

THE WASTE MANAGEMENT SYSTEM IN  
LOW INCOME AREAS OF  
JOS, NIGERIA: THE CHALLENGES AND  
WASTE REDUCTION OPPORTUNITIES:  
APPENDICES

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# APPENDIX 1: FOCUS GROUP DISCUSSION GUIDE ON HOUSEHOLD SOLID WASTE MANAGEMENT IN JOS

## 1. Introduction and purpose of the meeting

The discussion procedure or rules shall be as follows:

- Participants will be given the opportunity to introduce themselves.
- The discussion shall take approximately 2 hours. All record of discussions shall be coded to maintain anonymity and confidence.
- Your opinion and viewpoints are important in every issue that will be discussed. During discussion no answers will be treated as wrong, so please feel absolutely free to say everything you think.
- It is important to hear your view, but it is not a must to answer each question, try to express your thoughts any time you have something to say. Let others also speak and respect their opinions.
- My role is to run the discussion so that each and every one of you may get a possibility to speak out and to be sure that all matters have been discussed.

## 2. Main problems of solid waste management (20 minutes)

- In your view how well is solid waste managed in Jos?
- Do you think that waste has an impact upon society and the environment? If so give examples.
- What do you consider as the most urgent problem related to solid waste management in your household?

## 3. Solid waste management practices in households (80 minutes)

Let us discuss the current situation of waste management at your household. Please speak out and give more details about everything related to this issue.

- Generation and storage of solid waste at households.
- Waste separation at households.
- Do you separate solid waste in your household into different material types? If so what and why?
- Do you re-use or recycle any of your waste? If so what and why?
- Do you compost?
- Does anyone buy waste materials? If so what and why?
- Collection and disposal of household waste.

- Payment for solid waste collection.

4. How to contribute for improvement in solid waste management.

We have discussed the entire process of solid waste management from your households. It is important to know how willing you are to contribute to the improvement in solid waste management at households.

## APPENDIX 2: FOCUS GROUP TRANSCRIPT SUMMARIES

Examples of transcripts from two of the focus groups. Note these are consolidated versions providing a summary

### **2.1 FOCUS GROUP JENTA 1**

#### **In your view how is solid waste managed in Jos city?**

003- Waste is fairly managed because there are containers placed around the town/city for waste collection which is good and has helped the city to keep a clean environment.

001-Disagreed that waste is poorly managed due to poor dumping and collection methods. The waste containers in the town are not always emptied so waste fills up and overflow.

005- Blames people saying that government has good policies but the people but the people do not abide by the government policy as people dump waste indiscriminately thereby littering the whole environment.

004- Blames the government for not making good provision for waste management within the city and at the community level. Government does not even evacuate the waste in good time when the containers are filled up and hence more littering will take place due to the work of scavengers and wind.

006- States that even when the government collects the waste, it is still not dumped properly. They transport it openly thereby scattering the waste on the road, and also dump illegally not far from the city.

#### **Do you think that waste has an impact upon society and the environment? Give examples.**

#### **What do you consider as the most urgent problem of solid waste management in your household?**

001- As a result of crises, some homes were deserted and have become a dumping ground for waste. This has caused rodents to take over the house and multiply in their numbers thereby becoming a problem for the neighborhoods. These rodents can cause diseases such as Lassa fever.

003- Narrated that he personally contacted ascaris due to the use of polluted water from a stream near his house.

005- Added that polluted water can cause rashes and also cholera when in contact with the water.

002- When polluted water from a stream is used for irrigation farming, and such crops and vegetables are eaten raw can cause typhoid fever.

004- Said even when waste bins are available and waste has been collected, the main problem is where to dump the refuse.

007- Also agreed with 004 above that the biggest challenge is where to dispose the waste after its collection.

009-Said the populace has a non challant attitude towards waste handling.

006- Waste are uncontrollably dumped and burnt in populated areas causing serious air pollution.

### **How do you generate and store waste at your household?**

### **Do you separate waste in your household into different types? If yes what and why?**

003 and 004- affirmed that they do not separate waste.

005- Separates waste where food waste/ leftovers are collected and given to pigs while the other waste is collected for disposal.

Do you reuse or recycle any of your waste? If so what and why?

003, 004 and 005-recycleempty drink cans for pot production; empty plastic bottles are used to fill up local drinks (kunu), palm oil, groundnut oil etc.

006- Yam peels are dried and grounded to make” amala”

### **Do you compost?**

003- Yes using banana peels to compost for irrigation farming.

002- Chicken litter and cow dung are also used to produce organic manure.

006- Does not compost waste to manure because of lack of space.

005- Added that lack of proper education and farmlands for such waste is the major setback.

### **Does anyone buy waste materials from you? If so what and why?**

### **Who collects and dispose solid waste from your community?**

005- Waste is not collected, we manage it ourselves by burning or disposing it in river channels then waiting for the rain to come and move them downstream.

006 and 002- We collect our waste and dump it with other people in the open dumps. On sanitation days we organize the youths to go and clear it through burning.

004- Waste not collected so we throw it into a shallow pit behind the house. When it is full we set it on fire to reduce the volume, thereafter we scoop it and use like manure.

**Do you pay for solid waste collection?**

All members agreed that there was no payment for waste collection because there are no waste bins provided, 002 and 005 added that even areas where there are bins provided no payments are made.

**What do you think should be done to improve household waste management?**

003- Mobilize and educate as well as create awareness for the people and community to provide waste bins.

004- Government should provide equipment for dumping and evacuating refuse, also to provide cars and microphones to announce for people to bring out waste.

005- There should be tough and strict enforcement on people within the community.

002- There should be proper drainages

007- Suggested that government should partner with private companies to subsidize cost to the community as they manage waste themselves.

006- In addition suggested that there should be provision of sanitary facilities, e.g toilets for the communities, even though the topography of the area makes it very difficult for building the toilets.

001-Education is the best solution to the community waste management challenge

## **2.2 FOCUS GROUP 2 JENTA**

### **In your view how well is waste managed in Jos?**

008- Government is trying, but not all the time they come to pack waste. For example waste is left to overflow in the waste bin around Alheri private School.

005- For me government is trying to improve. Here in Jos there are waste bins, but they are placed too far from people. Here in Jenta only one point of collection, so too far from people. Even then it fills up but not collected on time so it scatters all around and causes problems. It is good for government to think of recycling to lessen the quantity of waste coming out from households.

006- Government tries to evacuate, but the evacuation vehicle is too open, so waste scatters all around in the process of transportation. We the people contribute in dirtying the environment because we eat as we move and throw packaging anywhere and anyhow, so it is like we are punishing government.

004- People throw waste a lot on the ground and in the gutter, so we help a lot in dirtying the environment..

007- Government trying? I rate them 25% in terms of trial because the distance people travel to drop waste is discouraging and it encourages them to throw it in any space they see.

001- In Jenta Makeri there is no waste bin anywhere nearby, so we dump our waste in the river nearby and same is the situation with other locations in Jos, so how can waste management in Jos be said to be fair?.

### **Do you think that waste has an impact upon society and the environment? If so give examples.**

007- Yes waste has an impact upon the environment for example waste that is disposed in drains block drainages causing water ponds or floods which help promote the breeding of mosquitoes that cause malaria.

002- Waste disposed behind the house or open dumps encourage flies and these flies can infect our food causing us different form of diseases.

007- Yes, look at the waste bin around Alheri private school. During mango periods or rainy seasons the waste bin there harbors a lot of flies which is dangerous for the school children, and also it smells terribly and can cause an outbreak of an epidemic in the school.

What do you consider as the most urgent problem related to solid waste management in your household?

005- In my household we don't have dustbin, so we sweep and pack in a polythene bag and throw away at night in illegal areas i.e on the street, drain, or stream.



007- My house is a compound with many tenants so sharing a waste bin is a big challenge because of issues about disposing the waste. As such individual families prefer to manage their own waste.

001-Sharing waste bin is a big problem for our compound, because my neighbors' will pack dog faeces, dead chickens etc and put in the dustbin and they will not be ready to go and dispose immediately. It will smell and attract flies in the whole compound which becomes a nuisance.

006- Our house does not have proper drainage because of the unplanned nature of the building; as such our sewage water gets trapped around the house and breed mosquitoes.

002- Some houses on the upper side of our house do not have toilets, so they use the immediate environment as their toilet and we suffer on the lower side when the rains comes from the stench of their waste.

### **Generation and storage of waste at households, how do we do that?**

#### **Do you separate waste in your household into different types? If so what and why?**

001-No. All waste is collected and dumped together, e.g dead chickens, yam peels, papers, pampers. Waste is waste as such all is collected together and dumped.

006- No, but useful things are collected and kept separate, while others are collected together and dropped in to the waste bin.

004- No. But cans, plastic etc are not waste anymore because we collect and sell to scavengers, while the other useless waste is collected together and disposed.

#### **Do you reuse or recycle any of your waste? If so what and why?**

006- Yes, Recycling of cans and plastics and reusing tins and bottles to package other items.

003- Yes, polythenes are reusable in pit toilets because of infection.

004- Yes, all forms of aluminum products including drink cans are recycled into pots at Katako market.

005- Yes, newspapers are sold for recycling into other products like egg crate.

007-Yes, plastic jericans or paint buckets are reused after using the original products. Also big milk tins are used to store items.

001-Yes. All old and spoiled electronic waste like TV, Fridge, DVD etc are collected for recycling.

002- Yes, all kinds of metals are collected and remelted to produce new metals.

#### **Do you compost?**

004- No, all waste is collected together and disposed

002- No, we live in a compound and there is no space so how do we compost?

**Does anyone come to buy your waste material? If yes what and why?**

**Who collects waste from your community?**

All participants voiced out that government does not collect waste from their community, so they manage it by themselves.

003- Said individual members either from their community or another community do come to help pack waste, but once done they have to be paid.

005- The bishops court (a catholic centre) does call individuals who have trucks and negotiate for their waste to be collected at a fee.

**Do you pay for solid waste collection?**

All participants agreed that they do not pay anything for waste collection, because government does not offer them that service.

**What do you think should be done to improve household waste management in your community?**

006- If government can appoint individuals from different zones (6) and allocate dumpsites for them to monitor the evacuation and disposal of such waste. Then individual communities will be the better for it.

005- Workshops to create awareness on solid waste management. If government does their part we can also do our part.

003- In Jenta our whole area is like a dumpsite because people eat and throw anyhow. If only people can be educated so that they can have a change of attitude and be responsible citizens of their locality, then issues of waste management within the community will improve.

002- Lack of roads compound our problems. If there was good road I believe we would have a dumpsite where everyone can drop their waste centrally and government would come to evacuate. Government should do something fast about waste in our locality otherwise even the pedestrian roads will be overtaken by waste.

001-Government should restore the public health workers to continue to come round for inspection and penalize households who are not disposing their waste properly so that it can serve as a deterrent to others who want to do it the easiest way. There was an outbreak of cholera some time ago and we lost some loved ones, we also spend money on hospitalization because of frequent malaria issues. Government needs to revive the laws concerning waste management.

003- Malaria is a common issue and is cheaper to treat than tetanus. The way sharp objects like nails, zinc, a needle etc are disposed with every kind of waste and indiscriminately is very dangerous. While you are doing your best to dispose properly, somebody is disposing his or her own anyhow and putting you at risk of infection. Government should rise up to the occasion by protecting its citizens through enforcement of enshrined laws. It will help improve the situation of solid waste management.

007- Government should collaborate with the ward heads who are government representatives in the community to make individuals participate in the monthly sanitation to clean all around their surroundings and take it to where evacuation trucks can access. If this can be done monthly the waste situation would improve.



## APPENDIX 3: CONSENT FORM

### Consent Form

Title of Project: The waste management system in low income areas of Jos, Nigeria: The challenges and waste reduction opportunities.

Name of Researcher: Mrs Janet Agati Yakubu.

1. I understand the research being carried out and know what is expected of me (to make contributions in group discussions, respond to interview questions, fill questionnaires or make available all solid waste collected from my household per day).

I \_\_\_\_\_ agree to be involved in this research which investigates (assessing the impact of waste prevention interventions on low income households in Jos, Nigeria). I give my permission for (Mrs Janet Agati Yakubu) to use excerpts from the (focus group discussion, interview, and questionnaire or baseline data collected) for the research she is carrying out.

2. I have read and understood the information sheet for the study and I have been given the opportunity to consider the information, ask questions and have all these explained and answered satisfactorily.

Mrs Janet Agati Yakubu has explained to my satisfaction the purpose of the study. I have been informed of the nature and purposes of the study and have read the information sheet. I understand the principles and processes of the study.

3. I am aware that I will be asked to participate freely in a focus group discussion on household waste management in low income areas, respond to interview questions based on my experience and expertise, fill questionnaires and allow access to collection and quantification of daily waste generated by my household members.

4. I understand that my personal details including my contacts will remain confidential. Data will be stored in a secure area and destroyed after the completion and publication of the research. I understand that relevant anonymous sections of any of the data collected during the study may be looked at by Dr Ryan Woodard for teaching and research purposes.

5. I understand that my participation is voluntary and that I am free to withdraw at anytime without giving any reason, without my rights being affected. In addition there will be no adverse effects either to me or the project as a result of my withdrawal.

6. I understand that the data collected will be used as part of a dissertation project. I understand that the data will be used in writing up and disseminating Mrs Janet Agati Yakubu's research (including in a dissertation which will be held in the School of Environment and Technology,

University of Brighton). I understand that only anonymous excerpts from the research will be used in this write up.

7. I agree to take part in the above study.

\_\_\_\_\_  
Name of Participant                      Date      Signature

\_\_\_\_\_  
Name of Person taking consent              Date                      Signature  
(If different from researcher)

\_\_\_\_\_  
Researcher                                      Date                      Signature

## APPENDIX 4: INTERVIEW TRANSCRIPTS

### 4.1 INTERVIEW WITH THE MINISTRY OF ENVIRONMENT

**What is the general impression of your ministry with regards to the standard of solid waste management in Jos city and the country at large?**

My impression about the ministry is that we have not gotten it quite right yet, because the ministry is young compared to other ministries like education, works etc. Ministry of environment is new and is saddled with so many responsibilities including waste management. The political head of the ministry is usually the commissioner who may be a novice in this field. The commissioner for environment is politically appointed and may not know the technical definition of the environment, and sometimes policies are implemented based on political bias, sentiments, and the rest of them like who gave us the highest number of votes, is who we will want to put in, not where the problem really is, so sometimes the will power to execute programs may not be there so no matter how you write memoranda you may not get adequate response if there is no political will to execute such program. These are some of the difficulties we are facing. My impression is that if you are lucky that the commissioner knows or is sensitive about environmental issues, he may put pressure on the Governor because every memo that goes to the governor is through the commissioner and the onus of convincing the governor on the issues involved lies with the commissioner. The resources of the state are quite limited and there are competing demands, so until they are convinced they will not just release funds for environmental matters like that.

**But I still don't actually understand what your impression about the ministry is, whether you think they are doing well or not?**

The ministry is not doing quite well; so I would not rate them as excellent but may be average.

**You mentioned that the ministry of environment is quite new I don't know if you have an idea about when it was established?**

We had Federal Environmental Protection Agency (FEPA) then it metamorphosed into the Federal Ministry of Environment (FME), it cannot be more than 15 years ago, so it is quite new.

**Are there any areas of concern or any new developments in the pipe line on a national level with regards to Municipal solid waste management?**

Yes, at the Federal level we are working on a policy where by manufacturers or producers of goods will buy back their waste and recycle, that is in the pipeline at the national level so that every manufacturing industry will be responsible for their waste which is a good development.

**Is there any relationship or link or do you work hand in hand with the Federal Ministry of Environment?**

Yes we collaborate with the Federal ministry of environment by adopting the laws which they make and implementing it in the States. For example we are State ministry of environment, waste management in this country is the constitutional responsibility of the third tier of government, primarily (the local government Agencies), but there is an understanding at the national level that the scope of waste management in urbanized areas is too big for LGA's to handle, because it is capital intensive, and so many other issues are involved, a lot of technical competence is required and so on, so the States may intervene. Jos is a city quite populous so the State government manages waste in Jos - Bukuru metropolis, instead of Jos North and Jos south managing waste. All other local governments within the State manage their waste.

**What is happening in the State now, do you think there are adequate measures in place to ensure that local municipal strategies and practices are in keeping with municipal solid waste legislation and policies?**

Yes we have tried quite a number of times to commercialize and privatize waste management but due to political reasons and so on we failed, for instance we tried to privatize waste management, where there is a policy called polluter pays and it failed, we interviewed quite a number of private operators but politics overshadowed it. All the big politicians in the State brought their relations who do not have the capacity to do the job, because they saw it as an opportunity to make money and so they all failed because they concentrated on generating funds and they were not doing the job, so it failed. We tried about twice but it all failed, hence government now manages waste as a social service. Presently in the State there are no private solid waste managers except if they are doing it illegally. Government is not registering private operators any longer, so even if they exist they cannot operate openly. Government manages waste from the public, from the streets but we do not enter individual homes, corporate organizations or companies to manage their waste or sweep their compounds but once waste is packaged and placed on the street, it becomes the responsibility of government, and we pick it up freely. The private people may manage in house waste, for example if you have a company they may be responsible for cleaning in house but once they package it and put it out on the street, it becomes the responsibility of government and that is what is obtained now.

**I don't know if you have an idea of the number of private companies that you tried, who they are, when they started, and when they failed?**

There were about 10 in number, and we tried that twice from 2002-2004, but I cannot remember their names (details can be found at PEPSA). PEPSA is a parastatal of this ministry; in fact they are directly implementing the waste management policy of the ministry. They are the ones actively engaged in the management of the waste. We at the ministry are in policy formulation.

**Do you think that there are adequate municipal budget allocations and national support structures in place for responsible municipal solid waste management in this city?**



Yes we have budget proposals yearly and the proposals are regularly approved but the problem is the cash backing. The cash releases are not done, each time we propose a budget for the year, we want to buy trucks, we want to buy septic tanks emptier, accessible vans, we want to buy this and that, the governor signs and says this is an approved budget but no money is released. That has always been the problem, it is like there is no budget discipline, and the politicians just divert the money the way they feel like. If you see our budgets you will see that everything is adequately budgeted for but there is no cash.

**Do you get any support from the Federal government or any NGO's on waste management?**

No, so far there is no NGO that is supporting waste management in the State. The little support we got some years ago was from UN Habitat, it was not to manage waste per say but to carry out a little research on waste management and they also supported two communities to build some toilet facilities for schools, it was like a pilot project plus equipment's to manage waste.

**Which organization is responsible for solid waste management here in the city? And what is their role?**

PEPSA is responsible for waste management in the State. The organization is a parastatal of this ministry and it is headed by a General Manager (GM) and is answerable to the ministry of environment. Their role is to on daily basis sweep the street, gather the waste and pack, evacuate, and convey/transport it to the final disposal site. The method of disposal is crude open dumping, not the standard sanitary landfill. Government is yet to acquire land and develop for final disposal of waste, year in year out we budget for it, but no releases are made and so we find other ways of disposing it. Jos is full of burrow pit because of tin mining activity, so there are lots of waste lands, so what we do is we solicit with the land owners and they give us a place which we convert to an open dumpsite and once it is filled, we leave it for the farmer and seek for another one.

When such is being done do you consider any issue about the environment? Like some of these dumpsites may be close to households and if you put it there some of the leachate may enter into our water bodies.

Yes, we consider that and we make sure that the dumpsites are taken far away from human habitation because when fire is set, nuisances of smoke is bad for the environment, more over such open dumps are not fenced and scavengers can scatter it which can be a risk to the environment and the inhabitants.

**Are you aware of any recycling or reuse going on within the city as part of waste management?**

No, government is not recycling anything, but there are scavengers that move from dump to dump, house to house, trying to sort for metals, plastics and other categories of waste, they

transport it to cities like Kano, Lagos and the rest in trailers, that is what I often observe. I have not seen any recycling plant yet in this city.

**Do you find the institutional arrangement for waste management effective in this city?**

The institutional arrangement is okay, however the ministry for political reasons do not release the monies meant for the agency (PEPSA) on good time to the agency and that often affects their performance. Sometimes the releases are not regular or constant for instance the fueling, the trucks belong to the ministry, for now the ministry repairs the trucks and fuels the truck and the agency just comes to obtain the trucks every day to work with them and bring them back and there is the tendency for the agency to come and the trucks are not fueled, the ministry will say the Governor has not yet given the money for fuel, and when the city is dirty everybody gives knocks (blames) to the agency, thinking the agency has failed not knowing that the ministry has not yet released the funds which is not a good arrangement.

**Do you think that there is adequate capacity for waste management in this city?**

No the capacity is not adequate because there are a lot of adhoc or street cleaners but the technical people, the environmental health officers or sanitary inspectors are quite few and government has failed to increase their number. The technical people are the ones to lead the street cleaners and the few labourers who have not gone to school; they are supposed to be guided by those professionals. Government also lack equipment's for managing waste, sometimes government does not buy the type of equipment's that we recommend, there are standard waste trucks with cover but government gives contract to whoever they want to give contract. Sometimes PEPSA is called upon and given an ordinary tipper with open body, and because there are no technical people along to insist that they must carry it with cover. As they carry it the wind blows and scatters it which is quite risky. These are the kind of challenges we are facing. There is a ban on employment now, it is yet to be lifted so as few as the people (professionals) are they have to continue to manage as government is not employing.

**Do you think that there are enough people to manage waste in this city?**

No, presently we are concentrating on where the volumes of waste are more like terminus central and Bukuru central, that is where we concentrate even though we are supposed to pack waste from everywhere within the urban centre but for now we concentrate on the most disturbing areas because we do not have enough people and equipment to manage waste in the metropolis.

**What would you say about managing waste from households in low income areas like Jenta, and Tudun Wada, because these places are actually very populous and the presence of the people managing waste is not even felt or seen at all?**

The reason is that these places are poorly planned, very unregulated pattern of buildings, people just build anyhow, no access road for our trucks to pass through, not only our trucks, but even the fire brigade and other vehicles cannot pass through to perform their duties, and where streets

are not provided people just build anyhow, it is quite difficult. However our organization is not responsible for planning so it needs a kind of collaboration with the ministry of lands and survey in order to re-plan those areas. Jenta and Tudun Wada areas are suburbs and they are quite old settlements which the ministry of land and survey neglected while they were growing. Jos city centre is well planned but there are many other places that are not planned like Gangare, Angwan Rogo, Rikkos, Gada Biyu etc. For those unplanned areas what we do is we go there and identify a place which we can use as a communal waste dump, then we can tell the people to bring all their waste and dump it there centrally then we go there and be evacuating it. In most cases when the waste piles up we need heavy duty equipment's like pail loaders to lift it and once we don't get money to hire those heavy duty equipment to evacuate it, it becomes a huge mountain of waste that is dangerous because all sorts of breeding of diseases vectors take place in such dumps and offensive odour's and so many other things. These are the challenges we face cos of the pattern of development.

**During the dry season people set the waste bins ablaze, is it normal?**

That has been the headache because people are used to the old public incinerators so they set fire to the bins in order to reduce the volume of the waste. There is a policy that bans burning of waste at national level, and we have been preaching against setting fire on the waste bins because they are very expensive, if you burn them their life span is reduced, but they still do it. Though sometimes it is not deliberate, but by packing ash with charcoal which may later catch fire or cigarette sticks may result to fire and it grieves us quite a lot to see our bins on fire.

**What can you say about policies and legislations are they adequate for this waste management because since we have rules and regulations and nobody is following it , are they being penalized?**

We don't have problem with legislation per se but we have problems with enforcement because in those days it was easy to enforce the laws because the sanitary inspectors worked hand in hand with the native authority's i.e the chiefs. The chief had the power to adjudicate, but now we have the police so the sanitary inspectors must work with the police and where are the police? Especially during the crises ridden period. There are no proper institutional arrangements for the sanitary inspectors to work well in Plateau State and as long as we have not gotten it right, things will not change. Times have changed so the sanitary inspectors can no longer work alone.

**What is your own role (at Ministry of Environment) in solid waste management?**

Our role is that we adapt the policies from the national level and liaise with the Federal Ministry of environment we try to get best practices recommended by the ministry to implement here. Ours is to tell government this is what is required and it is left to government to accept or not, then we monitor and supervise what PEPSA is doing to make sure they are doing what we say they should do. We also coordinate the activities of the (local government) third tier of government, so basically that is what the ministry of environment does in regards to solid waste

management. In Plateau State now at the topmost part of the hierarchy in solid waste management is the ministry of environment. The commissioner- permanent secretary- Director – PEPSA (who are directly involved with waste management). I report to the permanent secretary in the ministry of environment, and the permanent secretary reports to the commissioner while I have some subordinates under me which include PEPSA. PEPSA is headed by a general manager.

**What is the role of JMDB in solid waste management in Jos?**

Before PEPSA was established in 2002, the responsibility of managing waste in Jos- Bukuru metropolis was JMDB's, but since PEPSA was established JMDB ceased to manage waste. House to house sanitary inspection is PEPSA, management of waste is PEPSA, and enforcement of sanitation laws is PEPSA. JMDB is only saddled with regulating building developments.

**Are there any future plans or strategies that National/State government has with respect to improving waste management in the city? If yes what are they?**

Yes, we have made many proposals; first and foremost we have reviewed the sanitation laws which are obsolete. We have to domesticate them and we have done that, they are now with the ministry of justice. We sent a draft review which is being studied by the ministry of justice which will later be sent to the State house of assembly so that they prepare a bill for the governor to sign, which is what we are doing to make everything effective. At the national level we have no problem with the law.

**Has there been any study of the waste situation in this city?**

Yes we undertook a little study, an analysis on waste management it was funded by UN Habitat in 2007 but the study did not tell us the volume of waste generated in the city it only came out with percentages of these categories of waste metals, plastics etc in residential areas in market places and commercial areas and so on, it did not study the volume of waste generated, the reason was that we could not do that because there were no weigh bridges where a truck will come with waste and you weigh it so that you know how many you will reduce and calculate and remove the weight of the truck and you can easily calculate the tonnage, so that we can say Jos generates so so tons of waste in a day or year, we hope that one day someone will come to help us do that, may be an NGO.

**Are there any suggestions that you would like to make regarding the improvement of solid waste management at household level especially in low income areas?**

To me there is no problem with the people but the main problem is with government and government organizations such as JMDB and town planners they allow people to develop their structures anyhow compounding issues and making it difficult for us to manage the waste. The problem also is with government authorities they will is not there sometimes they mis-prioritise issues they concentrate on things that to me are not as important as health, it is often said that

preventive health is cheaper than curative, but we only sing it nobody gives funds . Politicians will prefer to go and build a clinic in the village something tangible they can hold and point and say we did that instead of employing more sanitary inspectors to go and give good doses of health education from house to house this is what you should do, you should cover your wells, provide covers, make aprons around your wells, don't leave containers of water around your compounds it will breed mosquitoes, and things like that and this is what sanitary inspectors are supposed to do, but nobody will employ sanitary inspectors because at the end of the day if the politicians say our achievement is that we have employed more sanitary inspectors the people may not see it as an achievement. They will prefer to build a big structure or clinic with no drugs inside and people will just see it and say hey they have done something. That is where I think the problem is, lack of will power and lack of coordination that is we are not relating well with other agencies of government organizations, we need to work together in order to get it right. The people are willing to listen.

**Is it the ministry of environment or PEPSA that is responsible for public education of the people?**

The ministry of environment, through PEPSA is responsible for public education of the people. They go out but the professionals are very few and there are no logistic arrangements (because you don't trek about from house to house) like vehicle, fuelling, uniforms, police protection and so many other things so that you do your work effectively. The main reason for going on sanitary inspection is not merely to detect nuisances but first and foremost to go and give health education and secondly to detect for the presence of nuisance and you proffer solutions, you give verbal or oral warnings and you give them good reasons why they should comply and if they fail with no good reasons for failing then you prosecute them in court, then they will be forced to abate the nuisance, but that is not quite effective.

## **4.2 INTERVIEW WITH PEPSA**

**How would you describe the solid waste situation in Jos city?**

The solid waste situation in Jos Plateau State capital is fair, I can say is fair because Jos Plateau State capital was rated sometime as the cleanest city in West Africa, and that tempo presently we are still maintaining it and we still want to continue to maintain it and be the best or the

cleanest city in Africa not only in West Africa, so for now the solid waste collection situation in the State is fair.

**I don't understand what you mean by fair from what aspect?**

The habit of the inhabitants of Jos towards waste generation and storage I say is fair because they are adhering strictly to our own advises. We have sanitary officers sent to various zones in the city and it is their responsibility to help educate the households on ways of keeping their environment clean and bringing out their waste and keeping them in designated areas for evacuation. For that I think the littering of the whole city is minimal, it is not every part of the city that you go that you get waste littered all over.

**You said that it was rated the best in West Africa do you have an idea when that was?**

Yes it was during the Buhari regime, 1984 to be precise when the declaration on sanitation was made by that government, government of the day in Nigeria, Jos was the cleanest.

**Has there been any study of the waste situation in this city? If yes when was it done and who did it?**

Records have shown that some researchers came to carry out waste study of the city, but because of the hierarchy of changing of buttons of the government of the day from one ministry to the other, presently we cannot lay our hands on such records of works done. Waste management in Plateau State was the responsibility of Jos Metropolitan Development Board (JMDB), later Plateau State capital development board, and it metamorphosed to task force on environmental sanitation, then Plateau State waste management agency was established to take over, later they disbanded that agency and presently the advent of Plateau Environmental Protection and Sanitation Agency (PEPSA). PEPSA is not even given a free hand to operate; it is still operating as a unit under the Ministry of Environment so those records readily we cannot easily lay our hands on them, but students like you are always in the agency to carry out research on waste.

**When students carry out research do they come back to give you copies of the research findings or they publish so that it can be somewhere in the archives?**

Yes a copy can be collected from the General Manager of PEPSA is one of such works that was done with details which we have as record, and I hope you will be able to lay your hands on it to guide you.

**You did mention that JMDB was managing waste in Jos at a certain time; can you remember when JMDB managed waste, what time they ceased to manage waste and why was the change in button from JMDB to PEPSA?**

JMDB was established under edict of 1974 and the Plateau State government gave them the responsibility of waste evacuation within the metropolis (restricted to Jos-Bukuru metropolis), and they existed from 1974-1984(10 years) then the military through a coup took over

governance. The military government (Buhari's government) created a task force on environmental sanitation, and the task force on environmental sanitation took over and was responsible for waste evacuation though they were working in conjunction with JMDB. Almost all the responsibility (policy making) was on the task force but the implementation was on the board because the trucks were with them and they were doing the evacuation. In 2001 when the democratic government came in they saw it right that JMDB was more or less in charge of electrification and road maintenance within the metropolis and were paying more attention to that, so they saw the need for an agency specifically responsible for waste collection, hence the creation of PEPSA under edict 2000. PEPSA came into operation in 2001 during the Dariye's regime and the agency is still operating up to date.

**As an agency operating waste management in Plateau State are you able to determine the following? The per capita waste output in the city?**

Yes at least because of our daily schedule and number of fleet we are able to determine on a daily basis the quantity of waste generated, and at least collected and disposed of on daily basis.

**Is it on paper anywhere where one could have such a document?**

Yes I think my schedule officer would be able to give us some records.

**Are you also able to determine the total daily waste output for the city?**

Yes based on the schedules we will be able to get that, it will reflect.

**Are you also able to determine the rate of increase in waste output at the same time?**

Yes it fluctuates on daily basis depending on the number of trucks we have. If we are able to have 20 trucks today definitely it will increase the collection and disposal rate, but once we have breakdowns we have lesser vehicles we will certainly have less collection and disposal rate. The volume of waste increases on daily bases because of the influx of people into the metropolis.

**Will I be able to have that data so that I can see it much more clearly?**

Yes my schedule officer is nearby he will be able to assist.

**Has the city's waste output been increasing in recent years? If yes what could be the cause of the increases?**

Surely you expect increases because as I earlier said influx of people, urbanization, people move into the city for greener pastures and other things, like ours in Jos here especially this season(dry season), this is the time that we generate more waste, in dry season we generate more waste, but not only the dry season all the seasons in Jos because Plateau State is known as the food basket of the central zone in the country because there is no month that we do not get a fresh farm produce in the market. In Plateau State the dry season farming is higher in tomatoes, so Plateau State produces the highest in the country. People from the villages bring

in their tomatoes to sell in the city and in the process bring in more waste. This is so because baskets of tomatoes are always covered with leaves when being transported, hence result to increases of waste being generated. In comparing between the dry and rainy season, we generate more waste during the dry than the rainy season. In the rainy season people dispose their waste in the drainages, streams or rivers and are carried away so you do not get to see it accumulate. The river once it is overflowing you can see the difference, that means the people do not take waste to the disposal site, they dispose it naturally, so we are not able to capture that one, unlike the dry season that one does not go anywhere even though the wind assist in transporting waste from one place to another e.g Tudun Wada to Low-cost area.

**What do you think are the major components of the waste stream and what are their major sources?**

Jos city being an urban area, the major sources of waste is from households, commercial areas, industrial areas, and institutional areas. The waste components are varied ranging from food waste, papers/cardboards, metals, glass/bottles, plastic, textiles, garden waste, hazardous and radioactive waste. However from households point of view since your research is with the households the waste generated is mainly from leftovers of mostly manufactured food items or raw food trashes like maize. This is the time households' harvest their farm produce they trash these things and the stalk are left over within the metropolis. They just don't dispose of it anyhow because there are no places that they can go and drop this things, so certainly this trashes are taken to our designated refuse collection sites. And other household waste are the kitchen food leftovers, raw food items like vegetables, papers, metals, glass, plastics, textiles, wood, hazardous and garden waste.

**Has the waste mix been changing? If so what is the cause of changes in the waste stream?**

Yes waste mix has been changing, and I think the changes can be linked to the natural happenings around like the months rotating from January to December. In December most of the households bring in their farm produce, so most of the waste stream would be made up of the left over from the farm produce and that is what will be generated this month. Again in December which is the Christmas period people will indulge in all kinds of eating and drinking because of the Christmas celebration, so the waste stream will change again to reflect the mood within that time. By January you certainly will not get the same left over of farm produce in waste streams from homes, but you can get the leftover of cooked food items from the festive period like ashes from the kitchen, broken pots and glasses used during the celebration, plastic bags from shopping etc. A lot of fruits and vegetables are produced in Jos, for example from February –June different kinds of fruits and vegetables will come to the market and that will result to a different kind of waste stream from the others. You can see that the waste mix varies from month to month, season to season depending on what is happening. Definitely the waste you get in December is not the same waste that you get in January and it goes on from month to month.



**Have you made any waste output projections for the next few years if yes what are the projections?**

Presently there has not been any concrete projection yet because of the frequent changes in the State. Sometimes you make proposals, but tomorrow the same person is not there to continue, so continuity is the major problem of the State and hence projections are not always made. There are always changes going on like in the Ministry of Environment itself they have changed three commissioners this year alone so how can projections become feasible with such changes? In addition PEPSA is not given a free hand to work (not autonomous), so there is always a clash of interest as you report from one unit to the other. For example when projections are to be made, the director of Environmental health in PEPSA will write to the general manager of PEPSA and the general manager will in turn write to the director in the Ministry of Environment who will then forward it to the Commissioner for onward submission to the governor.

**Without projections how easy then is your work?**

Not easy really, but we use short term projections (quarterly) to guide us, and that is what has been helping to keep us afloat.

**Can you describe briefly the arrangements for solid waste collections in Jos and Bukuru metropolis?**

Jos and Bukuru are designated into zones for easy attainment and these zones are headed by environmental health officers. There were up to 25 zones but because of the State governments' inability to provide trucks for all the 25 zones, we had to cut down to 6 zones which are still in operation now. They are Jos central, Bukuru zone, Angwan Rukuba zone, Gada Biyu zone Tudun Wada zone and Dadin Kowa zone. These 6 zones are helping us to managing waste in the metropolis because where we are not able to cover the officers in charge of those zones will call our attention to where waste has accumulated.

**The 6 zones do they cover the former 25 zones?**

Yes they do, because we have many officers attached to each zone e.g the Gada Biyu zone has about 13 health officers attached to that zone, the officer in charge of that zone to re-assigns the other health officers to cover the whole zone.

**In terms of Trucks for collection are they adequate? How many trucks are allocated to a zone?**

No specific truck is allocated to a zone, but trucks are rotated on daily basis. The roll on roll off vehicles are assigned to zones daily i.e 1 roll on to a zone daily and they are charged to carry 5 Dano bins per day, once they can carry 5 bins in a day then they will adequately serve Jos –Bukuru metropolis, since it is not every day that a bin is filled. The containers (Dano bins) are 13 tons each and cannot be filled with waste in a day.

**What about containers located in the market area can't they be filled daily?**

The market area or the city centre has a truck specifically assigned daily to take care of those areas. For example the AP filling station side (along old Bukuru Park) then the Murtala Mohammed way and Ahmadu Bello way central area, do not only have a truck on daily basis, but sometimes a truck is called for intervention at odd hours if there is a need. The responsibility of health officers is much, they work from 6am to 6pm so once there is anything like an overflow within the city centre they call for intervention.

**So the health officers determine which bin is to be picked and how do they determine which bin should be picked?**

The drivers know when and at what point the bins are filled up. There are about 64 bins within the metropolis and if you divide the 64 bins within 6 zones, then every zone will have 11 or 10 bins and it is expected that every roll on truck attached to a zone will pick 5 Dano bins daily, so I think the drivers will be able to know and attend to the bins on as expected. Also the health officers are responsible for making sure that there is no littering around or during transportation of waste. If a bin is left unattended, it is the responsibility of the health officer to call the attention of the schedule officer. Health officers also ensure that zones with greater number of houses are allocated more waste bins. Health officers make sure that disposal of waste is carried far away from residential areas, and ensure that laterite is added so as to stop the waste from being scattered by wind.

**In terms of disposal where do they (PEPSA) take the refuse to once they collect from the waste bins?**

Households are expected to bring their waste to the waste collection centre's (Dano bins) for disposal, and it is our responsibility (PEPSA) to remove the waste from the collection centre's to designated dumpsites far away from human habitat. We are responsible for that, which is why we have excavator and pen loader to cover the waste with lateritic soil to help consolidate and control the pit especially during the dry season.

**In distributing the waste bins do you have any specific considerations? For example I have observed that low income areas hardly have any presence of waste management in their communities. Tudun wada and Jenta have only 1 dano bin each located around the Tudun Wada market and Alheri private school respectively, which is not adequate for such high density areas, so how do you manage waste with one waste bin each in those areas?**

Madam this is the question i have been waiting for, sincerely from the professional point of view I will tell you the truth, waste management is suppose be for the less privileged people, the low income earners as you have observed, but the setting of these areas has made it difficult for us to meet their yearning demands. The Tudun Wada and Jenta areas are unplanned locations, with no spaces, poor planning, untarred narrow roads, poor electric pole alignment, and lack of accessibility among others. To place those waste bins we need special trucks

designed for that program to have access to the place and this has not been possible and that is why we have problems in putting those waste bins there. Apart from that there is shortage of dano bins, there are supposed to be more than 60 additional dano bins to cover Jos and Bukuru metropolis but presently we have only 64 which cannot cover all these areas, so there is a need for more dano bins to be provided. PEPSA has applied to the State government for the provision of more dano bins, and hopefully government will make provision for more even including trucks so that more areas can be covered. These are some of the impediments that made us not to site these things there, accessibility has the major problem. However, we have sent in more health officers to these low income areas because we want to curtail/prevent the outbreak of communicable disease that may arise from indiscriminate dumping of waste.

**I heard you mention that the State government has been trying, trying in terms of what?**

Recently government asked us (PEPSA) if there were things that could assist us in managing waste in the city, and really one of such things which we put across to government was the issue of inadequate number of trucks and waste bins. I said Plateau State government has tried because it employed over 4000 street cleaners (widows) who sweep and collect the waste and dump inside the waste bins provided (thus keeping the streets clean), but there are inadequate trucks or vehicles to evacuate the waste, hence there is litter at the collection points which is why government needs to provide more trucks for evacuation. Another reason why I said government has tried is because it has provided employment for those widows thus alleviating their plight and even reducing the health hazards of the community.

**As waste managers are you aware that residents do set the waste bins on fire sometimes? And what you are doing about it?**

Yes we are aware and it is part of the problem we have been facing with the local residents of communities. Sometimes the people where those bins are kept in front of their houses will not want to see fire or smoke because it gives them a lot of problem (inhale smoke nuisance) and they would not want these things to be done, but frankly speaking those who put the fire do not live around that vicinity. For example those who sell tea in the evening, at the end of the day they carry the kettle with the charcoal and empty it into the waste bin, similarly the women that fry Akara do the same thing, so and as the wind blows and because the materials in the waste bin are dry especially at this time (dry season) the fire is ignited and burns the waste.

Government would not want the waste bins destroyed, because as the fire burns those metals there is wear and tear it weakens the waste bins. It is not our inability to remove or empty the waste in the truck that made them to set it on fire, but that was during the medical and health workers strike. During that strike we had to involve ad hoc workers daily to evacuate the waste.

**Are you able to provide waste collection services in all areas of the city? If yes what are the arrangements for waste collection in the following areas in terms method of collection, frequency of collection and service provision for High income areas, middle income, low income and commercial areas?**

Yes we do, that is why I said we are running waste collection in Plateau State as a social service, and so all these areas you mentioned are covered. In high income areas like the Government Reserved Area (GRA) sometimes you may see the presence of more refuse bins there than anywhere else because of accessibility and convenience. The GRA is a planned area so there is enough space to place waste bins there, and the people's level of understanding is higher. If a waste bin is placed here or at least 100 meters away, the people around will utilize it conveniently, but in the low income areas somebody may prefer to throw the waste right in front of his house while he is moving towards the waste bin. It is an attitudinal thing but we shall get there soon.

We have established both the sensitization and health education unit already in PEPSA and we have applied to government so that more hands can be employed so that we can get to educate the people through fliers and daily visitation on the need to stop dropping waste all over the environment.

For the low income areas we had some polythene bags which PEPSA was able to acquire and were selling the polythene bags to households at the rate of N20, but immediately we sold those bags to low income earners, they discovered and diverted those bags to preserve foodstuff like beans, maize etc. The prize of the bags rose from N20 to N100 in Bokkos and Mangu markets and farmers were rushing to buy them, and that was how we had a problem with that. But in the high income areas if you go there now people use the polythene bags and it eases our work so even the health officers and street sweepers don't have problems in those areas.

Areas like Tudun Wada (attitudinal problem) people tell the street sweepers that if we don't throw these waste all around (litter) what will you be paid for? So we have to litter so that you will sweep and get paid.

**The people said that at one time they were given polythene by government to put their waste but government later stopped, now they don't have what to put the waste and so they have no choice but to throw it anyhow. What would you say about that?**

Yes we started these things for free, but it was being abused so we decided to give them at a cost of N20 so that they will feel the impact of buying it and maximize its use, but at the end of the day they were selling it, and are just like Oliver Twist who will always ask for more. These are people who are paying a tax of just N50 and government is doing an evacuation of their waste on daily basis for 365 days in a year. The people want light, water, market, road and hospital and it is this N50 they pay that covers for the provision of all these. What is their contribution to government? You see this is where we are having problems with the level of understanding of the low income people. The public enlightenment section at PEPSA really needs to be empowered to go round the low income areas and educate them on how to manage their waste.

For the commercial areas like the market there are people reaping the fruit of government labor. The hausa man is very intelligent, in all these markets within the town you see some hausa

boys with wheel barrows carting away waste. Most of them are self-employed and they go about with their own wheel barrow charging N10, N20, N50, N100 etc before evening he is going home with N2000 or N3000 per day. At the new market there is one man who constructed trolleys (pushcarts) and he hires them out to the young boys at the cost of about N500 daily. The boys use the pushcarts to pick waste from various locations within the market to make their living. They create more problems of waste management for us because sometime they take the waste to where nobody sees them, and then they just turn it on the ground. We have tried to assign some attendants to the various waste bins in the city to checkmate all this indiscriminate dumping.

In the institutions we don't have problems of waste management. For example Jos University teaching Hospital (JUTH), they have their incinerator which they use, Plateau Hotel and Hill Station Hotel have waste stores that we evacuate for them on demands.

### **The University of Jos do you go there to manage waste?**

No, University of Jos has contracted it out to companies like John Scot (a private company) and many others, these are companies that are not registered contractors but they are doing some waste cleaning within the metropolis.

**The high income areas you said that you find it easy to manage their waste because they are learned and have space for waste bin placement, but I still have observed that they have the small portable waste bins placed there quite alright but the waste bins are never emptied, it fills up and is littered all around. I have seen that in two good locations around Moi Hotels near Film Corporation and around Madugu close near unique high school, all in Millionaires' quarters. These waste bins I can say is never emptied but always being burnt and you know bottles and cans never burn, but papers, clothes and plastics burn and the waste (bottles and others that cannot burn) keep increasing thereby spoiling the aesthetical beauty of the environment. What can you say about that?**

You see at the start of the interview I stated that we are in a political era, and some of these things I will mention them to you since you are here on a research work. If you were within the system you would understand what I am saying. Most of these containers (the 64 Dano bins) I mentioned, if you ask me I can give you where they are located based on paper work, but if you go there based on paper work you will observe that they are not there, they may have been transferred because commissioner "A" may not have been opportune to be in the ministry before but today he is posted there, so he would want to use his veto power being the head of that ministry to provide for his people. He will then order the removal of a waste bin from point A to point C, and most times it is removed the drivers do not know its new location. These drivers are adhoc drivers most times because if they get better jobs they move and a new man comes on board who will give him paper locations, meanwhile the waste bins have been moved. In addition those locations may not even be known to me but only to the big shots. Waste bins are supposed to be kept in locations that are convenient and acceptable to the community so that it serves everybody, not just a category of people. You see if someone comes

with his pick up and forcefully removes a waste bin to relocate it how will I the schedule officer know where this thing is kept? The abuse of office is one of the reasons why you are seeing all these things.

If you go to some hotels you will see some of our waste bins right inside the hotel premises, at their back yards. These waste bins were illegally removed from some other location, so how do we get to know the where about of such waste bins if not told?

Sometimes they pay the private companies to evacuate the waste for them, and some other time they ignore it and continue to burn it in place. These are some of the problems we are having, but it is not in our habit to make provision for you for waste collection and we ignore you or don't come to serve you.

The number of those smaller bins in Jos- Bukuru metropolis is over 300 but if you go round you will not get up to 100 of them today. The scavengers steal and sell them to the local blacksmith to produce hoes, even the green walk side bins we had over 2000 of them, now you cannot see any because they have all varnished into recycling plants.

Even the adhoc truck boys that we engage to remove the waste from the walk side bins do remove both waste and the walk side bin and drop it into their bags. They take it to where they can sell (weighed and paid) it. Hence it is common to see trucks loaded with those things (metals) going to Kaduna, Kano, Port Harcourt and Lagos to supply to companies that deal in scrap metals. These are some of the problems that the government is facing with waste management in the State.

**Are there any considerations that influence your decision to serve or not to serve an area?**

No. We (PEPSA) are out to serve everybody as far as waste management is concerned.

**How do communities without waste collection services dispose their waste?**

I think they use their crude methods like the uncompleted buildings, burning, throwing it in the drains, streams, community waste bin; they make use of any available facility that nobody sees them throwing these things there. I must accept that it is really not a welcome development for us, that is why I said our enlightenment unit needs to be up and doing and we need government to come to our aid in making sure that we get to all these communities and make sure we provide standard disposal method be provided for them within such communities it is our responsibility and we will live up to our responsibility.

**Do you think that littering is a major problem in this city? If yes please explain.**

Yes. This season (dry) you need not to be told that littering is a serious problem, because you can physically see that within the metropolis. For example when I was a guest lecturer at the Nasarawa State University, i cracked a joke with the Vice Chancellor. I told him that we create waste problems for ourselves, because somebody goes to buy akara (fried cake) they will give him one white polythene and he will say it is transparent and they will add for him a black

polythene and he will say one is not enough because it will tear off easily and they will give him another one. He has taken 3 polythene bags for buying one small thing, and immediately he goes into the car he empties the content, instead of taking the polythene to go and dispose properly, he prefers to look around and throw it out of the window. The three discarded polythene will separate and take different directions as they fly. This is being done by one person if 10 people do the same thing, then the number of polythene flying on the street will be 30. And again you generate more waste when you go to the market to buy irish potatoes and you insist to have 2-3 polythene bags added, after emptying the contents at home you don't know what to do with the polythene, it becomes waste and who generated the waste? It is you. Hence littering is a serious problem within Jos-Bukuru metropolis.

This is especially compounded due to non-adherence to our bye laws, one of PEPSA's bye law states that every commercial truck should have a waste bin inside the car in order to minimize littering. At present the impediment to the enforcement of this law is the political will of the people, because if you try to force the people today they have their associations and political wards. They will move to the house of assembly and before you realize it, the house of assembly will throw their big hammer on your agency saying that you are infringing on the rights of the people. This is a serious problem that we are facing even in the enforcement of non-provision of toilets. There are a good number of houses within Jos –Bukuru metropolis without toilets. Go now to enforce, the people will run to the house of assembly to seek help. For example the house of the speaker of the house of assembly is by the river side where faeces and other kinds of waste are being channeled and dumped illegally, if you go to enforce by taking an offender (his neighbor) to court, the first thing is that the offender will call the speaker of the house of assembly and the speaker will talk to the chief judge of the State who will direct the magistrate to tell you to settle out of court , so how will you have the zeal to perform? These are some of the political problems that we have.

In Nigeria we need to learn from places like America, Britain and other places who uphold to law concerning waste generation and management. Before anyone is voted into office he/she must sell their manifesto to the people. What are you going to do for the people? What are you canvassing our votes for? If we say the houses of assembly in this country are law makers, what laws have they made to safeguard the environment and the common man? Rather the laws that have been in existence are being broken by the law makers. This is where I think in all spheres of research students have problems because of the political will especially in environmental waste management.

Every year we propose and budget for trucks to be bought, but if there is one truck that goes to government house and the secretariat then they don't care they think all the places are covered, so no approval is made for the procurement of trucks. Go to Lagos State, LAWMA today is paying government money because they are doing very well. Government gave them loan to invest in waste management which they did, today they recycle so much such that in a year they buy over 100 trucks. Lagos is not up to half of Plateau State in area or land mass, but as at today we have only twenty five trucks. Today manually I worked with only 5 trucks then 4

roll on roll off, then tell me how do you want us to cover Jos – Bukuru metropolis with such few equipment in operation? If I am given 50 functional trucks for Jos Bukuru metropolis today, I tell you we will be scavenging or hunting for waste in the metropolis. This is the serious problem that we have that is why the environment is as tidy as it is. The littering takes place all over within the city.

**Are there bye laws on waste disposal? And are you able to enforce the bye laws?**

There are byelaws because the agency was established based on laws and there are laws guiding the activities of the agency so certainly all our activities are being guided by laws.

There is a department of enforcement and in that department there is a prosecution unit. We have prosecutors because every licensed environmental health officer is a prosecutor, and we take our cases to court as those in charge of enforcement go from house to house to inspect and where structural nuisances (nuisances that cannot summarily be abated) exist, we give them time and that is what our boys normally do. For example a house that does not have a toilet you don't give the landlord an ordinary notice because it is not an ordinary nuisance.

A structural nuisance needs construction so the man needs time to make provision so you have to give the man at least not less than 30 days for him to dig the pit, excavate and build and make it usable. You can even give the man the first one month or even four months, if the man is serious and you come the first month and he has already dug the ground then you can add because of the hard times but the next time you come the man has built up you see you have to be considerate and you cannot take such person to court. But the man that you served him a notice and he even refused to dig the hole, this one you charge him under the law. However these things are being frustrated by the so called politicians as I said, so we are unable to enforce some of these things because of some human factors, but really our boys are trying. The governor even made a pronouncement when he made a public declaration on the state of emergency on sanitation in Plateau State. He personally visited Apata area and went to the ward heads house (Alh. Sani) to inspect his toilet, and he gave a directive which is why we build a public toilet at Longwave opposite amusement park. It was built to ease problem of open defecation, but today it is not being put used.

**You mentioned that you are unable to enforce because of some problems; can you mention some of the problems that have made it difficult for the enforcement of these laws?**

You see presently the high court of justice has approved a sanitation court for this agency, but the major obstacles to our going to court is the security situation in the state. To go out for a mobile court you know in our own case we have to hold it in public places, so the security situation in the State is a big problem, finance and logistics are other obstacles.

**How will you describe public attitude towards waste disposal?**



It is very poor here and I don't know whether it is because of lack of awareness, but even in areas where people are enlightened they tend to be ignorant of the knowledge. Those that contribute to the problems are the enlightened ones because i would have loved those who are exposed to the technical knowledge of waste disposal to enlighten those that do not know, but as it is they are birds of the same feather. Their attitudinal approach to the issue of waste management is still very poor, and is a very serious issue on the Plateau. Until people become aware of the dangers of staying with waste, they will still be lagging behind, so the agency (PEPSA) and its enlightenment unit will seriously need to sit up to that.

**Do you carry out public education on waste disposal? If yes how is it done? If no explain.**

Yes we do but we have not attained 90-100%, but how would you rate it now? I would say it is 50% because even without the funds or logistics, we have the professionals on ground that uses their professional capabilities to get to the public. For example since we don't stay in one place, I stay in Tudun Wada and Mr B stays in Nasarawa especially with the advent of sanitation that we carry out every month, it is our responsibility to enlighten the people around our communities and we have been doing it, that is why I can say it is 50%. If all provisions are made financially and otherwise I am telling you we will get there.

**What waste disposal facilities are operated in this city and where are they located?**

These facilities would have been for sorting and recycling, but frankly speaking we are not doing all this. We are doing the colonial open waste dumping (the crude dumping). Plateau State has an accelerated waste dumpsite that has been acquired far from the city, but it is not being used yet because it is not developed. All cities are supposed to have a sanitary landfill (facility is provided) and ours is not even developed, but Calabar, Lagos and Port Harcourt have a controlled dumpsite.

**This open dumpsites that we are operating here in Jos have they been arbitrarily picked or they were approved by Environmental Protection Agency (EPA)?**

They are arbitrarily picked; they have not even been acquired not to talk of being approved.

**Are you aware of any environmental problems associated with waste disposal sites? If yes what are they?**

Underground water pollution is one of the problems we are facing because these waste sites we are using are not developed. We are mindful of the escape route of leachate during rainy season when the water table is high. We use unlined burrow pit to dump waste and these burrow pit allow seepage and overflow, so definitely a combination of those waste that we remove from households without sorting is dangerous to the environment and public health.

When there is seepage leachate moves into the water source and people drink this water, and not only drinking the water here in Jos if you go to most of those places that produce spinach

you will not even buy spinach because they water the spinach with that type of water, even the carrots you will not even want to eat it.

Those waste bins were provided as a means of intervention to keep river Dilimi free from waste disposal. River Dilimi goes through many States in Nigeria and even beyond the country to Chad area. Pollution from river Dilimi can be massive; see the population of the people that can be affected by river Dilimi due to bad management of waste in Jos Plateau alone.

**What is the common problem that you face with managing waste in Jos city?**

The problems are many. Accessibility is one, the non-protection of the open dumps is another thing, we expose the community to many dangers because dogs and pigs scavenge and eat even dead people because the hausa people kill and dump into the river (especially river Dilimi). Finance is not common but to me it plays a major role and it is one of the problems we are facing in the management of waste and inadequacy of the waste facilities is another, manpower is another because number of evacuators is not enough we are lacking and all this things bounce back on lack of finance even the regular workers have not been paid in Plateau State. These are some of the common problems we are facing in managing waste in Jos city.

**What suggestions can you give on how to improve household waste management practice in the future?**

To improve this I think we need to get across to government by advising them to make provision for the welfare of the few already acquired professionals (health workers) in the field. Government should take proper care of their welfare, you see once people are motivated they will live up to expectation, so motivation is the key thing in anything you are doing. I advise that more hands or more trained professionals should be employed, since almost every year people are retiring and with globalization the numbers of people moving into the city are increasing. We should at least have a reasonable number of professionals per households to ensure those households receive adequate information on waste management. Government should provide more facilities and equipment in future in order to take care of new settlements within the metropolis.

If government does these seriously it will go a long way in improving the likes of waste management in Plateau State.

**Are there future plans or strategies that your organization has with respect to improving solid waste management at household level? If yes what are they?**

Yes, we are looking towards having a proper and adequate plan for the improvement of household waste management in the State, and one of such things that we have proposed and put across to government for the upcoming generation is the issue of recycling. It is the happening thing in the world today, and Plateau State should take its turn to benefit from such laudable programs which will help catapult the economy of the State as well as improve the management of waste within the city, thus promoting a cleaner environment and good health.

This will also help the State not to depend on revenue allocation, but will create wealth and job opportunities for the populace. It will adequately reduce the outbreak of communicable diseases because through recycling all the dangerous microbes are destroyed. The unsightly materials are removed thus restoring the aesthetic beauty of the environment. Recycling is one of those things that the State government is looking forward to, for future improvement of waste management in the city. Also there are plans for the training of capable hands because as we move forward things are changing so the scope of professional knowledge needs to be improved. Government is working towards the provision of more materials or working equipment's in order to forestall future challenges of waste management. These are some of the things I see as ways of improving the household management of waste in the future.

**What tools or equipment do you have for waste management operations? Explain in terms of equipment type, number required number available and number in use.**

We are using the crude open dumping method, and as you know we have some trucks in use and the type of trucks we have available for use are the compressors or compactor vehicle ,the roll on roll off, open tippers, pail loaders. In terms of no required and number available and number in use. For Jos and Bukuru metropolis alone we need not less than 50 trucks for a start, but presently on we have only 26 (combined all of them) and the equipment we use for the work, on every truck we have one operator one driver then we attach five evacuators, five sanitary attendants and one sanitary supervisor and in each truck we use 2 fork shovels, 2 shovels, one digger. i.e the requirement per a vehicle

**Are you able to adequately maintain equipments for waste management? If not, why?**

The ones provided so far we maintain them to a certain level, but not adequately maintained because the fuelling is a bit difficult. In Plateau today we have problem of funds. I told you today we worked with only 5 trucks and it is because of lack of funds to put those broken down vehicles into order. For example sometime N2000 will keep a vehicle down for a whole week or two weeks. One vehicle which has been down for long just got repaired yesterday with the sum of N1800. The other one today we had to remove the kick starter of another one that stopped to put in this one. Out of 26 trucks there are those that do not go out. Today only 9 trucks worked out of 26 with one pail loader making it 10. There are trucks that have been down since 2008 e.g that yellow one without tires. On record we have it that there are 64 trucks, though they have not been working, that is why our turn over or output at work is always a problem. Yesterday I worked with 10 trucks, on Monday I worked with 11, last week we worked with 12 and 13 but this week the highest we have worked with is 11, and 9 today. You see you cannot compare them, and that is why it does not give us an accurate interval. We cannot have a chart, a straight chart that can give us the measure of performance. The working equipment's that we have are grossly inadequate, with the increase in population and the development that is taking place on the Plateau today, and you see in town planning you are not supposed to plan without provisions for this things but in Jos city we do planning without provision for things. For example the present highway construction along Bukuru was going

on without due consideration for things like underground provision for tunnel lines for waterways, communication gadgets, other security gadgets, electricity etc.

**What other equipment's are you supposed to have in terms of waste management that you don't have here in Plateau?**

Frankly speaking we are supposed to have a bulldozer a D7D or D9 preferably a D9 bulldozer with a low bed in the waste management agency (PEPSA) but we don't have, because anywhere you pick the waste to a dumpsite at a certain level you know the trucks don't go into the pit they drop from outside, this D9 is supposed to go and roll this waste into the pit and match over it so that it will compact the waste then you continue using that facility, but today in Plateau we don't have any, so it is a serious problem.

**Is there any other equipment that you don't have?**

Yes, even the protective gadgets like the hand gloves and nose masks is lacking, these things are supposed to be provided weekly, nose mask is supposed to be provided daily because these are disposable but we are given nose mask once in a while or twice in a quarter. For example this bomb blast that occurred last Thursday (a week today) it was after the bomb blast that they went and bought nose mask for us to use and evacuate the dead bodies. In waste management the store is supposed to be stacked with all this things, like chemicals, detergents, nose mask, gloves etc. Even the evacuators are supposed to be given a tin of milk each because it reduces the inhalation of dust and fumes, but we don't do it. Sometimes you may see the waste attendant getting fatter and fatter you will think he is hefty but it is the effect of the waste.

**In your view how can the equipment problem of waste management sector be solved?**

These can only be solved if government lives up to her responsibility by making available more funds to procure this equipment. Government should discourage the appointment of nonprofessionals to manage waste agencies because in this State since the inception of the agency, this is the first time we are having a professional as a waste manager, all this while we have never had any professional heading the agency. The professional just took over last year (2013) as the head of the organization and he is a waste manager. For the procurement of the equipment's, only the professionals (waste managers) know the right requirements, so they would be able to advise appropriately.

**What are your sources of finance, are you able to acquire enough funds for your operation?**

No, our only source of fund is the annual budgetary allocation from the State government, and the agency is not even a self-sustenance agency. It is answerable to the ministry of environment which is another serious impediment to the management of waste in Jos city because our entire request has to go through the ministry. All memos that we write to the governor we do it through the ministry, and the ministry will have to endorse it before dispatching to the

governor. If there is any release of funds, it is made to the ministry, and the ministry manages the fund on our behalf, so it does not even get to us that is why all the trucks are in the ministry.

The ministry is a policy formulating body which is supposed to formulate policies and send down to PEPSA for implementation but that is not done; instead it is busy controlling the affairs of the departments under them (forestry department, wild life department, and protection and sanitation agency).

**Is there any other organization that supports you in terms of finance apart from the State government allocation?**

Yes, normally the Federal Ministry of Environment assists the State Environmental Protection Agency (SEPA) with funds and logistics but ours everything is channeled to the ministry of environment; nobody directly gives any support to PEPSA but thru the State ministry of environment. Though sometimes we are told that World Health Organization (WHO) and their likes donate funds towards waste management, but we don't see it we only hear it. Anything that has to do with grants go through the State ministry, even the procurement of equipment, they procure and give us.

**Do your clients pay for waste disposal? If yes who pays and at what rate? Who do not pay and why?**

Presently we don't have any client that pays for any waste disposal because we have not commercialized the waste management activities in the Plateau. It is still being run as a social service, but we are aware that there are people on their own that are running that as a business and they are getting enough funds from the public. These people generate revenue from the public at the detriment of government. We have written proposing that high income areas ( knowledgeable people) like the low-cost housing areas, Millionaires quarters and other government reserved areas (GRA's), let us do a study so that we can commercialize their waste management in order to serve them better. If we do that and we are able to serve them well, they would be happy and would like to participate more, but for now nothing is being done on the Plateau everything is left in the hands of government. No group pays, not even the high income areas.

**Are there any potential sources of generating funds? If yes are they still available for exploitation apart from the State government?**

If commercialization had been in place I would have said yes we will give you a good answer to this question, but since government has not taken up anything, then the answer is no.

I must say that our house of assembly members are just sleeping dogs, they are supposed to think of these things, these are where we can look inward for the generation of revenue for the State and this is one aspect but you see I cannot go in to talk of something that the State is not willing to resolve.

**In your view what could be the solution to the finance problem of the waste sector?**

To me if the agency (PEPSA) is made self-sustaining or self-accounting that will be the solution. Funds should be channeled directly to he/she who does the work, who manages the waste; he/she would know what to do and would be accountable, so unless that is done the financial problem of the waste sector may continue.

**Have you received any donor support for waste management in recent years?**

No.

**So how is waste being managed from households right now?**

It is done through daily visitation by our team of workers. We visit streets not homes where households are expected to bring their waste to dispose and we pick it up from there. For households it is the responsibility of our enforcing agents (our staff who go from house to house) to enforce. Our staff are supposed to go from house to house but their number is inadequate because for the whole of Jos- Bukuru metropolis the agency has less than 100 environmental health officers taking charge.

**Are households involved in decision making about solid waste management? if not why?**

No, because the government laws or policies have not made it possible to involve households in waste management decisions. Communities are not even involved not to talk of households, if communities were involved, then the communities are the one to get back to the households that make up the community, so that they can be made to be part of the policy making but presently this is not so. That is the reason why the people in Tudun Wada are complaining of lack of siting of a number of waste bins in their community. If they were part of the policy making certainly they would be considered for more waste bins as they would give reasons for that. For example out of the 60 waste bins to be charged in Jos city, the decision makers will agree on how many communities exist, and how many waste bins each of the communities will get, so if they were to be part of the people to decide on where this waste bins should be dropped, they would have benefited, but now they are not being involved.

**Why do you think that is happening or why are they are not being involved?**

For now I would say it is the policy of the government, if I go further I may be digging my grave.

**What do you consider to be the major problems or constraints to waste management in Jos city and what causes the constraints and how can they be addressed?**

Presently in the metropolis here (Jos- Bukuru), sanitation is the responsibility of local governments but the Local Government Areas (LGA's) do not know their right in these that is why PEPSA is still running these activities. The LGA's are just after revenue generation just like in Jos- Bukuru metropolis, they don't even have one refuse truck, the health department of

all LGA's are just interested in monies generated from immunization , go to them they will only preach about immunization . They don't even know that waste management and collection is a problem, they talk more on revenue generation, so there is problem there. Until there is separation of power who is in charge of what, if this is done that is when we will get somewhere but if it is left the way it is today then we are not getting anywhere. Until the LGA's and the agency (PEPSA) know their right and responsibility, who does what and at what point, if not we will still be lacking behind that is a major problem of waste on the Plateau. Other problems of waste management in the State range from lack of finance, lack of equipment, obsolete laws and non-enforcement, lack of public education, inadequate waste workers, politicization of appointments and activities, lack of autonomy etc.

**In your view what can PEPSA do to improve household waste management?**

I think if the lots of the agency are taken care of by government, we will improve seriously on household waste management in the metropolis. I mean if PEPSA is given a free hand to operate, we are people who go out to the field, we interact with the communities, the household owners and we come back and strategize and let government know, but where government will only direct us to go and do these in the communities, I don't think we will be heading anywhere, so PEPSA will improve on household waste management if given a free hand to operate. Also if we are given the logistics and the funds to do this work, we will involve whoever is supposed to be involved for the improvement of this activity.

**In Jos city is the private sector involved in waste management activity? If yes who are they?**

No, because government has not officially recognized the private sector in Jos –Bukuru metropolis, but some people are doing it quietly and we see their roles as very helpful because if not for them most of these organizations would have had a lot of pollution but private professionals have evolved and are handling their waste like in Jos University Teaching Hospital (JUTH). The outbreak of disease is minimized because professionals like Anthony Gunok (a registered fumigator) is fumigating for JUTH and University of Jos (UNIJOS).

**What other private companies help in waste management in Jos, even if not for the State?**

Anthisan is another company; Dura clean is a registered cleaning company, and Rimfort in Bukuru is also into waste evacuation and fumigation. We would love to involve the private waste sector but the policy makers have not allowed that yet.

**Does recycling take place in Jos municipality?**

For now no, but it is a no and yes answer. The no is affirmed because there is no official registered company for recycling waste in Jos. However there are places we know that are recycling waste like along police training school on Zaria Road (I don't know if they are still in operation), there use to be a plastic recycling company, they buy waste slippers and other plastic rubber to produce plastic kettles and buckets. At Katako market here in Jos, a lot of

recycling is going on using aluminum drink cans to produce pots, bones are also being recycled through incorporation in to chicken feed, and cartons are used to produce egg crate.

There are scraps like the one we saw today using the wheels of motor cycle and the wire mesh from the rims of tires to produce a gauge for drying (smoking) meat and fish. There is also a company that reuses cartoon, they reopen and turn the cartoons inside out, and then they stamp the name of their product on it and repackage. For example the Niger bar soap has a counterfeit; just try to observe the cartons when you go to buy. You will see that the inner part of the carton is a different company from the outer part. There are many outlets that are producing the Niger bar soap, and they are not the same with the real Niger bar soap. There are a lot of things that are being done here in Jos city through reuse. For example there are some gin, wine and even beer in shops today as a result of that. These are produced after buying the bottles to reuse. Many such outfits were sealed up some time ago at Rukuba road here in Jos.

**Does composting take place in this city? If yes explain the level at which these happens.**

There is no exact place to show where composting takes place, but schools were doing it in those days, and ministry of agriculture is also supposed to be doing it. During governor Dariye's regime the fertilizer blending company in Bokkos was set up mainly for that purpose. The general manager together with one woman were always packing ash to go and have some trial on composting in preparation for the take-off of the fertilizer blending plant, but somehow that did not happen, so nothing is going on now. Composting does not take place in Jos at present.

**Does the municipality conduct any training or public awareness program on solid waste management? If so what has been the response of the public?**

For the past 15 years (since 2000) there has never been any training or public awareness campaign on solid waste management. When we were in JMDB we use to organize an in house training especially for the attendants because they are the people that do the evacuation. We even use to invite the producers of certain items like bakers and food handlers (they generate more waste), every 6 months we were organizing training workshop for them. However since 2000 no training has taken place. The creation of the environmental health department in the ministry of environment took place this year when Sarah Yusuf was handing over to Sylvanus Dangtoe. That department was created about 6 months ago. The response of the public cannot be rated since the public awareness has not been doing its work.

**Is there any Non-Governmental Organization (NGO) operating in this city to promote waste management?**

For now no, because the one that was trying when they disbanded the trial of commercialization the man ran away from Plateau, so right now nothing exist like that on the Plateau. In Nasarawa State and the Federal Capital Territory (FCT) Abuja there are many NGO's. These NGO's exist only in places where they are recognized by government, but since they are not recognized here in Plateau, they left.



Even the solid waste management you know is part of household waste management is not being done, it was JMDB that was doing it and that truck broke down since the past 2-3 years. Sometime is the one that use to come from Bauchi prisons that go from house to house you pay them, recently Unijos consultancy bought one and every evacuation is 10,000 and there is no truck that will give you money like that truck, but nobody has it in Plateau.

### **4.3. INTERVIEW WITH ACADEMIA**

#### **What do you consider to be the cause of the poor solid waste management in the city of Jos?**

There are many reasons why there is poor waste management in Jos city; the rocky nature of the city has made it very difficult to have access to some households which is a major problem. The city has grown very rapidly without any planning and so access routes are narrow and that is a major issue. The problem particularly with low income areas is that there is even no proper access to organize waste collection system because the houses are just built anyhow. Then the other reason why wastes are not really well collected is that from the public point of view i.e government itself (PEPSA) is the waste agency in Jos now, and I think they are doing their best. When you look at PEPSA now they have got new vehicles, they have got man power, I think they have tried to improve, it is the best agency but they are not even able to collect all the waste from the city centre and the commercial area even where there are proper roads, so that is a very major problem for them to be able to collect. The third major problem is that we don't even have an organized household waste collection system, in other countries they have waste bins, government gives them waste bags and they are even supposed to sort out their waste before disposing, then government just come and collect it and take it away. But here in Jos we don't even have that kind of system at households. Following that is that most of the households don't even know what is called a public waste dump itself because there is supposed to be neighborhoods where there should be public waste dumps, where vehicles come to collect from the secondary waste dump to a primary waste dump, and then to the final sanitary pit. We don't even have this kind in our cities and that is a very big problem. Another last one I would say is the lack of any stringent regulation on sanitation. You know that even in the colonial period there use to be very stringent laws and there were sanitary inspectors that use to go round and inspect your houses, drains and sewage and if they found out that even your gutters were not clean you will be fined. Even the mining camps in those days had sanitary inspectors, because to the white man "health" was very important, they feared mosquitoes like they fear God, so they made sure that the environments were very clean because those were breeding points for mosquitoes, and mosquitoes were never their friends because of malaria. You can see that we don't have strong public health legislation and bye laws to enforce it on that, so based on that attitude of people themselves our attitude to waste is nonchalant. We don't seem to understand that we need to be guardians' of the environment, and we need to keep our environments clean and protect it. People just throw waste anywhere they want, they don't seem to understand the public health implication talk less of environmental implications and impact of waste. Another reason I can also give you is the cultural and economic changes that we face in the society, as income is increasing our taste and consumption is also changing, you will find that people are buying more packaged things in paper and plastics, and the major cartridge is plastics and women compound the problem because when they go to market they buy things in plastics which end up in the waste bin.

The socioeconomic change I am talking about is the pure water thing, whether it is pure or not only God knows. In those days there was no pure water company but there use to be taps everywhere and people could go open and drink, but now everywhere you go now people are buying the so called pure water in plastic sachets and the sachets all end up on the streets, in our gutters and everywhere.

**Has there been any study done on the waste situation in this city? If yes when was this done and who did it?**

To the best of my knowledge a lot of studies have been done on waste which I will give you but most of them have been done by tertiary institutions especially the University of Jos, if you come to the department of Geography and planning you will find that we have done a lot of work on waste. I will give you the research that has been done at various levels. There was a research commissioned by the European commission and we did another by Jos-Durham, which was not on waste but on the resources and ecology of Jos Plateau environment, but a component of it was on how they could research on how they can use some of the solid waste manure as organic nutrient to enrich the fadama irrigation that was taking place.

A number of papers have been done by Prof, Adepetu, Prof Olowolafe and Joshua Galadima on the use of organic manure as micronutrients for irrigation for farming. There is a lady from Durham (Margaret Pasquini) who did her PhD on the use of urban refuse as micronutrients for irrigation facility. Also there are researches on a second level done by our masters and undergraduate students in geography. The third level of research is done by the people from Physics department, University of Jos looking at the public health implications of some of the vegetables being farmed in Jos and I think their finding was that there are lots of heavy metals in the vegetables and that makes them not healthy for human consumption. If you look at our Journals (Journal of Environmental Sciences) there are some papers that were published in the 1980's, those papers from physics were published there. Some people from Federal University of Technology Yola (FUTY) also published a paper on the use of manure as micronutrients in Yola.

**Does University of Jos run courses in solid waste management?**

No course on solid waste management, but the department of geography and planning's courses at undergraduate level is very broad, so we are able to look at the aspect of waste management when we are looking at environmental problems. At masters level we have a masters in Environmental Resources Planning (ERP) and under that course we teach environmental problems and also on urban environmental planning, so again the aspect of waste management comes in there, and many students have an interest in it and have done some projects on waste management. We also have courses at MSc in Urban and Regional Planning (URP), and some students of URP do their projects on waste management e.g Dr Gani Bogoro did his MSc in URP and did his project on waste management in Bauchi metropolis.

**When did this programme start at the University of Jos and how is it impacting on the solid waste situation in the city?**

The Department of Geography and Planning is as old as the University itself (1972) and became autonomous in 1975, and the Master's program (MSc) started since 1979 and has been there, the real issue is about the impact. The application of research findings in Nigeria is almost tending towards zero, because even when research results have been published, public officers don't tend to use it or implement it, so it is a very big issue, as a result the linkage between universities and governance is not really useful. The best attempt was during the Jos-Durham project, when they tried to look at it in an unrestricted manner, by stimulating fadama agriculture and at the same time they were also working on how they can use organic manure to improve farming they discovered that the farmer was still using a lot of organic manure in various seasons, so they want to try that and see how they can be able to do that. One or two people have made attempts to produce these organic manure, the former General Manager (GM) of JMDB (Dr Steven Hirse), actually became interested and around Kwang village some years back tried recycling to produce organic manure but one organization (ECWA) came and packed them to try on their farm in Makurdi, but never came back to pay, and that was how his company collapsed. Also recently I was told that somebody recycles polythene, he collects wasted polythene, cleans and shred it to produce the present polythene bags that we are using. They produce it here in Jos (Rantya) and even transport them out for sale to places like Lagos, Kano, and Kaduna etc. I also learnt that there is a woman who collects polythene and moulds them into statues of (people and animals) and sell, but I have not gotten enough information about that yet.

We were talking about communal waste management, it can be possible because what you need to do is, if there is proper awareness and there is a designated waste dump where all the people in the community can carry their waste, the place designated is well secured you can be able to do some primary sorting and then if you have enough space you can begin to compost it, pick recyclables at the communal level and get some people to manage it and once they know that you can sell it and make money, then the community can begin to work on that, but the major issue is space. If you get a space you can fence it to secure it from animals and children otherwise it will be a big nuisance for the community.

**Do you think the farmers would buy this compost in place of fertilizers?**

Yes they will accept to buy, especially the fadama farmers because they know the importance of this organic manure, and they even give some money to the PEPSA drivers to take the waste and drop on their farms for them to burn and use as fertilizers.

## **4.4 INTERVIEW WITH RECYCLING ENTREPRENEUR**

### **Who is the owner of this business?**

The owner has travelled to supply metal scrap to Lagos. If he had not travelled there was no space to park here because of the mountain of metal scrap that we had gathered. A full truck of metal scrap just left here with the owner of the business.

### **What type of recyclable material do you buy to sell?**

As you can see all around us, we buy different kind of things like metals, plastics, sometimes bottles.

### **What kind of metal scrap do you buy from people?**

We buy different types of metals like black metal (karst), even in black metal there is special and mixed materials, yellow metal (brass) it also has light and deep, white metal (aluminum for pots, tutia for handbags and button) red metal (copper) for earrings and necklaces.

### **What time did you start this business?**

This business has been on for a very long time, it started small by small before it became big and people got to know about it, it is over 10 years now.

### **What other things do you deal with apart from metals?**

We buy bones (for chicken feed at Katako market), swan plastic material (for pure water sachets), tin cans (pots at katako) and left over from aluminum roofing sheets (for pots), also motor filters people come to buy for decoration, bottles for reuse, condemn batteries are refurbished for reuse.

### **Is there any recycling company here in Jos?**

Yes some recycling are done here in Jos at Katako market (pots), Nasco Company (plastics), but others out of here. For example bones, aluminum, plastic are recycled here in Jos, but others can be done in either Kano or Lagos. We buy a whole motor and disintegrate the parts to produce different things e.g bucket, stove, and doors, then we send the remaining parts to Port Harcourt. Even this drum we use it to produce pails, or doors.

### **How do you get all this materials that you have here?**

We have agents who go out to scavenge, so when they bring the consignment we weigh and pay them. We collect to sell to companies or organizations that need them, for example we buy a Kg of aluminum for N100 but we sell it for N150.

### **How much do you think you make in a month?**

It depends on how much materials we get but definitely we have about 50 Naira on each Kg.

**What motivated you to start this business?**

We don't want to depend on our parents for every need, so we started this so that we can make our own money and help ourselves.

**Is there any problem that you encounter in the course of carrying out this business?**

Yes everything has advantage and disadvantage, when we cut this metals it can wound you or you can inhale the dust which is dangerous to one's health.

**What do you feel about this business that you are doing?**

We feel comfortable because it has given us a source of livelihood, many do not have what to do but we are earning money from this business. A full truck of scraps you pay N170, 000 to be transported to Lagos, even at that you have to pay revenue and police on the road but all the same there is a breakthrough in this business.

**4.5 INTERVIEW WITH A RECYCLING ENTERPRISE**

**Who owns the business?**

I am the owner of the business and I have five (5) people working for me.

**When did you start the business?**

I have been in this business for about 10 years now

**What type of metals do you use to produce these local pots?**

We use all kinds of aluminium metals i.e. aluminium from metal cars, zinc, drink cans, aluminium from machines, and all other aluminium.

**Where do you get the metals from?**

We buy either directly from scavengers, individuals (householders), or from waste recycling banks. Sometimes we exchange the metals collected with already made pots after considering all expenses.

**How much do you buy per kg of the metals?**

It all depends on the type of aluminium and the weight because we buy per kg; it can be from N150 and above from waste recycling companies and much lower from individuals who bring it directly to us. Individuals sell the thick aluminium from N100/kg, light one for N70/kg, and the very light one for N50/kg.

**How much of the metal can produce a pot?**

There is no standard quantity of metal that we use because the pots we produce are of varying sizes and shapes; in addition we produce other things like masa pots, mortars, pestles and dalma.

Dalma is a material used to seal holes in pots. It is gotten from motor battery when melted, and it produces iron bars.

**How much does each pot cost?**

The cost of a pot depends on its size. We have different sizes of pots for example size 20 costs N5, 650, size 40 costs N14, 500, size 6 costs N1000. Bigger sizes of pots attract higher costs. These pots are very durable and can last for as long as ten (10) years.

**How many people do you employ over all?**

A local pot producing company like this one employs 5-7 people per shop because the shops are small. At katako market here we have about 30 shops that are doing this kind of business.

**Apart from Katako market are there other pot manufacturing companies here in Jos?**

In Jos this kind of pots are produced only at Katako, but all over Nigerian cities this kind of pots are produced and sold. A bigger market of this kind of pots exists at Panteka in Kaduna state.

**How much do you pay them?**

I have defined jobs in the shop and I pay according to which of these jobs you are doing. For example a cutter I pay about N18, 000 per month, pot producer N45, 000 per month, cover producer N24, 000 and three other positions which I pay N18, 000 each per month.

**Where do you sell the pots?**

Pots are sold in many markets in the different states in Nigeria, and even to the neighbouring countries like Chad, Niger, Cameroon, and Benin republic.

**What motivated you to start the business?**

For a long time I had been without a job and I have a family to cater for, so I decided to start a business that is cheap and can give me money. I developed this business idea in order to help my family, friends and the community.

**What do you feel about what you are doing?**

I am so happy today because my business is a success. I am making money but the people are benefiting from my product which is cheap and durable. Very poor people can afford these pots for example picking drink cans from rubbish can help them own a pot or pots that will last them years, even if they leak they can be mended using dalma.

**What other thing would you like to say?**

Thank you. I hope you will get back to us again with you findings.



# APPENDIX 5: QUESTIONNAIRE FOR LOW INCOME HOUSEHOLDS

## PART 1: PERSONAL INFORMATION

**1. Area (Please tick one)**

Jenta       Tudun Wada

**2. How long have you lived in this neighbourhood?**

6 months     1-2 years     Over 2 years

**3. What is your age?**

18-29 years     30-49 years     50-69 years     above 70 years

**4. To what level are you educated?**

Primary     Secondary     Undergraduate     Postgraduate

None     Others  (specify) .....

**5. How would you describe your profession? .....**

**6. What is the total number of people living in your household?**

Own     2-4 people     4-6 people     More than 6 people

How many children..... How many adults.....

**7. What is your household's monthly income range (Naira)? Please tick the range that applies to you.**

Less than 18,000     18,000-50,000     50,000-100,000

100,000-150,000     Over 150,000

## PART 2: KNOWLEDGE OF SOLID WASTE MANAGEMENT

Please respond to the following questions by ticking only 1 answer.

**8. Who manages waste in the household? .....**

**9. What type of container do you use for waste collection at your household?**

Plastic bucket  Metal bucket  Polythene bag  Other  (specify) .....

**10. Who collects the waste from your household for disposal? (Tick one)**

PEPSA  Private Contractor  Not collected  (Go to quest. 13)

Other  (specify).....

**11. How frequent is your waste collected for disposal?**

Twice a week  Once a week  Once in 2 weeks  Other (specify) .....

**12. How does your household dispose of its waste if not collected? Tick one**

House member takes waste to communal bin

Burn it at the backyard  Throw it in the river/drain

Other  (specify).....

**13. What is your reason for disposing the waste in the manner stated? Tick one**

Lack of facilities  Lack of awareness  No penalty  To save cost

Other (specify).....

**14. Which of these environmental problems is associated with waste disposal in your community? Tick as many as apply.**

Water contamination  Land and air pollution  Soil contamination

Other (specify).....

**15. Do you pay for waste disposal service?**

Yes  (go to quest. 16) No

If no are you willing to pay for the service? Yes  (Go to ques. 17)

No  why? ..... (Go to ques. 17)

**16. Please specify, how often you pay, how much you pay, who you pay to and how affordable is it?**

How often you pay.....

How much you pay.....

Who do you pay to?.....

How affordable is it?.....

**17. How will you describe the quality of waste collection service that you receive?**

Very satisfied       Satisfied       Poor       Very poor       Don't know

**18. Which of the following could improve the management of waste in your community?**

Community education       Community involvement in waste management

Incentives for waste separation       Effective house to house waste collection

Workshops       Other  (specify) .....

**PART 3: RECYCLING: RECYCLING**

Recycling means converting waste materials into new products that can be used again.

**19. Do you recycle?**      Yes       No       (Go to ques. 24)

**20. If yes what materials do you recycle? Tick as many as apply**

Garbage (organic waste)       Glass       Metals       Textiles       Plastic

Paper       Wood       WEEE       Furniture

Other  (specify) .....

**21. Who collects the recyclable materials from your community?**

Government       Private Individuals       Other  (specify) .....

**22. Do you know or have you seen a recycled product?**

Yes  (Give examples)..... No

**23. Which of the following gives the best reason why you recycle?**

Saves cost       Reduces pollution       Improves economy       Reduces waste

Other  (specify) .....

**24. If no, which of these could be your reason for not recycling? Tick one**

Not convenient  Lack of space  Too hard to recycle

Doesn't make a difference  Other  (specify).....

**25. What could encourage you to recycle?**

External rewards  Penalty  Properly informed  Legislation

Other  (specify) .....

**PART 4: RE-USE**

Re-use means to use an item again after it has been used (e.g. food, clothes, polythene bags, nappies, rechargeable batteries).

**26. Have you been re-using items in your household?**

Yes  No  (If no go to ques. 30)

**27. If yes what items have you been re-using? Tick as many as apply**

Food  Clothes  Polythene bags  Nappies  Furniture  Batteries

Electrical products

Other  (specify) .....

**28. How have you been re-using them? .....**

**29. Which of these reasons best describes why you have been re-using items?**

Saves cost  Concern for environment  Right thing to do  Economic benefit

Others  (specify) .....(go to ques. 32)

**30. If no why don't you re-use? .....**

Degrading  Not quality  not interested  not aware  don't know

**31. What could encourage you to re-use?**

Consumer incentive  Proper education  Cheapness  If others re-uses

Other reasons  (specify) .....

**PART 5: COMPOSTING**

Composting is the act of making manure from organic matter (food and garden waste) at home to use as fertilizer.

**32. Do you compost?** Yes  No

**33. If yes, what materials do you use to make your compost? Tick as many as apply**

Food waste  Garden waste  Vegetables

Other  (specify) .....

**34. Where do you compost?**

.....

**35. What is your reason for composting? Tick one**

Saves money  Saves resources  Reduces impact on the environment

Improves soil  Other (specify) .....

**36. If no which of these best describes why you do not compost?**

Lack of awareness  Lack of space  Takes time and effort

Don't know how to compost  Other  (specify).....

**37. What could encourage you to compost?**

Education  Concern for environment  Save resources

Reduce cost of waste management  Other  (specify) .....

**PART 6: FOOD WASTE PREVENTION**

Food waste prevention means reducing the amount of food that we throw away from our homes.

**38. Have you been throwing your cooked or raw food into the waste bin**

Yes  No  (go to ques. 43)

**39. If yes how much of that over all would you say you throw away? Tick one**

Very plenty  Plenty  Small  Hardly any  Don't know

**40. What are some of the foods that you throw away? Tick all that apply**

Fruits & vegetables  Cooked food  Raw food  Other  (specify).....

**41. Which of these best describes your reason for throwing these foods away?**

Gone bad  Has expired  Cooked too much  Food not tasty

Other  (specify).....

**42. Which of these could encourage you to reduce the amount of food that you throw away? Tick one**

Education  Learn composting  Learn to reuse  Feed animals

Other  (specify) .....

**43. If no, which of these best describes how you have been preventing food waste?**

Feed animals  composting  Using leftovers  Buying only that needed

Other  (specify) .....

**44. What is your motivation for preventing food waste?**

Saving money  Feeling of guilt  Reducing environmental impact

Managing an efficient home  Other  (specify).....

## **PART 7: WASTE PREVENTION**

Waste prevention is also known as reduction of waste at source.

**45. Who do you think should be responsible for reducing the amount of waste generated?**

Manufacturers  Councils  Individuals  Shops  Don't know

**46. When going out to shop what are some of the things you would do to reduce the level of waste generation?**

Re-use shopping bag  Don't buy excess food

Other (specify) .....

**47. Do you have a family with children under 3 years old?**

Yes  No  (go to ques. 49)

**48. If yes what type of Napkin do you use for your children?**

Washable napkin (real)  Pampers (disposable napkin)

**49. Why do you use the type of napkin stated above?**

.....

**50. What might encourage you to start using the real washable napkin?**

Cheaper than disposable  Quick to wash and dry  Proper information

Saves money  Other  (specify) .....

Any comments:

# APPENDIX 6: REVIEW OF WASTE PREVENTION

## **Definition of waste prevention**

Waste prevention is defined by the new WFD (2008/98/EC) as measures taken before a substance, material or product has become waste, that reduce: and it includes strict avoidance of waste generation, reduction of waste at source, and reuse of products, or "Prevention" means measures taken before a substance, material or product has become waste that reduce:

1. the quantity of waste, including through the re-use of products or the extension of the life span of products;
2. the adverse impacts of the generated waste on the environment and human health; or
3. the content of harmful substances in materials and products;

Kasfikis (2005) and Zacho and Mosgaard (2016) observed that the terms ‘waste prevention’, ‘waste reduction’, ‘waste avoidance’, and ‘waste minimisation’ are often used interchangeably in policy-related and academic literature, with their definitional limits often overlooked, yet defining the same idea. Although publications which use the phrase ‘minimisation’ and ‘zero waste’ normally work with a broader perception of waste prevention, as well as reduction of residual waste through sorting, recycling and incineration (Cole et al 2014, Farelly and Turker 2014). All these prevent waste from going to landfills. Ferrara and Missios (2012) has studied waste prevention and recycling which is a mix similar to minimisation studies. Whereas Barr (2007 and Tonglet et al (2004) have the same opinion that motivators and barriers for waste prevention and recycling are not the same. As a result there needs to be a clear distinction and understanding of the differences between these two phrases, ‘prevention’ and ‘minimisation’, especially for those who work with prevention, reuse and recycling. There seems to be no compromise on the usage of the terms describing the higher stages of the waste hierarchy, in recognition of this and to avoid mix-up, authors like Hahtala (2003) and Tonglet et al (2004) prefer to define the terms they use before arguing their cases. Both waste prevention (avoidance, reduction and reuse) and recycling (material recovery) include ‘waste minimisation’.

Finally Cox et al., (2010) assumes that waste prevention is a complex topic, hence a ‘basket of measures’ is required for a satisfactory description of prevention policies and their influence on waste generation.

## **Introduction of concepts**

### **Strict avoidance of waste**

According to OECD (2000) strict avoidance of waste involves the total prevention of waste generation through practical exclusion of harmful substances or by reducing substance or energy intensity in production, consumption and distribution. This implies that substances



which are harmful to humans or the environment should be avoided or substituted. For example a ban could be placed on Polychlorinated Biphenyls (PCBs) and ozone depleting substances or effective elimination of toxic organic chlorines released in pulp mill effluents. A polychlorinated biphenyl (PCB) is an organic chlorine compound with the formula  $C_{12}H_{10-x}Cl_x$ . They were once widely deployed as dielectric and coolant fluids in electrical apparatus, carbonless copy paper and in heat transfer fluids (Rossberg et al. 2006).

The use of materials at different stages of production or consumption can be avoided by eliminating provisional packaging for cosmetics and toothpaste, or substituting continuous casting for ingot casting at steelworks. In addition waste can be prevented by restricting unnecessary consumption and by designing and consuming products that generate less waste.

### **Reduction at source**

Waste reduction at source involves all activities intended to reduce the volume, mass, or toxicity of waste before recycling, composting, energy recovery and land filling become options. It includes the design and manufacture, use, and disposal of products with minimum toxic content, minimum volume of material, and/or a longer useful life. This implies that the final user should consider re-use, repair or refurbishment as options.

An example of source reduction is the use of reusable shopping bags in shops, thus moving away from single use disposable products toward durable, reusable, and repairable goods. Although it may use more material than a single-use disposable bag, but the material per use is less.

Some of the things that can be done to reduce waste at source is to avoid the use of disposable utensils, napkins, paper towels, and other disposable products. Buy only durable items that will last longer for example buy large bags of rice, or other grain-related foods, and store them in reusable containers until when needed. This eliminates the boxes that are used to package and store smaller portions.

EPA (2012b) suggests that maintaining and repairing durable products, reusing bags, containers, and other items, borrowing, renting, or sharing items, selling or donating goods, recycling products and containers, and composting will reduce waste at source. For example, repairing an old TV set instead of purchasing a new one is an ideal way of reducing waste

### **Product reuse**

Products reuse means extending a products lifetime by using it over and over again for the same purpose for which they were conceived or for an alternative purpose without reconditioning it. 'Preparing for re-use' means checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they will be re-used without any other pre-processing;" This aid in diverting waste flows from the waste stream. For example in this study plastic bottles were seen being reused to sell

‘kunu’ (a local drink) or empty oil drums for water storage. In addition shopping bags can be reused many times without reconditioning it. The directive differentiates between ‘preparing for re-use’, which means checking, cleaning or repairing, recovery operations, by which products or components of products that have become waste are prepared so that they can be reused without any other pre-processing.

### **Importance of waste prevention**

Waste prevention’s main focus is on actions that are taken before an item becomes waste. The importance of waste prevention cannot be overemphasized if sustainability is to be achieved, as it is the vital component in policy directed at sustainable development. The benefits of waste prevention are many some of which are environmental, social or economic (EC 2012, Enviros 2004, OECD 2000, Wrap 2016). As waste prevention means reducing the amount of waste generated, reducing the hazardous content of that waste and reducing its impact on the environment. It then means that if society consumes less resources, a lesser amount of waste would be generated as such there would be no need to spend so much money on waste recycling or disposal as waste that has not been generated does not need to be managed, hence making money available for other areas such as public education and health care among others. The implication of this is that it improves resource efficiency through energy saving, reduced use of waste material, as well as reduced impacts of extraction, manufacturing and distribution on the environment (EC 2012). Waste prevention enables individuals and businesses to save money. Some other examples of waste prevention include reduction in demand for natural resources which are even limited, reduction in environmental impacts of extraction, harvesting and processing of these resources, reduction in emission of greenhouse gases which is connected with the collection, transportation and treatment of waste, reduction in the need for landfills and incinerators, and encourage social inclusion and economic development through job creation, volunteering schemes and training opportunities as well as improving access to reduced prices of goods for lower income families. Furthermore waste prevention include promoting an ecologically beneficial shift in manufacture and eating patterns, encourages use of new technologies that limit natural resource extraction and associated ‘hidden’ materials flows, stimulates demand for eco-friendly products and services through greener procurement practices, minimises human and environment health risks by avoiding waste treatment and disposal, and promotes cooperation between stakeholders to meet waste prevention targets. Waste prevention therefore fundamentally depends on changes in attitudes and behaviour of households and businesses and on new paradigms in industrial processes and product design (EC 2012). Graham-Rowe et al. (2014) have highlighted the benefits of prevention initiatives and these include financial savings among others.

### **Waste prevention concept categories**

Waste prevention publications focus on different aspects which range from its potential/impact, social/behavioural, monitoring, management and policy. These aspects are deliberated on the following subsections:

### **Potential/Impact aspect of waste prevention**

Municipal solid waste management planning and operations depends on the quantity and composition of household waste generated (Beigl et al 2008), which is the vital information required to evaluate the potential impact of waste reduction, and to prioritize areas to concentrate on, such as the waste streams for prevention strategies. For example Cox et al (2010) and Sharp et al (2010a) stated that household waste in the UK can practically be reduced by 0.5-1kg waste per household per week through campaigns. In addition there is a consensus in literature that food waste has the uppermost prevention potential (Aschemann-Witzel et al 2015, Foley et al 2011, and Godfray et al 2010), followed by paper waste. The reasoning behind this could be that individuals within homes could effortlessly influence the production of these types of waste unlike the other types like plastic coverings. The real prevention potential depends on the quantity of waste produced and composition in a community, hence it would vary from one country to the other. For instance Salhofer et al (2008) propose a 20% reduction of both food (3.3kg/cap/year) and paper waste (3.7kg/cap/year) as reasonable in Austria, while Bernstad Saraiva Schott et al (2013) proposed that 34% of food waste, which is equal to 58kg per household per year in Swedish households, is preventable. Whereas in the UK, Sharp et al (2010a) suggest that avoidable food waste comprise 78kg per household per year. Gentil et al (2011) evaluates the environmental impact potential of Salhofer et al's (2008) 20%, and stated that food and paper waste prevention has a high environmental impact due to avoidance of generation. Similarly Bernstad Savaira Schott et al (2013) posits that food waste prevention has a higher environmental impact compared to any waste treatment alternative like incineration and anaerobic digestion. Therefore the prevention of these waste streams can have a profound effect on resource preservation and change in climate.

Reuse is a part of waste prevention, and in the UK Bulkeley and Gregson (2009), Cox et al (2010), and Kissing et al (2012) regard it as a method of preventing waste, but they could not assess the prevention potential, as that would depend on the general character of the waste. Bulkeley and Gregson (2009) think that reuse fuels consumption, since the funds saved from purchase of used goods can be utilized for buying new stuff. The resource conservation potential of the reuse of electrical waste has been evaluated by Truttmann and Rechberger (2006) to be up to 33%, yet it is inconsequential when compared to recycling because it contributes more to resource conservation. Consequently, Truttmann and Rechberger advocate that other considerations apart from resource conservation should have a say in the choice of investing in reuse or not. As it is the environmental impacts of reuse have mostly not been exposed, any prospective effort of evaluating it would necessitate a careful description of scheme restrictions. Cox et al (2010) and Curran and Williams (2010) have stressed out the social perspectives of waste prevention, which consist of the fact that reuse of used goods provide individuals from low income households the capacity to sustain a good quality livelihood at reasonable price. Furthermore, reuse should generally substitute the use of new

items, hence bringing about environmental profit. It creates jobs and reintegrates marginalised persons (Curran and Williams 2010, and Gelbmann and Hammerl (2015). In addition reuse has an economic potential (Christis et al (2015), thus it may potentially contribute to all three proportions of sustainability.

### **Social and behavioural aspect of waste prevention.**

Household waste is generated through individual household member's regular practices. Therefore, to be able to reduce the quantity of waste generated from households would require an apparent change in the behaviour of household members, for example waste prevention initiatives can be introduced through campaigns to promote waste prevention. Abeliotis et al 2014, Bortoleto et al 2012, Bulkeley and Gregson 2009 observed that the formation of waste prevention initiatives require a comprehension of what constitutes and vicissitudes waste generation and prevention behaviour. The obvious need to comprehend household waste prevention is the reason why a lot of literature is concerned with behavioural and social aspects of waste prevention (Barr et al 2013, Cox et al 2010, and Quested et al 2013). Some of the publications are concerned with broad waste prevention behaviour across waste streams, some on food waste and others on behaviours and practices related to reuse.

Literature shows that waste prevention behaviour differs from recycling behaviour; it therefore needs diverse methods in engaging individuals (Barr 2007, Barr et al 2013, Bortoleto et al 2012, Cox et al 2010, Ferrara and Missios 2012, Tonglet 2004). Recycling involves sorting when products and substances have become waste, while prevention happens in a range of circumstances before the product or substance becomes waste like in cooking and shopping. As a result prevention behaviour is a complicated subject, involving a complex mixture of activities (Barr et al 2013, Cox et al 2010, Quested et al 2013), linked to a range of different physical context (Bulkeley and Gregson 2009, and predisposed to a variety of factors (Parizeau et al 2015). Many reasons motivate waste prevention behaviour some of which include concerns for the environment (Barr 2007, Bortoleto et al 2012, Ferrara and Missios 2012), moral obligations (Bortoleto et al 2012, Graham-Rowe et al 2014), unselfish attitudes (Cecere et al 2014), and evasion of bad feelings like guiltiness and inconvenience (Bortoleto et al 2012). Bortoleto et al (2012) and Cecere et al (2014) pointed out that prevention behaviour is not inspired by social pressure (like recycling), or by economic incentives (Cecere et al 2014), except food waste. Therefore prevention campaigns can arouse overall environmental attitudes amongst customers so as to improve environmental standards (Bortoleto et al 2012).

Due to the complex nature of waste prevention behaviour, members of the public are frequently stuck between prevention and other wishes, for example prevention activities could be in clash with the wish to serve good and plenty food (Graham-Rowe et al 2014) or buying more than one needs (Barr et al 2013). The dominant societal norm inspires mass intake of new things, not being frugal or using second hand things (Cox et al 2010). According to Barr et al (2013), Cox et al (2010), Fell et al (2010), and Graham-Rowe et al (2014), consumerism is the main obstacle to prevention. In disagreement to this, (Salhofer et al 2008) mentions that avoiding food waste does not require a reduction of consumption, and so does not conflict with

consumerism. Other barriers to waste prevention are habits; and lack of tools, skills, and knowledge (Barr et al., 2013; Cox et al., 2010). Therefore, education and clear directives on how to prevent waste in practical terms is advocated as an instrument to buoy up waste prevention behaviour (Bortoleto et al., 2012; Williams et al., 2012).

Further to the complex nature of waste prevention behaviour, Abeliotis et al (2014) specify that individuals are normally optimistic regarding the prevention of food waste; as such they see it as a subject of concern. If they were to act according to their viewpoints then there would not be any food waste. This goes to show that preventing food waste is not just about lack of knowledge and attitude, but Parizeau et al. (2015) emphasizes the necessity for education and building skills. It is important to know that using information as an instrument to change behaviour can only be effective when the person receiving the information is in tune with the issue. Since people are usually concerned with food waste, information is one of the suitable instruments to influence food waste (Huhtinen 2009). According to Evans (2011, 2012) prevention of household food waste is not only about changing an individual's behaviour, but that interventions ought to generally aim at the ways and means of providing such foods, for example substructures of provision and the importance of packaging (Williams et al 2012). In the same way, Cox et al (2010) deliberates on how organisations and strategies can enable prevention and reuse, rather than leaving the responsibility to the individual. Barr et al (2013) also warn against relying too much on the role of the individual in reaching waste prevention targets.

Reuse is waste prevention. Cox et al (2013) examined the subject of consumer attitude towards the lifespan of products, and established that consumers anticipate regular updates of products, and they added that the environmental penalties of throwing away waste does not appear to be a problem for customers with concerns. As a result goods are substituted regularly causing excess goods available. Bulkeley and Gregson (2009) and Gregson et al (2013) have highlighted the difference between excess goods and waste. They clarified that second hand goods are not waste, but rather are unwanted excess goods that are too good to be thrown away. Consequently, reuse happens in most households as a normal practice (Bulkeley and Gregson, 2009; Cox et al., 2010; Gregson et al 2007). For example, when a TV is upgraded to the latest version, the children take over the older TV and move it to their room. In the absence of reuse things get thrown away as waste from homes, and Bulkeley and Gregson (2009) describes this situation as a sign of lack of social connection to reuse. Lack of receivers of unwanted excess goods was recognised by Fortuna and Diyamandoglu (2015) in New York, where they discovered that the quantity of second hand products surpassed the request for such products. Gregson et al (2013), believe that reuse is not driven by environmental concerns, but rather by social concerns and thrift. Donation and circulation of excess things is thought to be the ideal social thing to do, but of higher significance is that purchasers and suppliers of second hand things do make a good bargain (Gregson et al 2013). Thus reuse does not decrease consumption but rather increases it, and 'For buyers, second hand goods are a means to saving money but also of making that money go further to allow for more consumption' (Gregson et al 2013).

### **Monitoring and measuring household waste prevention**

Monitoring is the systematic process of collecting, analyzing and using information to track a programme's progress toward accomplishing its objectives and to guide management decisions. It usually focuses on processes, such as when and where activities occur, who delivers them and how many people or entities they reach. Zorpas and Lasaridi, (2013) stated that monitoring is one of the key instruments used in deciding a tactical arrangement for effectual waste prevention initiatives. The ability to monitor and measure the outcome of a waste prevention initiative is essential in order to weigh up the initiatives, whose management depends on targets. According to Sharp et al (2010a), tracking the development of waste prevention initiatives against targets depends on good monitoring methods, which they conclude have little understanding in regards to monitoring methods and measures for waste prevention. Generally no method is able to monitor and weigh up the effects of waste prevention measures (Zacho and Mosgaard 2016), this should be a challenge for future prioritization. Zacho and Mosgaard in reviewing the subject observed that there is limited research on monitoring, most of which are on general household waste (Read et al 2009, Sharp et al 2010b, Wilts 2012, Zorpas and Lasiridi (2013), with only one article focusing on a particular waste stream, which is reduction of paper waste through stickers for unwanted mails (Puig- Ventosa et al., 2014). A major reason that makes waste prevention hard to monitor is because it can only be measured indirectly as the quantity of waste that would have been produced without applying any prevention measure (Sharp et al., 2010b). Although reduction could be discovered during weight based monitoring, nonetheless it is tricky to point the changes to precise measures such as cultural changes or rising environmental awareness (Wilts, 2012). Peter et al (2012) cited an example of waste reduction in tonnages during the 1980s which were probably caused by using lighter packaging material with greater recycling than waste prevention activities within households. Previous studies, (Read et al 2009; Sharp et al 2010b,) were not able to establish the exact activities which influenced the recognized waste reductions. Lasaridi et al. (2015) has developed a tool to help local authorities in monitoring waste prevention, which builds on tonnages, though the tool is yet to be tried.

Tonnage of waste is an output indicator, but is not the only type of indicator. Wilt (2012) has examined national waste prevention programs, indicators on progress and barriers, and suggest for the need for more process oriented indicators. According to Wilt this could include the number of prevention campaigns during a year or the number of people reached by a prevention campaign.

There are also difficulties in monitoring the reuse of consumer goods and appliances. For example, Ongondo et al (2013) clarified that it is not easy to change numbers to tonnage or tonnage to numbers. Other indicators for reuse could be the number of second hand shops or their turnover (Kjær and Kiørboe, 2014). In conclusion, there is a need for further studies on monitoring methods both for weight based measures and for other types of indicators. In addition there is a need for direct research anywhere prevention studies are planned to gather and evaluate primary information.

### **Planning management and policy**

Literature exists on planning, management and policy related aspects of waste prevention. Many of the publications examine obstacles to and drivers for waste prevention plus reuse. Among the obstacles often cited is the absence of monetary provision for waste prevention (Zorpas et al 2015). For example a 35% food waste reduction from public viewpoint could be an economic advantage, but then the waste management company might have expenses that has to do with collection and treatment of waste irrespective of the quantities. The consequence of the reduction of the most realistic waste (food waste and paper) could even make the collection and treatment cost per unit higher, which is not cost effective for the waste management company (Bartl, 2014; Van Ewijk and Stegemann, 2014). On the other hand it is also not important to spend money on infrastructure for treating waste that could have been avoided (Williams et al., 2015). Existing regulation does not prioritise prevention economically, as such waste management companies are neither indebted nor encouraged to prevent waste. The major obligation of the waste management company is to manage the waste that has already been produced. Preventing waste from being created is a totally different rational from managing the waste (Corvellec et al., 2013; Wilts, 2012). Other barriers include deficiency of administrative abilities and knowledge. Zorpas et al (2015) opines that prioritisation of prevention requires leadership.

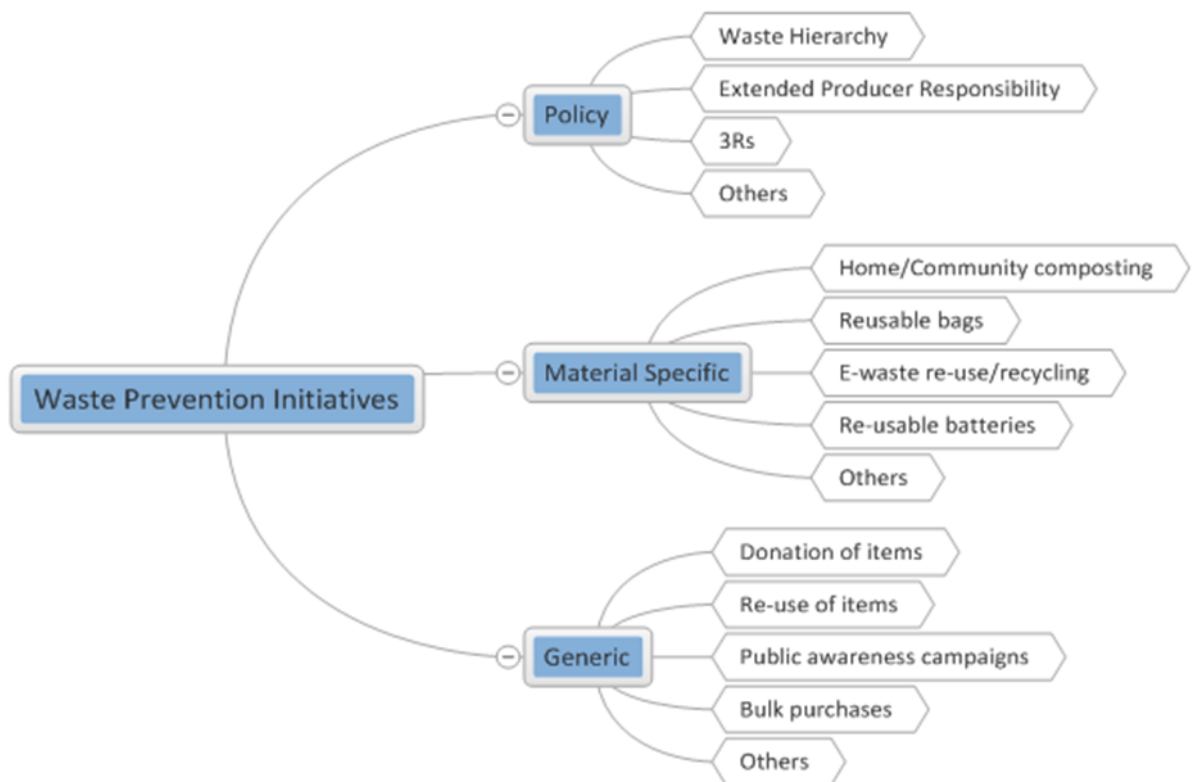
Thyberg and Tonjes (2015) have formulated a waste management framework which incorporates prevention. It is built on the principle of plan, implement, evaluate, and improve. The framework provides a tool to ensure complete planning process complete, while encouraging data collection and monitoring practices. In the same way, Lasaridi et al. (2015) have designed an online tool for monitoring prevention initiatives, and as part of the planning process specific targets have been set. Cox et al (2010) noted that setting targets in order to reduce waste would inspire municipal solid waste managers to include waste prevention strategies.

### **Existing Waste Prevention Activities (WPAs) in MEDCs and LEDCs**

Many waste prevention activities exist mainly in MEDCs with a few in LEDCs involving individuals, cooperatives, NGOs, professional bodies, and local governments on initiatives that could prevent waste. The review identified many initiatives mainly from Europe, have a few from USA and LEDCs. The initiatives include different kinds of activities and a variety of waste, but they generally provide that which can be used to prevent waste from households. Waste prevention at households can be achieved through decisions that reduce waste at source, and the reuse of materials that could have been disposed (Kasfikis (2005). Waste reduction at households could result when householders choose to use products that are more durable, with the least packaging, with packaging that can be more easily recovered, environmentally friendly products, goods made from recycled materials, which come in refillable containers. In addition householders could buy loose fruits and vegetables instead of packaged packs, and choose products and services which generate less waste. Furthermore they should purchase items that use rechargeable batteries and avoid battery-driven appliances. Finally householders should avoid the practice of excess and unnecessary shopping, while making efforts to stamp

out junk mails. Whereas waste reuse at households could be in the form of using ‘bags for life’ for shopping, reusing plastic bags from shopping as bin liners, reusing glass/plastic packaging to store food or other items and reusing paper. Others include reusing textiles as cleaning cloths or for other purposes, and reusing dishcloths instead of buying new ones. In addition householders should repair or refurbish goods to extend their useful life, donate unwanted but useful goods to charity, and also use products responsibly in order to avoid damage before the end of their useful life. Furthermore they are encouraged to share appliances with friends and neighbours, rethread car tyres, and store excess food for later use instead of throwing it in the bin. The Waste Management Strategies of England and Wales (DETR, 2000), Scotland (SEPA, 2003), and Northern Ireland (DOE, 2000) have provide the examples of all that households can do to reduce the quantity of waste generated daily, including reuse. These are complemented with ideas from Barr et al. (2001), Tonglet et al. (2004), the ‘Slim your Bin’ campaign of the Anglian Region (SyB, 2005), and the ‘Second Nature’ Campaign in Norfolk (NCC, 2005a).

Different practical waste prevention initiatives exist in literature ranging from information campaigns to regulatory frameworks (Bakas et al 2011, Zacho and Mosgaard 2016), material specific and generic approaches. These initiatives could be divided into three basic classes as seen in Figure 1 which either could be policy based, or based on specific materials or generic approaches. The research would assess and determine the good applicable examples that could be adopted for the study area.



**Figure 1** Classes of waste prevention initiatives



Cleary (2010) has listed eight kinds of waste prevention activities (WPA) that summarize the realistic ways in which waste prevention could occur. Normally, each activity concentrates on a single waste stream, for example food waste (including composting); bulky waste; electrical; unwanted mail; nappies; and textiles. In addition, the reuse section outlines the opportunities for supporting and promoting re-use activities as part of a waste prevention plan (Defra 2013). Waste prevention activities according to Lèbre (2012) consist of different kinds of activities, applied at different levels through various methods. They touch on different waste streams, and aim at different groups, among which are households (the focus of these research), retailers, industries or public organisations. More so that many kinds of tools can be used to influence the target group, for instance communication (such as awareness campaigns) or making new services or infrastructures available (such as a second-hand stores). These tools can also be economical such as taxes on the behaviour that is to be prevented, or subsidies on the behaviour that is to be encouraged, regulatory through implementing laws or product standards, or come from a collaborative agreement such as certifications and labels. Other ways could be through effective schemes to promote public awareness of waste prevention and to reduce the generation of specific types of waste which are already in operation in EU Member States and in other countries, particularly of household waste prevention which is at the centre of this research. EEA (2002) explained that waste prevention is a long-term process which requires modifying the behaviour of societal actors ranging from households and communities, producers, businesses and institutions, and other participants in the economy. Therefore regulatory measures also play a key role, but they are rarely effective in isolation (Commission of the European Community, 2003b).

For example in 2014 during the European Week for Waste Reduction (EWWR) about 12,000 initiatives were identified (EWWR, 2015). Corvellec (2016) analysed fifty one Swedish waste prevention initiatives which were shortlisted for waste prevention competitions or best cases collections between 2008 and 2015. Generally waste prevention initiatives promote three types of actions, it raises awareness on the need for waste prevention, increasing material efficiency, and developing sustainable consumption. The three classes of waste prevention initiatives shall be discussed in the following subsections:

### **Waste prevention policies.**

Policies are a set of principles, rules, and guidelines formulated or adopted by an establishment to achieve its long term goals. They are usually printed in form of a brochure or other form that is extensively accessible. Policies are designed to influence and determine all major decisions and actions, including all activities that take place within the set boundaries. Waste prevention is a priority of the European Member states, hence the Waste Framework Directive, was established in 1975 (EEC, 1975) to form the basis of the EU waste policy and a legal framework of all EU waste legislation. The revised Waste Framework Directive (WFD 2008/98/EC) introduced the waste hierarchy which is a five step way of managing waste with prevention being the most preferred option seated right at the top, followed by preparing for reuse, recycling, and other forms of recovery. Disposal is the least preferred option, and is located at

the bottom of the hierarchy. The aim of the waste hierarchy is to identify the most likely option that would deliver the best environmental outcome.

Waste prevention has been given the highest priority in waste policy in European Union and since then it has been adopted worldwide as the principal waste management framework. Although decoupling waste growth from economic development has not been substantiated even in Europe (Mazzanti and Zoboli 2008). The waste framework directive mandated all EU Member States to embrace waste prevention programmes by 12 December 2013, after which the directive shall undergo revision (EC 2015a). The European Commission (EC, 2012) prepared a guidance document in 2012 to help countries formulate their own waste prevention packages, and while developing waste policy and legislation waste prevention measures were to be considered a priority. Therefore all EU Member states and other countries including LEDCs which practice waste prevention activities have decided and are driven by the principles sitting behind the waste hierarchy which identify waste prevention as the most desirable option. The waste prevention activities engaged in by the EU Member states and other countries demonstrates the importance of waste prevention in reducing the quantity of waste generated. As a consequence of the prioritisation of this strategy, the EU Member states and other countries have been carrying out waste prevention programmes for quite some time now with the aim of reducing the quantity of waste that needs to be managed. Traditionally waste prevention has involved promotional efforts in an attempt to persuade residents to change consumption and disposal behaviors. These policies are becoming increasingly well developed, and hence, more likely to deliver results and would form a central part of a well-rounded waste prevention action plan (Defra 2006).

Another framework promoted by Japan and other Asian countries is the 3Rs which provides a similar approach to waste management by ranking the options of reducing the volumes of waste generated through reusing of goods instead of discarding it and recycling the waste (Sakai et al 2011, Shekdar 2009, and Yoshida et al 2007). In 2000, several laws on the 3Rs were enacted by the Japanese government, including the Fundamental Law for Establishing a Sound Material-Cycle Society. Japan has also spread the concept of “urban mining” which is a need to recover the precious metals contained in even the smallest electronic gadgets thereby preventing waste (McCann & Wittman 2015). Similarly the City of Freiburg in Germany, has become a leader of waste prevention, as its government published a handbook in 2013 whose title perfectly illustrates the philosophy of the waste hierarchy: “Repairing rather than discarding, using rather than owning” which is a positive step towards waste prevention. Around the world, millions of small repairers and second-hand shops have prioritized reuse and repair, as valuable goods are usually not discarded especially in poorer regions

Nnorom and Osibanjo (2008) observed that most developed countries operate Extended Producer Responsibility (EPR). EPR is a form of legislation mandating electronic manufacturers and importers to take back used electronic products at the end of its life. The EPR concept is an established principle of environmental policy in many countries. Kibert (2004) posit that EPR is a method of integrating sustainable development principles into

international trade based on an international environmental law principle known as the polluter pays principle. Countries like Europe and Asia (Japan, Taiwan and others) have “take-back” laws, which necessitate the producers to take-back the used merchandise at the end of its life. Langrova 2002, and Widmer et al 2005 observed that most times attention is focused on brown goods such as computers, mobile phones, or white goods like refrigerators, air conditioners, automobiles and batteries which require special handling and treatment. According to Gutowski (2005) the same legislations are in operation in USA, particularly in California and Massachusetts. Essentially EPR is an indirect European Commission legislative-based policy designed to ensure that market pressures are harnessed to achieve environmental protection through the management of life of electrical electronic equipment (Hume et al 2002). Some policy instruments are covered under EPR, this include different types of product fees and taxes referred to as Advanced Recycling Fees (ARFs), product take-back mandates, virgin material taxes, and combinations of these instruments (Gentil et al 2011). Other policies include pay-as-you-throw, waste collection charges, and landfill bans. According to Oh and Thompson (2006), a cost effective instrument is one that exploits all the possible avenues for waste reduction, from source reduction, recycling, material substitution and product design changes and not just a single method.

The European Union has other policies such as the Waste Electrical Electronic Equipment, WEEE (Directive 2002/96/EC) and it applies this principle in relation to electrical and electronic equipment The broad aim of the WEEE Directive is to address the environmental impacts of electrical and electronic equipment when it reaches the end of its life and to encourage its separate collection, subsequent treatment, reuse, recovery, recycling and environmentally sound disposal (CIPS 2007). The WEEE Directive is an extensive piece of European environmental legislation, which is part of EPR. The WEEE Regulations are directed at all companies that produce, import, re-brand, distribute, sell, store, treat, dismantle, recycle, dispose, and use electrical and electronic equipment (EEE) without exemptions. The regulation came into force in 2007.

The European Union has another policy on Restriction of Hazardous Substances, RoHS (Directive 2002/96/EC) in electrical electronic equipment. This legislation promotes the collection, re-use and recycling of such products. It also calls for the replacement of heavy metals like lead, mercury, cadmium, and hexavalent chromium and flame retardants such as polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE), by harmless options in the manufacture of electrical equipment (EC 2017).

The chartered institute of purchasing and supply (CIPS 2007) mentioned that setting targets for waste reduction is very crucial to reducing the impact of waste on the environment and saving costs. It is viewed as one of the waste management strategies that can address current and future issues, thus reducing the quantities of waste that is sent to the landfills. Establishing waste minimisation targets in Jos has the potential to reduce the quantity of waste that goes to the open dumpsites.

### **Waste prevention material specific approaches**

Waste prevention activities from research and tool kits comprise targeting a variety of materials such as food waste (home composting), paper and cardboard (stopping unwanted junk mail) and textile (clothes and nappies) Salhofer, et al. 2008; Gray, 2009). Other waste preventive initiatives cover waste types such electrical and electronic equipment waste (WEEE) and batteries, packaging waste, hazardous waste and municipal/household waste. In order to reduce the quantities of materials from the waste stream household waste prevention activities could be designed to target them.

Food waste appears to be the easiest target for prevention initiatives than other waste types, this could be because messages concerning the environment, economic benefits, and the social justice of reducing food waste are commonly conversed with members of the general public. Campaigns on food waste prevention must include events that could enhance consumers' food management skills (Graham-Rowe et al., 2014), a case in point is understanding food labelling (Abeliotis et al 2014) and how it can be stored to extend its lifespan. Graham-Rowe et al. (2014) has highlighted the benefits of prevention initiatives which include financial savings and being the right thing to do.

Electrical and electronic equipment (EEE) has received enough attention in reuse literature, (Curran and Williams, 2010; Kissling et al., 2012, 2013; Ongondo et al., 2013). Due to high replacement rates of EEE goods among consumers, there has been an increase in both unwanted excess items and waste electronic and electrical equipment (WEEE). In Europe, WEEE is regulated by the WEEE Directive, which implies that once WEEE is collected by a waste management company the used products are categorised as waste and referred for recycling. In this regard the existing WEEE system is regarded as an institutional lock-in stopping reuse. Ongondo et al. (2013) has recommended the advancement of a filtering mechanism to sort out reusable WEEE from the waste stream in order to increase the supply of used products and to reduce the quantities of waste for land filling. Zacho and Mosgaard (2016) added that similar actions could be taken to increase the supply of other categories of used consumer goods.

Examples of some of these waste prevention activities include home and community composting. This research on the management of waste in low income households shall deliberate on both home (backyard) and community (decentralized) composting as a possible way of reducing waste that is generated from households. Centralized composting is a considerably larger scale composting hence environmental, social and technical considerations must be approached in a more formal manner (Hoornweg et al 1999). It is however beyond the scope of this research therefore it shall not be discussed.

### **Waste prevention generic approaches**

Generic is a term that relates to a class or group of things which are non-specific and could be likened to 'general', hence generic waste prevention approaches encompasses all (general) approaches that could be used to reduce the quantity of waste being generated.

Cox et al (2010) specified that waste prevention is not one, but many behaviours which hierarchically could range from donating clothes to charity, to small reuse behaviours around the home, and to activities that involve changes in eating habit. Households may not be engaged in all this at a time, but some 60% could be involved with one of these activities some time. These activities are mainly aimed at consumers who could be engaged in local or national campaigns, through a varied array of interventions and communications methods, while the product and services side could increase reuse or donating items. Waste prevention could take other forms such as prevention targets, producer responsibility, householder charging, funding for pilot projects, collaboration between the public, private and third sectors, and public intervention campaigns (Cox et al 2010). Others include buying in bulk, reducing packaging, redesigning products, and reducing toxicity (EPA 2016). Buying merchandises that integrate into these features supports source reduction or waste prevention. Eunomia (2013) produced a Waste Prevention Toolkit (WPT) for the United Kingdom (UK) that could enable the local authorities to use a mix of waste prevention initiatives to recycle and reduce waste. Some of the waste prevention initiatives included home or community composting, reusable nappies, no junk mails, love food hate wastes, paint reuse, community swaps, zero waste challenges, reducing size of waste containers, no side waste policies, and general communications. European Environment Agency (EEA) 2015 reviewed waste prevention packages being used in Europe. The review included programmes from the 28 European Union (EU) Member States and the three European Free Trade Association (EFTA) countries, namely Iceland, Liechtenstein and Norway. European Commission (EC 2005, 2011), and EU, (2013) all identified the necessity for waste prevention. Roadmap to a Resource Efficient Europe set the target that waste generation per person should be in absolute decline by 2020 (EC, 2011). In 2013, the EU's 7th Environment Action Programme recognised the need for further efforts to reduce waste generation both per person and in absolute terms (EU, 2013). Emphasis has been placed on reuse, repair, refurbishing, re-manufacturing and recycling of existing materials and products (EC, 2015a). Most of these waste prevention programmes were aimed at decoupling waste generation from economic growth, so as to move towards a circular economy, or target the reduction of harmful substances, create jobs, develop new businesses, and to change behaviours. In principle the goal of waste prevention is to look beyond waste and embrace a more efficient way of managing resources till the end of their life cycle, with the intent of changing Europe into a more competitive, resource efficient economy, in line with the European Commission's priorities of boosting economic growth and providing new job opportunities. Countries, such as Taiwan (Young et al., 2010), South Australia (Zero Waste South Australia, 2007) and New Zealand (Ministry for the Environment, 2007) have adopted the target of "zero waste" as a form of strategic waste prevention.

MEDCs and LEDCs employ the use of generic waste prevention activities in order to reduce and recycle some of the waste generated from their households and communities.

Other campaigns have focused on specific waste streams with many targeting food waste. The Love Food Hate Waste campaign in the UK increased the number of committed food waste reducers from 12% to 21% equating to a 1,875 tonne reduction in food waste and cost savings

estimated at £133,000. Similarly the North London Food Waste Challenge run by the North London Waste Authority (NLWA) led to households reducing food waste on average by 38% and saving 30% on their weekly food bills, with one household reducing their food waste by 75%. Wigmore & Lee (2010) reported that campaigns in Southwark Council in 2003 helped around two million households reduce their food waste, amounting to savings of almost £300 million and preventing 137,000 tonnes of waste going into the bin.

In France, as part of the National Waste Prevention Plan, the Ministry of Ecology and Sustainable Development, launched a public awareness campaign to address the problem of junk mail. In the first year of the initiative there were requests for 2.6 million stickers that could be stuck to letter boxes declining junk mail. Many organisations personalised or designed their own post box sticker, a further 1.5 million of which were printed. More than 70% of sticker users were satisfied with the results of sticker and received significantly less junk mails (EC, 2016). In another the awareness campaign “Réduisons nos Déchets” (Reducing our Waste) was developed by the ADEME, the French Environmental and Energy Management Agency, in order to provide information to households about waste generation and prevention. This campaign also participates and promotes the European Week for Waste Reduction (EWWR, 2012).

## APPENDIX 7: FEEDBACK ON THE SHORTLISTED WASTE PREVENTION INITIATIVES FROM THE FOCUS GROUP DISCUSSION

A summary of the strengths, weaknesses, opportunities and threats identified by the focus group members for each of the five shortlisted waste prevention interventions. Statements from individual participants are included and coded FGDWPIP – from the PEPSA focus group and FGDWPIH from households with the number denoting the participant number.

<b>Initiatives</b>	<b>Strength</b>	<b>Weakness</b>	<b>Opportunities</b>	<b>Threats</b>
<b>Home Composting</b>	<ul style="list-style-type: none"> <li>• <i>Home composting is an ideal and better way of managing organic waste from low income areas since a chunk of the waste can be composted FGDWPIH 002, 003.</i></li> <li>• <i>Food waste and other organic materials will be acquired for free FGDWPIP 001, FGDPIH 007.</i></li> <li>• <i>-It drastically takes a large portion of the waste out of the waste stream thus reducing the quantity of waste that needs to be managed, hence saving collection, transportation and disposal</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Inadequate spaces around some households in the study area could be a limitation for home composting FGDWPIP 001, 003,005 FGDWPIH 003.</i></li> <li>• <i>If not properly carried out home composting could attract pests like flies and rats home, FGDWPIP 001, and make the environment look dirty, consequently causing contagious diseases and illness that could lead to death FGDWPIH 002, and 007.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Food waste and other organic waste materials in the waste stream make composting a viable scheme for producing organic fertilizer FGDWPIP 002.</i></li> <li>• <i>Food waste can be used to produce maggots to feed animals such as fish FGDWPIP 001.</i></li> <li>• <i>Composting conserves natural resources, FGDWPIP 002 thus saving cost.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>It could attract rats and flies around the house thereby subjecting households to certain illnesses FGDWPIP 001, FGDPIH 003.</i></li> <li>• <i>Composting around households can make the environment dirty and smelly hence discouraging households from engaging in it FGDWPIP 002, 003, 005.</i></li> <li>• <i>Composting at home could have some health risk if not carried out</i></li> </ul>

Initiatives	Strength	Weakness	Opportunities	Threats
	<p><i>cost. FGDWPIP 001, 002, 003, 005.</i></p> <ul style="list-style-type: none"> <li>• <i>It reduces the number of dumpsites and also elongates their lifespan FGDPIH 003.</i></li> <li>• <i>It enables householders to take responsibility for their waste FGDWPIP 002, FGDPIH 007</i></li> <li>• <i>It lessens the burden of impact on the environment and eliminates the emission of greenhouse gases FGDWPIP 005.</i></li> <li>• <i>The compost produced can serve as a good replacement for artificial fertilizers on their farms and garden which could be costly and harmful to the environment. FGDWPIP 001, 005, FGDWPIH 002, 007.</i></li> <li>• <i>It benefits the economy because it saves resources</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Composting is less understood by households; hence it is unattractive and less practiced FGDWPIP 002, FGDWPIH 002, 003.</i></li> <li>• <i>It takes time and effort which is not convenient for most households FGDWPIP 001,003</i></li> <li>• <i>It spoils the aesthetic beauty of the environment FGDWPIH 003, 007.</i></li> <li>• <i>It may lack acceptability for use as a replacement of chemical fertilizer for the farm by households FGDWPIP 003.</i></li> <li>• <i>Individual members of households need to change their behavior and attitude if they decide to compost FGDWPIP 005. For instance they need to embrace the habit of</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Household members are personally involved with home composting which means limited labor is required from outside FGDWPIP 003, FGDPIH 003.</i></li> <li>• <i>Anybody can compost at home as long as there is space and organic waste materials in the waste stream FGDWPIH 002.</i></li> <li>• <i>Composting reduces the quantity of waste that comes out from households for disposal FGDPIH 007.</i></li> <li>• <i>Composting at home could create an avenue for children, young and old people</i></li> </ul>	<p><i>properly FGDWPIH 002.</i></p> <ul style="list-style-type: none"> <li>• <i>The risk of unhealthy conditions of compost production and the possibility of pollution by heavy metals and (toxic) organic materials FGDPIH 003. Attracts flies and other vectors which could cause diseases and even death FGDPIH 003, 007.</i></li> </ul>



Initiatives	Strength	Weakness	Opportunities	Threats
	<p><i>from being dumped at waste sites FGDWPIH 002.</i></p> <ul style="list-style-type: none"> <li>• <i>Home composting is practically free as it involves householders converting their own waste to a resource material, so it is a cheap and natural way of making your own fertilizer FGDPIH 007.</i></li> <li>• <i>Composting reduces the need for a dumpsite, or elongates its lifespan FGDWPIP 002, FGDWPIH 002.</i></li> </ul>	<p><i>saving things that they would have ordinarily thrown away, or not to dump unwanted stuff like meat, food left over with compost materials since it would attract flies and rodents. FGDPIP 005</i></p> <ul style="list-style-type: none"> <li>• <i>Composting is looked at as dirty hence proud people would not want to be associated with it.</i></li> <li>• <i>Lack of knowledge and awareness could be the reason why people are not composting FGDPIH 002.</i></li> </ul>	<p><i>to learn to conserve natural resources while saving money FGDPIP 001</i></p>	
<b>Community Composting</b>	<ul style="list-style-type: none"> <li>• <i>Community composting is ideal based on the type of waste generated from households FGDWPIP 004, 005, 007. Food waste and other organic materials can be acquired for free FGDPIH 005, 006. Reduces the quantity of waste generated thus reducing the</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Community composting requires the availability of a suitable land or site within reach of community members so as to avoid transportation cost FGDWPIP 003, 007 FGDPIH 005. Cost of transporting compost from</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>It could provide jobs for unemployed youths through collection of waste from households to community composting sites, which is a valuable social contribution to</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Composting could cause environmental pollution of nearby streams and rivers with water running off from composting sites if not properly handled FGDWPIP 001, 006,</i></li> </ul>

Initiatives	Strength	Weakness	Opportunities	Threats
	<p><i>cost of its management FGDWPIP 004, 007, 008. FGDWPIH 001,003, 005, 006.</i></p> <ul style="list-style-type: none"> <li>• <i>Compost can be used to improve the condition of soils thus enabling good crop yield FGDWPIP 001, 004 FGDWPIH 001.</i></li> <li>• <i>In addition it improves the environmental condition of residential areas as streets would be kept clean from litter FGDWPIP 007, FGDWPIH 001.</i></li> <li>• <i>It creates good relationships with others FGDWPIP 005, 006 FGDWPIH 003.</i></li> <li>• <i>Composting diverts away organic waste from going to the dumpsites, thus extending the lifespan of the dumpsites, and saving cost of transportation FGDWPIP 003, 008, FGDWPIH 001, 004, 005.</i></li> <li>• <i>It provides free fertilizer for households saving them from</i></li> </ul>	<p><i>the urban centres where it was produced to the farms in the rural areas can be expensive hence difficult for farmers FGDWPIP 001. If site is far from the community area, then there would be problems of transportation since compost is bulky FGDWPIP 003. Lack of space within the neighbourhood, inadequate finance and people to operate the compost site could be a major concern FGDWPIP 005, 007, FGDWPIH 003.</i></p> <ul style="list-style-type: none"> <li>• <i>Non separation or sorting of waste could make poor quality compost because of the presence of metals and other deleterious substances in the waste stream FGDWPIP 001.</i></li> </ul>	<p><i>the society FGDWPIP 001, 007.</i></p> <ul style="list-style-type: none"> <li>• <i>It provides opportunities for recovering organic waste and turning it into natural fertilizer FGDWPIP 001, 005, FGDWPIH 001,003, 004, 005.</i></li> <li>• <i>It can be a source of liveliness or business venture FGDWPIP 005.</i></li> <li>• <i>Since land is within the locality, it provides an opportunity for family members to partake in transporting organic waste to the land cheaply FGDWPIP 003, FGDPIH 006.</i></li> </ul>	<p><i>FGDWPIH 001, 003, 004, 006.</i></p> <ul style="list-style-type: none"> <li>• <i>Dumpsites where composting takes place need to be secured otherwise it could be a dangerous site for children FGDWPIP 003.</i></li> <li>• <i>There is a risk of getting infections as a result of workers coming in contact with waste from households FGDWPIP 005, 008, FGDPIH 006.</i></li> <li>• <i>Composting is looked at as dirty and has the potential to smell and attract flies, harbour rats and other rodents, including dogs, pigs and scavengers, hence can be a source of diseases and even deaths FGDWPIP 004, 007 FGDPIH 005, 006.</i></li> </ul>

Initiatives	Strength	Weakness	Opportunities	Threats
	<p><i>buying artificial fertilizers FGDWPIP 006, 007, 008.</i></p> <ul style="list-style-type: none"> <li>• <i>The organic part of solid waste is used to produce compost; this reduces the volume and weight of material which has to be disposed of and improves the urban environment FGDWPIP 003, 008. It is friendly to the environment if properly controlled and produced.</i></li> <li>• <i>Jos climate is conducive for composting FGDWPIP 003.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>There could be a lack of support from government in terms of land, equipment, and funds, without which sustainability may be difficult FGDWPIP 004, 005, 006 FGDPIH 004, 005. For example lack of support from the PLSG does not encourage compost production because government itself is not practising it. It failed to make real the fertilizer blending plant it started some years back at Bokkos, FGDPIH 004.</i></li> <li>• <i>Compost production process unnecessarily takes a long time FGDWPIP 003, 008, FGDWPIH 001, 006 and is labour intensive, as a result householders prefer to use animal manure (cow dung, goat, pig or chicken</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>The communities can generate large quantity of compost for sell to farmers by the youth which is eco-friendly and a very good economic venture FGDWPIP 004, FGDPIH 006.</i></li> <li>• <i>Conserves natural resources by turning organic waste into a useful resource (fertilizer)for farming FGDWPIP 006, 008, FGDWPIH 001.</i></li> <li>• <i>It could become a business venture, thereby contributing in improving the environment and the economy.</i></li> <li>• <i>It gives a good harvest of crops FGDWPIH 003.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Composting can cause air, if not carefully and properly controlled FGDPIH 001.</i></li> <li>• <i>Community composting if not properly planned and cared for could make their surroundings not habitable FGDWPIP 007, 008. FGDPIH 006.</i></li> <li>• <i>Composting generates risk to health and also odour nuisance. It should not be cited in populated areas FGDWPIP 008.</i></li> <li>• <i>Waste could contain hazardous components such as chemicals or heavy metals, which could affect the quality of the compost FGDWPIH 003, 006.</i></li> </ul>

Initiatives	Strength	Weakness	Opportunities	Threats
		<p><i>manure) since it does not require composting FGDWPIP 004, FGDPIH 005.</i></p> <ul style="list-style-type: none"> <li>• <i>Insufficient knowledge about compost and its benefits makes most householders to be oblivious of it. FGDWPIH 001, 006</i></li> <li>• <i>Lack of unity among community members. Poverty could hinder any good plans and effort of community members FGDWPIH 003.</i></li> <li>• <i>Governments' promotion of the use of chemical fertilizers through subsidies greatly has a negative impact on compost production, FGDPIH 006</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Community composting is simple and cheap, it only requires the availability of space, labour and organic waste FGDPIH 003.</i></li> </ul>	

Initiatives	Strength	Weakness	Opportunities	Threats
<b>Reusable bags</b>	<ul style="list-style-type: none"> <li>• <i>Reusable bags save householders from buying shopping bags whenever they go shopping as it can be reused as many times as possible FGDWPIP 007. They are strong and durable and can be recycled, thus conserving energy and reducing the number of bags that are thrown into the bins FGDWPIP 007. This reduces the negative impact on the environment FGDWPIP 007.</i></li> <li>• <i>Reusable bags are economical as one does not have to buy a bag each time for shopping thus saving cost, FGDWPIH 002.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Reusable bags last longer but the initial buying cost is expensive FGDWPIP 007.</i></li> <li>• <i>Reusable bags can easily contaminate other products so it can discourage people from its use FGDWPIP 007, FGDWPIH 002.</i></li> <li>• <i>There is a need to have at least two reusable bags for food products and nonfood products FGDWPIP 007.</i></li> <li>• <i>Single use polythene bags are issued freely in shops and markets in Nigeria; hence limiting the chances of people acquiring</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Reusing this bags on and on reduces or avoids its negative impact on the environment while saving cost FGDWPIP 007.</i></li> <li>• <i>Reusable bags could increase brand awareness or as a marketing strategy FGDWPIH 002.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>The risk of reusable bags is in contamination having to use same bag for a variety items such as meat, fish, milk and others so the possibility of contamination is high and makes it not safe FGDWPIP 007.</i></li> <li>• <i>Reusable bags are risky because they could pass on dangerous bacteria as a result of contamination FGDWPIH 002.</i></li> </ul>

Initiatives	Strength	Weakness	Opportunities	Threats
	<ul style="list-style-type: none"> <li>Concerns about the environment makes people want to reuse bags FGDPIP 007. Others could reuse because they know it is the right thing to do FGDWPIH 002.</li> </ul>	<ul style="list-style-type: none"> <li>reusable bags FGDWPIH 002.</li> <li>People view the reuse of a bag as degrading, hence want to use only single use bags FGDWPIH 002</li> </ul>		
<b>Eco schools program</b>	<ul style="list-style-type: none"> <li>Teaching waste management morals to school children in the long run reduces waste and its harmful effects, FGDWPIP 008.</li> <li>Educating children is as good as educating families and communities, FGDPIH 004. It fosters a positive environmental behaviour for the future, FGDWPIP 008 FGDPIH 004</li> </ul>	<ul style="list-style-type: none"> <li>It takes years before the effect of eco school program is felt in communities and it is expensive as well, FGDWPIP 008.</li> <li>It requires government support and legislation, and it may take a long time for it to be effected even if government is willing FGDPIH 004. Hence it is a long term goal whose effect may not be seen and felt immediately, FGDWPIP 008, FGDPIH 004</li> </ul>	<ul style="list-style-type: none"> <li>Eco schools program encourage and support the development of children with interest on the environment FGDWPIP 008.</li> <li>Eco school program improves children's awareness and knowledge on the environment FGDPIH 004.</li> <li>It makes children to be better environmentalist in the future thereby improving the</li> </ul>	<ul style="list-style-type: none"> <li>Embarking on eco school program require the involvement of government, and funds and these are long term goals which could fail if government develops a lackadaisal attitude FGDWPIP 008.</li> <li>Eco schools program require the use of professionals in teaching the children about environmental issues FGDWPIP 008, FGDPIH 004 Hence</li> </ul>

<b>Initiatives</b>	<b>Strength</b>	<b>Weakness</b>	<b>Opportunities</b>	<b>Threats</b>
			<i>environment on the long run FGDWPIP 008.</i>	<i>opportunities exist for training more environmentalists FGDPIH 004.</i>
<b>Public awareness campaigns on waste prevention</b>	<ul style="list-style-type: none"> <li>• <i>Public awareness campaigns disseminate information which helps educate householders to promote and facilitate waste prevention FGDWPIP 002. Householders could change their behaviour towards decreasing waste generation FGDWPIP 002.</i></li> <li>• <i>Public awareness campaigns and education bring issues of importance to people's attention, and makes them understand and decide to take action FGDWPIP 006. For instance public awareness campaigns on waste prevention would make households understand</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Inadequate funding and shortage of professional manpower (EHO's) has made it difficult for PEPSA to carry out public awareness campaigns FGDWPIP 002.</i></li> <li>• <i>Public awareness campaigns take a lot of time and needs huge financial investments. It requires the use of a variety of methods (posters, jingles, online, radio, workshops and others) and the effects take quite some time for it to be felt or be seen FGDWPIP 006.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>SWM has been a challenge for the low income households and members are willing and eager to learn what could be helpful to them FGDWPIP 002.</i></li> <li>• <i>There are different ways of educating the public, less expensive methods can be used FGDWPIP 006.</i></li> <li>• <i>Public awareness campaigns can bring about a long lasting change in behaviour and attitude of the general public FGDWPIH 001.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Inadequate staffing could make it fail, as currently there is an embargo on employment. FGDWPIP 002</i></li> <li>• <i>Lack of will from government to support public awareness campaigns could lead to its failure FGDWPIP 002.</i></li> <li>• <i>Waste education campaigns are expensive so its sustainability is threatened FGDWPIP 006.</i></li> <li>• <i>Threats to public awareness campaigns are lack of finance, and</i></li> </ul>

Initiatives	Strength	Weakness	Opportunities	Threats
	<p><i>and decide to take positive action towards its prevention which could result to long term behaviour change FGDWPIP 006.</i></p> <ul style="list-style-type: none"> <li>• <i>Public awareness campaigns make people to be aware of the importance of waste prevention to themselves and the environment FGDWPIH 001</i></li> <li>• <i>It helps them change their attitude and behaviour in response to the messages received. It can also restore and promote the confidence of individuals engaged with waste prevention FGDWPIH 001.</i></li> <li>• <i>People take positive actions as a result of being conscious, hence limiting the impact of waste on the environment and people FGDPIH 006.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>It is expensive because equipment, personnel and finance are involved FGDWPIH 001.</i></li> <li>• <i>Government may not be willing to support it because of insufficient funds FGDWPIH 001.</i></li> <li>• <i>Public awareness campaigns require support from institutions, regulatory frameworks, policy makers and political leaders, FGDWPIP 002. Requires finance and logistics for it to be successful FGDPIH 006.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Public awareness campaigns generates fresh perceptions on waste prevention and reveals all the negative aspects to individuals and the society at large FGDPIH 006.</i></li> </ul>	<p><i>not knowing the effectiveness of the campaign measures to be used FGDPIH 006.</i></p> <ul style="list-style-type: none"> <li>• <i>In spite of the different methods used in communication, campaigns could still be ineffective if the key points are not planned and addressed properly FGDWPIH 001. Insecurity in Jos limits the extent of awareness campaigns to media which is expensive. Lack of power hinders media services in delivering messages especially to low income areas who cannot afford private source of power (FGDWPIP 006). Whatever methods are used in communication</i></li> </ul>



Initiatives	Strength	Weakness	Opportunities	Threats
				<p><i>campaigns, it could still be ineffective if the key points are not planned and addressed properly (FGDWPIH 001).</i></p>

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