Peri-Urban Community Socio-Cultural Preferences for, and Experts' Views on, Sanitation Options: A Case Study of the Kotoko Community in Suame (Kumasi), Ghana

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Abstract

Sanitation affects all aspects of human development due to its cross-cutting nature. Sanitation improvement has health and non-health externalities. Drivers that motivate sanitation improvement, ownership, and usage are governed largely by non-health externalities – improved privacy, convenience, time-saving, social status, prestige, safety for women and children, cleanliness, odour, fly reduction and modernity. Community perceptions and experts' views on sanitation options are critical for choice selection and use. This research seeks to explore and evaluate views and preferences of experts and users to inform sustainable and acceptable sanitation for a low-income high-density predominantly Muslim multi-ethnic peri-urban Kotoko community in Kumasi, Ghana. Respondents were distributed in proportion to each household size using an equation developed for representativeness. Out of 2,200 inhabitants, 133 respondents (6% of the population) were interviewed. The study revealed that the community's sanitation preferences were inclined towards modern sanitation options – 75% preferred flush as against 76% for water seal. Contrary to some opinions that the direction in which one faces during defecation does not matter, this research revealed that 41% (55) of respondents preferred positioning in the North-South direction, and most preferred sitting (47%) to squatting (34%) during defecation. Experts' analysis of five sanitation options emphasized non-technical, health and environmental factors over technical features although the trend varies across individual sanitation options. Experts identified with socio-cultural, health and environment factors as most important. The findings can thus be used by local authorities to gradually address the complexities of peri-urban sanitation challenges.

Keywords: preferences, peri-urban, socio-cultural, sanitation, experts, Ghana

1. Introduction

Studies show that improving sanitation has greater benefits than disease burden reduction, as the wider economic and social benefits often motivate individuals and communities to improve sanitation (Pearson and Mcphedran, 2008; Isunju et. al., 2011). The non-health drivers for improving sanitation include improved privacy, convenience, time saving, prestige, safety for women and children, social status, odour and fly reduction, cleanliness, conflict with neighbours, and modernity (Feachem, 1984; Jenkins and Scott, 2007; Hutton et. al., 2007; Nkansah, 2009; Mara et. al., 2010; Isunju et. al., 2011). Fundamental to the acceptance and sustainable use of sanitation options is thus an understanding of non-technical issues (Roma et. al., 2010). Therefore, beyond technical aspects of sanitation, users' preferences on style, layout and design of sanitation options can have an impact on usage.

Widespread evidence exist on the importance of involving householders' views in sanitation improvement to ensure satisfactory operation and maintenance even when community preferences relate to matters outsiders may consider irrelevant – the non-health factors (Cotton et. al., 1995). Failure in the past to incorporate users' needs and preferences, and experts' views into sanitation planning often resulted in communities' loss of sense of ownership of developed facilities, which promoted misuse, non-use and poor operation and maintenance practices (Mehta and Knapp, 2004) – which led to poor sanitation in communities. There is a lot of work looking at sanitation options through planning tools, but it is only recently that it has been integrated with social, cultural and economic factors. Sanitation therefore affects all aspects of human development due to its cross-cutting nature. Success began to emerge when attention was paid to users' preferences, disaggregation of services, and the involvement of formal and informal institutions in sanitation delivery (Wright, 1997).

2. Research aim and objective

Low-cost sanitation options for peri-urban settlements often requires information on several aspects of community life largely because the designs require local materials and expertise, community co-operation, and local preferences or needs (Simpson-Hébert, 1982). Studies in Benin and Ghana show that, besides health factors, community's motivation to use sanitation facilities depends on social parameters as prestige, increased comfort and privacy (Nkansah, 2009; Schouten and Mathenge, 2010). Users' experiences study of sanitation

technologies in Durban (South Africa) suggests that cleanliness or affordability of facilities can affect acceptance (Roma et. al., 2010). Religion also influences sanitation design – to avoid facing Mecca or give their back to it, residents of a largely Muslim community preferred squatting in the North-South direction during defecation (Avvannavar and Mani, 2007). This research seeks to explore householders and experts views and perceptions of local sanitation needs, attitudes and preferences in the low-income high-density predominantly poor peri-urban Kotoko community in Kumasi, Ghana. The following objectives are therefore set to:

- Assess the community's current sanitation situation;
- Assess the community's preferences and priorities for sanitation;
- Investigate experts' opinions on various sanitation options; and
- Make recommendations for study community future sanitation preferences in tandem with experts' options.

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. Mainly inhabited by Christians (79%) and Muslims (16%), it has a rough population of 1.6 million (Millennium Cities Initiative, 2008). Kotoko is predominantly Muslim, multi-ethnic low-income high-density peri-urban community located close to Kumasi city centre (Kejetia) with 67 households and about 2,200 inhabitants. Houses are built largely from mud and bamboo, and roofed using 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
A transect walk conducted observed the community's water and sanitation infrastructure and services. Three peri-urban communities (Kotoko, Akwatia Line and Race Course) were short-listed, and Kotoko in Suame (Kumasi) was selected. Elements of a peri-urban community and physical information such as topography, population density, and estimated level of community co-operation were factors considered for the selection. Before the research commenced, informed-consent and willingness to participate was sought through meetings at three levels – elders, unit committee and community. Permissions were obtained from Kumasi Metropolitan Assembly (KMA), and a translator was available since most community members had no formal education.

4.1 Sampling and questionnaire design
An equation developed for sample size determination for representativeness (Katukiza et al., 2010) was applied as follows:

$$N = Z^2 \left(\frac{Pq}{e^2} \right) = Z^2 \left\{ \frac{P(1-P)}{e^2} \right\}$$

where N is the sample size; e is the desired level of precision of $\pm 5\%$; Z is 1.96 at 95% confidence interval; P is estimated level of an attribute present in the population; and q the estimated level of an attribute not present in the population (i.e., q = 1 – P). Given that household sizes ranged from $3 - 100$, the number of respondents per household should be proportional to household size for representativeness. Therefore, Z = 1.96 at 95% confidence interval; P (for study area) = 0.91 – represented 91% of study community that used some form of sanitation facility (private or community latrine); q = 1 – P = 1 – 0.91 = 0.09; and e = 5% = 0.05 – the desired level of precision (sampling error).

$$\therefore N = 125.9 \approx 126$$

A 5% sampling error was assigned to account for non-responses, 133 (or $\simeq$ 6% of population) respondents were interviewed for the community of about 2,200 inhabitants. For a household size (h), study area population of 2,200 and sample size 133, the household sample size (n) was given by (133h)/2,200. The questionnaire had 19 questions, and the household size was determined from Question 1 of the questionnaire.

4.2 Experts ranking of sanitation options
An initial broad list of sanitation options was identified based on WHO/UNICEF JMP (2014) definition of improved sanitation. The broad list was shortened to five through existing literature underpinned by technical, global situation, government and Kumasi city policy direction and plans for improved sanitation. Experts composed of technical and non-technical professionals drawn from private sector, government and academic institutions in the water and sanitation sector in Ghana ranked the five sanitation options. They included

engineers, public health specialists, social scientists, economists and institutional experts (n = 20). Pre-determined sustainability indicators and criteria included socio-cultural, technical, economic, health and environment and institutional.

A table for options ranking was presented to experts who determined the scores for the sustainable indicators. These are indicators considered important for sustainability of sanitation improvement in the Kotoko community. Scores on sustainability indicators depended on the degree of importance the expert attached to each indicator. A scale of 1 (lowest) to 5 (highest) was adopted to estimate scores for each sustainability criteria (Katukiza et. al., 2010). Experts scored each criterion under every indicator. For example, "local materials" means the potential for the sanitation to be built using local materials. Most experts involved in the ranking were familiar with the study community. Additional information about the community background and the sanitation options under consideration were available to experts to inform their ranking decisions.

5. Data analysis
The socio-cultural preferences collected data was coded and analysed with the aid of Statistical Package for Social Scientists (SPSS), using tabulation, cross-tabulation, graphs and charts. Other analytical techniques such as documentation, coding and categorization were however used for qualitative data. Filtering was applied to analyse specific selected subset of data. Experts' ranking analysis averaged scores for each sustainable criterion and the total average scores for each sustainable indicator were determined based on the individual scores of the 20 experts. The normalized scores for each sustainable criterion were calculated from the average scores for each sustainable criterion, the sum of the average scores for each sustainable indicator, and experts' average weighted scores for each sustainable indicator. The experts' average weighted scores were earlier determined by averaging the sum of all 20 experts' scores for each indicator. These normalized scores of the sustainable indicators and criteria by experts then determined the final sanitation option score and rank.

6. Results and discussions
A family in this study was referred to a person(s) who lived together in a structure (or part of it) and were catered for as a unit with the same house-keeping arrangement. A household was however defined as a single or multiple families who lived in a single compound structure.

6.1 Respondents' demographics
A sample size of 133 (≈ 6% of population) was used for the survey, and most 62% (82) were females. Figure 1 reflects a predominantly adult sample and most of them were women. Similar results were reported on the population trend in Ghana and the Ashanti Region, where females out-numbered males (Ghana Statistical Service, 2011). The scientifically sampled preferences survey was therefore likely to be representative of each household and the population.
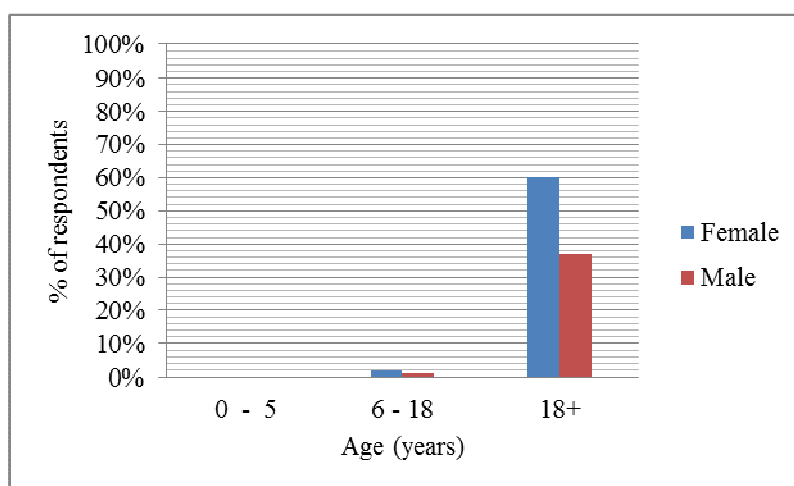

Figure 1: Age-gender distribution of respondents

6.2 Research community sanitation preferences
It was therefore important to understand what matter to users. Preferences expressed by respondents are summarized in Table 1. Only the most significant preferred options were introduced in this table and so the percentage sum would be less than 100. It is assumed that respondents who had no preference were likely to opt

for any option, including the most popular. The sitting posture during defecation was the most (47%) preferred by respondents, at the expense of squatting (34%), two-thirds of who were women. The preference level of the most preferred option rose to 66% (88) when those without preference were included. Of particular relevance to the design of improved facilities was the clear preference for flush toilets (75%) and water seal (76%). Comparable findings show that though the older generation of a Pakistani village had strong feelings about excreta and encouraged open defecation, the majority of them favoured flush toilets (Nawab et. al., 2006).

Contrary to some opinions that the direction in which one faces during defecation does not matter, this research revealed that 41% (55) of respondents preferred positioning in the North-South direction. Though this percentage was under half, it was a significant proportion. The percentage rises to 86% (114) if those who have no specific preference are included. The community being predominantly Muslim, this result is consistent with a research finding which concluded that Muslims during defecation prefer to squat in the North-South direction to avoid either facing Mecca or giving their back to it.

Table 1: Summary of users' preferences for sanitation

No.	Item	User preference	Gender	% respondents	Sub-total	Total
1	Superstructure shape	Rectangular	Male	13% (17)	31% (41)	76% (101)
			Female	18% (24)		
		No preference	Male	14% (19)	45% (60)	
			Female	31% (41)		
2	Superstructure roof material	Corr. Iron sheets	Male	24% (32)	65% (87)	90% (120)
			Female	41% (55)		
		No preference	Male	10% (13)	25% (33)	
			Female	15% (20)		
3	Defecation posture	Sitting	Male	15% (21)	47% (63)	66% (88)
			Female	32% (42)		
		No preference	Male	5% (6)	19% (25)	
			Female	14% (19)		
4	Latrine type	Flush	Male	19% (25)	60% (79)	75% (99)
			Female	41% (54)		
		No preference	Male	7.5% (10)	15% (20)	
			Female	7.5% (10)		
5	Cover slab type	Concrete	Male	29% (38)	79% (105)	86% (115)
			Female	50% (67)		
		No preference	Male	3.5% (5)	7% (10)	
			Female	3.5% (5)		
6	Gender arrangement	Separate	Male	34% (45)	91% (121)	92% (123)
			Female	57% (76)		
		No preference	Male	1% (2)	1% (2)	
			Female	0% (0)		
7	Defecation direction	North-South	Male	16% (22)	41% (55)	86% (114)
			Female	25% (33)		
		No preference	Male	16% (21)	45% (59)	
			Female	29% (38)		
8	Water seal or hole	Water seal	Male	28% (37)	76% (101)	76% (101)
			Female	48% (64)		
		No preference	Male	0% (0)	0% (0)	
			Female	0% (0)		

Open defecation in the community was consistently lower than published figures of 19% for Ghana as a whole (WHO/UNICEF JMP, 2014). Research conducted nearly two decades ago in Kumasi (Ghana) found that about 40% of households used public latrines because they had no private facility in their building or compound (Whittington et al., 1992; Republic of Ghana, 1993). Another recent study reported that 38% of Kumasi's population relies on public toilets (Thrift, 2007). It is likely that the difference between this study results and published data is attributable to the danger in soliciting peoples' opinions on sanitation – the danger that accurate information might not be obtained was ever present because sanitation and latrine habits touch on the private aspect of one's life that people are unwilling to openly and sincerely discuss, especially with strangers (Otieno, 2005). This research results are most likely trusted and reliable due to the use of a significant sample size of 133 (≈ 6% of population) and a scientifically proven sampling strategy.

6.3 Ranking of sanitation systems by experts

The total score for each indicator is shown in Table 2. Experts considered local materials and labour (technical aspects) with total scores of 17 each as the most important. They however considered space availability (economic aspect) with total score of 12 as the least important.

Table 2: Experts' average scores for sustainable indicators

Sustainability function		Average scores for sustainable indicators based on a scale of 1 (low) to 5 (high)					
Indicator	Criteria	Pour-flush (a)	VIP (b)	KVIP (c)	UDDT (d)	SS (e)	Total score
Socio-cultural	Acceptance	3	3	3	1	3	13
	Perception	4	3	3	2	3	15
	Usability	4	3	3	1	3	14
							42
Technical	Local material	4	4	4	2	3	17
	Local labour	4	4	4	2	3	17
	Robustness	3	3	3	2	3	14
							48
Health & environment	Pollution	3	3	3	2	3	14
	Pathogens	3	4	3	2	3	15
							29
Economics	Space availability	3	3	2	2	2	12
	Capital cost	3	3	3	3	4	16
	O & M	3	3	3	2	3	14
							42
Institutional	Policy	3	3	3	2	3	14
	Adoptability	4	3	3	2	3	15
	Management	3	3	3	2	3	14
							43

The average weighted scores (Table 3) show that socio-cultural factors came next only to health and environment issues as experts' priorities in choosing a sanitation option. The finding confirmed that non-technical issues ere fundamental to acceptance and sustained use of technologies (Roma et. al., 2010). The least important consideration by experts was the institutional aspects. Available literature however indicate that users' primary motivation in choosing a sanitation option are prestige, privacy and comfort, with little or no motivation for health and environment (Jenkins and Curtis, 2005; Nawab et al., 2006; Pearson and Mcphedran, 2008). The research findings show that while experts seem to identify with socio-cultural, and health and environmental factors as important in sanitation option selection, users primarily see non-health issues as paramount. Acknowledgement of stakeholders' divergent views will therefore strongly support a more effective co-operation between them.

Table 3: Sanitation options final ranking

Sustainability function		Experts' average weighted scores (%)	Normalized scores used for ranking sanitation options				
Indicator	Criteria		Pour-flush (a)	VIP (b)	KVIP (c)	UDDT (d)	SS (e)
Socio-cultural	Acceptance	21.5	1.5*	1.5	1.5	0.5	1.5
	Perception		2.0	1.5	1.5	1.0	1.5
	Usability		2.0	1.5	1.5	0.5	1.5
Technical	Local materials	20.9	1.7	1.7	1.7	0.9	1.3
	Local labour		1.7	1.7	1.7	0.9	1.3
	Robustness		1.3	1.3	1.3	0.9	1.3
Health & environment	Pollution	24.9	2.6	2.6	2.6	1.7	2.6
	Pathogens		2.6	3.4	2.6	1.7	2.6
Economics	Space availability	18.6	1.3	1.3	0.8	0.8	0.8
	Capital cost		1.3	1.3	1.3	1.3	1.7
	O & M		1.3	1.3	1.3	0.8	1.3
Institutional	Policy	14.1	1.0	1.0	1.0	0.7	1.0
	Adoptability		1.3	1.0	1.0	0.7	1.0
	Management		1.0	1.0	1.0	0.7	1.0
Total score		100	22.6	22.1	20.8	13.1	21.4

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Final ranking (position)	1st	2nd	4th	5th	3rd

* Normalized score for pour-flush latrines with regard to acceptance is determined as follows:
$(3/42) \times 21.5 = 1.5$

Experts' average scores generally ranked dry Kumasi ventilated improved pit (KVIP) latrine and urine diversion dry toilet (UDDT) low in preference to wet ones, such as pour-flush, simplified sewerage, and ventilated improved pit (VIP) latrine options. It was unclear why VIP latrine was ranked higher than KVIP. Experts ranked pour-flush latrines first followed by VIP latrine and then simplified sewerage. The first two were probably favoured because they were some of the common sanitation options found both in the community and in Ghana. Besides, the toilets connected to septic tanks usually used by a small proportion of the community as private facilities were mostly (56%) pour-flush. KVIP latrine which was one of the common types of excreta disposal facilities in Kumasi (Thrift, 2007; Awuah et. al., 2009) was ranked second to the last, UDDT.

UDDT was similarly rejected by a predominantly Muslim Pakistani community where all respondents strongly opposed to it, but favoured flush toilets (Nawab et al., 2006). Its rejection may be attributable to the community's need for anal cleansing with water (as most are Muslims) which, by the UDDT design, is technically impermissible. Overall, pour-flush, VIP and simplified sewerage are suggested by experts in this work as the most applicable to the study community, Kotoko. A similar study confirmed that in terms of cost, the two favourable sanitation systems for Soweto (South Africa) are VIP latrines and simplified sewerage (Courtney, 2011). The result is also consistent with Iwugo (1981)'s work where VIP was found appropriate, but pour-flush and simplified sewerage were excluded in the selection process in that research.
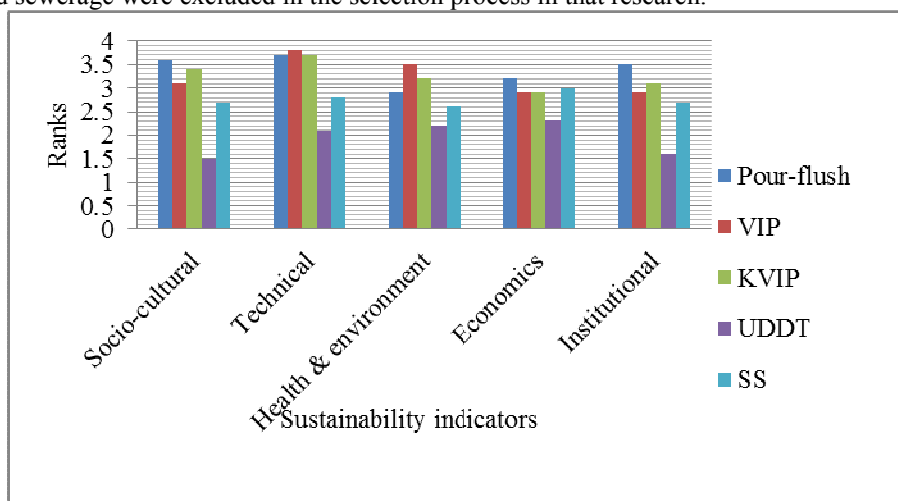

Figure 2: Experts' ranking of sustainable indicators for various technology options

Experts ranked all aspects of sustainability to be differently important for the various sanitation options (Figure 2). Whereas the technical aspect of sustainability was viewed as the most important for pour-flush, VIP and KVIP latrines with ranks of 3.7, 3.8 and 3.7 respectively, economic issues were considered most important in the case of UDDT and simplified sewerage with lower rankings of 2.3 and 3 respectively – emphasizing the relevance of technical and economic considerations in choosing sanitation system. Health and environment were however considered least important for pour-flush (2.9) and simplified sewerage (2.6), socio-cultural and economic issues for UDDT (1.5) and KVIP (2.9) respectively, and economic and institutional aspects least considered important in the case of VIP (2.9) latrines.

Across all five sanitation options, socio-cultural (3.6), institutional (3.5), and economic (3.2) issues were considered most relevant in pour-flush latrines, while technical (3.8) and health and environment (3.5) were thought most important in VIP latrines. Therefore whereas this investigation found socio-cultural and environmental issues as key in sanitation option selection from experts' perspective, consumers largely identified with the non-health factors. It is thus important to acknowledge divergent stakeholders views for a more effective co-operation between actors. The results also highlight that different experts have different opinions and perceptions of what weighs most for a sanitation option to be sustainable. These different perceptions may have influenced the results and therefore the final ranking, but likely also increased the validity of the sustainability concept. This study again shows that experts prefer wet sanitation systems (such as pour-flush, SS) to dry ones (KVIP and UDDT latrines). Peoples' rejection of KVIP latrines is however despite its traditional and long-term use in Ghana shows that KVIP latrine technology needs improvement.

7. Conclusions and recommendations
This research which sought to explore and evaluate users and experts views, preferences and opinions on sanitation options selection, arrived at the following key conclusions and recommendation:

- Contrary to some opinions that the direction and posture during defecation does not matter, this research revealed that the larger proportion of respondents (41%) predominantly Muslims preferred to defecate sitting in the North-South direction, and most (47%) preferred sitting during defecation to squatting (34%);
- The research community's sanitation preferences were found to be inclined towards modern sanitation systems with specific preference for flush toilets (75%) and water seal (76%);
- Sustainability function analysis showed that socio-cultural, and health and environment factors were experts' priorities in choosing a sanitation option for the Kotoko community – a finding that confirmed that experts consider non-technical issues as fundamental to acceptance and sustained use of sanitation facilities. Consumers however largely identified with the non-health factors. Therefore this issue should be included in experts and decision-makers sanitation choices to encourage acceptability and usability by consumers (users). Thus, for effective co-operation between sanitation actors, it is important to acknowledge divergent stakeholder views, as the results showed that different experts and users had different perceptions and opinions of what weighs most for sustainability;
- Experts' sanitation options final ranking generally ranked dry sanitation options (KVIP and UDDT) low in preference for wet ones such as pour-flush, simplified sewerage, and dry VIP latrine option. They ranked pour-flush latrine first followed by VIP latrine and then SS. KVIP latrine option (one of the common sanitation options in Kumasi) was ranked last but one to UDDT.

8. Limitations
Acquiring individual or even household-level responses in crowded urban areas could be challenging due to possible information leakage between respondents. Representativeness is also difficult to achieve in areas where household sizes range from 3 to 100. It is therefore likely that in future application of the planning approach a more iterative community data collection method would be needed.

References
Avvannavar, S. M. and Mani, M. (2007). A conceptual model of peoples' approaches to sanitation. *Science to the Total Environment.*

Cotton, A., Franceys, R., Pickford, J. and Saywell, D. (1995). *On-Plot Sanitation in Low-Income Urban Communities: A Review of Literature.* WEDC: Loughborough University of Technology.

Courtney, P. (2011). *Determining an Economic Solution to Sanitation in Soweto, South Africa* (MEng thesis). Leeds: School of Civil Engineering, University of Leeds.

Feachem, R. G. (1984). 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. Ghana Statistical Service (2011). *2010 Population and Housing Census Provisional Results – Summary of Findings.* Accra: Republic of Ghana.

Hutton, G., Haller, L. and Bartram, J. (2007). Global cost-benefit analysis of water supply and sanitation interventions. *Journal of Water and Health* **5** (4), 481 – 502.

Isunju, J. B., Schwartz, K., Schouten, M. A., Johnson, W. P. and Dijk, M. P. (2011). Socio-economic aspects of improved sanitation in slums: a review. *Public Health* **125**, 368 – 376.

Jenkins, M. W. and Curtis, V. (2005). Achieving the "good life": why some people want latrines in rural Benin. *Social Science and Medicine* **61**, 2446 − 2459.

Jenkins, M.W. and Scott, B. (2007). 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.

Katukiza, A. Y., Ronteltap, M., Olega, A., Niwagaba, C. B., Kansiime, F. and Lens, P. N. L. (2010). Selection of sustainable sanitation technologies for urban slums – a case of Bwaise III in Kampala, Uganda. *Science of the Total Environment* **409**, 52 – 62.

Maoulidi, M. (2010). A water and sanitation needs assessment for Kumasi, Ghana. *MCI Social Sector Working Paper Series No. 16/2010.*

Mara, D. (2010). Sanitation options for low income urban areas: technical options and financial arrangements. *Kf W Water Symposium 2009: Financing Sanitation,* Frankfurt, 8 – 9 October.

Mehta, M. and Knapp, A. (2004). The challenge of financing sanitation for meeting the Millennium development Goals. *The 12th Session of the United Nations Commission on Sustainable Development (CSD – 12).* New York Millennium Cities Initiative (2008). *Invest in Ghana: Focus Kumasi.* Canada: Columbia University.

Nawab, B., Nyborg, I.L.P., Esser, K.B. and Jenssen, P.D. (2006). Cultural preferences in designing ecological sanitation systems in North West Frontier Province, Pakistan. *Journal of Environmental Psychology* **26**, 236 – 246.

Nkansah, A. (2009). Management of faecal sludge in the urban areas of low-income countries: a case study of Tamale, Ghana. *Doctoral Thesis.* Loughborough University, U. K.

Otti, V. I. (2011). Prospects and processes of human waste management in the rural areas of Nigeria. *Journal of Toxicology and Environmental health Sciences* **3** (5), 142 – 144

Pearson, J. and Mcphedran, K. (2008). A literature review of the non-health impacts of sanitation. *Waterlines* **27** (1), 48 – 61.

Republic of Ghana (1993). *Strategic Sanitation Plan for Kumasi.* Kumasi Metropolitan Assembly. Republic of Ghana (2010). *The Coordinated Programme of Economic and Social Development Policies, 2010 – 2016. An Agenda for Shared Growth and Accelerated Development for a Better Ghana.* Accra: Republic of Ghana

Roma, E., Buckley, C., Jefferson, B. and Jeffrey, P. (2010). Assessing users experience of shared sanitation facilities: a case study of community ablution blocks in Durban, South Africa. *Water SA*, **36** (5).

Schouten, M. A. C. and Mathenge, R. W. (2010). Communal sanitation alternatives for slums: a case study of Kibera, Kenya. *Physics and Chemistry of the Earth* **35**, 815 – 822.

Simpson-Hêbert, M. (2007). Low-cost Arborloo offers Ethiopians health and agricultural benefits. *Waterlines* **26** (2), 12 – 14.

Thrift, C. (2007). Sanitation policy in Ghana: Key factors and the potential for ecological sanitation solutions. *Stockholm Environment Institute, Stockholm.*

Whittington, D., Lauria, D. T., Wright, A. M., Choe, K., Hughes, J. A., Swarna, V. (1992). *Household Demand for Improved Sanitation Services: A Case Study of Kumasi, Ghana.* Washington, DC: United Nations Development Program – World Bank Water and Sanitation Program.

WHO/UNICEF JMP (2014). *The Millennium Development Goals Report 2014.* USA: WHO/UNICEF.

Wright, A. M. (1997). *Towards a Strategic Sanitation Approach: Improving the Sustainability of Urban Sanitation in Developing Countries.* UNDP-World Bank Water and Sanitation Program.

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