. It is also used to pay bills or buy telephone cards. It is less bureaucratic and convenient to many people. However, mobile phones users in slums and villages have to walk a long distant to charge their mobile phones. There is opportunity to offer mobile charging services with solar system, close to the people and independent from grid. The two new solar products are suitable for this target group. But first the products have to be tested before market launch.
- Solafrica.ch has attracted a lot of attention lately with the winning of the Prix Nature award both in the print and new media. This has led to a stream of inquiry about the project both in Kenya and Switzerland. We want to use this wave to popularize our organization and products offering.

J. Solar Installations

1. Installations at Kibera Centre as part of training. August 2010

The Kibera Centre is in the periphery of Kibera slum. The building is a four-roomed maisonette and a kitchen. The installation was part of training to acquire more hands-on experience.

Trainees on the roof of Kibera center fixing a solar panel. This was part of hands-on practical training.

A group of female trainees installing switches inside the Kibera centre.

2. First Installation by kibera youth at Mr. Jakoyo Owambo house August 2009

The first installation done by the trainees with limited instruction from the solar trainer.

Mrs. Owambo on the left in the picture has set up a mobile charging business and earns CHF 150 per month. Besides free light that she uses in her home.
On the right is Mr. Joshiah Ramogi, the Executive Director of Solafrica.ch

3. Solar installation at Mama Sarah Obama August 2009

Mama Sarah Obama and some trainees

Installation at Mama Sarah Obama

The solar home system at Mama Sarah is a 35 watts solar panel and 80 Ah battery. It is enough to light 5 rooms and charge mobile phones. She charges mobile phones for her neighbours as well.

4. Senator Barack Obama Secondary school solar installations

The secondary school had two parallel installations for light and to power 20 laptops.

Light:- Two polycrystalline solar panels each 35 watts, 8 Ampere charge control, 80 Ah battery, 5 bulb holders and 150watts inverter. The system is sufficient to provide light for 6 hours everyday even on cloudy days and can also power radio and mobile phones.

Solar to power 20 laptops:- There were Ten polycrystalline solar panels each 35 watts, 30 Ampere charge control and two life long batteries each 130 Ah. This is sufficient to power 20 laptops for 4 hours per day. The students and teachers can now learn computer skills.

5. Solar for education for schools: Nov. 2009

The learners sent President Barack Obama a solar email using laptop powered by solar energy.

K. New Products

i.) <u>Kibera lamp</u> has been modified to charge mobile phone via a USB port.

For light and charging mobile phones. Additional features are 1 accumulator and a USB port

ii.) <u>Solar Box</u> (School power station) developed by Kibera youth in February 2010, as a second product.

Consist of a 35-Watts panel and 40 Ah accumulators. Provides 5 hours of light for one classroom. It is portable and made in Kibera.