

(RESEARCH ARTICLE)



An evaluation of solid waste management in Monrovia (Liberia)

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Abstract

The populace of Monrovia is growing observed by using fast urbanization. Due to fast urbanization, monetary development, higher dwelling standards, and changes in consumption patterns and life-style, the technology charge of waste have accelerated. Mismanagement of strong waste has a tendency to prevent environmental sustainability and this examines endeavored offerings inside the city, discover the linkage between populace, improvement, and the boom inside. We acknowledged qualitatively and quantitatively results consisting of knowledge, attitude, and practices of strong waste management, collaboration amongst stakeholders, and demanding situations associated with sustainable waste control in Monrovia. Households had been determined on randomly (clean and stratified) to expose employees in the price of waste control and the use of questionnaires captured crucial data on waste control inside the town. The primary findings showed the principle percentage of the waste generated in Monrovia became natural refuse (40.2percentage) observed with the aid of plastic (14.2%). Waste generated is inadequately disposed because of the insufficient collection system, and demanding situations have grown heightened because of inadequate era to make sure professionals, implementation of policies referenced.

Keywords: Solid Waste Management; Policy; Monrovia; Liberia

1 Introduction

Coping with waste end result from populace increase, economic improvement, speedy urbanization and changes in intake patterns, and stepped forward dwelling requirements [3].

UNEP has been active in Liberia given that 2003, first project a submit-war evaluation and later, in 2005, establishing a subject workplace for providing ability building up. With growing populace, converting consumption patterns, and monetary increase, it is probably that stable waste technology goes to boom notably. Already, Liberia's waste management sector faces extraordinary problems, due to different factors, together with: unclear and over-lapping criminal mandates and duties; inadequate institutional framework; bad enforcement mechanisms; extremely weak technical and human potential in the government zone; low degree of public attention on health-waste control linkages; and a complete absence of value restoration mechanisms [4]. At the request of the Environmental Protection Agency of Liberia (EPA), UNEP performed a technical assignment to examine each the technical and institutional troubles associated with stable waste control in Liberia. The venture changed into hosted by means of the EPA and undertaken between 17– 27 June 2007[5].

Three percent of all Liberians stay in Monrovia. The state of affairs within the town is, in addition, has worsened through a lack of properly enough technological, technical-economic, and human sources potential [6]. With this in notion, t

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we've a examine endeavors to research home strong waste control in Monrovia and make applicable recommendations for sustainable strong waste manipulate in Monrovia. The observer's issues center throughout implementation of guidelines, the failure to gain the cause of sustainable home strong waste manipulate.

2 Material and methods

Monrovia, the capital has a lifestyles expectancy of 51year [6]. Monrovia comprises as a minimum one in every four human beings in Liberia and gets almost half of as many once more for daylight sports activities. Monrovia consists of several semiautonomous townships (Congo Town, New Georgia, Sinkor, Paynesville Gardnersville, Dixville, Barnesville, Caldwell, Johnsonville, and Garworlon) and observed changed performed inside the city Monrovia (Figure 1). The sample population consisted of 500 households and discipline visits made to a number of places with waste management troubles, waste control sites, new community and personal area initiatives.

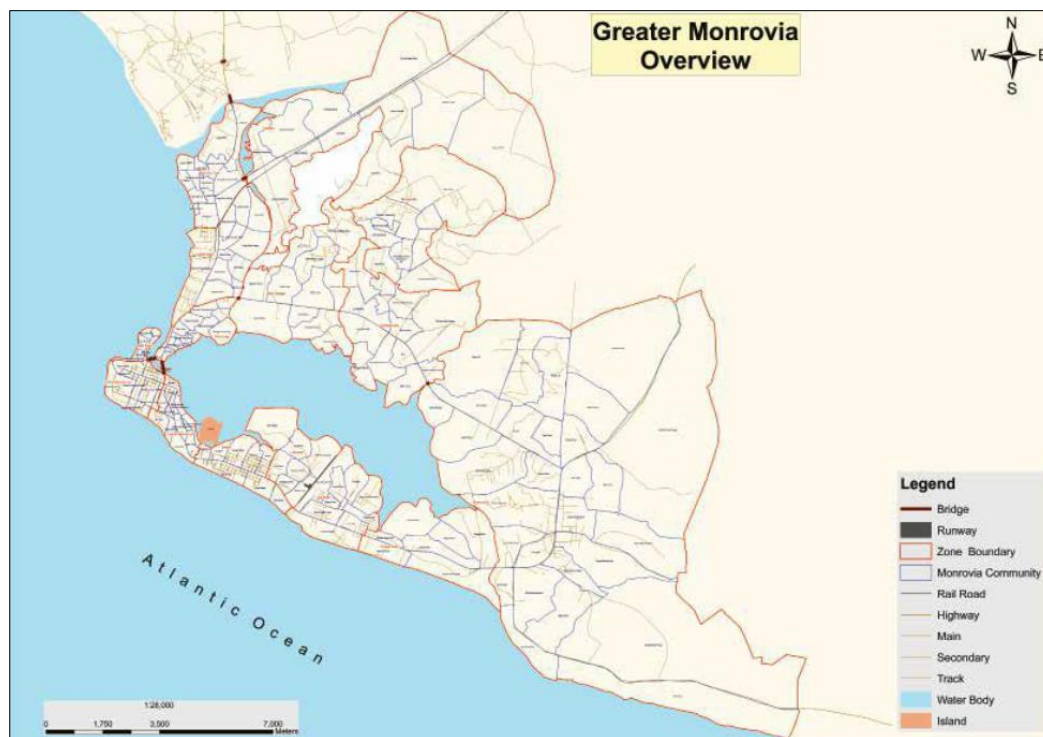


Figure 1 Map of Monrovia

Qualitative and quantitative methods were performing the checking of strategies of records collection techniques used in this study together with the usage of questionnaires. Permission to conduct studies obtained from the Monrovia City Corporation and the Environmental Safety Agency. The sample of households become determined randomly (easy and stratified) from special zones of which the metropolis of Monrovia is broken up particularly: Congo Town, Barnesville, Gardnerville, Dixville, Caldwell, Johnsonville, Garworlon, and New Georgia households were randomly selected according to ([1]. The idea of family on this have a look at refers to as someone or group of related and unrelated people who lived collectively within the equal living unit(s), who stated one adult male or woman because the pinnacle of the circle of relatives, who shared the same housework preparations [1]. In addition, purposive sampling turned into used to pick out key informants.

Primary facts accumulated via open- and close-ended questionnaires, interviews and site visits, and comments. The questionnaire for families focused on gathering information about the respondent's socio-demographic records, cutting-edge waste manipulate techniques, waste series, sorting, storage, delivery price. Series, availability of communal containers in neighborhoods, types of disposal, and worrying situations managing the present control techniques aimed by questionnaire and face-to-face interviews elicited. Interviews accomplished with personnel solicited statistics on waste collection as a lot as disposal observed via the involvement of all stakeholders for the duration of the planning and desire-making approach.

Field remark additionally completed as a way for amassing information. The concern announcement, involved watching became an important aspect used to analyze powerful waste control practices in Monrovia [2]

3 Results and discussion

Institutional placing Set of legal guidelines and rules formulated to deal with environmental problems in Liberia. However, the lack of enforcement and the availability of possible alternatives is an assignment. On the other hand, other than being a technical difficulty, full implementation is likewise motivated the usage of political, jail, socio-cultural, environmental, economic factors, and unavailable belongings. On the alternative hand, aside from being a technical trouble, complete implementation brought about the usage of political, felony, socio-cultural, environmental, monetary factors, and unavailable assets.

Table 1 Agencies with mandates on Solid waste management in Monrovia

Institution	Mandate
The Environmental Protection Agency (EPA)	Growing and publishing countrywide tips for solid waste control in Liberia, environmental satisfactory standards (and associated penalties and fines), and making sure compliance for pollution manipulate. It need to also provide recommendations for the training of environmental effect tests (EIAs), audits/inspections, and environmental licenses/permits for engineered landfill web sites (as articulated in section sixty four of the Act Adopting the National Environmental Policy of the Republic of Liberia).
The Ministry of Health and Social Welfare (MHSW)	Mandate to evaluate and offers this Division the strength to behavior sanitary inspections to assess compliance with the Public Health Law. Nonetheless, as of today, no Hazardous Health Care Waste (HHCW) controls guidelines or requirements with the aid of the Ministry.
The Ministry of Public Works (MPW)	Is answerable for installation of infrastructure required for waste series and transfer stations, and the construction of engineered landfill websites.
The Ministry of Lands, Mines, and Energy (MLME)	Duty is to assess city sanitation projects, which includes providing steerage for the geotechnical investigation of engineered landfill web sites.
Monrovia City Corporation (MCC),	Ordinances' Chapters 1 and seven (UNICEF-DFID 2020) designate diverse departments of MCC as being in rate of municipal waste disposal sites, prohibition of the littering, and requiring citizens fees for the making plans, development, operation and protection of the stable waste control systems.
National Environmental Commission of Liberia	Creates and promotes environmental attention; develops a national environmental coverage, environmental protection, and control regulation.
National Environment Policy Council	Responsible for policymaking concerning the environment and promoting co-operation among Line Ministries, local government, the personal area, non-governmental agencies engaged in environmental protection applications and the general public.

3.1 Waste technology

A widespread percent of the waste generated in Monrovia is natural refuse accompanied via plastic. The growing amount of plastic waste is a result of the multiplied use of plastic merchandise available in the marketplace in Monrovia. E.G. Plastic sachet water, polyethylene terephthalate (PET) bottles, and plastic luggage generated consisted mainly of

plastic 14.2%, glass/ceramics 10.5%, metals 3.0 %, rubber 10.2 %, and batteries 9.9 %.) These results also are in line with extraordinary research which found out that the best element of wastes generated in growing global locations consists of natural substances [1] (see Table 2 B).

Table 2 Composition of solid waste generated in Monrovia

Composition	Percentage
Paper	12.2
Plastic	14.2
Glass/ Ceramics	10.5
Metal	3.0
Organic refuse, vegetables	40.2
Rubber	10.2
Batteries	9.9
Total	100

Source: Author’s fieldwork 2017

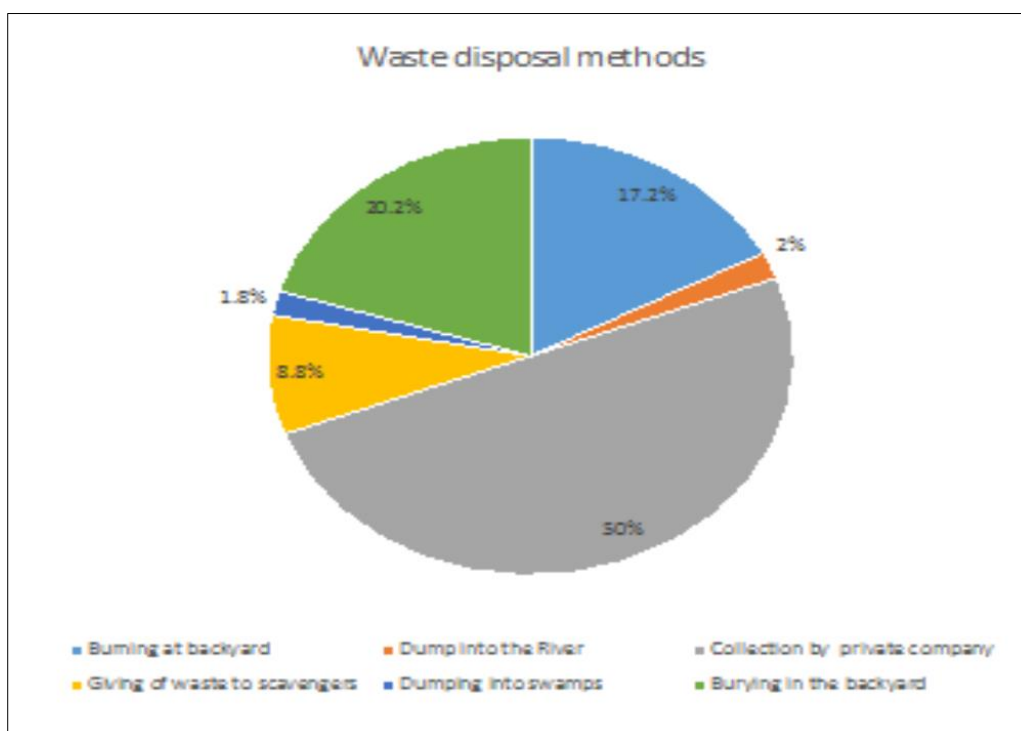


Figure 2 Waste Disposal Method

3.2 Solid Waste collection and disposal

The check found out that waste generated and turn out to randomly mixed. There may be very little recycling of the waste in the metropolis. Wastes collected from families or focused factors in communities are accrued two times in step with week. The Monrovia City Corporation is answerable for waste manipulate within the city. The town corporation on the side of the Paynesville city employer and 5 non-public groups are in price of collection and waste disposal of waste. It is properly well worth citing that the town agency and personal companies are confronted with annoying situations ranging from insufficient logistics, lack of finance, expert people, and insufficient business enterprise amongst but, is stuffed and the government have precise a new landfill net page in Chees operates burgh. Adequate disposal of municipal strong waste tends to decrease threats to fitness and the surroundings. From the sampled respondents, 50% stated that their waste collected with the resource of personal organizations for disposal on the landfills on the equal

time as 20.2% stated they buried waste of their backyards. 17.2% practiced open burning inside the out of doors, 8.8 % deliver their waste to scavengers, 2% unload wastes into rivers, and 1.8 % sells off their waste into swamps (Figure 2).

3.3 Waste recycling

Recycling program achieved through the City of Monrovia not acknowledged. Although the town does not have a right waste recycling device, it have become found that the disposal website on-line has casual waste reclaimers. Waste reclaimers acquire recyclable beginning from, plastics, metals cardboards, cans, and lots of others (Figure 3). Interviews finished with the waste reclaimers placed out the unavailability of records concerning the big form of recyclables gathered in step with day.

3.4 Waste Transportation

Portion of strong waste collected from actual collection of factors by using the use of the Monrovia city commercial enterprise. Subcontracted personal companies are answerable for choosing a muddle to pick out up clutter alongside the streets and in the end disposing on the landfill. 45.6 % of waste turned into transported using private organizations, 35 % explains the problem of open dumping in the town. 11. 4 % of waste turned into transported thru the Monrovia town agency (MCC) and 8 % using the Paynesville city business enterprise (Figure 4).



Figure 3 Collection of plastics

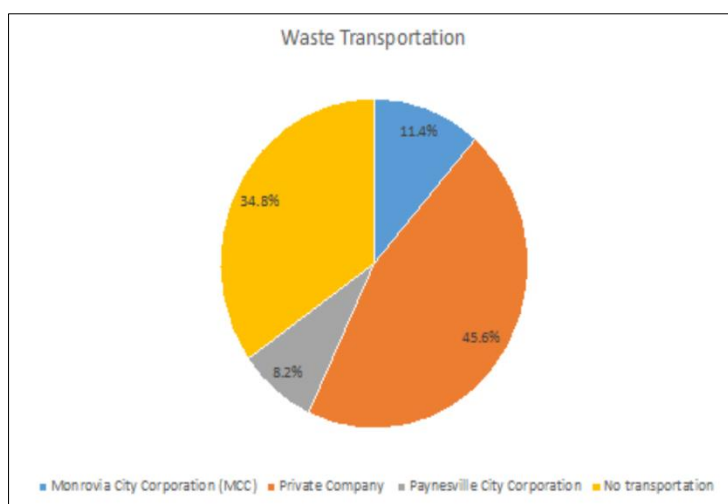


Figure 4 Entity responsible for waste Transportation

4 Conclusion

A sustainable technique to waste control inside Liberia must integrate sanitary as well as social goals, ensure a profitable, dependable provider and lift public attention on health-related worries. Further, there is a need to convey collectively the public, personal, and community-primarily numerous fields from initial series to recycling. One recommended way of strengthening institutional potential for waste control in Liberia might be first to raise the "profile" and ability of the general public government in rate of this quarter, especially the Environmental Protection Agency.

Compliance with ethical standards

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Disclosure of conflict of interest

Authors declare no conflict of interests.

References

- [1] Chikowore, Noleen. "Factors influencing family waste management practices in Zimbabwe." *Journal of Material Cycles and Waste Management*. 2021; 23(1): 386-393.
- [2] Chuen-Khee P, J Othman. Household call for for strong waste disposal alternatives in Malaysia. *World Academy of Science, Engineering, and Technology*. 2020; 16: 1153- 1157.
- [3] Kawai Kosuke, Tomohiro Tasaki. Revisiting estimates of municipal stable waste technology in step with capita and their reliability. *Journal of Material Cycles and Waste Management*. 2016; 18(1): 1-thirteen.
- [4] Wilson DC, C Velis, C Cheeseman. Role of casual quarter recycling in waste control in growing international locations. *Habitat International*. 2006; 30: 797-808.
- [5] UN information. Country profile. Available at: United Nations Framework Convention on Climate Change - CGE GHG Inventory Handbook (NAI) Waste Sector (2001).
- [6] UNICEF-DFID. Waste Management Plan for Monrovia. 2020.