













disposal of solid waste. The study found that there was bad ordure arising from the illegal dumping sites which had mushroomed the townships of the Chililabombwe district. The indiscriminate waste attracted dogs, cats and many more street children scavenging food around the district [4].

Solid waste and un-cleared drainages in the district had been implicated in high incidences of malaria cases with high malaria attack positivity in the district. Unkempt or indiscriminate disposal of waste contributing factors associated with the incubation and proliferation of flies' mosquitoes, and rodents; in turn, transmit diseases that affect the population's health such as malaria, diarrhea, cholera, and typhoid now with the embattlement of Covid-19 and many other public health concerns [4].

Respondents' knowledge levels of the health implications and aesthetics effects of increased solid waste management indicated that 330 (86.1%) responded Yes, implying that they were knowledgeable, while 14(13.9%) responded No indicating that their level of reasoning had not beyond the aspect of understanding the implication of the aforementioned.

With the sample size of 383 respondents that represented the number of households, a total number of 364 questionnaires were returned and analyzed, representing a 95% turnout of the total of 383 questionnaires administered and 19 questionnaires were not returned, representing 5% of the total administered. The study noted that 300 were males representing 78.34% of the sample size, while 83 were female, representing 21.67% respectively. The age range of respondents indicated that 53 were in the age range between 21-30 years, representing 13.9% 99. The median range was aged between 31-34 years, amounting to 25.7% while 231 were aged 35 years and above, representing 60.4%. The largest number of the respondents were married with children representing 86.1%, with the minority being either single, divorced, and on separation, respectively.

Academic distribution of the sampled population indicated that the minority (11), representing 3% had attained tertiary education, 65(16.8%) were the median group who had reached at least primary school, 27(6.5%) had never stepped in a classroom while the majority 280(73.3%) had attained either a school certificate or General Certificate of education

Respondent's altitude towards a reduction of escalating levels of municipal waste also indicated that 306(84.2%) showed a negative altitude and linked their reasoning on the economic side of the health implications of indiscriminate waste, while a small fraction 58(15.8%) understood the direct impact of indiscriminate disposal of waste on the health of the community if not taken care of.

The impact of native or indigenous traditional ways of disposing waste on escalating levels of solid waste showed 78.2% (280) of the respondents who still argued that waste management was the duty and responsibility of the local authorities to collect and dispose of the solid waste without any condition. In comparison, 21.8% (103) responded no, implying burying or burning of waste within their yards or homes was an olden way of waste management no longer a factor, as it contributed to high levels of solid waste accumulation and the burning continued to pollute the air hence the vice was retrogressive and was a likelihood of many public health diseases. It shouldn't be encouraged anymore [5].

### **Disposal of Solid Waste**

The study reviewed that improper bin collection practices, collection, transfer and/or transport systems had immersed effect on the characteristics management of solid wastes. Besides, the poor of planning criterion, inadequate health education and sensitization by the public on the collection schedules, number of vehicles for solid waste collection and poor road network, and insufficient infrastructure were among the other factors that contributed to poor management of solid waste in the district.

Effective ways and affordable waste collection services were noted and reported in the study conducted by researchers indicated thereof [5].

The essence was to organize the informal sector to part in the management of waste through the promotion of micro-business enterprises within the operation areas. It was noticed lack of knowledge and expertise on waste treatment by authorities was one of the important factors that affected the handling of solid waste in the country and the district at large. [5] The results indicated that the supply of waste facilities significantly affected the available choices for waste disposal, hence dominated with indiscriminate disposal.

Further, insufficient waste storage and distance to transport the waste from the disposal sites in the district were reported to be among the factors that necessitated indiscriminate disposal and illegal dumping in the drainages, along the roadsides, and many other open places. who mentioned that insufficient financial resources, absence of legislation, well equipped and engineered landfills all contribute to the limitation of solid waste safe disposal [6].

### **Disposal of Municipal Solid Waste**

Likewise, solid waste disposal has proved to be one of the major environmental problems in the collection, management, and disposal of the MSW in the Chililabombwe district. Lack of innovation and modern mechanization of municipal solid waste management systems led to a significant environmental disintegration marred with public health threats ranging from water pollution, air pollution, and soil pollution. Such environmental problems are associated with human health disorders due to the increase in greenhouse gas emissions and other toxic substances [6, 7].

The amounts, quality, and significance of such disposal are poorly understood. It was generally assumed that the household-generated waste was small. Thus, risks of disposal were negligible, yet it was the opposite of the reality on the ground. Nevertheless, industrial waste,

municipal solid waste, and many other types of waste continued to raise toxic and hazardous products in the environment and posed many health risks with some of the elements that were lethal to the general public. There are some concerns about the presence of several chemicals in household products. [7] The consequences and the impact to the environment resulting from the disposal of HHW were also of great concern that required remedies. Thus, the disposal of household waste at the dumpsite should be in tandem with the existing pieces of legislation on waste management (EMA) so as to decrease the risk to the environment.

Globally, about 65% of MSW's were disposed of in landfills or dumpsite areas. MSW contains mostly, hazardous substances included, including batteries, paints, mercury-containing waste, pharmaceuticals, vehicle maintenance products, and many other products. Further, it was noticed that much of the waste disposed of, more than 53% of the landfilled waste, consisted of hardboard paper, construction waste, household waste, papers, and food that are biodegradable by the anaerobic bacteria and plastic wastes in general.

### **Problems of Solid Waste Disposal Within Rural and Urban Communities in Chililabombwe District**

The indiscriminate disposal of garbage (solid wastes) was noticed to be a widespread problem in both urban and rural areas in the district. Similarly, main open places and drains were widely used in dumping varieties of garbage, was a source kind of domestic organic and inorganic waste. The inconsistencies in the manner that waste was collected created room for indiscriminate disposal by the residents as the collection system were not well coordinated. This resulted in blockages of the drainage system with the dumping of various waste articles from the residential houses and main other public places. [6] Much of this waste was plastic and paper with few toxic materials, and



those with toxic materials had a hazard impact on the environment due to the breakdown of the degradable constituents, a matter that added significant loads of BOD and the immediate impact to the eco-system.

In fact, lack of financial incentives to stop them from such practice and to encourage them to alter the habits contributed to the escalation of the general public outcry on uncollected and poorly managed solid waste in the districts. Most of the residents in the district opted to dump waste in the drains, burning in the yards as a way of getting rid of the waste, yet it was a serious disaster for the surrounding communities and to the country. Meanwhile, the existing laws were not effectively enforced to prevent the environment from such hazardous practices unless a better solution could be achieved if we overcome the situation [7, 8].

### **Management and Recycling of Solid Waste**

The district lacked recycling companies that could have reduced on the waste that was taken to the dumpsite, and this contributed to indiscriminate disposal of waste as it never had any value of some kind. The pricing for solid waste disposal and high disposal pricing had a positive effect on recovering the generated solid waste. [8] noted that social influences, regulatory and altruistic were among other factors that, if well tapped, could strong pillars in the communities to inculcate recycling habits in most areas to keep our environment clean, green, and healthy [8].

In other cases, it was noticed that distance to the set bins was yet another barrier and others used it as an excuse to dump waste anyhow and anywhere. [9] added that in order to increase the recycling rates, the local government must encourage the markets for recycled materials and should increase the number of professionals in the recycling companies.

Further, other factors noticed by the scholars included financial support for different recycling

projects to support the infrastructure of the recycling companies in the country [10].

Suffice to say the importance of recycling. Chililabombwe district has no recycling companies making it difficult to recover some of the products that could have been recycled. Indeed, solid waste managed remained a big challenge in main countries worldwide as collection and disposal required financial resources that included modern waste equipment with highly qualified expertise. [11], [12] Proper waste management in developing countries needs commitment and consistency, financial sustainability, technique feasibility, and socially and then legally acceptable for the environmentally friendly way of dealing with waste issues [13].

In the same way, a good knowledge of the characterization of solid waste before disposal was important for the management of solid waste. In the course of the management of solid wastes, some problems could be arisen due to their possible heterogeneous structure by nature. The physical features of solid wastes were extremely important for the mode of collection, transportation, recoverable matter, and energy transformation, as well as for selecting and designing the proper disposal methods.

Some studies suggested that residents near waste dumping places risked the health of the general populace, especially the children that experienced low weight birth, congenital anomalies, and some suspected cancer cases [14]. However, waste was not only considered as a source of materials recovery (metals, glass, plastics, and fibres) and energy, but also as oil saving and a tool for environmental protection.

### **Valorisation of Solid Waste in Chililabombwe**

The increasingly tighter regulations in terms of organic solid waste, as well as increasing the demand for renewable chemicals and fuels, are recently pushing the industrial manufacturers and the environmentalists towards sustainability to improve cost-effectiveness and meet

customers' demands. During the past few years, valorization of organic food waste has seen to be on a high rise of scientific research to ascertain its chemical composition to the environment.

It has attracted more attention as a potential alternative to the conventional solid waste disposal of a wide range of residues in landfill sites [15-17]. In addition, the increasing development of environmental strategies to process such solid waste was an interesting area of increased importance in our current society.

The study shown that municipal authorities in the study areas lacked the necessary financial resources to organise waste management effectively [18]. The limited funding to the waste sector makes it difficult for the department of public health to acquire proper solid waste equipment to respond effectively to the high generation of waste in the district. Also, it hampers the recruitment of enough workers to undertake regular cleaning of the roads and public places. [19-21] The poor waste-handling attitude of people also emerged as one of the causes of the poor waste situation in the study areas.

Sometimes there is what seems to be the inability of municipal authorities to enforce existing by-laws on waste disposal resulting in a general failure to respect the law and a 'throw-it-where-you-like' attitude towards waste disposal among the population [22-24].

The inadequate and inconsistency data on the waste situation was also a constraining factor in waste management in the district. It emerged from the interviews conducted with staff of the municipal waste department that no research study has been conducted to generate accurate data on the quantities of waste generated, the types and characteristics or even the waste disposal needs of the population [25-27].

The improper disposal of solid waste in Chililabombwe district continues to pose a health risk to the general population. Whilst the validity of this statistic cannot be ascertained, one thing that is clear to any casual observer was that quantities of solid waste remain uncollected

each day and waste accumulation was a growing problem in the district, making the city environments health hazardous and life threatening. [28-34] equally important, the study found that dumping done everywhere by the community regardless of the municipal council undertaking punitive actions on members of the society that were found dumping indiscriminately, and loads of solid waste collected by the municipal waste departments are dumped in a poorly managed dumpsite managed by a private entity as, the local authority does not have a landfill for proper disposal of solid waste, which create dire environmental conditions in the vicinities[35, 36].

## **Conclusion and Recommendations**

From the study it could be concluded that there are more gaps in the improvement of solid waste management in Chililabombwe, as it has been noted the main challenges faced by the local authority ranging from lack of modernized waste management equipment, financial constraints in waste management, lack of specialized trained waste managers and the unwillingness of the community members to cooperate with the local authority. On a contrary, it was noticed that there was no political interference in management of waste in the district. The local authority however, needed to continuously engage the residents through community mobilization campaigns with the civic leaders and other stakeholders for sensitization on the importance proper waste management. The district is however, needed to engage franchised waste companies that could supplement on the works the local authority was doing that could create more employment opportunities among the youths of Chililabombwe. The practices, storage, and disposal of solid waste in the district were unsatisfactory together with the separation of waste that was not practiced was yet another setback in the management of solid waste. However, the intolerance by the communities

and the unwillingness to participate in the proper way of waste management was still a concern that worried the authorities and its impact to the district. Therefore, there was a need for authorities to engage residents of urban areas, slums, and other peri-urban areas to improve the practices in solid waste management, especially on waste separation and disposal in the district.

## Recommendations

The study covered a small part of a big challenge that surrounded the management of solid waste in Chililabombwe. However, this article opens quite a few opportunities for further research studies, and the listing was abridged below for future waste management.

1. Stakeholders and other government institutions to come on board to partner with the local authority in the management of solid waste.
2. The local authority to engage the community with the civic leaders and ward development committees to sensitize the community on the proper disposal and management of waste.

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3. The local authority to engage the central government for funding in the solid waste management sector.
4. The local authority should procure modernized waste management equipment and employ qualified waste management experts.
5. The local authority to engage franchised companies in waste management and other stakeholders in the recycling of the waste into other goods.

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## Conflict of Interests

The author has no competing interests to declare.

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