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1. Background information

1.1 Description of the Work package 2

The work package 2 will establish a complete and cross-sectional diagnosis of the current situation of the solid waste management at a regional level in the targeted countries: Côte d'Ivoire, Ghana, Nigeria and Senegal. It will facilitate the proposal of appropriate technological and organizational solutions in work package 3, as well as policy guidelines and recommendations in work package 4.

Specific objectives include the following:

- To present a regional characterization and assessment of the targeted countries regarding SWM aspects.
- To identify key actors and stakeholders in the targeted countries
- To evaluate the current solid waste management practices in the targeted countries.
- To evaluate the national and regional policy and legislative frame, governance and socio-economic structure regarding SWM in the targeted countries.
- To detect and analyze main barriers and obstacles related to SWM in the targeted countries.

1.2 Objective of task 2.3

The objective of this Task is to identify the actors involved in data management in order to establish a database for disseminating the project outputs and information relating to solid waste management.

1.3 Methodology for the development of task 2.3

The key actors were identified according to the criteria defined in Work Package 1, task 1.2. "**Criteria for identification of relevant key stakeholders**". According to the instructions in this task, the key actors should be identified by answering the following four questions:

1. Who are the people/groups/institutions that are involved in the management of USW?
2. Which ones have an interest in establishing integrated waste management systems?
3. Who may impact or be impacted by SWM?
4. Who is concerned about SWM in a locality (village, town, region, district, country, international, etc.)

To answer these questions, a literature review was conducted and interviews were held with key resource persons in the identified organizations to ascertain what their roles and responsibilities are in waste management, and the extent of interrelationships between actors.

The actors are identified according to their level of involvement in the solid waste management chain. The relationships between the various actors were also identified.

We have not been able to collect data regarding the actors and their interrelation in Ghana. The bibliography we have identified does not provide information about waste producers.

A. SENEGAL

1. Identification of actors according to the field of waste management

The waste management sector involves various actors at the different stages of the process. In Senegal the actors identified along the chain from production to waste disposal are presented below.

2.1 Waste producers

At the production level, the main actors are households, industry (of which over 90% are in the Dakar region), shopping centres and markets.

In 2002, there were nearly 556 industrial businesses in the whole country and the Dakar region accounted for 537 of these (i.e. 96.9% of the total) and the department of Dakar managed 82.7% of the national total and 85.7% of the regional total. The density of industrial businesses in the department of Dakar was close to six per square kilometre, whereas it averaged one per square kilometre for the region and almost zero when averaged at national level.

The table below shows the level of waste production by region.

Table 1 Population and Waste Production by region in 2008

Region	Population	Waste production (tons/day)
Dakar	2 669 277	1441
Diourbel	1 243 663	609
Fatick	682 993	341
Kaolack	1 244 433	663
Kolda	1 045 698	544
Louga	783 403	391
Matam	505 813	223
Saint Louis	809 607	485
Tambacounda	734 827	309
Thiès	1 660 914	830
Ziguinchor	494 853	247
TOTAL	11 874 991	6 083

Source: APROSEN, 2008

The table below presents a summary of annual waste production by origin for the region of Dakar from 1988 to 2005.

Table 2 Summary of annual waste production by origin for the region of Dakar

	1988	1995	2000	2005
Population	1.440.000	1.832.000	2.175.000	2.584.000
Total waste production (Tons)	259.000	330.000	392.000	465.000
Household share (tons)	207.000	264.000	313.000	372.000
Markets share (tons)	41.000	53.000	63.000	74.000
Share from street-sweeping (tons)	10.000	13.000	16.000	19.000

Source: Agence Nationale de la Statistique et de la Démographie (ANSD), October 2005

2.2 Pre-collection

Two types of actor are concerned at this stage:

- Cart-drivers carry out pre-collection and intervene in two ways: regular collection against an average payment of 200 to 500 CFA in areas without regular collections and also collections against a monthly contract with dealers in poorly served areas.
- Local community organisations: these could be informal or linked to the collection system. The pre-collection is more built-in to the overall collection system in smaller towns or in the suburbs in the Dakar region. For example, in the Mbaou district, the GIE (Economic Interest Group) *Nouvelle Vision* has become specialised in the pre-collection of waste. This GIE carries out door to door collections using a push-trolley to bring the waste to a secondary point where a waste truck is ready and waiting.

In the Saint-Louis region, pre-collection is carried out by 15 GIEs using horse driven carts. The waste collected is carried to the Darou transfer site or to the waste skips along the *langue de Barbarie*.

2.3 Collection and transportation

In regions like Dakar, waste collection is outsourced to private operators. The latter are responsible for collecting and transporting waste to disposal sites. In Dakar there are deals with 14 such companies, a full list can be found in the annex of this document.

Secondary towns such as Ziguinchor and Mbour also outsource waste collection and transportation to private companies.

In the towns of Saint Louis, Kaolack and Thies, the municipal system is used. In the Thies region, each district carries out waste collection, except for markets and main transport routes which are outsourced to a private operator.

In districts with less than 100,000 inhabitants, the municipality carries out the collection using the more appropriate carts – as most streets are not paved mechanised operations are limited to tarmacked roads.

2.4 Waste recovery

2.4.1 Informal recycling

A large part of waste recovery is carried out by the informal sector. In Dakar, the waste pickers at the Mbeubeuss landfill have joined together and formed the Bokk Diom Association. The association has nearly 800 members who are active in the recovery of household and industrial waste.

There are also lone waste pickers who roam the cities.

Recovered metals are sold onto craftsmen who reuse aluminium, such as in the manufacture of kitchen utensils. These craftsmen, based in temporary and insecure sites, have grouped together to form the Association of Artisan Smelters.

2.4.2 Formal recycling

There are few experiences of formalised waste recycling. However, it is possible to look at the experience of the NGO LVIA in recovering waste plastic and establishing a processing centre for plastics in the region of Thies. The centre employs women to clean, grind and package the plastic, which is then sold on to industrial plastic factories.

A second plastic processing centre has been opened in the region of Kaolack.

The recovered and cleaned plastic is sold to national industries, such as the company *Transtech*.

For organic waste, there are a few initiatives looking to recover waste through the fabrication of compost. IAGU has partnered with the International Centre for Sustainable Cities to develop a project to use organic waste to make compost within one town district.

2.5 Disposal

A technical landfill site is being developed in the region of Thies. This site will accept waste from the Dakar region and will be run by a private operator (GTA Environment). A transfer and sorting centre is also being developed.

Currently, all regions dispose of waste in open dumps. In Dakar the *CADAK-CAR* Agreement entrusted waste disposal (control of trucks and waste burial) to three private companies. In other areas, waste is dumped at open sites without any treatment.

A landfill site was developed in the Saint Louis region. This landfill site has been in use since 2008 and is managed by the Municipal Development Agency for the town of Saint Louis. There are lots of technical failures at the landfill site, which does not conform to current industry standards.

The government ministry in charge of the Environment had begun construction of a landfill site in the town of Touba. The work was stopped following numerous technical difficulties encountered in the process. The project was financed by the Dutch Cooperation.

2.6 Financing

Waste management is an area of competence entrusted to local governments. Aside from the Dakar region which receives a state subsidy for waste management, the sector is financed by local municipalities.

The municipalities often receive financial support from development partners, such as the Luxembourg Cooperation or the Belgian Cooperation.

2. Identification of actors at institutional level

At the institutional level, the main actors are as follows:

3.1 Ministries

- **Ministry of the Environment and Protection of Nature (M.E.P.N)**

Waste management used to belong exclusively to state control. The Ministry of the Environment, through the Department of Environment and Classified Establishments (*DEEC*) applied policies relating to waste management.

In 1996 with the transfer of powers, urban solid waste (USW) management fell under local government responsibility. From then on, the state only managed dangerous waste.

The M.E.P.N. has regional services supporting its main mission, which is to implement central state policy. These services act as intermediaries between the state and local levels, and are also responsible for the execution of state policy on environmental protection, the fight against pollution and nuisances.

The DEEC develops environmental policy and ensures it is applied. It also monitors compliance levels of public and private programs on environmental policy, law and standards. Its role is more strategic than operational. The department has a “waste” office, which deals mainly with specific types of waste, as well as an “environmental impact study” office. Their role is principally environmental monitoring and technical support.

- **Ministry of Public Health and Living Standards (MHPCV)**

The Ministry is primarily concerned by USW management, in particular through the Department of Public Health, the Department of Collective and Individual Prevention, the Department of Living Standards, the Department of Nature and Landscape, the Department for the Fight against over-crowding, and *APROSEN*.

The national Department of Public Health implements hygiene and health policy on behalf of the Ministry of Public Health. The Department has decentralised services and agents sworn in to ensure hygiene measures are respected and the population is informed.

- **Ministry of Decentralisation and Local Government (MDCL)**

The Ministry provides technical and financial guidance to local government who received transfer of powers during the 1996 law dealing with the decentralisation of USW management.

The Department of Local Governments (*DCL*) provides technical support to municipalities and monitors the application of the Local Government Code. It prepares legislative and regulatory texts which oversee Local Government operations.

- **Ministry in charge of Industry**

The Department of Industry (DI) within this ministry oversees the management of waste from industrial sites. Together with the DEEC, it should provide a system of industrial waste disposal.

3.2 Local Government (CL)

According to Law n° 96-07 of 22nd March 1996, the Environment is one of nine areas of expertise transferred from central state responsibility to local government. The latter are therefore responsible for managing environmental issues in their respective regions.

Regarding waste management, the local authorities are wholly responsible for urban solid waste (USW). They should develop strategies for the entire community on the collection, transportation and disposal of household waste according to the Environmental Code and standards in force at the time.

The emergence of inter-municipal organisations should also be noted, most notably in the agreement in the Dakar region between: the Community of Dakar Agglomerations (*CADAK*) and the Community of Rufisque Agglomerations (*CAR*). Their joint mission is to monitor and provide household waste management, street maintenance and lighting for all of Dakar, Rufisque and suburbs.

Local governments are able to refer to relevant bodies of elected representatives, such as the Association of Senegalese Mayors (*AMS*). They are involved in capacity building, facilitation of resource acquisition, advocacy and institutional mediation.

The state provides support for large-scale works for which the local governments lack technical and financial capacity. The decentralisation approach also allows local governments to develop partnerships with foreign countries and take advantage of their expertise and/or financial assistance.

3.3 National Agencies

There are two main agencies: the Agency for Cleanliness in Senegal (*APROSEN*) and the Municipal Development Agency (*AMD*).

- **Agency for the Cleanliness of Senegal (*APROSEN*)**

APROSEN is a public agency providing advice and support, and assistance in decision making within cleanliness-related matters managed by the Ministry of Public Health and Living Standards.

Further to decree no 2010-1659, the Agency aims to facilitate and maintain better living standards for the welfare and vitality of the population across the whole country by constantly monitoring norms and promoting action for public hygiene.

Its responsibilities include:

- Developing policies and programs on behalf of the state to fight insalubrities, to help local governments with the planning and implementation of their waste management programs

- Contributing to building the material and technical capacity of local governments
- Maintaining constant technical, regulatory and judicial observation of waste management
- Participating in the drafting of legislative and regulatory texts relating to waste management
- Providing technical assistance to Industry in the field of waste management
- Promoting waste collection, recycling and recovery systems and programs
- Developing public information, education and awareness initiatives and supporting basic health initiatives
- Creating a waste management database
- Contributing to the consolidation of national skills in the field of waste management

- **Municipal Development Agency (ADM)**

The ADM is an institution that provides support to local authorities in the implementation of their activities. In this context it is involved in the management of household waste through the Program for Strengthening and Equipping Local Governments (*PRECOL*). This program aims to reinforce organisational and financial management, but also to increase local authority infrastructure and urban service provision. It is, therefore, involved in the CADAK-CAR Agreement to improve environmental monitoring in view of the closure of the Mbeubeuss landfill site. A support study has been carried out to accompany the management transfer for household waste management.

Aside from the ADM, other national agencies are also involved in USW management. One example is APIX which is currently leading the study for the rehabilitation of waste disposal from Mbeubeuss to Dakar.

3.4 NGOs

NGOs provide support to local authorities in waste management. They intervene at different levels; some through thematic studies e.g. IAGU; others such as ENDA through research, social support and awareness building; LVIA through recycling...

3.5 Development partners

Several donors and multilateral institutions help to finance projects in the solid waste management sector. In most cases the support provided is limited to a specific area of the sector and does not take into account the whole chain.

- **Luxembourg Cooperation**

Through program 25 of the 2007-2022 bilateral cooperation between Senegal and Luxembourg, five local authorities, in the regions of Louga, Saint Louis and Matam, will be equipped with efficient solid waste management systems by 2011. The local authorities are the districts of Louga, Dagana, Podor, Matam and rural community of Darou Mousty. The project aims to install the complete chain of household waste management. This will take place through three key activities in the target areas: the development of a manageable landfill, the construction of a waste transfer site and the purchase of collection equipment.

- **Belgian Technical Cooperation,**

This is financing action planned as part of the global clean-up of Saint Louis district. The support envisaged by the Belgian Cooperation is worth over 1 billion FCFA (roughly 1.7 million euros).

- **Canada: International Research and Development Centre (IDRC)**

With funding from the IDRC, IAGU is supporting the CADAK-CAR Agreement in the development of a strategic plan for integrated and sustainable waste management with the following objectives: mobilise and involve all actors, carry out an assessment of the current waste management system, carry out studies to identify the threats, opportunities, strengths and weaknesses of the sector, formulate a shared vision as well as an integrated and sustainable waste management strategy, prepare a three-year action plan, prepare a communication plan, prepare a monitoring and evaluation program, carry out pilot projects in waste recovery and recycling.

- **World Bank**

Through the Program for the Strengthening and Equipping of Local Government (PRECOL) established by the Municipal Development Agency, the World Bank is supporting the CADAK-CAR Agreement with the necessary resources for the recruitment of a consultant to prepare a Tender document for the selection of new operators in USW management.

Still within the parameters of PRECOL, the World Bank is also supporting the CADAK-CAR Agreement with a feasibility study for conversion operations of the open dump at Mbeubeuss.

- **French Development Agency (AFD)**

This supports the CADAK-CAR Agreement through a study into the institutional and organisational development of inter-municipal structures and aims to propose an adequate financing system. Long-term, they will propose appropriate statutes, optimal organisation and adequate funding mechanisms for the inter-municipal structures in the Dakar region.

- **United Nations Programme for Development (UNDP)**

The UNDP support fund for local initiatives to improve the urban environment, as part of the UNDP LIFE Programme, has also provided support to the management of household waste in secondary cities in Senegal. The LIFE programme is involved in the districts of Thies, Tambacounda, Rufisque and Kolda by supporting the development of pre-collection and recovery of household waste in the least urbanised neighbourhoods.

- **Dutch Cooperation**

This supports the Department of Environment and Classified Establishments through its scheme to put controlled waste disposal schemes in place in the ten regional capitals of Senegal and the cities of Tivaouane and Touba.

Table 3 Actors identified according to the level of involvement in the waste management chain

<i>STAGE IN THE CHAIN</i>	<i>ACTORS INVOLVED</i>
Waste production	General population, households, commercial facilities, public parks, factories, offices, bus stations
Pre-collection	Private collectors, collectors organised in associations
Organisation of the collection	Local authorities, CADAK-CAR
Transportation	Private operators, private cart owners
Recovery	Association Bokk Diom, women's groups
Recycling	Plastic recycling industry (Transtech), LVIA
Training of OCB, collectors, local representatives	APROSEN, IAGU
Financing	State, Municipalities, development partners
Collecting local taxes	Municipalities
Laws and regulations	Ministry of the Environment, Ministry of Public Health and Living Standards
Research	Universities, IAGU
Information/Communication	ENDA, APROSEN

Table 4 Key actors and their levels of involvement in the waste management chain

ACTORS	INTERVENTION LEVEL	LINKS WITH INSTITUTIONS	ROLE	Impact on waste management
1. Waste producers : Households Halls and markets Green spaces and roads	Local			Significant, as good waste packaging makes collection much easier
2. Key actors in waste management				
Private Operators (contractors)	Local	Contract with local authorities & with the state	Collection and transportation of waste	Significant
Cleaning staff	Local	Staff attached to municipalities	Road sweeping, rubbish collection	Significant
Recyclers	Local		Recovery of waste materials	Medium
Social communities	Local	Links with local communities and to private operators	Waste pre-collection	Weak
3. Institutional actors				

Ministry of the Environment and Protection of Nature	National	Support, collaboration and complementarities with other ministries looking at USW management and local authorities	Definition of laws and regulations Monitoring	Significant
Ministry of Public Health and Life Standards	National	Collaboration with the ministries involved in USW management and with local authorities	Definition of policies, laws and regulations	Medium
Ministry of Decentralisation and Local Government	National	Support local authorities	Support local authorities	Medium
Local authorities	Local	Manage implementation	Support from the state and development partners	Significant
APROSEN	National	Training, technical assistance to local authorities		Medium
ADM (Municipal Development Agency)	National	Financial assistance to local authorities	Local authorities	Medium
IAGU	Local	Research, technical support, training, planning	Local authorities, ministries, recyclers	Significant

ENDA	Local	Awareness building, technical assistance	General public, recyclers, local authorities	Significant
4. Development partners				
Luxembourg Cooperation	Local	Technical Assistance	Local authorities	
Belgian Technical Cooperation	National	Funding and Support	Local authorities	
International Research and Development Centre	Local	Funding for research & elaboration of strategic plan	IAGU	
World Bank	Local	Funding and technical assistance	CADAK CAR	Significant
AFD/ French Development Agency	National	Technical Assistance	CADAK-CAR	Significant
United Nations Development Programme	National	Funding and support		
Dutch Cooperation	National	Funding and support	Ministry of the Environment	Medium

Table 5 List of contact persons

Ministries		
Direction de l'Environnement et des Etablissements Classés	Ms Aita Sarr Seck Chef du Bureau Déchets et produits chimiques Khady Ndiaye Kebe	aitasec@yahoo.fr
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Local Government		
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B IVORY COAST

3. Identification of actors according to the field of waste management

The waste management sector involves various actors at the different stages of the process. In Ivory Coast the actors identified along the chain from production to waste disposal are presented below.

4.1 Waste producers

At production level, the main actors are households, markets, hospitals, industries, most of which are located in the port area, the industrial areas of Kumasi and Youpougon (in the District of Abidjan).

- **Industries**

The main industrial sectors are agri-food, energy (mining and production), chemicals and textiles which represent 80% of industry. The NSA¹ (General Population and Housing Census, 1988) lists 2,822 industrial establishments in Ivory Coast with 92.8% of these located in Abidjan, and the rest in San Pedro and Bouaké.

On the environmental front, there isn't a specific process in place for the disposal of hazardous waste. In 1990, only 9 industries had a wastewater treatment plant (ANDE, 2002). For industrial waste produced by classified establishments, part of the waste, mainly those that are solid or paste-like, is diverted and disposed of alongside other general waste in an uncontrolled landfill site which also receives household waste from Abidjan city (traces of cyanide and mercury have been detected).

Other industrial waste is from electrical energy (polychlorinated biphenyls – PCBs - unmeasured), waste oil from vehicles. Solid industrial waste has been estimated to be 150,000 tons (MINEEF/DCV, 2001).

- **Households**

There are lots of companies operating in the careless collection and dumping of household waste in the saturated site of Akouédo (DCV, 2001). In 2001, the Department of Life Standards estimated household waste production to be 2 million tons with a collection rate of 50%; which is a far cry from the situation in 1988 when 70% of urban households saw their waste collected by rubbish collection trucks.

In the city of Abidjan and its surroundings, the areas poorly served or not served at all in terms of collection are those with lower living standards and in spontaneously built settlements (i.e. unplanned). Before the crisis, the level of waste collection was around 60% and the total collection in Abidjan came to 683,000 tons (BNETD, 2002). Currently the collection rate is much lower, with around 1 million displaced people.

In 2009, the World Bank initiated an emergency urban infrastructure programme (PUIR) with an urban waste collection component for the District of Abidjan. The projected amount of

¹ National Statistics Agency

solid waste to be removed from illegal dumps was 500,000 tons (over 3 months). Of this, 98% was collected in the district of Abidjan. The project was deemed to have been very successful in its implementation. It will continue until the end of December 2010.

In inland cities, local authorities are currently unable to finance the collection and disposal of household waste with their own resources, once carried out by now outdated equipment. The CARE Ivory Coast programme intervened to assist in household waste management in the towns of Bouaka and Korhogo.

There is no waste collection system in rural villages and waste is thrown into the country side.

4.2 Pre-collection

• Background

Pre-collection is a predominantly informal activity. It consists of sorting solid household waste from the neighbourhoods not served by the collection trucks for access reasons, and bringing the waste to dumping points: skips – installed by the collection companies, vacant land, valleys or even in the lagoon. This started in 1991 when SITAF, the contractor at the time, showed weaknesses. The problem has grown ever since and other contractors have not had any choice other than to deal with pre-collection and the pre-collection agents as this brings the waste out from neighbourhoods that collection trucks cannot access. This covers numerous precarious neighbourhoods in all areas of the city except for *plateau*. The average annual waste production is estimated at 21,049.55 tons per year.

• Organisation

Current pre-collection is carried out by cooperatives, youth groups, GVC (Cooperative-like groups) or individuals who operate privately and informally. These pre-collection agents, undeniable actors, deal with 70% of household waste not managed by the sector. In most cases, the pre-collection agents are registered in different communes. They own modest equipment, mainly two or three-wheel man-powered wheelbarrows, shovels, rakes, forks, gloves and facemasks, and very occasionally overalls. In the district of Abidjan, pre-collection is carried out as follows: door to door (bins, buckets or rice sacs and black bags), deposits in masonry points near households, deposits in skips and dumps.

• Typology of the pre-collection actors

As part of the PIUIR project (Operation Clean City) funded by the World Bank, a census held in the Youpougon neighbourhood (district of Abidjan) from the 18th to 22nd May 2009 helped to identify and define the typology of the actors involved in pre-collection. As such, the main actors define themselves as laid out in the following table.

Table 6 Main actors

Actor	Function
Head of the depot point	As owner of the depot, he manages the activities that take place there
Depot officer	Under the direct supervision of the head of depot, he is responsible for recording the hours worked by the different stakeholders

	for payment. Due to the financial crisis there currently there aren't any of these officers
Shifter	Equipped with a pitchfork, he is responsible for moving the rubbish dumped on the ground into the skips
Sweeper	He keeps the depot tidy
Sorter	He recovers certain rubbish items from the rubbish (plastic or glass bottles, metal etc)
Wheel barrow/carter	Equipped with a cart or wheelbarrow he collects rubbish from households to bring to the depot
Tractor driver	He manages and drives the tractor in the different neighbourhoods to collect rubbish to supply the depot
Dustman	He assists the tractor driver during collection trips
Mechanic	He maintains the tractors

- **Financing of pre-collection actors**

The initial financing of these pre-collection "SME" agents is mainly made up of personal contributions by the founder(s). Then, added to that comes the contributions made by households for the agents to carry out their pre-collection services. In general this amount varies according to the neighbourhood and isn't always very accurate depending on the different actors.

Table 7 Financing of pre-collection actors in Yopougon (District of Abidjan)

Type of actor	Earnings	Source of earnings
Head of depot	(700 – 1800 F per ton)	(Operator)
	- 500 – 1000 F per month (household)	Households
Depot officer	40000 – 50000 F CFA	Head of depot
Shifter	3000F per skip	Head of depot
Sweeper	1000F per day	Head of depot
Wheelbarrow man	25-100F per collection (household)	Household (independent)
	Not specified (Head of depot)	Head of depot
Tractor driver	150F per trip	Head of depot
Dustman	125F per trip	Head of depot
Mechanic	Not specified	Head of depot

4.3 Collection and transport

- **District of Abidjan**

In the District of Abidjan, waste collection is outsourced to private operators. A contract is signed between the District of Abidjan and the private service provision companies following

an open consultation. Four companies have state authorisation to collect household waste in the district of Abidjan. They are:

- Lassire déchets services (Lds);
- Clean Bor-Côte d'Ivoire;
- Intercore ;
- Ciprom;

Collection equipment consists of ampliroll lorries, tipper lorries, forklifts, tractors, compressors (packer).

The operators with state authorisation are responsible for the collection and transportation of waste to the Akouédo dump which opened in 1965.

- **Secondary cities**

Secondary cities, outside of Abidjan, manage their own household waste collection services. Waste is collected and transferred either to a managed landfill or to an undeveloped site for incineration. This service is carried out under the technical management of these secondary cities.

4.4 Waste recovery

4.4.1 Informal recycling

Recycling relies largely on the informal system. Plastic waste is recovered by “manna-féréla” as the waste pickers on the Akouédo site are known, meaning “plastic seller” in the local Malinke language. These waste pickers can be found in increasing numbers around water points in the Ivorian economic capital (Abidjan) where they treat over 2 tonnes of plastic bags per day.

The recovered plastic bags (see Figure) are washed, dried, packaged into bales, weighed and sold to industrial actors, mainly Lebanese traders. The plastic waste is sold for 100 CFA per kilo.

4.4.2 Formal recycling

In Ivory Coast, there are some structures that have become interested in recycling solid waste.

In the TIP SARL factory, in the industrial area of Youpougou (district of Abidjan), the 200 tons of waste plastic bought each month are polyethylene of preference, unmixed with other types. In fact, recycling plastic becomes problematic when the plastic is made of different compositions as they are not compatible. The reaction temperatures vary and final product quality is lost when different plastics are mixed together. Chemical transformation is possible, but this option is not very developed in Ivory Coast as it is expensive. It involves decomposing the constituent polymer macro-molecules into something reusable. The plastic material is de-polymerised under heat influence and/or a chemical compound. Depending on the method used, the process brings the material back to the monomer which existed at the very beginning or to basic petrochemicals.

Several other companies are also carrying out plastic waste recycling in Ivory Coast. Aside from the TIP SARL, we can take the examples of Kim-Plastique and CI-plast (Plastic processing company). The latter received a prize from the University of Abobo Adjame for

efforts made in recycling. It was recognised as one of the best companies in terms of the collection and recycling of household and agricultural items.

Two main industrial zones are affected, Youpougon and Koumassi. The final products vary greatly: from kitchen utensils to awning used as sun shelter at the many ceremonies which form part of everyday life (parties, funerals), shoes, packaging, bin bags, buckets, shovels etc. In fact, with plastic waste the same objects can be reproduced. It is also possible to produce agricultural equipment. This is the case of CI-PLAST which produces nursery bags (for seed planting) and rubber cups.

4.5 Disposal

The Akouédo dump is an unmanaged landfill site since industrial and other non-household waste are also brought here without any particular precaution, nor treatment nor recovery.

This area of waste disposal in the city of Abidjan is in a peri-urban area, 47km from the centre of town and near the Ebrie village – from which it gets its name. It occupies a small valley from which natural drainage heads to the Ebrie lagoon less than 2.1km away. The choice of site was influenced by economic considerations.

Akouédo indiscriminately receives all household, industrial and other waste from the city, including chemical, toxic, flammable and biomedical waste. Waste control, which amounts to weighing, is done at the entrance. The landfill, having received household waste over the last 34 years, has shown pockets of gas which should be managed with the security of the local population in mind.

The next planned technical landfill (CET) will be at Atiekoi, to replace the Akouédo site, however this is situated near to the ground water zone which supplies Abidjan. In this context, it is highly desirable to review the strategy for household waste disposal in Abidjan.

4.6 Financing

Law n° 80-1180 of 17 October 1980 on municipal organisation, amended by laws n°85-578 of 29 July 1985 and 96-611 of 3 August 1995, mandates operating municipalities to take charge of the management of household waste. In secondary cities, waste management is carried out by the municipalities. The latter ensure finances are available for the sector.

In the district of Abidjan, the state finances solid waste collection through ANASUR.

In 2009 and 2010, the district of Abidjan received significant financial support from the World Bank for the sector of pre-collection and collection of solid waste.

4. Identification of actors at institutional level

Waste management in Ivory Coast involves multiple stakeholders. The institutional frameworks not only affect formal government structures, but also informal structures created by institutions, associations and other community organisations whose involvement can vary, along the whole process of waste management. At institutional level, the main actors are:

5.1 Ministries

- **Ministry of Environment, Water and Forestry (MEEF)**

This ministry is responsible for the implementation and monitoring of government policy in terms of water and forest protection. In this context and in collaboration with other interested departments, it must initiate and be responsible for the following actions for environmental and living conditions:

- Preparation of environmental policy and planning, monitoring and evaluation of what is carried out;
- Development of laws and regulations concerning environmental and natural protection, and monitoring their implementation ;
- Monitoring, together with the Ministry of Foreign Affairs, the implementation of international agreements in terms of the environment and the protection of nature;
- Monitoring of activities carried out by the Sustainable Development Commission;
- Monitoring of projects funded by the Global Environment Fund (GEF) and the United Nations Environment Programme (UNEP) together with the Ministry of Public Health, the Ministry of the Economy and Finances, the Ministry of Foreign Affairs and the Ministry of Cities and Urban Sanitation;
- Promotion of environmental services provided in the network of national parks and nature reserves in liaison with the Ministry of Tourism and Crafts
- Protection and promotion of aquatic ecosystems, rivers, lagoons and beaches, and humid areas ;
- Management of national parks and nature reserves in liaison with the Ministry of Tourism and Crafts;
- Monitoring of classified installations for environmental protection;
- Coordination of the management of major natural hazards;
- Information, education and awareness-raising in environmental matters in liaison with the Ministries of National Education, Higher Education and Scientific Research, and communication of Public Health
- Capacity building in the management and monitoring of industrial waste;
- Participation in the monitoring of sewage and drainage networks, in liaison with the Ministry of Construction, Urban Development and Housing and the Ministry of Urban Sanitation;
- Supervision and monitoring of industrial, agricultural, toxic or dangerous waste in collaboration with the affected ministries;
- Forest protection and fighting bush fires, in liaison with the Ministry of Defence and Civil Protection and the Ministry of Agriculture;
- Development and monitoring of government policy in relation to the prevention of risks caused by household, hospital and industrial waste, in collaboration with local authorities and the Ministry of Cities and Urban Sanitation;
- Promotion and development of renewable energy, in collaboration with the Ministry of Mines and Energy.

- **Ministry of Youth, Sport and Sanitation**

Since the toxic waste crisis which generated so much debate around the management of waste in Ivory Coast, and with government training and direct dialogue, the Ministry of Cities and Urban Sanitation was created by decree N° 2007-458 of 20 April 2007. It was the first official interlocutor with the agents of the sector of household waste management. In March 2010, this ministry was replaced by the **Ministry of Youth, Sport and Sanitation** by decree N° 2010-32 of 4 March 2010. In addition to its responsibilities towards the youth and sport, this ministry also holds the initiative for and responsibility for urban sanitation, through the following actions:

- Assistance and advice to Towns, Districts and Communes, in conjunction with the Ministry of the Interior;
- Project management, approval and monitoring of waste disposal infrastructure for urban and suburban household and industrial waste disposal;
- Regulation and monitoring of urban sanitation, particularly in terms of health risks linked to household and industrial waste;
- Preparation of regulations for sanitation;
- Prevention and alerts to urban pollution, in conjunction with the Ministry of the Environment, Water and Forestry;
- Fight against urban pollution and decay in liaison with the Ministry of the Environment, Water and Forestry;
- Promotion of cleanliness and the civic duty for sanitation and living standards in the city;
- Creation and monitoring of the management of a support fund for projects working on the development of urban sanitation in collaboration with the Ministry of the Economy and Finances;
- Support to economic actors in the sector.

In order to fulfil its mission, there is a Department for Urban Sanitation Operations (*DOSU*) responsible for the planning and management of urban waste management (plans, management guides and regulations), a National Agency for Urban Environmental Sanitation known as *ANASUR* and an Urban Sanitation Force.

Law n°2007-587 of 4 October 2007 states that the objectives of the National Urban Sanitation Agency (*ANASUR*) are:

- To regulate waste management operations of all kinds, with an impact on urban health
- Contracting of public cleaning services and cleanliness of cities, communes and districts in Ivory Coast
- The contracting of waste processing
- To monitor the operations of infrastructures handed over by the state to third parties or communities for waste and rubbish transfer, sorting and processing
- Organisation and management of emergency operations;
- To manage the Support Fund for Urban Sanitation Programmes (*FSPSU*); the fight against pollution and rubbish in urban areas

As such, *ANASUR* provides:

The planning, implementation and infrastructure equipment for urban sanitation;

- Project management for all maintenance and rehabilitation work of the aforementioned infrastructures;
- Assistance to communities, and monitor compliance to **innervation** regulations by public sanitation service providers, as set out in the terms of reference defined or otherwise by any regulation used by the governing body.

Created by ministerial decree, the Urban Sanitation Brigade is a part of the National Urban Sanitation Agency. It is responsible for providing logistical support in the fight against unlawful installations, nuisances of all kinds and illegal occupations in the public domain.

- **Ministry of the interior (MI)**

Decentralisation gives a significant role to local and regional authorities in environmental management. As a result, this ministry has a role to play in the involvement of local and regional authorities (communes, departments etc) which come under its guidance. As the supervising ministry of local authorities, the MI is involved in waste management at commune level.

- **Ministry of Construction, Urban development and Housing (MCUH)**

This ministry manages housing and urban development plans. As such, the ministry also manages land entitlement. In terms of waste management, it is involved in the selection of sites for waste disposal.

- **Ministry of Health and Public Sanitation (MSHP)**

This ministry is responsible for implementing and monitoring government policy on health and public sanitation:

- Development and monitoring of regulations concerning public health;
- Design, implementation and monitoring of government policy concerning medical waste;
- Monitoring and evaluation of regulation concerning all food and medical products, in collaboration with the Ministry of Agriculture and the Ministry of Animal Production and Fisheries
- Proposal and implementation of incentive measures, to encourage or sanction the population and/or local authority decision makers in Public Sanitation issues.

5.2 Infra-governmental organisations (Implementing bodies)

- **National Agency of Urban Sanitation (ANASUR)**

The Ministry of Cities and Urban Sanitation oversees, through decree n°2007-578 and 588 of 04 October 2007, a commercial and industrial public establishment known as the National Agency of Urban Sanitation (ANASUR) and the Funds for Financing Urban Sanitation Programmes (FFPSU).

The National Agency of Urban Sanitation (ANASUR): the operating structure of the Ministry of cities and Urban Sanitation is in charge of the regulation and management of all types of waste, except for medical waste:

- The concession of public cleaning services and cleanliness of cities, communes and districts in Ivory Coast
- The concession of waste processing and transformation
- To monitor the operations of infrastructures handed over by the state to third parties or communities for waste and rubbish transfer, sorting and processing
- Organisation and management of emergency operations;
- To fight pollution and unsanitary conditions in urban areas;

- The Fund for Financing of Urban Sanitation Programmes (*FFPSU*): is responsible for finding and managing resources to render waste management operations more sustainable by:
 - Financing Sanitation programmes and activities;
 - Financing investment in waste management, waste disposal equipment and infrastructure;
 - Financing special programmes to support local authorities.

- **Ivorian Antipollution Centre (CIAPOL)**

The Ivorian Antipollution Centre is a public administrative structure which falls under the Ministry of the Environment, Water and Forestry. The objectives of CIAPOL are:

- The systematic analysis of natural water, waste materials (solid, liquid and gas);
- Evaluate pollution and rubbish levels;
- Establish an ongoing monitoring system, know as the “National Observation Network in Ivory Coast in collaboration with all ministries affected by environmental protection” (RNO-CI);

- **National Environment Agency (ANDE)**

The National Environment Agency (ANDE) ensures implementation of procedures resulting from the Environmental Impact Assessment (EIA).

- **Classified Installations Inspection Service (SIIC)**

The inspectorate of classified installations monitors the activities of classified installations (SIIC).

- **Sanitation and Drainage Department (DAD)**

This service checks the implementation, monitoring and regulation controls on sanitation and drainage.

5.3 Local Authorities (CL)

Municipalities must carry out and monitor the level of sanitation in their respective regions, including the maintenance of drains, roads and public places, parks and markets in their municipality.

Table 8 Actors identified according to their level in the waste management chain

STEP IN THE CHAIN	ACTORS INVOLVED
Production	Population, households, commercial areas, public parks, factories, offices, bus stations
Pre-collection	Private waste pickers, organised collection association movements
Collection Organisation	ANASUR (National Agency for Urban Sanitation); Local authorities.
Transport	Sub-contractors, carters
Recovery	Women's groups «manan-féréla » Men's groups « samalakoro »
Recycling	Plastic recycling industries (TIP SARL, Kim-Plastique and CI-plast)
Financing	Central government, municipalities, development partners (World Bank)
Laws and regulations	Ministry of the Environment, Water and Forestry
Research	University of Abobo-Adjamé

Table 9 Key actors and their level of intervention

ACTOR	LEVEL OF INTERVENTION	LINKS WITH OTHER INSTITUTIONS	ROLE	Impact on waste management
5. Waste Producers : Households Hospitals Industry	Local			Significant, as good packaging of waste makes collection much easier
6. Key actors in waste management				
Private Operators (contractors)	Local	Contract with local authorities & with the state	Collection and transportation of waste	Significant
Cleaning staff	Local	Staff attached to municipalities	Road sweeping, rubbish collection	Significant
Recyclers	Local		Recovery of waste materials	Medium
7. Institutional actors				
Ministry of the Environment. Water and Forestry	National	Support, collaboration and complementarities with other ministries looking at solid waste management and local authorities	Definition of laws and regulations	Significant
Ministry of Cities and	National	Collaboration with other	Definition of laws and	Significant

Urban Sanitation		ministries looking at solid waste management and local authorities	regulations Monitoring	
Ministry of Health and Public Sanitation	National	Collaboration with other ministries looking at solid waste management (medical)	Development, implementation and monitoring of public sanitation policies and regulation with regards to medical waste	Significant
Ministry of the Interior	National	Support local authorities	Support local authorities	Medium
Ministry of Construction, Urban Development and Housing	National	Collaboration with other ministries looking at solid waste management	Support to local authorities (choice of waste disposal sites)	Significant
Local Authorities	Local	Implementation and management	Support to the state and development partners	Significant
University of Abobo-Adjamé	National	Research	Local authorities, ministries	Medium
8. Development partners				
World Bank	Local	Financing	Financial assistance to the state	Significant

Table 10 Actors identified according to the level of involvement in the waste management chain

STAGE IN THE CHAIN	ACTORS INVOLVED
Waste production	General population, households, commercial facilities, public parks, factories, offices, bus stations, hospital, market
Pre-collection	cooperatives, youth groups, GVC (Cooperative-like groups) or individuals, collectors organised in associations as FEPSU-CI (Federation of Solid Waste Pre-Collection) and UFEP-CI (Union of professional federation Solid Waste Pre-Collection)
Organisation of the collection	ANASUR (National Agency of Urban Sanitation), MACOM (Mission of Support in the conduct of municipal operations), Local authorities
Transportation	Private operators for example CLEAN BOR , Kraff-CI, VILLERS, INTERCOR, LASSIRE Waste Services, EIDA, MBH
Recovery	Women's groups «manan-féréla » « plastics seller » in Malinké language Men's groups « samalakoro » « plastics shoes seller » in Malinké language
Recycling	Plastic recycling industry for example PLAST-KIM factory, TIP SARL factory and Côte d'Ivoire-PLAST factory
Training of OCB, collectors, local representatives	ANASUR (National Agency of Urban Sanitation)
Financing	State of Côte d'Ivoire, Development partners (World Bank)
Collecting local taxes	Municipalities
Laws and regulations	Ministry of Urban Sanitation, Ministry of the Environment and Durable Development, Ministry of Public Health and struggle against AIDS
Research	Universities (University of Abobo Adjamé), Research Centre (CSRS, CIAPOL)
Information/Communication	ANASUR(National Agency of Urban Sanitation),

	ANDE(National Agency of Environment)
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Table 11 Key actors and their level of involvement in the waste management chain

ACTORS	INTERVENTION LEVEL	LINKS WITH INSTITUTIONS	ROLE	Impact on waste management
1. Waste producers : Households Hospitals markets Industry	Local			Significant
2. Key actors in waste management				
Private Operators (contractors)	Local	Contract with local authorities & with the state (ANASUR)	Collection and transportation of waste	Significant
Cleaning staff	Local	Staff attached to municipalities	Road sweeping, rubbish collection	Significant
Recyclers	Local		Recovery of waste materials	Medium
Social communities	Local	Links with local communities and to private operators	Waste pre-collection	Significant

3. Institutional actors				
Ministry of Urban Sanitation	National	Support, collaboration and complementarities with other ministries looking at USW management and local authorities	Definition of laws and regulations Monitoring	Significant
Ministry of Public Health and struggle against AIDS	National	Collaboration with the ministries involved in Solid Waste management and with local authorities	Definition of policies, laws and regulations in frame medical waste management	Medium
Ministry of the Environment and durable development	National	Collaboration with the ministries involved in Solid Waste management	Definition of laws and regulations Monitoring	Significant
Ministry of Construction Urban	National	Collaboration with other ministries looking at solid waste management	Support to local authorities (choice of waste disposal sites)	Significant
Ministry of the Interior	National	Support local authorities	Support local authorities	Medium
Local authorities	Local	Manage implementation	Support from the state and development partners	Significant

ANASUR	National	Training, technical assistance to local authorities	Regulation and management of all types of waste, except for medical waste	Significant
FFPSU (Fund for Financing of Urban Sanitation Programmes)	National	financial assistance to local authorities	Responsible for finding and managing resources to render waste management operations	Medium
ANDE (National Environment Agency)	National	technical support, training	Local authorities, ministries	Medium
CIAPOL (Ivorian Antipollution Centre)	National	technical support, training	Local authorities, ministries	Medium
UVICOCI (Union of Town and Commune of Côte d'Ivoire)	National	technical support	Local authorities	Significant
SIIC (Classified Installations Inspection Service)	National	technical support	Local authorities	Medium
University of Abobo-Adjame	National	Research, technical support, training	Local authorities, ministries	Medium

4. Development partners				
World Bank	Local	Funding and technical assistance	Financial assistance to the Côte d'Ivoire state	Significant

Table 12 List of contact persons

Ministries		
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Coopérative des pré-collecteurs volontaires et de salubrité urbaine de Côte d'Ivoire (CPCVSU)	Mr. Jean Kipré Président	
Fédération des entreprises de pré-collecte et du service urbain de Côte d'Ivoire (FEPCSU-CI)	Mr. Etienne Dougba Président Mr. Iran Guéblon Vice-président	

C. NIGERIA

5. Identification of relevant actors according to the level of waste management

Different actors are involved in solid waste management processes in Nigeria, right from the production to the final disposal. The different actors are highlighted below

6.1 Waste Producer

The main actors in waste production are residents e.g., households; industrial, commercial and non-commercial facilities e.g. academic institutions, small shops, hotels, offices, markets; service providers e.g., laboratories and healthcare facilities, financial institutions; government institutions etc. Statistically, the municipal solid waste generation has been estimated to be 1,467,820 tons monthly and 18,285,589 tons yearly as of 2005 across the 36 states and the Federal Capital Territory. Current estimates puts the annual generation of waste of Nigerian at 20 million tons of municipal waste. As a developing economy, the composition of the waste is 50% -70% organic waste, 9%-20% plastic, 6%-10% paper and the rest taken up by glass, metal and wood. Except for Lagos State which has installed Weight Bridge at its dumpsites, current data for the 36 State could not be accessed to determine the waste stream and quantity produced. Table 4.1 shows the urban solid waste generation while Table 4.2 gives the quantity of waste generated in Nigeria capital cities as of year 2005.

Table 13 Urban Solid Waste Generation

City	Population	Tonnage per month	Density (kg/m ³)	Kg/capital/day
Lagos	8,029,200	255,556	294	0.63
Kano	3,248,700	156,676	290	0.56
Ibadan	307,840	135,391	330	0.51
Kaduna	1,458,900	114,433	320	0.58
Port Harcourt	1,053,900	117,825	300	0.60
Makurdi	249,000	24,242	340	0.48
Onitsha	509,500	84,137	310	0.53
Nsukka	100,700	12,000	370	0.44
Abuja	159,900	14,785	280	0.66

Source: Ogwueleka, 2009.

The waste generation rates in Nigeria ranged from 0.66 kg/cap/d in urban areas to 0.44 kg/cap/d in rural areas. The rate of waste generation is highly influenced by the population income. Lagos is the commercial nerve centre of Nigeria and over 70% of industries in the country located there, which amount to over 7,000 medium and large scale manufacturing industries. It is also the fastest growing city in Nigeria in terms of development and industrial infrastructure. Lagos, Port Harcourt, Kano and Onitsha have the highest per capital per day

of waste generation which can be attributed to the level of urbanization, population and the economic activities in the cities.

Table 14 Quantity of waste generated in Nigerian capital cities as of year 2005

S/N	State Capital & Cities	Cap/Day (Kg)	Tonnage Per month	Yearly Tonnage	Organic Waste%	Organic Waste Yearly (ton)
1.	Umuahia	0.23	15,875	190,740	65	123,981
2.	Abuja	0.28	14,684	176,213	54	95,155
3.	Yola	0.28	25,365	304,380	68	206,978
4.	Uyo	0.25	16,112	193,344	55	112,139
5.	Awka	0.31	25,395	304,740	60	182,844
6.	Bauchi	0.31	25,372	304,464	64	194,856
7.	Yenagoa	0.23	14,246	170,952	65	111,118
8.	Makurdi	0.28	24,242	290,904	70	203,632
9.	Maiduguri	0.28	32,956	395,427	66	261,011
10.	Calabar	0.26	15,242	182,976	68	124,789
11.	Asaba	0.28	15,950	191,400	60	114,840
12.	Abakaliki	0.24	14,346	172,152	70	120,506
13.	Benin City	0.63	27,459	329,508	54	177,934
14.	Ado-Ekiti	0.28	14,784	177,408	65	115,315
15.	Enugu	0.31	16,009	192,108	58	111,422
16.	Gombe	0.28	14,006	168,072	70	114,091
17.	Owerri	0.30	15,846	190,152	70	137,256
18.	Dutse	0.30	16,340	196,080	70	137,256
19.	Kaduna	0.23	44,433	533,199	63	336,181
20.	Kano	0.56	156,676	1,880,112	50	940,056
21.	Katsina	0.32	18,452	221,424	70	316,320
22.	Birnin Kebbi	0.28	15,456	185,472	70	129,830
23.	Lokoja	0.26	15,478	185,736	70	130,015
24.	Ilorin	0.25	345,560	414,720	70	129,830
25.	Lagos	0.73	255,556	3,066,672	35	1,104,001
26.	Lafia	0.21	13,956	167,472	70	117,230
27.	Minna	0.25	14,989	179,868	68	112,310
28.	Abeokuta	0.36	36,116	433,632	60	260,179
29.	Akure	0.32	15,089	181,068	60	108,640
30.	Osogbo	0.24	14,957	179,484	60	107,690
31.	Ibadan	0.31	135,391	627,250	60	992,622
32.	Jos	0.23	27,667	332,004	56	189,742
33.	Port Harcourt	0.70	117,825	1,413,900	60	845,340
34.	Sokoto	0.28	15,255	183,024	65	120,429
35.	Jalingo	0.25	14,253	171,036	70	119,725
36.	Damaturu	0.24	14,001	168,008	70	117,608
37.	Gusau	0.26	14,062	179,604	70	126,620
38.	Aba	0.31	64,347	772,164	70	540,514
39.	Onitsha	0.70	84,137	1,009,644	61	625,979

Source: Federal Ministry of Environment.

6.2 Waste pre-collection

Pre-collection of waste in Nigeria is done in different ways which include:

1. Cart Pushers: These are the group of informal private sector involved in the house-house waste collection at a fee, using specially built carts.
2. Scavengers: This is one of the groups/organizations involved in both on-site and off-site waste/resource recovery. They recover re-usable and recyclables materials like plastics, aluminium, glass, paper, scrap metals, animal wastes like horn, bones etc. Some of them go from door-to- door to recover re-usable and recyclable materials, while majority limit their operation to the waste brought to the disposal sites.

6.3 Waste Collection and transportation

The existing solid waste management system in Nigeria is very rudimentary, inefficient and unsustainable. Accurate data on the quantities of municipal solid waste generated in the country is not easily accessible. Municipal solid wastes were inadequately managed for many years. It is unfortunate to note that waste collection systems are either non-existence in many areas (up to 90 percent in some cases) or most towns and cities are not serviced or are under-serviced. The collection of solid waste is the function of state and local government environmental protection agencies. Informal solid waste collection operations exist in parallel with official agencies in some major cities like Onitsha, Lagos etc. Informal collectors provide the service for a fee.

Currently, in Nigeria, there are associations of door to door community based waste collectors/processors and private refuse companies (Private Sector Participation (PSP)) in the states of Lagos, Oyo and the FCT. Agreements on prices are made among these companies and groups where households pay daily or monthly fee to the service provider on a need basis. There is inadequate service coverage in most urban areas and in rural areas there is no collection. Rural dwellers have no access to waste collection service. They dump waste at any vacant plot, public space, and river or burn it in their backyard, thereby polluting the environment. In most cases, where collection system exists, wastes collected are dumped along roads, drainages, around facilities or any available space. While in urban areas, stationary containers system is adopted for waste collection; the waste containers remain at designated points of waste generation.

All the vehicles in operation include manually driven small carts, side loaders, rear loaders, dump and mini trucks, open trucks (popularly called "tippers"), skip trucks, mechanically driven sophisticated transportation vehicles and special vehicles for special wastes - hazardous, bulky and recyclable wastes. Most of the available trucks in most of the cities in the country are always out of service at any one time due to frequent breakdown caused by overuse. With the exception of Lagos State which has about 700 compactors, only a handful of the private firms operating in Nigeria (no more than 10 out of over 500 firms) have made investments in appropriately designed refuse vehicles. Others employ depreciated equipment from construction (open tipper trucks). All types of vehicles are utilized to transport solid waste from its generation point to the transfer station; and from there to the treatment and disposal sites. All the vehicles in operation include manually driven small carts, mechanically driven and sophisticated transportation vehicles and few waste compactor vehicles in some municipalities.

It is important to note that industrial wastes generated in Nigeria cities and metropolitan areas are collected along with municipal wastes. As such the waste is mostly co-mingled and some types of solid waste which require special handling, treatment and disposal are collected along with other municipal wastes. The unfortunate outcome is that, wastes like used motor oils, discarded tires, oil-based paints, pesticides, and host of industrial hazardous waste are often mixed municipal wastes streams.

6.4 Reuse and recycling

This includes various types of activities like recycling of reusable materials (e.g., plastic and glass containers), recycling of materials for industrial production (e.g., paper and iron), and converting waste into energy (e.g., burning tyres in cement kiln to produce heat), and converting waste into a resource (e.g., composting and landfill gas). Hence, technology can determine the level and sophistication of recycling and recovery activities. There is however one form of recycling and recovery activity or the other in some of the States of the Federation but this is usually carried out by the informal sector. The following waste material fractions are mainly recycled or recovered:

- Wet biodegradable wastes,
- Paper and cardboard wastes, subdivided into cardboard wastes, newsprint wastes and other paper wastes,
- Plastics wastes, subdivided into polyethylene wastes, and other plastics wastes,
- Glass wastes,
- Iron and steel wastes,
- Aluminium wastes,

It is generally believed that informal waste recycling is carried out by poor and marginalised social groups who resort to scavenging/waste picking for income generation and some even for everyday survival. This is widespread throughout the urban areas and it is estimated to be about 3% of the population in the cities. The groups involved are

1. **Itinerant waste buyers:** Waste collectors who often go from door to door, collecting sorted dry recyclable materials from households or domestic servants, which they buy or barter and then transport to a recycling shop of some kind. Apart from their labour, they invest capital to acquire and run a vehicle. This is the oldest tradition across the country. Newer categories are the street pickers or scavengers.

2. **Street waste picking:** Secondary raw materials are recovered from mixed waste thrown on the streets or from communal bins before collection.

3. **Municipal waste collection crew:** Secondary raw materials are recovered from vehicles transporting MSW to disposal sites.

4. **Waste picking from dumps:** Waste pickers/scavengers sort through wastes prior to being covered. This is often associated with communities that live in shacks built from waste construction materials on or near the dump. Scavenging at dumps occurs in all the cities in open dumps across the country.

5. Resource Merchants: This group is made up of traders (merchants) involved in the purchase of all recovered, recyclable and re-usable materials from the scavengers. Some members of this group are retired scavengers who cannot scout for materials on the site again due to either age or advancement in financial capability.

6. Recyclers: This is another category of informal private sector that includes both the micro and the small scale recycling companies. They convert recovered waste materials like paper, aluminium, animal by-products, plastics, scrap metals etc, to valuable materials and raw materials for the consumption of other sector.

As it is a large scale of the recycling and recovery process of waste is carried on by the informal sector. And this involves collection of refuse for a fee and salvages of any recyclable material prior to the disposal of the waste. This type of recovery takes place at illegal dump sites where scavengers search continuously for valuable metals, plastics, and bottles to be reused or for sale to buyers of different type of scraps. The informal private sector comprises unregistered, unregulated activities carried out by individuals, families, group or small enterprises and is usually prevalent in Lagos, Onitsha, Anambra State, Kano amongst others.

6.5 Disposal

This includes separation of different types of waste hence; the technology available at this level may enable separation of various types of materials for recovery and recycling, equipment for shredding and treatment of final disposable waste. A number of informal salvaging or separation occurs at dumps all over the country. Solid waste disposal in Nigeria is done at the open dumpsites in different part of the country primarily by the government agencies or their contractors after waste collection while the scavengers and waste pickers flock the sites to recover useful or valuable materials. In most part of the country, the waste is collected by the various agencies, transported to designated sites, and occasionally openly burnt to reduce the volume. The informal collectors use pushcarts, barrow etc. They provide service in areas where agencies and their contractors cannot.

Basically, most of the disposed waste is not treated. The practice is to burn the waste at the dumpsite because of the lack Incineration facility or approved sanitary landfill in most cities. Although, the use of sanitary landfill is the most common technology around the world, the conventional and environmentally unfriendly methods of open-burning, open-dumping and non-sanitary landfill are still very common in most of the target countries. Table 4.3 shows the list of Institutions involved in Solid Waste Management Chain.

6.6 Training

Training or capacity building of the different stakeholders in the solid waste management chain is still very low or non-existence as well as the level of awareness of municipal solid waste management. Ogun and Lagos States waste management authority have benefited from capacity linkage/training from international organizations such as World Bank, Swedish Government (Kemi), IDRC(Canada) and the German Government.

6.7 Funding

To date there are only financial disincentives in the form of charges, levy, fine and penalty for waste generators. Solid Waste Management being a local issue is mainly financed through annual budget from the state and local government. Occasionally, there are subsidies from the national government and of recent international cooperation. Various tiers of governments' agencies have started adopting various financing modes and some of the widely practiced ones are as follows

1. Annual budget
2. User charges

Current, most states in the country have not benefited any support on solid waste management from international funding organizations and donors except Lagos.

Table 15 List of Institutions involved in Solid Waste Management Chain

Type of Service	Regulator	Service Provider			
		National Government	State Government	Local Government	Private
Municipal Solid Waste Management	Federal Ministry of Environment, NESREA, State Ministries of Environment, State Environmental Protection Agencies(SEPAs) State Ministries of Health				
1. Collection		None	LAWMA in Lagos and other State waste management authorities,	All the 774 local council	Several licensed operators
2. Transportation		None	LAWMA in Lagos and other State waste management authorities	All the 774 local council	Several licensed operators

3. Treatment		None	LAWMA in Lagos and other State waste management authorities	All the 774 Local Council	Several licensed operators
4. Disposal		None	LAWMA in Lagos and other State waste management authorities	All the 774 Local Council	Several licensed operators
5. Recycling		None	LAWMA in Lagos and other State waste management authorities		Private companies

6. Identification of institutional actors

7.1 Ministries

1. The Federal Ministry of Environment

In June 1999, the newly elected democratic government in an effort to ensure that environmental issues receive priority attention in the Nigeria's development agenda, created the Federal Ministry of Environment through a presidential directive. To consolidate the primary responsibility of environmental management in one institution, the Federal Ministry of Environment (FMoE), which absorbed Federal Environmental Protection Agency (FEPA) and accepted the transfer of relevant departments and units from various other federal ministries (e.g., Forestry Department from the Federal Ministry of Agriculture [FMoA], Soil Erosion and Flood Control Department from the Ministry of Water Resources [MoWR]). The broad mandate of the FMENV, as elaborated in the revised 1999 National Policy on the Environment, is to coordinate environmental protection and natural resource conservation for sustainable development, and specifically to:

- Secure a quality of environment adequate for good health and well being,
- Promote the sustainable use of natural resources,
- Restore and maintain the ecosystem and ecological processes and preserve biodiversity,
- Raise public awareness and promote understanding of linkages between environment and development, and
- Cooperate with government bodies and other countries and international organizations on environmental matters.
-

2. The State Level

The institutions at the state level for waste management can be grouped into 2 main types namely

- Statutory bodies- Ministry/agency/boards
- Quasi permanent bodies- task forces, Project monitoring units (PMUs)

Each state of the federation has a board or an agency and supervising ministry that oversee the management of waste. These agencies, board or ministry are marked with conflicts and overlap in roles and responsibilities among themselves and between them and sector ministries. Some of the agencies are within ministerial control while others are not. The quasi permanent bodies are task forces, which are created to deal with issues as determined by various administrations. On solid waste management, there are task forces in all the states such as the WAI brigade/KAI brigade in Lagos State. Other institutions at the state level that deals with solid waste management either directly or indirectly are;

1. Ministry of Environment and Health
2. State Environmental Protection Agency
3. State Waste Management Authorities

7.2 Local actors

This include

1. Task force on sanitation,
2. Local Government Environmental Health Officers

3. Private Sector Participation (PSP): There is an increasing trend of private sector participation in solid waste management chain. The activities under SWM (collection, transportation, treatment, disposal, recycling and recovery) can be easily separated from each other, enabling various organisations to involve in one or more aspects of the chain.

7.3 National Enforcement Agencies

1. The National Environmental Standards and Regulations Enforcement Agency (NESREA): It is the main enforcement parastatal of the Federal Ministry of Environment. NESREA is charged with the responsibility of enforcing all environmental laws, guidelines, policies, standards and regulations to enforce compliance with provisions of International Agreements, Protocols, Conventions and Treaties on the environment.

7.4 Donors

Various bilateral initiatives are helping local governments to seek assistance for financing their development projects including SWM. Notable ones include the World Bank, DFID, UNDP, Clinton Foundation (Clinton Climate Initiative) and carbon credit at Olushosun dumpsite in Lagos State through LAWMA. Internationale Weiterbildung und Entwicklung g GmbH Inwent funded WM in Oyo and Kano states

The institutional roles of the various stakeholders on solid waste management are outlined as follows:

The Federal Government

- Develop, periodically review and update the Policy Guidelines on Solid Waste Management;
- Develop and circulate set standards for equipment procurement and maintenance in Solid Waste Management;
- Develop and circulate set standards on private sector participation in Solid Waste Management services;
- Prepare a Solid Waste Master Plan as a national Blue Print for effective Solid Waste Management and ensure its implementation at the appropriate levels of government;
- Enact appropriate legislation that will foster successful implementation of the Policy Guidelines and Master Plan;
- Source for funds for programme development, specialized studies and capacity building on Solid Waste Management;
- Provide technical assistance to States and LGAs in Solid Waste Management;
- Initiate relevant programme for Solid Waste Management practices;
- Establish a national data bank on Solid Waste Management for planning and development;
- Provide environmental education and awareness on sound Solid Waste Management
- Collaborate with relevant stakeholders on Solid Waste Management;
- Register Solid Waste Management facilities that require EIA Certification

The State Government shall:

- Support and ensure the implementation of the Policy Guidelines on Solid Waste Management
- Facilitate the implementation of the National Solid Waste Master Plan
- Enact Relevant State Legislation

- Make adequate annual budgetary provisions for Solid Waste Management
- Provide technical support to the LGAs through training and man power development programme for capacity building
- Support the provision of logistics including financial instruments to facilitate private sector participation in Solid Waste Management;
- Conduct public education and enlightenment on sound Solid Waste Management
- Conduct research into local options for Solid Waste Management to guide LGAs
- Establish data bank on Solid Waste Management
- Provide land for siting of waste management facilities

Local Governments Shall:

- Implement the Policy Guidelines on Solid Waste Management as a statutory obligation
- Implement the National Solid Waste Management Master Plan;
- Enact appropriate legislative instruments and establish necessary sanctions and enforcement mechanisms for efficient service delivery;
- Enlist the services of the private sector and other stakeholders in Solid Waste Management
- Register and licenses all operators of waste management facilities and services
- Make adequate annual budgetary provisions for Solid Waste Management;
- Recruit, train and retrain staff for efficient service delivery.
- Establish a consultative forum with members of the public to build consensus on appropriate strategies for waste management;
- Promote private sector participation in the delivery of waste management options

The Private Sector Shall:

- Comply with the provisions of the National Policy Guidelines and Master Plan on Solid Waste Management
- Participate in Solid Waste Management on Cost Recovery Basis
- Undertake waste recycling activities in an environmentally sound manner
- Engage in partnership with Local Governments for better service delivery;
- Undertake research, specialized studies and product development in Solid Waste Management;
- Promote public enlightenment campaigns

Civil Society Organisations Shall:

- Undertake grassroots mobilization to support appropriate waste management options
- Promote the adoption of waste separation and resource recovery at household level
- Promote public enlightenment campaigns on appropriate strategies for waste storage, collection and disposal

The public shall:

- Adopt environmental friendly habits and practices
- Comply with the existing Legislations on Solid Waste Management;
- Comply with the provision of the policy guidelines

- Cooperate with other stakeholders to ensure sustainable solid waste management systems;
- Patronize recycled goods and biodegradable packages
- Pay for Solid Waste Management services to ensure its sustainability

Table 16 Actors identified according to the level of involvement in the waste management chain

STAGE IN THE CHAIN	ACTORS INVOLVED
Waste production	General population, households; industrial, commercial and non-commercial facilities e.g. academic institutions, small shops, hotels, offices, markets; service providers e.g., laboratories and healthcare facilities, financial institutions; government institutions
Pre-collection	Informal sectors, private collectors
Organisation of the collection	Local and state authorities, Ministry, SEPA, LASEPA etc.
Transportation	Private operators, private cart owners, State agencies e.g., LAWMA, IWMA, Clean Green Initiative (Imo State) etc
Recovery	Informal sectors
Recycling	Plastic recycling industry, solid waste recycling, paper recycling e.g., Alesinloye solid waste recycling
Training of OCB, collectors, local representatives	Universities, NGOs
Financing	Federal Government and State governments
Collecting local taxes	State and Local Government
Laws and regulations	Federal and State Ministry of Environment and its agencies such as NESREA, SEPA etc.
Research	Universities, NGOs
Information/Communication	NGOs, State and Local Government

Table 17 Key actors and their level of involvement in the waste management chain

ACTORS	INTERVENTION LEVEL	LINKS WITH INSTITUTIONS	ROLE	Impact on waste management
9. Waste producers : Households Halls and markets Green spaces and roads	Local			Significant, as good waste packaging makes collection much easier
10. Key actors in waste management				
Private Operators (contractors)	Local and State	Contract with waste management agencies	Collection and transportation of waste	Significant
Cleaning staff	State	Staff attached to state waste agencies e.g., LAWMA	Road sweeping, rubbish collection etc	Significant
Recyclers	Local	Scavengers, merchant, itinerant waste buyers, waste pickers etc	Recovery of waste materials	Medium
11. Institutional actors				
Ministry of Environment	National State	Support, collaboration and draft policies on waste management	Definition of policies, laws and regulations Monitoring	Significant
NESREA	National	Collaboration with ministry of Environment and waste	Definition of policies, laws and regulations;	Significant

SEPA	State	management agencies	enforcement	
State waste management agencies, LAWMA, ISWM etc	State	Collection and disposal	Support from the state and development partners	Significant
NGOs Environmental Law Research Institute	Local State	Public enlightenment, Awareness (Legislative Advocacy)	Support from International Organization	Medium
Universities and Research institutions	Federal State	Research, technical support, training,	Local authorities, ministries, recyclers	Significant
BCRC-Nigeria	Local	Capacity building, Training and Awareness Consulting and Technology Transfer	Federal, state, General public, recyclers, local authorities	Significant
12. Development partners				
United Nations Industrial Development Organization (UNIDO)	National State	Funding, technical assistance and support	Federal government State government	Medium
World Bank	National State	Funding and support	Federal government State government	Medium

Table 18 List of contact persons

	Organization	Name of contact person	address
1	Federal Ministry of Environment	Olori O. Babade (Director)	obabade2002@yahoo.com
2	Basel Convention Regional Coordinating Centre (BCRC)-Nigeria	Prof. O. Osibanjo (Director) Ms Bolanle Ajai	osibanjo@yahoo.com bolanleajai@yahoo.com
3	NESREA, Abuja	Dr (Mrs) Ngeri Benebo (Director General)	dq@nesrea.org
4	Abuja Environmental Protection Board	Dr. Engr. Abubakar S. Yabo (Director)	dryabo@yahoo.com
5	Nigerian Environmental Society (NES)	Mr. Agbanusi Uchechukwu	jonagba@yahoo.com
6	Waste Management Society of Nigeria (WAMASON)	Mr Reuben Ossai (President) Engr. Laoye Oluseye (Oyo State Councillor)	rmossai@initiatesgroup.com seyelaoye@yahoo.com
7	Oyo State Waste Management Authority	Mrs E.A. Anibaloye	
8	Lagos State Waste Management Authority (LAWMA)	Mr. Ola Oresanya	olaoresanya@yahoo.com

9	E-waste and metal Recycling International Company Ltd	Haroon Adekilekun	haroon.adekilekun@mscslimited.com
10	Poroku and Company, Ibadan	Ahmed Babatunde	tundeahmed12@yahoo.com
11	DipeAdesope Nig. Enterprises, Ibadan	Ogundipe Adesope	Saog59@yahoo.com
12	Environmental Harmony Ltd	Kitan Ogungbuyi (Mrs)	kitanogungbuyi@yahoo.com
13	Kano State Ministry of Environment Kano State Refuse Management & Sanitation Board	Dr. Garba Saleh Engr. Hussam Musa Kary	- remasab@yahoo.co.uk
14	Cross River Ministry of Environment	Mr. E. Gekpe	edgekpe@yahoo.com
15	Richbol Environmental Services Ltd.	Adebola Olugbenga O.	adebolagb@richbol.com adebolagb@gmail.com
16	Abia State Environmental Protection Agency	Dr. Cosmos Ndukwe	cosmos504@yahoo.com
17	Lagos State Environmental Protection Agency (LASEPA)	Engr. Adebola Shabi	
19	Ogun State Environmental Protection Agency	Mr. F.O. Ewulo	oqepa@yahoo.com
20	Kaduna State Urban Planning and Development Authority	Mr. Husaini Ibrahim Garba	ibrahimgarbahusaini@yahoo.com
21	Centre for African Study Shelter and Development (CASSD)	Nicolas Dosunmu	
22	Association of Waste Managers of Nigeria	Adegboyega Adepitan	jimsifltd@gmail.com
23	Oyo State Ministry of Environment and Water Resources	T. Tunde Tairu	tttairu@yahoo.com

24	Alesinloye Market Environmental Health Project	Prof. Sridhar Prof. B.O.O. Oyediran Dr. D.A. Fadare	mkcscridhar@yahoo.com kayelemona@yahoo.com fadare@yahoo.com
25	Kaduna EPA	Mr. Aminu Shehu Sani	Aminusani58@yahoo.com
27	Department of Chemistry, University of Ibadan, Ibadan	Dr. M.B. Ogundiran Dr. A.A. Oketola	mbogundiran@yahoo.com bolaoketola@yahoo.com
28	Cherith Pharmacy and Refuse Contractor, Ibadan	Mr. Onaeko, Olukemi A.	cherithhealth@yahoo.com

D. Ghana

7. Institutional actors

8.1 Accra Municipal Assembly

The AMA is created under Ghana's Local Government Act (1993) (Act 462) which empowers Ghana's District Assemblies to enact By-Laws. In 1995, the Accra Municipal Assembly, in conformity with the Agency's mandate of enforcing sound environmental principles in waste recycling and other aspects of waste management passed the Liquid and Solid Waste Management By-Law and Regulations. These regulations deal with the management of solid and liquid waste in Accra.

8.2 Sogakofe District Assembly

The Environmental Health and Sanitation Unit of the Sogakofe District Assembly have in their work, included waste management and recycling, in conformity with EPA rules and regulations. Though there are a few success stories, many challenges still remain. This Agency has expressed a deep commitment to promoting recycling because waste is produced in such large quantities in many communities within this area, with inadequate recycling and disposal facilities. The Accra and Sogakofe District Assembly particularly expressed the need to create jobs, generate income and promote environmental protection through the enactment of appropriate by-laws and policies which will enable their workers and individual community members to collect and recycle waste. At the moment, individuals have embarked on recycling waste, albeit on an ad-hoc and informal basis. This Agency also needs some financial assistance, more facilities such as sufficient bins, as well as more incentives and other forms of help to effectively collaborate with communities so as to collect and recycle waste.

8.3 Council of Scientific and Industrial Research (CSIR)

The CSIR was established in its present form by NLC Decree 293 of October 10, 1968. On 26 November, 1996, the CSIR was re-established by CSIR Act 1996 (Act 521). It focuses on generating new technologies which exploit Science and Technology (S & T), with the aim of promoting socio-economic development in the critical areas of agriculture, industry, health and environment and improve scientific culture of the civil society. Its projects include those on natural resources, energy and waste management.

8.4 Ministry of Environment, Science and Technology

This Ministry aims at promoting sustainable development in Ghana by improving the existing scientific and technological base in the country. The Ministry also has the vision of contributing to the development of sustainable human settlements in Ghana. It works on formulating and implementing relevant legislation, including those pertaining to waste management in this country. MEST also implements waste management projects in Ghana.

1. Private sector

Cyclus Plastics Recycling Company

Established in 2006. Main thrust of activities: To collect and recycle used plastics (plastic bags, plastic bottles, sachet water bags, gallons and other forms of plastics) which have been dumped on the ground and along the beaches, from various towns and cities such as Takoradi in The Western Region, through others such as Cape Coast, Biriwa and Saltpond in

the Central Region to Accra in the Greater Accra Region. Also sells some of the collected wastes to giant plastic recycling companies such as the Tema-based Blowplast Recycling Company. Cyclus reprocesses the used plastics into seedling bags, waste disposal plastic bags and shopping bags for sale and use in Ghana. Through these recycling initiatives, Cyclus is therefore able to produce raw material for other sectors and create jobs for the local populace in Aburansa as well as help clean the environment of littered plastic waste.

Qualiplast Limited, Accra

Established in Accra in 2002 as a plastic processing company which imports raw material from China, Thailand, Germany, the USA and other countries for recycling into solid plastics. These solid plastics include buckets, plastic crates for storing soft drinks and alcohol, funnels, jerry cans, food and drink flasks, plastic cups, plastic bottles and other plastic products. In addition to this process, Qualiplast also collects used plastic chairs, used buckets and used solid plastic products from individuals in whichever part of Ghana's community, pays the individuals for this and recycles these plastics into buckets, jerry cans and other solid plastic material which Qualiplast then sells to diverse parts of Ghana's populace.

Blowplast Recycling Company

Set up in 1993 to recycle plastics and has since then, been the largest Polyethylene Packaging Industry in West Africa, with over 500 workers. Of the 40,000 metric tonnes of sachet plastics which are produced daily by individuals from various sectors in Ghana, Blowplast recycles about 20,000 metric tonnes on a daily basis at its recycling plant in Tema, to produce black plastic shopping bags and black plastic disposal bags. Company is committed to promoting environmental protection and aims at reducing the costs of cleaning the environment when it has been littered with plastic waste. For Blowplast, the idea to recycle used plastics in Ghana was because of the need to reduce over littering of plastic waste in Ghana and to provide plastic bags and containers (from recycling used plastics) so as to promote compact packaging of food and other materials. Blowplast also aimed at reducing its costs in purchasing raw material for use as plastics products. This is because in Ghana, recycling plastics is cheaper for Blowplast as well as local companies which buy the reprocessed plastic products for selling.

Tilbury Environmental Group

In Ghana, the Tilbury Environment Group (TEG) is an affiliate of the UK based TEG. TEG in Ghana operates the port waste reception facility in the Port of Tema. TEG further runs a purpose designed flexible port reception facility with a portable sludge treatment system dedicated for Annexes I and V of MARPOL 73/78 for Port of Tema, Ghana. Annex I seeks to prevent marine pollution by oil and prescribes the conditions under which tankers may discharge oil into the sea. Annex V prevents pollution by garbage from ships. This Annex deals with the different types of garbage and specifies the distances from land and the manner in which they may be disposed of.

Tema Steel Company Limited

Set up in the 1960s to recycle used steel into steel bars for utilization in the building industry. This company was also set up with the aim of creating jobs. The company further has as its objectives, the need to protect the environment from being contaminated with used steel and metals which contain harmful elements such as zinc and copper, as these could pollute human and ecological health.

Ghana Agro Food Processing Company,

A major company in canning tuna, milling wheat and milling fish feed/fishmeal for use in feeding fishes. In the fishing industry which is its main focus, this agency has indicated that massive amounts of fish waste had in the past been produced and dumped in the sea. Here, this waste could biodegrade, cause the emissions of harmful gases and pollute marine life, while causing foul odors. GAFCO therefore felt a need to change this pattern. The solution was for this company to recycle the fish waste which it produces from processing and canning fish, into fish meal which would be used to feed the fish before the processing of fish is carried out. Hence, for GAFCO, the main objective for recycling fish waste was to promote environmental protection.

Furthermore, recycling fish waste is a profit-oriented venture as it is more cost-effective than having to buy fish feed. The waste here becomes raw materials for other operatives within the facility for feeding the fish. Fish meal normally costs about 620 USD for 1 ton and if it can be obtained by recycling, then this would suggest a better approach than dumping fish waste at sea where it pollutes the sea and other forms of marine life.

Barry Callebaut Company Ltd

Barry Callebaut has been operating in Ghana since 1994 in Tema. Amongst the priorities of this company are the need to promote environmental protection through conserving resources, minimizing adverse impacts of industrial activities, and promoting waste recovery as well as recycling. After processing cocoa into these products therefore, Barry Callebaut recycles the residual cocoa shells by burning them in a shell boiler and also, composting these shells for use as manure on farms. In carrying out these activities, this company recycles these with the aim of saving energy and attaining environmental sustainability, rather than dumping the waste anywhere.

Cocoa Processing Company

This company produces cocoa products such as Ghana's Golden Tree chocolate, chocolate powder and chocolate butter from cocoa beans which are grown in Ghana. During this activity, the wastes produced are cocoa shells from the raw cocoa which is processed into these items, as well as waste water which is generated during this process. Whereas the cocoa shells are not recycled per se but sold to farmers, the waste water is recycled by the Cocoa Processing Board.

The Cocoa Processing Board has many objectives in recycling namely: reducing financial expenditure in the company, reducing energy usage, using less power consumption in recycling, reducing air and water pollution, preserving natural resources, reducing pollution caused by waste, preserving natural resources, reducing pollution caused by waste, preserving natural resources for future generations, contributing to the reduction of the release of harmful chemicals and green house gases from rubbish and saving space required at waste disposal and landfill sites.

Gieffe Wood Technology Limited, Kumasi

Gieffe Wood Company was established in 2005 in Kumasi, to process different kinds of wood into coffins which are sold locally. Owing to the many quantities of wood which it processes, the company produces excessively large quantities of sawdust. With a view to saving costs and promote ecological health, Gieffe recycles the saw dust which is produced as a by-product of its activities. Hence, as a result of avoiding having to purchase wood fuel for processing wood into coffin, the generation of power from this exercise becomes a more cost-effective way of producing fuel.

Modern Wood Technology Limited

In 2000, Modern Wood Technology was set up in Kumasi to produce quality wood products for exports and to support the local furniture industries of Ghana. In carrying out this objective, this company produces household and office furniture. While mainly exporting furniture to Italy and other countries of the European Union, Modern Wood Technology has a monthly average product capacity of fifteen containers.

Owing to the vast quantities of sawdust which this company produced from its timber processing activities, Modern Wood Technology has for some years now, started a system of recycling the sawdust, so as to obtain some profits. This was preferable to being faced with the continued trend of how to dispose of this waste. Hence, similar to Gieffe Wood Technology Limited, Modern Wood has for some years recycled its saw dust so as to generate power for the kiln dry machine which the Company uses to process wood.

Zeal Environmental Technologies Limited

The main thrust of this company's activities is to collect oily waste water and general garbage from ships, for recycling and final disposal. Zeal currently operates a Port Reception Facility so as to collect these wastes and treat them, in accordance with the International Maritime Organization Convention MARPOL 73/78.

Jar Hua Company

Based in Amassamang in Accra, this recycles used engine oil which it collects from Total Petroleum Ghana once every six to twelve months. This used engine oil is from cars, trucks and other vehicles. Jar Hua reprocesses this waste oil for further use in furnaces and bakeries, and for the manufacture of coal tar. For Total, the main reason for giving this waste to Jar Hua lies in the desire to enhance environmental protection because dumping used oil in the sea, rivers, gutters and on land, could produce toxic gases (such as hydrocarbons) which damage the ecology and human health. Hence, Jar Hua recycles because of economic and environmental motives.

International Centre for Environmental Governance and Development (ICEGAD)

ICEGAD aims at improving rural and urban development in Ghana and the rest of Africa by empowering communities within this region with sufficient levels of environmental governance. In order to attain this objective, this NGO implements projects on waste management, climate change, afforestation and other related areas, with a focus on deriving relevant economic and social benefits for target communities.

NGO

Smart Youth Volunteers Foundation

This NGO works on increasing the knowledge base of young people in areas such as waste management, climate change, ocean acidification and other related programmes through outreach programs in senior high schools.

UNIDO, Guinea Current Large Marine Ecosystems Project

The activities of this project include encouraging private sector companies to recycle the waste which they generate as a by-product of their industrial activities.

International agency

Environmental Protection Agency

In 1994, Ghana passed its Environmental Protection Agency Act (Act 490). This Act set a body known as the Environmental Protection Agency in that same year. According to Section 2(j) of Act 490, the functions of the EPA include granting environmental permits and pollution abatement notices for regulating the volumes, types, constituents and effects of waste discharges and emissions and of substances which are potentially hazardous to the environment. The EPA also has amongst other functions, prescribing standards and guidelines on air, water, land and other kinds of environmental pollution including the discharge of waste and the control of toxic substances, Section 2(h).

In carrying out these functions, the Agency generally provides advice, direction and technical guidelines to assist Ghana's Metropolitan, Municipal and District Assemblies within the ten different regions of Ghana, within the area of waste management. The Agency also grants Environmental Approval to waste management projects which are undertaken by private sector companies and other parties in the latter's promotion of waste recycling and other waste management initiatives.

Furthermore, the EPA also monitors activities of MMDAs to ensure that the work of the latter comply with EPA requirements on waste management. The EPA also oversees the extent to which the MMDAs create awareness and educate the public on waste management issues such as refraining from littering waste. Though this is remarkable, the present report also recommends that to enhance the levels of compliance with EPA regulations, more waste disposal bins should be given to the MMDAs so that when distributed to the various communities, it becomes easy for these communities to abide by government regulations on waste management and recycling.

Over the years, the role of the District Assemblies in the management of waste generally and recycling specifically has been generally unsatisfactory. This is because these Assemblies have not been able to cope with the daily quantities of waste generated in Ghana. This in turn owes to various technical, financial and logistical bottlenecks. It is therefore the expectation of the EPA that the District Assemblies should create the necessary legal and administrative environment for the private sector to operate in waste management.

Table 19 Contact details

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8. Conclusion

We have identified that many institutions are involved in the waste management sector in the four target countries. The roles and responsibilities of the various actors are not clearly defined. In Senegal, for instance, the high number of stakeholders involved makes it difficult to establish a sustainable waste management system considering the frequent changes at institutional level.

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