
Strategies for the Sustainable Management of Solid Waste from Sinfra's Urban Hotel Establishments

N'guessan Eclair-Sales YAO¹, Sophie Pulcherie TAPE²

^{1,2} Peleforo GON COULIBALY University (Korhogo - Côte d'Ivoire)

ABSTRACT: Located in the Marahoué region in the central-west of Côte d'Ivoire, the town of Sinfra is a victim of inappropriate hotel waste management. This poor management of solid waste from hotel establishments has repercussions on the environment of this urban area, which is exposed to an abundance of rainfall. The aim of this study is to propose actions and strategies to mitigate the impact of poor hotel waste management. The methodology used is based on documentary research and field surveys supported by semi-directive interviews, questionnaires and direct observation. Systematic random sampling was used, which made it possible to include half of the city's hotel establishments. The reasoned choice method was used to target the hotels to be surveyed on the basis of certain criteria. The results showed that in the town of Sinfra, 45% of hotels dispose of their waste in unauthorised dumps and collection sites, 33% of hotels entrust their waste to pre-collectors and 22% of hotels have their waste collected by municipal services. This situation has given rise to environmental problems affecting people's quality of life. In response, solutions have been proposed for the sustainable management of hotel waste. These include supporting hotel managers in changing their practices, setting up and encouraging waste recovery channels and creating appropriate solid waste management infrastructures.

KEYWORDS: Sinfra, Solid waste, Hotels, Sustainable management, Strategies

I. INTRODUCTION

Since the industrial revolution, economic activities have led to a sharp increase in greenhouse gas (GHG) emissions. These anthropogenic emissions have gradually led to a warming of the atmosphere and oceans, and consequently to a change in the Earth's climate (FNADE, 2020, p.9). Given this state of affairs, in 2015 the Conference of the Parties (COP21) will be debating the measures to be taken in order to considerably reduce GHG emissions across the planet. Faced with this worrying situation, preserving the environment, integrated climate risk management and green growth are now among the priorities of public policy. Most countries have clearly understood that climate change represents an additional challenge that must now be taken into account in their development efforts (Economic Commission for Africa, 2011, p.19).

Today, climate change and sustainable waste management are major concerns for developing countries. To mitigate climate change, it is important to reduce GHG emissions by adopting environmentally-friendly practices. The intensification of accommodation activities considerably increases the amount of waste to be treated. However, solid waste management by hotels in the town of Sinfra, located in central-west of Côte d'Ivoire (Figure 1), goes against the preservation of the environment through uncontrolled incineration and illegal dumping. These practices, which have a negative impact on the environment, require remedies to be found for the ills of inappropriate solid waste management in hotels.

What are the obstacles to the sustainable management of hotel waste in Sinfra?

The aim of this study is firstly to examine the ways in which hotel waste is managed, secondly to identify the difficulties faced by the rational management of hotel waste, and thirdly to propose strategies for the sustainable management of this waste.

The aim of this study is to provide operational solutions to mitigate the impact of poor hotel waste management, and to ensure that hotel waste is properly recycled.

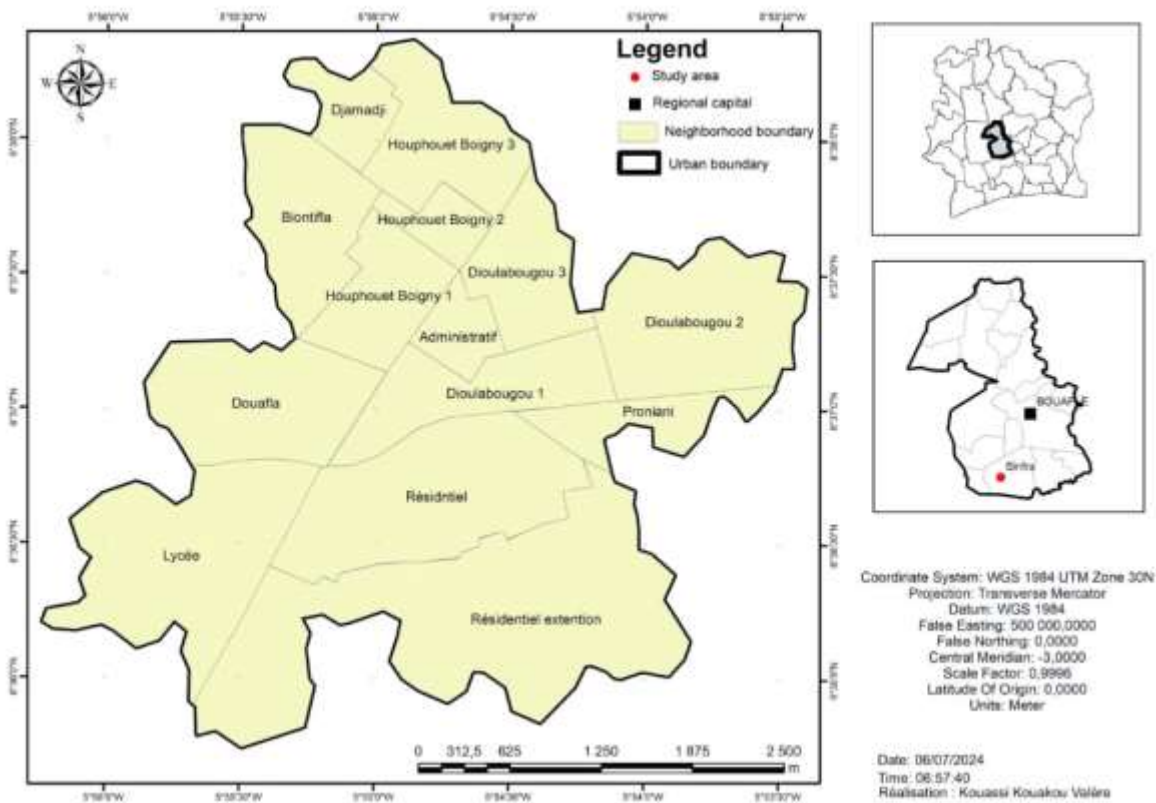


Figure 1: Location and presentation of the town of Sinfra

II. METHOD AND MATERIALS

The method used for this study was a combination of documentary review, direct observation and field surveys. The materials used were survey sheets and a camera.

The first stage was a documentary analysis relating to our subject. The second stage consisted of consulting administrative data from the mayor's secretary general. The third and final stage involved direct observation and field surveys. Direct observation involved taking photographs and comparing the data read and perceived. The field survey was carried out between August and December 2023.

We began by conducting semi-directive interviews with the urban players, in particular the municipality. At town hall level, the interview with the technical director of the town hall focused on their involvement in hotel waste management, the number and distribution of hotel establishments in the town and their standing. Subsequently, questionnaires were administered to hotel managers on their solid waste management methods. In addition, we used systematic random sampling to select half of the hotels to be surveyed, i.e. nine (9) hotels out of a total of eighteen (18). It was supported by the reasoned choice method, in which the choice of these hotels was based on their solid waste production and management methods.

We used a TECNO POP 7 camera to take the photographs, and the UTM GEO MAP 3.9.2 application to record the geographical coordinates of the hotels and their solid waste disposal sites. ArcGis was then used to produce a map of the city. The quantitative data were processed using Excel 2010 to produce statistical graphs for interpretation.

III. RESULTS

A. Solid waste management methods used by hotels and their impacts

1) Solid waste management methods used by hotels :

The city's hotels have several ways of managing their waste. They evacuate waste via municipal and private collections, unauthorised dumps and grouping sites (Figure 2).

Strategies for the Sustainable Management of Solid Waste from Sinfra's Urban Hotel Establishments

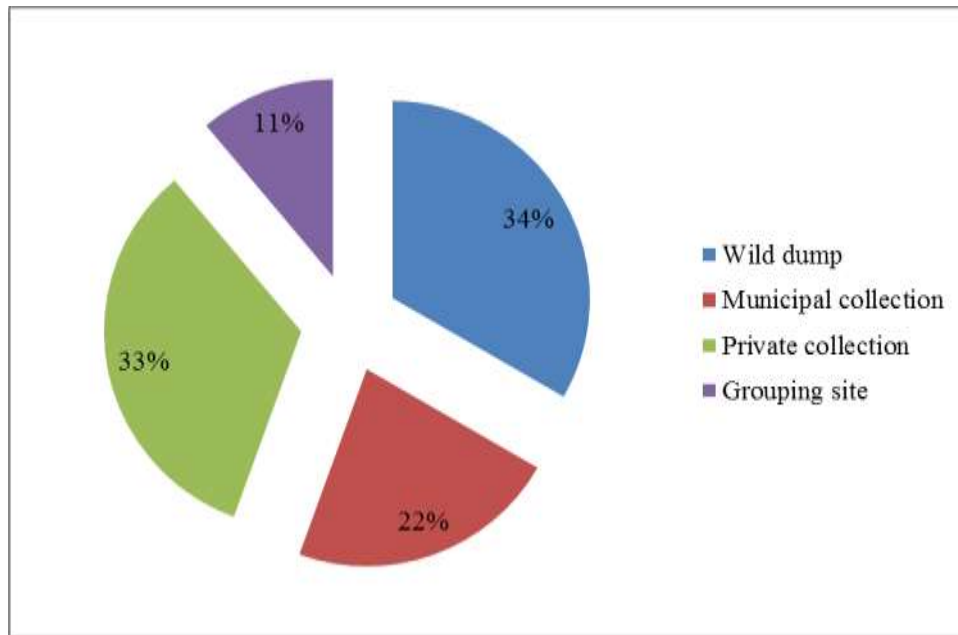


Figure 2: Collection points and disposal service for hotel waste in Sinfra
Source: Authors, August 2023

Analysis of this graph shows that hotel waste disposed of in illegal dumps accounts for the largest proportion, at 34%, followed by private collection at 33%. Municipal collection accounts for 22%, while collection of hotel waste at grouping sites, which is poorly represented, accounts for 11%.

These different methods of collecting and disposing of hotel waste can be seen in the photographic images below (Plate 1).

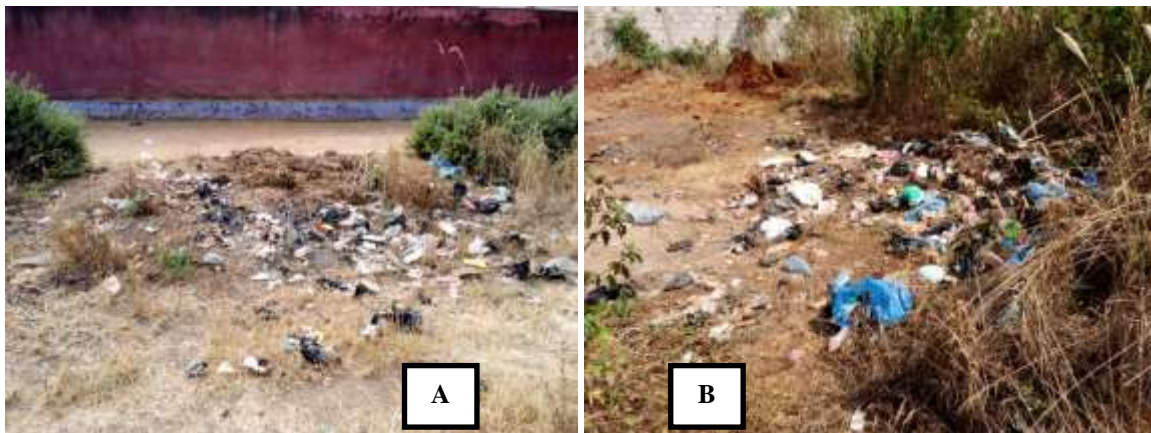


Plate 1: Solid waste collection and disposal sites for the 18 Moutain (A) and Château (B) hotels
Source: Authors, December 2023

This photograph shows two hotel waste disposal sites. These unauthorised dumps are located along the roadsides in the new districts, notably Dackoury (A) and Senoufla (B). The 18 Moutain hotel collects and burns its solid waste on the overgrown road (photo A). The same applies to the Château hotel, which takes advantage of the overgrown road to dispose of its solid waste (photo B). This type of management accounts for 34% of all the hotels surveyed. The waste incinerated includes plastic packaging, paper, bags, cardboard and grass clippings.

In contrast to the disposal of waste at illegal dumps, some hotels turn to municipal collection and pre-collectors to dispose of their waste (Plate 2).

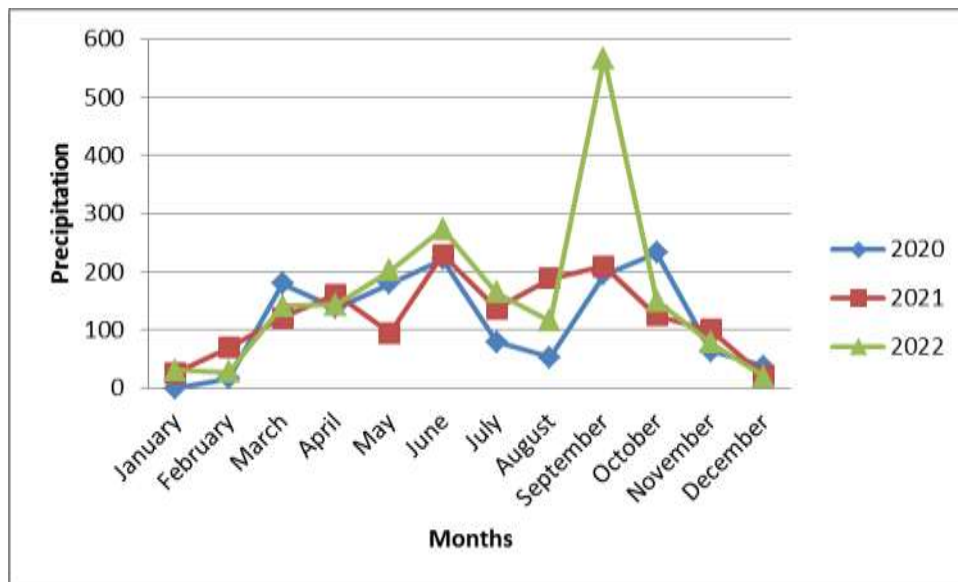


Figure 4: Trends in average monthly rainfall in the town of Sinfra

Source : <https://power.larc.nasa.gov/docs/>

Average rainfall in January and December show that these are the driest months, with temperatures fluctuating between 24 and 28°C. The wettest months are June and September, with average rainfall of 241.2 and 320.43 mm respectively over these three years. And the average temperature varies between 24 and 26°C.

During these three years, the average temperature in Sinfra was 26°C, with an average rainfall of 1,593.39 mm.

During the wet months, variations in rainfall have a major impact on the decomposition of solid waste dumped in uncontrolled dumps. This has a negative impact on the environment and people’s health. Under the effect of temperature and rainfall, waste is decomposed and washed away, polluting the soil, the atmosphere and waterways. This state of affairs also leads to a proliferation of disease vectors and attracts small rodents.

However, during the dry season, especially in December and January, hotel waste is incinerated daily in illegal dumps, resulting in air pollution and the risk of lung disease.

The healthiness of the urban environment is assessed on the basis of a number of parameters, including air, soil and water quality. Given the poor management of hotel waste, it can be deduced that the level of cleanliness in the town of Sinfra is low. There is air pollution caused by the decomposition of food and organic waste in uncontrolled dumps, and soil contamination. All these factors contribute to deterioration in the quality of life of the population and compromise their good health.

B. Problems of rational management of hotel waste in the town of Sinfra

1) Difficulties linked to urban policy :

There is no urban waste management master plan. A waste management master plan is an effective waste management tool that also helps to protect the environment. However, cities lack this strategic plan for efficient waste management. There is no real urban waste collection plan. This situation is a major obstacle to the collection of hotel waste, leading to anarchy in the management of hotel waste.

In addition, the lack of political will to recycle solid waste is an obstacle to the sustainable management of hotel waste. With no control over waste recovery and recycling circuits, there is a lack of action on waste reduction, collection and treatment. The public authorities do not encourage hotels to recover the waste they produce. There is no eco-responsible certificate for hotels that manage their waste responsibly, to encourage hotel managers to protect the environment by managing their waste sustainably.

2) Difficulties related to material and infrastructural deficiencies :

The lack of funding and the absence of a budget line specific to the municipality for the management of the city’s waste has resulted in obsolete waste collection equipment and insufficient collection materials. Municipal actors are therefore hampered in their primary role, which is to make the urban landscape healthy. In addition, operational constraints such as the lack of waste storage and processing infrastructure faced by the municipalities in the study area have led to the creation of illegal dumps. Unauthorised dumps are not without consequences for the environment and the health of the population, especially those living near them.

3) Difficulties in raising awareness among hotel managers :

The difficulties are enormous. Hotel managers are not sufficiently aware of the need to change their behaviour in the face of environmental pollution. In fact, there is almost no concern for environmental education regarding hotel waste. The Tourism

Strategies for the Sustainable Management of Solid Waste from Sinfra's Urban Hotel Establishments

Department, which is responsible for monitoring hotel activities, is flexible when it comes to raising awareness of efficient waste management. However, it does not have an eco-responsible awareness-raising slogan for the sustainable management of hotel waste, nor does it use traditional awareness-raising channels that can draw the attention of hotel managers to good management practices for the waste they produce. In addition, there is a lack of measures forcing hotels to sort and recover their waste through partnerships with formal and/or informal solid waste recycling and recovery structures. As a result, the large quantity of waste dumped in unauthorised landfill sites represents a significant loss of materials, which is not in line with the principles of sustainable development.

In addition, there is a lack of education on the selective sorting of hotel waste. According to the 2014 Tourism Code in the chapter « rights and obligations » of tourism operators, in its Article 50 stipulates that « Tourism operators must ensure the pre-treatment of waste and take all measures to minimise its impact ». Contrary to Article 50 of the Tourism Code, hotel managers in Sinfra are not carrying out any awareness-raising campaigns to encourage guests to sort their waste. Guests use the pre-collection equipment available to them to store waste, without any selective sorting. This lack of environmental education and selective sorting of hotel waste undermines the town's sustainable development, as the environment and people's health are threatened by poor waste management. Indeed, they do not have bins for each category of waste. The failure to apply existing regulations means that hotel waste is collected in bulk in the same bin.

C. Sustainable hotel solid waste management strategies

1) Capacity building for solid waste managers :

Capacity building for solid waste managers must begin with training on the importance of eliminating uncontrolled dumps and setting up waste recycling and treatment facilities. To achieve this, the municipality must seek a partnership with the private sector to support it in the rational management of household and similar waste. The municipal authorities should target the main areas where waste is produced, based on the number of unauthorised dumps. They should then proceed to set up Organic and Plastic Waste Recovery Centres (CVSOP), which are the most common types of waste produced.

In addition, it is very important to develop the circular economy by raising awareness and motivating those involved in the chain to recover recycled waste. To achieve this, the municipality must set up awareness-raising and training programmes aimed at informing hotel managers about the methods for recovering the various types of waste produced. Similarly, it should encourage collaboration between the various players in the waste value chain, such as recycling companies and the municipality itself, to promote the development of innovative and sustainable solutions for urban waste management.

2) Support hotel managers in changing their practices :

Audit and support hotel managers in developing actions to prevent and sort solid waste. The Tourism Department should make hoteliers aware of the need to sort their waste by installing bins for each category of waste. They must have different bins according to the following classification: for paper and cardboard, food, plants, metals, plastic packaging and bottles, glass, and others. This categorisation of waste will ensure that it is properly recycled and effectively treated. Similarly, room cleaning staff should be made aware of the need to sort waste before putting it in the bin. Customers are not left out of this work either. They should also be made aware of selective collection through posters in the hotel. This will lead to the provision of selective bins in hotels.

Adopting this new practice will gradually lead to a more pleasant environment. These behaviours will lead to a reduction in the collection of waste from hotels and also to a reduction in their environmental impact through degradation.

In short, these are the responsibilities of the stakeholders in an effective solid waste management scenario for hotels (Figure 5).

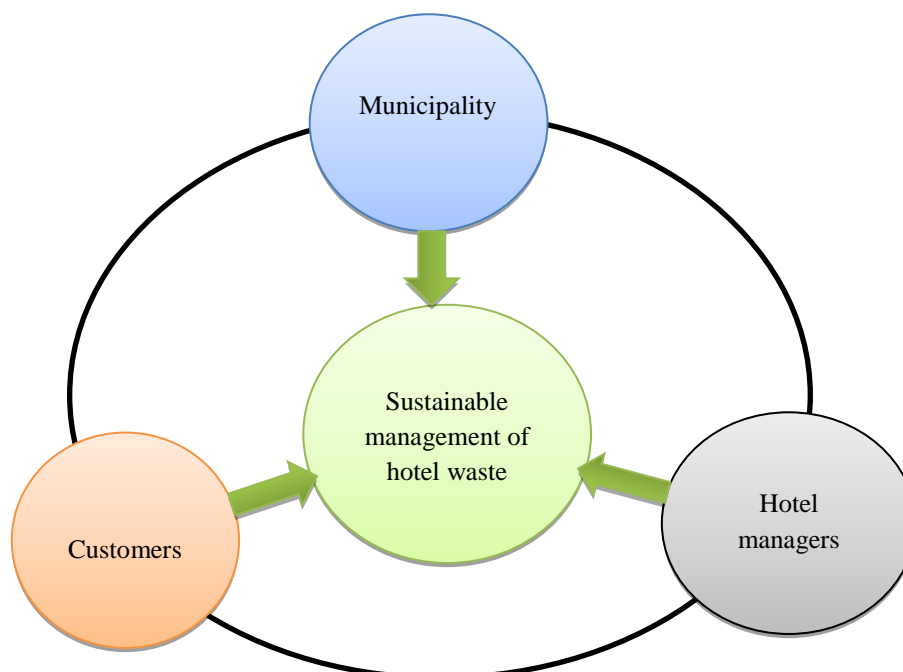


Figure 5: Diagram of hotel waste management stakeholders

Source: Authors

This diagram shows the three main stakeholders involved in urban hotel waste management. These are the municipality, hotel managers and guests.

As the guarantor of urban development, **the municipality** has a duty to ensure that hotel managers comply with waste management regulations and standards in the hotel sector. It must set up awareness and incentive programmes to encourage good practice. It must also control and monitor the compliance of hotel establishments with regulatory requirements in terms of environmental protection, through the Tourism Department.

Hotel managers must implement effective waste management policies within their establishment. To do this, they need to train staff and raise their awareness of the need to reduce, sort, collect and dispose of the waste produced. They must also invest in equipment and infrastructure for the selective collection of waste in order to achieve this effective management. Hotel managers should also collaborate with solid waste collection and recycling services to better direct their waste.

Guests must actively contribute to the effective management of the waste they produce. They should adopt responsible behaviour by sorting their waste in the room. In addition, they can express their expectations and concerns in terms of effective waste management in order to make their contribution to management.

Consequently, collaboration and shared responsibility between these three stakeholders are very important, indeed essential, for the effective and sustainable management of hotel waste.

IV. DISCUSSION

A. The effects of hotel waste management on the environment and public health

In the town of Sinfra, 45% of hotel establishments dispose of their waste in uncontrolled dumps and on consolidation sites. As a result, open-air incineration of waste is releasing GHGs into unauthorised dumps in some parts of the town. This method of waste management is supported by M. E. Lwanzo (2023, p.37) in the Katindo district of Goma. In this town, hotel waste stored in bins is made available to waste collection organisations. These collectors find plots of land to dump the waste collected from hotels. 50% of these collectors categorise the waste on site and give it to recycling organisations, while 50% do not sort it on site and incinerate it.

Similarly, E.T. Appaw-Agbola and B. Freeman (2015, p.45) show in their article in Ho the regional capital in Ghana that hotels do not have a department responsible for processing the waste they generate. Some plastic and paper waste is incinerated by those responsible before the waste is collected. But it is the Zoomlion company that is responsible for collecting and depositing hotel waste in landfill sites. In support of the same method of managing hotel waste in Ghana, A. Behera and S.S. Jatav (2022, p.10) point out that 50% of small hotels in Dehradun store waste and then dispose of it. However, 43.8% of these hotels frequently have their waste collected and disposed of by a waste management company.

In addition, in the Nusa Dua region of Indonesia, hotels are the main producers of waste, with an average of 1.43 kg/room/day, or 7.3 tonnes per day (W. W. Made and al., 2022, p.185). These establishments produce around 70% organic waste, including food, and 30% paper, plastic, glass, metal and other waste. Food waste can be processed and used as pig feed. Garden waste can be

Strategies for the Sustainable Management of Solid Waste from Sinfra's Urban Hotel Establishments

turned into compost, which local hotels need for their gardens (p.190). With this in mind, A. El Maguiri and al. (2016, p.23) show other ways of recovering organic waste, producing compost that provides humus and fertilisers needed for crops to thrive, and biogas that can be burnt to produce heat or electricity, or used as fuel. Along the same lines, in Tunisia, 83% of hotels produce mixed waste for landfill, while 17% of hotels are developing small-scale recycling and composting initiatives. Recycling involves sorting PET plastics, cardboard, glass and bread (C. Wassim and al., 2018, p.7). Waste recovery is also similar in the hotels of Sinfra. In this town, hotel waste is recycled into metals and plastic water and drink bottles, which are easy to recycle. Yao and Tape (2023; 2024) provide further support through their articles on the towns of Bouafle and Zuenoula in Côte d'Ivoire. In these two towns, the main types of waste recycled are textiles, plastics, metals and household appliances for other uses. In Bouafle, 76.18% of hotel waste is dumped illegally, compared with 87% in Zuénoula. These high rates are due to the lack of waste management infrastructure and, more generally, to the lack of an appropriate policy and strategy, leading to anarchy in the waste management circuit, particularly pre-collection, collection and disposal.

Furthermore, H. Le Picard (2019, p.18) shows the alarming environmental and health consequences of poor waste management, where some landfills are located in sensitive areas, close to water reserves, without any means of protection to prevent contamination. The leachate produced by the percolation of water through the waste can infiltrate the soil and pollute the water table or nearby rivers. Polluted water thus becomes a vector for the spread of disease, with serious repercussions for the health of local residents. The incineration of waste in open spaces has repercussions on local air quality. Similarly, poor waste management in the city of Kinshasa in Congo has a variety of consequences, including unsightliness, nuisance linked to unpleasant odours, pollution and environmental degradation of water resources, soil and air (N. G. Nkula and al., 2023, p.168). This situation in Kinshasa is not unlike that in the town of Sinfra, where practically the same problems are encountered. Inappropriately managed waste, combined with urban household refuse, creates unhealthy conditions in the study area. In addition, climatic parameters such as high temperatures and heavy rainfall in the city mean that the decomposition of this waste pollutes the area concerned and is a source of proliferation of certain organisms such as malaria-carrying mosquitoes, which are harmful to the health of the population.

B. Determinants of inappropriate solid waste management in hotels

Poor solid waste management stems from several factors that some authors have mentioned in their works.

In their article, E.B. O. Nogo and L. B. Tchoukoua (2021, p.42) show that institutional and organisational shortcomings have led to urban disorder in waste management and, consequently, to the deterioration of the population's living environment. These same waste management problems also exist in Haiti, in Jeremie. The management of solid household and similar waste in Jeremie faces material, institutional and legal problems. Sustainable waste management is not seen as a necessity by the majority of the population. In most cases, waste is thrown directly into the environment without being sorted (B. Ametel, 2022, p.7). As in Jeremie, in the town of Sinfra, due to a lack of waste management infrastructure, many hotels dispose of their waste in the streets and unauthorised dumps.

In Burkina Faso, in the communes of Banfora, Bousse, Kaya and Ziniare, apart from the metals sector, which has been tacitly organised, household and similar waste recovery/recycling activities are poorly developed and are said to be due to enormous difficulties (A. Gango, 2021, pp.32-33). These include: a lack of equipment and appropriate training; a lack of professionalism and resources on the part of operators; the low competitiveness of recovery products, linked to a lack of knowledge and acceptance of waste processing products; and the absence of sorting at source. The problems of waste management in the communes of Banfora, Bousse, Kaya and Ziniare are in addition to the problems encountered by hotels in the town of Sinfra in managing their solid waste. These hotels are faced with a lack of infrastructure and a waste management master plan, which leads them to mismanage the waste they produce. Also in Mali, in commune IV of the District of Bamako, similar problems of municipal waste management are highlighted in the work of B. Dagno and al. (2023, p.17). These authors show that the means used for solid waste management remain very inadequate. The pre-collectors, who are mainly informal, use carts, while the town hall has only one van and some equipment for associations working in the field of sanitation. As a result, commune IV in the District of Bamako continues to face problems of information, training, the structure of the waste value chain, the disengagement of the authorities in favour of the Economic Interest Groups, incivism, and the lack of adequate infrastructure.

V. CONCLUSION

The management of hotel waste in the town of Sinfra is problematic. It is inappropriate. This situation has a negative impact on the environment and poses a health risk for the population. This poor management of solid waste from hotel establishments is linked to a number of difficulties such as the lack of survival in the application of regulatory texts, the absence of a hotel waste management control brigade, the lack of awareness among hotel managers of the need for selective collection of solid waste, the lack of recycling and urban composting facilities and the absence of a hotel waste management master plan. In response to these problems, this study proposes concrete actions to be taken. These include the effective and sustainable recovery of solid waste, which is a timely response to the negative effects of poor solid waste management, with a predisposition to selective collection,

Strategies for the Sustainable Management of Solid Waste from Sinfra's Urban Hotel Establishments

while raising awareness among hotel staff and guests about environmental education. The municipality must take to heart the rational management of solid waste from hotel establishments for the health of its population. As a result, the benefits of sustainable management of hotel waste will be just as beneficial for the hotels as for the population and the municipality.

REFERENCES

- 1) Appaw-agbola, E. T., and Freeman, B., 2015. Solid waste management in the tourism sector of Ghana. A study of selected hotels in Ho the regional capital of Volta Regio, *Journal of Tourism, Hospitality and Sports*, Vol.10, pp. 45- 50. <http://www.iiste.org/book/>
- 2) Ametel, B., 2022. Recycling household waste in urban and periurban agriculture in the town of Jeremie (Haïti), master's thesis, Liège University, 45p. [in French]
- 3) Behera, A., and Jatav, S. S., 2022. Waste Management Practices of Small Hotels in Dehradun, *Journal of Tourism Insights*, Vol.12, N°1, Article3, 14p. <https://doi.org/10.9707/2328-0824.1270>
- 4) Dagno, B., Coulibaly, K., Kante, M. K., and Mariko S., 2023. Solid waste management issues in commune IV of the Bamako district, *International Journal of the Researcher* , Vol. 4, No. 3, pp. 1 – 19, <https://doi.org/10.5281/zenodo.8299624> [in French]
- 5) Economic commission for Africa, 2011. Sustainable development and climate change: How is North Africa positionned ? 47p. [in French]
- 6) El Maguiri, A., Fawaz, N., Abouri M., Idrissi, L., Taleb A., Souabi, S., and Vincent, R., 2016. Physical characterisation and recovery of household waste produced by the city of Mohammedia, Morocco , *Nature & Technology. C- Environmental Sciences*, No.14/ January 2016, pp.16-25. <https://fr.scribd.com/document/663533277/> [in French]
- 7) FNADE, 2020. The waste sector and its role in combating climate change, 33p. [in French]
- 8) Gango, A., 2021. Study on the economic profitability and sustainability of the waste management sector in the communes of Banfora, Bousse, Kaya et Ziniare, Burkina Faso, 110p. [in French]
- 9) Le Picard, H., 2019. Waste management and electricity generation in Africa : incineration for a sustainable city ? 48p.
- 10) Lwanzo, M. E., Mahamba, B. R., and Shabani, E., 2023. Qualitative and quantitative study of hotel waste management in the Katindo district, Goma, north Kivu province, RD Congo, *Let's talk land and Biodiversity*, Vol.1, No.1, pp.29 – 041. <https://www.pugoma.com> [in French]
- 11) Made, W. W., Made, A. P., and Luhur, A. D., 2022, Solid waste Analysis and processing potential in the tourism sector: Case study in Nusa Dua, South Kuta, Bali, *Indonesian Journal of Urban and Environmental Technology*, Vol.5, No.2, pp. 181-192. <https://doi.org/10.25105/urbanenvirotech.v5i2.13538>
- 12) Nkula Nsindu, G., Kongolo, T. B., and Kudiaku, B. K. A., 2023. Impact of household waste on the environment and health on the outskirts of Kinshasa, RDC, *African Scientific Journal, ASJ* Vol. 3, No.16, pp.148-172, <https://hl.science/hal-04003881>
- 13) Nogo, E. B. O., and Tchuikoua, L. B., 2021. Public incivism, laxity on the part of public authorities and urban disorder in the town of Yagoua (Far north Cameroon), *Canadian Journal of Tropical Geography*, Vol.8, No.1, pp.38-42. <http://laurentian.ca/cjtg> [in French]
- 14) Yao, N. E-S., and Tape, S. P., 2023. Solid waste management in hotels in the town of Bouafle (Central West of Côte d'Ivoire), *The notebooks of ACAREF*, Volume 3, December 2023, pp.132-147. <https://revues.acaref.net> [in French]
- 15) Yao, N. E-S., and Tape, S. P., 2024, Characterisation and Recovery of Solid Waste from Hotels in the Town of Zuenoula (Central West of Côte d'Ivoire), *European Journal of Environment and Earth Science*, Vol. 5 , N°3 ,pp.21-27. <http://dx.doi.org/10.24018/ejgeo.2024.5.3.465>
- 16) Wassim, C., Abdallah N., and Michael, N., 2018. Solid Waste Management Key Indicator Development for Hotels: A Tunisian Case Study Analysis, *Recycling*, Vol.3, N°56, 19p. doi:10.3390/recycling3040056