Case study

Freetown Waste Transformers

A study of private sector innovation in the waste management sector in Africa

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Key messages

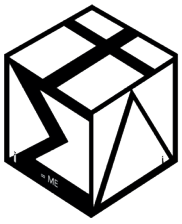
Waste-to-energy is not a common waste management strategy in Africa; however, there are interesting small-scale models from which to learn. Freetown Waste Transformers (FWT) has been able to invest in anaerobic biodigesters, reducing waste going to landfills, while creating biogas that can be used to supplement an unreliable power grid, in addition to creating fertiliser for agricultural use.

An important innovation has been the DortiBox App, which has enabled the company to secure a reliable supply of organic waste and provided significant wider benefits to the city's waste management system.

The environment created by Freetown City Council, which has set up microenterprises to provide door-to-door waste collection services throughout the city, including in hard-to-reach areas, has played a critical role in enabling FWT to develop and execute its business model.

Although waste management is of critical importance for African cities, it is underfunded; innovative financing solutions are required to progress the sector. Blended finance can help fill key gaps in funding waste management solutions by using concessional finance to de-risk credible projects and leverage private finance for sustainable growth.

As the success of FWT in leveraging private finance shows, cooperation between private and the public sectors, along with productive partnerships, are necessary and can help deliver effective waste management solutions in cities across Africa.



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About this publication

This case study has been jointly produced by authors at ODI and ARK Group International Ltd (ARK). ARK is a global support network that works with impactful small growing businesses (SGBs) across Africa to access catalytic grant funding and private finance for sustainable growth. This case study has been prepared as part of the Africa–Europe Mayors' Dialogue platform. This platform is coordinated by ODI and brings together more than 20 cities across Africa and Europe to work on shared challenges related to sustainable urban development.

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Acronyms

CEO	Chief Executive Officer
CFM	Climate Fund Managers
EU	European Union
FCC	Freetown City Council
FWT	Freetown Waste Transformers
IOM	International Organization for Migration
kWh	kilowatt hour
MoU	memorandum of understanding
RBF	results-based financing
SGBs	small growing businesses
TWT	The Waste Transformers
WCMA	Waste Collection Management Association
WtE	waste-to-energy (schemes/initiatives)

1 Introduction

Waste management is of critical importance in Africa for reasons related to public health, human dignity, climate resilience and environmental preservation. Cost-effective and contextually appropriate approaches to waste management are imperative. There is experimentation and innovation in many African cities, particularly with waste collection and recycling systems, which offer scope for learning and knowledge exchange in this area. The job creation potential across the entire waste management cycle is impressive. There is a real opportunity to scale up and support inclusive employment and entrepreneurship in urban areas across Africa, if city administrations have adequate financing and productive partnerships (Kumar et al., 2022). Many city administrations are working on creating partnerships with private companies for waste management, particularly to advance recycling and waste-to-energy programmes. This shift to a partnership model is often driven by city administrations' budget limitations; however, it is also based on a vision of the city's waste as an economic resource. This opens doors for innovative public–private partnerships and models, such as the experiences documented in this case study.

At ODI, we have already conducted primary research working with the city authorities in Freetown, Sierra Leone and Kanifing, The Gambia, and we have profiled the innovative waste management approaches of these two cities (ibid.). This case study is a follow-up to that research and aims to look more closely at the approaches and innovations of private sector waste management companies, including in relation to their access to finance. It looks particularly at Freetown Waste Transformers (FWT), chosen because of its pioneering role as a waste-to-energy company in Freetown and its successful experiences leveraging both public and private investment. Readers should note this study is not an independent evaluation, nor a formal assessment of the business. We simply aim to tell the story of the business in context, and particularly to share the experience of practitioners who have worked closely with the business to help it access the finance needed to grow. Through profiling FWT (and with a focus on its innovative DortiBox digital application), we hope to share the lessons learned with other waste management companies and with city administrations that seek to create an enabling environment for companies operating in the waste sector. This research has been carried out in partnership with ARK Group International, a global support network that works with impactful small growing businesses (SGBs) across Africa to access catalytic grant funding and private finance for sustainable growth.

This case study has been informed by a series of interviews with key stakeholders. These include employees of FWT, a representative from Freetown City Council (FCC), the head of one of the waste enterprises that works with FWT, the head of MeDomot, a software development firm, and GSMA Innovation Fund, a grant provider investing in innovative solutions with a positive socioeconomic and environmental impact in low- and middle-income countries. We have summarised key findings from these discussions throughout the paper. We have also drawn heavily on ODI's previous report on waste management in Africa to inform the wider context of

this study (ibid.). Section 2 presents a brief introduction to the context of waste management in African cities. Section 3 then provides an overview of the work of FWT, explaining how the business was established and laying out its key achievements and innovations. Section 4 looks particularly at the business finance side and explores how FWT has leveraged public and private investment to support the growth of the business. Finally, Section 5 presents some conclusions and lessons learned.

2 Waste management in African cities

High-income countries are responsible for the largest generation of waste per capita, but sub-Saharan Africa is the world's fastest-growing region in this regard with its total waste generation expected to triple by 2050 (Kaza et al., 2018). This increase is being driven largely by the growth in consumption and changing trends in production and consumption that have accompanied rapid urbanisation (UNEP, 2018). Waste collection services are significantly less comprehensive in Africa than in other regions. While collection rates are higher in North Africa, in sub-Saharan Africa only 44% of waste is collected; this can be compared with an estimated collection rate of 71% in East Asia and the Pacific and 84% in Latin America and the Caribbean (Kaza et al., 2018).

Waste management is of critical importance in Africa for reasons related to public health, human dignity, climate resilience and environmental preservation. However, delivering waste management services requires adequate funding; this has generally been lacking in a context where waste generation exceeds the development of waste management infrastructure in most cities (UNEP, 2018). The treatment of collected waste also varies and, despite the growing importance of recycling, composting, and waste-to-energy (WtE) schemes, many African cities still largely follow a traditional waste management approach focused on collection and disposal (Ikhlayel and Nguyen, 2017; Kaza et al., 2018). Formal recycling systems are, therefore, not commonplace and in many locations, informal workers undertake most of the separation and recycling (van Niekerk and Weghmann, 2019). As such, the waste that municipalities collect is often dumped without treatment or separation.

Many African cities are prioritising the expansion of household waste collection and investing more in recycling and composting or exploring WtE options. In particular, the high percentage of organic waste among the waste generated in African cities is notable, as is common in low- and lower middle-income countries (Kaza et al., 2018; van Niekerk and Weghmann, 2019). These high levels of organic waste create much greater opportunities for composting initiatives than is the case in high-income countries. WtE initiatives in Africa are relatively rare, since the technology is complex; however, small-scale anaerobic digesters are now being explored more by municipalities (Mutz et al., 2017; UNEP, 2018). These digesters require a consistent supply of properly separated organic waste, which presents its own challenges. Some regard WtE schemes with caution, given that they can discourage reduction and recycling strategies (Gaia, 2021). They can also directly affect the livelihoods of informal waste pickers and informal recyclers if WtE companies are competing for access to waste (Kaza and Bhada-Tata, 2018). However, for Freetown in Sierra Leone, it has been suggested that the city would greatly benefit from WtE initiatives, given its low level of access to grid electricity and because it would reduce waste going to overburdened dump sites (with knock-on effects in terms of reducing harmful emissions) (Ngegba and Bertin, 2020).

There is significant potential in Africa to extend the informal strategies already in place to deliver more effective waste management strategies on a larger scale. The sector offers opportunities for

job creation across all aspects of the waste management cycle, particularly collection, recycling and treatment initiatives (Bundhoo, 2018). African cities are experimenting with their own models to work with informal waste pickers, cooperatives and community-based organisations to deliver waste management services. These models create opportunities for the design of inclusive strategies within the sector. This is often a key aspect of cities' strategies; however, there are still significant opportunities to expand action in this area (Kumar et al., 2022).

While waste collection is a relatively straightforward, non-technical task, the treatment and disposal of waste is a more challenging area. Effective waste management systems are often the direct responsibility of local governments, but many cities have struggled to implement them. Lack of national investment, insufficient delegation of powers and constrained municipal budgets present large limitations; cities often find themselves with inadequate financing for the often sizeable investments required. It is estimated that in low-income countries, waste management takes up almost 20% of municipal budgets, compared with around 10% in middle-income countries and only 4% in high-income countries (Kaza et al., 2018). In some African cities, the rate is significantly higher than 20% and, for many, solid waste management can be the single largest item of the municipal budget (UNEP, 2018).

An overall lack of funding – both limited municipal revenues and low revenue generation from waste management fees – has major implications. Countries in sub-Saharan Africa often rely on donor funding to build sanitary landfills, which means that – despite sanitary landfills being a basic necessity for effective waste management – they are still relatively rare (Chisholm et al., 2021). The lack of funding also often results in a lack of vehicles for collection, difficulties in providing receptacles for households to separate and store waste for collection, and an inability to invest in appropriate recycling and treatment systems at scale. This is one of the key reasons for caution around seeking to replicate the more expensive waste management models of higher-income countries; financial (as well as capacity) constraints mean contextually appropriate solutions are encouraged (World Bank, 2018).

Revenue can be generated from waste management services, not only from fees for collecting waste, but also from recycling and WtE initiatives. Ideally, the revenue generated from waste management would cover the costs of operating the service. However, while full cost recovery is common in high-income countries, this is far from the case in low-income countries (Kaza et al., 2018). African cities certainly generate some revenue from fees, but few make sufficient income to cover all the costs associated with the full solid waste management cycle (that is, from waste collection through treatment to disposal) (Jones et al., 2014; UNEP, 2018). At the same time, care needs to be taken when setting fees, as low-income households can easily be excluded from collection if fees are set too high (Jones et al., 2014; Kumar et al., 2022).

Securing private finance for the waste management sector is also a difficult area for cities. The sector is considered a high-risk investment in Africa (UNEP, 2018). However, some cities are exploring feasibility and preparing projects that can attract investment in the sector. The limited

funds available for waste management have led many cities in Africa to contract out services to private operators, who then collect fees directly from households and businesses. This has generally translated into the provision of services in richer neighbourhoods to the neglect of low-income areas, with numerous privatisation failures documented in cities in Egypt, as well as Dar es Salaam, Tanzania, and Lagos, Nigeria (van Niekerk and Weghmann, 2019). Low levels of waste collection in poorer areas are then associated with high levels of open dumping and burning of waste, which has severe environmental and health impacts, including increasing the incidence of air pollution and respiratory diseases (ibid.).

Many cities are seeking new forms of private sector partnership, particularly to advance composting, recycling and WtE initiatives (Kumar et al., 2022). This strategy aims to reduce both the burden on the city's waste management system (and budget) by reducing waste in landfills and to leverage private finance for investment in an area where the city's resources are constrained. It is important for cities to ensure that robust criteria are applied to all private sector partners so that these partnerships provide wide social and economic benefits and protect informal workers' livelihoods. Private sector companies operating in this space (often small and medium-sized enterprises) also need support, particularly to access finance to build their businesses and put in place more efficient service provision in this area.

3 Freetown Waste Transformers

An introduction to the business

Freetown Waste Transformers (FWT) was founded in 2019 by Aminata Dumbuya-Jarr, who had co-founded one of the first waste management companies in Freetown, where she also led as National Project Manager from 2011 to 2019. There she was able to contribute immensely to shaping and influencing policy and the strategic direction for the waste management sector in the city. However, in 2019, she divested from that business and partnered with a Dutch company, The Waste Transformers (TWT), which has developed its own proprietary anaerobic digesters to produce biogas from food waste. Biogas can be turned into electricity for local consumption and leftover waste can be transformed into organic nutrient fertiliser. In founding FWT, Dumbuya-Jarr's vision was to add value to organic waste streams and to strengthen the capacity of the waste management sector in Sierra Leone.

FWT is a limited liability company, made up of an advisory board and a management team, which includes eight employees: the CEO, project manager and other personnel in charge of finance, operations, IT, communications and human resources, as well as supporting graduate students through an internship programme. Central to the business's structure is a tripartite memorandum of understanding (MoU) set up between FWT, Freetown City Council (FCC) and the Waste Collection Management Association (WCMA) in the city.

At the time of writing this case study, FWT was in the process of setting up five new waste-to-value digesters, named 'waste transformers', and also upgrading the existing pilot digester that the business already has running at a women's clinic in the city. In addition, the company is also part of the Energica Consortium, which is a European Union (EU)-funded project, 'Green Deal for Africa', where Sierra Leone is a demonstration site to showcase another biodigester as a prototype for frugal innovations in waste management. FWT is the local implemention partner in this consortium. The biodigesters are delivered and operated in 20-foot shipping containers. They are modular anaerobic digesters that produce biogas from organic waste, which is then turned into electricity (energy) for consumption. The remains of the anaerobic process can also be turned into nutrient-rich liquid fertiliser. However, this aspect is still under testing before it can be certified and approved for sale.

FWT's pilot biodigester is located at Aberdeen Women's Center. This first installation was co-funded by FWT's CEO and the Technology Partner to prove the concept. The centre was selected due to its heavy reliance on diesel-powered generators. The high cost of diesel meant that unsustainable amounts of the centre's funds were used to power the clinic (White and Punjani, 2022).[1] As a result of the biodigester, overhead costs have been reduced (ibid.). There are also plans to upgrade

1 However, if diesel costs were to come down significantly, this would not necessarily impact FWT's business model. Most of FWT's off-takers (the entities that buy the electricity) are primarily interested in reducing their carbon emissions and having a positive environmental impact. Therefore, cost savings are often secondary to buyers' overall interest in this technology.

the current pilot biodigester, which FWT hopes will reduce the fuel costs by at least 25% (ibid.). Another key benefit of the biodigester is that it provides back-up power, which is essential given the main electricity grid is unreliable. This pilot biodigester converts 300–600kg of organic waste per day. Currently, the waste being fed to the digester is sourced from the Aberdeen Women's Center itself and the nearby Radisson Blu Hotel by FWT's site operator. At the time of writing, this was done at no cost; however FWT will charge a waste take-off cost when upgrades to the installation are made, and the operation becomes fully commercial.

FWT, along with its partner TWT, have developed a project 'Turning Waste into Opportunity for Sierra Leone', the longer-term aim of which is to install 40 small-scale anaerobic digesters across Freetown and its surroundings. These will divert close to 100 tonnes of organic waste away from the landfill and produce roughly two megawatts of electricity. The project has received development funding from Climate Fund Managers (as discussed in Section 4). The CFM development finance will fund the placement of an initial four new units and upgrade the existing unit placed at the Aberdeen Women's Center.

The fifth new installation is not for commercial use and was purchased by the UN Office for Project Services with Japanese Government funding on behalf of the Freetown City Council for its 'Resilience Building for Disaster Affected Communities in Freetown' project. The system has been installed in Susan's Bay, one of Freetown's largest informal settlements. Freetown City Council has a contractual agreement with FWT to manage this biodigester. The installation was procured directly from TWT, but FWT is responsible for operations and maintenance for an initial period of one year – with a view to this arrangement being extended. At the time of writing, the council was in discussions around how to finance the project in its second year and in relation to a future operations and maintenance agreement. One hundred percent of the byproducts from this installation will supply energy for the local toilet facilities, market and community in the Susan's Bay area.

In total, six operational anaerobic digester units will be placed across Freetown with the potential to process nearly 12 tonnes of organic waste per day into much-needed electricity, thermal heat and nutrient-rich liquid fertiliser. This will also increase the revenue generation capacity of waste collectors.

Working with waste collection enterprises

Once all the biodigesters are up and running, it is estimated that 12,000kg of organic waste per day will be required for all six biodigesters being placed during the development phase of the project.[2]

2 This can be put in context of the daily waste generated in the city. Of the 550 tonnes generated per day, only 180 tonnes go to landfill, while it is estimated that around 120 tonnes collected is organic waste (Kumar et al., 2022). FWT needs 12 tonnes a day from this. This is, therefore, 10% of the organic waste that goes daily to the city's landfill sites.

It is essential that FWT can access a consistent stream of organic waste to fuel the biodigesters. To secure this waste stream, FWT has partnered with the Waste Collection Management Association (WCMA).

WCMA's role is to provide the sorted organic waste necessary for the biodigesters to operate. WCMA is an association of waste collection microenterprises set up by the Freetown City Council to support the municipality in undertaking commercial waste collection activities across the city. The association consists of 135 waste collection enterprises, with each enterprise having around 10–15 individual members. WCMA charges a monthly membership to each registered enterprise (minimum payment per group is 50–100 leones, that is $2.50–5.10). The association is meant to be an industry association for the waste management sector with a clear mandate to build a consensus and support best practices in waste collection, as well as to advocate for the sector. While the association has a large membership, only micro waste collection enterprises operational in the areas where the biodigesters are located will be required to deliver the waste to FWT. However, it is part of FWT's vision to strengthen the overall waste management in Freetown, including those that are not directly delivering waste to the biodigesters.

From April 2022 to May 2023, FWT has engaged all 135 waste collection enterprises within WCMA on different technical capacity-building training workshops on industry-related topics, such as waste conversion processes, waste and technology integration, and waste sorting, which is particularly important because some waste streams have a higher calorific value and produce more energy than other waste streams. A key aim for FWT is to increase the capacity of the association (see Box 1).

Given the number of small enterprises, WCMA does not have capacity to train all the collectors, so for most training workshops it uses a train-the-trainer approach. This involves training the waste collection group heads, who make up around 10% of the general membership, and working by block – with around 130–150 trainees participating in each session.[3] WCMA has also created WhatsApp groups for training. Although training has been conducted, FWT was yet to fully install the five new biodigesters at the time of this study, and the waste collectors had not yet started delivering waste to the biodigesters.

3 For the purpose of waste management, the city of Freetown is divided into eight blocks.

Box 1 A snapshot of capacity-building with WCMA

As part of the capacity-building process, in November 2022 FWT hosted a brainstorming and capacity-building workshop with the executive branch of the Waste Collection Management Association (WCMA) alongside other stakeholders. This helped FWT to better understand the structure of the WCMA and its mandate, allowing it to assess the association's capacity to operate effectively. FWT also used the session to discuss the characteristics and components of industry associations, to determine whether the WCMA was indeed an industry association in its current capacity or if it was operating as a short-term project implementation arm of FCC. The session found that the WCMA lacked the authoritative prominence to serve as an umbrella association for the entire waste management industry. FWT provided a series of recommendations to the WCMA on how to reform and restructure the organisation – for example, by developing an improved governance structure, by-laws and a code of ethics.

In addition to seeking to improve the business model of waste collection enterprises, FWT has safeguards in place in relation to working conditions. All collectors must be over the minimum working age of 18. FWT has also developed a company policy on children and vulnerable people, which all partners – including WCMA – have to agree to adhere to. All waste collection groups must also follow the company's guidelines on occupational health and safety.

Ultimately, the aim is that, through working with FWT, the enterprises will increase their revenue. This is primarily because, in addition to getting paid for collecting waste from households and businesses, they will get additional payment for sorting the waste and providing appropriate waste to FWT at the biodigester sites. The waste collectors will receive $20 per tonne of sorted waste. As noted earlier, once all six biodigesters are operational, FWT will need to procure 12 tonnes per day. This implies procurement in the range of $240 of organic waste per day and $87,600 per year. This revenue will benefit a total of 12 waste collector groups (2 per site), implying an average annual income boost of $7,300 for each waste collector group involved. Linking the payment of the waste collectors to a fixed dollar amount per tonne delivers additional benefits by protecting their income against local inflation and currency devaluation. The process of registering the volumes of waste collected for payment will be automated through the DortiBox App (see more on this below).

Collaboration with Freetown City Council

Freetown City Council (FCC) oversees the provision of waste management services to the city's population, which has doubled in the past 30 years. This expanding population has caused the city to sprawl beyond municipal boundaries, with settlements in the hillside, along the coast and inland. This has led to deforestation and land reclamation, resulting in increased flooding, landslides and exacerbated by more extreme weather conditions. The lack of devolved funding

in Sierra Leone has left FCC struggling to provide effective waste management services. The city is still suffering from the legacy of the civil war, which destroyed waste infrastructure such as skips and skip trucks (Sood, 2004). It has two official dumpsites, Kingtom in the west and Kissy (Granville Brook) in the east, both of which have reached capacity.

A great deal of waste generated in the city never reaches these dumpsites. Solid waste is commonly dumped on the streets and in rivers, blocking drains and increasing flood risk and air pollution. There are reportedly 46 major illegal dumpsites across the city and a major focus of the council's initiatives has been clearing illegal dumpsites and expanding household waste collection services (Kumar et al., 2022). The Sanitation and Environment Department within FCC is responsible for the management of municipal waste; of the 600 staff FCC employs, 100 work on waste management (ibid.). The council directly supervises and manages cleaning and waste collection in public spaces, hiring youth groups to conduct twice-daily street sweeping and removal of waste. The city also has microenterprises to collect waste by tricycle in a flagship initiative to increase the coverage of waste collection services (see Box 2).

Box 2 Tricycle enterprises

FCC launched its Local Microenterprise Development Project in June 2019 to support waste collection. Through this programme, microenterprises, run largely by youth groups (young people over the age of 18), collect household waste using tricycles, which enable easier access to informal settlements. This programme was initially set up with 80 tricycle carts (funded by an EU grant and the International Organization for Migration – IOM). It was later expanded with an additional 40 tricycles (funded by the Mayors Migration Council from February 2021) (MMC, 2022). Under this programme, FCC supports the registration of tricycle groups, provides them with tricycle equipment and trains young people on how to start their own waste collection businesses.

With this preparation, the groups can market themselves to households as a waste collection service, operating twice weekly and collecting fees directly from households that use their services. They charge an average of Le25,000 ($1.90) per household per month (FCC, 2016). This scheme has been very successful, particularly in its contribution to tackling youth unemployment. In total, it has created 1,200 jobs, with 70% of these going to rural migrants living in informal settlements (FCC, 2021). There is also evidence that these jobs are sustainable, with 78 out of the 80 microenterprises registered under the scheme initially having been evaluated as turning a profit (ibid.). In addition, the programme has greatly increased the coverage of household waste collection services. When the initiative was launched, the number of households registered for waste collection in the city was 8,000; this number has now climbed to 35,000 (Kumar et al., 2022).

The relationship between FCC and FWT is critical, as by working together they have managed to improve waste collection services in the city. FWT provides an opportunity for the council to repurpose waste, while FWT gains critical societal buy-in through council support, regulation and assistance. In particular, the work done by FCC in developing the waste management system in the city and supporting the development of microenterprises working in waste collection has created an enabling environment for the work of FWT. FWT is also contributing to the council's Climate Action Plan; the council believes that the biodigesters will rapidly advance the council's climate change agenda by reducing greenhouse gas emissions and the dumping of waste. As the Mayor starts her second term in office, there are plans to install a further 35 biodigesters across the city in cooperation with FWT. The council has also assisted FWT with the storage of fertiliser, while it is in its testing stage, at the FCC-run sludge plant.

The DortiBox App

In 2022, FWT was successfully awarded a competitive grant from the GSMA Innovation Fund (see more discussion of this funding in the next section). The grant was provided to develop a waste collection app to digitise the waste collection system in Freetown. The app is called 'DortiBox' and is now live (DortiBox, n.d.). 'DortiBox' means 'dustbin' in Krio, the main language spoken in Sierra Leone. The app's vision is to fully digitise Freetown's waste collection system to increase its ease and efficiency. The app enables households and businesses to schedule their waste pickups for specific times and days of the week. The geolocational mapping has made waste collection more efficient, as customers no longer have to explain their location over the phone. This results in improved customer experiences and easier means by which waste collectors can locate customers.

While for FWT the app is a means to secure its future supply of waste for the biodigesters, it also provides a much wider and significant public service by improving the functioning of the waste collection system as a whole. As well as the broad public health and environmental benefits, this also aims to increase consumer demand and benefit all the microenterprises that are working in waste collection. DortiBox will also enable waste management companies, municipalities and other stakeholders to make data-driven decisions, improving efficiency and minimising the environmental impact of waste disposal. The platform offers real-time monitoring and reporting, route optimisation, and predictive analytics to enhance waste management operations. In addition to these core features, DortiBox provides valuable insights into waste generation patterns and recycling opportunities. This will empower businesses and local governments to develop targeted waste reduction and recycling programmes, ultimately promoting a 'circular economy', with potential for replication across the continent.

There are two public-facing DortiBox Apps: one for the customers (households or businesses) requesting waste pickup and one for the waste collectors (see Figure 1 and Figure 2 for visual representations). After signing up for the app, there are three options available to the household or business: schedule trash pickup, request trash pickup and view requests. The app user can

select their location from a map of Freetown, select their waste type (plastic, organic, mixed and metals) and waste volume. They are then asked to select a date and can either choose a specific enterprise to pick up their waste or send the request to all collection groups up to two kilometres away from their location. There is also an option to choose a specific day of the week to have waste picked up and to set up a recurring request. After filling in this information, the user is provided with the cost. Both the customer and waste collector versions of the app are available for download. The app for customers has been downloaded more than 502 times, with over 300 active users. Currently, 114 waste collection enterprises are registered and providing services on the app.

Figure 1 The DortiBox App for customers

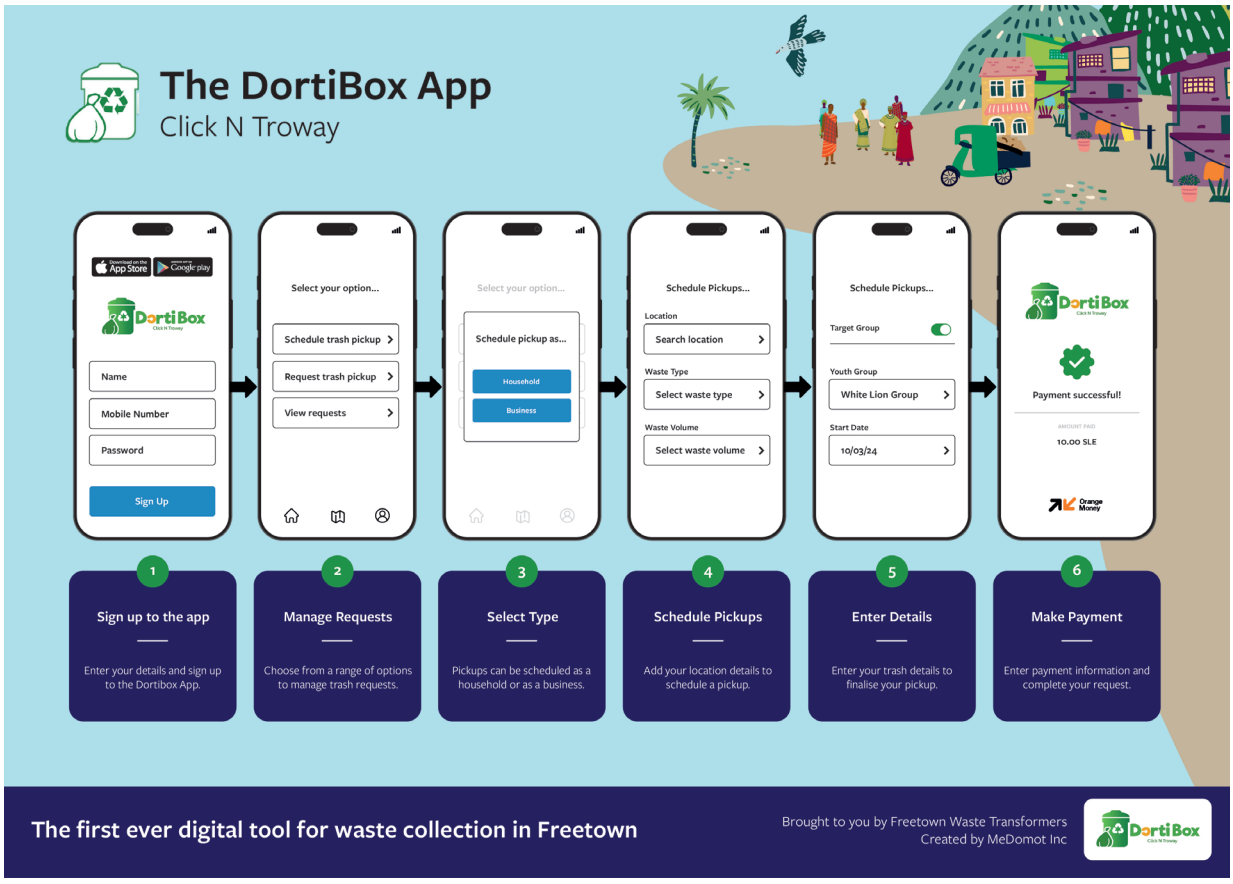
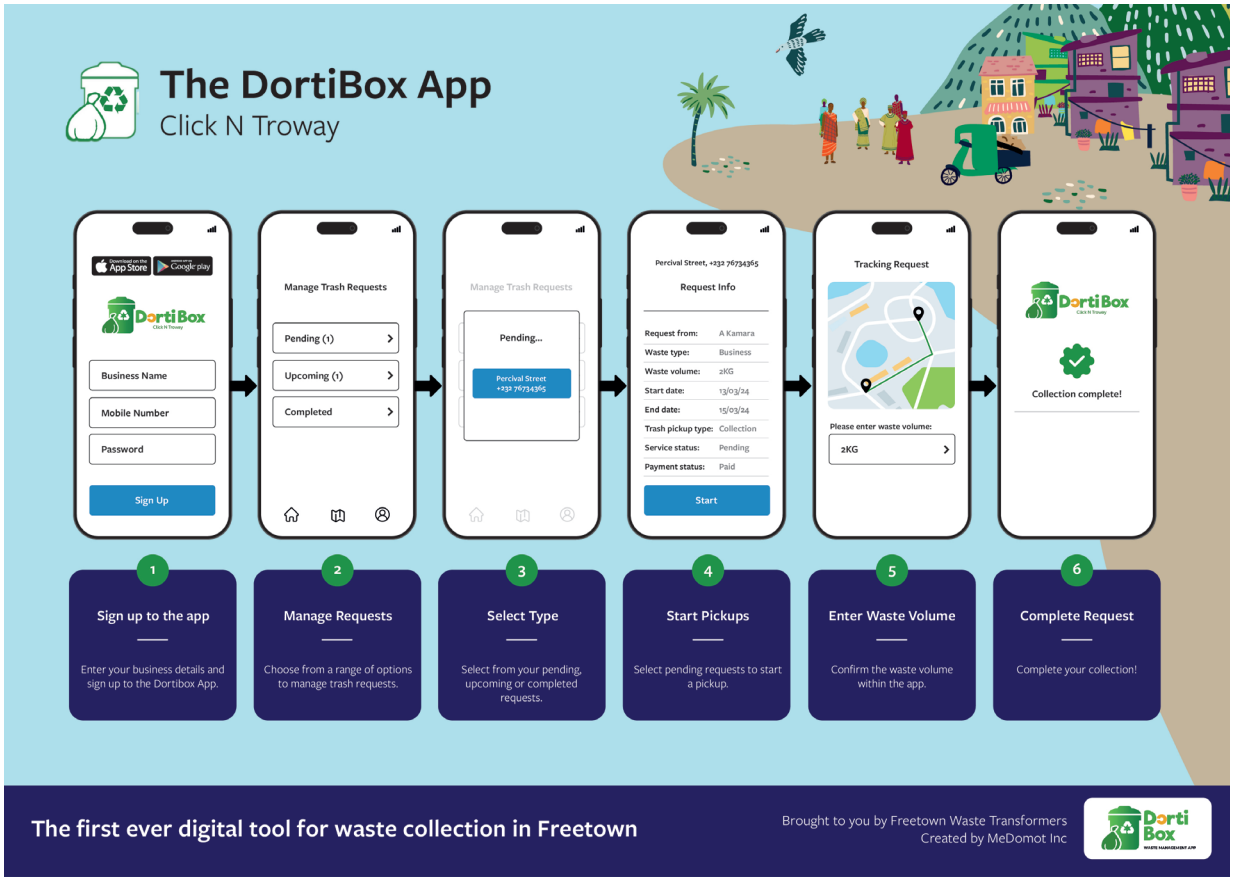


Figure 2 The DortiBox App for waste collection businesses



FWT developed the app in partnership with MeDomot Inc., a Freetown-based software development firm. After signing a contract in April 2022, the app was developed over a four-month period using a participatory process with a series of workshops to inform the development and iterant improvements of the app. FWT, FCC, the WCMA, residents of Freetown and other waste management stakeholders participated in a needs-based assessment workshop, which took place before the development of the app to determine its scope. A team of 11 people at MeDomot worked on the creation of DortiBox, including a product designer, software analyst and software engineers.

After the development of the functional version of the app, a user-testing workshop helped to fine-tune its design. Around four to five waste collection enterprises then piloted the app (see Box 3). Training the waste collectors to use the app was a significant challenge given their low level of familiarity with app-based tools. Waste collectors have been trained via workshops lasting four to six hours and through online tutorials using screen recordings of the app being used with voiceovers. There is also a WhatsApp chat group, which the waste collectors can use to get advice on any problems with the app. Community buy-in is another barrier to the app rollout, for the same reason of unfamiliarity with this type of product. Social media posts, TV ads, paper flyers and campaign boards are being used to promote the app. Waste collectors are also encouraged to tell their customers about it.

Box 3 Piloting the app: Environment Sans Plastic

A small enterprise, Environment Sans Plastic, was selected to pilot the DortiBox App. It was chosen because of its consistent client base and strong participation in FWT-run workshops. Environment Sans Plastic is primarily a solid waste service company with an emphasis on plastic pollution. It tries to raise awareness with customers and communities on the hazards of single-use plastics. Established in 2016 as a non-profit organisation, in November 2019 the head of the organisation, Banor Barrie, won a grant from FCC to set up a waste business. Consequently, Environment Sans Plastic became a profit-making business. The company has two main functions: public space cleaning and waste collection from homes and businesses. The WCMA helped it secure a contract for public space cleaning from the FCC. This enterprise has 10 employees, who are serving an increasing number of clients: in March 2023, they served more than 280 households and around 60–70 businesses. The employees are paid according to their contract and do not work on commission. Six workers are paid in cash because of difficulties they face in mobile money payments due to literacy levels.

FWT has an MoU with Environment Sans Plastic and has provided institutional training to the company on how to manage its finances and workers, and on marketing. The business has welcomed the app, characterising it as being user-friendly and useful to help support its own monitoring. This is because the app records whether waste has been picked up and payment made, so there is no leakage of payments. The geolocational aspect of the app is particularly welcome, as it enables more efficient waste collection and improves customer relations: customers can more easily provide their location rather than trying to give detailed directions over the phone. In addition, the app removes the need for companies to purchase radio or tv adverts.

Waste collection fees paid by the customer through the app sit in FWT's escrow account, which is integrated with the mobile money payment systems. The service fees are then paid out to the service providers (in this case, Environmental Sans Plastic) upon them accepting and rendering services to the customers, with confirmation from the customers upon satisfactory service delivery.

Source: Information provided directly through interview

A final one-day workshop (the user acceptance workshop) was held to receive the last round of feedback for fine-tuning of the app with the involvement of FCC, FWT, WCMA and a cross-section of residents across Freetown. The beta testing version of the app was launched in February 2023, rolling the app out across six communities with 15 waste collection enterprises involved in the exercise. One significant piece of feedback received after piloting the app regarded payment.

Initially the only form of payment on the app was through Orange Cash, an online money service set up by the mobile network operations company Orange SL, which enables individuals to send and receive money online (Orange, 2023). However, many customers struggled to use Orange Cash, so FWT developed an option for cash on pickup, which was added to the app in March 2023. FWT is also developing Afrimoney as another possible mobile money payment option.[4] The app was launched to the general Freetown municipality in May 2023, with 114 waste collection enterprises servicing the municipality via the app.

An additional concern is that waste collectors may not currently have the capacity to meet the demand coming from the app, particularly given the state of tricycle disrepair. FWT's CEO is reaching out to development partners (e.g., IOM, Don Bosco, the EU, the World Bank, GOAL, etc.) and the local council to see if they could fill the gap – for example, by enabling waste collectors to access equipment through leasing schemes. This would help ensure that waste collectors are able to handle the increased waste collection demand. It is thought this will become a critical issue to address moving forward.

4 Afrimoney is the mobile money transfer option operated by Africell, a pan-African mobile technology company.

4 Access to finance for waste management businesses

There are many innovative waste management solutions, which are commercially feasible, scalable and can create significant impact in their contexts. However, despite having sound business models and impressive teams, many of the waste management businesses that should be spearheading solutions are limited by scarce access to finance. Our experience shows that waste management solutions are significantly underfunded. It is a sector that, if not financed appropriately, could have major negative economic, social and environmental impacts, and reverse some of the development gains made to date.

The funding we are referring to is financial inflows to credible and bankable private sector organisations in the waste management sector, as opposed to finance to the public sector or in-kind financing – which are important but outside the scope of this chapter. The content of this chapter is based mainly on the practical experiences of ARK Group International from working with small growing businesses (SGBs) across Africa, including FWT, to access catalytic grant funding and private finance for sustainable growth.

Typical barriers to access finance

While there are growing efforts to fund impactful innovations in African cities, there is still a range of barriers that limit access to finance. Often these high barriers mean businesses do not consider raising external cash, due to the risk that the time invested to raise capital will not reap the desired results. The potential upside to this is the early-stage businesses that do not access external funding have been able to 'grind' to refine their models through trading income, leading to financial resilience and non-dependence on external funding. However, the downside is that many innovations, especially those that require high up-front costs – like the innovations seen in the waste management sector – are unable to fund growth and innovation to kickstart their enterprises if they cannot access appropriate external capital. Specifically, waste-to-energy solutions, like that of FWT, are expensive and require a high up-front investment to get the model up and running. FWT biodigesters, for example, cost $250,000–$500,000 each; without external capital, these would typically be difficult to procure.

The barriers businesses face fall into two broad categories, structural and technical. Structural barriers are the systematic barriers companies face, largely at the macro level; these usually cut across a range of sectors. Technical barriers are the micro-level barriers that hinder businesses from pursuing case-by-case funding opportunities; these vary across specific businesses. The following summarises some of the typical barriers faced in practice.

Structural barriers: Private investment can play an essential role in filling the finance gap. However, financiers often face a range of macroeconomic, political and institutional risks that make it difficult for credible businesses to access investment in many African cities. This includes concerns about risks related to macroeconomic instability, currency depreciation, weak business regulations, an underdeveloped financial sector and infrastructure, unpredictable politics, and corruption. In addition, there are challenges around the contextual application of environmental, social and governance (ESG) standards in many of the settings that require such investment, making it difficult to progress an investment (see Asare, 2023, for example). Meanwhile, the waste management sector is often considered to be high risk and faces unique market barriers, including hard-to-measure demand and consumers' willingness to pay, as well as a lack of market information to inform investment decisions. This same lack of understanding about the demand profile in the market is present in sectors such as energy access. However, the additional component making it riskier in waste management is the behavioural change element, which is often a necessary part of making a business model in this sector work. It takes time to achieve and directly affects consumers' willingness to pay. FWT, and other waste management firms that have raised appropriate funding, have invested a significant amount of time and energy into building relationships, educating and influencing behavioural change at the community level in the waste management sector; this, in turn, has created investor confidence about the demand profile of consumers that would otherwise be considered high risk.

Companies that have been able to progress waste management solutions often get stuck in a 'missing middle', where they struggle to access appropriate finance for sustained growth: they are too big to access microfinance and too small for traditional development finance. This finance gap leaves space for innovative opportunities, as well as for non-traditional private players to cooperate in ensuring continuing access to finance during the developmental stages of such solutions (Honberger and Chau, 2017).

Technical barriers: In many instances waste management enterprises face barriers to access appropriate finance due to limitations on their time, as well as informational barriers. These can be classed as technical barriers, as they are things that can be overcome by building team resources on a case-by-case basis. However, companies that are cash tight and struggle to access funding also struggle to have the necessary funding to build their teams. The ecosystem requires innovative approaches to support organisations that struggle with technical barriers yet require affordable and partnership-based solutions to overcome them.[5] Informational barriers include a lack of know-how and misinformation, or no information at all, about how to navigate the funding landscape. For example, information asymmetries are widespread across the funding landscape and often reliant on existing networks. In addition, the technical know-how to write competitive applications and create investment documents is often weak, given the

5 ARK Group International offers an example of this kind of support. It provides a subsidised and affordable results-based fundraising subscription to companies, which is a partnership-based service (minimum 12 months) and is designed to ease the time capacity of the team to submit bid applications.

lack of familiarity with the standards expected and the fact many enterprises do not 'speak the language' that funders appreciate. Unfortunately, processes that often 'gatekeep' the funding make it difficult for many enterprises to secure an initial engagement, while working in favour of those that come from the same setting as the funder. These barriers leave many entrepreneurs that have a strong understanding of the context and problem, as well as feasible and bankable solutions, unable to succeed in getting the attention of a funder. Ultimately this also contributes to an inefficient allocation of funding.

In particular, the waste management sector, which lacks its own specific financial instruments, is at risk of having higher technical barriers and potentially being overlooked, because of limited experience from funders of investing in the sector. Specific attention needs to be given to the sector to decrease the technical barriers and provide a level playing field for credible and bankable organisations to present their solutions to be funded.

Blended finance solutions

Blended finance is an important part of the 'development toolkit' and could offer financing solutions for businesses in the waste management sector. There is no one definition of blended finance that everyone agrees on; rather, different donors and organisations implement it in different ways. Yet there are three consistent characteristics, regardless of the varying definitions:

- Leverage: use of humanitarian or development finance and philanthropic funds to attract commercial finance into projects.
- Impact: investments that drive development, social, environmental or humanitarian progress.
- Returns: financial returns for private investors in line with market expectations, based on real and perceived risks.

For this case study, the benchmark definition we use is the one developed by the Addis Ababa Action Agenda, which defines blended finance as 'combining concessional public finance with non-concessional private finance' (IDFC, 2019). Concessional finance[6] can be catalytic in terms of providing essential funding to kickstart activities and setting up enterprise in the earliest stages, such as piloting or procuring important working capital, and should pave the way for private finance in later stages. This experience is mirrored by FWT, which utilised grants to support growth early on that helped position the business to leverage additional private investment from CFM.

In practice, blended finance uses concessional finance to absorb some of the risks of a venture, adjusting the risk–return ratio for investors and leveraging private finance, reaping returns for all parties. Concessional finance is usually motivated by both returns and impact, in turn offering a more patient form of capital. Such finance also has longer maturities than usually provided by the

6 That is, financial tools with terms below the market average.

market. It is designed to absorb some risk and help to make the ventures more financially viable and sustainable in the long run. Blended finance therefore not only ensures that the project can be implemented, but also helps the project achieve better results.

There are different kinds of concessional finance, including grants, results-based financing and philanthropic giving, which can play an important role in kick-starting waste management solutions in cities. Box 4 provides a glossary of blended finance tools that can be applied to the waste management sector.

Box 4 Blended finance tools for waste management

- Grants: these are a form of non-repayable financial support for early-stage ventures, subject to eligibility criteria and, often, a highly competitive process. Development finance institutions (DFIs), bilateral development partners and private foundations typically offer grant-making programmes. They are not reliable as a sole source of finance, due to the risk involved in not winning a grant award and the limitations of their use. In the waste management sector, they play an important role for funding proof of concept, feasibility studies and absorbing essential capital procurement costs.
- Results-based financing (RBF): this is a financing mechanism with pre-agreed financial incentives and rewards to an organisation based on achieving the agreed results. It is based on a contractual agreement between a donor and implementing organisation, which clearly outlines the outputs, outcomes and desired impact. Given the high risks around behaviour change and demand for waste management solutions, RBF can play a significant role in placing the risk of consumer buy-in on the private sector organisation, which – if it has the credibility to stimulate demand (as was done in FWT's case) – can achieve investment for doing so. RBF is typically used in mini-grid investment to incentivise consumer connectivity results. However, it is also a useful tool the waste management sector can benefit from.
- Angel investors: these are high net-worth individuals who provide direct financial backing for small start-ups or entrepreneurs and can even provide investment to unincorporated businesses in exchange for part ownership. An advantage of angel investors is that they often have a sector or focus area for their portfolio, which organisations can explore on a case-by-case basis. Waste management organisations looking to raise funding from these individuals and groups should consider building relationships with angel investors that have an interest in waste management and adjacent sectors, as well as those both within and outside of their geographic borders, including diaspora communities and those with buy-in to the vision of the organisation. These investors are often willing to accept deals at below the market rate.

Box 4 Blended finance tools for waste management (continued)

- Diaspora bonds: these bonds are typically issued by a government to its expatriates to invest in discounted government debt. However, if legally feasible, corporates can also raise debt through diaspora bonds. In settings where diaspora bonds exist, they are popular for infrastructure projects, which have high up-front costs, as is the case with waste-to-energy solutions. Therefore, bonds of this type have potential to support waste management solutions.
- Impact bonds: this is a financing mechanism that rewards investors for successfully delivering impact. It is a form of public–private partnership. An impact bond is based on an innovative performance-based contract between an investor, an outcome funder and a service provider that is tackling a social challenge, such as waste management. In essence, it is an RBF tool due to the nature of transferring the financial risk away from public resources. However, rather than the service provider bearing the financial risk, it is the investor that does so.
- Impact investing: this is an investment strategy that aims to use money and investment capital for positive social or environmental results. Impact investments offer both a financial return and an impact return in line with the investor's social priorities and may take the form of several asset classes combined to achieve a specific outcome. Most impact investment is done by institutional investors such as hedge funds, private foundations, banks and pension funds. With waste management's clear social and environmental impact, it is a sector that should be on many impact investor funds' eligible sector lists. More so, if concessional funding is raised successfully, impact investing can be a source of finance to be leveraged to work alongside this.

Overall, blended finance is a way for public and private funding initiatives to work together, despite differing agendas. However, given the varying contexts of African cities and waste management solutions, there is an argument that a 'one size fits all' approach would not work. Instead, blended finance should be considered on a case-by-case basis, where appropriate concessional and private finance tools are applied based on the context and relevance to support waste management innovations in each setting. Waste-to-energy innovations specifically require high up-front costs; this means more funding is needed to support feasibility studies, proof of concept efforts, assessing demand and early piloting. This can be done well with grants to leverage private finance for further development and growth.

How FWT is using blended finance

To date, FWT has used various funding sources – both public and private – to achieve its early-stage growth, despite being in a setting where access to finance is scarce. Specifically, FWT used a combination of self-funding, grants and private investment to kickstart its business model, and continues to do so. For example, the first pilot biodigester was partially self-funded and supported through in-kind contributions from the procurement partner. Furthermore, an EU biodigester has been financed by the Horizon 2020 research and innovation programme of the European Union, through the 'Energy Access and Green Transition Collaboratively Demonstrated in Urban and Rural Africa – ENERGICA' project. Here, FWT is a consortium partner, demonstrating how innovative renewable energy technologies can adapt to local needs (ENERGICA, n.d.). These early ways of getting the pilot up and running and testing the concept have placed FWT in a better position for conversations with investors and non-concessional funders, to support further development and growth. There is a risk that without these streams of funding, including the founder's contributions, new investors would have struggled to understand the risks and potential of the venture.

Grants have played an important role in FWT's development, but the team has been conscious of avoiding grant dependency. FWT has received two key grants over the last two years, which have totalled just under £500,000. Each grant FWT planned to obtain had a strategy for how grant implementation would lead to financial resilience beyond the grant term, with the implementation of the grant designed to lead to an improved trading revenue stream. In the case of the GSMA grant (see below), this is expected to lead to long-term revenue improvements through strengthened efficiency that provides both cost savings and operational scalability. Building understanding about the role of the grants FWT was applying for and how they fitted into its business model was important to ensure the funding served a clear catalytic purpose.

One of the grants FWT was awarded was from the GSMA Innovation Fund for Digital Urban Services,[7] through a highly competitive process. The fund received 335 applications across 43 countries, and only 10 start-ups – including FWT – were awarded the funding.[8] FWT worked with ARK Group International to assess the fit of the grant for its business and the potential ways the funding could support FWT's early-stage growth. This helped to set expectations early on, ensuring the mentality was not chasing the funding, but instead finding a clear vision-overlap for the funding to have a purpose and function for the growth of the organisation.

7 The GSMA Innovation Fund drives innovative digital solutions with positive socioeconomic and environmental impact in low- and middle-income countries and supports local entrepreneurs on their journey to scale.

8 See GSMA (n.d.) for more information about this call.

Through the assessment process, one of the key bottlenecks to growth discovered was that the organic waste had to be transported in a timely manner to ensure that biodigesters could use it. However, the current waste management infrastructure in Freetown did not allow for this and required efficiency improvements. To improve the supply chain, the team proposed the launch of the digital application, DortiBox (as discussed in the previous section). The app provided real-time logistics updates to waste collectors to improve the timely pick up and drop off of organic waste – an 'Uber for waste management'. This both improves the waste management sector in Freetown and provided the operational efficiency of FWT's business model; critically it also de-risked any concerns around timely organic waste inputs to the biodigesters as the organisation grows. In addition, successful implementation of the grant was assumed to not only improve FWT's efficiency and build operational resilience, but the enterprise would also have a pioneering digital app that it could license to other waste-to-energy innovations in other settings in the long run, to ensure further income.

The funding helped to cover the costs of developing the app, conducting needs assessments, roadshows and workshops to ensure buy-in across the sector, and promoting behavioural change to strengthen waste management from both the household and waste collector perspectives.

Some of the benefits of the grant have also been that FWT now has a direct relationship with the funder and can tap into and utilise GSMA's wider network and support. FWT is required to report regularly on how the grant is being spent and its impact, which also enables the funder to spot if it can offer any timely technical assistance. GSMA is an active grant funder and a good example of an organisation that can effectively partner with a credible business, recognise it as the sector and contextual experts, and deliver impact through funding and ongoing support (see Box 5 for some insight into how the GSMA Innovation Fund operates).

Box 5 The funder's perspective

GSMA offers different funding rounds, each with its own theme or focus based on GSMA's research. These themes align with the strategic priorities of GSMA and its donor partners. Basic service provision is an area of strategic focus, given its essential nature and the fact that many cities struggle to cope with basic service provision in the context of rapid population growth.

Waste management is an essential aspect of basic service provision, and GSMA has multiple companies in its portfolio that work in the sector. It focuses on the circular economy aspect of waste management, how to reach underserved populations, and the use of technology to improve service provision.

Box 5 The funder's perspective (continued)

In terms of determining who to fund, GSMA looks for organisations that are already creating revenue, as well as organisations not already creating revenue but that have a minimum viable product and high potential for partnerships with mobile operators or local municipalities for scaling. It reviews applications and proposals, invests time in due diligence and building confidence, ensures MoUs are in place and that an enabling environment exists for the solutions to work.

For GSMA, it is important to shape grant milestones, monitor and evaluate progress, capture learning, and to consider sustainability. It has a 'match funding' component to ensure that specific businesses have 'skin in the game' and can fund business activities outside the grant. This gives GSMA confidence the business will deliver and ensures it can absorb the funding. Key performance indicators and metrics play a crucial role in tracking growth and ensuring the long-term impact of the grant is in line with expectations.

Innovation is essential to GSMA grants, while partnerships and the role of local government are important factors in determining whether solutions can scale. Digital innovation is an enabler, but groundwork needs to be carried out beforehand. Logistics are key, especially in waste management, in terms of how waste is collected, distributed and treated.

It is important for businesses to understand the type of grant they are applying for and why it was created. GSMA has a focus on digital transformation, limiting what it can fund in terms of core costs or hardware, so it is important to have a roadmap that aligns well with the grant's goals. GSMA funds specific projects, so it is essential to have a clear idea of how the specific project adds to the business as a whole and what is achievable within the grant's timeframe. GSMA believes grant funding is just one part of the larger funding ecosystem, and it needs to work with other kinds of funding, including private funding, to be sustainable in the long run.

FWT is recognised as a market pioneer and first mover. In particular, the partnership between FWT and FCC is considered a strong example of the private and public sectors working together, including through the development of the DortiBox App. This was one of the key factors that made FWT an attractive grantee for the GSMA fund. Through the pilot and development of the DortiBox App, FWT has been able to show proof of concept and signal stronger investment readiness, which in turn helped leverage additional investment through Climate Fund Managers (CFM).

CFM is an impact development fund focused on making investments in climate-themed sectors to respond to the climate crisis. It is set up as an impact investor, which has an impact expectation tied to its investments, but also expectations of achieving commercial returns. In 2022, CFM signed a development funding agreement with FWT and The Waste Transformers (TWT) for an investment of $3.9 million. This investment was framed under a separately registered consortium called Salone Waste Transformers, which is the legal entity that can absorb and implement the investment in Sierra Leone. At the time of writing, the investment was in the first stage development phase, which is designed to purchase five additional biodigester units to be deployed in Freetown and to test the feasibility of scaling.

FWT's revenue source is mainly from off-takers who buy electricity and heat from its waste-to-energy process. The average cost per kilowatt hour (kWh) is $0.30 for each off-taker. For the five systems at optimal operating capacity, the total combined output for heat and electricity will be 3,365 kWh being sold per day, which at the average cost of $0.30 could yield an average revenue of $1,009.50 per day at current capacity, and approximately $30,285 per month. A similar level of annual revenue is likely to be generated from the fertiliser yield of the five installations. Together, these will make up the revenue forecast for the development phase.

CFM is not expecting to make any commercial returns from this development phase. However, it is keen to see it be successful before it can move on to the second phase of investment. Essentially, this development stage investment further absorbs commercial risk and guides the scalability before CFM can move on to phase 2 – scaling investment, which is where commercial returns are expected.

To access this investment, the FWT team entered into active conversations with the funder for 12 months before the investment materialised, with the support of ARK, which acted as an adviser to FWT. This included CFM conducting due diligence around the team, business model, technology, governance and macroeconomic environment. The CFM team made several in-country visits to see the work in action before it was able to commit to the development phase investment. During CFM's decision-making, it would have separately put together a financial model and case that would have been approved by its investment board, taking into account the fully scaled returns expected and the higher risk the development phase poses. FWT had been through a significant number of these due diligence assessments in its grant application processes, which helped prepare it for CFM due diligence.

The CFM funding also covers market studies to guide the scalability beyond the five biodigesters, which are jointly owned, and if successful will secure an additional agreement representing an opportunity of $20.3 million to invest in further scaling (see CFM, 2022, for further information).

In general, blended finance is an important part of the toolbox to enable financial flows into credible waste management solutions in African cities. FWT provides a good example of capturing self-funding, in-kind support and grants to kickstart early development, leveraging additional

investment from CFM and continuing to strategically allow different funding sources to work together to develop their models and create impact. Grants, in particular, have played an important role for FWT to improve investment readiness signals and de-risk its venture to better position it to leverage other non-concessional types of finance for growth. Specifically, the GSMA funding has been essential for creating the app and helping position FWT to mitigate a major business model risk, which strengthened the feasibility of the business and its long-term commercial attractiveness to investors.

5 Conclusion and lessons learned

While waste-to-energy is not a common waste management strategy in Africa, the experience of FWT shows that there are interesting small-scale models to learn from. The company has been able to invest in anaerobic biodigesters, reducing waste going to landfill, while creating biogas that can be used to supplement an unreliable power grid and create fertiliser for agricultural use. The company has faced challenges, including accessing and managing this complex technology. However, particularly difficult decisions have been made as to how the business should be structured and how to gain credibility, especially in a context where larger waste-to-energy projects have not been successful in the past. Starting small with a pilot biodigester, to gain traction with the city council, has been key to FWT's strategy. The efforts of Freetown City Council, which has established micro-enterprises to provide door-to-door waste collection throughout the city (including in hard-to-reach areas), have also played a critical role, allowing FWT to develop and execute its business model.

A key concern faced early on was how the business would secure the properly separated organic waste required for the biodigesters. This is an area where FWT has shown great innovation with the design of the DortiBox App and in its partnerships with the WCMA and its microenterprises. This has enabled FWT to secure a reliable supply of organic waste, essential for future growth of the business, and to provide significant wider benefits to the city's waste management system. Access to finance to enable the business to grow has been critical, especially given the substantial up-front capital investment needed in the biodigester technology. FWT provides a useful example of using blended finance to gain support in the early phase of development of the business, while positioning itself to leverage significant long-term investment to support its innovative business model.

Lessons learned

Several lessons have been observed through the work of FWT and its approach to utilising blended finance that others can draw on. The most important elements are summarised here.

Relationship building: FWT has spent a significant amount of time building relationships and developing credibility, not only throughout the waste management sector, but also across the wider international development community. While this does not guarantee funding, strong relationships with the networks that provide funding have strengthened its knowledge of, and access to, funding opportunities.

Partnerships: FWT works with organisations like ARK Group International, which can act as an adviser and source of funding advice. Partnerships are not always necessary; however, since blended finance requires insight into a wide range of funding sources, partners remove the burden from the central team and give some of the responsibility to partners to support them. It is important to note that partnerships are about cooperation to build understanding and develop long-term support strategies; partners will not necessarily act as finance suppliers or brokers directly.

Signalling to the market: FWT has strong signals in place, including a credible and passionate team, effective financial management, and deep understanding of the waste management and energy sectors. Companies can self-assess their own signalling to the market and should conduct an honest audit of how investors will see them, paying close attention to the risks in their model and how to overcome them.

Strategy: The objective of FWT has not been solely obtaining funding. Instead, it has taken a realistic approach to mobilising resources, which includes taking time to critically assess and define the feasibility of a particular funding type to support the growth of the business. This has allowed FWT to understand the boundaries of what funding supports (or does not support) growth. Moreover, the company strategically thinks through how concessional funds at the early stages can leverage more private funding and how these different funding types could play a role in growing the business. This includes having a strategy in place to avoid grant dependency or reliance on a single funder.

Strategic approach: Identifying the right opportunities can help secure the right type of funding at the right time. For example, FWT waited almost four months to get an outcome from its GSMA grant application. This included full proposal development, due diligence, interviews, and other tasks as part of a highly competitive process. It did not rush from the pilot to find a way to procure new digesters, and there were time lags between pursuing a new funder, such as CFM. This patience was productive: FWT was able to gain more traction with funders based on the results achieved from its original grant. This approach requires planning, and a team that can critically assess the potential and purpose of a fund, while maintaining the core business vision at the centre of activity.

Benefits beyond the funding: FWT is now a part of the GSMA network. It has been presented to investors by the funder, been involved in joint publications, built connections with other grantees in the portfolio, and maintained an overall good relationship with the funder. The funder–business relationship is not simply a transactional one; there are important non-financial benefits a company can utilise to support the sustainable growth of its business.

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Appendix 1 Interviews

Interviewee	Interviewers	Date
Aminata Dumbuya-Jarr, CEO and Founder, Freetown Waste Transformers	Claire Kumar Anna Bailey-Morley	08/03/23 23/05/23
Michael Yambasu, Project Manager, Freetown Waste Transformers	Anna Bailey-Morley	30/03/23 26/04/23
Banor Barrie, Founder, Environment Sans Plastic	Anna Bailey-Morley	24/04/23
Fanta Kelfala Yanka, Finance Manager, Freetown Waste Transformers	Claire Kumar Anna Bailey-Morley	25/04/23
Joseph Jawah Kebbie, CEO, MeDomot	Anna Bailey-Morley	18/05/23
Mariama Whitmore, Consultant, Urban Planning, Housing and Mobility team FCC and C40 Cities	Anna Bailey-Morley	28/04/23
Wadé Owojori, Director, GSMA Innovation Fund	Joevas Asare Mahira Dasgupta Anna Bailey-Morley	10/08/23