

User-minded audit of peri-urban Kotoko community pour-flush latrine usage in Suame (Kumasi), Ghana

Roland S. Kabange¹, Andrews Nkansah²

¹*Civil Engineering Department, Faculty of Engineering and Technology, Kumasi Technical University (KsTU),
P. O. Box 854,
Kumasi, Ghana*

²*Department of Energy & Environmental Engineering, University of Energy & Natural Resources, Box
214, Sunyani, Ghana*

¹*Corresponding Author's Email: skabange@yahoo.com*

²*Email: ankansah@hotmail.com*

Abstract: Critical to excreta-related disease prevention and public health promotion is regular latrine use by all community members. This research explores usage pattern, general user behaviour and factors that influence latrine usage of the only community pour-flush latrine (CPFL) in Kotoko (Kumasi) through a user-minded latrine audit to inform user-friendly options design that would encourage usage. The audit was triangulated by interviews with two latrine attendants. As a multi-ethnic low-income high-density peri-urban community located near Kumasi city-centre (Kejetia), Kotoko consists of 2,230 inhabitants living in 67 households. The research findings showed that 58% of the CPFL users were females as against 42% males. Females however stayed in the facility twice longer at weekends than males, but the same length of time weekdays. Queues were generally non-existent, as an average of two people was in queue only at peak times of 06:00 – 08:30 hours. Analysis showed low latrine patronage of 25% of community population, with the observation that open defecation in the main concrete drain downstream and on the community refuse dump was common. Open defecation practice was partly attributable to restricted opening hours of 3:45 – 23:00 hours. Anal cleansing at the facility was mostly (77%) by newspaper, 21% used water, and 2% used toilet roll. Over half (56%) of the latrine monthly expenditure was on pit emptying, payment of cleaners and attendants, and pit emptying alone constituted 39% of the latrine monthly expenditure. The income generated was largely used for latrine management – pit emptying, payment of cleaners and attendants. With an average generated daily income of USD 22 and an annual profit of USD5254, the facility was financially sustainable provided the generated income would be available for operation and maintenance. It is recommended that extended opening times could be a useful policy to improve access and usage.

Keywords: user-minded audit, peri-urban, latrine usage, community latrine, Ghana

1. Introduction

The world leaves 2.4 billion people in 2015 without access to improved sanitation facilities, the majority ($\approx 83\%$) of whom live in three regions – Sub-Saharan Africa (695 million), Southern Africa (953 million), and Eastern Asia (337 million) [1]. Non-access to improved sanitation endangers human health, economic and social despair among the affected [2]; [3]. Lack of sanitation access compels people to rely on available poor sanitation alternatives which do not guarantee effective public health protection. The vicious circle of poverty, disease and low productivity in developing countries is partly attributable to poor sanitation [4]. Since sanitation partly deals with human behavior, community involvement and social engagement at household and individual levels are critical. Studies show that the most important operation to ensure effective sanitation is keeping latrines clean, as they may have adverse health effects if not properly cleaned, used, and maintained.

Poorly operated and maintained communal and public latrines remain barriers to latrine usage. Other barriers to communal latrine usage include lack of privacy, odour and fly nuisance, conflict with neighbors, lack of safety, distance to latrine, and non-access when latrine is either busy or locked [5]; [6]; [7]; [8]; [9]. One way to break some of these barriers is to offer households (or communities) a choice to decide the most appropriate options to their needs [10]. Improved usage and general latrine management could be enhanced by giving each family its own cubicle and key to the door, and the family made responsible for its cleaning and maintenance [11]. It is however important that each family chooses with whom they would share to minimize the chances of disagreements on sharing duties. Recruitment of well-paid attendants to keep the facility clean, and ensure the necessary maintenance works were done would be another option.

2. Research Aim and Objectives

Poor maintenance and cleaning are known barriers to sanitation facilities usage. Besides pit emptying, general cleaning and effecting minor repairs, latrines require little maintenance [12]. It is argued that keeping latrines clean is the most important operation that ensures effective sanitation, as human contact with excreta is limited [13]; [14]. It also promotes latrine use, and minimizes flies and odour inside the latrine. Latrine management costs are generally acknowledged as extremely high and so may affect the sustainability of sanitation facilities. The total annual operation and maintenance cost and expenditure, and generated revenue of facilities could be determined to ascertain the financial sustainability of the facility.

Regular latrine use by all community members is critical to disease prevention and public health promotion [9]. Latrine usage is not however regular even when well operated and maintained latrines are available. For instance, a Northern Ethiopian study of latrine use among rural households showed that 37.4% of households use them consistently [15]. The remaining households in the same study cited cultural beliefs (44%), inconvenience (17.8%), and foul smell (22.6%) as the major reasons for non-use of latrines (Ashebir et. al., 2013). It is argued that to ensure regular latrine usage, technology choice, facility design, construction and operation and maintenance (O & M) ought to be linked to intended users' defecation practices, preferences and socio-cultural values [16]; [17]; [18]. This research which aims to explore the general attitude and behaviour of Kotoko CPFL users through an audit and latrine attendants' interview to inform user-friendly options design and encourage usage set out the following objectives to:

1. Determine CPFL patronage;
2. Understand factors that influence latrine patronage;
3. Identify user and latrine management practices; and
4. Evaluate the financial sustainability of the CPFL.

3. Kumasi and the research community (Kotoko)

As Ghana's second largest city and capital of the most populous region (Ashanti), Kumasi is one of the largest market centres in West Africa. Predominantly made up of Christian (79%) and Muslim (16%), Kumasi has a rough population of 1.6 million [19]. Kotoko is a multi-ethnic low-income high-density peri-urban community located close to Kumasi city-centre (Kejetia) with 67 households and about 2,230 inhabitants. Houses are built largely from mud and bamboo, and roofed with old rusted and often leaking corrugated iron sheets. Characterized by inadequate infrastructure and land tenure challenges, the community is of mixed socio-economic profile.

4. Methodology

Three peri-urban communities (Kotoko, Akwatia Line and Race Course) were short-listed, and Kotoko in Suame (Kumasi) was selected for audit. The community had only one community latrine managed by Kumasi Metropolitan Assembly (K. M. A.). Elements of a peri-urban community such as topography, population density, and estimated level of community co-operation were factors considered for selection. Prior to the research commencement, informed-consent and willingness to participate were sought through meetings at three levels – elders, unit committee and community. Permission was obtained from K.M.A., and a translator was available since most community members had no formal education.

4.1 Pour-flush community latrine audit and other latrines data

Latrine audit was anonymous, and quantitative data was collected on facility usage to inform general user behaviour relevant for future design of user-friendly options. Data collected recorded quantitative evidence on facility usage – including how many people use it and when on a typical day, gender and broad age breakdown of users, queuing times, and users' length of stay in facility. Audit of the community's pour-flush latrine attendance was conducted over two days – a weekend (Sunday) and a weekday (Thursday) from 3:45 am to 11:00 pm to gain detailed understanding of the existing community latrine usage pattern, among others. Located outside the facility but inside the latrine attendant's kiosk facilitated the investigator's passive and unobtrusive observation of users entering the facility.

Latrine audit also included interviews on management aspects with the two latrine attendants, pit emptying and O & M arrangements, and their knowledge on usage levels. Data on the operation of other latrines similar in nature to research community within the Kumasi Metropolitan area were gathered. A total of 18 latrines were selected in six communities to offer a broader picture of the sanitation situation and compare with community latrine. The communities where additional latrine data was collected were Aboabo, Asawasi, Magazine, MoshieZongo, Race Course and TafoZongo. Costs data could not however be gathered because informants were unwilling to do so, and efforts to gather them from K.M.A. also returned no results.

4.2 Data analysis

The analysis was based on data gathered from two methods – latrine audit and key informant (latrine attendants) interviews. The latrine attendants' interviews ensured triangulation of the audited data. Collected data were coded, entered and analyzed using Statistical Package for Social Scientists (SPSS) version 16.0. Descriptive statistics such as frequency distribution, percentage proportion, and tabulation and cross-tabulation were used for data analysis for trends and patterns. Specific selected subsets of data were however analyzed by filtering.

5. Results and discussion

The outcome of the Kotoko CPFL audit that included its annual income and expenditure, and operation of selected community latrines in the Kumasi metropolis are presented as results and discussions in this section.

5.1 Research community latrine audit

Table 1 presents users' visits by gender to the research community latrine over a two-day audit period from 03:45 – 23:00 hours daily. Consistent with Ghana's demographic data, about 58% of users were females and 42% were males. However, the ratio of the proportion of male to female visitors on weekdays was observed as 1:1, as against 0.57:1 on weekends. The results also showed that females stayed nearly twice longer inside the facility at weekends than males, but the same length of time on weekdays. Further investigations required to understand and explain this finding.

Table 1: Two-day CPFL observation by gender

Day	Female	Male	Total
Weekend	284	162	446
<i>% within weekend</i>	<i>64%</i>	<i>36%</i>	<i>100%</i>
Weekday	155	154	309
<i>% within weekday</i>	<i>50%</i>	<i>50%</i>	<i>100%</i>
Total	439	316	755

Average daily operational period of about 18.7 hours meant that the community latrine users were without sanitation access outside these opening times. The latrine operating regime could therefore likely encourage inappropriate defecation. This was supported by evidence that even within small distances of households without latrine living further from a sanitation facility, they were more likely to practice open defecation than those living close to it, and the effect may be more marked if opening times further restricted access [20]. With two latrine attendants at post and paid for, extended opening times could be a useful policy to improve access and usage. The study however showed that queues were nearly non-existent in the community latrine, as an average of two persons were in queue only during peak times (Table 2) between 06:00 – 08:30 hours.

A total of 755 visits were made to the facility over the two-day period – most (77%) used newspapers, 21 % used water and 2% used toilet roll for anal cleansing. An average of 5.9 minutes was spent by each user inside the facility. Most (77%) users were over 18 years, 6% were under five, and 17% were between 5 – 18 years. In comparison, children under five were found to predominantly use potties (82%) in a similar research conducted in Ghana, and the toilet habits of children above five broadly reflected those of their parents [6]. It was found that 7% of users over the two-day period spent only one minute each inside the facility, all of which occurred during the weekday and most (80%) of them were women. Further probe suggested that users who spent about a minute in the facility went there either to urinate ("pee") or change pad. The CPFL patronage was significantly lower than expected given the community size of 2,230. Average daily attendance over the two-day observation period was 378 (\approx 25% of expected user population). Later interview with latrine attendants confirmed that the two-day attendance figure was normal and no external factors influenced it. The figure obtained through observation was therefore likely to be reliable. However, this usage was not unusual when compared to an average of 223 people per day for the other selected latrines sampled in Kumasi Metropolis. Latrine attendants reported that those who did not use the facility defecated inside the main concrete drain downstream and refuse dump. Early workers however defecated elsewhere at work.

Table 2: Two-day CPFL observation results summary

Observ'n	Start & end time	Open time	Gender	Visits	Total visits	Peak times	Av in queue at peak times	Av time per visit
Wkday	3:52 am – 10 pm	18 hrs 8 minutes	Female	284	446	6 am – 7:10 am	1	4.4 min
			Male	162		8:15 am – 8:30 am	2	4.2 min
Wkend	3:48 am – 11 pm	19 hrs 12 minutes	Female	155	309	6 am – 7:30 am	3	9.4 min
			Male	154		5 am – 6:30 am	2	5.6 min

5.2 Selected community latrines operation in Kumasi Metropolis

Out of the 18 latrines visited in six communities similar in nature to community pour-flush facility, more than half (56%) were pour-flush, the rest 44% (8) were ventilated improved pit (VIPs) latrines, and all were functional. The number of compartments per facility ranged from 10 to 28 with equal numbers for males and females in all cases. All the facilities charged a fee per visit ranging from USD0.067 (Ghp10) to USD0.133 (Ghp20) – an average of USD 0.10 (Gh¢15) per visit. A booth was provided for latrine attendant who collected money and gave each person a piece of newspaper for anal cleansing. The charge at the CPFL was USD0.067 (Ghp10) per visit, but doubled to USD0.133 (Ghp20) if a toilet roll was requested for anal cleansing instead of a newspaper.

These charges compared unfavourably with a charge of USD0.015 per visit to public latrines in Kumasi when a research was conducted in 1992 [21]. Relative to the current fee of USD0.067 paid per visit at the community latrine, the charge per visit increased four-folds since the publication of the 1992 research. The inflations contained in the annual progress report for Ghana however remained the same over the period [22] – suggesting that charge increment was not attributable to inflation. The user fee of USD0.067 ~ USD0.07 was however the same as fee charged in Accra for attending the same type of sanitation facility [23]. An exploratory study carried out in seven poverty pockets in Bhopal (India) on both users and non-users of communal latrines showed that almost all users (95%) paid a fee to use them, and reported fees ranged from USD0.045 (2 INR) to USD2.045 (44 INR) per visit [20] – fees comparatively higher than in the case of Ghana.

All 44% (8) of attendants who knew how the generated income was used mentioned pit emptying, payment of cleaners and attendants. All latrines were emptied by truck at an average cost of Gh¢114 (USD 69) per trip. Six trips (on average) were required to completely empty each facility and payment was done by K.M.A. through the latrine attendants. In contrast, the CPFL was emptied at Gh¢140 (USD 85) per trip per month (Table 3). In most (72%) latrines, children were admitted free, but paid the same amount as adults where it was not. However, two facilities in Race Course did not permit children. The reason for non-permission of children was unclear, but it was thought that children did not feel shy and could conveniently defecate in the open. It was also thought risky for children to use the facility due to the open nature of the squat hole – raising the issue of ignorance on the effects of open defecation. The condition of 67% (12) of all selected facilities was good or fairly good, though cracks were seen in about half of the latrine superstructures.

5.3 Community pour-flush latrine annual income and expenditure

Table 3 shows the community latrine annual operating costs and generated revenue based on latrine attendants' interviews and past operation and revenue trends. At an average exchange rate of Gh¢ 1.65 to the United States dollar, the average daily generated income from the CPFL and selected ones within the metropolis were Gh¢36 (USD 22) and Gh¢25 (USD 15) respectively. Similar results were reported in a slum community in Kampala, Uganda [24]. An annual profit of Gh¢8,641.20 (USD 5,254) recorded for CPFL demonstrated that the facility was financially sustainable provided the generated revenue would be used for O & M – a figure that represented a net monthly profit of Gh¢720.10 (USD 436.4). Over half (56%) of the latrine monthly expenditure was on pit emptying, payment of cleaners and attendants, and pit emptying alone constituted 39% of the latrine monthly expenditure. Generated revenue could be used for infrastructure extension, new services provision and facility improvement, but would require that these targeted services were prioritized. The CPFL viability and sustainability might suffer if generated revenue was diverted for alternative uses.

Table 3: Community pour-flush latrine annual operational costs and revenue balance sheet

Transaction description	Revenue (Gh¢)	Expenditure/Costs (Gh¢)
Average income generated from pay-per-use policy @ Gh¢36/day: $12 \times 30 \times \text{Gh¢}36$	12,960.00	
Pit emptying cost @ Gh¢140/trip/month: $12 \times \text{Gh¢}140$		1,680.00
Payment of 2 latrine attendants @ Gh¢30/month: $2 \times 12 \times \text{Gh¢}30$		720.00
Payment of 1 cleaner @ Gh¢40/mth: $12 \times \text{Gh¢}40$		480.00
3 cakes of soap/month for handwashing @ Gh¢0.60/cake: $3 \times 12 \times \text{Gh¢}0.60$		21.60
3 bundles of newspaper/month @ Gh¢35/bundle: $3 \times 12 \times \text{Gh¢}35$		1,260.00
6 toilet rolls @ Gh¢0.60/mth: $12 \times \text{Gh¢}0.60$		7.20
Latrine electric bill @ Gh¢12.50/month: $12 \times \text{Gh¢}12.50$		150.00
TOTAL	12,960.00	4,318.80
Net profit (Gh¢)		8,641.20

6. Conclusions

This research explored usage pattern, general user behaviour of the Kotoko CPFL through a user-minded sanitation audit to inform user-friendly options design that would encourage usage. Analysis of collected and observed data showed that the community latrine operated from 03:45 – 23:00 hours daily, 58% of users were females as against 42% males – result consistent with Ghana's demographic data on gender ratio. Most (77%) users of the facility were at least 18 years, 6% were under five, and 17% were between 5 – 18 years. It was however found that females stayed inside the facility about twice longer at weekends than males, but the same length of time weekdays. Queues were nearly non-existent, as an average of two people was in queue and only at peak times of 06:00 – 08:30 hours. On average 5.9 minutes were spent per user inside the facility. With 755 visits made to the facility over a 2-day period, most (77%) used newspaper, 21% used water and 2% used toilet roll for anal cleansing.

Average daily attendance over the 2-day observational period was about 25% of community population. The observed low latrine patronage was confirmed by latrine attendants. The low patronage was attributable to community members' defecation in the main concrete drain downstream, refuse dump and elsewhere. The restricted opening hours of the latrine could be one reason for the open defecation. With latrine attendants at post and paid for, extended opening times would be a useful policy going forward to improve access and usage. Average daily generated income in the community latrine and other similar selected latrines within the Kumasi metropolis were similar – USD22 (Gh¢36) and USD 15 (Gh¢25) respectively. Over half (56%) of the latrine monthly expenditure was on pit emptying, payment of cleaners and attendants, and pit emptying alone constituted 39% of the latrine monthly expenditure. The CPFL was found to be financially sustainable given a generated annual profit of USD 5,254 (Gh¢8,641.20) generated provided the revenue would be used for operation and maintenance.

References

- [1]. WHO/UNICEF JMP, *25 Years Progress on Sanitation and Drinking Water: 2015 Update and MDG Assessment*, USA: WHO/UNICEF, 2015.
- [2]. DANIDA, *Reaching the MDG Target for Sanitation in Africa – a Call for Realism*, Ministry of Foreign Affairs, Denmark, 2010
- [3]. K. Sigel, K. Altantuul, Basandorj, "Household Needs and Demands for Improved Water Supply and Sanitation in Peri-urban Ger Areas: The Case of Darhkan, Mongolia," *Environmental Earth Sciences* **65** (5), 1561 – 1566, 2012
- [4]. A. Y. Katukiza, M. Ronteltap, C. Niwagaba, J. W. A. Foppen, F. Kansime, P. N. L. Lens, "Sustainable Sanitation Technology Options for Urban Slums," *Biotechnology Advances* **30**(5), 964 – 978, 2012
- [5]. R. G. Feachem, "Interventions for the Control of Diarrhoea Diseases Among Young Children: Promotion of Personal and Domestic Hygiene," *Bulletin of the World Health Organization* **62**, 467 – 476, 1984.

- [6]. M. W. Jenkins, B. Scott, “Behavioral Indicators of Household Decision-making and Demand for Sanitation and Potential Gains from Social Marketing in Ghana,” *Journal of Social Science and Medicine* **64** (12), 2427 – 2442, 2007.
- [7]. G. Hutton, L. Haller, J. Bartram, “Global cost-benefit analysis of water supply and sanitation interventions,” *Journal of Water and Health* **5** (4), 481 – 502, 2007.
- [8]. J. B. Isunju, K. Schwartz, M. A. Schouten, W. P. Johnson, M. P. Dijk, “Socio-economic Aspects of Improved Sanitation in Slums: A Review,” *Public Health* **125**, 368 – 376, 2011.
- [9]. P. A. Obeng, B. Keraita, S. Oduro-Kwarteng, H. Bregnhøj, R. C. Abaidoo, E. Awuah, “Usage and Barriers to Use of Latrines in a Ghanaian Peri-urban Community,” *Environmental Processes International Journal*, 2015. DOI: 10.1007/s40710 – 015 – 0060 – z.
- [10]. D. Mara, “Sanitation Options for Low Income Urban Areas: Technical Options and Financial Arrangements” in *Kf W Water Symposium 2009: Financing Sanitation*, Frankfurt, 8 – 9 October, 2010
- [11]. D. D. Mara, *The Design of Ventilated Improved Pit Latrines*, TAG Technical Note No. 13, Washington, DC, The World Bank, 1984
- [12]. A. Cotton, R. Franceys, *Services for Shelter: Infrastructure for Urban Low- Income Housing*, WEDC: Loughborough University of Technology, 1991.
- [13]. Gavin, et. al., *Community Sanitation Improvement and Latrine Construction Program: A Training Guide*, Technical Report 83, Water and Sanitation for Health Project, Arlington: USA, 1993.
- [14]. J. Pickford, *Low-Cost Sanitation: A Survey of Practical Experiences*, Intermediate Technology Publication, London, 1995
- [15]. Y. Ashebir, H. R. Sharma, K. Alemu, G. Kebede, “Latrine Use Among Rural Households in Northern Ethiopia: a Case Study in Hawzien District, Tigray,” *International Journal of Environmental Studies* **70** (4), 629 – 636, 2013.
- [16]. M. Garfi, L. Ferrer-Marti, “Decision-making Criteria and Indicators for Water and Sanitation Projects in Developing Countries,” *Water Science and Technology* **64** (1), 83 – 101, 2011. DOI: 10.2166/wst.2011.543
- [17]. A. Olschewski, *Technology Applicability Framework Manual*, Skat, St. Gallen, Switzerland, 2013
- [18]. R. S. Kabange, A. Nkansah, “Peri-urban Community socio-cultural Preferences for, and Experts’ Views on, Sanitation Options: a Case Study of the Kotoko Community in Suame (Kumasi), Ghana,” *Journal of Environment and Earth Science* **5** (18), 28 – 35, 2015 of The International Institute for Science, Technology and Education (IISTE)
- [19]. Millennium Cities Initiative, *Invest in Ghana: Focus Kumasi*, Columbia University, Canada, 2008.
- [20]. A. Biran, Communal Toilets in Urban Poverty Pockets – Use and User Satisfaction Associated With Seven Communal Toilets in Bhopal, India, *WaterAid Report, India, 2010*.
- [21]. D. Whittington, D. T. Lauria, A. M. Wright, K. Choe, J. A. Hughes, V. Swarna, *Household Demand for Improved Sanitation Services: A Case Study of Kumasi, Ghana*, Washington, DC: United Nations Development Program, 1992.
- [22]. The Republic of Ghana, *Annual Progress Report for the Year 2011*, Accra: Ministry of Finance and Economic Planning, 2012.
- [23]. K. I. Osumanu, L. Abdul-Rahim, J. Songsore, F. R. Braimah, M. Mulenga, Urban water and sanitation in Ghana: How local action is making a difference. Human Settlement Working Paper Series. *Water and Sanitation – 25*, 2010. London: International Institute for Environment and Development (IIED).
- [24]. A. Y. Katukiza, M. Ronteltap, A. Olega, B. B. Niwagaba, F. Kansime, P. N. L. Lens, Selection of sustainable sanitation technologies for urban slums – a case of Bwaise III in Kampala, Uganda. *Science of the Total Environment* **409**, 52 – 62, 2010.

Author Profile



Roland S. Kabange is born in Navrongo (Ghana) to uneducated parents. Roland holds a PhD in Environmental Engineering (sanitation option) from The University of Leeds, West Yorkshire (The United Kingdom), MSc (Irrigation Engineering) and BSc. (Civil Engineering) both from Russian Peoples’ Friendship University, Moscow (Russia). He also participated in a certificated Ecological Sanitation Course in Sweden, South Africa, and Ghana

He is the immediate past Head of the Department of Civil Engineering at Kumasi Technical University (KsTU) where he has been working as a Lecturer. He has about fourteen (14) peer-reviewed publications to his credit, and attended fifteen (15) relevant workshops and courses. Some of the publications include: Shared Sanitation Facilities – a Reality or Mirage?, *American Scientific Journal for Engineering, Technology, and Sciences (ASRJETS)*, 2015); Community Population Density Variation

Implications on Sanitation System Cost – The Case of Kotoko Community in Suame (Kumasi), Ghana, The International Institute for Science, Technology and Education (IISTE), 2017; and From The Great Bubonic Plague Outbreak to PUSH UP in Ghana, International Journal of Recent Engineering Research and Development (IJRERD), 2017. He is an Adjunct Lecturer with Ghana Technology University College (GTUC) in Kumasi (Ghana), and a Reviewer for The African Journal of Environmental Science and Technology (AJEST).

Dr. Kabanger research interests include promotion of sustainable low-cost sanitation systems for low-income densely-populated peri-urban communities; knowledge, attitude, and practices (KAP) of sanitation; and greywater management and use.