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SOLID WASTE COMPOSITION IN URBAN LOCAL AUTHORITIES. IMPLICATIONS TO LOCAL GOVERNANCE AND ENVIRONMENTAL SECURITY. CASE OF MUTARE CITY COUNCIL

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ABSTRACT

Mutare City has challenges in managing solid waste from its residents. The city fails to collect solid waste regularly resulting in residents dumping their waste on undesignated places. There has been an accelerated mushrooming of such sites damaging the aesthetic value of all the residential areas in the City. Cases of waterborne diseases, including typhoid and related diseases, have been recorded among children and adults by the Ministry of Health as well as the City Health Department. Addressing the waste in Mutare remains a challenge due budgetary constrains and the City's failure to replace refuse compactors adequate to the size of the city. The central government, thorough its Public Sector Investment Programme, has not been allocating bridging funds for urgent capital funds required to address challenges such as this. The City Council lost its capacity to raise funds from its residents due to political interference and resistance by some residents. The need to address the City's solid waste is urgent and the City needs to know the nature of this solid waste so that it can develop appropriate interventions. This research seeks to analyse the constituent parts of Mutare urban's solid waste to enable the authorities to respond accordingly. A survey was conducted in Dangamvura, Hospital Hill, Westlea, Yeovil, Sakubva and Fairbridge Park as a follow up to a conference on Waste Management and Local Governance that was held at Africa University on the 13th of November 2018. Aproximately 18500 kg of waste was analysed and 62% of it constituted food waste.

1.0 Introduction

Solid waste management is one of the biggest challenges facing environmental agencies world over. Solid waste is regarded as the second most important environmental health concern apart from water quality as per the WHO (Zerbock 2003). The differences lie in how each and every management agency respond to the challenge.Still the humans continue to "produce waste whether being in residential areas or workplace" (Mudzengerere and Chingwenya, 2012.p.228). Solid waste is generated by any activity such as food preparation, sweeping, cleaning and burning fuel, gardening and recreation (Medina, 2010). "Municipal solid waste may be "defined as waste generated from homes, street sweeping, industries, institutions and commercial areas" (Mafume, et al. p.142). Solid waste compresses "all the waste arising from human and animal activities that is normally solid that is discarded as

useless or unwanted" (Musingafi, et al.2014. p.68). In Zimbabwe, while waste generation is still at relatively low levels, there is less scope for its reduction. Waste disposal should be done in accordance with the best principles of public health, economics, engineering conservation, aesthetics and other environmental considerations.

Mutare City experiences the similar growing concerns with the mounting waste management. While Enock C.Makwara and Snodia Magudu(2013) believe that it is "economic growth and changing consumption patterns" (Makwara and Magudu, 2013.p.68) that increases refuse "output" they are partly correct when it come to Mutare. Nleya, et al. (2016.p.54) think that increasing solid waste is accounted by "rapid growth in population, industrialization, urbanization and technology". However, Mutare City is not experiencing either of these phenomena,yet its consumption related solid waste is increasing resulting in increased pests and pollution. This is confirmed (Makwara and Magudu, 2013.p.68) "waste generation is intractably linked with resource consumption". In 2011 the aggregated and combined (domestic and industrial) baseline tonnage of solid waste stood at 2.5 million tonnes (Nleya, et al.2016.p.54) country-wide.

There are many different types of waste, which are usually identified according to their source. These include house-hold waste, industrial waste and sewage sludge (Musingafi, et al, 2013). To determine the constituent parts of waste, particularly in large urban areas, a lot of work has to be done. Orgnaised waste collection in Zimbabwe began many years ago and it this organised process that has virtually collapsed "triggering its chaotic and rampant illegal dumping" (Makwara and Magudu. 2013. P.70). There are cases were "waste accumulated in streets, often blocking drains" (Ibid.p.70). The waste is characterized by vegetative matter, tins, glass, cans, metals polythene, dead animals, and wood among others. The cocktail of such garbage is hazardous. "If improperly handled and disposed of, it can cause substantial harm to human health, death of smaller animal and plant organisms and a general breakdown and loss to the immediate ecological systems" (Ibid.p.70).

Collection and disposal of solid waste is crucial in ensuring a clean, safe and healthy environment. This "refers to the integrated control of unwanted materials, which would otherwise have been harmful to the environment" (Ampofo1, Soyelle, and Abanyie, 2016.p.94). The process involves storage, collection, treatment and disposal of solid waste. Thus, "collection and disposal of solid waste is an important facet of environmental hygiene

and needs to be included in any environmental planning" (Ibid.p.94). In Mutare, just as in the rest of African cities, "half of the solid waste generated is not collected" (Mutetwa, et al. 2016.). The waste is rarely recycled but thrown on dump sites. The Mutare City like many other cities in Zimbabwe, refuses to do its refuse collection obligations due to financial constraints (Mohee and Simelane, 2015; Senkoro, 2003) forcing the residents to practice illegal dumping of some solid waste in open spaces. Mutare City has not purchased up to standard equipment for refuse collection. Equipment and manpower needed for refuse collection is usually inadequate and in most cases old and obsolete. The City also charges for refuse collection, and their charges are very nominal and in some cases fail even to cater for the operational costs. Government subsidy is now non existent and efficient refuse collection is further complicated by poor roads and general access problems which make house- to-house collection difficult and expensive.

The challenges of solid waste management have scaled health problems as well in Mutare. City of Mutare has recorded six cases of cholera in recent months.These health problems in Mutare are "compounded by a combination of overcrowding, uncollected accumulated solid waste from the main market, residential areas and local industrial sites" (Ibid.). Many cities use Integrated Municipal Solid Waste Management System aims to reduce solid waste while at the same time enhancing utilization of solid waste as a resource. This method integrates waste and people in a beneficial way. But in cases where house-to-house collection is practicable, lack of collection vehicles makes the process irregular and unreliable. Refuse character and non availability of trucks affect frequency of collection. The researcher wanted to find out the major constituents of household solid waste generated by respondents. The pie chart below reveals that the major constituencies of household solid waste are foods waste which constituted 46%, followed by plastic waste 20%, diapers 7%, sanitary waste 4%. Solid waste are things that are thrown away because they are no longer useful, e.g. food left-over, paper, plastic used for wrapping things, and empty containers. A lot of biodegradable waste is generated in the study area.

2.0 Statement of the problem

Solid disposal in Mutare is becoming a challenge as evidenced by huge stacks of uncollected garbage in the residential areas, Dangamvura, Hospital Hill, Westlea, Yeovil, Fairbridge Park and Sakubva open market and all shopping centres in high density residential areas. In

the same vein the dumpsites are becoming an eye sore and also some solid waste is finding its way into the streets and residential homes. This research sort to analyse the major constituents of household solid waste generated by respondents and implications to local governance and environmental security in the targeted residential areas to help the municipality of Mutare develop appropriate and effective solid waste management strategies for the city.

3.0 Objective

The research breaks down the constituent parts of the Mutare City solid waste and document its major components to assist the City in designing appropriate intervention strategies.
This objective is operationalised by the following research questions:

1. What are the types of solid waste generated in Mutare city?
2. In what ways is solid waste disposed of in Mutare city
3. What are the implications of composition of solid waste to environmental security and local governance?

4.0 Justification

The research intended to produce information on refuse management in the city of Mutare necessary in the development of a sustainable city. The information would be used by both city fathers and the community at large in bringing up and maintaining a sustainable city. The importance of this information is rooted in the contemporary urban issues of sustainable cities. Failure to live up to the dictates of sustainable cities will result in cities degenerating into fertile grounds of breading diseases and catastrophe for human life.

5.0 Literature review

Solid waste is an everyday thing in human life. It “consists of everyday items that are used and then thrown away, such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, appliances, paint, and batteries” (Nleya, et al.2015.). Causes of the problem include “urbanization, population growth, industrialization, economic development, non- cooperating community and lack of environmental education on solid waste management” (ibid.p.55). Unmanaged solid waste contributes to:

- spread of diseases;

- deterioration in agriculture activities;
- land, water and air pollution;
- deterioration in tourism industry;
- development of hideouts for thieves and thugs;
- blockage of drainage system and surface water contamination;
- risk of fire;
- destruction of ecosystem and properties;
- loss of livestock due to consumption of plastics;

In view of these diverse problems of unmanaged solid waste, downstream problems are noted. These include unsatisfactory quality of the residential and working environments, and associated health problems, of poor urban people is now generally recognised. The urban poor, living in inadequate overcrowded shelters, suffer from diseases and injuries resulting from proximity to toxic and hazardous wastes, lack of clean water and sanitation (Songsore, 2004). The poor residents are particularly vulnerable to typhoid, diahorreal diseases, cholera and intestinal worms from contaminated water and food, as well as diseases associated with poor drainage and garbage collection such as malaria (Yedla, 2005). The poor in society often do make a trade-off between the quality and the location of their living spaces – living in areas with poor, insanitary environments in order that they can be in a preferred location with access to livelihood generating assets (Tsiboe, 2004).

The solid waste in Mutare in the past has been documented. Challenges affecting the City include lack of equipment and financial resources. However, Anomanyo (2004) observed that, apart from lack of funds, insufficient information on quantities and characteristics of waste is the major contributing factor to waste management problems. The existing waste management systems in the country has not appropriately integrated other essential components of waste management such as reuse, recycling, reprocessing and treatment (Monney, Tiimub and Bagah, 2013.p.11).

5.0 Methodology

The study is a follow up to the Conference on *Waste Management and Local Governance* that was held at Africa University on the 13th of November 2018 in which City of Mutare participated. The research included an extensive review of theoretical literature as well as the

use of experiential observation and measurements. The researchers are residents of the City of Mutare. The scope of the empirical investigation was limited to the City of Mutare. The study was largely based on quantitative and qualitative design. The study approach involved an assessment of the physical characteristics (composition, generation rate and bulk density) of solid waste generated from Dangamvura, Hospital Hill, Westlea, Yeovil, Sakubva and Fairbridge Park residential areas in the study areas using the weight- volume analysis. Purposive random sampling method was used in the selection of the study households both for solid waste composition analysis and questionnaire administration. By this method, households and study respondents were selected from low, middle and high income communities within the study area to provide a holistic idea about the waste characteristics and management practices. The criteria used to classify the households were based on the residents' living standards, housing and access to basic essential services such as potable water, electricity and toilet facilities, among others, according to the City of Mutatre zoning criteria. Six communities from Mutare City were therefore identified for study: Dangamvura as low income community, Hospital Hill and Fairbridge Park as middle income community and Westlea and Yeovil as high income community. Five households from each of these communities were used for the study. Each of the participating households were provided with a 120L plastic bin after thoroughly sensitizing residents on the study objectives for their full cooperation. Waste from each household was initially weighed and average of each waste type was calculated by dividing the sum of each constituent part by the 150 households sampled for low, medium and high density. A comparison was made for low medium and high density and was presented by way of a bar graph. A combined analysis for all the residential areas was done and presented by what of a pie graph.

6.0 Results.

The results produced during the survey are presented in the table 1 and figures 1 and 2.

Table 1 Average Weight of Constituent Solid Waste

	Average Weight of solid waste (Kgs)		
	High Density	Medium density	Low Density
Food waste	145	140	185
Paper	3	4.09	5.8
Cardboard	7	5	4.3
LDPE	12	36	19.8
HDPE	6	6.3	222

PET	2	2.2	3.13	
Kayite	1	1.3	2.8	
Textiles	8	2.7	0.29	
Rubber	6	4.4	0.45	
Leather	0	0	0.8	
Garden waste	53	0	6.13	
Wood	0	0.13	0	
Glass	7	5.8	8.22	
Cans	2	1.2	5.92	
Metals	7	3.2	2.81	
Styrofoam	2	0	0.06	
Sanitary waste	1	1.4	17.37	
Electrical	4	6.6	0.16	
Residue	1	0.5	1.23	
Batteries	0	0	0	
Containers of auto oil/liquid	0	0	0	
pesticides container	0	0	0	
paints container	0	0	0	
Synthetic	1	1	1.62	
Diapers	3	28	11.4	
Ceramics	2	0.61	1.4	
Others	5	1.4	3.83	
Total	278	251.83	504.52	1034.35

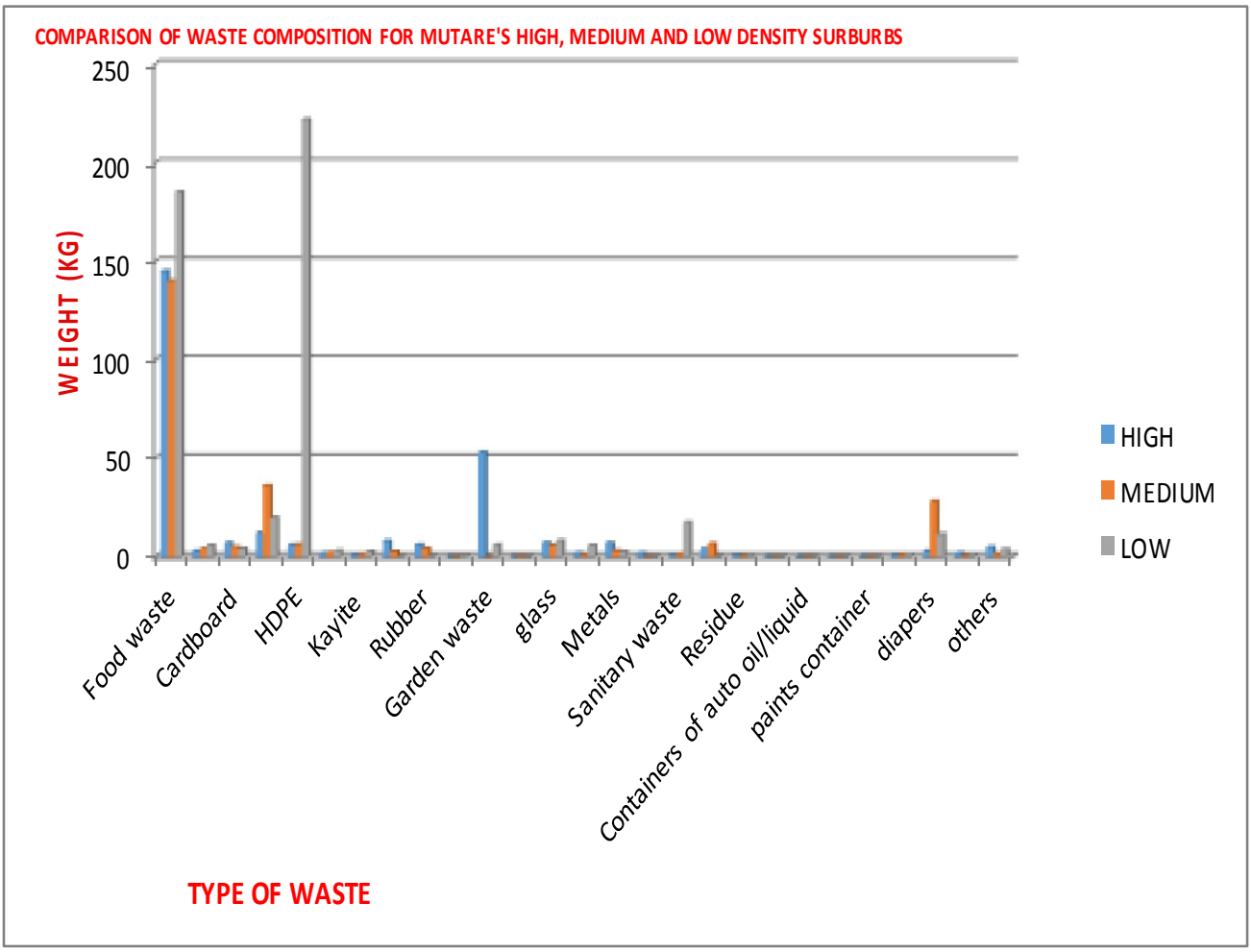
COMPARISON OF WASTE COMPOSITION FOR MUTARE'S HIGH, MEDIUM AND LOW DENSITY SURBURBS
WEIGHT (KG)
250
200
150
100
50
0
Food waste
Cardboard
HDPE
Kayite
Rubber
Garden waste
glass
Metals
Sanitary waste
Residue
Containers of auto oil/liquid
paints container
diapers
others
HIGH
MEDIUM
LOW
TYPE OF WASTE

Fig 1

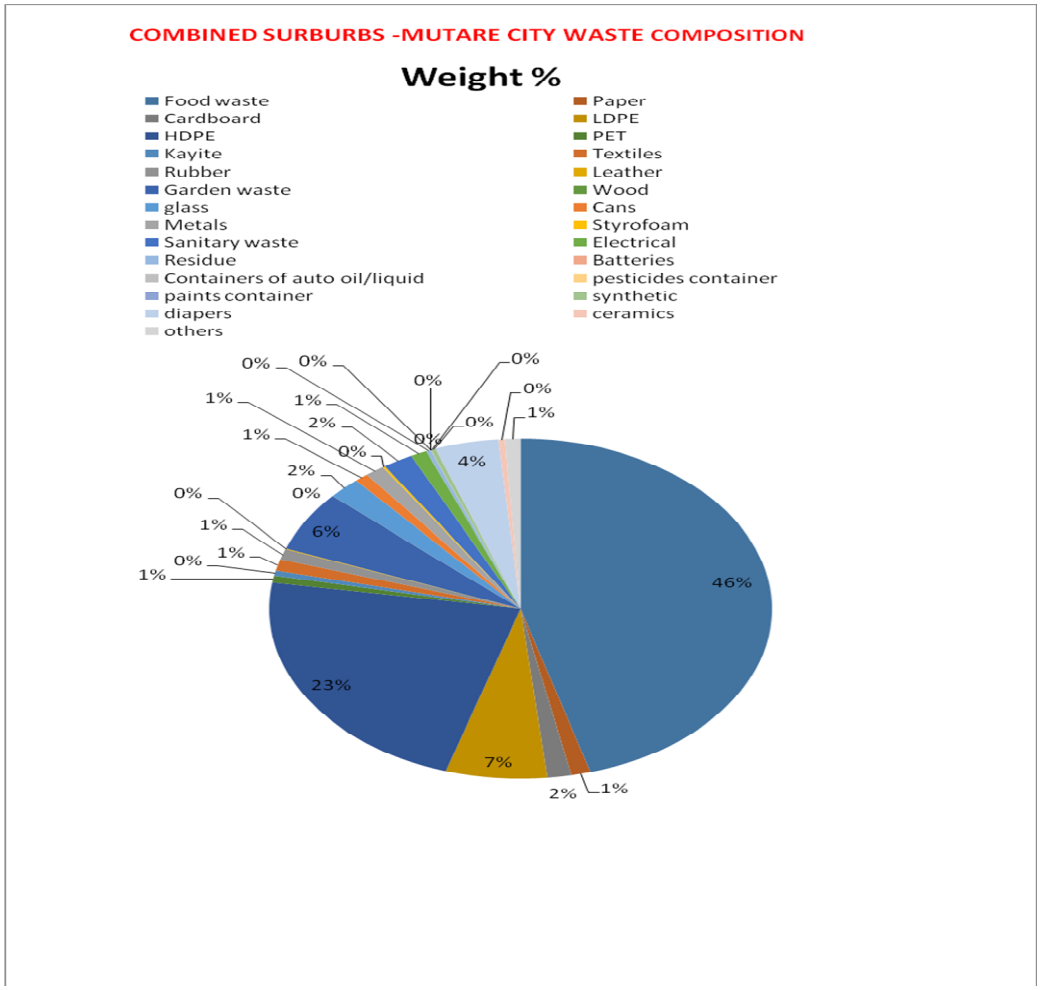

Fig 2

6.1 Solid Waste Challenges

It was outlined in the conference presentations and discussions that solid waste challenges span from collection to disposal. The council has been operating with an aged fleet of two refuse collection vehicles instead of an ideal 14 vehicles. This has crippled the ability of council to adhere to the collection schedule resulting in mushrooming of refuse heaps around the Central Business District and residential areas. The capacity of the council has been worsened by the fact that council is no longer receiving grants from the national fiscus for capital projects. The economic challenges has also crippled the residents and rate payer's ability to pay for services provided by council. The City of Mutare dumpsite is non-compliant to disposal sites regulations of Zimbabwe and best international disposal practice. In addition to that the dumpsite was sited at the source of Munene River, which feeds into Chikamba Dam in neighboring Mozambique. There are also no hazardous waste disposal facilities. The current consumption trends is generating significant volumes of hazardous waste (10%).

7.0 Discussion

A total of approximately 1.03 tons of solid waste generated by 60 households over the five-day study period was used for the assessment. 30% of this total quantity of solid waste emanated from households in the low-income area whilst middle- and high-income households contributed 20% and 50% respectively. The greater proportion of waste emanating from low-income households is due to relatively larger household size as compared to middle- and high-income households. However, the average per capita waste generation rate in the low-income area (0.2kg/cap/day) was lower than that of middle and high income areas. The increasing trend in waste generation rate from the low to high income groups as shown by this study is growing. Moreover, the difference in waste generation rates among the income groups conforms to the view that the quantity of waste generated is a function of the residents' lifestyle and living standards. Residents in low-income communities are generally poorer and have low purchasing power resulting in low waste generation rates.

It has been observed that 46% of the solid waste is composed of food waste the bulk of it coming from the low density, followed by high density and lastly medium density. This could be attributed to households in low density have higher disposable incomes hence can afford to buy more food. Overally, the results show that residents prepare more food than what they can eat. Environmental public awareness campaigns should be carried out with the aim of reducing food wastage. Public awareness campaign should also encourage composting which will go a long way in solid waste disposal problems. It was further observed that 46% of waste is plastic waste. Education and awareness programs should put emphasis on plastic/ waste separation at the source or household. If 46% and 23% is managed using the above mentioned, it is anticipated that 69% is well managed and will have a corresponding effect to the problem of illegal dumping.

It has also been noted that sanitary waste and diapers collectively is ranked third (10%) in solid waste composition. It is an indication in change of consumption. Civic awareness should be extended to management of sanitary waste as it is classified as hazardous waste.

Cumulatively managing food waste, plastic and sanitary waste will reduce waste at source by approximately 70% and will have a corresponding effect to the volume of waste that is supposed to be collected by Mutare City Council for final disposal to the dumpsite.

It was observed that the non-timeously collection of solid waste has threatened the lives of the residents as high incidence of diarrhea related diseases of 5% was recorded. Mutare is a tourist destination and an investment center, non collection of solid waste has damaged its reputation as the Jewel of the East.

Problem of waste collection and management can further be addressed by effective citizen and civic society engagement. The current problem of illegal dumping can be seen as a protest by citizens on council's failure to timeously collect solid waste. Failure to pay user service charges by some residents has worsened the situation/ capacity of council to collect solid waste. The issue of political interference/ directives has also contributed to council's incapacity to collect solid waste.

The non-collection of solid waste in Mutare can be interpreted as of lack of accountability, and denial of human rights, created conditions which prevented or impeded development (Shar:2009). It is indeed a threat to environmental security.The Millennium Development Project defined environmental security as the relative public safety from environmental dangers caused by natural or human processes due to ignorance, accident, mismanagement or design and originating within or across national borders. Failure to dispose of waste in in a violation of fundamental rights and In terms of section 73 of the Zimbabwe constitution of Zimbabwe.

The World Bank embraced local governance as one of the major governance reforms on its agenda. Local Governance is viewed as an improvement in governance and is an enabling condition for successful development-efficiency, transparency, accountability, manageability. It comes as a result of re-examination of citizen state relationship. Shar (2009) further argues that local governance includes the diverse objectives of vibrant, living, working, and environmentally preserved self-governing communities. It is also about preserving the life and liberty of residents, creating space for democratic participation and civic dialogue,

supporting market-led and environmentally sustainable local development, and facilitating outcomes that enrich the quality of life of residents

8.0 Conclusion and Recommendations

The study showed that 46% of solid waste is food waste, 23% is plastic waste, 10% is sanitary and diaper waste. Non collection of solid waste causes a number of health related hazards and destroys the aesthetic beauty of the City. Civic education/ awareness and community participation as a strategy will greatly reduce solid waste volume by more than 70%. Given this scenario council should be more effective in solid waste collection and management. For this to happen, there should improve council residence relationship through dialogue and citizen participation in planning and decision.

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