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Practice

EcoSan Club

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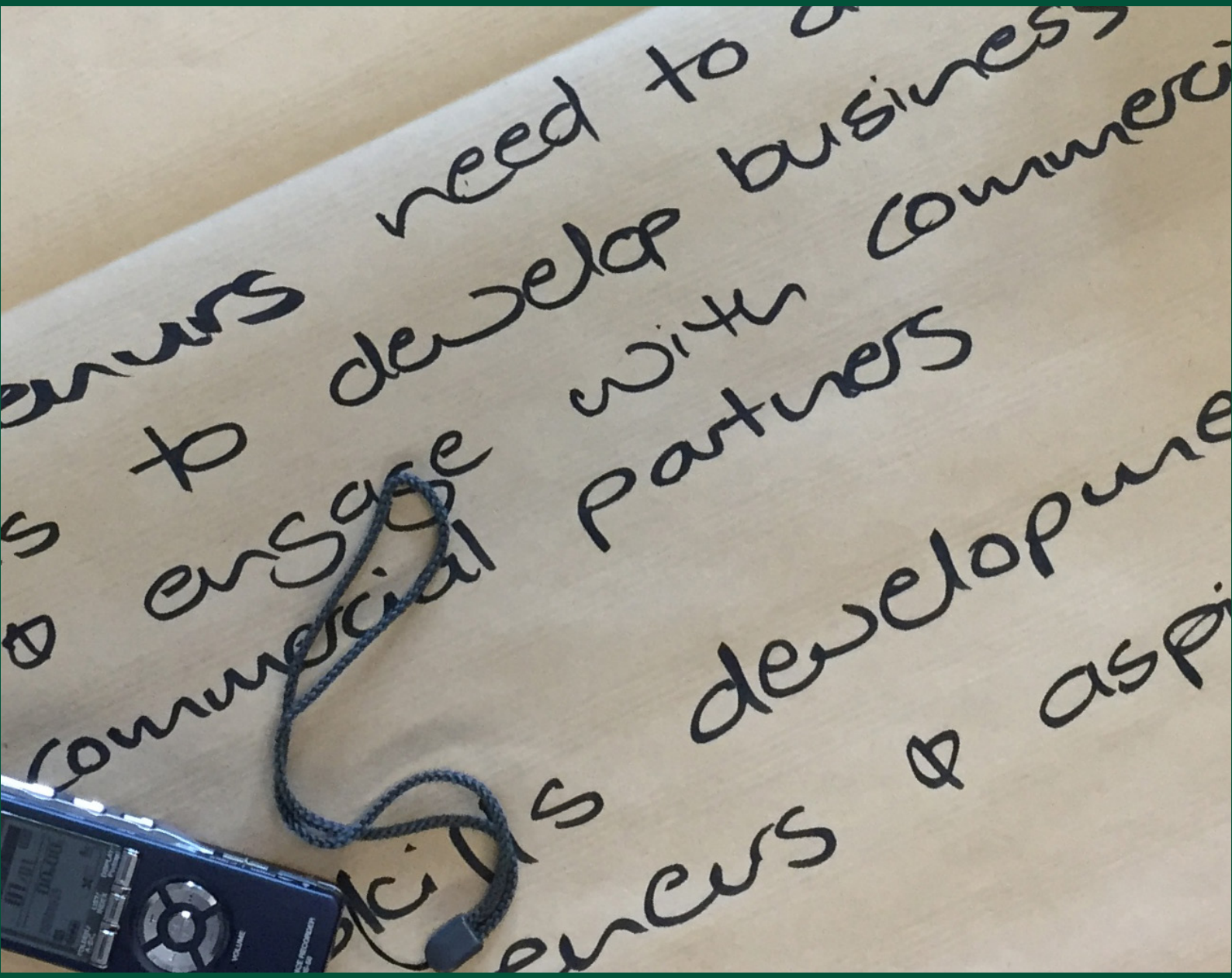

cewas success stories

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Aim and Scope / ***Offenlegung der Blattlinie gemäß § 25, Abs. 4 Mediengesetz***

Sustainable Sanitation Practice (SSP) aims to make available high quality information on practical experiences with sustainable sanitation systems. For SSP a sanitation system is sustainable when it is not only economically viable, socially acceptable and technically and institutionally appropriate, but it should also protect the environment and the natural resources. SSP is therefore fully in line with SuSanA, the Sustainable Sanitation Alliance (www.susana.org). • SSP targets people that are interested in sustainable sanitation systems and the practical approach to it. • Articles are published after blind review only. • Sustainable Sanitation Practice is published quarterly. It is available for free on www.ecosan.at/ssp.

Sustainable Sanitation Practice (SSP) hat zum Ziel praxisrelevante Information in hoher Qualität im Zusammenhang mit „sustainable sanitation" bereit zu stellen. „sustainable" also nachhaltig ist ein Sanitärsystem für SSP wenn es wirtschaftlich machbar, soziokulturell akzeptiert, technisch als auch institutionell angemessen ist und die Umwelt und deren Ressourcen schützt. Diese Ansicht harmoniert mit SuSanA, the Sustainable Sanitation Alliance (www.susana.org). • SSP richtet sich an Personen, die sich für die praktische Umsetzung von „sustainable sanitation" interessieren. • Artikel werden nur nach einer Begutachtung veröffentlicht. • Sustainable Sanitation Practice erschient vierteljährlich, kostenlos unter: www.ecosan.at/ssp.

Information on the publisher / ***Offenlegung gemäß § 25 Mediengesetz***

Publisher: EcoSan Club, Schopenhauerstr. 15/8, A-1180 Vienna, Austria • chairperson: Günter Langergraber • website: http://www.ecosan.at/ • scope: EcoSan Club was funded as a non profit association in 2002 by a group of people active in research and development as well as planning and consultancy in the field of sanitation. The underlying aim is the realisation of ecological concepts to close material cycles in settlements.

Medieninhaber: EcoSan Club, Schopenhauerstr. 15/8, A-1180 Vienna, Austria • Obmann: Günter Langergraber • Gegenstand des Vereins: Der EcoSan Club wurde 2002 als gemeinnütziger Verein von einer Gruppe von Personen gegründet, die in Forschung, Entwicklung, Planung und Beratung in der Siedlungshygiene - Sammlung, Behandlung oder Beseitigung flüssiger und fester Abfälle aus Siedlungen - tätig waren und sind. Das Ziel des EcoSan Clubs ist die Umsetzung kreislauforientierter Siedlungshygienekonzepte (EcoSan Konzepte) zu fördern, um einen Beitrag zum Schutz der Umwelt zu leisten.

Cover Photo / ***Titelbild***

Martin Wafler

Editorial

From October 2009 until April 2016, the Sustainable Sanitation Practice (SSP) journal was published quarterly. During this period, 26 issues have been produced. All these issues are available online from the journal homepage at the EcoSan Club website (www.ecosan.at/SSP) for free. In 2016, several more issues have been planned but due to the fact that promised contributions were not submitted, these issues could not been published.

One of the ideas that was discussed for some time was that success stories that came out from cewas entrepreneur trainings should be presented in the SSP journal. cewas runs start-up programs for entrepreneurs in the sanitation, water and resource management sector.

Now here it finally is! Louise Carpentier and Martin Wafler, staff of cewas and member of EcoSan Club, collected the contributions - a special thanks to Louise and Martin to make issue 27 happen! The following six contributions are included in this issue:

- In the first paper, Carpentier and Wafler describe the importance of entrepreneurship in the sector.
- The remaining papers describe five successful start-ups that were supported by cewas:
- Eco Solutions Forge (Bogdan Popov),
- SR3 INVENT (Stefan Breitenmoser),
- SOIL (Natalie Miller and Leah Page Jean,
- BENAA (Kareem Hassan), and last but not least
- The Urinal Project (Lillian Volat).

You might ask yourself: what is now the future of the SSP journal? We intend to publish new issues of the SSP journal but only on demand. That means if you want to organise contributions for an issue of SSP please contact the journal manager at ssp@ecosan.at to express your interest.

We do hope that we find interested persons that will bring interesting topics to the SSP journal.

Additionally, we also invite you to visit SSP and EcoSan Club on facebook (www.facebook.com/SustainableSanitationPractice and www.facebook.com/EcoSanClubAustria, respectively).

With best regards,
Günter Langergraber, Markus Lechner
EcoSan Club Austria (www.ecosan.at/SSP)

Content

Building Viable Business Models for Small and Medium-sized Enterprises

This paper highlights the roles and importance of Micro, Small and Medium-sized Enterprises (MSMEs) in the sanitation, water and resource management sector and the challenges they face.

Author: Louise Carpentier and Martin Wafler

Abstract

This paper highlights the roles and importance of Micro, Small and Medium-sized Enterprises (MSMEs) in the sanitation, water and resource management sector and the challenges they face. Secondly, it introduces cewas, the Swiss-based competence centre linking sustainable water, sanitation and resource management with business development. cewas was founded as a non-profit association pushing innovations for sustainable water and sanitation management and offering professional training, coaching, networking and consulting to bring sustainable business ideas to fruition. In cewas Start-Up Programmes, 92 businesses have been developed in various sub-sectors aiming to tackle water and sanitation challenges. 67% of the start-ups are still actively implementing their business. With tailored Business Matchmaking Services, cewas facilitates the creation of new markets and connects local service providers with innovative products and funding. When going through organisational changes, utilities and other sector organisations can draw upon the Integrity Management (IM) Toolbox which has been co-developed by cewas to identify integrity risks and turn them into business opportunities.

Business expertise in sanitation, water and resource management

Water, sanitation and resource management constitute an increasing and pressing global problem. Both North and South face challenges related to climate change, dwindling (water) resources, pollution, unsustainable resource management and unaffordable conventional infrastructure. The Joint Monitoring Programme (JMP) update from 2017 estimated that still today, 2.1 billion people do not have access to safe drinking water. The JMP also states that 4.5 billion people (62% of the

Key facts of the cewas Start-up Programmes:

cewas trains and coaches water and sanitation entrepreneurs in its start-up programmes:

- Throughout year-long Start-up Programmes, entrepreneurs develop an idea, create a business model, pitch to key sector actors and start to implement their business.
- Main focus: entrepreneurial skills, personal support and in-depth sector knowledge, creating an international network of experts
- Start-ups are active in sub-sectors: WASH, Sanitation / Wastewater, Water supply, Water Resource Management, Waste or other sub-sectors adjacent to water and sanitation
- Start-ups tackle water and sanitation issues with business types including: consulting, capacity development, services, products, advocacy and awareness or others
- 92 start-ups from 21 countries participated between 2011 and 2017
- 67% of the start-ups still actively implement their business idea
- In 2013, cewas launched a compact version of the start-up programme to reach participants from low- and middle-income countries
- 172 entrepreneurs from 114 MSEs participated in cewas-led Start-up Programmes in the Middle East, South Asia and Southern Africa

global population) have no access to safely managed sanitation, and 17% or 2.3 billion people lack even basic managed sanitation services (basic toilets) (JMP, 2017). These enormous challenges cannot be solved neither by conventional solutions from the industry nor by development and humanitarian aid alone: young and motivated entrepreneurs with fresh ideas are needed.

Based on their shared conviction of this need, Swiss and international experts teamed up to establish cewas. cewas empowers individuals, organisations and businesses to develop and implement sustainable solutions for the global water sector. One of cewas' key activities is the cewas Start-Up Programme, geared at young professionals that dream of putting business ideas in water and sanitation into practice but do not know how. The programme develops entrepreneurial skills in sustainable sanitation and water management and emphasises on personal support combined with in-depth sector knowledge and access to an international network of experts and partners. Since 2011, the cewas Start-Up Programme brought forward 92 start-ups from 21 countries. To directly reach participants from low- and middle-income countries, cewas launched compact versions of its start-up programme in the Middle East, South Asia and Southern Africa.

Opening new markets poses a great challenge for any business. A lack of resources, local business partners, market knowledge and networks make for a difficult market entry and heightened risk. Since 2016, cewas offers Business Matchmaking Services in the shape of structured, guided processes that facilitate market access for MSMEs and help establish North-South or South-South business partnerships.

The water sector worldwide faces many integrity challenges, which can be understood as violations against transparency, accountability or participation. To address these integrity challenges in the sector, cewas partnered up with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and the Water Integrity Network to develop the Integrity Management (IM) Toolbox. With an underlying business perspective approach, this toolbox aims at realising performance opportunities and advantages that arise from improving integrity within water organisations during a 2-year change process.

Challenges for SMEs/Role of SMEs in the global water and sanitation sector

With the launch of the Sustainable Development Goals (2015-2030), the international community aims to secure access to improved water and sanitation services for all as well as better water quality, water-use efficiency, resource management and improved water-related ecosystems (Goals 6) (United Nations, 2017). To reach these goals, the OECD considers MSMEs to play a crucial role as providers of employment opportunities. Not only do entrepreneurs provide employees with an income which allows access to basic services, they are also increasingly playing a role in addressing societal needs through market mechanisms. Regarding this, particularly social enterprises contribute to delivering public goods and services such as healthcare or waste management while often employing people at the margins of the labour market (Kamal-Chaoui, L., 2017).

Nevertheless, despite their important role as employer and service delivery, businesses in the water and sanitation sector face difficulties in viability due to limitations in demand, lack of business and technical skills and financial challenges such as access to credit. Another finding highlights poor marketing and poor coordination which could reduce value chain costs (Gero et al. 2014) of products for safe water and sanitation.

Coaching entrepreneurs in water and sanitation

To tackle the water and sanitation crises and overcome the lack of innovation and capacity in the sector, cewas supports individuals, organisations and businesses so that they can act on global challenges in water and sanitation, resource recovery and reuse. The focus lies on developing and spreading innovative ideas and business models that are economically viable, socially responsible and ecologically sound. cewas is a lean organisation which is built on maintaining partnerships, and is actively

Figure 1. Toilet design workshop with children (source: Mosan 2017).

involved in cooperating with organisations leveraging financing for water and sanitation. For example, the Swiss Bluetec Bridge which strives to accelerate sustainable access to safe water for people at the base of the social pyramid (BoP) in developing and emerging countries and supports Swiss SMEs that own innovative technologies, processes or services and are willing to adapt them to the specific needs of under- or unserved customers in BoP markets.

Today, cewas supports water and sanitation entrepreneurs and start-ups around the world through various programmes:

cewas Start-Up Programme Switzerland

Initiated in 2011, the annual cewas Start-up Programme in Willisau, Switzerland, was the first of its kind. The programme targets young entrepreneurs and consists of sector relevant lectures providing the knowledge that allows participants to develop an idea, create a strong business model, pitch the idea to the water sector at the International Water Week in Stockholm, develop the idea and manage the business model. Expert coaches provide one-on-one coaching such as technical or business advice, introduce the start-ups into their network and assist with funding options. The community of experts, start-ups and alumni can make use of the formation of clusters which leverage synergy potentials or help to acquire projects collaboratively. The programme lasts for one year and so far, 54 start-ups and SMEs have participated (cewas, 2018).

Industrial designer Mona Mithab, for example, founded the Switzerland-based start-up Mosan (www.mosan.ch). The social business develops circular sanitation systems, including user-friendly Urine Diverting Dry-Toilets (UDDTs) for private in-home use. cewas supports Mosan with profound coaching, workshops and a broad network. With support of the Swiss Bluetec Bridge initiative, Mona and her team currently work in Guatemala, where they collaborate with Mayan communities and local partners to implement their market-based sanitation solution, adapted to local needs and demand.

cewas Middle-East for Humanitarian WASH

The WASH crises in the MENA (Middle East and North Africa) region:

Worldwide, the Middle East is the most water-scarce region struggling to meet the basic water and sanitation demands of its rapidly growing population. The on-going Syrian and Iraqi conflict have created a devastating humanitarian crisis with millions of people displaced both within the countries and to neighbouring countries. The situation is even more critical as refugees and displaced populations are acutely vulnerable, and increasing pressure is put on the resources of host communities (World Bank 2018). Adding to that, youth

Figure 2. Field trip to a decentral sanitation system (source: Cewas Middle East 2017).

unemployment in the Middle East ranks highest in the world, which further contributes to its instability and increased vulnerability (World Economic Forum 2014).

To address the pressing WASH crises in the MENA region, cewas implements a multi-faceted project that trains and supports local entrepreneurs and humanitarian WASH actors in the region to develop innovative, locally adapted water and sanitation solutions for refugees and host communities. Since 2015, 62 entrepreneurs of 33 businesses participated in the cewas Middle-East Start-Up Programme.

„My ambition of improving the environmental norms in Jordan has a three steps approach." O. Hammad, Turjumaa

The start-up Turjumaa, founded by Owice Hammad, is specialised in translating and creating materials in Arabic which are related to water and sanitation. Turjumaa translated some basic resources which will help enable the start-up to foster capacity building and awareness raising among the community, the first step to achieving their goal. Envatech, on the other hand, is an educational environmental start-up that aims at raising knowledge on environmental challenges and impacts among locals, policy makers and youth using Virtual Reality tools and applications.

cewas Smart Start-up Programme

In 2013, following the success of the Swiss cewas Start-up Programme, a lean business development programme was developed and successfully tested in cooperation with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) Gmbh Reform of the Water Sector Programme in Zambia. In 2016, cewas joined forces with seecon (a Swiss consultancy company that creates innovation for sustainable development), the Namibia University of Science and Technology's (NUST) Namibia Business Innovation Institute (NBII), ICRD Group Foundation and the Water and Sanitation Association of Zambia (WASAZA). Together, they implemented a

Figure 3. Countries in which cewas Start-Ups were founded (MAPCHART 2018).

series of business development activities aiming to make sustainable business ideas in sanitation, water and resource management in Namibia, South Africa and Zambia a reality. Those activities were implemented in the context of a development partnership with seecon that is part of the develoPPP.de programme, which GIZ implements on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ).

Through training and coaching, cewas Smart Start-up Programmes aim to increase the proficiency of start-ups, small business owners and entrepreneurs in promising business models in sanitation, water and resource management. The model of the Smart Start-up Programme has since been implemented in other countries, as visualised on the map below.

Between 2013 and 2017, 172 entrepreneurs from 114 start-ups and MSEs participated in the smart start-up programme.

Coaching champions with entrepreneurial solutions

SwissRe Foundation, in cooperation with cewas, supports high-potential sanitation and water entrepreneurs through various programmes: The Junior ReSource Fellowship aims to support young dedicated graduates, disruptive innovators and change-makers to develop their convincing ideas to foster resilience in the water sector; the International ReSource Award for resilience in water management acknowledges social entrepreneurial thinking and leadership in implementing the principles of sustainability in water management.

The 2018 winner of SwissRe Foundation's ReSource Award was the Guatemalan entrepreneur and astronomer Antonio Aguilar with his business CASSA. CASSA builds affordable social housing with local materials such as bamboo and includes solar energy, rainwater harvesting, and grey- and blackwater treatment. After building a dozen houses the goal of the prize money is to up-scale the sales. cewas helped CASSA identify key previously-unexpected challenges that might occur while developing and strengthening their business. For example, maintaining quality standards will be a major factor for success. Additionally, CASSA learned how to formulate a better framework for the residential waste water treatment systems - within industry standards and with a scope for constant improvement.

«With the support of cewas we improved how to frame and communicate the impact and value of our housing solutions to potential stakeholders.» A. Aguillar, CASSA

Looking back: figures and numbers on the Start-Up Programmes and coachings.

The world map above (Figure 3) shows the countries where start-ups were founded or coached in the Swiss or Middle East yearlong Start-Up Programmes, or the winners received coaching by programmes of the Swiss-Re Foundation between 2011 and 2017 (small countries: Guadalupe, Trinidad and Tobago, Palestine). The entrepreneurs and NGOs are active in various sub-sectors such as WASH, sanitation, water supply, waste management and others (Figure 4, sub-sector).

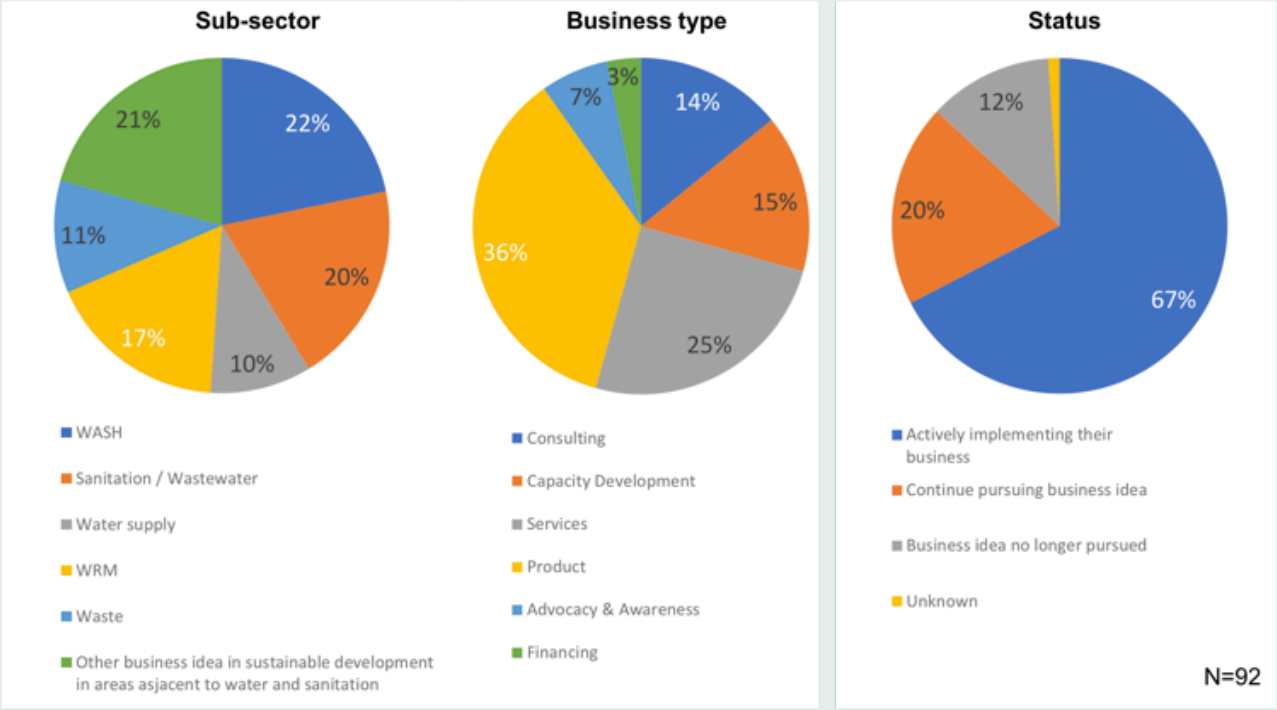

Figure 4. Sub-sector, business type and status of the 92 cewas start-ups (source: cewas 2018).

Start-ups aim to tackle the sector challenges they face with various business types including consultancy, capacity development, products such as floating isles that absorb nutrients from water bodies (Phoster GmbH), or they focus on advocacy amongst others (Figure 2, business type). Of all start-ups initiated between 2011 and 2017, 67% are still actively implementing their business idea and 20% still pursue the idea. Only 12% of businesses are no longer pursuing their idea.

Business Matchmaking Services

The lack of resources, local business partners, market knowledge and networks are factors that make market entry very challenging. Since 2016, cewas offers structured and guided Business Matchmaking Services for MSMEs from around the globe with the aim to facilitate the scaling of best-practices and identify innovative solutions to local challenges in the water sector. The target group comprises not only Swiss and European technology and service providers seeking new markets in countries like Namibia, Zambia or South Africa. It also includes SMEs from Southern countries looking to diversify their portfolio of goods and services and to identify innovative solutions to local challenges in the water sector.

Integrity Management Toolbox

Finally, irregular procurement processes, illegal connections, collusion of officials with informal water cartels, and falsification of invoices and accounts are all serious integrity challenges that water sector organisations face on a daily basis. Such risks can damage an organisation's reputation, and in the worst cases seriously affect their bottom line. While there are some initiatives addressing related issues in policy and legal frameworks, until now there has been little practical guidance for water sector organisations to tackle these problems at the organisational level.

The Integrity Management Toolbox co-created by the Water Integrity Network, GIZ and cewas was designed to support organisations in making integrity a part of their strategic plans, business models, and - most importantly - their daily practices to reduce risks and improve performance. The toolbox entails a change management approach that range from assessing organisations' performance and describing their business model to identifying the most relevant integrity risks, using practical tools for better managing risks, and finally to monitoring performance improvements. The outcomes can reduce costs and bring "lost money" back into their operations, minimise reputational and legal risks and increase accountability to customers, stakeholders, public authorities, and partners. The toolbox targets utilities, SMEs, public institutions and other water sector stakeholders (Integrity Management Toolbox, 2017).

Closing remarks

This paper points to the need for innovative business models in a challenging sanitation, water and resource management sector. The international centre for water management services, cewas, was found to address this need. Up to today more than 92 start-ups worldwide have been coached, of which 67% are still

actively implementing their businesses. Between 2013 and 2017, 172 entrepreneurs from 114 start-ups and MSEs participated in the smart start-up programme. By facilitating business matchmaking, cewas supports cooperation, funding and knowledge transfer towards this sector. The integrity management toolbox is used as a tool to address the integrity risks that often occur in the water sector, and aims at turning them into business opportunities.

In the following chapters of this journal, five entrepreneurs, foundations and NGO's present their innovative solution to tackle water and sanitation issues. All of them were coached by cewas in various stages of their development, from ideation up to support for up-scaling the product or service.

Acknowledgements:

cewas would like to thank all the entrepreneurs that wrote an entry for this edition of the Sustainable Sanitation in Practice journal.

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Eco Solutions Forge

Story-telling about bringing together modern ecological approaches and the ancient spirit of blacksmithing to produce ideas and products for basic personal needs.

Author: Bogdan Popov

Abstract

Eco Solutions Forge (ESF) was founded in 2014 as a result of participating in the cewas Start-Up Programme in Switzerland. ESF aims to change the current situation in the Ukrainian Carpathians with regard to wastewater treatment, and to offer sustainable sanitation solutions for the tourist industry in the region. I, Bogdan Popov, the founder of ESF, is an ecologist and blacksmith. ESF is based in Mukachevo, Ukraine. Its main activities are consulting and teaching on water and sanitation issues, as well as designing and building wastewater treatment systems. Additional activities include designing and building public dry toilets and rainwater harvesting systems. Lately, the main focus has been on researching and building high-performance cold climate insulated vermifilters with biochar substrate (biopot). The most noteworthy lesson learned is that offering ecosanitation products must go together with education, since a completely new market is created.

Problem statement

We work primarily for the touristic and recreational sector in Ukraine, especially in the Carpathian region. One of the major problems here (as everywhere in Ukraine) is the lack of centralized wastewater treatment infrastructure, which causes pollution of ground water and water streams. This greatly undermines the recreational opportunities of the region, threatens water supply and degrades natural ecosystems. We strive to offer our customers solutions for treating wastewater and other organic wastes in the most ecologically sound way.

Company description

Eco Solutions Forge had been created in 2014 with the goal of bringing ecological sanitation to the Ukrainian Carpathians. After living for several years up in the mountains and running a tourist eco-camp, I realized that water pollution is one of the major challenges of this beautiful region. Before moving there, I did not know that situation was so bad. For the most part, Carpathians are associated with clean nature, clean water and a healthy environment. In reality, one will hardly find a stream which has not been polluted, and, to make matters worse, local people themselves are drinking and using the water from their wells which are often polluted. This revelation was shocking to me and I decided to do something to change the situation. I had some experience with composting toilets and grey water in my camp, but my skills and knowledge were limited. So, I decided to learn more about the best sustainable wastewater treatment practices and implement them in Carpathians. The vision was clear – make the water in the streams clean and living again. The mission was to do this through the tourism industry since they have the money to pay. The values were the same as always– taking care of the earth and its people.

Technical data - Biopot wastewater treatment system for the hostel and community centre in Nijne Selishe:

- system is designed for maximum 24 guests staying in the hostel
- no black- and greywater separation (mixed flow)
- the flow rate varies between 500 and 2500 l per day with long idle periods
- wastewater is pre-treated in a two-chamber septic tank, recirculated through the biopot filters and guided into a horizontally constructed wetland (50 m^2) for final treatment
- the filtering substrate in biopots is charcoal with addition of earthworms

Figure 1 and 2. Combining ecological sanitation and traditional blacksmithing and functioning Biotpots in winter (source: ESF).

The first composting toilets

At first, I was very much inspired by constructed wetlands, since they appeared to be the best natural solution for the situation and I liked the idea that plants can purify wastewater. I had a first opportunity to build a small 30 square meters constructed wetland that would treat water from a guesthouse at the mountain pass. It was a great experience to put theory into practice - designing the system, working with the soil to construct a terrace and then actually building the wetland itself. It is at that time that I realized first how important the details are and that, if you want to have things properly made, you have to make them yourself. Hired dredgers might not understand the importance of the details, which can negatively influence the system. The location of the wetland was a rather frequented place since it is a favourite stop for tourist buses. Many people were in need of a toilet, and open defecation was common. That is how I came up with idea to build a public compost toilet and offered that to the owner of the guesthouse. A dry toilet was the best option there since there was a shortage in water supply as well as limited space to treat the wastewater. I used the Clivus Multrum as the base design, which worked well. I did not even expect that my first major toilet project would be such a success. There was absolutely no smell and visitors of the toilet were quite happy, although sometimes wondering where the flush button is. The number of visitors varied, but during the high season it exceeded 400 persons a day. One of the best features of this toilet was the incredible view over the surrounding mountains. Both the view as well as nice music left a very good impression on the toilet visitors. The fact that the toilet offered a paid service did not create any problems, although some tourists expected it to be free. By that time, I had already gone through a start-up course at cewas and set up our agency. I invited one of my blacksmith friends Vladislav Zelenyi (Vlad) to join me. Since that time, we work together as a core team. We share our responsibilities in such a

"There was absolutely no smell and visitors of the toilet were quite happy although sometimes wondering where flush button is." Popov B, founder

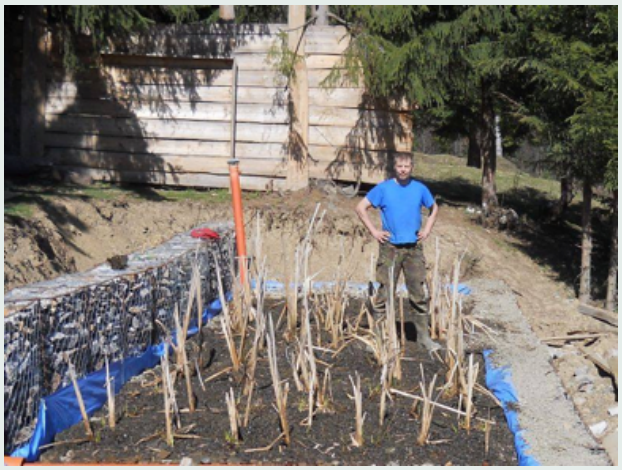

Figure 3 and 4. The first composting toilet and constructed wetland on the Sinevir pass (source: ESF).

way that I am mostly in charge designing projects and communicating with people, while Vlad works on the implementation side.

The next public toilet I designed was located near Kiev. It was built with the idea to be simple, function without electricity and fit into the natural landscape. The basis for the design was the crib toilet developed by the Green Mountain Club and Appalachian Trail Conservancy (USA). The asset of our design is the use of zeolite as filter under the composting chamber since the toilet was located in a situation with very high ground water levels, and the client wanted to exclude the possibility of pollution. Hand-forged elements for the toilet like door hinges, handles, cloth hooks, etc. made it look very natural and traditional. The toilet worked well and clearly showed that it is possible to achieve proper comfort in the toilet by using only natural ventilation without pipes. However, a weak point was cleaning up the chamber after the composting process. As a result, I developed a cartridge system for the toilet which would enable easier maintenance as well as better composting, sometimes difficult to achieve in a built-in chamber.

Biopot

In 2017, I could implement the idea in the centre of Ukraine's capital city Kiev at Trukhanov island beach recreation zone. The toilet serving an eco-café uses replaceable ventilated cartridges for collecting human waste and allows complete composting outside the toilet chamber. This design got to prove its merits during a period with many users – sometimes over 500 visits per day, and it still rarely developed any smell. This proof of concept evolved in the development of the next generation of cartridge toilets, which we are going to implement in nearest future.

Figure 5. Prototype of the biopot (source: ESF).

Initially, I was very inspired by the technology of constructed wetlands, but I soon realized that the technology might pose many challenges in our context. First, the lack of space in the mountains and difficulties with soil on the steep terrain with available machinery. Second, the lack of proper materials for building constructed wetlands such as graded and washed gravel and sand. A third issue is the performance of constructed wetlands in our climate during winter, when the load on them might be the highest due to seasonal tourism. To address these issues, I wanted to reduce the necessary size of the wetlands through better pre-treatment of the inflow effluent, for which the compact biofilters, co-developed in Norway by Prof. Petter Jenssen, could be very helpful in a cold climate. Inspired by this idea, I started to develop a compact insulated biofilter which would also be a beautiful landscape art object and called it the biopot (Jenssen et al., 2004a, 2004b).

I set the goal to design a closed loop system, enabling recycling of the nutrients contained in the wastewater through use of biochar as a filtering substrate. The biochar, charged with nutrients and microorganisms, is regularly removed from the filter and used as soil amendment. Additionally, the biopot substrate is inhabited by earth worms feeding on organic wastes and aerating the substrate. This project brings together many things - land art and landscape design, sustainable local biochar production, closing the loop of nutrients and vermifiltration of wastewater. A main asset of charcoal is that it can be produced locally from brushwood in a sustainable way.

The first biopots were installed in 2017 in Nizne Selishe, Ukraine, to be part of the wastewater treatment system serving a hostel. The volume of wastewater varies very much with a maximum flow of around 2 500 l a day followed by periods with no influent at all. Black water is not separated. The whole system consists of an 8 m^3 septic tank, the biopots used as recirculation filter, and horizontally constructed wetland providing final treatment. Currently, testing and experimentation is conducted to define the best mode and loads for the biopots.

Rainwater harvesting

Along with the biopot project we are setting up rainwater harvesting systems in the area. Shortage of water is an acute issue all over Ukraine, even in the Carpathian mountain region where we mainly work. As centralized water supply still reaches only a minor part of the rural population, most inhabitants rely on wells of which

"Although rainwater harvesting, dry toilets and wastewater treatment are usually considered as different services, when you work in the field you clearly see these resources and waste streams are connected and can't to be dealt with separately." Popov B., founder

Figure 6. Rainwater harvesting system in Nijne Selishe during construction. (source: ESF)

many go dry during the summer. One of the solutions for this challenge could be the use of rainwater reservoirs. To date, most people do not believe in the potential of rainwater, or they collect rainwater in a primitive way that doesn't provide clean water for safe household use. We think that this could be changed through creation of proper demo examples of rainwater harvesting (RWH) and use. This year, we designed and built a RWH system for the hostel with the biopot wastewater system, to supply its water needs while providing the proper water quality. Rainwater is regularly considered to be waste, but we try to turn it into resources.

Independently of the product, I try to keep our work as open-source as possible, since I am convinced that learning from each other and enabling free access to important information are crucial to make a better world. I use forums such as the SuSanA to present my work and openly discuss it, which has led to many good inputs and helped sharing practical experiences with others.

Building a viable business model

As soon as I decided to be involved with the ecosaniation business I started to look for relevant trainings. Long-term university courses were not realistic for me and I was looking for something really practical, a hands-on approach that would give me the necessary tools to act. Eventually I found cewas – a Swiss based training centre for water and sanitation and enrolled in their start-up course. The studies at cewas were eye-opening. The idea of Eco Solutions Forge evolved during the training - an agency that implements ecological sanitation in the Ukrainian Carpathians and at the same time bears the practical spirit of blacksmithing. We learned about the basics of starting and managing the business, and had the opportunity to meet the people whose articles I was reading before in person. Cewas is a place of inspiration - it combines an informal environment with a highly professional and qualified approach.

Challenges of starting/growing a business

The main challenge is the fact we are working in Ukraine. Ukraine is a poor and backward country, suffering under permanent crisis. The market for ecosaniation (or just sanitation) is still non-existing. Most of the rural people in the Carpathians (and Ukraine in general) do not perceive water pollution as a problem and do not recognize the need to change the situation – all waste ends up in streams and government control is weak. The only practical opportunity is to try to offer sanitation to more or less affluent homeowners and especially hotel owners who are able to pay for wastewater treatment systems. On the other hand, they often choose to forgo the ecological systems for fashionable ones like package treatment plants.

Offering ecosaniation solutions in this pioneer phase may seem too early, since awareness in society is lacking. But if we want change, we must bring the change.

Another issue is the lack of proper materials for building wastewater treatment facilities. For instance, one may face a real problem trying to find the right gravel and sand for constructed wetlands. Working with the local builders also might be a challenge since they often do not follow the building codes and do things with little attention to detail. With ecosanitation, success depends on the details, and small deficits might represent a large problem that could even undermine the entire project performance.

Our reliance on high-quality standards is a main challenge, since it is something people are not used to in Ukraine. We try to achieve the best possible results, not only in regard of the nice outside look but on all levels, such as including only high-quality materials. The outcomes of this might take longer and come at a higher price compared to initial expectations. But we make things to work properly and long-lasting – that is our rule.

Lessons learned as a start-up entrepreneur

I have found that the most crucial thing in setting up the company is **persistence**. So many disappointments and challenges arise on your way that it is very easy to lose the initial inspiration and to abandon the project. This is especially true for pioneers in the country you work in. Of course, you have to be aware of the context you are in and adapt to it, but on the other side you need to learn how to create a protective sphere around you and your work. As R.D. Laing said: "Do not adjust your dreams, reality is at fault".

This is of course the idealistic part of the story. But concerning the practical side, what is really important are your **personal connections** you had before, or that you have created during setting up and running your business. This is probably the best and only way to find customers, since advertisement is difficult to realise at this initial stage and nobody would believe what you offer them unless they know you as a person.

The other thing I have learned is that, in order to get customers, you have to **educate** people. People usually have very little understanding of sanitation in general and ecosanitation in particular. In order to create the demand for a product that will benefit them, education or social marketing is needed. You need to explain to them what is happening with the water they use and what kind of problems might arise from that. Educate about ecology in general and move to sanitation from that. You need to inspire people with the idea that we can together create a system based on natural cycles where nutrients are reused or at least wastewater is treated so it can be safely put back into the environment.

Continues learning is something that needs to be practiced if you want to achieve some results in your business. You have to constantly search for the new information, participate in specialized internet forums and discuss things. Someone somewhere is dealing with the same problems as you and has perhaps already found a solution which they might even be willing to share with you.

Entrepreneurial success stories

In spite of the fact that the initial goal of the ESF was to be involved more with treating wastewater using constructed wetlands – the first successes came with designing and building public compost toilets in different parts of Ukraine. The first toilet was built in 2015 at Sinevir Pass. It demonstrated that dry toilets can save money and, moreover, they can generate income for their owners. This toilet is privately owned and provides paid services. It offers the same level (or even more) of comfort that a flush toilet can provide. The next two public toilets were also successful but much simpler by design. Those experiences demonstrated that even with a low budget, a real composting toilet can be built which works well.

Besides these implementation projects we booked successes in education for sustainable sanitation. In various lectures about ecosanitation in Ukraine during the past three years, the audience, especially younger people, showed great interest.

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SR3 INVENT sustainable projects and businesses in Ecuador

Ways to minimize the impact of agricultural and industrial recyclable by-products and increase visibility through environmental marketing.

Author: Stefan Breitenmoser

Abstract

SR3 INVENT advises, accompanies and designs businesses and solutions for companies to minimize the negative impact of agricultural and industrial recyclable waste.

Problem statement

Some of our clients are facing problems such as an absence of an integral management of their recyclable industrial or agricultural waste, and are confronted with financial hardship, image loss, fines for non-compliance and danger of production line shut-downs. Another client segment is already investing in environmental initiatives but aware of their deficits in environmental marketing, and is thus seeking to create communities within their interest groups and national/international visibility campaigns for their projects.

Company discription

SR3 INVENT (http://sr3invent.com/) is a company conformed by Ecuadorian and Swiss partners located in Quito, Ecuador, which is dedicated to the development of sustainable projects and businesses. We ensure the corporate social benefit of our customers by strengthening their business through working with their stakeholders. Among the services offered are: environmental impact reduction studies, management of environmental projects, development of sustainable environmental initiatives through applied management models and others, according to customer requirements, such as environmental marketing and international visibility. Within our own business line, we established the Resource Recovery and Reuse (RRR) Project "BOMBASOIL", pellets made of chicken manure enriched with nutrients (depending on the type of crop that is used). This product was created to demonstrate an effective solution of sustainable sanitation for the treatment of chicken manure. The BOMBASOIL addresses the issue of improper chicken manure and poultry litter usage - in addition to altering the nutritional balance in the soil - causing the loss of nutrients by washing out (leaching and runoff) (Gerber et al., 2005).

"Our philosophy is to promote sustainable sanitation through reusable resources and alternative technologies - seeing the conservation of the environment as engine for economic reactivation and generation of awareness in the population". Belen Vallejo, SR3 INVENT Director.

Mission: We design sustainable sanitation businesses in Ecuador through alliances to increase the corporate benefit of our customers with the goal to promote environmental conservation.

Vision: To be the leading company in Ecuador in sustainable sanitation projects and businesses focused on a corporate benefit.

Key facts of BOMBASOIL pellets:

- BOMBASOIL are pellets made from chicken manure that can be used as soil enhancer
- In our first pilot we have a capacity of 60 kgs of pellets from 150 kg of manure per hour
- Initial target costumers are urban gardeners. Later, with increased production and reduced production costs, the product will also be more competitive for plantations, flower production, etc.

Figure 1. BOMBASOIL "Machinery"

Core values: The three core values of SR3 Invent are integrity and transparency, active environmental and social responsibility and closeness and commitment to the environmental performance of our clients.

Products and services:

- Design and development of environmental marketing projects, and creation of communities within their interest groups: strengthening the clients' socio-environmental relations, connecting environmental initiatives with the relevant communities where our client wants to have a positive impact.
- Creation of new products, projects and businesses for the client based on social and financial welfare.
- International representation and visibility: showcase and distribute Ecuadorian projects and initiatives at international conferences such as World Water Forum or the Water Week Stockholm
- Technical support in Ecuador for international companies and NGO's which want to develop and implement sustainable projects in the water and sanitation sector.
- Environmental impact reduction studies: studies of environmental impact and mitigation measures
- Environmental projects or initiatives management: managing and assessing the clients' projects per hour or as PMaaS.
- Implementation of reuse measures for agricultural and industrial recyclable waste: implementing RRR-projects for our clients using their recyclable wastes and turning them into innovative products. Our own initiative BOMBASOIL consists of drying and milling poultry manure and processing to a pellet which can be used as soil enhancer, losing less nutrients through leaching due to rain and avoiding contamination of watersheds. Tests will be run to enhance the pellets with additives such as micro organisms or other elements (capacity: up to 60kgs of pellets per hour / input : aprox. 150 kgs of manure per hour / commercial units: bags of 2 and 5 kgs / target market: urban gardeners (until production can be increased and production costs can be reduced to make the product more competitive for plantations, flower production etc.) / distribution through supermarkets.

Figure 2. BOMBASOIL Process

Figure 3. BOMBASOIL V1

Figure 4. SR3 INVENT Partners

Company history

From September 2013 to June 2014, Belen Vallejo attended the cewas start-up program in Willisau/ Switzerland. After the program and with a clear vision of the BOMBASOIL project, they founded the association "Yaku and You" in Switzerland. The aim is to promote water sanitation in the Andean Region. Founding members are Belen Vallejo, Stefan Breitenmoser, Karla Schlie, Alfons Breitenmoser and Leonellha Barreto. After moving to Ecuador, "Consultora SR3 Cia. Ltda." was founded by Belen Vallejo with husband Stefan Breitenmoser as CEO in order to enter the consulting sector in Ecuador.

In July 2017, Belen Vallejo, Stefan Breitenmoser and Alfredo Lopez founded "SR3 Invent Cia. Ltda." in Quito as equal partners with clearly defined responsibilities.

Building a viable business model

The start-up course of cewas helped Belen Vallejo to bring her ideas to paper and to develop a sustainable business model for her RRR project (pellets made from chicken manure). Cewas supported the idea of founding the association "Yaku and You" which now has its home under the roof of cewas in Willisau/Switzerland. In 2015, already in the process of further developing and promoting the project in Ecuador, "Yaku and You" received financial project support over US$ 10,000 from Chocolats Halba in Switzerland made possible by the support of cewas. In 2017, we realized that in order to be sustainable we need to redesign the company, defining new services and values for our clients. In June 2017, the consulting company Estay Consulting supported us to identify our core services and define a company strategy for SR3 Invent Cia. Ltda. Elaborating a service portfolio turned our company into a service provider, no longer depending on external funding for our RRR Project BOMBASOIL. BOMBASOIL is based on a business model of receiving capital from investors or funding from NGO's in order to increase production capacity and multiplication, while the business model of SR3 Invent consists of selling our defined services.

Challenges of starting/growing a business

The main challenges were the transformation of a project idea promoted through an association into an implemented project, securing income and growth through selling valuable services and a clear long-term company strategy.

Lessons learned as a start-up entrepreneur

Perseverance, patience, discipline and the will to redesign the project (and sometimes even personnel redesign) is as important as always staying in the learning lane. We were confronted with so many unfamiliar aspects, such as company strategy, legal or organizational structure, finance and marketing. It is important for us to get external support from experts and mentors in their fields or building alliances where it is necessary, and we are continuously working to extend our network.

Entrepreneurial success stories

In 2016, we were involved in an environmental review of 55 water and sanitation projects around Ecuador that gave us a general idea of the opportunities in the sector. In 2017, BOMBASOIL was nominated in "The Latin America Green Awards", and ranked 25 out of 55 in the water category. We are getting continuous positive feedback and invitations to present our products and services to a wide range of potential clients, from small and medium-sized businesses such as farmers' associations, ecolodges, the dairy products industry and the financial sectors to decentralized government. A highlight within our service of environmental marketing and institutional strenghtening was the representation of the recently founded Water and Sustainable Development Fund of the Imbabura Province (FONADERI) (www.imbabura.gob.ec) at this year's biggest water related event, the World Water Forum 8 in Brasilia, which only takes place every 3 years in a different host city. At this event, we were also informing about our own project BOMBASOIL, a pellet with a package that contains information to raise awareness about water and sanitation issues. Successfully produced earlier this year for the first time in Ecuador, we presented the product physically on a total of three occasions where we got to expose those Ecuadorian initiatives within the Swiss Booth. Our gratitude goes out to all the facilitators, especially cewas and SDC Switzerland.

Figure 5. „BOMBASOIL in the Latin America Green Awards 2017“

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SOIL - Building a Sustainable Citywide Sanitation Service

By building a circular economy sanitation business model, SOIL demonstrates that it is possible to provide a safe, dignified, and sustainable citywide sanitation service that is financially accessible to everyone, even to those living in the world's most resource-scarce communities.

Author: Natalie Miller and Leah Page Jean

Abstract

SOIL is a non-profit research and development organization currently scaling up a transformative social business model for the sustainable provision of household sanitation and ecological waste treatment in Haiti. For a small monthly fee, SOIL's social business, EkoLakay, provides over 1,000 households with container-based sanitation (CBS) toilets and safely transforms all collected waste into agricultural-grade compost. Revenues from toilet user fees and compost sales support ongoing project costs and showcase the potential to affordably provide household sanitation in the world's most impoverished urban communities.

Over the past four years, SOIL has refined the EkoLakay service delivery model, improved the toilet and waste treatment technology, and implemented cost reduction strategies. SOIL's model is now one of just three household CBS services globally that has grown beyond the pilot stage and demonstrated progress towards creating a sustainable social business model for providing safe sanitation services to rapidly-growing urban settlements.

Problem statement

Despite growing international recognition that sanitation is the single most important health intervention of the past two centuries, 2.5 billion people, or 36% of the global population, still lack access to a toilet (WHO/ UNICEF 2015). This crisis is particularly evident in Haiti, which has the highest childhood diarrheal incidence rate in the world and one of the largest and most virulent cholera epidemics in recent global history (Walker, 2012; Paho, 2016).

Attempts to create a functional sanitation system to solve this sanitation crisis are often ineffective, focusing only on the provision of toilets and neglecting waste treatment. But a toilet without a waste treatment system is just a means for displacing a problem, cleaning up one local environment while polluting another. As a result, the wastes of 4.2 billion people in the world are dumped directly into waterways or sit, untreated, in underground reservoirs where they often leach into groundwater (Baum and Bartam, 2013).

The majority of available sanitation technologies are dependent on scarce water resources, have prohibitively high start-up costs, and are financially unsustainable. In contrast, SOIL's holistic approach to sanitation links vulnerable rural and urban communities to one another through the simple biological process of nutrient recycling. The ecological sanitation process returns nutrients consumed in urban areas to the fields from which they came, creating livelihood opportunities at

Key facts:

SOIL's container-based city-wide sanitation service:

- Currently operating more than 1000 toilets serving 6000 users;
- A volume of 10 metric tonnes of human excreta is collected weekly;
- 100% of excreta collected is fully treated and transformed into agricultural-grade compost which restores depleted soils throughout Haiti;
- Initial cost is 30 USD per toilet which is recovered in monthly service fees of around 3.00 to 3.75 USD;
- Providing 84 full-time staff positions in the communities where EkoLakay operates in Haiti, with more hiring happening as service continues to grow.

Figure 1. SOIL is creating a model for an in-home sanitation service that can be run and operated by Haitian entrepreneurs, providing a sustained source of jobs and contributing to local economies (source: Bernard Cherelus).

Figure 2. SOIL provides full-cycle sanitation services from containment to reuse (source: SOIL).

every step of the sanitation cycle and ensuring both economic and ecological sustainability.

Company description

SOIL works at the nexus of economic empowerment, sanitation access, and climate change mitigation. Our mission is to promote dignity, health, and sustainable livelihoods through the transformation of waste into resources. SOIL's social business, EkoLakay, simultaneously addresses the linked crises of poor sanitation and environmental degradation by using simple ecological sanitation technologies that provide affordable and sustainable household sanitation and waste treatment services. Customers rent a SOIL household EkoLakay toilet for a monthly fee of 200 to 250 HTG (~3.00 to 3.75 USD) per home.

The initial cost of the toilet, approximately 30 USD, is incorporated into the monthly maintenance fee so that it will be paid off over a period of several years. Every week SOIL sanitation workers visit each household to collect the toilet wastes and deliver a fresh supply of the carbon material that is used for „flushing" composting toilets. The collected wastes are then transported to the SOIL composting waste treatment facility where they are transformed into organic, agricultural-grade compost through a carefully monitored process that exceeds the World Health Organization's standards for safe treatment of human waste (WHO, 2006). SOIL sells the compost for 300 USD per metric ton. To date, we have treated and transformed over 1,800 metric tons of human waste from our sanitation services in Haiti.

Building a viable business model

SOIL first piloted this social business model in 2013 and over the past four years have refined our service delivery model, improved the toilet and waste treatment technology, developed and finalized our logo and branding, and implemented cost reduction strategies like the introduction of mobile payments. This work was done in collaboration with a range of partners and research institutions around the world, including but not limited to: Stanford University, Eawag, the US Centers for Disease Control and Prevention, Brown University, EY, University of Hawaii, Ashoka Foundation, Schwab Foundation, and Lawrence Berkeley National Laboratory.

Revenue from monthly toilet user fees, waste treatment fees, and compost sales supports ongoing project costs and showcases the private-sector potential to sustainably provide affordable and ecologically-beneficial sanitation services. SOIL is currently servicing over 1,000 EkoLakay toilets, which are providing over 6,000 people with sanitation access. The cost of the toilet, weekly collection, carbon "flushing" material, hygiene promotion, repairs, waste collection, and treatment is now approximately $29 per person per year. Developed from a small grassroots effort, SOIL's initiative is now one of the most promising tests globally of the paradigm-shifting hypothesis that sanitation no longer needs to focus on waste disposal, but rather on the ecologically-beneficial and economically-profitable nutrient capture and agricultural reuse of human waste. The model SOIL is innovating in Haiti is gaining traction worldwide and is one of the few interventions for informal urban communities that meets the new standards for safely managed sanitation set by the Sustainable Development Goals.

SOIL is currently focused on researching and capturing economies of scale, operational efficiencies, and technological innovations to further refine the EkoLakay model and ensure the service is able to achieve financial sustainability. The global consulting firm Ernst and Young worked with SOIL in developing a projection for a future social business break-even point achieved by taking advantage of economies of scale while also making operational improvements and cost reductions.

Figure 3. A SOIL sanitation staff member returns after completing his weekly container collection in a neighborhood of Haiti's second largest city, Cap-Haitien. (source: Vic Hinterlang)

Figure 4. Transforming wastes into rich compost proactively heals Haiti's environment and helps to combat the effects of climate change. (source: Tony Marcelli)

Working in the context of Haiti presents unique challenges however, and thanks to being selected as a finalist for the 2018 ReSource Award, SOIL is receiving coaching from cewas in Willisau, Switzerland. For five months, cewas has been supporting SOIL to develop a multi-stakeholder model for financial sustainability that combines earned revenues (or tariffs), corporate partnerships, results-based financing through international financial institutions, monthly donor support, public sector support, and carbon credit. In addition to supporting an evaluation of SOIL's best path to sustainable scale up, cewas coaches have helped analyze the risks and assumptions of the business model and productively plan for the future.

Challenges of starting/growing a business

As a research and development organization striving to build an innovative solution to the global sanitation crisis, SOIL is committed to transparently sharing outcomes, challenges, and lessons learned with the global community of practice. Some of the key challenges that SOIL has faced with EkoLakay and how we addressed them include:

- **Human Resources:** Throughout the past year there have been a few points in which we found our EkoLakay program understaffed. While it is exciting that SOIL's social business' growth allows for increasing livelihood opportunities in the neighborhoods we work, the back-end of recruitment and hiring is often time intensive. We've been investing more heavily in staff capacity development and recruitment efforts and are encouraged to see that we are now more proactively staying ahead of our staffing needs.
- **Data Management:** Our Excel-based data management system became strained as our sanitation service surpassed 500 customers. EkoLakay has since fully transitioned into using a new customer relationship management (CRM) system that utilizes a combination of Salesforce, Taroworks, and GPS data points. We are now able to easily collect customer data and location by using smartphones in the field, which has allowed us to increase operational efficiency and improve customer service.
- **Political and Economic Instability:** Over a period of less than 12 months, the value of the Haitian Gourde (HTG) decreased from 43 HTG/USD to 65 HTG/USD. The change in currency rates was devastating to many living in Haiti and presented an unanticipated challenge to SOIL, both as potential clients had less flexibility to spend money on our service, and because the devaluation caused SOIL to lose money each month as our revenue comes in HTG, but we pay our staff in USD. We have since made efforts to reduce our vulnerability to currency fluctuations by decreasing the number of contractual obligations we have in US dollars. Volatile political instability with delayed and contested elections has also created challenges for our operations, as it has been difficult to establish and maintain working relationships with government officials in the face of questions of legitimacy and high turnover rates.

Lessons learned as a start-up entrepreneur

Climate Resilient Design:

In addition to building resilience to climate-related disasters through creating soil amendments that sequester carbon and facilitate plant growth, SOIL has refined the EkoLakay toilet to itself be a disaster resilient sanitation solution. As one of the third most climate-vulnerable nations in the world, it is especially important that sanitation interventions in Haiti are durable and adaptive, particularly to the cases of flooding (Kreft et al., 2017). Although we were very lucky that the communities where we offer the EkoLakay service were not seriously impacted by

Figure 5. EkoLakay toilets have been intentionally designed to be disaster resilient and the collection service will go on rain or shine. (source: Tucker Cahill Chambers)

the two most recent hurricanes to come in contact with Haiti (Hurricane Matthew and Irma), we learned very important lessons during the preparation for, and aftermath of, both storms. Before each storm, we worked with Haiti's largest telecommunications provider, Digicel, to send an SMS blast to our clients informing them to seal the containers from their EkoLakay toilets in the event of flooding. Because EkoLakay toilets have sealable containers, they are more resilient than alternative sanitation solutions such as pit latrines and sewers which often overflow and malfunction during flooding evens. In both the flooding that followed the hurricanes, as well as other flooding events that occur regularly throughout the country, SOIL has had no issues with waste contamination.

Inclusive Innovation:

SOIL operates in a country where far too many organizations have struggled to deliver on their goals and too many billions of dollars have been spent on failed projects. We believe that our successes in building EkoLakay into the growing social business that it is today are a result of our commitments to local collaboration. Over 90% of SOIL's staff are local to the neighbourhoods where we work, and we have consulted beneficiaries at every step from project design to implementation which has allowed us to build a globally renowned and locally loved sanitation service.

Responsible Growth:

The weekly transportation of household toilet wastes to our waste treatment sites has always been SOIL's biggest expense. We have realized in the past year that we could significantly decrease operational expenses by focusing on increasing service density in priority neighbourhoods before expanding to new zones of service. By concentrating on saturating service provision, SOIL has reduced transport-associated costs by more than 30% and increased the public health impact of the EkoLakay service. This approach is also laying the groundwork for the potential private spin-off of local EkoLakay businesses in each target neighbourhood in the coming years.

Public Sector Engagement:

SOIL's waste treatment site is already one of the lowest cost waste treatment operations globally, and we are proud that we recover approximately 20% of our operational costs from compost sales. However, as is the norm with waste treatment services globally, we anticipate a need for ongoing government or donor financing at some level (through taxes, tariffs, subsidies and/or grants) in the long-term. We believe it is unreasonable to expect household clients living in vulnerable communities to support the full costs of waste treatment – a public good which is heavily subsidized in wealthier nations. The Haitian government agrees with this assessment, and they have expressed interest in working with SOIL to develop a sound financial plan for a public-private partnership (PPP) which would ensure the delivery of waste treatment services. SOIL believes the ultimate pathway to scale will require the ongoing participation of both the private and public sectors.

Figure 6. "Before there will toilets like this, the street was full of waste. Now our situation is changing as more and more people are signing up for EkoLakay," – Naderge, longtime EkoLakay user in Cap-Haitien, Haiti. (source: SOIL)

Figure 7. SOIL satisfaction survey results from SOIL's EkoLakay users in Port-au-Prince. (source: SOIL)

Entrepreneurial success stories

Growing EkoLakay's Citywide Sustainable Sanitation Service:

SOIL's EkoLakay service provides low-cost, dependable, and environmentally-sound household sanitation in informal urban settlements, where over three billion people are expected to reside by 2050 (UN, 2015), and this work represents an elegant public health and environmental intervention for resource-poor communities. Given the sheer number of people requiring access to these services, there is significant demand to drive large-scale replication globally. In Haiti, SOIL has already expanded EkoLakay to the two largest cities in the country, Cap-Haitien and Port-au-Prince, and demand for toilets continues to outpace installation. Demand for the end product of our service, Konpòs Lakay compost also remains high. To date we have earned nearly $95,000 in compost revenue alone. In addition to a high rate of demand for EkoLakay toilets and Konpòs Lakay compost, we're proud of the fact that current EkoLakay users report extremely high rates of satisfaction with the service and share that EkoLakay allows them to save money, increases their sense of safety, and improves the quality of life for their family in regard to their health (SOIL, 2017) (see Figure 7.).

Strengthening the Global Sanitation Sector:

The innovative technology and implementation model SOIL uses leverages naturally efficient ecological systems, making it easy to scale and to replicate. Although SOIL's implementation efforts are focused solely on Haiti, our ultimate objective is to develop a globally replicable model for the delivery of ecological Container-Based Sanitation services in dense urban areas. All aspects of our service and design details are open source and we share outcomes and lessons learned widely in the hope of fomenting further innovation.

We always welcome people to learn more about our work at www.oursoil.org and join us in the conversation on Facebook and Twitter (@SOILHaiti).

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Youth-Led Sustainable Sanitation in the MENA region

This paper is a step-by-step guide on how youth innovate and scale sustainable sanitation solutions.

Author: Kareem Hassan

Abstract

As a solution to the alarming sanitation situation in the MENA (Middle East and North Africa) region and the lack of efficient scalable sustainable solutions, BENAA developed a business model that is highly dependent on the power of youth. It aims at implementing sanitation solutions for poor and rural communities, through the utilization of the power of youth, which is often neglected by the planning and executive bodies in the region.
BENAA completes the whole loop of change-making in the field of WASH (Water, Sanitation and Hygiene); by producing knowledge on sustainable sanitation and water management, strengthening youth capacities and implementing knowledge-based youth-led sanitation projects on the ground.
The three pillars of this loop form the Social Innovation Pyramid invented by BENAA. The implementation of this approach on the ground was conducted by BENAA throughout the last two years and proved its effectiveness and ability to scale in the region.

Problem statement

The lack of sustainable sanitation is an alarming issue challenging development in the MENA region. Proper wastewater collection and treatment is missing in the majority of rural areas and some urban areas in MENA countries. Out of 360 million inhabitants in the region (World Bank, 2015) there are more than 7 million people in North Africa that still practice open defecation (AMCOW, 2012), and about 37 million people (around 10%) in the MENA region suffer from a lack of improved sanitation (World Bank, 2015). The insufficient sanitation infrastructure has led to surface and groundwater contamination, negatively impacting the environment, public health and, consequently, leading to socio-economic challenges.

In Egypt, 30.000 rural villages lack improved sanitation facilities (Ismail, 2018). With more than 60% of the Egyptian population under 30 years old (the average age of the overall Egyptian population is 25.1 years) (Insights MENA, 2011), Egypt holds a very strong youth power. Therefore, those youth have to take the lead and play a major role towards innovation for sustainable sanitation. Notwithstanding, the actual situation shows that Egyptian youth are suffering from a lack of motivation, knowledge, and experience in the field of sustainable sanitation and water management. Empowering youth and providing them with the required knowledge and experience is a necessary outcome which BENAA aims to achieve.

Business Description

BENAA – in Arabic – stands for "Building up", in which we aim at building the youth's capacities, to develop participatory sustainable sanitation projects in Egypt and the MENA region. BENAA completes the whole loop of change-making in the field of WASH; by producing knowledge on sustainable sanitation and water management, strengthening youth capacities and implementing knowledge-based youth-led sanitation projects on the ground. These three main pillars shape the Social Innovation Pyramid invented by BENAA.

Knowledge Production

BENAA aims to build an open-source library containing applied knowledge in the field of water and sanitation.

Key facts:

- Knowledge production: Knowledge material produced by BENAA has reached 200,000 young Arab users on the internet and has been downloaded more than 20,000 times.
- Since September 2015, BENAA has trained and empowered more than 3,000 Egyptian youth to implement participatory, youth-led WASH projects.

We produced Arabic versions of some main knowledge sources:

- the Compendium of Sanitation Systems and Technologies
- the Sustainable Sanitation and Water Management in Humanitarian Crisis Toolbox
- the Guidelines for Community-Led Urban Environmental Sanitation Planning (CLUES), in addition to 30 Planning Tools for Sustainable Sanitation

Our produced knowledge materials have reached 200,000 young Arab users on the internet and have been downloaded more than 20,000 times. (link to one of the shared documents: https://goo.gl/ctHoXV). This translated library represents the knowledge basis for all of BENAA's activities.

Capacity building

BENAA utilizes the translated knowledge to prepare several trainings for youth who can build on the acquired knowledge for further actions. All the trainings include group discussions, brainstorming, and exploring innovative ideas for implementation. We have delivered several trainings with the aim of enabling the youth to implement participatory sanitation projects in rural Egypt. Since September 2015, we have trained more than 3000 Egyptian youth from different regions in Egypt.

Participatory projects

Our work aims at protecting and preserving regional water resources by creating integrated WASH solutions and building a youth-led enabling environment. The trained youth are developing BENAA's local and community-led solutions, which have significant impact and an increased possibility for successful scaling (BENAA, 2018). In addition, BENAA focusses on building up an enabling environment by: raising public awareness, facilitating institutional arrangements, fostering socio-cultural

Figure 1. Nile Delta region is suffering the lack of proper sanitation facilities (source: Kareem Hassan).

acceptance, supporting socio-economic development, performing financial arrangements, and continuous monitoring and evaluation.

Based on the transferred knowledge, BENAA started a new company called "100 WASH Solutions", which aims at innovating local and sustainable WASH solutions. The company was funded by Misr El Kheir Foundation

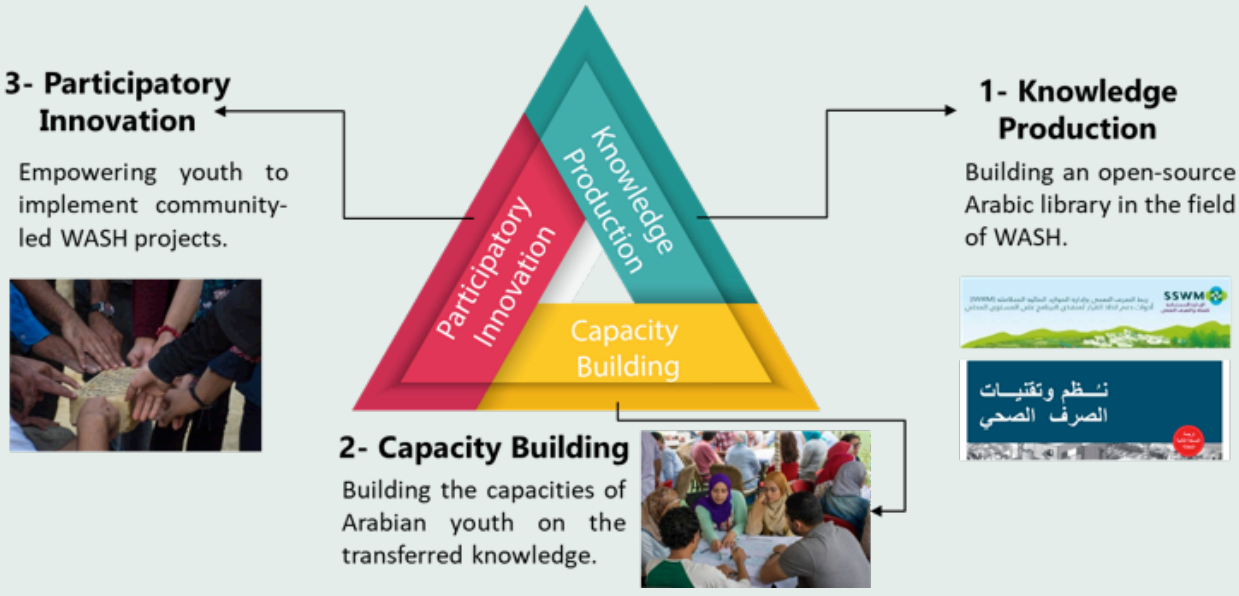

Figure 2. BENAA's innovative approach: „Social Innovation Pyramid" (source: BENAA, 2015).

Figure 3. BENAA's trainings for the youth on Sustainable Sanitation and Water Management. (source: BENAA, 2015-2018)

to design and implement EABRA (Egyptian Anaerobic Baffled Reactor with Aquaponics/Hydroponics) systems. The first unit was installed in Ayat (Giza), where it serves a community school and its surroundings (300 persons). The treated wastewater is used to irrigate the school's landscape and 400 trees around it. BENAA was responsible for its implementation on the ground during the last year, proving the unit's effectiveness and ability to scale up in the region.

Over the next three years (2018-2021), BENAA will aim to:

1. Build the capacity of 150 enthusiastic youth leaders in the fields of water, sanitation, hygiene and social entrepreneurship;
2. Transfer, adapt, test and re-create 30 integrated water, sanitation and hygiene solutions;
3. Raise awareness among low- and middle-income communities for possible solutions in five major regions in Egypt;
4. Empower communities in targeted areas by strengthening their social, economic, cultural and governmental environments;
5. Transfer our experience to the millions of youth in the MENA region.

People behind this business

BENAA's story started with a young man from Egypt with immense motivation to change lives and empower youth in the MENA region. Kareem Hassan along with his friend Mohamed Ateia, started the journey towards this dream in 2015.

Kareem spent 10 years on research and gathering knowledge on sustainable development, travelled to more than 20 countries to find inspirations, and interviewed more than 500 experts in the field of WASH and sustainable development to build up his mentality regrading starting up this entity.

Target Groups

1. The main target group of BENAA is the youth (18-35 years old) who are trained to build up projects and carry on their implementation on the ground.
2. National and international development organizations, charities, governmental organizations, etc. who are seeking sustainable, cost-effective and locally produced WASH solutions for poor and rural communities.
3. Our products and services

Figure 4. Implementing the EABRA system: Egyptian Anaerobic Baffled Reactor with Aquaponics/Hydroponics. (source: BENAA, 2017)

Building a viable business model

BENAA has a unique business model with several local and international partners. Each track has its funding streams and supporters. For example, at the Knowledge Production track we work with publishing organizations that seek to translate and localize their knowledge, such as: Eawag, seecon gmbh, GIZ, etc. For our Capacity Building track, we got support from LUSH Spring Prize, Cairo Greater Library and several local partners. At the participatory implementation track we provide products and services offered by Misr Al Khair Foundation, The Ministry of Water Resources and Irrigation, Care International, Manahyaha, Handover etc.

Challenges of starting/growing a business

We are facing plenty of challenges in Egypt, however, we believe that the main challenge was the initial stage of converting our ideas into prototypes. This stage requires funding, technical support, and external mentors; these requirements are not easy to get by in the initial stages of any new project. But after we got something done on the ground, many people and entities showed up with the willingness to support.

Lessons learned as a start-up entrepreneur

BENAA started almost 2 years ago envisioning the empowerment of youth in the MENA region. The many lessons learnt during this journey can be summarized as following:

1. Strengthenig capacities of the youth in order to build up sustainable water and sanitation projects in the Arab region is a must.
2. Incubating youth's innovative ideas in their early stages is game-changing for the region.
3. A youth-led enabling environment in the MENA region could foster the social innovation activities, and will lead to more effective policy-making.
4. No matter how well we are prepared for our activities, they are still many obstacles and challenges along the way. They will never cease, and accordingly, we have to stand up after every failure, try again, and again, until we succeed.

Entrepreneurial success stories

One of our greatest accomplishments is the installation of the EABRA (Egyptian Anaerobic Baffled Reactor with Aquaponics/Hydroponics), a seven-years dream that has become reality. More than 30,000 marginalized small villages in Egypt suffer from a lack of sustainable sanitation infrastructure. These villages are in a need of efficient and cost-effective solutions. We started the realization of this dream last year with the installation of EABRA1, the first unit of its kind in Egypt for ecological sanitation. With that, we started our journey towards 30,000 environmental sanitation projects in the Egyptian villages that are marginalized from the urban masterplans. This unit was the first product of our 100 WASH Solutions project, which we started last year. We installed it at a community school where it will provide improved sanitation for 300 children. The treated wastewater is used for irrigating the school's landscape, and to produce economic crops that benefit the community. This accomplishment showed great institutional arrangements, community participation and governmental support.

Since our launch on the 1st of September 2015 we achieved so much besides the EABRA1. So far we achieved the following:

- Mobilized 3,000 Egyptian youth;
- Initiated 35 successful social projects;
- Created a community of 1000+ active volunteers;
- Initiated five massive awareness campaigns;
- Our produced knowledge has reached 200,000 Arab users on the internet, and has been

1. Knowledge Production	**Service**	**Description**	
	Technical Translation (English-Arabic)	BENAA translates - into Arabic - the essential practical knowledge in WASH.	
	Knowledge Dissemination	BENAA widely publishes (online and offline) its produced materials and creates public awareness. BENAA converts and simplifies the translated knowledge into innovative and interactive materials to create interest among the target groups.	
2. Capacity Building	Capacity Building	An intensive training aims at motivating youth to envision sustainable life goals and foster their implementation on the ground. We have activated 2,000 of Egypt's youth during the last 2 years.	
	Technical Modules	We offer several workshops and trainings on Environmental Sanitation and Water Supply based on the knowledge that we have translated.	
	imp!act Modules	A joint program with the Swiss-based youth organization "Euforia", which aims at empowering the youth to start up local initiatives in the field of environmental sustainability.	
3. Participatory Implementation	**Products**	**Accompanied Services**	**Description**
	EABRA: The Egyptian Anaerobic Baffled Reactor with Aquaponics/Hydroponics	Community-Led Planning and Implementation	A small scale locally produced prefabricated unit for wastewater treatment accompanied by resource recovery systems.
	GTRS: Greywater Treatment and Reuse System	Implementation and reforming landscapes	To collect, store, treat, and safely reuse greywater.
	WashaLOT	Rehabilitate water and sanitation facilities	Group washing facilities at schools in addition to rehabilitating the toilets' superstructures and facilities, with a complete guideline for toilet management and maintenance.
	Soap roll	CHAST (Child Hygiene & Sanitation Training	Cooking Oil Recycled Soap; Easy and cheap way of making soap. In addition to promoting personal hygiene practices among children using exercises and educational games.

downloaded more than 20,000 times;

- We are enhancing the living conditions of 10,000 people in five Egyptian villages.

In addition, BENAA won several awards: Lush Spring Prize London 2017; Winner of GESR Prize Cairo 2017; Winner of the Ministry of Environment's prize, Cairo 2016.

Lastly, BENAA participated in many global events: World Water Forum in Brazil 2018, the Young Mediterranean Water Heroes Forum 2018, World Water Week, 10th UNESCO Youth Forum, and many more.

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The Urinal Project

Urine is an undervalued resource in an untapped market.

Author: Lillian Volat

Abstract

The Urinal Project was born from a desire to solve the widespread mismanagement of finite resources, to recover precious nutrients that we flush away every day, and to create a new economy around nutrient recovery and reuse. The catalyst to start the project stemmed from the 2011 Syrian refugee crisis, where the emergency response was dominated by traditional, non-environmental technologies and approaches, creating pollution, high expenditures and missed the opportunity to develop market-based responses to sanitation provision. The Urinal Project provides safe, odourless, unisex urinals for refugee or recently displaced women with young children and elderly persons to use in the safety and convenience of their tents. The Urinal Project also develops market-based service chains for each context where the urinals are used, consisting of collection, transportation, treatment, testing and reuse.

Problem statement

Humanitarian responders in Syria, Jordan, Iraq and Lebanon do not have access to quickly deployable, safe, hygienic, cheap, environmental, market-based sanitation solutions for rapid emergency response. Refugees and internally displaced persons in urban and rural areas and people migrating are resorting to using plastic bags, or unsafe and unhygienic methods. In immediate emergency response, toilets are usually at a distance from the shelters and women and children must travel in the dark and sometimes in very harsh weather conditions. They are prone to harassment and attack and the elderly have difficulty accessing the facilities. In addition, humanitarian responders are deploying technologies in emergencies that are generally not managed across the entire service chain, and these technologies are consuming limited resources (fresh water) and creating expensive externalities (polluted wastewater that needs to be transported and treated). The result is an increase in social tensions between refugees and hosting communities whose ecological systems are being polluted and their natural resources are increasingly stressed. Humanitarian responders don't have the time and resources to innovate the existing sanitation solutions, nor do they tend to have the capacity to think too far beyond the crisis situation and ensure the financial and ecological sustainability of their projects.

Company description

Vision: The economies of the MENA region grow towards inclusivity, environmental justice and sustainability.

Mission: Solve the widespread mismanagement of finite resources, to recover precious nutrients that we flush away every day, and to create a new economy around nutrient recovery and reuse.

Our Products: A convenient, odourless, well designed urine collection system for the 1-12 months of service provision following a crisis/displacement.

The Urinal Project provides an ecological, market-based sanitation solutions to immediate emergency responses (between the first 1-12 months of a service provision in a crisis). We design, produce and train on the local production of unisex urinals that are easily modified to be attached to any standing container (e.g. used jerry can) and develop a service chain for any situation, whether rural, urban, migrant to manage the collection, transport,

Key facts:

- The Urinal Project provides ecological, market-based sanitation solutions to immediate emergency responses
- The project provides safe, odourless, unisex urinals for refugee or recently displaced women with young children and elderly persons to use in the safety and convenience of their tents.

Figure 1. Founder, Lillian Volat, testing jerry cans at an industrial recycling warehouse in Erbil, Iraq, 2014 (source: Urinal Project).

Figure 2. Internally displaced camp for Iraqis in Erbil, Iraq, 2014 (source: Urinal Project).

treatment, testing and reuse of urine. In addition, we research and develop with our implementing partners a value chain for the final output within the context of crisis situation with different local actors. For example, in Iraq a local fruit tree farmer agreed to use the urine as a fertilizer on his trees and in Lebanon a USAID funded reforestation project agreed to take the urine as a fertilizer. Other types of outputs can involve using urine to provide electricity for toilet facilities in the camps, or for greening the camps. Our product provides a convenient, odourless, well designed sanitation solution that reduces the need for expensive or finite inputs such as desludging and fresh water. The Urinal Project was founded by Lillian Volat, a sustainable sanitation enthusiast who has been living in the Middle East since 2011. She was joined by Phil Jones at Byspokes, a consulting company working in the region, and Carmen Andronache as a project assistant.

Building a viable business model

This business idea developed at the cewas start-up trainings in Switzerland. Cewas provided the coaching and expertise necessary to turn the initial idea into a feasible business project. After coaching through variations of business models and research, cewas also helped to make important connections that supported the development of the project.

Challenges in starting and growing a business

It is difficult to enter into a market that hasn't been tested before as a start-up. The market didn't even exist. We also didn't have the leverage that a university or established NGO has to approach customers such as humanitarian responders in our case. Another challenge was trying to design, develop and test the entire service and value chain of the product. Because the value chain didn't exist yet for urine, the collection, transport, treatment, testing and reuse services had to be designed and developed from the base. There was no outsourcing of any of these services into the existing market.

> "The market didn't even exist." Lilian Volat, founder.

Lessons learned as a start-up entrepreneur

Starting the business gave us the best insight into how the system worked and how it could be improved. We didn't have any experience in humanitarian sanitation response, but just observed what was happening around us. We learned a lot about our customers and how to approach them, just by diving headfirst into starting the initiative. We learned that our business was too broad to function individually, and that we couldn't provide a urinal and full-fledged tailor-made service for each context, but rather needed to focus on finding partnerships for the parts that we didn't have the expertise for (data collection

Figure 3. Syrian refugee tending her okra plant in a garden she planted next to her tent, Erbil, Iraq, 2014 (source: Urinal Project).

and analysis, reuse testing, implementation of collection, transport and treatment services).

Entrepreneurial success stories

The Urinal Project is the winner of the 2014 environmental award from a Swiss Environmental Foundation (Umweltpreis der Schweizerischen Umweltstiftung) and received 10'000 CHF in seed funding, which helped to develop the project in Iraq and Lebanon. We also received seed funding from the Pollination Project to build and test the urinal prototype and through them we were featured in the global innovation section of the Huffington Post. With the Rich Earth Institute, we hosted the 2nd Annual Urine Diversion Summit in Vermont, USA bringing together actors working in urine diversion from government, academia, business and agricultural sectors. Currently, the project is on hold, and I focus efforts more broadly on developing resource recovery and reuse business orientation in the region. The Urinal Project is serving as a basis to support, develop and promote other waste to value-based sanitation projects in Lebanon, Jordan, Iraq and Palestine.

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