Assessing The Usage Rate And Management Practices Of Public Latrines In Urban Ghana: The Case Of Cape Coast

Eric Awere, K. B Micah Edu-Buandoh

Abstract: Developing countries are faced with the problem of improper treatment and disposal of human excreta due to the use of unimproved sanitation systems. In an attempt to increase access to sanitation facilities, many governments have adopted public latrines. Field experience has shown that public latrines have the problem of high usage rate and the use of non-degradable anal cleansing materials leading to the filling up of the pits much faster than their design life. This research, therefore seeks to assess the usage and management practices excreta degradation and desludging rate of public dry on-site sanitation systems in the Cape Coast Metropolis. Thirteen (13) public Ventilated Improved Pit latrines located in the Cape Coast metropolis were selected. Structured interview was conducted to determine the usage rate, desludging frequency and user practices of the public latrines. The results show that the usage rate of public dry latrines in the Cape Coast metropolis is low (9 – 25 persons/squat hole) but the desludging rate is high (7 – 120 days). The high desludging frequency is attributed to the addition of non - biodegradable materials and less microbial activity due to the excessive use of disinfectants.

Index Terms: Desludging rate, Excreta, Pit Latrine, Public Latrines, Sludge Accumulation Rate, Urban Ghana, Usage Rate

1 INTRODUCTION

Human excreta management in urban and peri-urban areas is a major challenge for Ghana and other developing countries [1]. Many disease outbreaks and deaths have been attributed to improper management of human excreta [2]. Due to the low uptake of household latrines, public toilets have become widespread in urban and peri-urban Ghana. Technically, public latrines are meant for visitors but according to van der GeestObirih‐Opareh [3] they have become sanitation facilities for residents. In 1992, nearly 40% of households in Kumasi [4] and 25% in Accra [3] used public latrines scattered throughout the cities. In addition, 23% out of 100 respondents in a study conducted in Madina, Ghana, used public toilets [5]. The Ghana National Environmental Sanitation Strategy and Action Plan (NESSAP) 2010 – 2015, reports that 37.6% of residents in Central Region (where Cape Coast is the Regional Capital) use public toilets, the third in the country after Ashanti Region (46.3%) and Brong Ahafo Region (39.7%). According to the 2010 Ghana Population and Housing Census, the national figures for the proportion of households using public toilet facilities increased from 31.4 percent in 2000 to 34.6 percent in 2010 [6]. It is alleged that the principles on which the dry on-site sanitation systems is designed are not always being observed in practice [7], [8].

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Field experience has shown that pits latrines are filling up much faster than their design life leading to lack of necessary anaerobic activity in the pit. Like any other type of toilet facility, pit latrines are designed to serve specific number of people. However, there are reported cases of extremely high usage rate [9], [10]. This has been observed and reported in Kumasi, Ghana [11] and South Africa [7], [8]. As a result of the high usage rates of public toilets they have to be desludged regularly posing extra challenge to management of these latrines. For instance, certain public toilets in Kumasi are desludged about once or twice a week but increases to about ten times a month during rainy season and at busy sites [11]. In addition, the high cost of emptying coupled with the long waiting time between the pit filling up and an emptying service being acquired forces users to resort to other means of excreta disposal which may not be improved. Moreover, in order for the liquid portions to be soaked into the nearby soil, pit latrines should be constructed in areas with porous soils. van der GeestObirih‐ Opareh [3] reports that most pit latrines are built on clayey soils leaving the toilet always wet and requiring frequent desludging. Perhaps the greatest challenge with public toilets is maintenance. In a survey conducted in Kumasi, Ghana by Frantzen [11], 43% of respondents were dissatisfied with the use of public toilets due to poor maintenance, high user fees and long distances of facilities from users' homes. To provide a long service life of pits, the rate of degradation or leaching of the material in a pit should be similar to the rate of filling [12]. The rate of filling of pit latrines (whether privately or publicly used) is dependent to a large extent on the sludge accumulation rate and the type of anal cleansing materials used. Vast array of data has been published on sludge accumulation rates for pit latrines. World Health Organisation (WHO) in the 1950s observed an accumulation rate of 40 l/c.a in wet pits where solid anal cleansing material was used and recommended 60 l/ca person per year for dry pits and up to 50% more if large amounts of solid material (grass, stones etc.) were used for anal cleansing [13]. Many authors, in the design of pits, still use the WHO figures as guidelines [14], [15], [16]. A study in Besters Camp (now called eThekwini Metropolitan Municipality) in Durban, South Africa in 1995

showed varied data but a median filling rate of 64 l/c.a was observed to be realistic and recommended for further comparison [17]. Whittington,Lauria*et al.* [18] has reported a sludge accumulation rate of 180 l/c.a in Kumasi, Ghana. The Community Water & Sanitation Agency (CWSA) of Ghana uses sludge accumulation rate of 30 l/c.a as a standard for the design of latrines for small towns [19]. Franceys*et al.* [14] has recommended maximum sludge accumulation rates (presented in Table 1) based on whether decomposition takes place above or below the water table and the type of anal cleansing material used.

TABLE 1.
Maximum suggested sludge accumulation rates [14]

Conditions in Pit	Sludge Accumulation rate (l/c/a)
Wastes retained in water where degradable anal cleansing materials are used	40
Wastes retained in water where non-degradable anal cleansing materials are used	60
Waste retained in dry conditions where degradable anal cleansing materials are used	60
Wastes retained in dry conditions where non degradable anal cleansing materials are used	90

Pit latrines contain faeces, urine, anal cleansing material (such as tissue paper, newspaper, magazines, stones, rags, plastic bags, sticks) and/or anal cleansing water [20]. There are reported cases of the presence of solid non-degradable refuse such as used clothing, polythene bags, etc. in pits latrines [7, 14, 20, 21, 22, 23]. Pit latrines may also contain worms and maggots [24]. The presence of maggots in pits has been observed to enhance volume reduction of pit latrine contents through digestion and aeration of inner layers of heap for aerobic degradation [20, 24, 25]. Pit latrine additives [26] and disinfectants [25, 27] may also be present. Disinfectants have microbiocidal properties and may inhibit the functions of active bacteria in the sludge thereby increasing the rate of accumulation in the pit. This research, therefore seeks to assess the usage rate and user and management practices Metropolis and how these practices affect the desludging rate of public pit latrines in Cape Coast.

2 METHODOLOGY

2.1 Study Area

The Cape Coast Metropolitan Area is the administrative capital of the Central Region of Ghana. It lies in the coastal part bounded to the South by the Gulf of Guinea, West by the Komenda Edina Eguafo Abrem District (KEEA), East by the Abura Asebu Kwamankese District and to the North by the Heman Lower Denkyira District. The Metropolis occupies an area of approximately 122 square Kilometres with a population of approximately 169,894 according to 2010 Population and Housing Census [6]. There are 25 dry and 29 wet public toilets/latrines in the metropolis. There is approximately, one public toilet per 0.443 square kilometre. All the sanitation facilities are operated and managed by private contractors who collect user fees per person per visit and pay monthly franchise fees to the Cape Coast Metropolitan Assembly.

2.2 Research Instruments

A total of 13 public pit latrines were randomly selected for this study from the 25 public pit latrines in the metropolis. Interviews, observation and field measurements were employed in collecting data for the study. The interview (using a pre-tested interview guide) was conducted with the people involved in managing, operating and cleaning the toilets. Questions used for the interview focused on usage and desludging rate, user behaviour practices and management practices. All questions were asked in the local language since most of the attendants did not understand the English language. To confirm the usage rate obtained from the interviews, observers were assigned to the selected public latrines to record the number of people who use the toilet each day. Since most public toilets in the study area operate from 4:30 am until 9:00 pm, three (3) observers were assigned to each toilet; one person each for the morning, afternoon and evening shifts. Each toilet was observed for seven (7) days including Saturdays and Sundays. The desludging rates obtained from the interviews were triangulated by visiting the toilets anytime desludging activity is carried out. Field measurement of the dimensions of each pit was determined using tape measure and graduated stick. The data obtained from the field measurements were used to estimate the volume of each pit. The volume of each pit, actual usage rate and a sludge accumulation rate of 60 litres/capita per annum [14] were used to estimate the retention time for each pit using equation 1.

$$Estimated\ retention\ time = \frac{Volume\ of\ pit}{No.of\ persons\ using\ pit\ x\ Sludge\ accumulation\ rate} \quad \ldots (1)$$

3 RESULTS AND DISCUSSION

3.1 Usage Rate and Desludging frequency

Table 2 represents a summary of the usage rate and desludging frequency of public VIPs in Cape Coast. The table also contains the estimated retention time determined from the field measurements.

Usage Rate

Figure 1 shows that between 9 – 25 people use a squat hole per day though few public VIP latrines are heavily used such as Abura Ahmediyah (33 persons/hole) and Abura Roman School VIP latrines (82 persons/hole).

TABLE 2.
Usage rate and Desludging frequency of Dry Public Toilets in Cape Coast

Facility	Location status	Capacity	No. of users/day	No. of users/ drop hole	Actual Desludging rate	Volume of Pit (m^3)	Estimated Retention time (yrs)**
Abura Ahmediyah VIP	Urban	30 seater	965±25	33	8 days	97	1.7
Pedu Nguado VIP	Urban	10-seater	250±15	25	30 days	32	2.1
Abura Roman School VIP	Urban	10-seater	812±20	82	7 days	32	0.6
Adisadel VIP	Urban	20-seater	252±13	13	120 days	64	4.2
Sewdu No. 1 VIP	Urban	18-seater	156±8	9	30 days	58	6.1
Sewdu No. 2 VIP	Urban	18-seater	180±12	10	100 days	58	5.3
Sewdu Compound 1 VIP	Urban	12-seater	253±16	21	21 days	40	2.5
Sewdu Compound 2 VIP	Urban	10-seater	110±6	11	60 days	32	4.8
Aquarium VIP latrine	Urban	20-seater	275±5	14	80 days	64	3.8
Abease VIP latrine	Urban	20-seater	321±21	16	60 days	64	3.3
Bakaano Gas station VIP	Urban	20-seater	203±4	11	72 days	64	5.2
Senawin VIP latrine	Urban	10-seater	186±9	19	42 days	32	2.8
Ankaful KVIP latrine	Peri-urban	20-seater	176±6	9	365 days*	52	4.9

* Last emptying time
** Based on volume of pit and sludge accumulation rate of 60 l/c.a (Franceys *et al.*, 1992)

The usage rate is generally low compared with literature recommended usage rate of 25 persons per squat hole for design purposes. The low usage rate is contrary to reports of high public toilet usage in Kumasi [4] and Accra [3]. The implication of a low usage rate is low desludging frequency and reduced daily frequency of cleaning.

Desludging Rate

Using volume of the pits and sludge accumulation rate of 60 l/c.a for wastes retained in dry conditions where degradable anal cleansing materials are used [14], the estimated desludging frequency for the pit latrines ranged from 7 months to 6 years (Table 2). The least estimated desludging frequency occurred in Abura Roman School VIP latrine (7 months) but the actual desludging frequency for that latrine is 7 days.

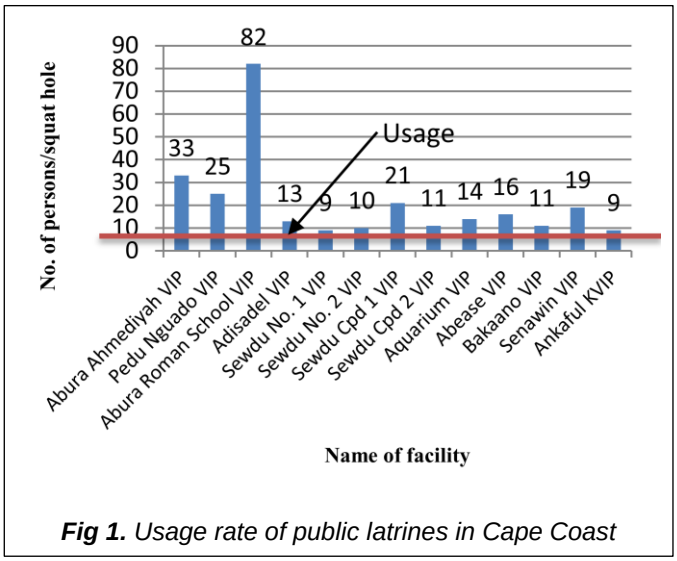

Fig 1. *Usage rate of public latrines in Cape Coast*

The actual desludging frequency for all the pit latrines (7 – 120 days) was far lower than the estimated storage time for the pits (from Figure 2 and Table 2). Anaerobic degradation which occurs mostly in pit latrines is relatively slow [28] therefore in order to achieve a greater degree of stabilization Mara [29] recommends a minimum of one year storage time while Franceyset al. [14] proposes between two years for design. For tropical countries StraussBlumenthal [30] asserts that 10–12 months are needed. Comparing the desludging frequency with the recommended storage time in literature for pit latrines and the estimated retention time it can be inferred that the desludging frequency of public latrines in Cape Coast is high (Except for Ankaful KVIP). High desludging rate has also been reported in public latrines in Kumasi [11]. The short time between desludging presupposes that the storage time for faecal matter is short with less anaerobic activity in the pit. The findings confirm Vodounhessivon Münch [10] and SaywellHunt [9] report of reduced time required for contents decomposition in pits of public latrines resulting from high desludging rate. The reasons assigned for high desludging frequency are high usage rate [9], [10], intrusion of groundwater and surface runoff [26], addition of other non-degradable anal cleansing materials [14], [20], [23], presence of inhibitory substances such as disinfectants, permeability of the soil and effectiveness of the desludging [20], [24]. The low usage rate of 15 persons/squat hole recorded shows that usage rate could not be the cause of high desludging frequency. The study was undertaken during the dry season of the year when surface runoff is almost non-existent and therefore intrusion of surface runoff could not also be the reason for the high desludging frequency. Again, the physical location of most

latrines (located on high elevation) does not suggest the intrusion of groundwater into pits. The high desludging frequency recorded in this study may be due to the disposal into pits of materials other than anal cleansing materials. This was confirmed by the results from the user practices survey and this confirms reported cases in literature [7], [8], [14], [20], [21], [22], [23], [27]. During desludging, portion of the partially digested sludge rich in anaerobic micro-organisms must be left at the bottom as seed to ensure that digestion continues [14], [31]. All the partly digested sludge is removed depriving the pits of seed (anaerobic microorganisms) to ensure continuous digestion. Due to that, the microbial population in the fresh faeces will have to adapt to the new environment (pit) over time increasing the filling rate of the pits. Faecal sludge is desludged using a cesspit emptier. Desludged faecal sludge was transported away by the cesspit emptier for final disposal.

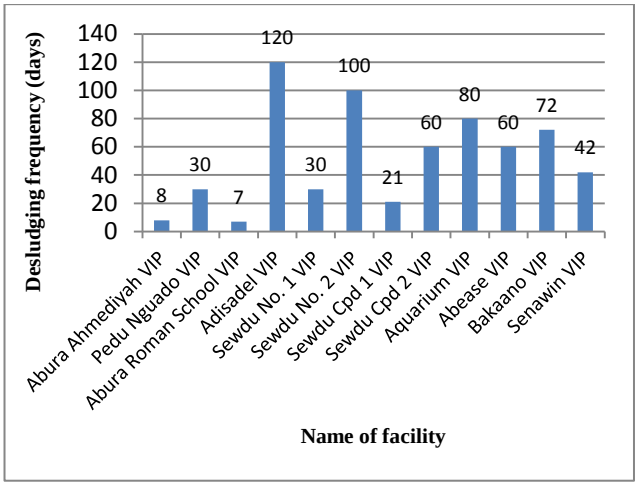

Fig 2. *Desludging frequency (in days) of public latrines*

3.2 User and Management practices

Types and Management of Anal Cleansing materials

Users are not restricted on the type of anal cleansing material to use. However, anal cleansing materials mostly used are old newspapers, tissues and water (on a low scale particularly in Muslim Communities). The type of anal cleansing material to be given was dependent on the user's preference and this influences the user fees to be paid. That notwithstanding, users are allowed to bring their own anal cleansing materials. In all the facilities, used anal cleansing materials were collected either into receptacles placed in each cubicle for that purpose or kept on the floor where they are collected periodically for onsite burning. Open burning of used anal cleansing materials raises concerns related to air pollution to residents in the vicinity of the facility and also the possibility of accidental fires in such clustered communities. Moreover, the National Environmental Sanitation Policy frowns on open burning.

Other materials disposed into pits

It was also found that some users dispose used clothing and rags, polythene bags (mostly containing faeces) into the pit. This could be a contributing factor for the relatively high desludging rate obtained from the site survey. While KVIP latrines are designed to be alternating twin pit latrines, all the pits of Ankaful KVIP are used concurrently with one of the squat holes sealed permanently. This ultimately defeats the alternating pit principle behind the KVIP design.

Measures for controlling Odour, flies and Maggots

Many public toilets are characterised by odour, flies and maggots. To control the odour, flies and maggots, different types of chemicals such as Saponated Cresol (Izal), Dettol, and other liquid detergents are used daily. Most of these chemicals are disinfectants and exert their detrimental effect on the life of the microorganisms which are responsible for the degradation of organic matter in the faeces [8], [32], [33]. The negative effect of disinfectants on the maggots could have corresponding negative effects on pit degradability since maggots in pits have been observed to enhance digestion and aeration of inner layers of faeces for aerobic degradation [20], [24], [25]. These practices have the potential of contributing to increased fill-up time of the pits.

Cleaning Regime

For all the facilities assessed, cleaning was done by a latrine attendant who is also responsible for the collection of user fees. Using attendants to clean the facilities affects the frequency of cleaning since they have to combine collection of user fees and cleaning. Generally, cleaning mainly involved collecting and disposing used anal cleansing materials and sweeping and mobbing the floors. Cleaning was done mostly in the morning/dawn before the start of operation and a few times within the day depending on the discretion of the attendant. These notwithstanding, the frequency of cleaning as obtained from the assessment ranges from twice to thrice a day.

Hand Washing

Only two (2) of the facilities assessed had functional hand washing facilities (Veronica Bucket) with soap close to the toilet block. Even for the two (2) facilities with functional hand washing facilities, the soap was kept by the attendant and given upon request by users. This practice is common to most public toilets in the country because the soaps are reported to have been stolen by the users when left close to the handwashing facilities. Generally, water for handwashing was obtained from Ghana Water Company Limited source.

Assessment of Adequacy of Design for use by disadvantaged groups

The main disadvantaged groups to be considered in the design of toilet are the physically challenged, pregnant women, the elderly and minors. To make the facilities useable by the disadvantaged groups (particularly the elderly, pregnant women and the physically challenged), handrails and seats have to be provided. In all the facilities, no special enhancements such as hand rails and specially-designed seats had been provided to make the toilets disadvantaged-friendly. None of the facilities were designed to address the needs of these disadvantaged groups. However, because of the standardized nature of the squat holes they are useable by the minors without fear of falling inside. Public latrines have been found to be inaccessible at night or by the elderly, disabled and young children [2], [34], [35].

Institutional Arrangement for Operation and Maintenance of Facilities

The general management structure involved the facility owner (Metropolitan Assembly) at the top. The owner then employs operators to manage the facilities and pay monthly franchise fees to the Assembly. The amount paid as franchise fees depends on the location of the facility and the usage rate. The operator employs attendant(s) who takes care of the day-to-day running of the facility including, in most case, cleaning and collection of user fees. In most cases, the attendants rendered agreed daily sales to the owners. This served as an incentive for the attendants to report for work early, close late and be strict in the collection of user fees since the more revenue they collect, the more the likelihood that they may make surplus.

Revenue Generation and Management

The user fees charged for using the toilet facilities depended on the users preferred type of anal cleansing materials and the number and types of facilities within the neighbourhood. Generally, the dry toilets charged less than wet toilet systems. However, irrespective of the location, users pay thirty (30) Ghana pesewas (equivalent to US$0.08) for old newspaper and forty (40) Ghana pesewas (equivalent to US$0.11) for toilet rolls. In situations where the users come with their own anal cleansing material, the user fee for old newspaper is reduced by ten (10) Ghana pesewas (equivalent to US$0.03) for them to pay. The monies generated from the user fees are spent on maintenance of the facilities, procurement of anal cleansing materials and cleaning agents, payment of electricity bills, desludging and salaries for the attendants.

4 CONCLUSION

From the site survey it can be concluded that the usage rate of public dry latrines in the Cape Coast metropolis is low (9 – 25 persons/squat hole). However, the desludging rate is high (7 – 120 days) compared with literature values. The high desludging frequency (high filling rate) is attributed partly to the usage rate in some facilities (such as the case of Abura Ahmediyyah and Abura Roman School VIP) and the addition of non – biodegradable materials. The excessive use of disinfectants (mostly Izal) for cleaning the latrine floors could possibly have a negative effect on the microorganisms and maggots which are involved in the degradation of the faeces. The high filling rate may also be due to the impermeable nature of the soil (due to clogging of soil pores) to allow infiltration of liquid and soluble components of the pit contents. Moreover, during desludging all the partially digested sludge is removed from the pits depriving the pit of 'seed' which will ensure continuity in digestion. Faecal sludge from public pit latrines are strong and with high desludging frequency (less storage time), the contents desludged are relative fresh and without further treatment could have negative consequences on the receiving environment.

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