



MANAGEMENT OF HOUSEHOLD SOLID WASTE DURING THE RAINY SEASON IN THE CITY OF KINDIA, GUINEA

Wogbo Dominique GUILAVOGUI^{1*}, Ansoumane SAKOUVOGUI²,
Mamby KEITA³, Idrissa DIABY⁴

1Département Energie, Centre de Recherche Scientifique de Conakry-Rogbanè, Conakry, Guinée

2Département Energétique, Institut Supérieur de Technologie de Mamou, Guinée.

3,4Département de Physique, Faculté des Sciences, Université Gamal Abdel Nasser de Conakry, Guinée

ABSTRACT: The management of household solid waste is a permanent concern in large African cities. The city of Kindia in Guinea is not left out. The objective of this research is to study the management of this solid household waste in the urban municipality of Kindia during three months of the rainy season (August, September and October) 2022. It aims to make a comparative study of the production of solid household waste in the town of Kindia during the two seasons (dry and rainy) of the year. The survey covered ten (10) households in eighteen (18) neighborhoods out of the thirty-three (33) in the town of Kindia. The main results obtained are: the average daily production of household solid waste per household during the three survey months: August (37.89 kg); September (40.85 kg) and October (48.88 kg), with a quarterly average of 42.54 kg per household. The average daily production per inhabitant is 0.52 kg/capita/d; which corresponds to an average annual production of waste from the 18 districts of the city of Kindia is: 17,573.718 tonnes for a population of 92,413 inhabitants, then an average annual production of household solid waste from the entire city of Kindia which is 32,411.152 tons, for a population of 170,437 inhabitants. The average ratios by type of waste are: fermentable (57.34%); cardboard/paper (3.33%); textiles (5.10%); plastics (7.84%); glasses (0.18%); metals (0.05%); sands (11.03%) and others (15.13%). Through these results, we note that the average production of waste per household is a function of the standard of living of the populations, the different activities carried out by these populations and the different seasons of the year.

Keywords: Management, waste, solid, household, season, rain

INTRODUCTION

Waste management means all the provisions allowing the collection, transport and environmentally sound disposal of waste, taking into account health, technical, scientific, aesthetic, economic, social and environmental considerations [1, 2]. In recent years, the issue of waste has become alarming in both developed and developing countries. Indeed, the increase in the volume of municipal solid waste poses serious problems in urban areas. Population growth, the improvement in the level of per capita income and the level of economic activity, have resulted in an increase in the production of solid waste [3]. This large production of waste constitutes a threat to the quality of the environment and the living environment. The problem of managing this solid waste is becoming the major concern of communities [4].

The accumulation of waste and its presence in the city can clog drains and sewers. This phenomenon disrupts wastewater sanitation mechanisms, increases the risk of flooding and provides breeding grounds for mosquitoes, increasing the proliferation of diseases such as malaria or lymphatic filariasis [5]. The greenhouse gas emissions produced by the degradation of waste in open landfills have significant effects on global warming. The organic components present in the piles of rubbish in landfills decompose according to different decomposition processes which last from a few years to several decades and which lead to the production of CO₂ and CH₄ [6, 7].

In terms of solid waste management, the rules for the collection, treatment and even burial of waste defined by the legislative framework are not respected. More than 80% of households nationally and more than half (52.6%) of households in urban areas dispose of their household waste in nature, the sea, rivers, streets, gutters. However, the country does not currently have a controlled technical landfill. Improvised areas on the outskirts of cities are used as landfills to evacuate part of the waste [8].

This quantity of household solid waste produced is poorly managed and compromises the quality of life. A simple observation of the city testifies to the extent of this problem: anarchic dumping of garbage in the lowlands, streets, water pipes, on the banks of surface water, empty unfenced land.

Uncontrolled dumping of waste is therefore a very common practice and it can be harmful for the environment and for the population. Beyond the nuisances generated (odors, smoke, flying plastics), fly tipping is a source of pollution for soil, surface water, wells and groundwater. Kindia is one of the towns in Guinea that is confronted daily with this problem of managing this solid household waste [9]. This research is part of this dynamic of effective management of household waste management in the city of Kindia during both seasons (dry and rainy of the year).

METHODOLOGY

This research took place during three months of the rainy season (August, September and October 2022). It covers the main districts of the city of Kindia. The Urban Commune Kindia is a city of Guinea located 135 km from the capital Conakry. It covers an area of 500 km², with a population of 170,437 inhabitants. It is between 10°04'00" north altitude and 12°51'00" west longitude. From an agro-pastoral tradition, it is sometimes nicknamed "the city of citrus fruits" [9].

The survey and the collettes covered eighteen (18) neighborhoods (Slaughterhouse I, Bamban, Banlieue, Cacia I, Caravanserail, Féréfou I, Filigbé, Gangan, Gare, Kenendé, Koliady I, Lack Mosque, Lack TP, Sekhouya, Sinaniya, Tafari Almamiya, Tafari Météo, Yéolé) of the town of Kindia. This work is a continuation of that carried out during the dry season 2022, it also covered ten (10) households of 6 to 10 people. The garbage bags were deposited in these different families and we proceeded to collection, sorting and weighing once a week for three months.

RESULTS AND DISCUSSIONS

Average daily production of waste per house hold in each neighborhood

The average daily waste production per district and per month is shown in Figure 1.

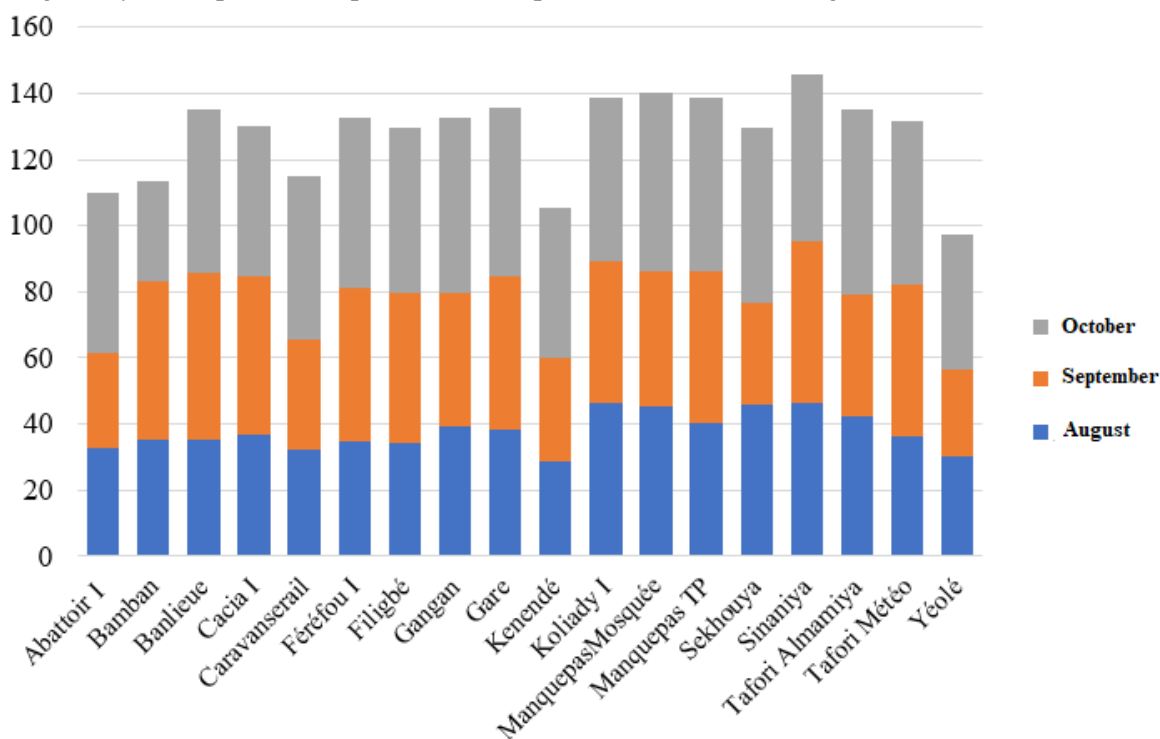


Fig1: Average daily waste production per house hold in each neighborhood per month

Figure 1 shows that, during the three survey months (August, September and October 2022), the average daily production of waste per household in each district and per month varied as follows: from 28.80 kg to 46.50 kg in August; from 26.19 kg to 48.69 kg in September and from 30.50 kg to 55.90 kg in October, with respective

averages: 37.89 kg; 40.85kg and 48.88kg. The average quarterly production of waste per household is 41.01 kg. These results show that the quantity of waste produced by households depends on the income of the population in the different districts of the city of Kindia (low standing, medium standing and high standing) [10].

Averagedaily production of waste per inhabitant of each district

The average daily production of waste per inhabitant of each district is given by the diagrams in figure 2.

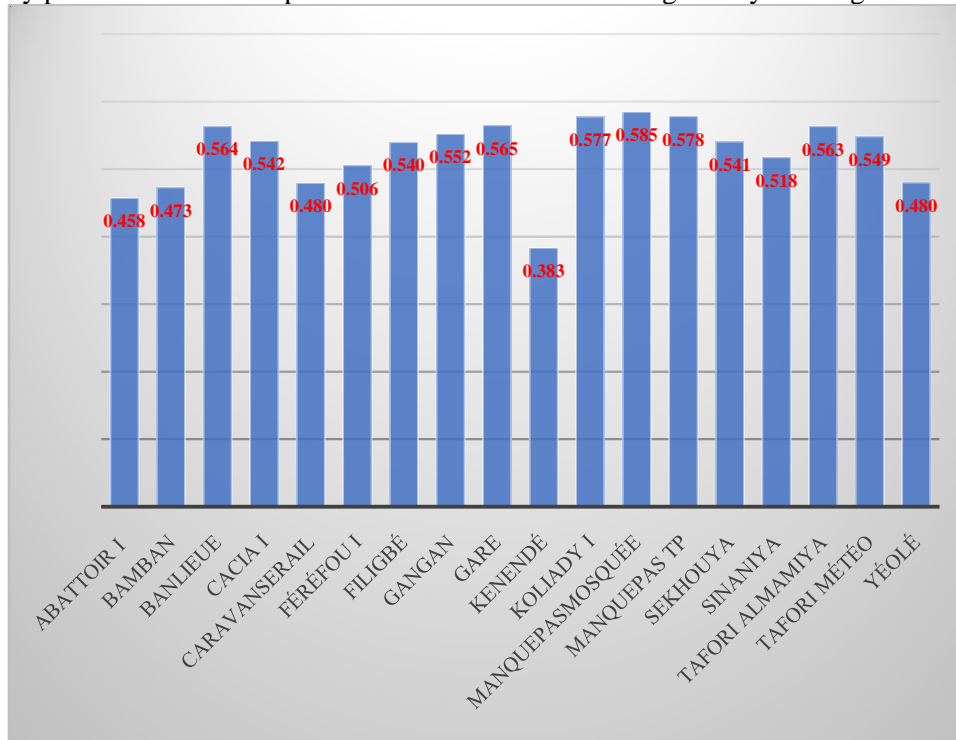


Fig 2: Averagedaily production of waste per inhabitant in each neighborhood

Figure 2 gives an overview of the averagedaily production of waste per inhabitant of each district recorded during the winter period. The small ratio was recorded in the Kenendé district, i.e. (0.383 kg), the maximum values of household waste production per inhabitant were recorded in the Manquepas Mosquée, Manquepas TP and Koliadi I districts, i.e. respectively: 0.585 kg/hat, 0.578 kg/ha and 0.577 kg/ha. The average household solid waste generation ratio per capita during the survey months is 0.521 kg.

The results obtained are in line with those of other authors in the literature, who confirm the averagedaily production of household waste per inhabitant varies between 0.30 kg/inhabitant/d to 1.50 kg/inhabitant/d. The average ratios retained are: 0.60 kg/capita/d, for low-class households; 0.65 kg/inhab./d, for average-class households; 0.75 kg/inhab./d, for high-end households [11, 12]

Thus, based on this average ratio (0.521 kg/hat/d), the average production of waste per year for the 18 neighborhoods of the urban municipality of Kindia is: 17,573.718 tonnes for a population of 92,413 inhabitants, with an average production annual household solid waste for the entire city of Kindia estimated at 32,411.152 tons, for a population of 170,437 inhabitants.

Averagedaily production of types of waste by family and by neighborhood

The averagedaily composition of household solid waste per family and per neighborhood is illustrated by the diagrams in Figure 3.

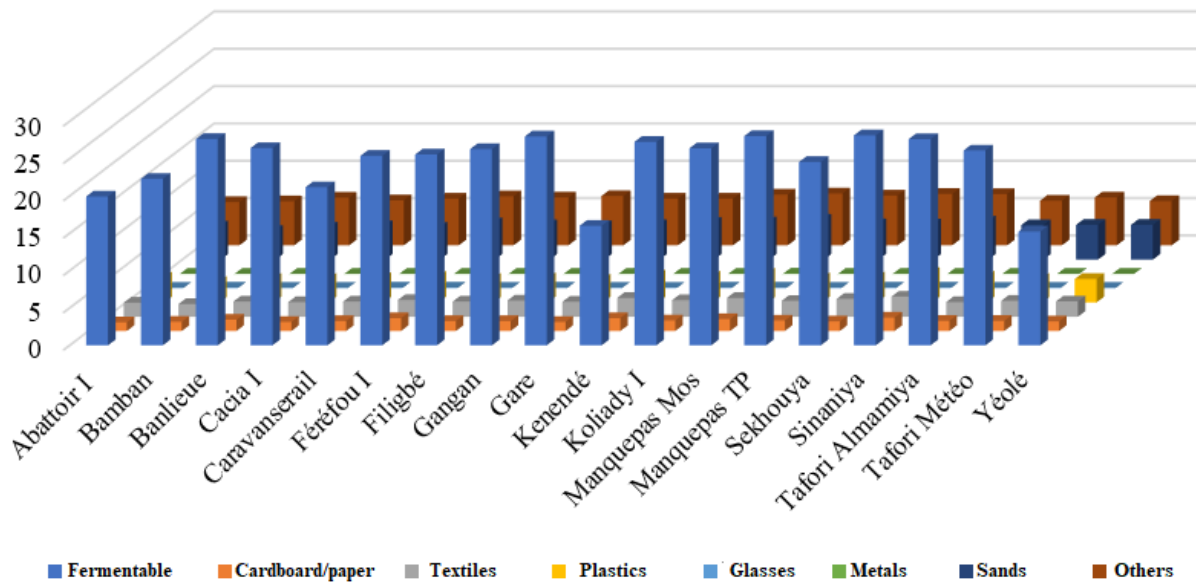


Fig 3: Averagedaily production of types of waste by family and by neighborhood

Average ratios by type of waste

The averagedaily production of households by type of wasteis: 24.55 kg for fermentables; 1.404 kg for cardboard/paper; 2.153 kg for textiles; 3.305 kg for plastics; 0.074 kg for glasses; 0.022 kg for metals; 4.652 kg for sands and 6.391 kg for others (figure 3). Thus, theseresults correspond to the followingaverage ratios: fermentable (57.34%); cardboard/paper (3.33%); textiles (5.10%); plastics (7.84%); glasses (0.18%); metals (0.05%); sands (11.03%) and others (15.13%) (Figure 4).

The resultsobtained are consistent withthose of the workcarried out during the dry seasonperiod (February, March and April, 2022), which show that fermentable waste has a higher ratio than the others, i.e. (57.34%) for the presentstudy, compared to 60.01% fermentablewaste for the periodFebruary, March and April, 2022 [9].

Averagehouseholdsolidwastegeneration by season to 2022

The average production of householdsolidwaste by season (dry and rainy) in 2022 isillustrated in Figure 4.

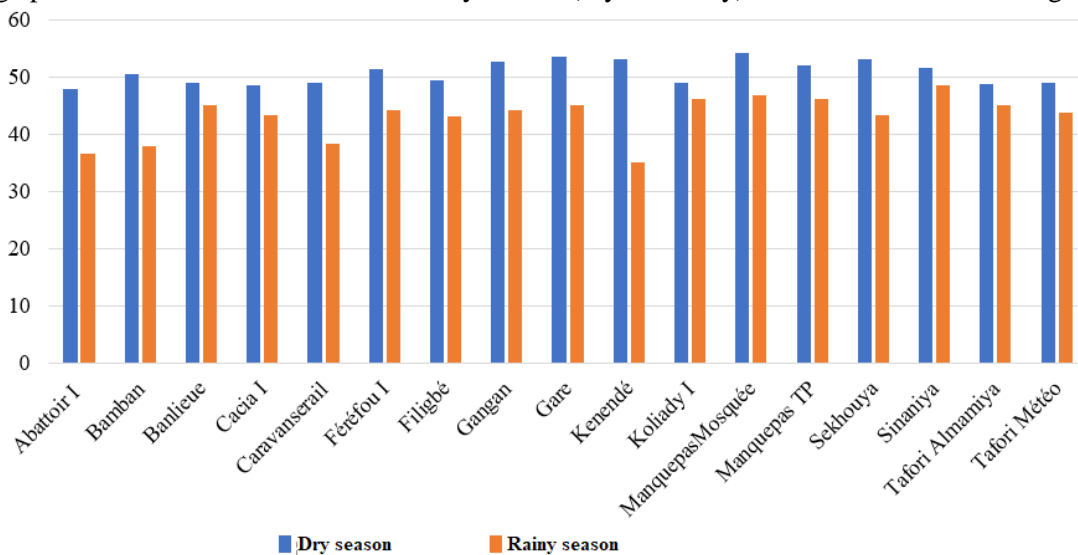


Fig 4: Averagehouseholdsolidwastegeneration by seasonin 2022

Average Production by Type of Household Solid Waste by Season to 2022

The average production by type of householdsolidwaste by season (dry and rainy) in 2022 during the surveyperiodisgiven in Figure 5.

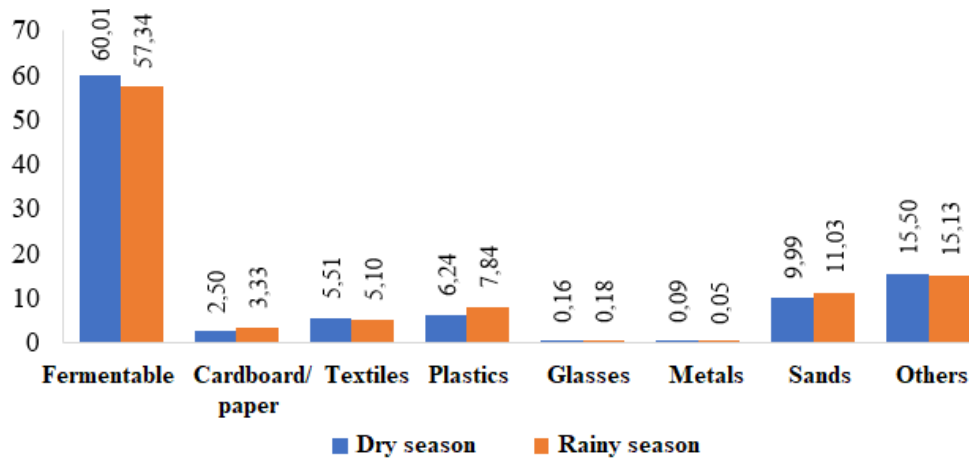


Fig 5: Average production by type of household solid waste by season in 2022

The averagedaily production of waste per household during the two seasons is: dry season 50.72 kg per household and in the rainy season 42.54 kg per household (Figure 5). This difference is explained by the fact that during the rainy season the waste is either drained by runoff water or thrown into the gutters; as for the average production of household solid waste by type, we obtained the following results: 60.01 kg of fermentables; 2.50 kg of cardboard/paper; 5.51 kg of textiles; 6.24 kg of plastics; 0.16 kg glasses; 0.09 kg of metals; 9.99 kg of sand and 15.50 kg of others for the dry season; 57.34 kg of fermentables; 3.33 kg of cardboard/paper; 5.10 kg of textiles; 7.84 kg of plastics; 0.18 kg of glasses; 0.05 kg of metals; 11.03 kg of sand and 15.13 kg of others for the rainy season (figure 6). These results show that, despite the small amount of waste produced during the rainy season, they weigh more unlike the dry season, this is explained by the fact that the bins are exposed to the rain in households.

CONCLUSION

This research has made it possible to make a perception of the production and management of household solid waste in the city of Kindia during three months (August, September and October) of the rainy season. The main results obtained concerned: the averagedaily production of waste per household for three months; the averagedaily production per inhabitant; the average annual waste production of the 18 districts; the average annual production of solid household waste in Kindia; the average ratios of the different types of waste. The results obtained made it possible to make a comparative study of the production of household solid waste during the two seasons of the year, which allows us to make proposals to the authorities in charge for the effective management of these types of waste in the city of Kindia. These proposals involve promoting the recovery of household solid waste in order to protect the environment, reduce poverty, meet food needs and create jobs.

REFERENCES

- [1] AFRIMAG, *villes africaines : Gestion des déchets ménagers une nécessaire révolution, Magazine de l'économie Panafricaine*, N°137, 2019, 26 -34.
- [2] Jacoba M. M. Viljoen, Catherina J. Schenck , Liza Volschenk, Phillip F. Blaauw and Lizette Grobler, *Household Waste Management Practices and Challenges in a Rural Remote Town in the Hantam Municipality in the Northern Cape, South Africa, Sustainability* 2021, 13, pp. 1-24.
- [3] Ma. C. Hernández-Berriel, L. Márquez-Benavides, D.J. González-Pérez and O. Buenrostro-Delgado, "The effect of moisture regimes on the anaerobic degradation of municipal solid waste from Metepec (México)", *Waste Management*, volume 28, Supplement 1, (2008), pp. S14-S20.
- [4] EPA, 2000. *Reducing Waste Can Make a World of Difference: The Link Between Solid Waste and Global Climate Change*, Reusable News, EPA 530-N-00-06 Fall 2000, Environmental Protection Agency, Emergency Response (5305W), 12 pages.
- [5] Shahriar Shams, Chikira Ibrahimu, *Household waste recovery and recycling: a case study of Kigoma-Ujiji, Tanzania, Int. J. Environment and Sustainable Development*, Vol. 2, No. 4, 412-424, 2003
- [6] Ibrahim Adebayo Bello, Muhamad Norshafiq bin Ismail and Nasser eldeen A Kabbashi S. Kaza, *Solid Waste Management in Africa: A Review, International Journal of Waste Resources*, 2016, 6:2, pp 1-4.

- [7] *L.Yao, P. Bhada-Tata et F.VanWoerden, What a Waste2.0 : A Global Snapshot of Solid Waste Management to 2050 », UrbanDevelopmentSeries, World Bank, 2018.*
- [8] *Mohamed HAFIDI (2015), Impact et la Gestion des Déchets Solides, Région Marrakech-Safi, Helmut ReifeldAbirIbourk, 104 pages (UNEP, 2016).*
- [9] *Contribution to the management of solidhouseholdwaste in the urbanmunicipality of Kindia (Republic of Guinea), IJARIE-ISSN(O)-2395-4396, Vol-8 Issue-4, pp. 577 – 581, 2022*
- [10] *Marie-Rose BANGOURA, Gestion des déchets solides ménagers et ségrégation Socio-Spatiale dans la ville de Conakry (Guinée). Thèse doctorale Université Toulouse, 2017, 560 pages*
- [11] *GBILIMOU Alain SIDIBE Diaka YABI Ibouraima et CAMARA Yacouba Characterization of solidhouseholdwaste in Conakry, Republic of Guinea, AfricanScientific Journal Vol : 3, Numéro 12, Juin 2022, pp. 183 - 200.*
- [12] *PARROT L, SOTAMENOU J, KAMGNIA Dia B., Municipal solidwaste management in Africa: Strategies and livelihoods in Yaoundé, Cameroon, Waste Management 29 (2), 2009, 986-995*