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Challenges facing integrated household garbage disposal for garbage management in Kisii town, Kenya

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Abstract

Factors that mostly affected household garbage management were; inadequate garbage disposal facilities in town and residential areas whereby 87% agreed and 13% disagreed ($M=3.41$, SD , 0.965), lack of enough dump sites whereby 86% agreed while only 14% disagreed ($M=3.27$, SD , 0.965), unsustainable collection, transportation and disposal systems whereby 83% agreed and 17% disagreed ($M=3.07$, SD , 0.873), and recycling of domestic waste whereby 81% of the respondents agreed and 19% disagreed ($M=3.24$, $SD=1.051$). The study recommend that Kisii County improves frequency of garbage collection and disposal through supervision and employing more staff; educate and train residents on the need to and how to reduce and recycle garbage as well as how to dispose the garbage; improve on garbage collection and disposal by increasing vehicles for collection and collection sites; and provide households with garbage collection materials and equipment.

Keywords: Household garbage management, disposal, unsustainable, disposal systems

Introduction

The problems of solid waste management and their solutions are different in Africa and the rest of developing countries as compared to those in developed nations not only on the various differences in their waste composition but also on the standards of waste management services. While in developed countries concentration is more on maximizing the recovery of resources from wastes, in developing countries more attention is given to attaining proper collection, treatment and disposal. One of the means to go about this problem would be through incorporating a waste management approach which attests to be environmentally accepted, economically feasible and socially enviable. Integrated Solid Waste Management (ISWM) is one of most recommended and compatible approach for waste management which provides a framework for the development of a sustainable municipal solid waste service. Moreover it presents a use of various collection, transport and treatment options (White, Franke, & Hindle, 1999) ^[62].

In developing countries in Asia and Africa, municipal waste are not well managed do not cope with the accelerated pace of waste production (Omara-Ojunga, 2002) ^[46]. According to Satterthwaite (2001) ^[15-16] waste collection rates are often lower than 70 per cent in low-income countries. While more than 50 per cent of the collected waste is often disposed of through uncontrolled land filling and through unsafe informal recycling. In Kenya, like in other developing countries the challenge of solid waste management is real. Collection systems are inefficient and disposal systems are not environmentally friendly (Gakungu N. K., 2011) ^[12]. The functional element of collection includes not only the gathering of solid wastes and recyclable materials, but also the transport of these materials, after collection, to the location where the collection vehicle is emptied.

According to Otieno (2010) ^[48], 30 to 40 per cent of all solid waste generated in urban areas is uncollected and less than 50 per cent of the population is served. He states that up to 80 per cent of collection transport is out of service or in need of repair and argues that if the issue of sustainable solid waste management in Kenya if not considered urgently, all the towns in Kenya will be engulfed in waste. He is supported by Rotich, K., Zhao, and Dong (2006) ^[51] who contend that although Kenya's waste management efforts are laudable, the problem of household garbage management remains unresolved. The challenge of solid waste management is much pronounced in informal settlements. For instance,

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Mwangi (2011) in a study done in Makina village of Kibera informal settlement reveal that 80% of households use shallow rubbish pits to store their wastes which with time turn into large dumpsites due to the irregular waste collection services in the area.

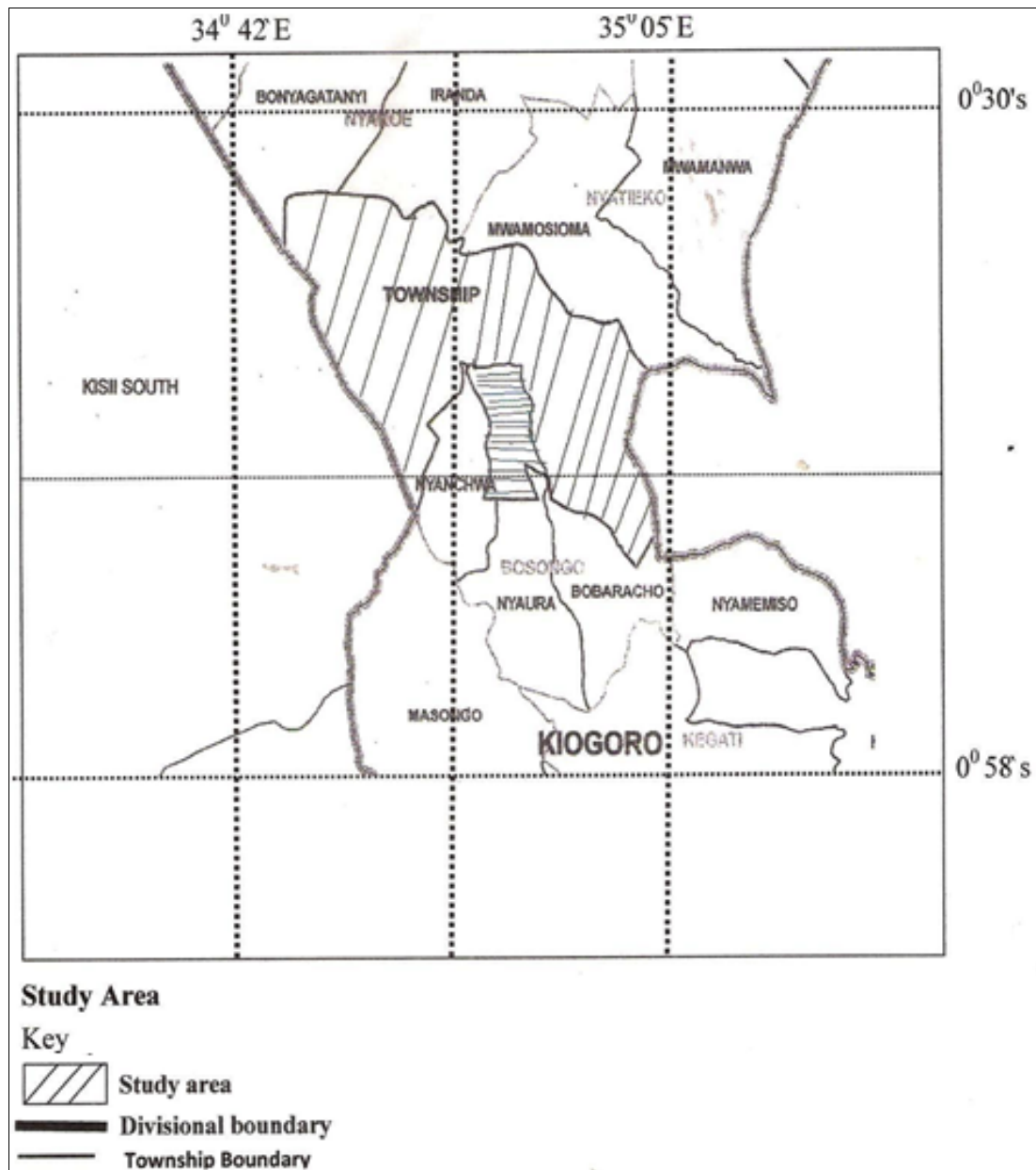
Materials and Methods

Research Design

The baseline study design was used to enable the researcher establish whether integrated household garbage disposal contributes towards effective garbage management (Best & Kahn, 2003) [3]. Baseline survey was also done to act as a benchmark for measuring the success or failure of a given project (Kothari, 2006) [27].

3.3 Study Area

Kisii Town lies at the centre of Kisii County located in southwest Kenya between latitude 0°30' and 0°58'south and longitudes 34° 42' and 35° 05' East. The town covers a total area of 15.5 km²: KDDP (2012). The town is bordered by Keumbu suburban to the West, Mosocho suburban to the North, Nyanchwa to the south east and Kiogoro to the South with Ogembo town to the east. Kisii Township has a highland equatorial climate hence it has a double maxima rainfall regime, averaging about 2000 mm annually. It has a hilly topography with several high hills and valleys. The principal rock formation is phylites, Nyanzian and felsites, which presents superior physical properties. Kisii town has a population of about 50,363 people with 25,569 males and 24,794 female (KNBS, 2009).



Source: KNBS (2009)

Fig 2: Map of Kisii town.

Target Population

Target population is a complete set of individuals, cases or objects of the study (Mugenda & Mugenda, 2004) [37]. The

target population in this study refers to all households within the town. The total number of households within the township location was 12,637 households (KDDP, 2012).

Table 1: Population distribution in Kisii town

Estate	Number of households
Nyamataro	1273
Town Center	1053
Nyangena/ Botori	1654
Mwamogesa	1718
Bochura	580
Jogoo	2826
Nyankongo/ Nyambara	664
Daraja/Nubia	950
Nyanchwa	1794
Total	12637

Source: KNBS, 2009

Sampling Procedures and Sample Size

The researcher used the formula of Morgan and Krejcie (1970) [36] published by the research division of the National Educational Association to get the sample size.

$$S = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2 P(1-P)}$$

Where S is the required sample size X^2 is the table value of

chi-square for 1 degree of freedom at the desired confidence level (3.841)

P is the population proportion (assumed to be 0.5)

N is the population size

D is the degree of accuracy expressed as 0.05

$$S = \frac{3.841^2 \times 12,637 \times 0.5(1-0.5)}{0.05^2(12,637-1) + 3.841^2 \times 0.5(1-0.5)} = 370$$

Through Morgan and Krejcie’s formula to determine the sample size, the researcher used 374 households. The researcher then used stratified sampling to draw the sample from each division within the town, (Mugenda & Mugenda, 2004) [37]. The researcher further employed purposive sampling to choose the households to collect data from. The respondents were chosen purposively depending on their acceptance to divulge information regarding their activities to the research. Purposive sampling was chosen because it gave the researcher an opportunity to collect focused information. In addition, with purposive sampling the researcher was able to select typical and only useful cases, besides saving time (Ibid).

Table 2: Estates within Kisii town, number of households and sample

Estate	Households	Proportion	Sample size
Town Centre	1053	$\frac{1053}{12637} \times 370$	31
Nyamataro	1278	$\frac{1278}{12637} \times 370$	38
Nyangena	1654	$\frac{1654}{12637} \times 370$	48
Mwamogesa	1718	$\frac{1718}{12637} \times 370$	50
Bochura	580	$\frac{580}{12637} \times 370$	18
Jogoo	2826	$\frac{2826}{12637} \times 370$	84
Nyankongo/ Nyambara	664	$\frac{664}{12637} \times 370$	20
Daraja Mbili	950	$\frac{950}{12637} \times 370$	28
Nyanchwa	1794	$\frac{1794}{12637} \times 370$	53
Total	12637		370

Source (Research Field Data, 2016)

Types, Sources and Methods of Data Collection

The researcher used both qualitative and quantitative methods of data collection. The first method for data collection was quantitative method. This method was used in collecting by use of questionnaire. The identified respondents were given the questionnaires and asked to fill them in as much as they could and their identities were hidden in order to avoid incidents of victimization and as a way to encourage the participants to freely give information

and their views regarding the managements of household garbage as reflected in the research questions (Oso & Onen, 2008) [47]. The introduction letter also indicated that the data collected was only to be used for academic purposes only.

The questionnaire method was chosen for the quantitative study because of the vast number of respondents that were involved (Mugenda & Mugenda, 2004) [37]. The researcher used two assistant researchers for data collection. They were guided by the researcher on how to collect data from the

respondents. Data was collected in a span of three weeks.

Data Analysis and Presentation

Descriptive statistical methods used to analyze and present data. Data collected was edited and coded to enhance interpretation. Prior to summarizing the data, the questionnaires were checked for completeness and accuracy. Data analysis proceeded according to objectives and research questions of the study using descriptive statistics. Data was analyzed by use of frequency tables, percentages and narration (Kothari, 2011) [26]. Statistical Packages for Social Scientists (SPSS) was used for computing all statistics including the mean and standard deviations and inferential statistics. Data entry took place concurrently with field work to ensure accuracy and security of data.

Validity and Reliability of the Instruments

Appropriate and relevant items were constructed to ensure that valid data is obtained. Discussion with peer groups, supervisors and experts in research lead to development of validation instruments. For the purposes of testing the validity of the instruments, a pilot study was carried out among 12 respondents from the study area. The findings from the tests were not included in the main study. On reliability of the research instruments, the questionnaires were also pilot-tested. The split-half procedure was used to test the reliability of the research assistants and questionnaires after the pilot testing. This procedure w.

Results

The research results are shown in Table 1 using a Likert scale of 1-5 where 4= Strongly Agree; 3=Agree; 2= Disagree; 1 = strongly disagree, *M*= Mean, *SD*= standard deviation, frequency and percentage of respondents.

Table 3: Factors affecting household garbage management in Kisii town

Statement	SA	A	D	SD	M	SD
Unsustainable collection, transportation and disposal systems	122(33%)	185(50%)	30(8%)	33(9%)	3.07	0.873
No serviceable refuse trucks.	130(35%)	108(29%)	66(18%)	66(18%)	2.81	1.100
Town budgets are usually under strain	57(15%)	30(8%)	97(26%)	186(50%)	1.88	1.085
High population size in the town	109(29%)	153(41%)	37(10%)	71(19%)	2.81	1.063
The town does not have enough dump sites	192(52%)	128(34%)	7(2%)	43(12%)	3.27	0.965
There are inadequate garbage disposal facilities in town and residential areas	221(60%)	101(27%)	29(8%)	19(5%)	3.41	0.842
Residents are not aware of the benefits of proper household garbage disposal	89(24%)	128(35%)	14(4%)	139(38%)	2.39	1.189
Residents are not involved in garbage disposal interventions	95(26%)	166(45%)	49(13%)	60(16%)	2.80	0.100
Ineffective household garbage management strategies	117(32%)	133(36%)	58(16%)	62(17%)	2.82	1.054
Recycling of domestic waste has been a serious problem	209(56%)	93(25%)	17(5%)	51(14%)	3.24	1.051
Overall mean					2.85	0.932

Source: Research Field Data, (2016)

From the table factors that mostly affected household garbage management were; inadequate garbage disposal facilities in town and residential areas whereby 87% agreed and 13% disagreed (*M*=3.41, *SD*=0.965), this was followed by lack of enough dump sites whereby 86% agreed while only 14% disagreed (*M*=3.27, *SD*=0.965), unsustainable collection, transportation and disposal systems whereby 83% agreed and 17% disagreed (*M*=3.07, *SD*=0.873), recycling of domestic waste whereby 81% of the respondents agreed and 19% disagreed (*M*=3.24, *SD*=1.051).

Other challenges were; not involving residents in garbage disposal interventions, 71% agreed and 29% disagreed (*M*=2.80, *SD*=0.100), high population size in the town whereby 70% agreed while 30% disagreed (*M*=2.81, *SD*=1.063), ineffective household garbage management strategies whereby 68% agreed while 22% disagreed (*M*=2.82, *SD*=1.054) and lastly, residents not being aware of the benefits of proper household garbage disposal, 59% agreed while 41% disagreed (*M*=2.39, *SD*=1.189). From the finding it can be noted that regarding town budgets usually being under strain, majority disagreed (76%) and only 24% agreed to the effect.

The overall mean for the Likert scale was 2.85 indicating that many respondents agreed that the challenges existed. The standard deviation was 0.932 that indicated convergence of the respondents on existence of the challenges affecting household garbage management in Kisii town in the company. The study findings are in line with findings of earlier scholars who cited the same challenges as encompassing garbage collection in Kenya's

urban towns. They include: rapid population increase (Tisdell, 2001) [53], illegal dumping (Chifamba, 2007) [6], strains of budgets that exacerbates the waste disposal problems (Mapira, 2001) [29] amid the rising costs of garbage collection and disposal (US Bureau of household garbage management, 2000), inadequate garbage storage and collection systems (Omara-Ojungu, 2002) [46], corruption and changing dynamics of consumption (Munowenyu, 2007) [39], poor and impassable roads (Guerrero *et al.*, 2013) [14], lack of regular waste-collection services (Hardoy *et al.*, 2001) [15], the bad habits of 'throw-away-society' common in Kenya (Miller 2008) [35], inadequate infrastructure (Kidd, 2009) [23], irresponsible collectors, negligence, improper disposal, and ignorance among other factors (Mbanga, 2011) [32]. The challenges as cited in the findings in table 4.6 and other studies encourages improper waste collection, transportation and disposal, leading to the degradation of the town's environment.

Discussion

Other challenges were; not involving residents in garbage disposal interventions, 71% agreed and 29% disagreed (*M*=2.80, *SD*=0.100), high population size in the town whereby 70% agreed while 30% disagreed (*M*=2.81, *SD*=1.063), ineffective household garbage management strategies whereby 68% agreed while 22% disagreed (*M*=2.82, *SD*=1.054) and lastly, residents not being aware of the benefits of proper household garbage disposal, 59% agreed while 41% disagreed (*M*=2.39, *SD*=1.189). From the finding it can be noted that regarding town budgets usually

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Conclusion

The challenges in this study and other studies encourages improper waste collection, transportation and disposal, leading to the degradation of the town's environment.

Recommendations

Issues of deposit refunds, pay as you throw rules need also to be implemented to monitor and control waste disposal like plastic bottles.

References

1. Achankeng E. Globalization, Urbanization and

- Municipal Solid Waste Management in Africa-Africa on a Global Stage. African Studies Association of Australasia and the Pacific 2003 Conference Proceedings African on a Global Stage, Adelaide, Australia, University of Adelaide, 2003.
2. Arena U. Process and technological aspects of municipal solid waste gasification. A review. *Waste Management*. 2011;32(4):625-639.
 3. Best JV, Kahn JV. *Research in Education*. London: Allyn and Bacon. Allyn and Bacon, 2003.
 4. Chalmin P, Gaillochet C. From waste to resource, An abstract of world waste survey, Cyclope, Veolia Environmental Services, Edition Economica, France, 2009.
 5. Chandak S. Trends in Solid Waste Management – Issues, Challenges, and Opportunities. International Consultative Meeting on Expanding Waste Management Services in Developing Countries, Tokyo, Japan. 2010 Mar, 18-19.
 6. Chifamba P. Trace metal contamination of water at a solid waste disposal at Kariba, Zimbabwe. *African Journal of Aquatic Science*. 2007;32(1):71-78.
 7. Coffey M, Coad A. *Collection of Municipal Solid Waste in Developing Countries*. Malta. UN-Habitat, 2010.
 8. Contreau-Levine, Conyers D. *Regional Development: Module GED 304*. Department of Environmental Affairs. National Waste Management Strategy; Republic of South Africa, 2010.
 9. Cunningham W. *Solid waste management*. Utah Refuse Collection and Disposal Utah Refuse Collection and Disposal Association (URCDA), University of Minnesota, 2009.
 10. Eawag. *Global Waste Challenge: Situation in developing countries*. Swiss Federal Institute of Aquatic Science and Technology, 2018.
 11. Environmental Management Agency. *Solid Waste Management: What is Solid waste?* Retrieved from, 2014. <http://www.ema.co.zw>
 12. Gakungu NK. *Solid waste management: A case of technical technical in Kenya; Nairobi, Kenya: Unpublished MSc. Thesis, University of Nairobi, 2011.*
 13. Gakungu N, Gitau A, Njoroge BN, Kimani M. *Solid waste management in Kenya: A case study of Public technical training institutions ICATOR Journal of Engineering*. 2012;5(3):127-138.
 14. Guerrero L, Maas G, Hogland W. *Solid waste management challenges for cities in developing countries*. *Waste Management*. 2013;33(1):220-232.
 15. Hardoy JE, Mitlin D, Satterthwaite D. *Environmental Problems in an Urbanizing World*. London: Earthscan. Earthscan, 2001.
 16. Hardoy J, Mitlin D, Satterthwaite D, Hardoy J. *Environmental Problems in an Urbanizing World: Finding Solutions for Cities in Africa, Asia, and Latin America*. London, Sterling, VA.: Earthscan Publications, 2001.
 17. Hoonweg D, Bhada-Tata P. *What a Waste: A Global Review of Solid Waste Management*. World Bank, Urban Development & Local Government Unit, No. 15, 98. Washington, D.C, 2012.
 18. Hoonweg D, Freire M. *Building Sustainability in An Urbanizing World: A Partnership Report*, Urban Development & Resilience Unit, Washington, DC

- 20433 USA. 2013. www.worldbank.org/urban: World Bank,
19. Jacobi R, Besen R. Solid Waste Management in São Paulo: The Challenges of Sustainability, estudos avançados. 2011;25(71):201.
 20. Jerie S. Analysis of institutional solid waste management in Gweru. EASSRR. 2006 Jan, 22(1).
 21. Kaundal R, Sharma A. Problems of Household Waste Disposal. *Journal of Human Ecology*. 2007;21(3):199-201.
 22. Khamis AA. Effectiveness of solid waste management systems in local government authorities in Tanzania: The case of Moshi municipal council, 2016.
 23. Kidd M. Importance of legislative development in Environmental Law in South Africa during 2009. IUCN Academy of Environmental Law, 2009.
 24. Kirov NY. Waste Management, Control, Recovery and Reuse. Michigan: Ann Arbor Science Publishers, 2005.
 25. Konteh F. Urban sanitation and health in the developing world: reminiscing the nineteenth century industrial nations. *Health & Place*. 2009;15(1):69-78.
 26. Kothari C. Research Methodology: Methods and Techniques. Second Edition. India: New Age International publishers, 2011.
 27. Kothari C. Research Methodology: Methods and Techniques, Revised Edition. New Delhi: New Age Publishers, 2006.
 28. Mandevero B. An investigation into the Effectiveness of household solid Waste management strategies in Harare, Zimbabwe. Harare. Unpublished MBA Research Project, 2015.
 29. Mapira J. Urban Geography. Module GED 204. Harare: Zimbabwe Open University, 2001.
 30. Marshall R, Farahbakhsh K. Systems approaches to integrated solid waste Management in developing countries. *Waste Management*. 2013;33(4):988-1003.
 31. Mawire W. Waste Management. *The Kenyan Newspaper*, 2010, 6(48).
 32. Mbangwa W. *The Kenyan Newspaper*. 2011 Aug 7(33):18-24.
 33. Medina M. The informal recycling sector in developing countries - Organizing Waste pickers to enhance their impact. Note No. 44, 2008 Oct.
 34. Memon M. Integrated solid waste management based on the 3R approach. *Journal of Material Cycles and Waste Management*. 2010;12:30-40.
 35. Miller G. Living in the Environment. An Introduction to Environmental Science. Belmont: Wadsworth Publishing Company: Wadsworth Publishing Company, 2008.
 36. Morgan Krejcie. Small Sample Techniques. *The NEA Research Bulletin*, Minesota, 2006, 38.
 37. Mugenda OM, Mugenda A. Research methods: quantitative and qualitative approaches. Nairobi, Kenya. African Centre for Technology Studies, 2004.
 38. Mungure JM. Governance and community participation in Municipal Solid Waste management, case of Arusha and Dar es Salaam Tanzania. Aalborg University, 2008.
 39. Munowenyu E. O Level Geography. Harare: Longman, 2007.
 40. Mutsvangwa L, Nhandara E, Noko J, Shumbayaonda W. Geography Today: Human and Economic. Harare: Zph publishers, 2006.
 41. Nema. The National Solid Waste Management Strategy, Nairobi: Nema, 2014.
 42. NEMA. Solid Waste Management By-laws, 20014, 2014.
 43. Obera B, Okecha, Oyier M. Sustainable Solid Waste Management for Kisumu, Kenya in: 28th WEDC Conference Kolkata. Calcutta, India, 2002.
 44. Ochieng, G. Challenges and Possible Interventions For Effective Solid Waste Management In Ngomongo Village of Korogocho Informal Settlement, Nairobi County, Kenya. Nairobi: Unpublished MBA Thesis, University of Nairobi, 2016.
 45. Omambia B, Ogonya AM. Assessing household solid waste management systems in Baraton Centre. *Baraton Interdisciplinary Research Journal*. 2015;5:140-150.
 46. Omara-Ojunga PH. Resource Management in Developing Countries. Themes in. New York: Longman. Longman, 2002.
 47. Oso Y, Onen D. A General Guide to Writing Research Proposal and Project Report. Kampala: Makerere University Press, 2008.
 48. Otieno T. Storm clouds of our solid waste may blow us away if we don't act now; *Daily Nation Newspaper*, Nairobi, 2010, Oct 25.
 49. Otiso KM. Urban environmental problems: the case of solid waste pollution and management in Kisii Town, Kenya. Ohio, 30 Park Place, Athens, OH 45701, USA: Ohio University Libraries, 1993.
 50. Prasad M, Yang J, Hongyuan Y, Choudhury RM. Chapter-Municipal Solid Waste Management: Turning Waste into Resources. *Shanghai Manual – A Guide for Sustainable Urban Development in the 21st Century*, 2011.
 51. Rotich K, Zhao Y, Dong J. Municipal Solid Waste Management Challenges in Developing Countries – Kenyan case study. *Waste Management*. 2006;26(1):92-100.
 52. Schübeler P. Conceptual framework for municipal solid waste management in low-income countries. In K. C. Wehrle, UNDP/UNCHS/World Bank/SDC Collaborative Programme on Municipal Solid Waste Management in Low-Income Countries. St. Gallen Switzerland. 1996.
 53. Tisdell CA. Development in Environmental Economics volume 1. Economics of Environmental Conservation: Economics for Environmental and Ecological Management. London: Elsevier, 2001.
 54. UN HABITAT. Urbanization Challenges, Waste Management and Development, ACP-EC Joint Parliamentary Assembly Mauritius, 2014 Feb 12-14.
 55. UN HABITAT. Solid Waste Management in the World Cities, United Nations Human Settlements Programme. Washington DC. UN-Habitat, 2010.
 56. UNEP. Integrated Solid Waste Management Plan for Nairobi, Nairobi, Kenya: UNEP, 2010.
 57. UNEP, UNITAR. Guidelines for National Waste Management Strategies: Moving from Challenges to Opportunities, UNEP, Nairobi: UNEP, 2013.
 58. UNEP. Selection, Design and Implementation of Economic Instruments in the Solid Waste Management Sector in Kenya. United Nations Environment Programme, Nairobi, 2005, 157-163.
 59. UN-HABITAT. Solid Waste Management in the World's Cities: Pre-Publication Series. Nairobi: UN-HABITAT, 2009.

60. Upendra MP. Sustainable solid waste management in a mountain ecosystem: Darjeeling, West Bengal, India. Unpublished Research Project, 2008.
61. Wang'ombe SM. Inadequacies of solid waste management among public, private and community based organisations in Kasarani constituency, Nairobi County. Nairobi Unpublished Thesis: Kenyatta University, 2010.
62. White P, Franke M, Hindle P. Solid Waste Management: A Lifecycle Inventory. An Aspen Publication, 1999.
63. Zerbock O. Urban Solid Waste Management: Waste Reduction in Developing Nations. Michigan Technological University. Retrieved from, 2003 June 18.
http://www.cee.mtu.edu/peacecorps/documents_july03/Waste_reduction_and_incineration_FINAL.pdf
64. Zurbruegg C. Solid Waste Management in Developing Countries: A Source book for Policy Makers and Practitioners: EAWAG/SANDEC, 2003.