Environmental Health Hazards of Solid Waste Dumping in Calicut City Corporation

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ABSTRACT *Owing to the increase in global population and the rising demand for food and other essentials, there has been a rise in the amount of waste being generated daily by households. Waste which is not properly treated, especially solid waste from households and the community, isa serious health hazard that leads to the spread of infectious diseases. Open dumps have environmental safeguards; they can pose major public health threats and environmental effects in urban cities. The present study aimsto examine the environmental health hazards of solid waste disposal at Njeliyanparambu dumpsite on the surrounding human settlementsin Calicut City Corporation, Kerala. The study uses primary data of 384 sample households from Calicut City Corporationdrawn by stratified random sampling with astructured questionnaire. Descriptive statistics involving mean, standard deviation,cross-tabulations,andstatistical test like Chi-squareare used to present and analyse the data. The results showed that issues of improper solid waste disposalposed a threat to the health of the residents proximate to the dumping site. As a result, this study highlights the need for evolving a mechanism to properly manage and relocate the dumpsite to a safe distance from all human settlements, and provide resettlement programmes for all persons living near to the dumpsite as interim measures.*

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1. Introduction

The demographic and economic growth of cities in the developing countries has beena serious challenge to urban local authorities. Increasing population, changing lifestyle and urbanisation together contribute massive generation of solid waste all over the world which has become an increasing environmental and public health problem everywhere in the world, particularly in developing countries (UNEP, 1996).High population, rapid economic growth and change in living standard accelerate the generation of municipal solid waste in Indian cities (CPCB 2004; Sharholy et al. 2008). The annual quantity of solid waste generated in Indian cities has increased from 6 million tonnes in 1947 to 48 million tonnes in 1997 with an annual growth rate of 4.25%,and it is expectedan increase to 300 million tonnes by 2047 (CPCB,2004).

With the increase in the global population and the rising demand for food and other essentials, there has been a rise in the amount of waste being generated by households. Mismanagement of waste especially solid waste from households and the community can cause serious health hazards and lead to the spread of infectious diseases.

Calicut City Corporation has a waste treatment plant at Njeliyanparambu in Cheruvannur- Nallalam area spread in 7 hectares. The biodegradable wastes collected by the Corporation sanitary workers and Kudumbasree membersare transported to Njeliyanparambu dumping yard every day. Enormous dumping of waste in this open dumping yard creates environmental and health problems to the residents surrounding that area. This paper is an attempt to study such possible environmental health hazards related toresidential proximity to a dumping site of solid waste in Calicut City Corporation.

2. Materials and Methods
2.1. Study Design
The study is designed to analysepossible environmental health hazards related to residential proximity to the dumping site of solid waste in Calicut City Corporation.
2.2. Data Collection
The present studyis based on both primary and secondary sources of data. Primary dataare collected from the households of Calicut City Corporation,and secondary data are collected from books, journals,the master plan for Kozhikode Urban Area (2035), reports ofCPCB, NEERI, Kudumbasree andannual reports of Kozhikode Corporation. Population in this study considered as a total number of households residing in Calicut city which is 171877 households (Master plan for Kozhikode Urban Area 2035). The study selected384 samples (n) from 20% of the total wards (15/75) by stratified random sampling.The whole

wards are divided into two strata by mean distance (the mean distance is 8km) from waste management plant. Strata 1 represents the wards within the mean distance and strata 2 represents wards above the mean distance.Strata 1 consists of 33 wards and strata two consists of 42 wards. The study selected 20% of wards each from strata 1 and strata two that are 7 and eight wards respectively. Each ward represents 24-28 households in a proportionate rate and the period of data collection is from April 2017 to July 2017.

2.3. Analytical Techniques

Descriptive statistics like mean, median, SD and cross tabulationare utilised to understand the basicpattern, deviation and spread of the data. Chi-square test is employed to test whether the discrepancy between expected and observed values may be attributed the chance. It examines the association between the incidence of disease and proximity to dumping yard;causes of illness and proximity to dumping yard and major environmental issues on disease and proximity to dumping yard.

3. Results

3.1. Socio-Economic Variables of Sample Households

Socio-economic background of the respondents plays a significant role in waste generation, storage and waste management practices they follow. Hence, the socio-economic identification of the sample households should be considered in order to develop a wider perspective analysis.

The mean and standard deviation of the variables used in the analysis is given in table 3.1.The household size is measured by a number of adults and children feeding on the same source,andaverage family size is 5.The average age of respondents is 51.5 years. The average household income per month is Rs.26710/-and average monthly expenditure is Rs.18235/-. Size of the homesteadis expressed in cents,andthe average size of the homestead is 7.4 cents. Only 4.7 % possess homestead above 12 cents,and6% of the respondent possesses only 2 cents of land. The gender distribution of the sample respondents is skewed in favour of the female as females are mostly present at home at the time of interview. In the case of education, 95.6 % of respondents have formal education in which 57.6% completed secondary education and above.

<div align="center">***Refer to table 3.1 in Appendix***</div>

3.2. Solid Waste Generation and Proximity to Dumping Ground

Proximity to dumping yard means a distance of residents from solid waste dumping ground. The mean distance of wards from dumping yard is 8 Km. Total sample households are grouped into two strata on the basis of proximity to dumping yard (see table 3.2).It shows that people residing in strata oneis near to dumping yard and people residing in strata two are more than 8km away from dumping yard. The average quantity of waste generation among the sample households across different stratais also reported in table 3.2.

<div align="center">***Refer to table 3.2 in Appendix***</div>

Strata 1 in table 3.2 shows the number of sample households residing within the mean distance which accounts for 46.9% of the total sample households. Strata 2 represents sample households residing beyond the mean distance which is 53.1% of the total sample.The results reveal that households in strata 2 generate more waste than in strata 1. Incidentally, victims are the households who generate less waste.

3.3. Disposal Practices in Calicut City

In Calicut City households generate waste in the form of organic, plastic covers and papers, recyclable plastics, glasses and lights, e-waste, sanitary napkins, dresses and other wastes.The biodegradable wastes are collected by the Corporation sanitary workers and Kudumbasree and transported to Njeliyanparambu, adumping yard in Cheruvannur-Nallalam area spread about 7 hectares. The collected wastesare dumped in an open surface for drying,and after that, these are converted into manure through a single window system. The manure so producedis sold to private firms at Rs.400 per sack. One of the major defects of the plant is that it does not have a leachate treatment unit and drier for drying. So the collected wastes are openly dumped for more days for drying which permeates stink. The people living near the plant complain of health issues like allergy, infection, other diseases, deterioration of water quality, etc.

3.4. Health Hazards

Indiscriminate disposal of solid waste in dumpsites located within urban areas has proved to be a problem to nearby residents. Open dumps have environmental safeguards; they can pose major public health threats and environmental effects in urban cities. In Calicut city, nearby residents in solid waste dumpsite suffered from related diseases such as malaria, chest pains, diarrhoea and cholera, due to the location of the dumpsite closer to their settlements. This part of the study focus on the environmental health hazards of solid waste disposal at Njeliyanparambu dumpsite on the surrounding human settlements in Calicut City Corporation, Kerala.

A).Incidence of Disease

The incidence of symptoms like a cough, cold, fever, headache, diarrhoea, skin infection, eye irritation and diseases like cholera, typhoid, dengue fever, rat fever, chicken guinea and respiratory disease occurred during the reference year are asked to the respondentsare reported in table 3.3.

Refer to table 3.3 in Appendix 1

The table 3.3 revealsthatthe relatively high percentage of the sample respondents in strata 1 and strata twoare affected by diseases during the referenceyear, but it is evident from the table thatnearby residents (strata 1) are affected more than the faraway residents(strata 2)in terms of proportions. Nevertheless, no harsh conclusions can be drawn from this since the association needs to be statistically proved and the difference needs to be tested for statistical significance; for which the study employs a chi-square test. Pearson chi-square value of 8.87 with 0.05 level of significance implies that there is a significant relationship between proximity to dumping yard andincidence of diseases. Here this study fails to prove the null hypothesis. So the study rejects the null hypothesis.Hence it is clear that households residing near to the dumping ground (strata 1) areaffected more than the households residing far from dumping ground (strata 2) that is the incidence of disease and proximity to dumping yard are highly associated.These findings arein line with the observations of Zhu et al.,(2008) &Suleman et al., (2015) that population living close to a waste dump have a higher risk of diseases prevalence.

B).Causes of Illness

The study examined various causes for an illness like environmental, non-environmental and others. The respondents who are affected by diseases are taken to identifycauses of disease to examine theassociation of former with proximity to dumping yard.

Majority of the affected people in strata 1 reveals that environmental factors are the root cause of the continuous ill health while non-environmental factors have a minute role in affecting disease.Table 3.4 shows that causes of illness and proximity to dumping yard are associated which needs to be statistically proved,and the difference needs to be tested for statistical significance.

Refer to table 3.4 in Appendix

The study employs a chi-square test to examine the association between the causes of disease and different strata.Thechi-square result shows that proximity to the dumping site andreasons for diseases are highly associated. Pearson chi-square value of 17.28 at 0.01 level of significance implies that there is a significant relationship between proximity to dumping yard and causes of illness. It reveals that households residing near the dumping ground (strata 1) are more affected by environmental issues than the households residing far from the dumping ground (strata 2). It emphasises that the root cause of health hazards of the people residing near the dumping ground is environmental issues and such issues do not have much affect the people residing away from the dumping ground.

C).Major Factors of EnvironmentalIssues

It is statistically found that environmental factors are highly associated with the incidence of disease in strata one compared to strata 2. Hence the study tries to examine the specific environmental issue that causes health hazard among the sample respondents.

Refer to table 3.5 in Appendix

Table 3.5 shows that dumping of solid waste is the specific reasonfor the incidence of diseases in strata one which is a small percentage in strata2. Households in strata two are pointed out other environmental reasons like pollution from vehicles, dust etc. for their ill health.It reveals that dumping of solid waste adversely affects the nearby residents.

Nevertheless, the study employs a chi-square test to examine the association betweenenvironmental issues and proximity to dumping yard. The result shows that proximity to the dumping site andissues of physical environment are highly associated. The result reveals that households residing near to dumping ground (strata 1) aremore affected by solid waste issues than the households residing far from dumping ground (strata 2). It emphasises that the root cause of health hazards of the people residing near the dumping ground is environmental issues specifically open dumping of solid waste. Hence it can be concluded that improper solid waste disposal has posed a threat to nearby residents.

4. Conclusion

Either due to resource crunch or inefficient infrastructure, waste gets collected and transported to the final dumpsites were not properly managed. It causes serious impacts on health problems in the surrounding

environment. Negative impactsbeing observed in Calicut city due to the open dumping of solid waste are contaminated water quality due to leachate from drying process, permeates stink to nearby areas which adversely affects air quality and open dumps of solid waste are providing attractive habitat to rats and other vermin. Besides open dumps of solid waste are a serious threat to human health and sanitation.It is examined that as residents move away from the dumpsite, the impact is not as severely affected as those who are closer to the dumpsite. It emphasises that the root cause of health hazards of the people residing near the dumping ground is environmental issues in general and solid waste issues more specifically.Accordingly, the study recommends further research with new insights concerning all the hazards faced by the people residing nearby dumpsites as well as people who deal with the collection and management process.

REFERENCE
1. Biju Govind (2010, September 25). Tackling waste management in Kozhikode with technology. The Hindu, Retrieved from https://www.thehindu.com/todays-paper/tp-national/tp-kerala/bigger-kozhikode-faces-mounting-garbage-menace/article2095387.ece
2. Biju Govind. (2011, June 11). Bigger Kozhikode faces mounting garbage menace. The Hindu, https://www.thehindu.com/todays-paper/tp-national/tp-kerala/bigger-kozhikode-faces-mounting-garbage-menace/article2095387.ece.
3. CPCB. (2000). Status of Solid Waste Generation, Collection, Treatmentand Disposal in Metrocities, Series: CUPS/46/1999–2000, Government of India, New Delhi.
4. IELRC. (2007). Malinya Muktha Keralam Action Plan 2017, Local Self Government Department Government of Kerala, November.
5. Koshy, P.(2006).Waste Management in Kerala- Private Sector Participation. Universal Eco Services.Retrievedfrom.http://www.universaleocoservices.com/wastemanagement in_kerala.cfm
6. Sharholy, M., Ahmad, K., Mahmood, G., & Trivedi, R. C. (2008). Municipal solid waste management in Indian cities–A review. Waste management, 28(2), 459-467.
7. Sharholy, M., Ahmad, K., Vaishya, R. C., & Gupta, R. D. (2007). Municipal solid waste characteristics and management in Allahabad, India. Waste management, 27(4), 490-496.
8. Suleman, D. T., & Agyemang-Duah, W. (2015). Solid waste disposal and community health implications in Ghana: Evidence from Sawaba, Asokore Mampong municipal assembly. J Civil Environ Eng, 5, 202.
9. Town and Country Planning Department. (2017). The master plan for Kozhikode Urban Area-2035, Govt. of Kerala
10. UNEP (2005). Solid Waste Management, United Nations Environment Programme (UNEP). Cal Recovery Incorporated
11. Zhu, D., Asnani, P. U., Zurbrugg, C., Anapolsky, S., & Mani, S. K. (2007). Improving municipal solid waste management in India: A sourcebook for policymakers and practitioners. The World Bank.

APPENDIX I

Table 3.1 : Descriptive Statistics on Socio-economic Background of Households

Variables	Mean	SD
Household size measured by the number of adults and children	4.6	1.2
The actual age of respondent in years	51.5	8.08
Monthly household income (in Rs)	26711	26194
Monthly household expenditure (in Rs)	18236	13876
Size of a homestead owned in cents	7.4	4.1

Source: Primary data

Table 3.2 : Average Quantity of Waste Generation across Strata

Strata	Noof respondents	Average Waste generation per week (In Kg)
Strata 1	180 (46.9)	5.06
Strata 2	204 (53.1)	5.48
Total	384 (100)	5.27

Note: Figures in parenthesis are a percentage to total respondents
Source: Primary data

Table 3.3: Incidence of Disease and Proximity to Dumping Yard

Disease	Proximity to Dumping Yard				Total		Pearson Chi-Square	Sig
	Strata 1		Strata 2					
Affected	139	(77.3)	129	(63.2)	268	(69.8)		
Not affected	41	(22.7)	75	(36.8)	116	(30.2)	8.87	.003***
Total	180	(100)	204	(100)	384	(100)		

Note: *** = Significant at 1 per cent level
Figures in parenthesis are a percentage of respondents
Source: Estimated from the primary data

Table 3.4: Distribution of Causes of Illness

Reasons	Proximity to Dumping Yard		Total	Pearson Chi-Square	Sig
	Strata 1	Strata 2			
Environmental	112 (80.6)	74 (57.4)	186		
Non environmental	9 (6.5)	22 (17.1)	31	17.278	.000***
Others	18 (12.9)	33(25.5)	51		
Total	139	129	268		

Note: *** = Significant at 1 per cent level
Figures in parenthesis are a percentage of respondents
Source: estimated from primary data

Table 3.5: Major Factors of Environmental Issues

Factors of environmental issues	Proximity to the Dumping yard		Total	Pearson Chi-Square	Sig
	Strata 1	Strata 2			
Dumping of solid waste	94 (84)	6 (8.1)	100		
Pollution by vehicles	0	22 (29.8)	22		
Dust in environment	9 (8)	20 (27)	29	108.641	.000***
Other	9 (8)	26 (35.1)	35		
Total	112	74	186		

Note: *** = Significant at 1 per cent level
Figures in parenthesis are a percentage of respondents
Source: estimated from the primary data.