

## CASE

# Urine and fecal matter collection for reuse (Ouagadougou, Burkina Faso)

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## Supporting case for Business Model 16

<b>Location:</b>	Ouagadougou, Burkina Faso
<b>Waste input type:</b>	Urine and feces
<b>Value offer:</b>	Provision of sanitation services and sanitized urine and feces as a safe organic fertilizer for agricultural production
<b>Organization type:</b>	Public-private partnership
<b>Status of organization:</b>	Project started in 2006, full system operational in 2008/2009
<b>Scale of businesses:</b>	Collection, treatment and reuse: 75,000 litres of urine and 11 tons of fecal sludge/year
<b>Major partners:</b>	European Union (EU), Water and Sanitation for Africa (WSA, formerly known as CREPA), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), National Water and Sanitation Authority (ONEA), Municipality of Ouagadougou

## Executive Summary

The ECOSAN-EU initiated project was selected as a unique example of a large-scale household based resource recovery venture, while providing urban farmers with a reliable nutrient source for agricultural production. As with many other rapidly growing cities in the developing world, Ouagadougou is representative of a huge nutrient sink – where massive amounts of nutrients brought into the city with food are not recycled back to productive land. Coupled with poor waste management practices, especially the risk of groundwater contamination from the accumulation of human excreta in deep-pit latrines and septic tanks, the current waste management approach has dire effects in terms of soil fertility loss, increased disease burden and eutrophication. The project's activities which cuts across the entire sanitation value chain via the provision of sanitation products and waste collection services, whilst having a direct linkage to the agricultural sector via the conversion of human excreta into organic fertilizers for supply to local farmers, represents a sustainable market-driven solution especially in the absence of political pressure. The initial pilot phase of the project, from June 2006–December 2009, was set up with funding from the EU with contributions from the implementing organizations, GIZ, CREPA and ONEA. The EcoSan system was implemented in four of Ouagadougou's 30 urban sectors and the project was engaged in the provision of household urine diverting latrines, decentralized collection and treatment of urine and feces and the sale/delivery of the treated excreta as fertilizers for crop production. A key characteristic of the

project has been its transfer of ownership to the municipality of Ouagadougou in 2010 and strong engagement of community-based organizations (CBOs) in different business activities along its value chain. The ECOSAN-EU business model is based on a CBO approach where in each urban sector, one group association or community-based organization (CBO) has a contract with the municipality to ensure the collection, treatment and delivery of sanitation products from households to farmers. A key success factor for this model has been the diversification of their portfolio as represented by the multiple products and services they provide. The variable income for the associations include monthly collection fees of USD 0.69 per UDDT (urine diversion dehydrating toilet), income from sales of EcoSan fertilizers (sanitized urine and feces sold at USD 10.37/m<sup>3</sup> and USD 5.34/50kg bag, respectively).

ECOSAN-EU has contributed to improved health and hygiene of households with installed UDDTs and offers a monthly collection service comparatively cheaper than having a one-off pit emptying service. Improved excreta management practices has resulted in a reduction of environmental pollution. Additionally, the activities of this project have created a significant number of jobs along the entire sanitation value chain and provided a low-cost and sustainable agricultural input alternative for farmers.

#### KEY PERFORMANCE INDICATORS (AS OF 2014)

Land use:	Data not available					
Capital investment:	USD 20,145 per year					
Labor:	Data not available					
O&M cost:	USD 3,319–3,651 per sector per year					
Output:	223,760 litres of sanitized urine and 21 tons of solid fertilizer over a 3-year period					
Potential social and/or environmental impact:	Improvement in health and hygiene of households with installed UDDTs, creation of jobs, reduction in environmental pollution, low-cost fertilizer for farmers					
Financial viability indicators:	Payback period:	N.A.	Post-tax IRR:	N.A.	Gross margin:	N.A.

### Context and background

Only 19% of the population in Ouagadougou, Burkina Faso, had access to improved sanitation (i.e. increased waste collection and treatment services) in 2006. With an annual population growth rate of around 5%, it has become increasingly difficult for municipalities to keep up with that with the provision of sanitation services. Large quantities of human excreta accumulating in deep-pit latrines and septic tanks not only represent a potential risk for groundwater contamination but are also wasted nutrient resources. An integrated ecological sanitation (EcoSan) system was implemented in 2006–2009 by the EU-funded ECOSAN-EU project led by WSA (Water and Sanitation for Africa), GlZ<sup>1</sup> (Deutsche Gesellschaft für Internationale Zusammenarbeit) and ONEA (National Water and Sanitation Authority). The key activities of this project were to support 1,000 households in obtaining appropriate and affordable, urine diverting dry toilets (UDDTs) with an associated collection service followed by treatment and reuse demonstrating novel excreta management systems that protect human health, contribute to food security and enhance the protection of natural resource and promote small and medium size enterprises. The project was implemented in four of Ouagadougou's urban sectors – “arrondissement” 17, 19, 27 and 30. Public UDDTs were initially installed at the central prison of Ouagadougou, the Bangrweogo Park, town hall and the zoo. Subsequently, households were willing to install UDDTs after the subsidies were increased, and within six months, 400 double vault UDDTs were built. By June 2009, 922 homes were using UDDTs and some 800 gardeners and small-scale farmers were trained on the application of treated urine and feces for their crops. The Ouagadougou municipality took over the coordinating role from January 2010 when the project was officially completed, after a

transition phase of six months. The municipal waste department (or “Department for Cleanliness” - Direction de la Propreté) set up an EcoSan committee, which has a chairman, one rapporteur and one focal point. A municipal budget line was dedicated for continued support to the associations. The total investment for the three-year project (2006–2009) was USD 2,070,218. In 2010, the municipality of Ouagadougou allocated USD 14,735 of its budget for continued support to the service providers (local CBOs), and took over the coordinating role of the project. The waste management regulations of Burkina Faso are such that the municipalities organise the collection, treatment and disposal of waste, which can be carried out in partnership with private organisations and Decree 95 indicates the setting up of a fee for household waste collection. The ECOSAN-EU is based on a concept where in each urban sector, a community-based organization (CBO) has a contract with the project to ensure the collection, treatment and delivery of sanitation products from households to farmers.

### Market environment

With increasing waste management costs but ever-dwindling budgets, municipalities are in dire need of sustainable alternatives such as integrated ecological sanitation solutions involving the reuse of waste in cities like Ouagadougou. Additionally, Burkina Faso is a landlocked country, affected by droughts and desertification, overgrazing, soil degradation and deforestation, with only 14.43 % of its land being arable. Around 90% of the population is engaged in subsistence agriculture and with unpredictable chemical fertilizer prices, exemplified by the price hike in 2008, reuse of treated human excreta can be a reliable nutrient recovery strategy for agriculture. This represents opportunities for business development in both the sanitation and agricultural value chains. It is important to note that although the demand for sanitation infrastructure (i.e. UDDTs) and services will demonstrate an increasing trend for the next decade, human fertilizer demand at least in the city may not reflect a similar trend. Factors related to transportation constraints especially for sanitized urine and the current area of urban agriculture within city limits may potentially limit the amount of excreta that can be absorbed in the agricultural sector, suggesting an excess supply. Based on 2012 data, the present farming activities in the city can potentially only absorb the excreta from approximately 50,000 people, whereas there are 1.5 million inhabitants in Ouagadougou. New technologies to add-value to urine and feces such as pelletized fecal sludge-based compost will allow businesses to access new markets beyond the city limits, as realized for example in Accra, Ghana.<sup>2</sup>

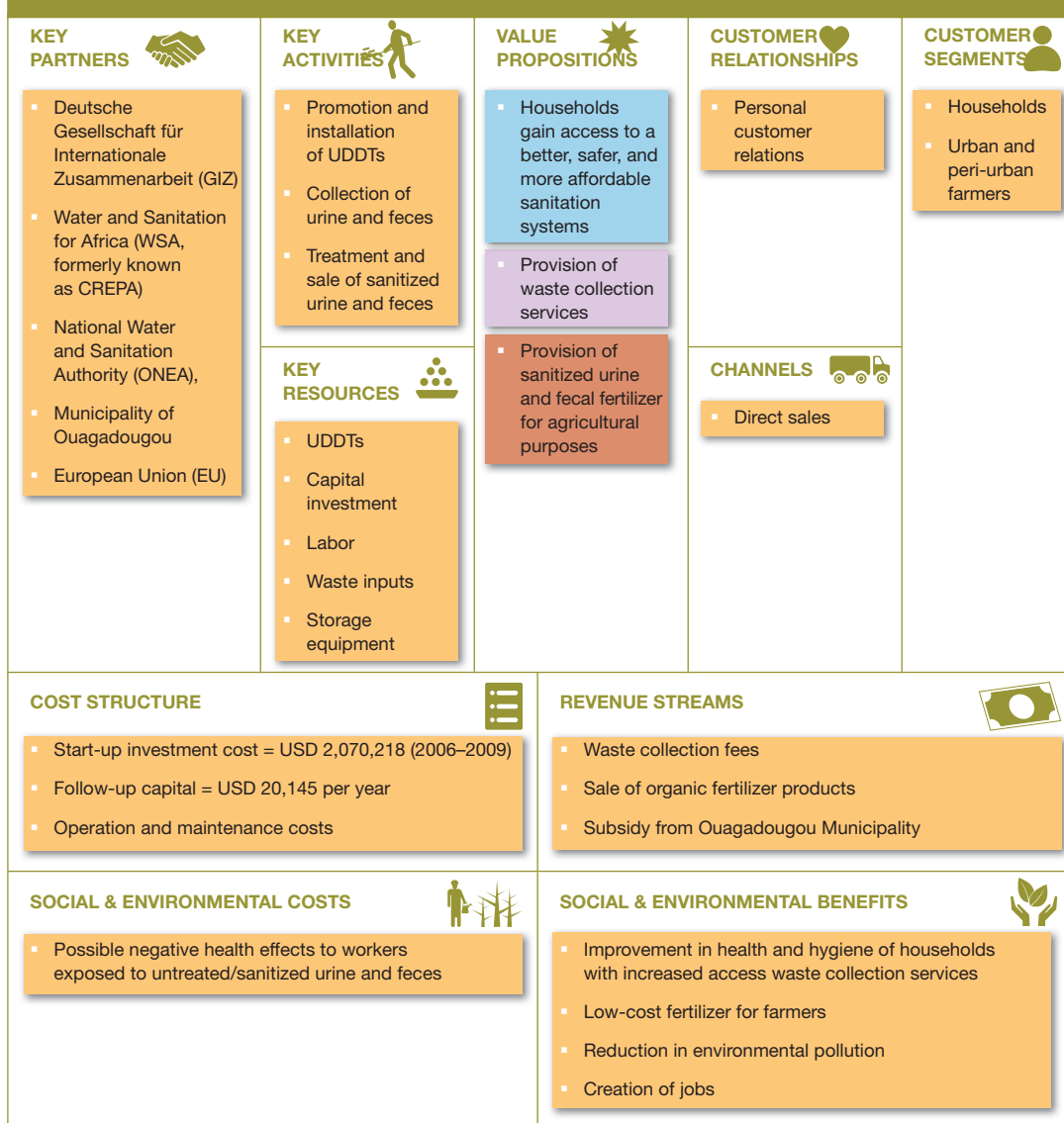
### Macro-economic environment

The Government of Burkina Faso does not have an officially recognized chemical fertilizer subsidy program (IFDC, 2013). However, financial difficulties experienced by cotton companies in the country in 2005 and the food crisis of 2008 influenced the government to undertake actions to support the production of cotton and staple food crops by facilitating access to fertilizers. The goal of the fertilizer support operation in Burkina Faso was “to increase the current level of fertilizer use by reducing its cost and facilitating farmers’ access to quality fertilizers”. There is no prescribed fertilizer package for farmers under this program, but it covers two types of fertilizers: a combined nitrogen, phosphate and potassium (NPK) fertilizer and urea. The fertilizer support program was first introduced in 2008–2009 with exclusive funding from the national budget, and subsequently from 2010 through 2012 with support from the African Development Bank in addition to government funds. So far, the government does not have an exit strategy for the fertilizer support program. Subsidized fertilizers account for approximately 17 percent of all fertilizer products consumed in Burkina Faso. While the availability of chemical fertilizers has been enhanced, these measures will have an undesirable impact on new organic fertilizer businesses which have to compete with the subsidized market prices of chemical fertilizer. Similar incentives may be required to be put in place to enable new ‘Resource Recovery and Reuse’ businesses producing pelletized fecal sludge-based compost, for example, to penetrate the fertilizer market.

## Business model

The ECOSAN-EU project's main goal was to facilitate access to sustainable, safe and affordable sanitation systems for the residents of Ouagadougou, support 1,000 households in obtaining appropriate and affordable closed-loop sanitation systems, provision of sanitation infrastructure (toilets) and waste collection services and contribute to food security via the conversion of human excreta into organic fertilizers for supply to local farmers (Figure 199). A notable aspect of this initiative has been the transfer of ownership to the municipality and the engagement of local community-based organizations. Although the initiative runs today as reduced level, the implementation of the initiative till this step was a success on its own. In that regard, the business model is to be viewed from the perspective of the CBO that operates, manages and owns the business entity. There are several factors that have driven

FIGURE 199. ECOSAN-EU'S BUSINESS MODEL CANVAS

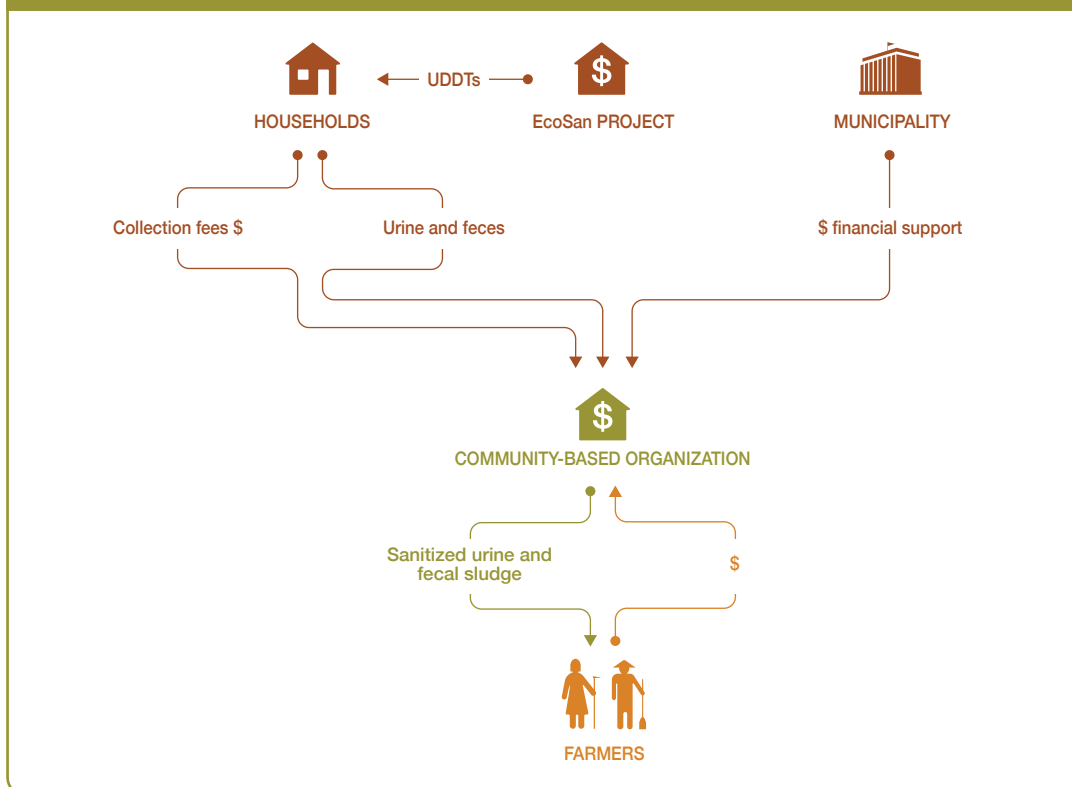


the sustainability of this initiative: a) key partnerships for financial support at the start-up stage; and b) portfolio diversification/multiple revenue streams to mitigate fluctuations in market demand of certain products and/or services (waste collection services and sale of organic fertilizers). Financial support from the municipality in the form of price subsidies on UDDTs incentivized the rapid adoption by households. This has a direct implication for the production side of the organic fertilizer products as the use of UDDTs represents easy access and availability to high quality waste inputs. With a business model that cuts across the entire sanitation value chain and also links in with the agricultural sector, the benefits from this initiative are multi-fold. The value proposition of increased access to safe and affordable sanitation systems translates into improved health of society, especially for low-income urban households in slum areas which are typically characterized by limited to no access to sanitation infrastructure and services. This notion can be extended through the second value proposition of provision of waste collection services. It is important to note that the CBOs are not directly engaged in the sale of UDDTs but the project provided subsidies to households for the construction which was done by local masons who in turn were contracted by ONEA. Benefits to the agricultural sector from the availability of organic fertilizers are noteworthy especially given the agro-ecological conditions (i.e. droughts, poor soil fertility) in Burkina Faso. Additionally, access to affordable agricultural inputs is crucial as most urban and peri-urban farmers are budget-constrained.

### Value chain and position

Figure 200 below provides an overview of the value chain for a community-based organization in each urban sector. The CBO provides waste collection services to households for which it has total market control as the municipality gives them sole responsibility for this activity and thus faces no competition for provision of this service or access to the waste as an input. The CBOs in all the four sectors however noted experiencing low levels of waste supply. This has been attributed to a significant decrease (41%) in the number of households using UDDTs from 2009 to 2014 and also the supply of excreta from each household being extremely low. Only 16% of urine and 25% of feces of the expected quantity from each household was collected. Broken and non-functioning UDDTs due to rains and inundations and misinformation about collection fees led to discontinued use by households. This suggests the need for CBOs to invest in and provide repair and maintenance services for the household toilets or at the least partner with an entity to provide such services as this component of their business has significant implications for their entire business value chain. Other possible reasons include other toilet alternatives, overestimation of expected volume of excreta and open-dumping by households if collection services were irregular. Despite the fact that approximately only 1.6% of households in the four sectors were connected to the project system, the demand for the fertilizer products is fairly low as not all the produced fertilizer (both sanitized urine and feces) had been sold. The CBOs currently face stiff competition from subsidized chemical fertilizer and other factors related to stigma of using excreta-based fertilizers, strong smell of urine, transportation challenges and additional labor costs due to bulkiness of urine and feces. The businesses subsequently have rebranded their products with labelling to dispel the negative perceptions of waste-based products. Sanitized urine is sold in green 20L cans labelled “birg-koom”, which means liquid fertilizer; and sanitized dried feces are sold in bags labelled “birg-koenga” which means solid fertilizer. Field demonstrations have also been key to show the efficiency and use of the fertilizer products and this has significantly increased demand especially for the dried feces in the past year. The main clientele are farmers and nurseries, with a few large-scale buyers – plantation owners from outside Ouagadougou. From 2009–2012, 21 tons of dried feces (424 bags of 50 kg) were sold, which represents 48% of the total quantity collected. The CBOs continue to face challenges with the sale of urine – which amounted to 11,188 20L jerry cans, which represents 74% of the total quantity collected. Additional awareness programs are being planned.

FIGURE 200. ECOSAN-EU'S VALUE CHAIN

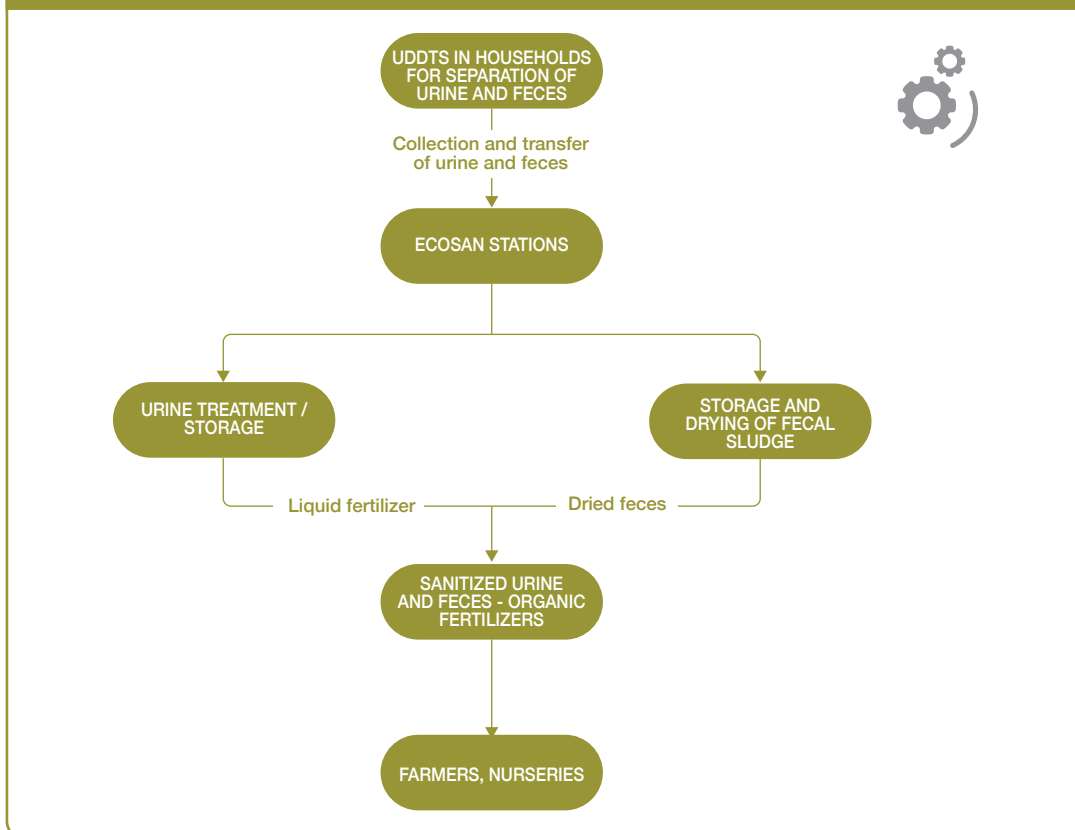


### Institutional environment

The management of waste in Burkina Faso in general is dealt with under several laws and regulations. As with the CBOs, in order to legally engage in any waste management activities, a clearance must be provided by the municipality. The sole assignment of the CBOs to excreta management in the different sectors by the municipality has enabled the CBOs to ward off any competition for the provision of waste collection services but also access to the waste input. The municipality additionally provides financial support to the CBOs by paying the salaries of all staff for the four associations. Approximately, CFA 7 million (USD 14,735 – using 2014 conversion rates) is set aside annually in the municipal budget for the system.

### Technology and processes

The process of production of the sanitized urine and feces is very simple and involves a low-level technology (Figure 201). There were originally three types of UDDTs used for the collection and separation of feces and urine at the household level: double-vault toilets, single-vault toilets and box toilets. Households are advised to add ash after each defecation to enhance pathogen die-off and drying. In the double vault toilet, the vaults are used in alternation and the full vault is kept closed for at least 6 months to sanitize the excreta. The vaults are then emptied by the collection service workers and brought to an eco-station for further drying and storage of at least two months before final packaging and sale. The sanitization of urine occurs once transferred to the eco-stations via storage in closed 1m<sup>3</sup> plastic tanks for at least one month. Feces from single vault and box UDDTs were directly collected in lined containers (using rice-bags). After the trial period, it was however

**FIGURE 201. PROCESS DIAGRAM FOR PRODUCTION OF ECONSAN-EU'S SANITIZED URINE AND DRIED FECAL SLUDGE**

decided that the construction of single vault/ box versions would cease due to the higher collection rates needed and challenges associated with providing adequate lining for the containers. During the period of 2006–2009, more than 300,000 litres of urine and 44,000 kg of feces in total were collected from the four sectors. This amounts to 27 20L jerry cans of urine and 80 kg of feces per household, which suggests that there are many households who are currently not using the UDDTs on a regular basis. The associations stated that collection services to households are provided on a weekly basis although cases of limited use were attributed to irregular provision of collection services and the malfunctioning of UDDTs. While this technology is simple and cost-effective for the CBO – in regards to easy access to waste inputs and income generation from waste collection, it is imperative that the CBOs pay particular attention to efficiently providing consistent collection and maintenance services.

### Funding and financial outlook

Initial capital cost for the project was provided by the following institutions in the amounts of: EU = EUR1.11 million (USD 1,534,908), CREPA = EUR207,120 (USD 286,405.54) and GIZ = EUR180,000 (USD 248,904). The involvement of households in the construction process of the toilets via the provision of building materials and assistance for the construction workers significantly reduced the start-up costs. Since 2010, when the municipality took over the management role of this initiative, it invests USD 14,735 yearly in the four sector associations which cover the staff salaries for all associations.



The support the associations receive varies from USD 157.64–324.96 per month depending on size of each sector and quantity of UDDTs. Based on the information of the associations, this means a subsidy of USD 1.78 (CFA850) per household per month. There were two CBOs appointed per urban sector, and these form one association in each of the sectors to reduce management costs. The associations are trained and involved in project management and operation, which includes collection, transport, treatment, management, delivery. The expenditure of an association consists primarily of salaries, maintenance work at the eco-stations, transport and communication expenses and this amount varies from USD 277–304 per month. The monthly income for each association consists of a fixed sum of about USD 415 for associations in sectors 17 and 30, and USD 318 for associations in sectors 19 and 27. This fixed amount was taken over in 2010 by the Ouagadougou municipality after the EU project was completed. The variable income for the associations include monthly collection fees of USD 0.69 per UDDT (dependent on households that are able to pay), income from selling the EcoSan fertilizers (sanitized urine sold at USD 0.21 for 20-litre jerry can or USD 10.37/m<sup>3</sup>, and sanitized feces at USD 5.34 for a 50kg bag). The total income received from all sectors from sales and collection fee, is about USD 451 (CFA214,400) per month and this goes toward maintenance of equipment. The income stream from current sales of sanitized urine and feces is fairly low compared to the revenue from waste collection fees at a ratio of about 70/30. The generated revenue only constitutes about 24–43% of the total revenue for the associations, with the rest been subsidies from the municipality. The associations could potentially become independent with increased demand and sales of organic fertilizers from increased product awareness, branding and product differentiation, to name a few.

### Socio-economic, health and environmental impact

This initiative has had noteworthy impacts on the communities in Ouagadougou. With a business model that cuts across the entire sanitation value chain, this initiative has created jobs especially for low-income persons who would otherwise be unemployed. Additionally, smallholder farmers who are typically budget-constrained have access to comparably cheaper fertilizer alternatives. The introduction and incentives put in place to facilitate household adoption of UDDTs have significantly improved the health and hygiene of households with installed UDDTs. Communities have also noted a reduction in air pollution and flies from reduced open dumping of human excreta. In total, approximately 224,000 litres of urine were sold from 2009–2012 for all four sectors, which represent 74% of the collected urine, and 21 tons of sanitized feces sold, representing 48% of the collected feces. Another advantage from the adoption of UDDTs by households is that the monthly collection service is cheaper than having a one-off pit emptying service and the lower risk of inundation of the latter toilet types compare to the former. Households, however, tend to empty jerry cans filled with urine into street gutters and the environment if collection services are irregular. Additionally, environmental pollution could also potentially occur at the eco-stations from leakages of aging 1m<sup>3</sup> urine tanks or from flooding of fecal storage vaults during extreme rains, which happened in 2009.

### Scalability and replicability considerations

The key drivers for the success of this initiative are:

- Strong partnerships for provision of start-up and working capital.
- Diversified portfolio – which mitigates risk associated with fluctuations in market demand for any one product or service.
- Assured supply of waste input at limited operational cost.

This initiative has a good potential for replication especially in low-income developing towns and cities with well developed urban and peri-urban market farming able to absorb the recovered resources. The strategy of close cooperation with communal authorities, community based organisations in peri-urban areas, and the local private sector was adopted throughout the project and this brought positive



results with a high degree of engagement from all stakeholders involved. This focus has helped to increase the capacities of actors to engage in a programme of sustainable sanitation systems aiming at ensuring that activities will be integrated into ongoing work when the initial project ended – an important strategy for any plans for out-scaling. Monitoring activities throughout the project phase were an integral part of the project cycle. This allowed improving the design, mitigating construction errors, ensuring that the households maintained their new toilet facilities properly, and to encourage safe reuse practices. The study was carried out for 2.5 years after which the municipality took over. Results indicate that the number of toilets had decreased from 938 in 2009 to 551 in 2012. The drastic decrease is due to reasons such as abandonment of toilets that were broken and not functioning, destroyed latrines by rains and inundations and households not using or removing toilets as a result of misinformation about waste collection fees. This suggests the need for CBOs to invest in and provide repair and maintenance services for the infrastructure (toilets) or at the least partner with an entity to provide such services as this component of their business has significant implications for their entire business value chain. The present farming activities in the city can absorb the excreta from approximately 50,000 people, compared to 1.5 million inhabitants in Ouagadougou. Both land and water resources may limit urban agricultural expansion. Therefore, any up-scaling of reuse of sanitation products has to connect with the hinterland of the city, and in the case of Ouagadougou, applied in rain-fed farming. This requires the use of new technologies to add-value to urine and feces such as pelletized fecal sludge-based compost, which will allow businesses to increase demand by accessing new markets beyond the city limits. Product differentiation will: 1) increase the competitiveness of the products; and 2) eliminate the transportation challenges and additional labor costs associated with the bulkiness of urine and feces.

### Summary assessment – SWOT analysis

Figure 202 presents an overview of the SWOT analysis for the EcoSan system in Ouagadougou. This initiative has been particularly successful in leveraging strategic partnerships to mitigate capital investment risk. The strategy of close cooperation with communal authorities, community-based organizations and the local private sector resulted in positive results with a high degree of engagement from all stakeholders involved, facilitating the transition phase from a project to a 'business'. The implementation of a multiple revenue stream strategy has been crucial in sustaining the viability of the initiative as it is noted that income generation from the sale of organic fertilizer products contributes only 30% of the overall revenue generated. One of the key weaknesses of this initiative is that it is highly subsidized, with municipal support covering 65–75% of the associations' income. The present system is not working in an optimal and efficient way, and it is clear that a subsidy that was close to CFA 10,000 per household per year would not be sustainable in the case of up scaling. In 2001 there were 154,000 households in Ouagadougou (SUSANA, 2012), which most likely is around 200,000 households today. Such a subsidy per household city wide would amount to approximately CFA 2 billion (equivalent to about Euro 3 million) per year for the municipality. There is an apparent gap in the business' value chain of activities – that is, a lack of provision of maintenance services for UDDTs and irregular waste collection services. This is negatively affecting the supply of waste inputs and directly affects profit levels. This represents an opportunity for the CBOs to invest in and provide repair and maintenance services for the UDDTs or at the least partner with an entity to provide such services as this component of their business has significant implications for their entire business value chain. The EcoSan system is also facing stiff competition from chemical fertilizers which are easily accessible and are now subsidized in Burkina Faso. Thus the sale of organic fertilizers will be difficult as long as chemical fertilizers are reasonably affordable. In the long run however, it is likely that chemical fertilizers will become more expensive as energy prices increase and resources become scarcer. On the other hand, these challenges present opportunities for the business to reinvent its product innovation and marketing strategy. Adoption of new technologies to add-value to feces such

as pelletized fecal sludge-based compost will increase the business' access to new markets beyond the city limits – reducing transportation challenges and additional labor costs due to bulkiness of feces, while supporting higher market prices for its products. Additionally, extending its business value chain to include provision of repair and maintenance services would be a new revenue source but also increase the number of households to which waste collection services can be provided and the amount of waste actually collected. This represents additional income and ensures an incremental quantity in the waste input available. The new EcoSan system in Ouagadougou is by no means ideal, but it has taken some innovative steps to go to scale in urban waste and nutrient management. Public funding is needed for investments in and control of the system and to a certain extent for running costs, at least in the short term. It is always difficult to mobilize scarce public funds but if the gain in health and environmental protection can be evaluated in addition to agricultural benefits, it can prove to be an economically sound public investment. Additionally, several opportunities exist for this initiative to become financially self-sufficient.

**FIGURE 202. SWOT ANALYSIS FOR ECOSAN-EU**

	HELPFUL TO ACHIEVING THE OBJECTIVES	HARMFUL TO ACHIEVING THE OBJECTIVES
INTERNAL ORIGIN ATTRIBUTES OF THE ENTERPRISE	<b>STRENGTHS</b> <ul style="list-style-type: none"> <li>Assured access and supply of waste input</li> <li>Strong partnerships and community involvement</li> <li>Diversified portfolio – multiple revenue streams</li> <li>Simple technology</li> </ul>	<b>WEAKNESSES</b> <ul style="list-style-type: none"> <li>High subsidy dependency limits upscaling</li> <li>Limited market demand for fertilizer products within a profitable distance as long as the products are bulky</li> <li>Challenges with availability of waste input as households can release collected urine elsewhere (street drain, etc.)</li> <li>Dis-adoption of UDDTs</li> <li>No UDDT maintenance service provided, which is a need of the market</li> </ul>
EXTERNAL ORIGIN ATTRIBUTES OF THE ENVIRONMENT	<b>OPPORTUNITIES</b> <ul style="list-style-type: none"> <li>Product innovation through value-addition of urine and dried fecal sludge into struvite and fortified and pelletized fecal sludge</li> <li>New business arm – repair and maintenance of UDDTs, creates additional revenues and fortifies other business arm</li> </ul>	<b>THREATS</b> <ul style="list-style-type: none"> <li>Stiff competition from chemical fertilizer products</li> <li>Budget insecurity at city level</li> </ul>

#### **Update of the Ecosan system in Ouagadougou (Oct. 2017):**

The international NGO Action Contre la Faim (ACF) coordinated a follow-up EU-funded project 2013–2016 in Ouagadougou to improve sanitation and hygiene in peri-urban sectors of the city. Part of the efforts included support to two of the existing CBOs involved in the EU EcoSan project. The

CBOs received help to develop business plans in addition to receiving improved equipment such as motorized tricycles for waste collection. Demonstration gardens were developed next to the eco-stations, enabling a supplementary source of income. The project subsidized 403 new urine diverting toilets (mainly constructed in 2016) and rehabilitated 37 old ones. During 2013–2016, the two supported CBOs sold 35m<sup>3</sup> of urine (43% of collected) and 17.5 tons of feces (86% of collected), which can be compared to the period 2009–2012 when 145m<sup>3</sup> urine was sold (82% of collected) and 12 tons of feces (60% of collected) in the same two sectors.

Challenges to sustain the operations remained, especially since the municipal subsidy for the CBOs was removed in 2013 during a turbulent period in the local administration while also households willingness to pay for collection decreased. Apart from variable demand of the fertilizer products, transport distances for input collection and product delivery is the main cost factor. To reduce costs, collection is today only 'on demand'. Technical innovations to transform urine, reducing volume and odor in a cost efficient way, will be necessary to sustain the business and enable further scaling in view of fertilizer demand and transport costs.

### Contributors

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*Case descriptions are based on primary and secondary data provided by case operators, insiders or other stakeholders, and reflect our best knowledge at the time of the assessments in 2014 and 2017. As business operations are dynamic data can be subject to change.*

### Note

- 1 It is important to note that GIZ only funded the start-up of the initiative and does not have a continuous role in the business model. This is also applicable to the case of WSA (Water and Sanitation for Africa) and the EU (European Union).
- 2 [www.iwmi.cgiar.org/tag/fortifier/](http://www.iwmi.cgiar.org/tag/fortifier/) (accessed 18 January 2018).