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SEWAGE, SEPTAGE AND FAECAL SLUDGE MANAGEMENT PROFILE IN HO DISTRICT OF GHANA

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Abstract

The paper presents the sewage, septage and faecal sludge management profile in the Ho District of Ghana. The excreta handling facilities available in Ho District are water closet systems, KVIP, pan/bucket latrines and public latrines. About 71 per cent of the population, especially people in the densely populated and low income communities, depend on pit/ KVIP/public latrines, and about 16 per cent of the population have no access to toilet facilities. Due to inadequate sanitation vehicles and equipment the District Assembly faces a lot of difficulties in the collection of septage and faecal sludges. The SS, BOD and faecal coliform of the septage were 70 mg/l, 320 mg/ l and 3.0 million counts/100 ml while the SS, BOD and faecal coliform of the raw sewage were 40 mg/l, 300 mg/l and 11 million counts/100 ml. There is the need for a definite and well coordinated effort by the agencies involved to properly manage the sewage, septage and faecal matter in the Ho District if the adverse effects of liquid waste on public health and environment are to be minimized, and a clean and healthy environment in the District is to be ensured.

Résumé

HODGSON I. O. A.: *Le profil de gestion des eaux d'égout, de septage et des vidanges fécales dans le district de Ho du Ghana.* Cet article présente le profil de gestion des eaux d'égout, de septage, et des vidanges fécales dans le district de Ho du Ghana. Les équipements de manutention d'excrétions disponibles dans le district de Ho sont les systèmes de W-C, KVIP, les latrine à cuvettes/seaux et les latrines publiques. A peu près 71 % de la population surtout les gens dans les communautés densément peuplées et à faible revenu dépendent de latrines à fosses/KVIPL/ publiques et à peu près 16 % de la population n'ont pas d'accès aux toilettes sanitaires. En raison d'insuffisance de voitures sanitaires et d'équipments l'Assemblée du District recontre beaucoup de difficultés dans l'évacuation de septage et des vidanges fécales. Les solides en suspension (SS), la démande d'oxygène biochimique (DOB) et le coliforme fécale du septage étaient 70 mg/l, 320 mg/l et 3.0 million de comptes/100 ml alors que SS, DOB et le coliforme fécale des eaux d'égout non traitées étaient 40 mg/l, 300 mg/l et 11 million de comptes /100 ml. Il y a la nécessité pour un effort précis et bien coordonné par les agences concernées de gérer proprement les eaux d'égout, le septage et la matière fécale dans le district de Ho si les effets défavorables de liquides usées sur la santé publique des habitants et l'environnement doivent être réduit au minimum, et si un environnement propre et sain pour les gens du district doit être assuré.

Introduction

It is estimated that about 2.4 billion people do not have access to basic sanitation (WHO, 2002) and all countries, including Ghana, are expected to reduce the fraction of people without access to hygienic sanitation by half in 2015 (WHO, 2004). In some of the district assemblies in Ghana, the sanitation programs have not been considered jointly with water supply (NDPC, 2004). Emphasis has been placed on water supply, neglecting the sanitation aspect. Such great efforts at providing potable water without making any improvement in the sanitation systems could lead to increase in epidemics and decrease the general quality of life, thereby, defeating the purpose for the provision of the potatble water supply. It is generally known that people who live in places with inadequate sanitation facilities, especially in the developing countries, suffer from diarrhoea, intestinal worms, etc. (WHO, 2004). It is, therefore, necessary to provide adequate sanitation facilities for everybody in the community to use if the spread of enteric diseases are to be reduced and the pollution of surface and groundwater is to be minimized.

In many parts of Ghana there are inadequate toilet facilities available to meet the demands of the growing population (Hodgson & Larmie, 1999). A good number of the people, especially children, defecate indiscriminately making the collection of human wastes very difficult and expensive. Due to inadequate sanitation facilities, vehicles and equipment (the District has only two cesspit emptiers available to the District Assembly for collection) as well as lack of treatment and disposal facilities and insufficient trained staff, the management of liquid waste has become a difficult task in some districts in the country. The lack of environmental awareness creation and education also makes it difficult for people in some districts in the country to give their maximum support in the fight to properly manage liquid waste.

The objectives of this study were to determine the different excreta handling facilities in use in the Ho District and assess the quality characteristics of septage and sewage to obtain information on the technologies for the collection, treatment and disposal of liquid waste; to ascertain the problems associated with the sewage, septage and faecal sludge management in the District, and suggest methods of improving the existing mangement system in place.

Experimental

Information for the study was obtained from the literature (GSS, 2005; NDPC, 2004), from discussions held with some of the workers of the Ho District Assembly and field visits. Grab samples of raw sewage and septage were collected from the Military Barracks and the septic tank at Social Security and National Insurance Trust (SSNIT) flats, respectively, at Ho and sent to CSIR-Water Research Institute laboratories for analysis. Standard methods for examination of water and wastewater approved by the American Public Health Association (APHA, 1998) were followed for the laboratory analyses. The waste water quality parameters analysed for the various analytical methods employed are given in Table 1. The temperature, *p*H and conductivity were measured *in situ*.

Study area

Ho District is the largest district in the Volta

TABLE 1

Waste water parameters and the analytical methods employed

Parameter	*Method employed*
Temperature	Mercury in glass thermometer
*p*H	Gallenkamp *p*H meter
Conductivity	Jenway model 4020 meter
Trace metals	Atomic absorption spectrophotometry (AAS)
Chloride	Argentometric method
Sodium	Flame photometer
Potassium	Flame photometer
Sulphate	Turbidimetric method
Ammonia	Direct nesslerization method
Suspended solids	Gravimetric method
Biochemical oxygen demand	Dilution and dissolved oxygen after incubation at 20^{o}C for 5 days
Chemical oxygen demand	Potassium dichromate reflux method
Total coliform	Membrane filtration method
Faecal coliform	Membrane filtration method

Region of Ghana. Ho is both the regional and district capital. The District lies between latitudes $6^{o}\ 20^{1}$ N and $6^{o}\ 55^{1}$ N and longitude $0^{o}\ 12^{1}$ W and $0^{o}\ 53^{1}$ N (Fig. 1). The District falls within the semi-equatorial climatic zone and the wooded savanna zone. The rainfall season is between March and October and the average fainfall is about 1300 mm. The dry season is between November and mid-March each year. The diurnal temperature is between 20 ^{o}C and 30 ^{o}C and evapotranspiration is about 1260 mm/yr (Mote, 1998). The District has a total land area of 2,600 km^{2} (GSS, 2005). The vegetation type is the moist semi-deciduous forest.

Geologically, the District is underlain by the Dahomeyan formation (80%) and the Togo series (20%). The Dahomeyan formation comprises crystalline gneisses and migmatites with subordinate quartz schists and biotite schists while the Togo series consist of metaporphosed arenaceous and argillaceous sediments (Kesse, 1985). The population of Ho District is about 235,331 with an average annual growth rate of 1.7 per cent and a population density of about 90 people per km^{2}. About 66 per cent of the population live in urban areas

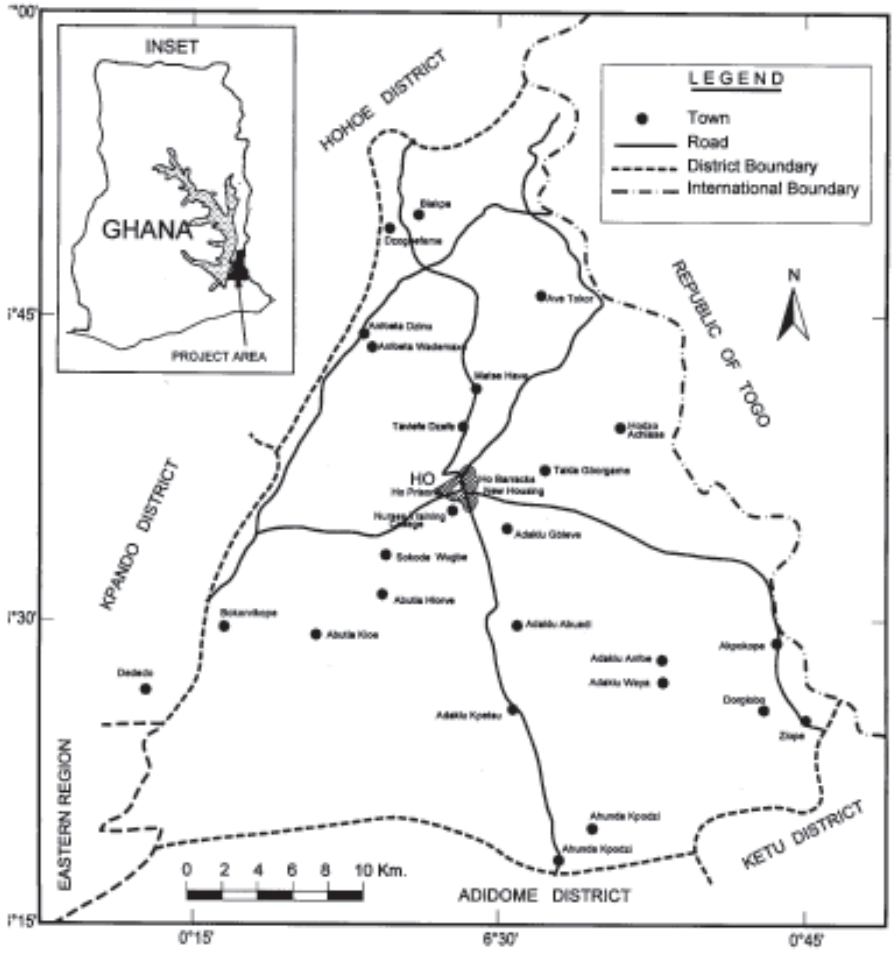

Fig. 1. Map of Ho District

while the rest (44%) live in rural communities. The total number of houses is about 31,392 (GSS, 2005).

The sewage, septage and faecal sludge are managed by the District Assemblies. The various toilet facilities available are the water closet systems, public latrines, Kumasi ventillated improved pits (KVIP) and pan/bucket latrines. While the Ho District Assembly aims at providing the populace with hygienic and safe toilet facilities, quite a substantial number of people, especially children, end up defecating indiscriminately in open areas.

Excreta handling facilities

Pan or bucket toilet facility. Pan or bucket toilet facility is very simple, easy to construct and use. About 12,000 people, i.e. 5 per cent of the population, use this facility. The District Assembly has put in place bye laws that require new houses to have water closets and not pan latrines. This bye law can only be implemented if the law enforcing agents can get the landlords to comply with the order. Presently, the District Assembly does not recruit labourers for the collection and emptying of individual pan latrines. The landlords depend on private contractors for the collection and disposal of their liquid waste. Unfortunately, these private contractors empty the nightsoil indiscriminately arround the surrounding houses, bushes, open areas and gutters. Such methods of disposal create environmental health problems to the inhabitants in the area and also pollute the environment. These private contractors carry out their nefarious practices under the cover of darkness.

Pit/KVIP/Public latrines. About 167,000 people, i.e. 71 per cent of the population in the District, use public latrines. The pit/KVIP/public latrines are very common in densely populated and poor communities where there are no toilet facilities in individual homes.

Water closet facilities. About 18,800 people, i.e. 8 per cent of the population in the District, use water closet facilities. The water closet facilities are enjoyed mainly by people who live mostly in government housing facilities.

No facilities (bush or open areas). About 37,700 people, i.e. 16 per cent of the population, have no access to any specified toilet facility and use the bushes or open areas. The practice of indiscriminate defeacation should not be encouraged since the feacal matter would invariably end in surface waters when it rains to pollute the environment.

Septage and sewage quality characteristics

The characteristics of the raw septage and sewage were compared to the Ghana Environmental Protection Agency (EPA) guideline values (EPA, 2003) to establish whether the requirements for the discharge of waste waters into receiving water bodies are met. The results of the quality of the sewage and septage alongside the EPA guideline values are given in Table 2.

The *p*H of septage (6.9) and sewage (6.4) were satisfactory since they both fell within the EPA guideline range of 6-9 (Table 2). The conductivity level of the septage (1811 µS/cm) was higher than the EPA guideline value of 1500 µS/cm while the conductivity of the sewage (361 µS/cm) was satisfactory. The suspended solids (SS) concentrations of both the sewage (108 mg/l) and septage (70 mg/l) were higher than the EPA guideline value of 50 mg/l. Higher levels of SS can lead to the development of sludge deposits and anaerobic conditions when untreated waste water is discharged into the aquatic environment.

The biochemical oxygen demand (BOD) levels of both the septage (320 mg/l) and the sewage (300 mg/l) were found to be higher than the EPA guideline value of 50 mg/l. Waste waters with a high BOD level if discharged into the environment may deplete the oxygen resources and develop septic conditions. The faecal coliform of both the septage (3.0×10^6 counts per 100 ml) and sewage (5.0×10^6 counts per 100 ml) were high. The EPA guideline value is 0 count per 100 ml. Communicable diseases can be transmitted by the pathogenic organisms that may be present in sewage

TABLE 2

Results of the septage and sewage quality alongside the EPA guideline values

Parameter	*SSNIT Flats septage*	*Ho Military Barracks raw sewage effluent*	*EPA guideline value*
Temperature (°C)	31	36	< 3 °C above ambient temperature
*p*H	6.9	6.4	6 – 9
Conductivity (µS/cm)	1811	361	1500
Sodium	80	20.6	-
Calcium	28.3	18.8	-
Potassium	65	20.8	-
Chloride	138	40	-
Sulphate	26	2.0	-
Nitrate–N	1.3	<0.001	50
Phosphate-P	15	3.40	2
Suspended solids	70	108	50
BOD	320	300	50
Total coliform (million counts/100 ml)	3.4	6.4	400
Faecal coliform (million counts/100 ml)	3.0	5.0	0

TABLE 3

Classification of sewage strength by Mara (1976)

Sewage strength	*BOD_5 mg/l*
Weak	< 200
Medium	350
Strong	500
Very strong	> 750

and septage. To eliminate the harmful effect that both the sewage and septage may have on the health of the people and to comply with the EPA guideline values faecal matter has to be treated before being discharged to the environment.

There are different classifications for sewage strength in the literature (Mara, 1976; Tchobanoglous, 2003). Mara's (1976) classification is based on the BOD level of the sewage (Table 3) while Tchobanoglous (2003) classification is based on an approximate waste water flow rate. The classification of typical composition of untreated domestic waste water by Tchobanoglous *et al.* (2003) alongside the results obtained in this study are presented in Table 4. Using Mara's (1976) classification, both the septage (320 mg/l) and the sewage (300 mg/l) would be considered as having medium strengths (200-350 mg/l) while comparing with the classification by Tchobanoglous (2003) the septage and the sewage could be classified as medium to high strengths.

Faecal matter treatment facility

The only faecal matter treatment facility, a trickling filter, at Ho Military Barracks was not working and has been abandoned. A cesspit emptier is used to collect sewage from the sedimentation tank and disposed into trenches at Congo, which is the disposal site. Proper treatment of the sewage, septage and faecal sludge in the District could yield sludge that could be composted and used to enrich the soil of poor and degraded farmlands in the District. The treated effluent could also be used for irrigation after it has been ascertained that there are no cultural barriers to its use. Thus, apart from eliminating the hazards or negative impact associated with sewage, septage and faecal sludge on the environment, the Ho District As-

TABLE 4

Classification of sewage strength alongside results obtained in study

Parameter	*Units*	*Concentration*				
		Low Strength	*Medium Strength*	*High Strength*	*Septage*	*Sewage*
SS	mg/l	120	210	400	70	108
BOD	mg/l	110	190	350	320	300
Nitrates	mg/l	0	0	0	1.3	< 0.001
Phosphates	mg/l	3	5	10	15	3.4
Chlorides	mg/l	30	50	90	138	40
Sulphates	mg/l	20	30	50	26	2.0
Total coliform	counts/100 ml	10^6 - 10^7	10^7 – 10^9	10^7 - 10^{10}	3.4 10^6	6.4 10^6
Faecal coliform	counts/100 ml	10^3 - 10^5	10^4 - 10^6	10^5 -10^8	3.0 10^6	5.0 10^6

Source: Tchobanoglous, 2003

sembly could also derive some economic benefits.

Septage and faecal sludge disposal

The collected sewage from the Ho Military Barracks, septage and faecal sludges were finally disposed off in longitudinal trenches (about 7.2 m × 0.9 m × 2.4 m). Instead of the primitive way of dumping sewage, septage and faecal sludge into trenches, drying beds could be adopted and sludge used for agricultural purposes.

General observations

1. It appears that children are left out in the design and usage of the community latrines. It is common to find children defecating indiscriminately on open grounds around houses, bushes and refuse dump sites.
2. No cleansing water is provided for the people who visit the public latrines.
3. There is generally a low level of awareness of the health implications associated with the use of poor and inadequate toilet facilities.
4. No provision has been made for underground holding tanks to temporary store the faecal sludge for onward transmission to the final disposal site, thus, the indiscriminate dumping of faecal matter collected from the pan latrines around the surrounding houses.
5. Lack of proper landuse and planning of the communities in the District has deprived it of good sanitary and disposal sites.
6. There is lack of proper co-ordination and harmonization of programmes by agents involved in water and sanitation in the District.

Conclusion

The study has highlighted the sewage, septage and faecal sludge profile of the Ho District. The excreta handling facilities available in the District are water closet systems, KVIP, pan/bucket latrines and public latrines. Majority of the people, about 71 per cent of the population, especially people in the densely populated and low income communities in the district, depend on public latrines or pit latrines or KVIPs. About 16 per cent of the population has no access to any toilet facilities (they use bushes and open areas). Due to inadequate logistics the collection of sewage, septage and faecal sludges is not efficient. There is the need for a definite and well coordinated effort by the agencies involved to properly manage the sewage, septage and faecal matter in the Dis-

trict if the adverse effects of liquid waste on public health and the environment are to be eliminated so as to ensure a clean and healthy environment for the people in the District.

Acknowledgement

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