

A Survey of Household Practices, Experiences and Expectations on Wastewater Management in Conakry, Guinea

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Abstract

People in developing countries, including Guinea, face a lot of problems in terms of sewage management. This is because sanitation provision is grossly deficient. Most people do not have access to hygienic toilets, and large amounts of faecal waste are discharged to the environment without adequate treatment. This has major impacts on infectious disease burden and quality of life. In view of this, a study was carried out with the aim of assessing knowledge, practices, perceptions, and experiences of households on sanitation and sewage management in Conakry, Guinea. The household survey results show that the sewage system remains underdeveloped, and there is no clear vision to improve the system. Greywater generated in the household is not re-used; it is generally released outside the household on the ground or in the stormwater drainage system directly. Treated wastewater from the treatment plants is drained into surface water bodies such as rivers and the ocean. It is further shown that the people of Conakry consider waste management the most important element to their health and quality of life, and households are not satisfied with the current services they get from the authorities. The residential sector is mainly affected by poor waste management and sewage disposal and seawater quality. However, it is pleasing to note that the residents are willing to contribute financially to projects that would reduce the risk of contamination of seawater. It is therefore recommended that Guinea adopt the concept of sustainable wastewater management, emphasize institutional effectiveness, create an enabling environment, and promote awareness campaigns for good wastewater management practices.

Keywords: *Wastewater, Management, Conakry, Household, Sanitation*

1. Introduction

In the history of wastewater management, the main strengths have been to remove wastewater from users in order to prevent unhygienic conditions and to remove storm water to avoid damage from flooding. All this should be done without harming the environment. Existing wastewater systems in the developed countries fulfill these fundamental requirements to a certain degree. People in developing countries face a lot of problems in terms of sewage management. This is so because sanitation provision in developing countries is grossly defi-

cient. So is the case in Conakry. Most people do not have access to hygienic toilets, and large amounts of faecal waste are discharged to the environment without adequate treatment. This is likely to have major impacts on infectious disease burden and quality of life (Hutton, et al., 2007).

The adverse impact of sewage is best addressed by establishing integrated programs where all types of waste and all facets of the waste management process are considered together. This holistic

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approach calls for clearer information on the current situation with regards to practices, knowledge, and perceptions on sewage management, particularly at the household level.

Therefore, this paper presents an assessment of household practices, experiences, and expectations regarding wastewater management services in Conakry. The assessment includes identification of problems and their solutions in order to improve Conakry's sewage system management.

2. Research Methodology

a. Study Site

The research was conducted in Conakry, which is the capital city of Guinea. It is located between 9°30' and 9°40' N and 11°30' and 13°40' W. The peninsula extends from the northeast to the southwest over a distance of 36 km. It is a narrow band of 1 to 8 km wide with an area of about 200 km². It is a port city on the Atlantic Ocean and serves as the economic, financial, and cultural centre of Guinea. Originally situated on Tombo Island, one of the Îles de Los, it has since spread up the neighboring Kaloum Peninsula.

The coastal region of Guinea and most of the inland have a tropical climate with a monsoonal-type rainy season lasting from April to November, relatively high and uniform temperatures, southwesterly winds, and high humidity.

Conakry is subject to a sub-Guinean tropical climate, characterized by two very contrasting seasons—a very dry season with northeasterly harmattan winds from December to May and a wet season with very intense rainfall from June to November. In addition, the local microclimate is responsible for a very abundant rainfall due to the influence of the ocean that brings the monsoon and sea breezes. Conakry's year-round average high is 29°C, the low is 23°C, and its average annual rainfall is 4,300 mm. In general, the average annual rainfall varies considerably from one year to another. Humidity varies from 69% to 88% (IRIN, 2009).

The population of Guinea is estimated at 10.2 million, giving an average population density of

38.5 inhabitants/km² and comprising about 24 ethnic groups. The annual population growth rate is estimated at 2.63%, with the projected population for the year 2015 at 11.2 million. The active population accounts for 42% of the total population while 64% of people live in rural areas (INS, 2008).

The population of Conakry is difficult to ascertain, although the U.S. Bureau of African Affairs has estimated it at 2 million (U.S. Department of State, 2007). Conakry is thought to contain almost a quarter of the population of Guinea.

b. Data Collection

Data collection was done through document/literature review and household surveys. The aim of the document review was to review the current status of the sewage system in Conakry and to evaluate the current management practices in line with some set standards. Several documents from government institutions, non-governmental organizations, and research centers on water and sanitation were reviewed.

The household surveys were employed to (1) identify and evaluate the level of household knowledge on local authority service delivery in sewage management; (2) assess the knowledge, practices, perceptions, and experiences of households on sanitation and sewage management; and (3) evaluate the nature and level of interaction between households and local authorities on sewage management. Questionnaires were used in the household surveys.

For the household surveys, a precision of $e = \pm 10\%$ (with a confidence level of 95 % and $p = 0.5$) was used to randomly select 100 households from Hafia, Bonfi, Matam, Almamy, and Sander-vallya districts in Conakry. The sample size was determined based on the sample size determination tables as reported in Israel (2012). The response rate was 77% due to transport problems caused by heavy rainfall.

c. Data Analysis

Data was analyzed through document analysis, descriptive statistics, and hypothesis testing. The analysis was achieved by using Excel and SPSS.

3. Results and Discussions

a. Sanitation Status in Conakry

The lack of proper urban waste (equipped landfills, wastewater treatment plants, etc.) in the capital Conakry highlights the degradation of the quality of life of the people. They often use informal means of “open dump” and dump the garbage in an open space, rivers, the sea, and the gutters, causing pollution of water and soil.

It should be noted that in Conakry, garbage collection is summed up in three stages: collection by SMEs, the management of the Assembly points, and transfer by Public Service Waste Transfer (PSWT) to the “Minière” dump site, the only authorized dump site for the city of Conakry. The “Minière” dumpsite, as it is known today, is a real ecological and social disaster because it now sits almost in the middle of the houses due to the fact that people have illegally constructed houses around it.

Hygiene and safety services are under-equipped. Stormwater drainage gutters are clogged in many places. Sea borders are affected by garbage produced during fishing activities and the inhabitants of Conakry. The consequences of this in sanitation are numerous, including the progressive degradation of the environment, especially in the sea border, with a high risk of flooding during periods of heavy rainfall.

Storm drainage gutters exist in some districts of Conakry and are undersized where they exist. They also suffer from a chronic lack of maintenance and improper use by the households due to discharges of sewage and solid waste, illegal connections of sewage, etc., creating obstructions and flooding. The growth of the city of Conakry has resulted in more houses and roads being constructed. This has led to an increase of waterproofed surfaces, strongly reducing the infiltration capacity and thereby resulting into flooding.

Despite the progress made during the International Decade for Drinking Water and Sanitation (IDDWS), the majority of urban suburbs and rural areas are insufficiently equipped with sanitary facilities. Table 1 shows the percentage of Guinea's population that has had access to improved and unimproved sanitation facilities since 1990. A household is said to have improved facilities if it has a flushing toilet, water pour pit latrine, or

ventilated improved pit (VIP) latrine. If not then it has unimproved sanitation facilities.

Table 1

Use of sanitation facilities in Guinea (% of population) (UNICEF/WHO, 2012)

Year	1990	2000	2010
Population (x 1,000)	5,759	8,344	9,982
Urban Population (%)	28	31	35
Urban Improved	19	26	32
Urban Unimproved			
Shared	23	32	40
Other unimproved	52	39	27
Open defecation	6	3	1
Rural Improved	6	9	11
Rural Unimproved			
Shared	4	5	6
Other unimproved	35	44	53
Open defecation	55	42	30

It can be observed that for the urban households, the percentage of the population having access to improved facilities increased from 19% in 1990 to 32% in 2010. While for the unimproved shared facilities, the percentage also increased from 23% to 40% during the same period. It is worth noting that the use of other unimproved facilities and open defecation for urban households decreased during this period from 52% to 27% and from 6% to 1%, respectively.

Institutionally, sanitation is under the Directorate of Land Planning and Housing in the Ministry of Urban Planning, Housing and Construction. The country is moving towards implementing the national policy document on sanitation, which was validated by the government in 2010.

b. Wastewater Management in Conakry

Wastewater Generation

In Conakry, wastewater comes from households, industry, and commercial buildings. In the household sector the sources of wastewater include toilets, bathrooms, kitchens, laundry, car washing, and storm water. As is the case with most developing countries, statistics are not available on the amounts of wastewater, either municipal or industrial.

According to national survey data from 2002 UNDP (EIBEP 2005, cited in UNDP 2006), about 9% of the population of Conakry had flushing toilets, 88% latrines, and 3% have no toilet (see Fig 2). The World Bank (2001) states that “a large number of plots are equipped with traditional and vault latrines, but these facilities are under-designed, poorly built, and badly maintained. According to the World Bank (2006), following the Third Water Supply and Sanitation Project, about 12% of the population has flushing toilets connected to the sewerage system.

Wastewater Collection

Greywater (water used for cooking, laundry, bathing, cleaning, etc.) is generally released outside the household, on the ground, or in the storm-water drainage system directly. However, the Third Water Supply and Sanitation project achieved a network for wastewater collection of approximately 70 km. All the networks and connections work by gravity to the pumping stations. This system connected a total of 200,000 people.

For the operation of the system, it is expected to have a collector by avenue or street. All of the individual connections are made by the construction of manifolds, while private users of the facilities are connected to an inspection port by a 200 mm diameter PVC pipe. The current operational status of the wastewater treatment plants is not known, nor is the functionality of the sewage system known.

Wastewater Treatment

The city of Conakry has the following sewer treatment plants or stations for its sewage system:

- Two (2) stations at Yimbaya and Sonfonia, which drain by lagooning to the ocean and Botari River, respectively. This system connects a total of 200,000 people.
- Five (5) stations for treatment of sewage by intermittent filter for the Hospital of Donka, University of Conakry, the blocks of professors A, B, and C.
- Five (5) stations in Kaloum, which were constructed to facilitate the collection and minimize costs. These have a capacity of 7000 m³/day, and the treatment works by natural lagooning and includes the following 5 stations (MUHC, 2013):

- o The Boulbinet pumping station, which returns to the pumping station of Diallo Telly with a height of lifting water of 7.20m;
- o The Diallo Telly pumping station return to Tombo pumping station; water from its catchment area increased from the waters of the Boulbinet pumping station, with a height of lift of 12.30 m;
- o The pumping of the port station returns to the pumping station of Tombo with a height of lifting water of 7.90 m.
- o The station of Teminataye returns to the pumping station of tombo with a height of lifting water from 8.20 m.
- o The Tombo pumping station returns the sewage, wastewater from its watershed increased Diallo Telly, Port and Teminataye pumping stations, with a height of lifting water of 18.60 m.

Wastewater Disposal

According to UNICEF/WHO (2012), 32% of the urban population and 11% of the rural population had access to improved sanitation facilities in 2010 (see Table 1). Generally, these consist of 2 cabins per household. The latrines built in Conakry are of three types: simple pit latrines, sealed pit latrines, and septic tank latrines. Latrines are usually built by the residents themselves or unskilled laborers employed on an ad-hoc basis. For this reason, many of them are poorly designed and inefficient from a hygienic and environmental perspective. There has been a campaign for people to construct and use ventilated improved pit latrines (VIP) and manual flush toilets (MFT).

Many public latrines in Conakry, although rehabilitated, remain closed because of poor management and drainage problems. However, in some districts, these toilets work and are widely used. In crowded places, including Madina and flea markets, users would agree to pay as long as public restrooms are maintained.

Greywater (water used for cooking, laundry, body toilet, cleaning, etc.) is generally released outside the household on the ground or in the stormwater drainage system directly. Treated wastewater from the treatment plants are drained into surface water bodies such as rivers and the ocean STRATHEG (2005).

Table 2

Education level of Head of Household and Importance of Wastewater Management to the Household Cross-tabulation and Chi-square Tests

How important is Wastewater Management to you and your household?						Chi-square Tests			
Count		Most important	Important	Not important	Total		Value	df	Asymp. Sig. (2-sided)
Education level of head household	None	19	10	1	30	Pearson Chi-Square	4.088 ^a	6	0.665
	Primary	5	4	0	9	Likelihood Ratio	4.762	6	0.575
	School								
	Secondary	8	5	0	13	Linear-by-Linear Association	0	1	0.986
	School								
	Tertiary Education	18	5	2	25	N of Valid Cases	77		
Total		50 (64.9%)	24 (31.2%)	3 (3.9%)	77				

^a 6 cells (50.0%) have expected count less than 5. The minimum expected count is .35

Table 3

Gender of Head of Household and Importance of Wastewater Management to the Household Cross-tabulation and Chi-square Tests

How important is Wastewater Management to you and your household?						Chi-square Tests			
Count		Most important	Important	Not important	Total		Value	df	Asymp. Sig. (2-sided)
Gender of head household	Male	27	14	2	43	Pearson Chi-Square	0.272 ^a	2	0.873
						Likelihood Ratio	0.276	2	0.871
	Female	23	10	1	34	Linear-by-Linear Association	0	1	0.605
						N of Valid Cases	77		
Total		50 (64.9%)	24 (31.2%)	3 (3.9%)	77				

^a 2 cells (33.3%) have expected count less than 5. The minimum expected count is 1.32

Institutional Set-up

On the sanitation side, the sewage system remains underdeveloped, and it has always been separate from the water supply system. Management of sewage and sewage treatment lies with the Direction de l'Aménagement du Territoire et de l'Urbanisme (Directorate of Land Development and Housing). In 2005, a services contract was signed with the private company Poubelles de Conakry (WUP, 2001) for operation and maintenance of the sewage system. It is not clear whether this contract remains extant. There is no evidence whether any state institution takes any sort of responsibility for onsite sanitation.

c. Access to Water and Water Consumption in Conakry

Figure 1 shows the distribution of how people in Conakry access fresh water. Most of them get water from public water pumps followed by owning a water pump. The public water pumps are connected to the water supply network with the Grande Chutes (Great Falls) reservoir.

Water consumption has been calculated to be 25 liters per capita per day. At the Johannesburg World Summit on Sustainable Development (WSSD) in 2002, governments approved a Plan of Action to "Halve by 2015 the proportion of people unable to reach or afford safe drinking water.

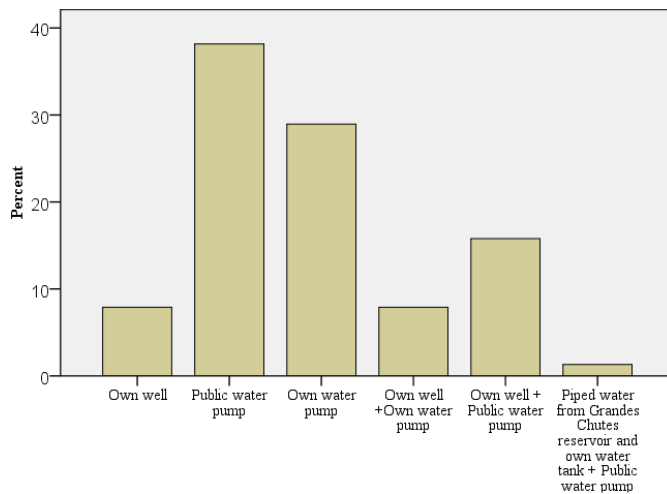


Figure 1: Household's resource of fresh water in Conakry

The Global Water Supply and Sanitation Assessment 2000 Report (GWSSAR) define "Reasonable access" to water as at least 20 liters per person per day from a source within one kilometer of the user's home" (WBCSD, 2005). Guinea appears to be on track to achieve this target on reasonable access to water.

However, access to water is a local distribution issue. The people in urban areas are often closer to water resources than those in the rural areas. The people in the rural areas often do not have access to the infrastructure in place. Hence, the calculated figure might be indicative of the urban areas in Guinea.

d. Importance of Waste Management

Table 2 shows that the people of Conakry expressed the view that waste management is most important (65%) to them. This indicates that the residents in Conakry realize that a failure in sanitation is a source of environmental and health problems. A chi-square test was performed to test the hypothesis that the education level of the head of household does not influence the opinion on the importance of waste management to the households. In Table 2 $\chi^2 = 4.088$, $df = 6$, $p = 0.665$, which implies that this hypothesis may be retained and conclude that education level of head of household does not influence the opinion on the importance of waste management to the households. A similar chi-square test involving gender leads to the conclusion that gender of head of household

does not affect the value of importance one gives to waste management (see Table 3).

e. Toilet Facilities

The distribution of latrines used in Conakry is shown in Figure 2. Most households use pit latrines (45.5%) and water pour pit latrines (37.7%). Very few households have flushing toilets (10.4%).

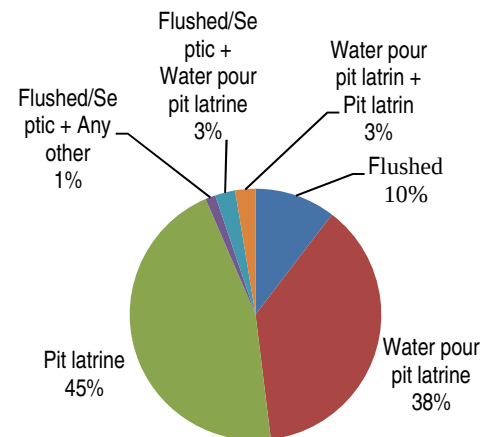


Figure 2: Type of latrines used in Conakry

A chi-square test was performed to determine if there is a relationship between type of household and the choice of type of latrine that is used by the households in Conakry. Since in Table 4 $\chi^2 = 4.333$, $df = 10$, $p = 0.931$, this hypothesis may be retained. It is therefore concluded that there is no relationship between the type of household and the choice of type of latrine that is used by the household. The use of pit latrines is not dependent on the type of household; they are commonly used in Conakry. What needs to be done is the promotion of ventilated improved pit latrines (VIP) and manually flushed toilets (MFT) for better sanitation.

The households using flushing toilets or septic tanks were asked to indicate whether their septic tank is full or not full. It was found that most of the households had their facilities not yet full (82%) and few had their toilets full (18%). Surprisingly, everybody indicated that these facilities are always used, whether full or not, because there is no space to build another one.

Table 4

Type of Household and Type of Latrine Used in the Household Cross-tabulation and Chi-square Tests

		Type of latrine in the household					Total	
		Flushed	Water pour pit latrine	Pit latrine	Flushed/Septic + Any other	Flushed/Septic + Water pour pit latrine	Water pour pit latrine + Pit latrine	
Type of household	Nuclear	2	6	11	0	0	0	19
	Parents/parent with no children	0	1	0	0	0	0	1
	Extended family	6	22	24	1	2	2	57
Total		8	29	35	1	2	2	77
Chi-square tests		Value		df		Asymp. Sig. (2-sided)		
Pearson Chi-Square		4.333 ^a		10		0.931		
Likelihood Ratio		5.782		10		0.833		
Linear-by-Linear Association		0.508		1		0.476		
N of Valid Cases		77						

^a 13 cells (72.2%) have expected count less than 5. The minimum expected count is .01.

Few households (13%) indicated that when their septic tanks are full, they are neither sealed nor drained, while the majority (87%) indicated that their septic tanks are either sealed or drained. The wastewater companies are called to empty the septic tanks. However, most of the households find the service too expensive. This is in addition to the fact that not all the sewage is removed from the septic tanks. The other problems households face with septic tanks are as follows:

- Septic system blocks sometimes
- It fills up quickly because of the number of people in the household
- The slab breaks and the water flows everywhere when some of the septic tanks are full.

Those households with pit latrines indicated that they face problems with water levels rising during the rainy seasons. For the urine diversion toilets, 65% of the households showed that they can consider using a urine diversion facility in their households.

Those who suggested having urine diversion toilets gave the following reasons:

- They can have it if it is a free service or if the government supports its construction financially to make its cost reasonable
- They can have it if the households see the environmental benefit of the system

Table 5

Willingness to Contribute Money Towards Urine Diversion Toilets and Consideration of Using Urine Diversion Toilets Cross-tabulation and Chi-square Tests

		Would you consider using Total a urine diversion toilet?		
		Yes	No	
Would you be	Not anything	3	25	28
willing to	1000 – 2000 FG	1	0	1
contribute	2000 - 3000 FG	4	0	4
money to the	3000 - 4000 FG	2	0	2
building of such	4000 - 5000 FG	6	0	6
a facility at your	5000 - 6000 FG	14	0	14
home?	7000 - 8000 FG	2	0	2
	8000 - 9000 FG	1	0	1
	9000 – 10000 FG	16	0	16
Total		49	25	74
Chi-square tests		Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square		62.026 ^a	8	0
Likelihood Ratio		75.591	8	0
Linear-by-Linear Association		45.391	1	0
N of Valid Cases		74		

^a 13 cells (72.2%) have expected count less than 5. The minimum expected count is .34.

Those who suggested not having a urine diversion toilet cited lack of space and that urine mixes with bathroom water as the reasons. Further analysis (in Table 5) shows that those who did not consider

using a urine diversion toilet were not willing to contribute money for the building of such a facility. To confirm this, a chi-square test was performed to test whether a relationship exists between consideration in using a urine diversion toilet and willingness to contribute money for the building of such a facility. Since from Table 5 $\chi^2 = 62.026$, $df = 8$, $p < 0.05$ the null hypothesis is not retained, it is therefore concluded that consideration in using a urine diversion toilet significantly affects willingness to contribute money for the building of such a facility.

Grey water from the bathroom is either drained into a septic tank (84%) or straight into the ground (16%). As is the case with toilet septic tanks, when the septic tanks for bathroom wastewater are full they are either sealed or drained.

Some households in Conakry have bathtubs and showers, but these are rarely used in low-income families. Most of the times buckets are used for bathing to control the amount of water due to high numbers of people per household.

Wastewater from laundry is mostly (60%) thrown onto the open ground and sometimes into the gutter, while 40% of the laundry water goes into the septic tanks. Of these septic tanks, 87.5% are not yet full and 97% get either sealed or drained when they are full.

Wastewater from the kitchen is mostly drained onto the open ground (62%). Some of the kitchen wastewater goes into the septic tanks (37%). All the households with septic tanks for kitchen wastewater get their septic tank either sealed or drained when they are full. However, at the time of this research 87% of the septic tanks for kitchen water were not full.

It has been observed that wastewater from washing and cooking is not re-used, it just gets drained into the public gutter, pit, old well, onto the ground, or into the septic tank. In fact, 66% of the households indicated that they cannot use the wastewater in their gardens.

One alternative for wastewater treatment and disposal is the soak away system. The majority (55%), though not by much, said they would consider using this system, and 51% indicated that they would be willing to construct such a facility at their premises. Even though the difference between

those willing and those not willing to use the soak away system is not very large, 75% of the households see no problem with this system. The problems that the 25% of the households indicated with the soak away system are as follows:

- There is not enough space for a soak away system
- Maintenance may be costly
- The soak away may contaminate drinking water and sea water due to changes in water table
- Most of the residents have no knowledge on how soak away systems work

f. Household Satisfaction Level on Wastewater Management Service Delivery

Households were asked to rate their level of satisfaction with the services they get from the city authorities regarding domestic wastewater management. Their opinions are shown in Figure 3.

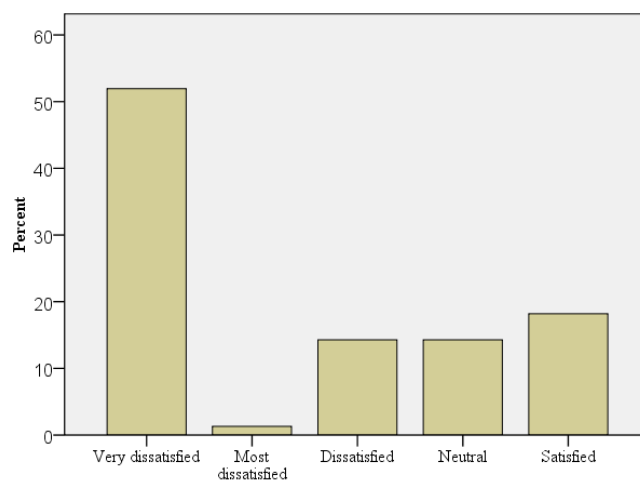


Figure 3: Household Satisfaction Level with Conakry's Service Delivery on Wastewater Management

It can be observed that the majority (68%) of the households are not satisfied with the services, while 14% are neutral, and 18% are satisfied. The areas that would need to be addressed in the wastewater management are as follows:

- Sanitation policy should be implemented in full
- Sensitization of good wastewater management practices should be conducted among both the public and authorities

- Wastewater collection from households should be regular, and that the authorities should be involved
- The wastewater collection system, which includes the gutter and the pipes, need to be improved
- Wastewater must be treated before being drained into the sea
- There is a need for an effective disposal system.

In addition to the rating of their satisfaction with the service delivery, the households were asked if they think that the current state of wastewater management and lack of sewage disposal impacts the residential sector of the town. About 95% of the households indicated that the current state does affect the residential sector in that the city becomes dirty and there is always a bad smell from the seawater because sewage is stagnant, and there are too many flies and mosquitoes everywhere.

The majority of the households (67%) indicated that there is a link between poor waste management and sewage disposal in Conakry and seawater quality. The explanation of the link is that all the wastes are drained into the sea, making the sea polluted and the marine ecosystem disturbed. Even the visual quality and turbidity of the water are disturbed because of too much garbage in the sea.

However, it is pleasing to note that most of the households (81%) are willing to contribute financially to projects that would reduce the risk of contamination of the seawater. The main reason for the willingness is that these projects may contribute to the households' improved health and quality of life, such as a reduction of water borne diseases. Those who were not willing (19%) indicated the following reasons:

- They are too poor to contribute, and the government has to fund the projects
- They can only contribute if loans are provided
- They can only contribute if it is affordable
- They can only contribute if they are forced

One idea that came out clearly is the need for peoples' awareness if there are plans for such projects in order for their implementation to be successful within the communities. It has to be noted that even though a small proportion of the

households are not willing to contribute, almost all households (99%) agree that they see benefits in supporting wastewater management initiatives in the city. The benefits include preservation of recreation parks, creation of employment, protection of biodiversity, and contribution towards sustainable development.

4. Conclusions and Recommendations

From the analyses in the preceding sections, it has been shown that Guinea is on the course of achieving the MDG target in sustainable access to an improved water source by 2015. However, the water supply sector in Conakry faces some problems and challenges, including deficient facilities, poor use of existing capacity, low productivity in the sector, and weak internal management of the system, among others.

On the sanitation side, many public latrines in Conakry, although rehabilitated, remain closed because of poor management and drainage problems. Not all households in Conakry are connected to the sewage system, and as a result, greywater is generally released outside the household, on the ground, or in the storm water drainage system directly.

Conakry residents have shown that waste management is most important to their households. However, the majority of the households are not satisfied with the wastewater management service delivery by the authorities and that the current state affects the residential sector in that the city becomes dirty and there is always bad smell from the sea water. Sewage is stagnant, and there are too many flies and mosquitoes everywhere, and all the wastes are drained into the sea, making the sea polluted and disturbing the marine ecosystem.

For a successful wastewater management in Conakry, it is recommended that the authorities in Conakry concurrently emphasize institutional effectiveness and create an enabling environment, which should include a strong political will, effective legal and regulatory frameworks, and an experienced and motivated workforce. The authorities in wastewater management may also consider adopting the concept of sustainable wastewater management, which emphasizes separation of pollutants at the source, decentralized management of components of wastewater facilities, and reuse of

by-products, especially treated wastewater and sludge. Interventions for the improvement of wastewater management in Guinea may include developing Public-Private Partnership (PPP) and establishing policies and regulations on concession management systems, developing real time Water Quality Model (WQM), and integrated wastewater management approach.

Most importantly is the promotion of the household awareness campaigns for good wastewater management practices, which may include a bag-it-and-bin-it campaign, think before you flush, disposing of garbage in litter bins when visiting the seaside, and the clean coast initiative.

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