# Experiences and Analysis of Safe Kiosk Models in Kenya

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**Abstract**
Siemens Stiftung (foundation) and SkyJuice Foundation are helping to bring safe drinking water to rural areas, relying on proven technologies, financial self-sustainability, local ownership, education and training. The partners are also focusing on "clean" technologies and well-trained kiosk managers to give people in remote regions access to clean drinking water and pave the way to better health and hygiene. The kiosks also provide opportunities for income and entrepreneurship and help unlock the potential for further development, since the kiosks are linked to existing community structures such as marketplaces, schools, or hospitals. A major upside is that through the strategic location of the kiosks long walks to obtain potable water have been significantly shortened. PureFlow Water Solutions has been selected as the local implementing partner. Even though the long-term goal must still be to connect every household to the water grid, water kiosks are an important step on that path. This paper reviews this impact evaluation assessment of the pilot projects in Kenya and reflects existing best practice models.

**Keywords:**
Safe Water Enterprises – Kenya –Social Entrepreneurship – Education – Technology – Collaborative partnerships

## INTRODUCTION

The Millennium Development Goals (MDG's) have achieved some relevant proof points with regard to safe water supply in the last decades and have reduced the amount of people without access to safe drinking water from more than two billion in 1990 to 765 million people in the last year (WHO/UNICEF 2013, p.8). Further developments of the MDGs argue for financially and environmentally sustainable solutions (WHO/UNICEF 2013, p.10). Based on these discussions, the Siemens Stiftung together with the SkyJuice Foundation has pioneered innovative Safe Water Enterprises (SWEs) that ensure access to safe drinking water while operating on a financially self-sustainably basis.

About 40 per cent of Kenya's population has no access to safe drinking water, which means an estimated amount of 16 million people is currently underserved. Many rely on rivers and streams for all their water requirements. Currently 185 million people in the world still do according to the latest Joint Monitoring Programme Report (WHO/UNICEF 2013, p.8). While the access to potable water in urban areas of Kenya has visibly been improved throughout the last years, the Water Services Providers (WSP's), which were established under the Water Act in 2002, only cover 5 per cent of the rural population. At the same time, other players that cover the rural areas lack coordination (IFC/SWN 2013, p.2). The need to find sustainable and affordable water supply strategies for the rural population therefore is more urgent now than ever before.

Siemens Stiftung (Foundation) and SkyJuice Foundation are helping to bring safe drinking water to rural areas, relying on proven technologies, financial self-sustainability, local ownership, education and training. With the water kiosk program called Safe Water Enterprises (SWE), the partners are focusing on modern technologies and well-trained kiosk managers to give people in remote regions access to clean drinking water and pave the way to better health and hygiene. The kiosks also provide opportunities for income and entrepreneurship and help unlock the potential for further development. Since the kiosks are linked to existing community structures such as marketplaces, schools, or hospitals, they often help shorten what were otherwise long walks to obtain potable water. PureFlow Water Solutions has been selected as the local implementation partner. Even though the long-term goal must still be to connect every household to the water grid, water kiosks are an important step along that path.

The recent emphasis on accountability and results-based management has stimulated interest in evaluating not just the process, outputs, and outcomes of development programs but also their impact, or ultimate effect, on people's lives. The results from this impact evaluation are intended to inform on where to allocate scarce resources and provide evidence of whether current water points are giving the expected results or not. This rigorous approach to evaluation is increasingly advocated as a more reliable way to develop an evidence bank of what works in development and what does not work. The results of this study are now being shared with stakeholders and other interested parties, to enable an open dialogue on opportunities and constraints for decentralized supply of potable water in developing countries. The key findings are presented in this paper.

## METHODS

Before investing into the SWE project the Siemens Stiftung conducted a project screening in Sub-Saharan Africa and beyond to identify promising approaches that offer the right service solution to remote regions and at the same time have the potential of self-sustainability. Through desk research and interviews some best practices have been reviewed.

In addition, the Siemens Stiftung commissioned Research Solutions Africa (RSA), to conduct the first impact evaluation for the pilot project of the SWE in rural Kenya. The survey was conducted in August 2012 and was carried out in two sites: Maragua Ridge Health Center (MRHC) and in WWN International Orphanage (WWN). It employed a combination of qualitative and quantitative methods to collect and analyze relevant data and report findings, based on more than 100 household interviews, two focus groups consisting of ten people each, as well as in-depth interviews.

## RESULTS AND DISCUSSIONS

### SUSTAINABILITY AND IMPACT RESULS ALONG THE TRIPLE BOTTOM LINE

Decentralized water treatment kiosks are contributing to better access to water in remote regions as many people depend on contaminated water sources. In 2000, still 92% of Kenyans in remote areas were depending on either surface water only or on so called improved sources of water, such as wells, ponds or existing kiosks (Thompson 2001, p.45). In most cases the water of these sources is contaminated through turbidity and bacteria. Effectively treating water from these existing drinking water sources is an efficient way of improving the water situation of those people, as waterborne diseases can be eliminated whilst people can still use the water sources they are used to.

The goal of executing the SWEs in Kenya is to create a model project that can be replicated by various partners to further regions. The project is therefore evaluated constantly to

understand which procedures and mechanisms need to be applied to achieve the best results. So far, one external study has been conducted that evaluated the sustainability of project benefits based on the triple bottom line. This included the (i) social sustainability, mainly covered by the capacity assessment of the community for operations and management, the (ii) environmental sustainability regarding the technology used for the purification of water and the quality of construction and the (iii) financial sustainability of the projects. An impact analysis helps to understand to which extend the SWEs benefit the communities directly or indirectly. In addition to this study other best practice models have been consulted.

**Social sustainability – Operational management and ownership**

The project is designed to benefit remote communities in Kenya and other developing countries. Its social sustainability is therefore especially evaluated. The best technical design can't succeed without understanding the market and its mechanisms. We concentrated on ownership, operations and management as well as on client behavior.

*Decentralized community ownership challenges standardized procedures.* The SWEs are based on community ownership. This includes either representative bodies of the communities in form of Community Based Organizations (CBO's) or other host institutions that are well embedded in their surrounding communities, such as schools or health centers. The study realized that community participation needs to be a major focus from the beginning, involving all major players as well as the marginalized groups of a community.

Other models (mainly for-profit) rather focus on a central ownership model with a parent organization that leases the kiosk to the entrepreneurs on the ground (REPIC 2011, p.20). These kinds of franchising approaches are increasing and have promising aspects, as they ensure standardized operating procedures whilst supporting the entrepreneurs on the ground with relevant knowledge. Still, centralized management and control is challenged by the scattered kiosks in remote areas.

*Sustainable operations mainly rely on good customer relationships and product valuation.* Sustainable operations of the SWE remain challenging, as there is a constant need for improvement on the reliability of water supply, sufficient income generation, stable customer relations and adequate management skills. Some solutions to meet these challenges have been identified by the study and include support to bridge the financial gaps for operations and management in the initial period, to subsidize maintenance costs and to realize extended marketing. Most relevant for sustainable operations are the kiosk manager's skills and personality. The selection of the right person in this key position of the project has turned out to be the major contributor to the project's success. Some major capabilities the entrepreneur should have are commercial experience, credibility within the village, a passion for communication, and the ability to execute (SWN 2013, p.76)

The foremost goal of the SWE is giving access to safe drinking water for people dependent on contaminated surface water in remote regions. Consequently, understanding people's habits and behavior is most essential. During the pilot projects we realized that a considerable amount of community members and potential clients does not highly value safe drinking water. The reasons for this are the following:

- There is no direct visible link between unsafe water and health, so the negative effects (e.g. diarrhea) are not perceived as directly related to the cause. In addition to that, there is no single cause-effect relationship between safe water and health, as one might still suffer from diarrhea due to poor hygienic standards, even though consuming safe water for drinking.

- Adoption of hygiene is a holistic educational and social process, and changing habits therefore is a long-term social process to be initiated and accompanied. People might refer to their ancestors who did not suffer from the surface water they consumed, but this does neither take further pollution nor the strong vulnerability of children into account.
- Safe drinking water is not positioned as desirable product, but factors such as status, lifestyle and wellbeing are very strong motivating factors that should be used as incentives in for the SWE marketing, instead of communicating safe drinking water as 'product for the poor'.

The value proposition of safe water is essential and must be established. Without this fundamental premise the whole concept of sustainability is undermined. If people are not willing to pay a small amount for the treated water and prefer untreated one, the station cannot operate self-sustainably, due to an insufficient amount of clients. Whereas the technical components of such projects have reached a standard where they can easily be adapted to the needs, the marketing strategy is more difficult to adapt to the different cultural and regional environments. “Engineers have done their job but marketers have not” (HYSTRA 2013, p.2) summarizes the situation to date very well.

The lack of proven marketing strategies needs to be tackled, as also so called Base of the Pyramid (BOP) customers base their purchase decision rather on the valuation of the product than on its price (HYSTRA 2013, p.6). Nobody wants to buy a product that has been made for the poor. The marketing strategies of the bottled water market might be of interest to decentralized kiosk services as well and could be further investigated. Other market developments, such as the mobile phone market covering 50 per cent of Kenya’s population (PPEO 2012, p.59), show that BOP customers by all means can afford a product when they desire it. This attitude needs to be taken into consideration when working in that market, and especially charitable players, such as foundations and NGOs, need to change their perception towards their target groups. By defining their target groups as beneficiaries of a project, charitable organizations often demote these people to passive recipients of goods, whereas the people regard themselves as active decision makers. The SWEs wants to empower this pro-active decision making process by defining its target groups as consumers that consciously choose what to purchase. The potential consumer’s understanding and valuation of the necessity of safe drinking water needs to be increased in order to safeguard market penetration of potable water. Marketing and communication are therefore necessary tools to be developed together with the concept. Especially education and awareness raising activities are a crucial part of the SWE model. Education should be regarded an inherent part of such ventures rather than as additional component.

**Environmental sustainability – site management and technologies**

The environmental sustainability of the project is key to dealing with scarce resources such as water. The model has been evaluated with regard to (i) water filtration technology, (ii) building technology as well as (iii) additional components for better impact (water containers). Throughout the process the technical design of the model has been successfully standardized. A challenge remaining is to define a suitable site with reliable water supply that covers all necessary criteria (Annex A).

*Site management requires an in-depth assessment of water reliability.* Reliable water supply is self-evidently the most crucial component of a successful SWE. It has been difficult to identify suitable sites that contain a reliable water source and at the same time are located at strategically relevant structures where many people pass by, i.e. market places, schools,

hospitals or churches. The SWE works with different kinds of water supply, this includes streams, pipes, ponds and rain water harvesting. No matter which source of water supplies the kiosk, a backup solution is highly recommended (IFC/SWN 2013, p.6). Rain water is a recommendable backup solution at low cost, but might not be enough to cater the demand throughout dry seasons. Other backup solutions are often associated to high transport costs (pumps and carriers).

*Water filtration is inevitable for remote water supply.* There are various water filtration technologies available, only some of them might adapt to the needs of remote regions. Technical conditions such as independency from the power grid and low maintenance are important. The key for the application of modern technologies will be their contextualization.

**Table 1:** An overview of existing filtration technologies

| *Main Technology* | *Sub-Technology* |
|---|---|
| Chemical disinfection | Chlorine disinfection |
| Membrane, porous ceramic and composite filtration | Porous ceramic or Carbon black filtration |
| | Membrane Filtration such as Microfiltration, Ultra-filtration, Nano-filtration, Reverse osmosis |
| | Fibre and fabric-filtration |
| Granular Media Filtration | Rapid granular, diatomaceous earth, biomass and fossil fuel based filters |
| | Household-level intermittently operated slow sand filtration |
| Solar Disinfection | Solar disinfection (Solar UV radiation + thermal effects) |
| UV technologies using lamps | UV irradiation |
| Thermal (heat) technologies | Thermal (e.g. boiling) |
| Sedimentation | Simple Sedimentation |
| Combined Treatment Approaches | Flocculation plus disinfection systems (e.g. commercial powder sachets or tablets) |

All filtration systems can be the best applicable technology, as the right filtration system depends on the contamination of surface water, whether it is chemical, physical or microbiologic. The SkyHydrant filtration unit is compact high volume gravity membrane water filtration system that provides physical disinfection.

Further features of the filtration technology that should be taken into account when choosing a technology are maintenance requirements, electricity supply and the acceptance of the technology. The technology applied should be low in maintenance requirements. Many projects fail as soon as spare parts are not available locally, or due to a lack of technical skills and financial means. A critical design factor is that SWE's use SkyHydrant filtration technology which is very low in maintenance. The SkyHydrant filter has a service life up to ten years. The SkyHydrant needs a backwash only a manual periodic backwash.

In 2010, only 15 per cent of Kenyans had access to electricity (PPEO 2012, p.59). Most remote areas are still off the power grid, and even if grid is available, many people won't be able to afford the connection. Safe water stations should therefore be able to operate independently from electricity. The SWE operates through gravity only and does not rely on

power at all. Other systems bring their own source of energy (mostly solar), which implies higher capital costs.

The community's acceptance of the technology is also crucial to the project's success. The ultrafiltration technology of the SkyHydrant was well accepted by the community since for both sites the beneficiaries were satisfied with the color and taste of water from the SWE. In general, physical or mechanical filtration is better accepted in our communities than chemical methods such as chlorine.

*Prefabricated buildings enable a standard for replication.* In addition to the water filtration system, the quality of the building is deciding on the customers' acceptance. The study realized that customers were very skeptical towards the quality of brick buildings. When working with different construction companies for different sites, it was challenging to secure the same level of quality for each site. The SWE project therefore decided to purchase pre-fabricated buildings that are standardized in size & equipment and can also be produced locally in the future, which again support local business and job generation. The prefabricated modules also give us the opportunity to move a building in case water conditions change, it ensures therefore the highest flexibility and mobility of the project.

*Safe water only comes in clean vessels.* We have experienced recontamination of the water through contaminated jerry cans used by the clients. Therefore, the SWEs sell new containers that are cleaned each time they are refilled. We use branded 10 litre containers, as this is normally sufficient for drinking water supply and can be easily stored.

**Financial sustainability – further development required**

The SWE project aims to be financially self-sustainable, which means that revenues should be sufficient to cover operational costs, whilst initial capital expenditures of the projects are donated. Still, financial sustainability remains challenging for such remote projects. The average amount of liters purchased has been below our expectations. The WHO has set a standard amount of 20 liters of water for each household, for our two sites WWN and MRHC the estimation of 3.8 liters per day seem more realistic (Thompson 2001, p.27). Further determinants of financial sustainability include pricing, maintenance expenditures, financial support, strategic location as well as marketing.

*Financial sustainability can hardly be met because safe water is sold below its costs.* The customers of a SWE have little money available and need to make very conscious purchase decisions. So far there has been negligible willingness to pay the price a re-fill would cost in a fully entrepreneurial model. The SWE is subsidized from the beginning to make the price affordable to the people. Still, the price of the water is between 2 and 10 KSH per jerry can, depending on the existing water market in the village. When people can't bear the costs for save drinking water, they have to bear the costs in the sense of hygiene and health problems, which often implies expenses for medication (Thompson 2001, p.94).

Our pilot site WWN reports on 50 per cent reduced costs for medication for their orphans since they have started to drink the water from the SWE. The willingness to pay for water was found to be very low for the MRHC site since the community felt that the price was too high and that water is a free good. This attitude also reflects the low valuation of safe drinking water as a part of the daily household expenses. As long as the appreciation of the product does not raise and tariffs stay low, prices need to adapt. In consequence, they are below the line for a fully self-sustainable business. In many cases people rather drink untreated water instead of paying for purified water (IFC/SWN 2013, p.3). This also applied to Naivasha's

Karagita Kiosk model, where 30 per cent of clients buy only untreated water to save money. (WSUP 2011, p.8) Education and marketing remain main drivers for successful implementation and also financial sustainability.

*Water services alone are hardly financially self-sustainable. Operations either need financial subsidies or further services.* Capital replacements (spare parts and maintenance) can hardly be afforded through own means arising from revenues of the project. Especially as the communities are not willing to pay more for the jerry can of save drinking water, this affects the capacity to meet immediate O&M costs. Additional support for new investments and maintenance should be included in the business planning, at least for the beginning, as one can't expect the water kiosks to be self-sustaining from the first moment on. Business models based on water supply alone are therefore very challenging with regard to their financial sustainability. Involving further services should be considered from the beginning. Customers of our kiosks suggested further services such as delivery services or agricultural products at the kiosks. This might help to define a more sustainable framework with potential for cross-financing services. This assumption can also be found in other models, such as the water stations planned by Trunz Water Systems AG (REPIC 2011, p.15).

*Services in remote regions have a limited chance for a sufficient customer base.* The more remote the SWE is located, the higher the threshold for potential customers to go there. Financial sustainability can easier be reached in densely populated or even urban areas with a large customer base living close to the kiosk and even there, capital investments might need public funding (WSUP 2011, p.9). Water kiosks in more remote areas should try to receive capital investments through charitable grants and public funding, in order to give the venture a realistic chance for self-sustainable operations. At the same time, an own contribution of the community or the entrepreneur should be required to ensure ownership and commitment. The SWE is funded by the Siemens Stiftung in cooperation with the SkyJuice Foundation and the local community. Costs after the initial launch, however, should be covered through revenues of the SWE. For both pilot projects in the remote areas, this target has not been reached yet.

*Sales, marketing and education are core responsibilities of the kiosk entrepreneur.* Today's performance of the SWEs encourages further marketing measures and education campaigns. These activities do not require high-costs advertising measures, as word of mouth advertising has shown the best success in remote communities. This again reflects the relevance of community involvement from the beginning, as projects easily fail when certain community groups have not been considered respectively. The latest Hystra report also recommends activities such as village demonstrations of the products, awareness raising campaigns (HYSTRA 2013, p.10). The activities mentioned are not cost intensive but they build on a highly capably kiosk entrepreneur that approaches the target groups pro-actively on a constant basis. The investment in the right choice of the entrepreneur as well as in his or her education is therefore of vital importance.

**Impact results on health, education and life quality**

The study assessed the projects' influence on (i) health, (ii) education and (iii) income generation activities, in order to evaluate its impact on people's life quality. The SWE project improved the customers' health, which is reflected through significant benefits in terms of reduced prevalence of waterborne diseases, but also to a reduction of back pain through shorter ways for fetching water. On average, people in Kenya need to walk 25 minutes to fetch water (Thompson 2001, p. 62), many inhabitants of rural regions effectively need much more time. A SWE is therefore located at strategic locations for people to save time when fetching water.

The SWE project claims to contribute to better education. At one site, school performance of the children improved visibly, as they had less sick days caused by waterborne diseases. The findings, however, highlighted that impacts were not uniform for the two pilot sites. The education impact was felt strongly at the WWN site, whereas awareness at MRHC has not been raised significantly. Through further educational programs in health and hygiene the SWE will strengthen the matter of education and marketing in the future.

The kiosk managers of the SWEs have the opportunity to generate income, and some water carriers have started delivery services as well. Through further services this component will be strengthened for further SWEs.

**Collaboration and partnerships, and the role of foundations**

As various players are active in the water management sector, their activities need to be coordinated. Public and governmental institutions play a vital role , especially since the Water Act in 2002. Foundations and charitable players are traditionally concerned about access to basic services for the poor. They are important partners for education and community relations. Community based organizations always have played a vital role in community water supply. Being supported by the Water Services Trust Fund (WSTF) as well as by foundations such as the Kenya Community Development Foundation, they can better access finances and available knowledge and best practices. As private companies are getting more and more interested in the water the enormous potential of the African demand for water is an opportunity for water services, as well as infrastructure of pumping and piping continues to steadily grow.

The combined efforts of players can lead to better developed services throughout the country. Potential for replication of model projects is given, but only when organizations are prepared to learn from each other and find their roles and responsibilities. In our understanding, foundations are excellent drivers for developing successful model projects for scale. Especially in the beginning, also self-sustainable models will need financial support in form of grants and donations. At the same time foundations can evaluate best practices and share this information amongst other players.

Foundations can furthermore contribute their core competencies in education, training and awareness raising campaigns, together with local NGOs and CBOs. Other reports have identified a shortage of potential operators for safe water projects (IFC/SWN 2013, p.8), which also corresponds to the experience of the SWE project. Investments in entrepreneurial and technical trainings to prepare people for operating their own water projects are a decisive step towards more successful water supply. Training in entrepreneurial skills, including finances, business idea development and planning, marketing, sales as well as life skills is inevitable for successful water ventures. Foundations can therefore strengthen their training activities on entrepreneurship and mentoring, that is why the Siemens Stiftung has supported mentoring activities of the Kenyan NGO “The Youth Banner” which has established a mentoring network for young entrepreneurs. Education, training, networking and mentoring have also been identified by the Omidyar Network as key assets for a better entrepreneurial environment in Eastern Africa (Omidyar Network 2012, p.22-23).

**Share best practices**

Effective monitoring of the operations is of great importance to the SWE project to ensure smooth operations of the water stations. This includes a consistent reporting on numbers as well as an observation of clients’ behaviors. All results need to be critically reflected and

discussed between the operator, local partners as well as the initiating partners, to decide on the best way forward. This also contributes to transparent operations and continuous learning, to be shared with other players in the field.

Some best practices have already been identified. The WSTF has developed checklists, draft contracts and evaluation forms for their urban water supply projects (WSTF 2011). The Safe Water Network also published a toolkit for assessment and application forms, ownership models as well as household surveys (SWN 2013). Collecting valid baseline data on individuals, households and communities is critical for assessing results and conducting impact evaluations which can assist in quantifying the impact of development interventions. When different partners apply the same forms and methodologies, results become comparable and opportunities for collaboration raise.

## CONCLUSION

Decentralized access to safe water remains a challenge for developing countries. Initiatives to meet the demand should be highly welcome. Whereas existing activities differ in ownership approaches (for-profit versus not-for profit models) technology and water sources, some common drivers for success could be identified. These include the involvement of the target group from the early stages through market assessments and community discussions. Even if the demand is high potential success depends on the willingness of the people to pay a respective amount for the service. Costs therefore need to be kept at a minimum, what also influences the decision on the source of water, which has to be low cost and fully reliable at the same time. Education and training for the kiosk manager is crucial, as this is a key function in the whole project approach, and it depends on an entrepreneurial personality with strong social skills. Education for the community is also vitally important, in order to raise the valuation of the product "safe drinking water". This also includes sales and marketing efforts.

*Key recommendations for safe water projects can be summarized as follows.*

- There must be tangible measures to ensure that community representatives reflect all groups, including other traditionally excluded groups like women and the disabled.
- Construction quality, periodic monitoring and effective supervision of the rural water projects can greatly enhance the sustainability of the projects.
- Investing in household and water committee trainings can greatly enhance the sustainability of the water stations (kiosks).
- Appropriate cost sharing and recovery could improve the sustainability of these projects.
- Wherever possible communities should gain project ownership by means of direct "sweat equity" models.
- For a high degree of project sustainability, there is paramount need to involve the community from the initiation of a project to the implementation stage.

These insights help to optimize the SWE project, and they can be used as lessons learned for further water projects. Partnerships and collaborations are crucial for a better coordinated response to the enormous demand for drinking water in remote areas. Our foundations realize and invest in projects on water and education to share best practices. Scaling will only work if other partners from the public and private sector are significantly involved in such projects. The language used from different sectors often requires translation, as there are different perspectives on entrepreneurship, community ownership and skills training. This role can be realized by foundations, which evolve to a catalyst for change through pioneering new model projects while integrating them in existing or potential new structures.

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**Supplementary material:** Annex A: Site Selection Criteria