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Towards a sustainable waste management in Cameroon

Abanda Well Victorien Bienvenu

University of Padova

victorienbienvenu.abandawell@studenti.unipd.it

Abstract. The management of waste is a challenge now-our-day. The current article intempts to propose solutions to a sustainable management of wastes in Cameroon. After a concise description of the context and a well definition of the scope. It comes out that efforts should be done to intensify awareness, the development of recycling units such as biogas or compost.

Keywords: waste management, biogas, compost, recycling, sustainable.

1. Introduction

Waste are any products that are leftover and no longer useful. According to EPA (2023), They are many types of wastes: municipal solid waste, hazardous waste, industrial non-hazardous waste, agricultural and animal waste, medical waste, radioactive waste, construction and demolition debris, extraction and mining waste, oil and gas production waste, fossil fuel combustion waste, and sewage sludge. They have several impact on the life of people. To avoid that, we use to refer to waste management technics.

The main goal of this article is to identify the various technics which are applied to manage wastes, to describe how things are done in Cameroon and finally to propose solutions to improve the management.

2. Material and method

2.1. Research methodology:

. Literature review from relevant authors and institutional portals.

. SWOT analysis of the management of wastes.

. Risk management in order to maximize the opportunities and mitigate the drawbacks related to implemented actions.

3. General technics to manage waste

Principle of managing waste is based on the classical waste hierarchy management which consists of reducing, reusing, recycling, recovering and finally disposal.

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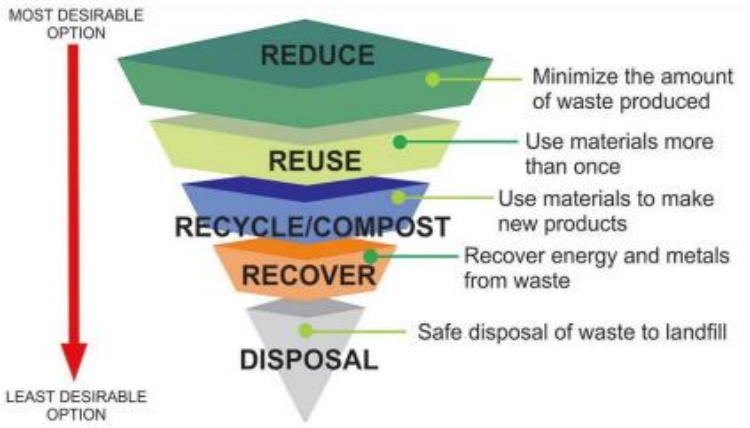

Figure 1: Waste management hierarchy; source: Mehta et al. (2018)

Let's go into details through all the components constituting the waste hierarchy.

3.1. Reduce:

As seen the above figure 1, reducing wastes is the first strategy of waste management. Of course, we cannot bypass wastes; but we can at least reduce the proportion. To achieve this objective, some applied methods consist of:

1. Buying what is essential/vital rather than what we want/desire. Infact, the desire is mostly emotional, and satisfy our need generally within a short period of time. But what is essential or vital will provide a capital added value to the person.
2. Thinking about the applicable options and select the best one. For instance, one may decide to borrow an item, or to loan it or to buy it. These options should involve the social economy context.
3. Dealing with quality products: Quality products are generally associated to long-term using and reutilisation. Some elements to take into account when choosing a product may be: Is it a single usage product? Is it repairable or maintainable?
4. Donation or selling: Rather than throwing a product into a bin when it is no longer desirable by the owner, it will be interesting to either sell it, donate it or lend it to any physical (people) or moral person (orphanage, institution) who want it.
5. Refuse to take unwanted products: It is very common in developing countries to receive announces of a training, work opportunity, etc. on the form of flyers. In this case people who are not interested about the announce should simply refuse to take the flyer.

3.2. Reuse:

Reuse wastes is a technic, which consist of either repairing or maintaining products. This implies to be smart in order to transform items into useful way. For instance, one may transform an oil container into bins or adjuvant for pavement or concrete.

3.3. Recycle/compost:

Recycling involves activities in which unwanted/or waste materials are reused for the reproduction of new products (Mwanza, 2021). Material suggest to recycling are typically solid material such as plastic (PET, PVC, PEHD), glass, wood. Through composting, organic wastes are transformed into natural fertilizer in the presence of oxygen. This is very important to protect both environment and provide a safe nutrition.

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3.4. Recover

Waste are useful to recover energy in particular biogas and electricity. The energetic potential depends on the type of biomass. This generally consists of municipal solid waste, wastewater sludge, vinasse, livestock manure, and agriculture residues (Nkweauseh et al., 2023).

3.5. Disposal

Disposal is the latest option in waste management. They are two main types of landfill: conventional landfill and unconventional landfill. In a conventional landfill, the soil that will support the waste load is well prepared in order to mitigate the contamination of ground water by the lixivia and greenhouse gas emission (EPA, 2011)

4. The case of Cameroon

Cameroon is located in central Africa region in equatorial climate. The country has an average population of 28 Million inhabitants. The main cities are Yaoundé (Political capital) and Douala (economical capital).

The management of solid waste in Cameroon is done as per the below model

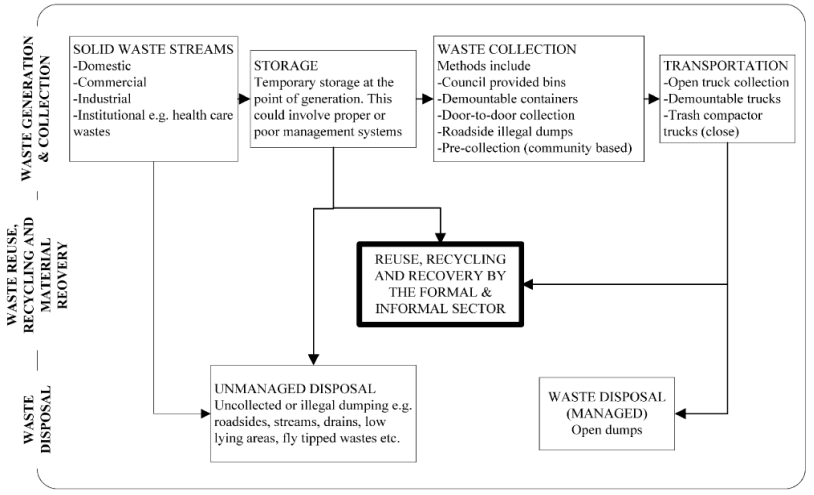

Figure 2: Cameroon's solid waste management model; source: (Ebot Manga et al., 2007)

Many interested parties are involved in the management of solid waste: Government, municipalities, NGOs and citizens. Their actions are framed by many legal and statutory requirements. Most of the municipalities outsourced the management of waste of their territory to subcontractors such as Hysacam which is the leader of the market (Nanje, 2021).

In order to better evaluate, let's do the SWOT analysis of Waste management in Cameroon.

4.1. Strength

1) The actor involved in the management of waste are well identified and responsibility well defined as indicated in the table below:

Table 1: Ministries liaising with waste management and their relevant text defining their role and responsibilities

Institution	Decrees organizing the activities
Ministry of Decentralization and Local Development (MINDDEVEL)	Decree N° 2018/190 of 02 March 2018 modifying and completing some elements of decree N°2011/408 of 09 December 2011 Related to the organization of the government

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Institution	Decrees organizing the activities
Ministry of the Environment, Protection of the Nature and Sustainable Development (MINEPDED)	Decree N°2012/431 of 1st October 2012 organizing the Ministry of the environment, protection of the Nature and sustainable development
Ministry of Mines, Industry and Technological Development (MINMIDT)	Decree N°2012/432 of 1st October 2012 organizing the Ministry of Mines, Industry and Technological Development
Ministry of Commerce (MINCOMMERCE)	Decree N°2012/513 of 12th November 2012 organizing the Ministry of Commerce
Ministry of Public Health (MINSANTE)	Decree N°2013/093 of 3rd April 2013 organizing the Ministry of Public Health.
Ministry of Housing and urban development	Decree N°2012-308 of 14th September 2012 organizing the Ministry of housing and urban development

Based on (Ebot Manga et al., 2007)

2) Good documentation of the Legal and regulatory framework

Many laws, decrees and orders are setup in order to better organize waste management.

Table 2: Legal requirement applicable to the waste management

Text	Detail of the action	Statutory order
Law N°96/12 on the framework law for environmental management	National Environmental Management Plan related to the protection of the atmosphere, marine and continental waters, soils, sub soils and human settlements; Regulates installations that pose dangers to the public; Stipulates modalities for the conduct of Environmental Impact Assessments (EIA) and categories of operations subject to EIA; Specifies air emission and waste water discharge standards; Sets conditions for issuing authorizations for allotment and management of land for uses, i.e. industrial, urban etc; Conditions for waste handling (e.g. collection, storage, recycling, etc.); Prescriptions relating to waste elimination by persons producing or treating waste; Stipulates the terms of reference for the supervision of municipal dumps by the competent authorities	Order N° 00001 / MINEPDED of february, 2016 determining the types of projects suggested to a social and environmental impact assessment. Decree N°2013/0173/PM of 14 february 2013, laying down the procedures for drafting environmental impact assessments Joint Order No. 004/ Minepded/Mincommerce of 24 October 2012 regulating the manufacture, import and marketing of non-biodegradable packaging Decree N°2005/0577/PM of 23 february 2005 on the on the procedures for environmental impact assessments

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Text	Detail of the action	Statutory order
Law relating to the installation of Classified Establishments (Law No. 98/15 of 14/07/98)	Stipulates two types of Classified establishments (Class I and Class II). Dump sites are classified as Class II establishments for which operation and management must follow prescribed guidance. It sets out the regulations governing the installation and exploitation of facilities classified dangerous, obnoxious and polluting	Decree No. 99/818/PM of 9/11/99, Order No. 13/MINMEE/DMG/SL of 19/04/77, 02/MINMEE/DMG/SDAMIC of 04/01/99
National Water Code (Law No. 98/005/of 14/04/98)	Provides framework for the exploitation of water resources including waste disposal, Specifies modalities for the protection of surface and groundwater from pollution (including from dump sites).	Decree No. 2001/165/PM of 08/05/01

Based on (Ebot Manga et al., 2007)

3) Availability of local expertize to handle the management of wastes. This is accentuated by the specialized schools that provide long-term training on the protection of the environment and sustainability.

4.2. Weakness

1. Lack of environmental culture to people (Nanje, 2021)
2. Low sorting option for waste at the collection point. When available, only a single bin is present to collect all kinds of wastes set a photo;
3. The removal rate of wastes by the contractors does not match with the filling rate of wastes by populations;
4. Absence of facilities to industrially transform wastes into biogas or fertilizers at a large scale.

4.3. Threat

1. Country growing population: If with the current situation, some drawbacks with the management of waste are observed, we can imagine that with an increasing population, the situation will get worse;
2. Strikes: In 2022, a company in charge of the removal of waste experiences strike. This led to a major accumulation of waste along roads.

4.4. Opportunities

1. Country growing economy: In 2022, the economy growth by 3.8% in comparison with 2021 performance ((INS, 2023). with that growing, the need for the energy will be very important. The biogas will be a very good option to sustain the energetic offer of the country. Furthermore, the Ukraine-Russia war has increased the price of fertilizers. Organic fertilizer from waste such as compost can therefore help to reduce the strong dependency to inorganic fertilizers.
2. Country growing population: With an increasing population, a huge quantity of wastes will be produced and consequently, a huge quantity of biogas will be available if recycling units operates very well.
3. The country green shift: Cameroon is involved in many protocols dealing with the environment such as the Stockholm conferences. The production of biogas is an environmentally friendly technology that has all the support of the population all around the world. Thus, the recycling unit of waste into biogas is devoted to succeed: it is a good risk.

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4. Availability of competent skills: Many universities and schools such as the National advanced school of public works offers long-term training in the management of wastes. This reduce the need for expensive foreign labour.

Now let's analyse thoroughly that SWOT in order to mitigate drawbacks and boost opportunities.

Table 3: Action plan following SWOT analysis for negative risk (Threat)

Risk type	Description	Existing control	Additive control	Responsibilities	Resources
Threat	Lack of environmental culture to people	Sensitization in some period, school program to educate on the management of the environment since primary school	Continuous sensitization	Decentralized local authorities	Media, budget
Threat	Low sorting option for waste at the collection points (only one bin is present)	. Sorting is observed only at the level of some companies; . Sorting is quite not existing for household; . Awareness in particular at school and companies	. Door to door sensitization . Provision of multiple types of bins to collect different types of items.	. Decentralized local authorities . Government . Contractors	Budget
Threat	The removal rate does not match with the filling rate	. Several trip of trucks to remove waste at some collecting point	. Multiplication of the number of collecting point; . Multiplication of the trucks available	. Contractors	Budget
Threat	Low facilities to industrially produce biogas and biofertilizer	N/A	Creation of facilities to industrially produce biogas and bio fertilizer	. Ministry of water and energy; Ministry of Mines, Industry and Technological Development (MINMIDT)	Budget, logistic, Skill human resource
Threat	Country growing population	Sensitization in some period, school program to educate on the management of the environment since primary school	Continuous sensitization	Decentralized local authorities	Media, budget

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Risk type	Description	Existing control	Additive control	Responsibilities	Resources
Threat	Strikes	Labour code is put in place by the administration to make the relationship between employer and employee fair; -A staff representive commity is currently put in place in organization to ensure the respect of employees rights.	. Re-designing of the company; . Enlargement of the portfolio through investment into recycling projects	Contractor	Budget
Threat	Absence of facilities to transform waste into recycling products	. Some company invest in that way especially for plastic recycling but also glass recycling in the beverage industry.	Incentive measure from the government such as reduction of tax fees or armistice.	Government	Orders

Table 4: Action plan for positive risks (opportunities)

Risk type	Description	Existing control	Additive control	Responsibilities	Resources
Opportunity	Country growing economy	Many incentives from to government to accompanies big and startup	Favor the creation of new companies and reduce taxation at least at the beginning of the activities	. MINISTRY OF finance; . Ministry of economy and planificaton	Budget
Opportunity	Contry growing population	Sensitization by the population on the benefit of sorting and recycling of waste	. Intensify awareness session and door to door discussion; . Adapt school program to fully integrate this new paradigm; . Increase the number of university and school which	. Ministry of secondary education; . Ministry of primary education; . Ministry of higher education; . Economic operators	Budget

Risk type	Description	Existing control	Additive control	Responsibilities	Resources
			deliver waste management program or generally sustainability program		

5. Discussion

From the above SWOT, we saw that even if some efforts have been done in order to manage wastes, there is still much to do. The implementation of circular economy will be very interesting as some companies will use byproducts or wastes from other companies as raw material. This is what is visible in Northern societies such as Swedish, Norway and Finland. The education of people is also a very important as they represent the future of life. This is an aspect that helped the European country to develop themselves on the field of environment.

6. Conclusion

Nowadays wastes are no longer considered as useless things as in the past. A good management of waste help to avoid diseases liaising with dirty and help to produce energy and fertilizers that sustain the industry. Cameroon is going towards this objective despite some shortcoming. Its achievement will be done by managing the efforts of all the interested parties for a sustainable environment.

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