Ministry of Foreign Affairs

Scoping Mission Waste and Circular Economy to Lagos, Nigeria

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Scoping Mission Waste and Circular Economy to Lagos, Nigeria

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Cover photo: "Waste to wealth" banner at the Compost Plus facility in Ikorodu, 30 October 2019.

Expert

This scoping study was reported by **Mr. Bert Keesman** of MetaSus as part of an assignment by the Foundation Holland Circular Hotspot. A Mechanical Engineer by origin, Mr. Keesman is an experienced consultant in the field of exports promotion in environmental technologies. Among other assignments, he has worked for the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) in Bangkok, Thailand and for the UNIDO supported Technology Management Center in Costa Rica. He is involved in many export promotion projects, especially in Latin America, Africa and Asia.
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Abbreviations

BBRI	Blue Box Recycling Initiative
CRC	Community Recycling Centre
EPR	Extended Producer Responsibility
FBRA	Food and Beverage Recycling Alliance
kg/pppd	kilograms per person per day
LASEPA	Lagos State Environmental Protection Agency
LAWMA	Lagos State Waste Management Authority
LCDA	Local Council Development Area
LGA	Local Government Area
LMA	Lagos Metropolitan Area
MoE	Ministry of Environment
NESREA	National Environmental Standards and Regulations Enforcement Agency
PSP	Private Sector Participants (private sector waste collectors)
RDF	Refuse Derived Fuel
SWM	Solid Waste Management
TLS	Transfer Loading Station (waste transfer station)

Exchange rate: 10,000 Nigerian Naira (NGN) = 24.54 Euro (3 March 2020)

Summary

"*Waste is wealth*". This promising message is stumbled upon regularly when studying the waste management sector in Lagos, Nigeria. In week 28 October - 1 November 2019 a team of four experts from the Netherlands carried out a scoping study there on waste management. The team consisted of Mr. Freek van Eijk of the Holland Circular Hotspot, Mr. Jeroen Nagel of the Dutch Infra and Environment Agency, Mr. Reinhardt Smit of the company Closing the Loop and Mr. Bert Keesman of MetaSus Consultancy. They worked together closely with the Netherlands Consulate-General in Lagos and with a team of two experts from the University of Lagos: Dr. AbdulGaniyu Omobolaji Adelopo and Mrs. Afolasade Nubi.

It may appear awkward to limit such scoping study to one city instead of the whole country. Then again, with an estimated 22 million inhabitants, Lagos is like a country in itself. When it comes to the quality of its waste management services it is recognized as the front runner in Nigeria. No doubt with an estimated waste output of 16,500 tons per day it is the #1 in terms of quantity as well. For Dutch exporters of products, services and expertise in waste/CE it is a big bone to chew on, plus there is a lot of scope for public sector cooperation. The Expert Team looked specifically at opportunities in organic waste, plastics and e-waste. It identified textiles as an additional "wildcard" focus. Specific business and cooperation opportunities in these areas are described in this report. Key organizations and companies in the waste/CE sector are identified. In Nigeria, waste management is organized at state level, and the Lagos State Waste Management Authority (LAWMA) plays a pivotal role.

To the outside world, the image of Nigeria is not always positive. In a special guest appearance, Dutch national Mrs. Thessa Brongers Bagu of the Nigerian based business support company Naijalink describes what it means to do business in the country. Her overall impression is that foreign entrepreneurs tend to be pleasantly surprised: it is "not as bad" as they heard. The experiences of the Expert Team with the fellow team members of the University of Lagos and other counterparts have been favorable indeed.

The overall goal of this project is to stimulate the circular economy in Nigeria, starting with improved waste management. This report provides input for a multi-annual Nigerian-Dutch Roadmap on Waste and Circular Economy. "*Don't patronize us, play with us*", a local computer salesman said to one of the Dutch team members. It appears a fitting motto to further explore opportunities for Nigerian-Dutch cooperation and business in waste and circular economy.

1. Introduction

In the week 28 October - 1 November 2019 four experts from the Netherlands visited the city of Lagos and surroundings in Nigeria to carry out a scoping study on waste management. The group consisted of:

- Mr. Freek van Eijk of the Holland Circular Hotspot
- Mr. Jeroen Nagel of the Dutch Infra and Environment Agency
- Mr. Reinhardt Smit of the company Closing the Loop; and
- Mr. Bert Keesman of MetaSus Consultancy

The experts have collaborated with waste management experts of the University of Lagos:

- Dr. AbdulGaniyu Omobolaji Adelopo
- Mrs. Afolasade Nubi

The Dutch-Nigerian team has worked together closely with the Netherlands Consulate-General in Lagos.

The overall goal of this project is to stimulate the circular economy in Nigeria, starting with improved waste management. During the scoping study, there has been a special focus on organic waste, e-waste, plastics recycling and an additional "wildcard focus", to be identified as a result of the findings. Key organizations and individuals in waste and circular economy were consulted and visits were paid to important infrastructure such as landfills, waste separation stations and a composting plant. A brainstorm session was held with representatives of the Nigerian waste/CE sector in order to assess the situation. Opportunities for increased bilateral cooperation and knowledge transfer between the Dutch and Nigerian private sectors have been explored.

This report is part of the deliverables of the RVO assignment nr. PTS19NI01 falling under the PSD Toolkit program. The aim was to develop a multi-annual Nigerian-Dutch Roadmap on Waste and Circular Economy and identify quick wins for improvement. This report shows the findings of the scoping study.

The fellow team members of the University of Lagos:
Dr. AbdulGaniyu Omobolaji Adelopo and Mrs. Afolasade Nubi

2. Lagos

2.1 A giant city in brief

Lagos is situated in south west Nigeria, along the coast and near neighboring Benin. Estimations of the population of Lagos vary widely, but it is now widely recognized as Africa's biggest city. In 2016, the National Population Commission of Nigeria set the population at 21 million. Assuming a moderate growth rate of 2% per year[1], the figure stands at around 22 million beginning of 2020. Our calculations will be based on this figure. In 2018 the Netherlands had 17.2 million inhabitants. This is one of the reasons why we only focus on Lagos in this scoping study. After all, as the head of LAWMA Mr. Muyiwa Gbadegesin put it: "*Lagos is a country*". Another reason is the fact that in waste management, Lagos is widely recognized as the frontrunner in Nigeria.

Being a coastal city, Lagos is made up of islands separated by creeks and a lagoon. Locally the city is known as "Eko" but the Portuguese named it "Lagos" because of the lakes. The city is situated in Lagos State. All in all, urban Lagos makes up about 37% of the land area of Lagos state, but 85% of the population lives there. Interestingly, Lagos is not a single municipality and therefore has no overall city administration. Instead, it consists of 20 Local Government Areas (LGAs) and 37 Local Council Development Areas (LCDAs)[2]. The latter include Ikeja, the capital of Lagos State.

Lagos was declared a colony of Great Britain in 1862 and gained independence in 1960. As a result, English is widely spoken. Although since 1991 Abuja is Nigeria's capital city, Lagos has steadily grown to become the economic powerhouse of the country with a major seaport. Between a quarter and a third (depending on the source) of Nigeria's GDP is generated here. It is the city where Mr. Aliko Dangote, Nigeria's cement tycoon, is building a huge oil refinery and fertilizer plant so Nigeria can become independent of foreign suppliers of these basic commodities.

Geographically Lagos can loosely be subdivided into "the island" (actually, a collection of islands where most business activities take place) and the mainland, connected by bridges. These bridges play a vital role in the city's logistics, or lack thereof. It is a matter of good planning to decide when to travel to and fro between the islands and the mainland. Traffic jams are

[1] Here we're short-changing Lagos, which is actually one of the fastest growing cities on the planet.

[2] The LGA's are recognized by the Nigerian constitution, whereas the LCDA's can be considered administrative centres for states facilitating development.

legendary. One day the Expert Team spent four hours to travel from one appointment to the next. More generally speaking, the hustle and bustle of Lagos has all the characteristics of a beehive which can be overwhelming at first. Lagos is a true melting pot with people from all over Africa, many of them very young (60% is under 35 years of age).

2.2 Nigeria / Lagos in a global perspective

The parameters below can help to put Lagos in perspective relative to other cities and countries.

Per capita income

According to the Financial Times, the nominal per capita income in Lagos is over US$ 5,000 per year, which is more than double the Nigerian average. The trouble is that this income is distributed very unevenly over the population. According to OXFAM International, economic inequality in Nigeria has reached extreme levels, despite being the largest economy in Africa. According to the Heritage Foundation, more than 60% of Nigerians live in extreme poverty.

GDP Growth

According to the Lagos Bureau of Statistics, in the period 2016 – 2018 the average annual growth rate of the GDP in Lagos was 4.2%. It is safe to assume that this figure is still a good estimate today.

Trade freedom

The Heritage Foundation places Nigeria in the "mostly unfree" category on place 111. Close by Ghana is at place 109. One of the structural problems which the Heritage Foundation is mentioning is that successive Nigerian governments have been keeping too close a grip on the market, especially on commodities such as oil and other resources. It is uncertain however up to what point this will affect business in waste and circular economy.

Corruption

Nigeria ranks #146 out of 180 countries on the corruption perception index 2019 of Transparency International. No doubt corruption is a factor in the Nigerian business environment. A recent PricewaterhouseCoopers report "Impact of corruption on Nigeria's economy" described the country as one of the world’s most complex corruption environments. Qualified local support on how to deal with this situation is considered essential.

Education

On the UNDP Human Development Index 2019, Nigeria ranks 158th out of 189 countries. The population is relatively young and many of those youngsters are working below their education level. Therefore, it should be relatively easy to find qualified personnel at competitive salaries.

Safety

Many westerners associate Nigeria with safety risks. In the safety instructions for travelers to Nigeria, the Dutch Ministry of Foreign Affairs warns that in the whole country there is a crime risk (e.g. (car) thefts, assaults, extortion or kidnappings). While in Lagos, the Expert Team was not overly hindered by safety concerns. The team crisscrossed Lagos in a minivan with closed curtains. Scrap yards were visited in the company of Nigerian counterparts and the team was met

with curiosity and a smile. The overall impression is that safety is indeed an issue, but if properly addressed with locals it is manageable. Indeed, the consul-general in Lagos Mr. Jan van Weijen observed that the safety situation in Lagos has improved lately.

3. Current solid waste situation in Lagos

3.1 Waste production and composition

A figure that is often mentioned when it comes to the waste output of Nigeria as a whole is 32 million tons per year. For a country with around 200 million inhabitants, this boils down to approximately 0.43 kg/pppd. Compared to other countries this appears more or less consistent. Typically, waste output is higher in metropolitan areas. For Lagos, we assume 0.75 kg/pppd. With a population of 22 million which we assumed earlier, the overall waste output of Lagos is a staggering 16,500 tons per day. That is a line of 825 trucks if each one carries 20 tons.

On its website (www.lawma.gov.ng), the Lagos State Waste Management Authority (LAWMA) shows interesting statistics about waste management in Lagos. Figure 1 shows the total amount of waste collected and deposited at the various landfill sites in Lagos State. Assuming the figures are correct, the annual variations are huge. Earlier we estimated that the daily waste output of the Lagos Metropolitan Area (which, in terms of population, is about 10% smaller than Lagos State) is 16,500 tons per day, or a little over 6 million metric tons per year. Compare this to Figure 1, especially in years with a low deposition of waste! Where did the non-deposited waste go? For the whole of Nigeria, the amount of waste collected is a mere 20% to 30% of the total waste output. For Lagos this figure is unknown, but it appears to vary enormously from year to year.

FIGURE 1. WASTE DEPOSITED AT LANDFILL SITES IN LAGOS STATE 1980 - 2016

Figure 2 shows the composition of the municipal waste in Lagos State as presented by LAWMA in 2016. With a mere 43%, the organics content is low but this could be due to the fact that this is

city waste[3]. 23% of the waste is plastics, which is promising when it comes to the recycling potential. The same goes for paper and textiles.

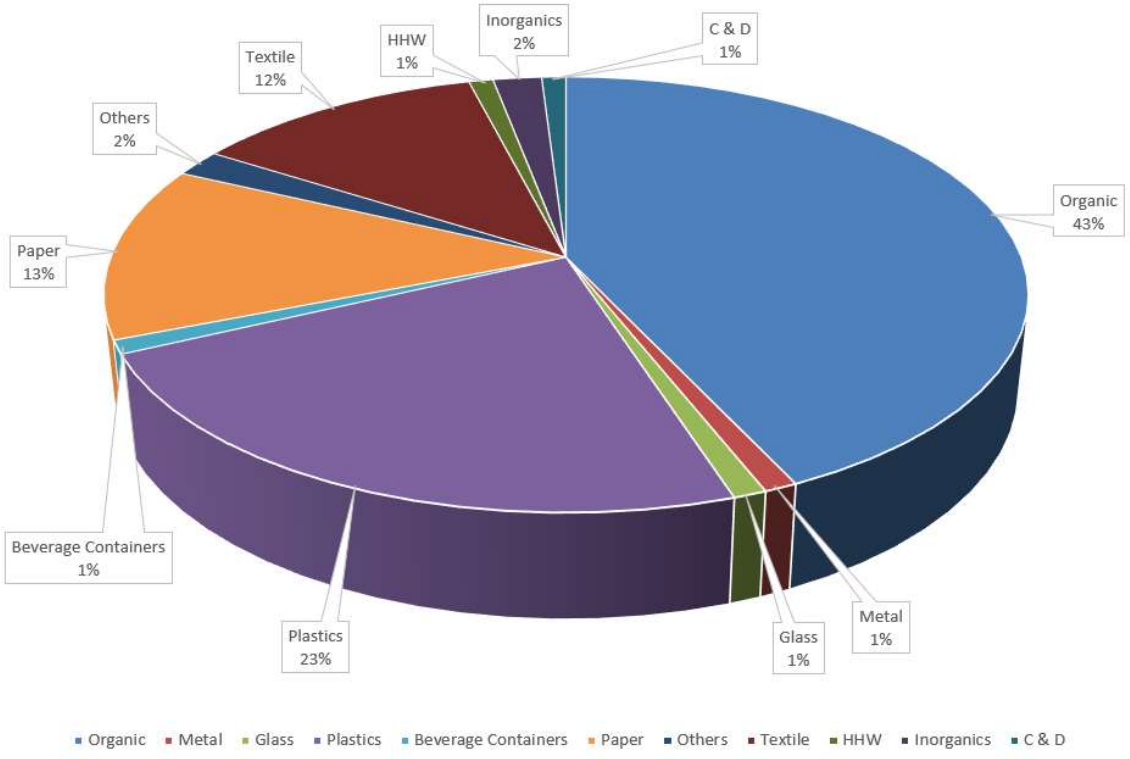


FIGURE 2. COMPOSITION OF THE MUNICIPAL WASTE IN LAGOS STATE, LAWMA 2016

3.2 Waste collection, transport, treatment and recycling

3.2.1. Waste collection, transport and Transfer Loading Stations

Waste collection and transport is the responsibility of the Lagos State Waste Management Authority (LAWMA). In practice, waste collection from households is carried out by so called Private Sector Participants (PSPs). PSPs surfaced in the early 2000s as a way to give the private sector a stronger role in waste management. In many instances they were local SME's emerging out of the informal sector. Under the arrangement, PSP operators had access to government-financed schemes that allowed them to take out loans for the purchase of waste collection equipment and pay back the costs gradually from the proceeds of their business. LAWMA's responsibilities were reduced to coordination of the PSPs; cleaning of public areas, public institutions and schools; management of transfer loading stations; and oversight of the dumpsites in the state.

LAWMA's website has an extensive list of PSPs: https://www.lawma.gov.ng/psp-directory/

[3] LASEPA mentioned an organic waste fraction of 60%. The real figure is probably between 43% and 60%.

The PSP's are categorized by wards in the LGAs and LCDAs. Since a first pilot phase in 1997 the number of PSP's providing waste management services in Lagos State has been growing, with occasional hiccups from time to time. Table 1 has the numbers (source: LAWMA).

Parameter	2004 2007	2007 2010	2011 2014	2014 2017
# of PSP's	116	213	346	364
# of jobs	696	1278	2076	Over 3500

TABLE 1. NUMBER OF PSP'S OPERATING IN LAGOS STATE

As can be seen in Table 1, on average the PSP's are small companies with approximately 10 staff. As a result, economy of scale which one would normally be after in waste management is difficult to achieve (including for foreign suppliers of waste management equipment). Interestingly, LAWMA carried out a SWOT analysis regarding the role of the PSP's in domestic waste management in Lagos. The results are depicted in Table 2.

Strengths	Weaknesses
• Increased number of households with access to SWM service • An enabling environmental law • Supportive government and competent management • Job creation and poverty alleviation • Increasingly good customer relations and satisfaction	• Inability to maintain and improve performance level • Difficulty in waste services charge collection • Unreliable service delivery • Failure in enforcing Law • Failure in enforcing standards • Branding of compactor etc.
Opportunities	**Threats**
• Additional poverty alleviation through job creation • Make materials available for local industrial use • Income generation from the sale of recyclables • Provide incentives for residents to separate at source	• Relationship between LAWMA, PSP's and some slum communities • Attitude of Lagosians towards waste handling • Difficulty in collecting waste service charge from residents • Insufficient number of waste compactors • Poor road network infrastructure

TABLE 2. SWOT ANALYSIS OF THE ROLE OF PSP'S IN DOMESTIC WASTE MANAGEMENT

Some trends in the SWOT are worth mentioning. It is considered a benefit that through the PSP system private sector jobs in waste management have been created. LAWMA is keen to expand this. The PSP system has also contributed to improved customer relations, in spite of PSP's apparent inability to maintain and improve performance levels. Two weaknesses of the PSP's – difficulty in fee collection and failure in enforcing the Law – reveal design flaws in the system, because fee collection and enforcing the Law should be carried out by public entities. In the "Opportunities" section, possibilities abound for additional valorization of waste. And under "Threats" a lack of citizen's environmental awareness (and willingness to pay) is revealed.

It appears that the system of a strong public institution (LAWMA) and a lot of small private service providers works relatively well for Lagos compared to other regions of Nigeria. All the more was the surprise when on March 1, 2017 the then State Governor Mr. Akinwumi Ambode decided to hand over almost 90% of waste management operations in Lagos State for the next ten years to

a Dubai based company called VisionScape (www.visionscape.group). In the new arrangement, state-run and owned LAWMA lost its core responsibilities to the so-called Cleaner Lagos Initiative (CLI), an environmental and sanitation program of the state government. The role of many PSP's suddenly came to a halt, although some did cooperate with VisionScape. The quality of waste management gradually worsened which is widely recognized as one of the reasons why Governor Ambode lost his reelection bid in 2018. Following this, the state house of assembly re-directed LAWMA's PSP operators to the streets again to clean up the city.

"*The need for transfer stations has been recognized particularly for some large metropolitan centers*". This is what the 2005 Nigerian Policy Guidelines on SWM are saying and indeed, in Lagos State a number of so called "Transfer Loading Stations" or TLS's are operational. A TLS is essentially a waste transfer station where waste is temporarily stored, then transferred to larger trucks and sent in bulk to the landfill. The TLS can also be the point of sorting and bundling of plastic waste, separating it from bio-degradable materials. In Lagos, the TLS's are used to contain the waste in a particular area during rush hour so it can be moved at night to the landfill. Three TLS's are currently in operation. The first one called Simpson was established in 2009 at Sura on Lagos Island. The second one, Oshodi TLS, started operating in 2011. This facility is able to treat 1,000 metric tonnes of municipal solid waste a day as well as 24 metric tonnes of medical waste. Then in 2015 Agege TLS was added. Apparently this one also has a medical waste treatment facility. Successive Lagos State Governors have promised to add more transfer stations but so far this has not materialized. In view of the still largely uncollected and unsorted waste volumes, the impossible traffic in Lagos and the city's exponential growth, the development of additional waste transfer stations with waste processing functions and logistics optimization is considered a necessity and at the same time a business opportunity. Figure 3 shows the three existing TLS's.

Simpson TLS | Oshodi TLS | Agege TLS

FIGURE 3. TRANSFER LOADING STATIONS (TLS'S) IN LAGOS

Same as in many other countries, Lagos has its share of waste pickers (or "scavengers" as they are derogatively referred to). In 2015, Samuel Oluranti reported that both men and women engage in waste picking in Nigeria. Males are often in scrap metals, whereas women go after PET and plastic bottles. The waste pickers tend to be on the move. They check waste baskets for recyclables and they also work at dump sites. They transport the recyclable materials with pushcarts, wheel-barrows, or on their shoulders or head. The majority of the waste pickers come from northern Nigeria (Hausa and Fulani tribes) and are poorly educated. At dumpsites there can be some degree of organization. The pictures below provide an impression of waste picking in Nigeria as encountered by the Expert Team.

FIGURE 4. WASTE PICKERS AT WORK IN LAGOS

Separation at source is still in its infancy in Lagos. However, with the launch of LAWMA's so called "Blue Box Recycling Initiative" (BBRI), this is about to change. The BBRI will encourage the separation of recyclable materials from the general waste at the households. Blue boxes will be distributed to the population to collect:

- Cans
- Glass
- Paper, and
- Plastics.

The photo shows an example of a blue box for plastics. The recyclable materials will be collected once a week. The non-recyclable general waste will be collected in black bags. Community Recycling Centers will be established in each Local Government or Local Council Development Area (57 in total). There the recyclables will be sorted and sold to off-takers.

Business opportunity: Investment plans LAWMA

The Lagos State Waste management Authority is an important point of call for anyone wishing to do business in the waste sector in Lagos. In a meeting with the Expert Team, the CEO Mr. Muyiwa Gbadegesin announced the following investments in the near future:

- All investments associated with the Blue Box Recycling Initiative such as blue boxes and black bags for residual waste;
- The development of 57 Community Recycling centers; and
- Five additional Transfer Loading Stations / Material Recycling facilities in the next year
- In view of the importance of composting, the next step of the Blue Box Initiative will be a green box for organics
- LAWMA wants to establish composting facilities around the state
- LAWMA just concluded a Memorandum of Understanding with Lafarge Nigeria (www.lafarge.com.ng) on the burning of waste tires in the cement kiln
- Furthermore, LAWMA is very interested in applying Waste-to-Energy to help tackle the waste problem plus the electricity shortages. It is negotiating a 5-10 MW facility with the company WestAfricaENRG.

The ambitious goal of the Blue Box Recycling Initiative is to capture about 50% of recyclables upstream in Lagos. According to LAWMA, by June 2021 there will be zero tolerance for scavengers. Instead, the informal sector workers will have to register and have a chance to be employed at the Community Recycling Centers under much better working conditions. Each recycling center will provide jobs for at least 50 workers.

3.2.3. Waste treatment including recycling

Professional recycling is not yet well developed in Nigeria. Separate collection and recycling primarily have been in the hands of the informal sector. In 2012 Iriruaga was mentioning some early recycling projects, such as the composting plant in Ikorodu (see next section), a Waste-to-Energy plant at Ikosi market (generating biogas from market waste), and a plastics recycling plant at Olushosun for the conversion of water sachets into garbage bags.

Nowadays, some private companies have introduced more professional recycling activities. Two major ones are Wecyclers (http://wecyclers.com/) and RecyclePoints (www.recyclepoints.com). Both combine a business-oriented approach with social goals and can therefore be termed social enterprises.

The Expert Team paid a visit to one of the four Collection and Sorting HUBs (CoSoHUBs) of RecyclePoints. This is an incentive-based recycling company which collects recyclable materials from registered post-consumers (both household and corporate). These clients have to report their recyclables one day before pick-up. The clients are then rewarded with "Points" which they can accumulate and change for cash and/or household items. The company offers door-to-door collection with so called "WasteBusters" who use electric cargo tricycles (see photo). The "RecyclePoints earning chart" is on the side of the tricycle. Table 3 shows the system.

#	Type of recyclables	Acronym	Qty	Points
1	PET Plastic bottles	PET	1	1
2	Used beverage cans (aluminum)	UBC	1	1
3	Pure water sachets	PWS	10	1
4	Old newspapers	ONP	5	1
5	Glass bottles (flint, amber, green only)	GBS	10	1
6	Brown corrugated cartons	BCC	10	1

TABLE 3. NUMBER OF RECYCLEPOINTS TO BE GAINED VS AMOUNT OF RECYCLABLE MATERIALS

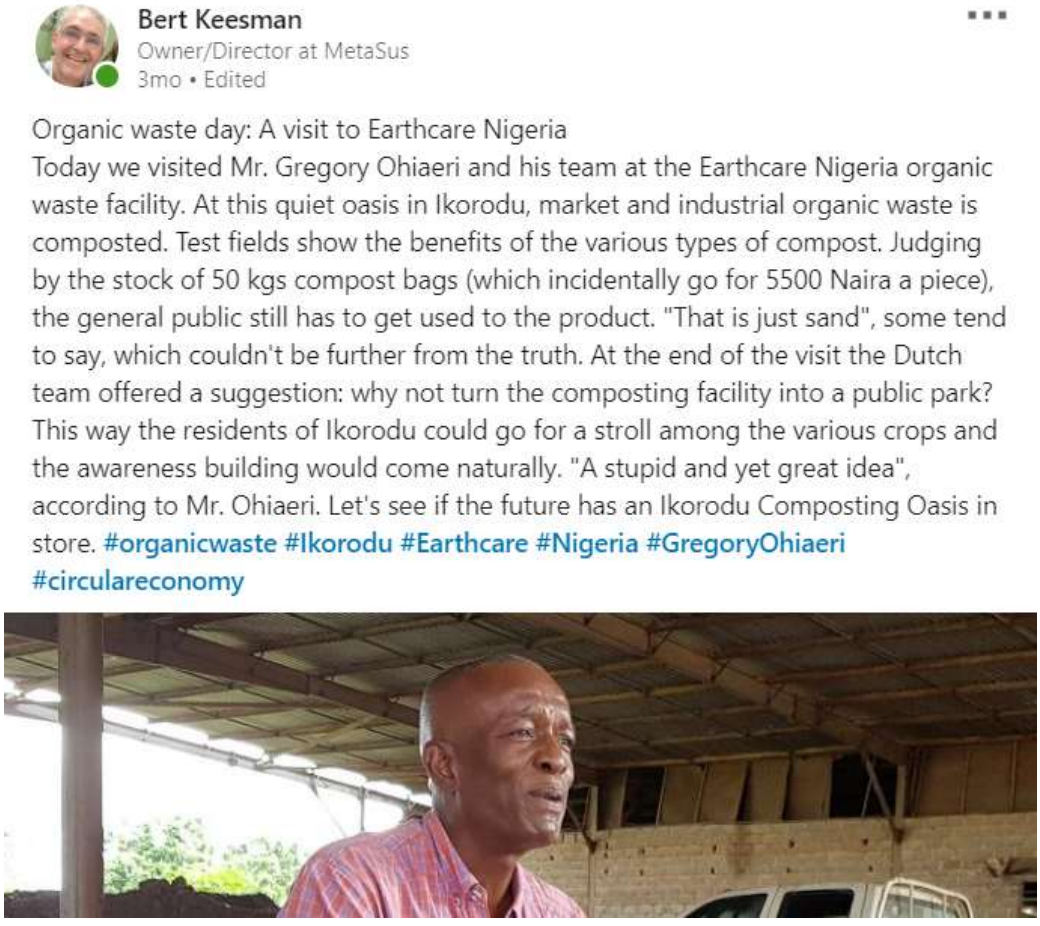
The recycle points can be changed for goods or cash. As an example, 5,000 recycle points will get you 12 bottles of Nestlé table water. 400,000 recycle points can be changed for 100,000 Naira which is almost EUR 250.

Currently 8,000 households are registered with RecyclePoints. They must earn at least 5,000 recycle points before they can redeem them. Some 200 waste pickers officially work for Recyclepoints and are supposed to bring in NGN 5,000 worth of recyclables each week. They also have to open a bank account with one of the RecyclePoints banks.

Organic waste and resources

No doubt organic waste is a major problem in Lagos. The rather conservative estimate in this report is that the organic fraction of the waste in Lagos is 43%. With a daily output of 16,500 tons of waste, the city produces more than 7,000 tons of organic waste per day. Some of this waste (e.g. from markets or food industries) is relatively homogeneous, but the household waste is mixed with all kinds of contaminants and therefore challenging to process properly.

The Expert Team visited a composting facility in Ikorodu. Below is a short write-up.



The news item above was posted during the week in Lagos by the Expert Team on the LinkedIn group page: “Towards a Roadmap Nigeria-Netherlands in Waste and Circular Economy”[4]. According to Mr. Gregory Ohiaery (photo), Earthcare Nigeria is a “Waste to Wealth” company (see also the front cover). In reality, business is rather slow. The supply side is pretty well established: Earthcare gets its organic waste from markets, breweries and from Nestlé food. When in the future the Blue Box program will have been expanded with a green box, there could be input from households as well. However, Mr. Ohiaery doesn't accept household organics yet because they are too contaminated with other types of waste. The real problem is on the demand side: it appears that Lagosians are not yet accustomed to compost.

The question remains what to do with the mixed organic waste. One low value option is to compost it at the landfill sites and use it as landfill cover. This would certainly be a step forward in landfill management in Nigeria but it would add to the costs without financial benefits.

An option that is way more value added is an innovative (Dutch) technique to separate the mixed municipal waste in two fractions by applying high pressure. The dry fraction can be easily transformed to a high caloric and clean Refuse Derived Fuel (RDF). The wet fraction (containing 95% of the organics) is a perfect input for a process of anaerobic digestion with only a minimal contamination by sand, broken glass or stones. This technique is offered by the Dutch company Leapfrog and is certainly worth investigating further in the case of Lagos. The local branch of Lafarge could be approached to see whether the RDF can be used in the cement kilns.

According to Mrs. Dolapo Fasawe, the Director of the Lagos State Environmental Protection Agency (LASEPA), food waste is a widespread problem in Nigeria. In this respect, oily waste generated at restaurants in Lagos may be a promising opportunity. In every registered restaurant, collection systems for this type of waste are already in place. However, oily waste is not collected and processed separately, although this can be a profitable business. The technology and experience of Dutch companies such as Renewi (specifically former Rotie Organics and Orgaworld) could help to develop this opportunity, perhaps on a licensing basis.

Table 4 provides an overview of the business and cooperation opportunities in organic waste.

Time frame	Business / project idea in plastics
Short term	Carry out a feasibility study on the use of the so called “OREX Organic Extruder Press” to separate mixed municipal waste in Lagos into a dry fraction (to be used as RDF in cement kilns) and a wet fraction (to be digested) (Dutch company Leapfrog)
Short term	Carry out a feasibility study on the collection of oily waste from restaurants in Lagos and the conversion into biofuel (building on the experience of the Dutch company Renewi)
Long term	Set up a cooperation project on the introduction of sustainable composting practices in connection to LAWMA’s “Green Box” source separation program and in combination with an awareness raising program on the benefits of the use of compost.

TABLE 4. IDEAS FOR BUSINESS AND PROJECTS NIGERIA – NETHERLANDS IN ORGANIC WASTE

[4] https://www.linkedin.com/groups/8850147/

Plastics

According to the CEO of LAWMA Mr. Muyiwa Gbadegesin, each year 1 million tons of plastics waste is generated in Lagos. On the basis of our figures, this may even be an underestimation: a little over 6 million tons of waste each year, 23% of which is plastics, yields 1.38 million tons of plastic waste per year or 3,800 tons per day. According to Business Day (2019), currently only 10% of this amount is recycled. The rest ends up in landfills, along the street, in waterways and eventually in the sea. This plastic is now clogging the water management infrastructure causing frequent flooding and adding logistic pressure.

Informal workers do collect some of the plastic waste and sell it to intermediaries. Recycling companies such as RecyclePoints and Wecyclers now contract waste collectors specifically to collect used plastics. As an example, this way Wecyclers collects 50 to 60 tons of waste per month (figure beginning of 2019). Unfortunately, even if this amount would be collected per day it would still be a drop in the ocean.

One major problem is that currently there are not enough buyers of the collected materials. Actually, in Lagos only Alkem Nigeria is able to treat used plastic in an industrial process and convert it into raw materials. In the case of Alkem this is fibers for making clothes. Obviously, the potential for recycling and upcycling plastics is way bigger, especially when it comes to PET. Serious scaling up could gain momentum if the offtake of recycled materials would increase. If companies such as Nigerian Breweries would start using recycled material for their plastic bottles (PET) a pull factor could be introduced in the market that would incentivize local collection by the informal sector and community recycling centers.

This is all the more urgent with the advent of the Food and Beverage Recycling Alliance of Nigeria (FBRA, www.fbranigeria.ng). This is a self-regulatory initiative for the recycling of used food and beverage packaging waste. It was founded in December 2013 with a view to recycle used food and beverage packaging waste into synthetic fiber and other uses.

Its members include some of the biggest food and beverage companies in Nigeria such as the Nigerian Bottling Company Limited/Coca-Cola Nigeria Limited, Nigerian Breweries Plc, Seven-Up Bottling Company Limited, Nestlé Nigeria Plc, Guinness Nigeria Plc, Intercontinental Distillers Limited, International Breweries Limited, Tulip Cocoa, and Prima Caps and Preforms.

With its collection partners RecyclePoints, WestAfricaENRG and Chanja Datti among others, FBRA has conducted awareness campaigns in curbing environmental pollution caused by food and beverage packaging waste. They have also been promoting proper disposal and separation of plastics. All in all, the FBRA could be a useful stepping stone towards a formal system of Extended Producer Responsibility in packaging in Nigeria, especially because all big players are already on board.

Table 5 shows some opportunities for cooperation and business.

Time frame	Business / project idea in plastics
Short term	Investigate the possibility of having Dutch traders in recyclables buy recycled plastics in Nigeria
Short term	Application of the so called Ocean CleanUp Interceptor, e.g. for “legacy flows” in the lagoon (https://theoceancleanup.com/rivers/)
Medium term	RDF production from residual waste, rich in caloric material, to be incinerated in cement kilns
Medium term	Conduct a study into the possibility of a PET recycling facility in Lagos (Heineken / Nigerian Breweries is possibly interested to participate in this. Han Stiphout of Stiphout Industries could be a useful contact)
Long term	Support Nigeria in the implementation of a formal system of Extended Producer Responsibility in packaging

TABLE 5. IDEAS FOR BUSINESS AND PROJECTS NIGERIA – NETHERLANDS IN PLASTICS

e-waste

Same as in some other countries of Western Africa, the subject of e-waste is a complicated one in Nigeria. In 2013, NESREA published the "Guide for importers of used electrical and electronic equipment into Nigeria". In this guide, it is stated that the federal Government of Nigeria allows imports of new and used electric and electronic equipment (EEE). Imports of waste and near-end-of-life EEE are prohibited.

However, every year huge amounts of waste and near-end-of life EEE keep pouring into the country. According to a January 2018 on-line article by Mrs. Valentine Iwenwanne called "Nigeria's e-waste mountain", each year Nigeria is burdened with over 1.1 million tons of e-waste, from local and international sources. This is in the order of 3.5% of the total amount of waste generated annually in Nigeria in terms of weight.

The same article mentions that each year, 288,000 tons of e-waste is imported (2017 figure). This is a 26% contribution to the overall amount of e-waste in Nigeria. Europe (including the Netherlands) has a large shared responsibility here. According to a 2018 United Nations University report, in 2015 and 2016 approximately 60,000 tons/yr of used EEE was shipped to Nigeria. At least 15,400 tons/yr didn't work. Europe was the origin of about 75% of the shipped material. 6%-9% came from the Netherlands (between 3,600 and 5,400 tons annually, compared to an approximate annual 100,000 tons of collected e-waste per year).

A lot of e-waste ends up in a place called “New Garage” in the Ojota district. This is an area with a multitude of small-scale workshops and scrap metal storages. The photos below give an impression.

FIGURE 5. SOME IMPRESSIONS OF THE "NEW GARAGE" E-WASTE RECYCLING DISTRICT

The Expert Team visited the offices of the E-Waste Producer Responsibility Organization of Nigeria (EPRON). This organization has been established in May 2019 and currently has six members (a.o. HP and MTN, but no other big companies). According to EPRON's Director Mrs. Ibukun Faluyi, all producers and importers of electric and electronic equipment should be member of EPRON. However, NESREA has awarded the companies a grant period of one year until June 2020. The Global Environment Fund (GEF) has awarded NESREA a US$ 2 million grant to strengthen the EPR system for e-waste.

EPRON works with two officially accredited e-waste recyclers based in Lagos: e-terra technologies (https://www.eterra.com.ng) and Hinckley (http://hinckley.com.ng/). These two companies primarily focus on high-end clients such as banks, bi- and multilateral organizations to offer them data and equipment destruction services. The trouble is that with their high standard of services they cannot compete with the informal sector. Both companies were visited by the Expert Team. Hinckley became the first registered electronic waste recycler in Nigeria, providing end of life solutions for electronics equipment while preventing environmental pollution and human harm caused by hazardous electrical waste. E-Terra Technologies Limited is a similar company working on the eco-friendly management of e-waste; recycling, refurbishing, and data destruction of storage devices.

Interestingly, since 2011 the so called "E-Waste Solutions Alliance for Africa", comprising of Dell, HP, Microsoft Mobile and Philips, has been working to implement a sustainable model for e-waste recycling in Nigeria. They appear to be working towards an Extended Producer Responsibility (EPR) system for e-waste.

As mentioned previously, the Netherlands has a shared responsibility for the scale and the way e-waste is processed in Nigeria. On a positive note, the Netherlands is already playing a role in e-waste recycling in Nigeria through the company Closing the Loop. They operate a material offsetting scheme. When big Dutch companies or organizations purchase new phones for their staff, the same amount of discarded Nigerian phones are recycled in a sustainable way. Closing

the Loop has teamed up with Hinckley to export the spent batteries of mobile phones to Western Europe for proper processing. Some other ideas are included in Table 6 below.

Time frame	Business / project idea in e waste
Short term	Together with EPRON and private recycling companies in Nigeria, set up a collection and recycling system for so called “deep cycle batteries” which are used in antennas for mobile phones. Nigeria has 42,000 antennas with batteries which have to be changed every three years. The spent batteries have no financial value but the long-term environmental costs of those batteries ending up in landfills (or worse) is very significant.
Short term	Help Nigerian companies set up proper WEEE recycling lines, e.g. for refrigerators (e.g. the Dutch company ATN Engineering has this sort of technology)
Medium term	Help Nigeria to set up a proper repair, reuse and recycling infrastructure. ICT Milieu, Wecycle and WeeeNL may be involved in the knowledge transfer of such program. Companies such as Computerrecycle, Holland Recycling, IT-recycling, Krommenhoek Metals and/or Milieu PC may be interested to team up with Nigerian counterparts. It could be argued that part of the funds available in the Dutch EPR system for e-waste should be spent in Western Africa as we are shipping part of our e-waste there.
Long term	In the Netherlands itself, prevent all exports of waste and near end-of-life EEE, except to countries where this equipment can be properly processed.
Long term	Help Nigeria to further develop a proper Extended Producer Responsibility (EPR) System on the basis of the existing EPRON organization.

TABLE 6. IDEAS FOR BUSINESS AND PROJECTS NIGERIA – NETHERLANDS IN E-WASTE

The “wildcard” waste stream

On top of the above, the Expert Team has been on the lookout for “wildcard waste streams”: waste related problems in Lagos which could be opportunities for Dutch-Nigerian cooperation and business. Below are the results.

Textile waste processing
According to LAWMA's breakdown in 2016, 12% of the municipal waste in Lagos is textile waste (see Figure 2). This means that every day, almost 2,000 tons of textile waste is disposed of at Lagos's landfills. This is a shame as discarded textile has value, especially in case it is not contaminated with other types of waste. It would be worthwhile to investigate whether a system of separated textile collection can be set up in Lagos. For cultural reasons, reuse of textiles is complicated in Nigeria, but there are many options available such as sorting the textiles and turning them into fibers. Nigeria is not a textile producing country (most is imported), but the processing of used textiles could be good business, could save a lot of resources and create jobs. On top of this, such project would contribute to the creation of a habit of source separation.

Medical waste
According to Mr. Muyiwa Gbadegesin, the CEO of LAWMA, medical waste used to be processed in hydroclaves in Lagos. However, at the moment it is buried. Options for sound collection, transport and treatment are welcome. In the future LAWMA is planning to incinerate the medical waste. According to sources, waste management practices at hospitals need improvement so there is a need for capacity building at all levels and also the formulation of policies and guidelines. Further study would be needed to assess the exact needs and design tailor made solutions for the Lagos situation.

Recycling of hair, wigs and hair extensions
An unusual challenge was handed to the Expert Team by Mr. Bankole Oloruntoba, CEO of the Nigerian Climate Innovation Center. He alerted the team to the fact that many Nigerian women use wigs and/or hair extensions. Indeed, according to a January 2019 article of the News Agency of Nigeria, 80% of Nigerian women wear wigs. Synthetic wigs typically last 4-6 months of daily use, while heat-friendly synthetic wigs only last 3 months. Natural hair wigs can be worn about half a year longer. As a result of this, there is a lot of discarded wigs and other hair products in Nigerian homes which eventually end up at landfills. It would be interesting to see whether an alternative destination can be identified. This may not be the biggest environmental problem in Nigeria, but it certainly is an eye-catcher!

Because of the quantity of waste and the potential profitability it is recommended to choose the wildcard “textile waste processing” as an additional focus in the Roadmap Waste/CE Nigeria – Netherlands.

3.2.5. Waste to Energy

As recently as in 2017, the Dutch company Partners for Innovation (PfI) has been involved in a EU funded project to evaluate the feasibility of a Waste-to-Energy project for the Ogun State Government in Nigeria. Ogun State is to the north of Lagos. The circumstances in the two regions are to some extent comparable.

In a discussion on the background of Waste-to-Energy (WtE) in Nigeria, the report starts by mentioning the peculiar situation of the energy market in the country. Despite being the biggest oil exporter of Africa as well as having the largest gas reserves, Nigeria suffers from an energy crisis. Demand for electricity is growing rapidly because of population growth and economic development. Energy generation facilities are poorly maintained and so is the electricity grid. The result is frequent power outages, especially in households. This is why many households and companies rely on diesel generators for their electricity supply. Indeed, while in Nigeria the Expert Team saw and heard generator sets all over the place (see the photo which was taken outside a series of repair shops at “Computer Village” in Otigba, Ikeja). According to the PfI report, of the total energy consumed by Nigerian industries only 4% is from grid-connected electricity. 96% is self-

produced, using either natural gas, oil products (usually diesel) or biomass and waste (usually wood products and agri-waste).

No wonder that the PfI team investigated the feasibility of off-grid Waste-to-Energy applications. The team concluded that "to turn municipal solid waste into electricity is feasible and seems viable, with no deal-breaking environmental or social issues". The installation that was evaluated consisted of a mechanical pre-treatment plant, an RDF pelletizer and a pyrolysis plant for the pellets. By-products included recyclables such as metals and glass plus RDF for cement kiln furnaces.

It was recommended to start with a Mechanical Treatment plant for the municipal waste, a pelletizer plus a 0.75 MW pyrolysis energy unit in Ogun State. At the same time the PfI team recommended to optimize the waste collection system and the management of the dumpsites, by introducing source separation, charging collection and gate fees and increase the collection efficiency.

The latter are indeed considered prerequisites for the successful introduction of Waste-to-Energy at a large scale in Nigeria. Off-grid applications will normally be relatively small scale. Apart from the danger that this may not be cost-effective, such installations will not provide a solution for reducing the massive volume of waste in Lagos. In itself, the huge waste output of the city in a relatively limited space could be the key to the successful application of Waste-to-Energy. Electricity prices are in the range of 40-55 NGN/kWhr (EUR 0.10-0.14). The high organic waste content may be a limiting factor, but there are solutions to this (e.g. the OREX high pressure technology by the Dutch company Leapfrog). But in order for Waste-to-Energy to work in Lagos, big challenges will still have to be overcome in waste logistics, cost coverage and the electricity infrastructure.

It is encouraging that the representatives of Lafarge HOLCIM who attended the brainstorm session at the Dutch Consulate on Monday 28 October expressed an interest in co-processing of waste for energy and raw materials for the cement industry. This is an angle which is worth developing further.

3.2.6. Waste disposal

Lagos State has five active waste dumpsites as shown in Table 7.

Name of landfill (yr established)	T/yr (2015)	Size in has	Residual life (yrs.)
Olushosun (1992)	980,106	42.7	20
Soluos II (2006)	202,544	7.8	5
Soluos III (2008)	301,967	5.0	5
Ewu Elepe (2008)	169,014		
Epe (2008)	172,316		
Total	1,825,948		

TABLE 7. LANDFILLS IN LAGOS STATE, NIGERIA

Table 7 reflects the waste output statistics on LAWMA's website. The total amount of waste deposited at Lagos's dumpsites in 2015 was said to be almost 2 million tons, which is roughly consistent with the trend presented in Figure 1. However, at the outset of this report we have

estimated the current total waste output of Lagos at 16,500 tons daily or a little over 6 million tons on an annual basis. According to Table 7, almost 54% of Lagos's waste ends up on Olushosun landfill. On the basis of today's figures this translates into 8,900 tons daily. This is pretty consistent with figures that are being mentioned in the press and literature. If all this waste were delivered in 20 tons containers, it would need 445 trucks daily. In reality the trucks are smaller and indeed there is an incessant traffic jam towards the tipping zone.

A recurring slogan on waste collection trucks

Entering the weighing bridge

Waste sorting starts inside the truck

Long lines before the tipping zone

Waste pickers at the tipping zone

FIGURE 6. SOME IMAGES OF OLUSHOSUN LANDFILL IN LAGOS

The Olushosun dumpsite plays a key role in Lagos's waste management. It is the biggest dumpsite in Nigeria. The Expert Team went for a visit over to the Ojota area in the Ikeja LGA, in northern Lagos. Established in 1992, the dumpsite covers an area of 43 hectares and the waste column reaches 18 meters at its maximum level. The waste is not subjected to any treatment before being landfilled.

Olushosun is equipped with a weigh bridge, a control room (out of order at the moment), a central office and a leachate pond. In theory, the area is subdivided into different cells, but this merely represents the area for waste disposal for a specific period. There is no base liner but the clay layers underneath the landfill help prevent soil pollution. At some point, a project was initiated to take out the landfill gas, but this was never implemented.

Figure 6 on the previous page shows some images of the Olushosun dumpsite.

During the visit of the Expert Team, a small army of waste pickers was sorting out the recyclables, especially around the tipping zone. With the bulldozers and excavators continuously moving around and lifting up the waste, this is a permanently life-threatening workspace. It would be way better to establish a relatively simple material recovery center at the landfill where the MSW would be first separated mechanically into a wet and dry component. This would be more effective than the current waste sorting by the waste pickers, and working conditions would improve drastically.

3.2.7. Financial aspects

"Waste is wealth". Many times during the week in Lagos the Expert Team stumbled upon this slogan. As an example, as shown on the front cover of this report, it was on a banner which was put up at the Earthcare Nigeria Ltd composting station. It is unknown how this slogan was introduced so widely in the waste sector in Lagos, but unfortunately the reality is different: on the whole waste has a negative value and the sound management of it comes with a cost. According to the World Health Organization, for developing countries the minimum cost can be estimated at 1% of the GNP.

The waste management sector in Lagos is clearly underfinanced. Apart from collecting the waste, the Private Sector Participants are also in charge of collecting the waste fees. Apparently, payment discipline among citizens is low, and the PSP's pay only 1% of the recuperated fees to LAWMA for the management of the landfills (there is no tipping fee). Extended Producer Responsibility systems could help to put money into the system. Indeed, the Producer Responsibility Organizations FBRA (plastics) and EPRON (e-waste) have been established, but to date no EPR funds have been set up.

Again, the vast dimensions of Lagos could be a way out of these financial doldrums. Remember (section 2.2.) that the nominal per capita income in Lagos is over US$ 5,000 per year. Let's assume a figure of EUR 380 per capita per month. Based on the average carrying capacity of EUR 3,80 per month for waste management per Lagosian (according to the WHO) and a current population of 22 million, a total of almost EUR 84 million per month could be recuperated in waste fees. This amount could be topped up with the proceeds of EPR systems for key recyclable waste streams.

A good start would be to have waste fees collected in the form of a municipal tax instead of by the PSP's. According to Mr. Muyiwa Gbadegesin, the CEO of LAWMA, Lagos is national champion in Nigeria when it comes to collecting taxes, so it is a suitable city to start such system.

Due to the extreme income differences, the fee system would have to be stratified according to socio-economic status of the citizens. Implementing such system will take time, but it would be a solid foundation for a more sustainable waste management system in Lagos.

3.2.8. Circular economy approach

In response to the global challenges of the 21st century, the circular economy has emerged as a viable alternative to the unsustainable linear (take–make–waste) status quo. In a circular economy, resources are not consumed but recovered in a system that is continuous and long-lasting, with the goal of keeping them functioning at their highest potential. Instead of destroying value after the use phase, value is retained through cycles of reusing, repairing, remanufacturing or recycling (see Table 8 below). For this purpose, we need new business models and innovative product design that makes use of non-toxic materials which can be endlessly cycled. The circular economy shifts wealth and prosperity from our current means of consumption to a system that is continuous and long-lasting. It is a system that is regenerative by design, where the needs of all citizens are provided within the natural means of the Earth.

The circular economy as a term is a little-known concept in Nigeria. There are many examples, however, that show the variety of ways in which the circular economy is already taking shape in the country. In some cases, it is a question of reaching back to old habits, such as wrapping foodstuff in Katemfe leaves, using baskets instead of plastic bags or engage in home composting.

In the scrap yards one could speak of a “poor man’s circular economy”, suited to the Nigerian circumstances and with an occasional innovative twist. In the Lagosian “Computer Village”, under poor working conditions, telephones get several lives before being discarded. Non-reusable components are thrown away, and environmental damage is an integral part of a process that only focuses on the valuable items.

A circular economy may suit the resilient and innovative Nigerian culture very well. However, it needs to be scaled up and professionalized. The flows identified in this study can be regarded as low hanging fruit:

- Closing the loop for **plastics** (starting with valuable PET bottles) by incentivizing informal collection, institutionalizing community recycling centers and guaranteeing offtake by companies such as Nigerian Breweries
- Valorizing source separated **organics** from agriculture through composting and digestion or turning source collected grease from kitchen waste into biofuel
- Professionalizing and scaling up **e-waste handling** facilitated by Extended Producer Responsibility and processing by involving public and private actors

There is a Nigeria Chapter of the African Circular Economy Network (ACEN). The contacts can be accessed on the following page: https://www.acen.africa/nigeria.

ACEN Nigeria is working on a circular economy report for Nigeria. An important element of this report will be the current level of implementation of CE practices. ACEN Nigeria is also considering to organize a circular economy challenge, combined with a circular innovation fund. For this to happen, it will be important that the Nigerian Government defines its position regarding the circular economy.

The Expert Team had the chance to meet some of the circular economy entrepreneurs of the Dutch Orange Corners initiative. This program provides young entrepreneurs across Africa and the Middle East with training, networks and facilities to start and grow their startups. Nigeria is one of the countries where young entrepreneurs can apply for support.

In order to get an impression of the way the Nigerian Orange Corners entrepreneurs are implementing the circular economy, let's break down the CE approach into ten so called "R-strategies" and then look how we can categorize the different businesses.

The R-strategies are presented in Table 8 (source: PBL, 2017). From a sustainability point of view the low R strategies are the preferred options (but all initiatives are laudable).

Type	R#	Name	Strategy
Smarter product use and manufac-ture	R0	Refuse	Make product redundant by abandoning its function or by offering the same function with a radically different product
	R1	Rethink	Make product use more intensive (e.g. through sharing products, or by putting multi-functional products on the market)
	R2	Reduce	Increase efficiency in product manufacture or use by consuming fewer natural resources and materials
Extend the lifespan of the product or its parts	R3	Re-use	Re-use by another consumer of discarded product which is still in good condition and fulfills its original function
	R4	Repair	Repair and maintenance of a defective product so it can be used with its original function
	R5	Refurbish	Restore an old product and bring it up to date
	R6	Remanufacture	Use parts of a discarded product in a new product with the same function
	R7	Repurpose	Use discarded product or its parts in a new product with a different function
Useful application of materials	R8	Recycle	Process materials to obtain the same (high grade) or lower (low grade) quality
	R9	Recover	Incineration of materials with energy recovery

TABLE 8. R-STRATEGIES IN THE CIRCULAR ECONOMY

With these strategies in hand we can categorize four CE initiatives in the Orange Corners program in Nigeria. The cases are presented in random order. Below Table 9 a brief description of the initiatives is provided.

#		R0	R1	R2	R3	R4	R5	R6	R7	R8	R9
1	InCycle				**X**	**X**				**X**	
2	Paperbags by Ebees	**X**									
3	Maanar	**X**									
4	Cyrus45				**X**					**X**	

TABLE 9. R-RANKINGS OF CE INITIATIVES IN THE ORANGE CORNERS PROGRAM IN NIGERIA

1. **InCycle** (http://www.getincycle.com) has developed a mobile platform for Lagosians to report their reusable and recyclable waste so they can have it picked up and paid for. Materials include plastics, metals, aluminum, paper/cardboard and e-waste. The system works both for households and businesses. In the past six months 50 tons of recyclables have been collected through this system. In terms of e-strategies, InCycle is mostly active

in recycling (R8), with some reuse (R3) and repair (R4) going on (especially in e-waste). The contact person is Mr. Arewa Boluwatife (for details see list at the end of this report)

2. Established in 2015, **Paperbags by Ebees** (https://www.facebook.com/Paperbagsng/) is a company which produces high quality paper and biodegradable packaging for (especially SME) businesses in food service, agro and fashion. Products include food bags, fashion carrier bags, pastries bags, food carrier bags, food boxes, shoes boxes, brown bag packaging for garri, flour, charcoal, tea boxes etc. In many cases, the biodegradable paper serves as a sustainable alternative for plastics packaging. This puts Paperbags by Ebees in the R0 category. The contact person is Mrs. Nnorom Chidiebere.
3. The company **Maanar** (https://maanar.com/) provides smart bicycles for easy communal use in communities in Nigeria. It has created a bike sharing service through a mobile app. The app allows users to locate available bicycles nearby. In order to unlock a bicycle, a barcode can be scanned with the maanar app. The trip is paid for through the app at the destination. If we consider transportation as a product, Maanar helps make cars redundant by changing them for bikes. This puts Maanar in the R0 category. The co-founder and CEO of this company is Mr. Olaolu Olaleye.
4. **Cyrus45 Factory** describes itself as "an art-inclined home decor company passionate about upcycling waste items into bespoke and ultra-modern furniture pieces and home wares". Waste tires play a key role in the furniture designs but glass and plastics are also applied. The company is classified into R3 (reuse) and R8 (recycling, or upcycling in this case). The creative director of Cyrus45 is Mrs. Banjo Olabanke.

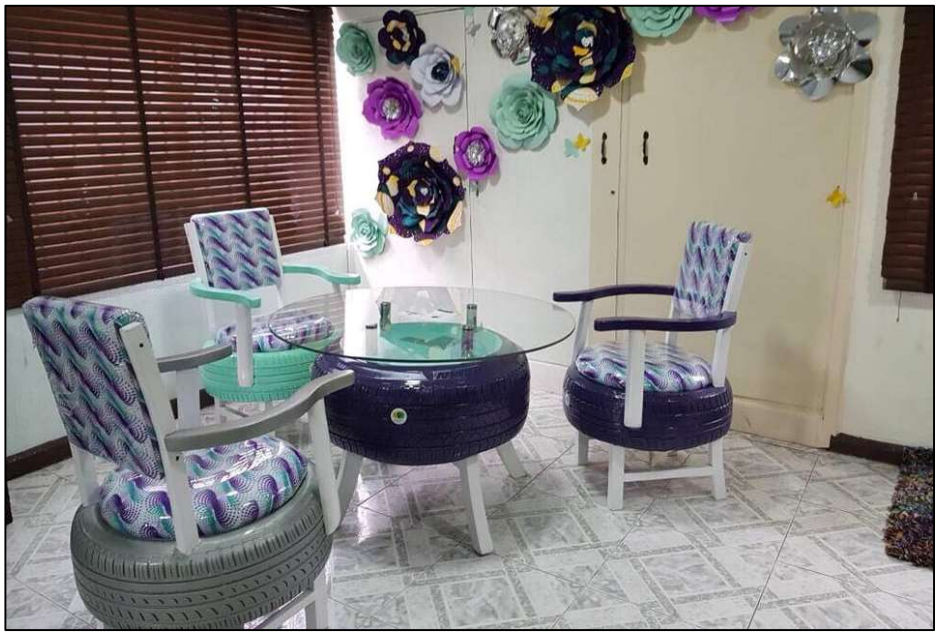


FIGURE 7. A CYRUS45 DINING SET BASED ON RECYCLED TIRES

4. Legal framework and authorities

Table 10 below shows the legislative framework of waste management in Nigeria (Federal level or “F”) and Lagos State (“L”).

Law / regulation	Year	Level	Significance
Harmful Waste Act	1988 2004	F	Prohibits and declares unlawful all activities relating to the purchase, sale, import, transport, deposit or storage of harmful wastes
FEPA Act	1988	F	Establishment of the Federal Environmental Protection Agency
EIA Act	1992	F	Legislation in the field of Environmental Impact Assessments
Environmental Pollution Control Law	1996	F	Requires the Ministry of Environment and Physical Planning to educate the public on the types of disposal methods acceptable by the State Government for domestic and industrial wastes
Lagos State EPA Law	1996	L	Establishment of the Lagos State Environmental Protection Agency. LASEPA monitors and controls waste disposal in Lagos State and advises the State Govt on environmental management policies
Constitution of the Federal Republic of Nigeria	1999	F	(Section 20) The federal government is empowered to protect and improve the environment and safeguard water, air and land, forest and wildlife
Lagos State Environmental Sanitation Law	2000	L	Requires the State citizens to clean their property on the last Saturday of the month
Policy guidelines on solid waste management	2005	F	This document provides a good overview of how solid waste management should be organized in Nigeria, which organization is responsible for what etc.
NESREA Act	2007	F	Establishment of the National Environmental Standards and Regulations Enforcement Agency
National Environmental Regulations	2009	F	Legal framework for the adoption of sustainable practices in environmental sanitation and waste management to minimize pollution
Natl Env. (WEEE) Regulations	2011	F	Imports of near end-of-life and waste electric and electronic equipment are banned.
Lagos Waste Management Authority Law	2015	L	Legal basis for the establishment of the Lagos State Waste Management Authority (LAWMA)
Environmental Protection Law	2016	F	Stipulates that MoE will have advisory and mediating role; LAWMA in charge of licensing and regulating waste management; PUMAU in charge of developing a stratified billing regime

TABLE 10. LEGISLATIVE FRAMEWORK CONCERNING WASTE MANAGEMENT IN NIGERIA / LAGOS.

In Nigeria, Local Government Areas (the third level of Government) are formally responsible for proper waste management. In practice, however, waste management is organized on a state level (the second level of Government). In Lagos the Lagos State Waste Management Authority (LAWMA) assumes this responsibility. Generally speaking, this situation makes it easier to achieve economy of scale in waste management.

According to Mrs. Dolapo Fasawe, the Director of the Lagos State Environmental Protection Agency LASEPA, the concept of Extended Producer Responsibility has been in the regulations since 2011. LASEPA is working with NESREA to implement EPR. Starting 2020, manufacturers, importers and assemblers will have to pay a fee for the proper disposal of the goods they put out on the market. If this materializes, existing EPR systems in Nigeria (FBRA for food and beverage packaging and EPRON for e-waste) are expected to get a major boost.

Table 11 provides an overview of the institutions involved in the municipal solid waste management chain in Lagos State, and the primary roles they play.

Institution	Primary roles related to Solid Waste Management
Federal Ministry of Environment (MoE)	• Issue waste legislation and policy guidelines at the federal level • Develop a Solid Waste Management Master Plan • Provide Technical Assistance to States and LGA's
Natl Env. Standards and Regulations Enforcement Agency (NESREA)	• Enforce compliance with environmental laws, guidelines, policies and standards • Conduct environmental audits • Create public awareness and provide environmental education
State Government	• Issue waste legislation and policy guidelines at state level • Provide financial instruments for private sector participation (PSP) • Provide land for Solid Waste Management activities
Lagos State Waste Management Authority (LAWMA)	• Responsible in practice for waste management in Lagos State • Contract, supervise and control the PSP's • Clean public areas, manage TLS's, oversee dumpsites
Lagos State Environmental Protection Agency (LASEPA)	• Advise the State Government on all waste management policies • Carry out awareness campaigns on sound waste management • Monitor waste management and environmental degradation in Lagos St.
LGA's and LCDA's	• Formally responsible for waste management in their area (but in reality, in Nigeria the waste is managed at state level) • Ensure that the waste is properly collected
Private Sector Participants (PSP's)	• Collect, transport and dispose of the waste in a designated area • Collect the waste fees from the citizens
Informal sector	• Collect and trade recyclables from households, along the street and from dumpsites

TABLE 11. ACTORS IN WASTE MANAGEMENT IN LAGOS STATE AND THEIR PRIMARY ROLES.

In the 2005 Nigerian Policy Guidelines on Solid Waste Management, it says that the private sector should participate in solid waste management on a cost recovery basis. A similar approach was adopted in Ghana, however, with a very different outcome. In Ghana this has led to the emergence of one dominant player in waste management, being the Zoomlion/Jospong Group. In Lagos, the public Lagos State Waste Management Authority (LAWMA) dominates the waste sector and cooperates with hundreds of small-scale Private Sector Participants. In many cases, these PSP's have evolved out of the informal sector. In an international perspective, this could be viewed as a successful case of professionalization of the informal sector.

5. Doing business with the Nigerian private sector

5.1. Private sector

Table 12 provides an impression of the kind of companies which are active in the waste management sector in Lagos and other parts of Nigeria. Some companies participated in the brainstorm session at the Dutch Consulate, while others are corporate members of the Waste Management Organization WAMASON. The list is by no means complete.

Name company	Description	Website
Alkem Nigeria Ltd	Plastics recycling	www.fibresyarns.com
Chanja Datti Recycling	Recycling company in Abuja, focusing on plastic, aluminum cans, paper, cardboard, glass bottles and tires	https://www.chanjadatti.com/
Del Waste Management Co	Waste management services to the oil and gas industry	www.delwastemgt.com
Earthcare Nigeria Ltd	Commercial producer of organic fertilizer	www.earthcarecompostplus.com
E-Terra Technologies	E-waste recycling and data destruction	https://www.eterra.com.ng/
Geocycle	The waste management service provider of LafargeHolcim	www.lafarge.com.ng/geocycle
Globetech Remedial	Waste management services for industrial and municipal clients	www.globetechremedial.com
Hinckley Group	A.o. Recycling of e-waste	https://hinckley.com.ng/
Incycle	Social venture focusing on recycling of metal and e-waste	https://www.f6s.com/incycle
Jawura Environmental Services Ltd	Environmental studies, lab services and field sampling	https://jawura.com.ng/
RecyclePoints	Social enterprise for the recycling of PET, cans, water sachets, paper, glass and carton	http://www.recyclepoints.com/
Scientific Ideas Limited (SIL)	A.o. design of waste management plans for municipalities and industries	https://scientificideasltd.com/
The Initiates PLC	Waste management, industrial cleaning and decontamination services	http://initiatesgroup.com/
Wastecare Solutions and Resources Management Ltd	Development of effective waste management and recycling systems	www.wastecaresolutionsng.com
Wecyclers	Social venture offering waste collection services for households and industries	http://wecyclers.com/
WestAfricaENRG	Waste collection and recycling services, incl. via a Materials Recovery Facility (MRF)	http://www.westafricaenrg.com/

TABLE 12. EXAMPLES OF COMPANIES IN THE WASTE MANAGEMENT SECTOR IN LAGOS / NIGERIA

Many of the prominent waste management companies in Nigeria focus on industrial clients, especially in the oil and gas industry. Some are social ventures such as Incycle, RecyclePoints

and Wecyclers. The hundreds of Private Sector Participants in the waste management sector in Lagos are not in the list as they are mostly SME's. A directory of PSP's can be found on LAWMA's website at https://www.lawma.gov.ng/psp-directory/.

For Dutch companies interested in doing business in waste/CE in Nigeria, the companies in Table 12 are potentially promising private partners to talk to. LAWMA is an important contact as well. As for the PSP's, their purchasing power is probably not sufficient to enter into serious negotiations about new waste collection equipment with Dutch suppliers. For second hand equipment the situation is different. During their visit to the Olushosun landfill, the Dutch team noticed that business contacts between the Netherlands and Nigeria have been quite well established in this area (see picture).

5.2. Doing business in Nigeria

(A special guest appearance by Mrs. Thessa Brongers Bagu, the (originally Dutch) Managing Director of Naijalink Ltd, a Lagos based business support company. More info on http://linkedin.com/company/naijalink/)

Nigeria can be a profitable place to do business. Virtually every industry is under-serviced, and opportunities abound everywhere. Many international companies are benefiting from the opportunities. International giants like Heineken, Shell and FrieslandCampina have been successful in Nigeria for decades, while in more recent years there have been a multitude of international companies entering the market, including in 'newer' sectors like fintech and clean tech. However, a weak legal sector, public sector corruption, multiple taxation, high cost of finance and fluctuating FX has made doing business in Nigeria quite challenging.

The business culture is heavily influenced by the US and Europe - places where many senior Nigerian managers and directors will have gone to university. Besides, countries like the Netherlands are among the main trading partners for Nigeria. Generally, Nigerians are welcoming, friendly (if loud) people who speak in a direct way so you tend to know where you stand. However, there are some differences:

- It's a relationship economy where building and maintaining relations is essential to winning business.
- There is often only one real decision maker in a company.
- No response or acknowledgment of email sent does not always mean a lack of interest. Emails are often not read.
- Face to face meetings are preferred over phone and email.
- A confirmed meeting may not go ahead and requires re-confirmation even on the day itself.

- It can take a long time (1-2yrs) before a first contract and a sale. However, once the contract has been awarded, a client would want you to deliver 'yesterday'.
- Seniority commands respect, so do wealth and success. Older, wealthier people can be very sensitive to how respectful they are spoken to. Moreover, and despite the hot climate, you're expected to show up dressed the part.
- "Africa time" is a real factor and you'll have to be patient. Having said that, in Lagos people tend to show up for meetings on time.

We often hear that Nigeria is "not as bad" as people heard, but key is to work with someone who knows the terrain. Most international companies will, at least at the start, work through a local partner. Generally, there are some tips that make succeeding in Nigeria easier:

- Identify a suitable partner: Choose a local partner who has international experience and a track record of growing similar businesses. The main risk is not to have a fraudulent partner (those scams are quickly spotted) but one that doesn't have the capacity to deliver results.
- Tweak and target your proposition to Nigeria. Something that works in another country in Africa does not necessarily work in Nigeria. Be affordable: pricing is a very important part of the proposition. Moreover, have a strong after sales proposition. If people want only cheap, they'll look to Asia, so make clear why it helps the client to work with you.
- Make sure you get paid. Luckily, it is accepted in Nigeria that there has to be 100% payment up front. Offer credit facility only to reliable partners and get export credit insurance.
- Build those relationships: Commit to visiting the market regularly and build a network of partners/clients. A successful partner generally works with several other international companies -they need to have you top of mind.
- Avoid going for cheap: work with reputable service providers such as lawyers, advisors, cargo companies etc. Otherwise: penny shy, pound foolish.

At the end of the day: doing business in Nigeria can be challenging, but the most significant gains fall on those willing to commit and adapt. We are happy to support you every step of the way. Talk to you soon? info@naijalink.eu.

5.3. Sector organizations in waste and CE

The **Waste Management Society of Nigeria** (WAMASON, www.wamason.org) unites companies and individuals working in the waste management sector in Nigeria. It works on capacity building within the waste industry, awareness campaigns among the public to promote proper waste handling and it also provides policy support to the Government of Nigeria. According to the website environmental-expert.com, WAMASON has over 6,000 members cutting across private and public sectors including the academics. The National Secretariat can be reached at Tel. +234 8180208198.

The **African Circular Economy Network** (ACEN, https://www.acen.africa/nigeria) is a network organization promoting the transition towards a circular economy in countries in Africa. The Nigerian chapter is represented by Mr. Paul Nekabari Visigah, nekabari.visigah@gmail.com.

5.4. Trade events

- **African Waste Management Exhibition & Conference,** Lagos, 24-26 September 2019. More info: http://africanwastemanagementexpo.com/. Note that the website says that this event had to be postponed indefinitely.
- 27-30 April 2020 the **Nigeria Waste to Wealth Conference and EXPO** will be organized by the Abuja Chamber of Commerce and Industry. The venue will be the Waste to Wealth Conference and EXPO in Abuja. Parallel to this event, the European Union will organize a **Circular Economy mission** to Abuja and Lagos.
- **CSEW** Cleaning, Sanitation, Environment and Waste Management Expo and Conference, Abuja, May 19-21, 2020. Info: info@bkgexhibitions.com.

5.5. Dutch network, cooperation projects and support instruments

On July 10, 2019, the Netherlands Consulate General in Lagos was officially inaugurated by Mrs. Sigrid Kaag, the Dutch Minister of Foreign Trade and Cooperation Development. This is a clear sign of the importance of Nigeria and Lagos State to the Dutch Government. The Consul-General Mr. Jan van Weijen and his team are ready to help Dutch entrepreneurs in waste management and circular economy to become active in the country.

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Tel. +234 803 659 0871
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An updated list of bilateral cooperation projects can be found here:
https://projects.rvo.nl/section/development-cooperation/

The current list of support instruments by the Dutch Government and the European Union can be consulted at the following address:
https://www.rvo.nl/subsidies-regelingen

Table 13 shows the support instruments which currently can be applied for environmental projects in Nigeria (see the website for detailed information).

Dutch support instruments valid for Nigeria (Feb 2020) (random order)			
DHI	FVO IMVO Conv.	PIB	SIB Kennisvoucher
DGGF	FVO Samenwerk.	SIB Coachingsv.	SIB Missievoucher
FBK	DRIVE	SIB Beursdeelname	SIB Marktentree

TABLE 13. DUTCH SUPPORT INSTRUMENTS VALID FOR NIGERIA

7. SWOT, conclusions, recommendations

7.1. SWOT analysis (random order)

In Table 14 an overview is provided of the current strengths, weaknesses, opportunities and threats related to doing business in waste and circular economy in Lagos.

Strengths	Weaknesses
• Lagos is a huge city, so you can achieve economy of scale • Young population that is eager to work • Relatively good education level and people speak English • Entrepreneurial people, no "donor disease" • Lagos is relatively safe and the safety situation is improving • Good access to sea transport because of the port • Existing collaboration between stakeholders in the waste sector	• Bad road infrastructure • Electricity supply very unstable, many generators • At the national level, only 25% of the waste is collected • Low availability of data • Widespread corruption • Political instability, many changes when govt changes (e.g. VisionScape) • Environmental and water stress • Local financing of environmental projects is a problem
Opportunities	**Threats**
• Opportunity to work with young leadership, educated abroad • Hook on to Trade Fair on Waste in Abuja and EU mission 27 30 April 2020 • Availability of financing, low interest loans, grants • More privatization in the waste sector • Wild card opportunities (e.g. PET, grease from restaurants, waste textiles)	• Foreign competition, especially the Chinese

TABLE 14. SWOT ANALYSIS WASTE AND CIRCULAR ECONOMY BUSINESS IN LAGOS

7.2. Conclusions

- Same as in many other countries, in Nigeria the legislative framework in waste management is pretty much in place. This is important as the waste management sector is very much dependent on legislation and enforcement. However, in practice, **governance in the waste sector is weak**. One major flaw is the fact that Private Sector Participants (PSP's) are responsible for collecting waste fees from households. Another problem is a general lack of enforcement of the rules in all phases of the waste management chain. Political changes can be undermining as well, as we saw when the company Visionscape took over waste management in Lagos State in 2017, pushing most PSP's out of business.
- Lagos is definitely a city where you can achieve **economy of scale**, considered important in efficient waste management. The two main challenges of Lagos – a permanent traffic heart attack and frequent power outages – may actually be drivers for change in waste management. Contrary to other cities in Western Africa, some transfer loading stations have been established already in Lagos (to enable bulk transport of waste during the night) and more are planned. The electric power problems may one day serve as a driver for the implementation of Waste-to-Energy (mass burn facilities, anaerobic digesters), although a number of problems will still have to be overcome such as the weak power grid, the lack of financing in the waste sector and vested interests in electricity supply.
- In Nigeria, Lagos is considered the frontrunner in waste management. The **Lagos State Waste Management Authority** (LAWMA) has an ambitious plan to professionalize waste management, e.g. through a source separation program (the Blue Box Initiative) and the establishment of Regional Community Recycling centres in all 57 constituencies. For Dutch suppliers of products and services in waste management interested in doing business in Lagos, LAWMA is a key contact. To the point that if a business mission is organized to another country in Western Africa, it is considered worthwhile to invite representatives of LAWMA.
- In the execution of waste services to households, LAWMA relies heavily on so called **Private Sector Participants** (PSP's). These SME's are generally too small to be serious clients for Dutch goods and services, with the exception of second hand equipment.
- The Expert Team focused specifically on organic waste, e-waste, plastics and a "wildcard". In all waste streams promising **business opportunities** were identified. In organic waste, a cooking oil recovery program could be set up to turn this into biodiesel. In e-waste the focus could be on the collection and processing of batteries for USP's and solar installations. And in plastics the need has been expressed for a PET processing facility. The recycled flakes could be exported but they could be reused in Nigeria as well. As for the wildcard, the recycling of textile waste came out as the most promising option.
- For a number of reasons Nigeria and Lagos tend to have an unfavourable image among foreigners. Occasional emails from Nigerians promising Westerners a major inheritance if they pay a deposit do not help any. However, paradoxically this also reveals the **entrepreneurial spirit** in the country. As Mrs. Thessa Brongers Bagu puts it in this report: in many occasions, it turns out that Nigeria is "not as bad as people heard". This can be confirmed by the Expert Team which interacted most productively with its Nigerian counterparts.
- The **University of Lagos** (especially Dr. AbdulGaniyu Adelopo and Mrs. Afolasade Nubi) has proven to be a most productive partner in the execution of the scoping study. With

70,000 students, the university itself can be a most fertile testing ground for new approaches in waste management in Lagos / Nigeria.

7.3. A future view and recommendations for a Roadmap

A future view on waste management in Lagos would have at least one scaleable recycling center in each community. From a logistics point of view, some (or most?) of these Community Recycling Centres (CRC's) would have to double as a Transfer Loading Station.

In addition to source separated collection and recycling, a city the size of Lagos will in the forseeable future need several waste incinerators, a dedicated medical waste incinerator, as well as composting and/or digestion sites in more rural areas.

Before sending residual waste to incinerators or landfills, part of it may be processed into RDF (under specs) for cement kilns.

In spite of the slogan "Waste is Wealth", which is quite widespread in Lagos State, waste management is a net cost factor. By good planning, valuable items can be retrieved from the waste and reused in a circular economy approach. Source separation with blue (dry recyclables) and in some zones green (organics) boxes will be key. This will create valuable niches and lower the overall cost of waste management. Just focusing on the valuable niches however would undermine the health and hygiene role of waste management.

This waste management infrastructure will have to be paid by municipal taxes and the introduction of Extended Producer Responsibility (EPR). The societal costs (environment, economy, healthcare) of not acting on the waste management challenge are expected to be way higher than investing in waste management.

The mission has yielded many ideas for a multi-annual Nigerian-Dutch Roadmap on Waste and Circular Economy. For starters, there was the well attended brainstorm session session at the Royal Netherlands Consulate-General on Monday 28 October 2019.

FIGURE 8. IMPRESSIONS OF THE OCTOBER 28 BRAINSTORM SESSION AT THE CONSULATE

Attendants of the brainstorm were asked individually to submit their ideas on possible business and cooperation projects. Annex 1 shows 19 entries. Table 15 provides a summary.

Theme	Specific topic	# of entries
Awareness raising	• The importance of source separation • The importance of e-waste recycling • Etc	8
Capacity enhancement	• Food & beverage waste recycling • E-waste recycling • Recycling logistics • Plastics recycling • Co-processing waste in cement kilns • Composting practices • Equipment fabrication for waste processing	7
Policy strengthening	• EPR packaging • EPR car tires • Recycling policies @ state level	3
Trade in recyclables	• Trade with the Netherlands in PET flakes	1

TABLE 15. SUMMARY OF PROJECT IDEAS PROVIDED DURING THE OCT 28 BRAINSTORM

Most ideas center around awareness raising and capacity development. These are elements to include in the design of follow-up activities. However, it should be taken into account that the waste and circular economy sector requires an integrated chain approach. As an example, an awareness program on the importance of source separation in households is useless if the different waste streams are not collected separately. So awareness raising and capacity building should not be isolated goals but rather elements of an integrated strategy.

On the basis of the Expert's mission and the input of the Nigerian stakeholders during the brainstorm session a list of recommendations has been developed for a "Nigerian-Dutch Roadmap on Waste and Circular Economy". The recommendations have been classified into long, medium and short term. Most of the recommendations have been mentioned earlier in the report. Some are public sector initiatives, others are oriented towards the private sector.

1/ Short term (1 year)

Issue	Project idea
Business promotion	Organization of a **waste/CE business mission to Lagos**, OR: organization of a side trip to Lagos as part of a waste/CE business mission to another country in Western Africa OR invitation of a group of key representatives of the Nigerian waste/CE sector to a waste/CE business mission in another country in Western Africa[5]
Municipal waste	To carry out a feasibility study on the use of the so called "OREX Organic Extruder Press" to **separate mixed municipal waste** in Lagos into a dry fraction (to be used as RDF in cement kilns) and a wet fraction (to be digested) (Possible partner: Dutch company Leapfrog)
Municipal waste	Team up with LAWMA to optimize the design of the **community recycling centers** and/or the **Transfer Loading Stations** to be established as part

[5] Note that a waste/CE business mission to Ghana is tentatively scheduled for 22-26 June 2020.

	of the source separation program (Blue Box Initiative). For demonstration purposes, a pilot project could be set up with the University of Lagos in which their existing waste separation station is optimized.
Oily waste	Carry out a feasibility study on the collection of **oily waste** from restaurants in Lagos and the conversion into biofuel (Possible knowledge partner: Dutch company Renewi)
Plastics	Conduct a study into the possibility of a **PET recycling facility** in Lagos. The upcoming LAWMA Blue Box Initiative and the 57 community recycling centers are expected to increase the amount of recovered plastics in the near future. Note that Heineken Nigeria is possibly interested to participate in this. The FBRA should be involved. Stiphout Industries could be a useful contact.
Plastics	Application of the so called **Ocean CleanUp Interceptor**, e.g. for "legacy flows" in the lagoon.
E-waste	Help Nigerian companies set up proper **WEEE recycling lines**, e.g. for refrigerators (ATN Engineering has this sort of technology which could be ideal for a pilot project)
Textiles	To carry out a feasibility study into the possibility of setting up a separate **collection system for textile waste** in Lagos State and processing the materials into second hand clothing or textile fibers. The amount of separated textile waste is expected to increase significantly because of LAWMA's initiative to promote source separation and the 57 planned recycling centers.
Circular economy	To set up a **Circular Business Community** (possible partner organizations: OXFAM NOVIB and the Nigerian Chapter of ACEN). Experiences with the Orange Corners program show that there is scope for young CE entrepreneurship in Lagos / Nigeria. In many ways, a Circular Business Community is a solid investment in a more sustainable future. An interesting add-on would be a **waste / CE business challenge** for students (possibly in the form of a "co-create my city" program with a special focus on waste and the circular economy).

2/ Medium term (1-3 years)

Issue	Project idea
Governance	Cooperate with Lagos State to set up a public **tax system** for waste management (both for households and the private sector) based on full cost recovery and taking into account the real costs of collection, transport, processing and final disposal of the residual waste
Plastics	As a demonstration project, set up a **PET free program** with the University of Lagos (70,000 students). The first phase of such program can be an on-campus return system for PET bottles, plus the installation of a washing and pre-processing unit at the waste sorting facility. In the second phase the students change to the use of "Dopper bottles", refillable at big bottle water outlets scattered around campus (at nominal cost). In the second phase the University of Lagos will become truly PET free.
e-waste	Together with EPRON and private recycling companies in Nigeria, set up a collection and recycling system for so called "**deep cycle batteries**" which are used in antennas for mobile phones. Nigeria has 42,000 antennas with batteries which have to be changed every three years. The spent batteries have no financial value but the long term environmental costs of those batteries ending up in landfills (or worse) is very significant.
e-waste	Help Nigeria to set up a proper repair, **reuse and recycling infrastructure.** ICT Milieu and Wecycle may be involved in this. Dutch

	companies such as Computerrecycle, Holland Recycling, IT-recycling, Krommenhoek Metals and/or Milieu PC may be interested to team up with Nigerian counterparts. It could be argued that part of the funds available in the Dutch EPR system for e-waste should be spent in Western Africa as we are shipping part of our e-waste there.
Circular economy	Team up with the Lagos State Government and the Nigeria Chapter of the African Circular Economy Network to map out a **circular economy strategy** fot Lagos State.

1/ Long term (3-5 years)

Issue	Project idea
Governance	Cooperate on the development of a "**Master Plan for Integrated Waste Management and Circular Economy for Lagos State**" with the State Government, LAWMA and other key stakeholders. This Master Plan would be a major step forward in waste/CE for Lagos State. Normally the first step would be to develop such plan on the federal level. In this case because of the size of Lagos State it may be possible to start with Lagos State and use the result as a model for a federal plan.
Organic waste	Set up a cooperation project on the introduction of **sustainable composting practices** in connection to LAWMA's "Green Box" source separation program and in combination with an awareness raising program on the benefits of the use of compost.
Plastics waste / packaging	Support the public and private sector in Nigeria in the implementation of a formal system of Extended Producer Responsibility **(EPR) in packaging**. This is not easy as a lot of interests are involved. However, the private sector companies have already teamed up in the Food and Beverage Recycling Alliance which is a good start.
e-waste	In the Netherlands itself, **ban all exports of waste and near-end-of-life EEE**, except to countries where this equipment can be properly processed
e-waste	Support Nigeria to further develop a proper Extended Producer Responsibility **(EPR) System for e-waste** on the basis of the existing EPRON organization. Compared to an EPR system for plastics / packaging, e-waste may be harder because most big private sector players have not joined EPRON yet.

You are cordially invited to join the LinkedIn Group "Towards a Roadmap Nigeria-Netherlands in Waste and Circular Economy" at:

https://www.linkedin.com/groups/8850147/

8. Sources and interviewed persons

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8.2. List of interviewed stakeholders and experts

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- Mr. Olaolu Olaleye, Co-founder and CEO of Maanar, olaolu.olaleye@gmail.com
- Mr. Olayinka Omotosho, Head, Ecology and Conservation, Lagos State Environmental Protection Agency (LASEPA), Tel. +234 909 915 5195, email: greatestluv1@yahoo.com
- Mr. Patrick Inoh, Plant Manager, E-Terra Technologies Limited, Tel. +234 806 234 7780, email: patrick.inoh@eterra.com.ng
- Mr. Taiwo Adewole, Executive Director of Recycle Points, Tel. +234 809 800 4005, email: taiwo.adewole@recyclepoints.com

Annex 1. List of participants in the Embassy brainstorm and their ideas on collaborative actions in waste and circular economy

Name	Company / Organization	Position	Area for cooperation	Project idea
Mr. Ifeanyi Ochonogor	E-Terra Technologies	MD/CEO President	Awareness raising and funding for the E-waste Relief Foundation (ERF)	Lagos e-waste capacity enhancement E-waste informal sector awareness creation and professionalization
Mr. Victor Dioji	E-waste Relief Foundation (ERF)	Project Officer	Education and awareness of the population and informal e-waste handlers	Partnership in the best method to spread the message of proper e-waste handling to the society
Mrs. Agharese Lucia Onaghise	Food and beverage Recycling Alliance (FBRA)	Executive Secretary	- Advocacy campaigns - Collaboration for technology and recycling	1/ Advocacy programs, education and awareness 2/ EPR Implementation 3/ Technology for recycling food and beverage waste solutions
Mr. Olayinka Omotosho	LASEPA	Head, Ecology and Conservation Department	Capacity building at the local level on single use plastics and management	Seminars / Workshops at ten local governments with laymen, market people and entrepreneurs on the dangers of single use polyethylene's in all forms
Boluwatife Arewa	Incycle Solution	COO (Co-founder)	Using technology in powering recyclables collection (for plastic, e-waste, paper, metal)	We would like to collaborate on powering our USSD[6] collection initiative

[6] USSD (Unstructured Supplementary Service Data) is a Global System for Mobile(GSM) communication technology that is used to send text between a mobile phone and an application program in the network. Applications may include prepaid roaming or mobile chatting.

A. Ramalingam	ALKEM Nigeria Limited	Chief Operating Officer	Technology and finance in plastics recycling	
Mr. Ibrahim Salau	Environmental Accord Nigeria Ltd	Managing Director	Conducting studies and Research	Consultancy
Mr. Greg Salami	Lafarge Africa PLC - Geocycle Dept	Operations Manager	Co-processing of waste for energy and raw materials for the cement industry	Waste collection related to WtE and possibly partnership in facility set-up and logistics
Mr. Daniel Adedokun	Lafarge Africa PLC	Head of Geocycle	Used tires, plastics waste (nylon, PET etc) co-processing in cement kiln	EPR system for tire collection, RDF
Mr. Ibrahim Odumboni	LAWMA	Executive Director	Recycling and EPR	- How to strengthen EPR in Lagos State - Bringing in other manufacturers from Netherlands that can use Nigerian PET generated from household sorting
Mrs. Temitope Dosumu	Lafarge Holcim (Geocycle)	Commercial Manager	Focus on international waste management	Collection of PET, tyres, laminates and commercial waste (destruction is carried out via waste processing)
Mr. Gregory Ohiaeri	Earthcare Nigeria Limited	Chief Operating Officer	Organic waste collection and processing	Organic fertilizer and protein production and marketing
Toro Baiyewu	Lagos State House Of Assembly (LSHA)		Recycling policies at state level	
Taiwo Adewole	Recyclepoints	Executive Director	Education, awareness raising, research and feasibility studies	Collection and feasibility studies development

Mrs. Belinda Osayamwen	Hinckley Recycling	Business Development Manager	Formalizing the informal e-waste sector (awareness and structuring)	With the E-waste Collectors Association of Nigeria (ECAN). The project will have to include awareness programs and incentives.
Mrs. Miranda Amachree	NESREA	Director of Inspection and Engagement	Capacity building for regulators on enforcement monitoring	Exchange programs on the role of Govt on recycling and collection of waste
Mazi Alison Ukonu	Recyclepoints / Recyclers Association Nigeria	CEO / President	Plastics Recycling	Community Engagement and waste recycling awareness
Dr. Akintayo Adiso	BASF	Manager Senior Projects Sustainability	Solutions for plastic waste	Waste to chemicals for local industry
Dr. Femi Oyediran	Environmental Laboratories Ltd	Managing Director	Chemical waste management and organic waste management	Buidling capacity on educating Nigerians Skill acquisition on handling of wastes Equipment fabrication for waste processing

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