

## Water-dependent livelihoods in selected communities: Analysis of practices and perception of water quality in Accra

### SWITCH Scientific Meeting

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*Various water-dependent livelihoods depend on both domestic and surface water sources. In Accra, Ghana, investigation shows that the productive uses of domestic water, which are not intentionally planned as part of household water systems, appear to be significant in terms of numbers of direct and indirect beneficiaries, the contribution to household income and the services they provide to the city population. In general treated water quality is considered good for various purposes whereas the use of surface water is limited. Though surface water has some uses today, many other past uses have had to be dropped due to pollution. The pollution has been attributed to the manner of disposal of human excreta and solid waste by individuals, and institutional lapses, among others. The paper presents preliminary findings on various practices in water-dependent productive activities. It presents the perception of river water quality and the factors influencing current behaviour and how unfavourable behaviour can be changed. The goal is to deepen the understanding of the urban water planning process.*

**Keywords:** Livelihoods, practices, perception, pollution, water quality

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## 1 Introduction

Livelihoods within the urban settings reflect the assets, capabilities and activities that individuals embark upon to make a living. Livelihoods strategies of individuals often are related to the objective of improving on their assets status. People aspire to get out of poverty for instance through increased income levels, increased food security, improved health status and general well-being (DFID, 1999). Productive use of water [water-dependent occupations] includes crop cultivation, food preparation and vending, car washing, construction, livestock keeping, floriculture, and hair and beauty salon operating (Abraham *et al.*, 2007). In Accra, there are about 1000 farmers on 7 large sites along streams and drains cultivating vegetables for the city on about 100ha in the dry season only (Obuobie *et al.*, 2006). Vegetable farming is mainly dependent on irrigation. It is therefore mainly practiced on valley bottoms along streams, which are now practically wastewater conduits.

For other productive use of water, people put in a lot of effort to access treated water, often paying between 3.6 to 12 times higher than the water utility domestic rate and 2.6 to 9 times higher even than the water utility direct commercial rate for water (Abraham *et al.*, 2007). The productive uses of domestic water, which are not intentionally planned as part of household water systems, appear to be significant if valued in terms of numbers of direct and indirect beneficiaries, the contribution to their household income and the services they provide to the city population. Many of the informal enterprises use substantial amounts of water with expenditure on the water being upto 30% of the income generated by such water use. In terms of livelihoods significance, for many the income from these informal enterprises represents 100 % of their earnings (Abraham *et al.*, 2007; WaterAid 2001).

Water supply coverage to the city is about 80% but this does not necessarily imply a house connection. In reality only 45% of the population has a household or at best a yard connection and this category includes the urban rich. The majority who live in the low income settlements depends on water vendors for their daily needs (Abraham *et al.*, 2007). All water uses, which take place outside the household, may be listed under commercial or public (institutional) water use. The most important groups are industries, water (vending) enterprises and livelihoods [activities] depending on water. In the urban environment, industries are the most well known and biggest non-domestic water users (GWCL, 2006). Small scale water vending is also a practice in communities where some households do not have access to a GWCL pipe connection. Per capita domestic water supply is said to vary between 60 and 120 litres per capita per day (in the well served areas only) and 25 to 60 liters per capita per day when poor households buy water from vendors (Abraham *et al.*, 2007).

In general treated water is of acceptable quality for various uses in Accra. Commercial urban agriculture is a less user of treated water, although it represents livelihood opportunities for a considerable group of people. Though surface water offers potential for livelihoods, it has been polluted by poor sanitation and solid waste management practices, thus limiting its use for many productive activities (Biney, 1998 and Boadi and Kuitunen, 2002).

Key challenges confronting urban sanitation relates to disposal problems especially at on-site low cost facilities where disposal is often done in an unsanitary manner. In Accra, about 1800 tons of Municipal Solid Waste (MSW) consisting of household and market waste and 600m<sup>3</sup> of human excreta are collected daily (Adampsey *et al.*, 2009). About 67% of the total MSW generated is collected and discharged in land fill sites with the remaining 33% left in the open environment (near riverbanks, drains, roads, and parks). Disposal of human excreta and solid waste can affect surface water quality resulting in certain perceptions of surface water quality.

What we perceive shapes our thinking and guides our actions. Perceptual experiences count as sources and reasons, which provide evidence for judgments and beliefs (O'Callaghan, 2007). Perception influences behaviour of individuals.

The goal of the research in the Odaw River basin is therefore to deepen understanding of the interrelationship between water-dependent livelihoods, stakeholder interventions and institutional responses, and the impacts on the biophysical environment, specifically surface water quality. The objective of this paper however is to analyze existing practices in surface and treated water-dependent livelihoods and to explore how unfavourable behaviour which limits the use of surface water for various livelihoods could be changed. This is to support improvements in the urban water planning process.

## 2 Methodology

### 2.1 Study location

The investigation took place within the Odaw River basin, one of the main river basins in Accra [AMA], covering an area of 250 km<sup>2</sup>. Accra, the capital city of Ghana, covers an area of about 200 km<sup>2</sup> [Fig. 1] (Ghana Districts, 2009). The population of Accra in 2000 was estimated as 1.66 million (Ghana Statistical Service, 2002).

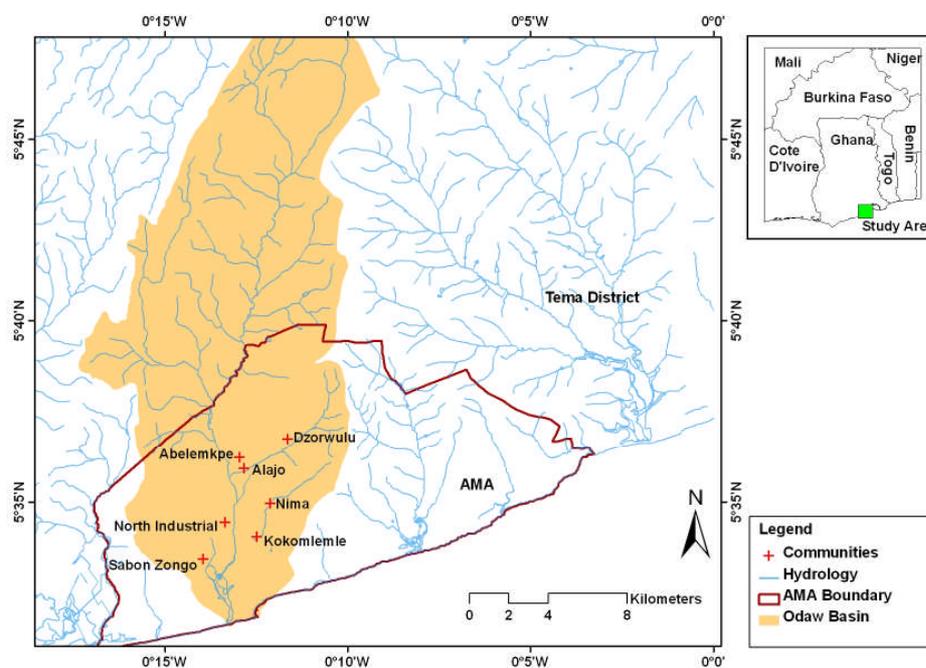


Fig. 1: Location of selected communities

With a population growth rate of about 3.4% annually, the current (2009) population including the Ledzokuku-Krowor Municipal Assembly, which was recently created out of the AMA boundary in

2000, is estimated at 2,242,812. Relating to commercial activities, Accra is estimated to accommodate between 2.5 million to 3 million on a daily basis (Ghana Districts, 2009).

## **2.2 Approach**

Data was obtained through semi-structured interviews and focus group discussions [FGDs]. Four different discussions with different groups of participants were held in each community: 1) a mixed group representing a cross-section of the community, 2) Men, 3) Women, 4) Youth. The guide questions used were in three parts: poverty and wealth [focusing on the differences between a good and a bad living and poverty and wealth]; water use for livelihoods [focusing on access and use of treated and surface water, livelihoods, perception of water quality and changing behaviour]; and sanitation and waste management [focusing on the sanitation situation and access and solid waste disposal and access]. Responses were then analyzed by extracting various ideas and organizing into categories and sub-categories. The issues which emerged are presented in the results and discussion section.

## **3 Results and discussion**

### **3.1 Contextual information on wealth and poverty status**

The number of participants at each FGD ranged between five and eight. The cross-section group consisted of elderly men and women [above 35 years] and youth [men and women with age ranging from 18 to 35 years]. The expressions of meanings and indicators of wealth and poverty, as perceived by the restricted focus groups within the selected communities can be grouped into eight main sets of criteria- *social and personal well-being, psychological or mental state, access to water and sanitation, health and personal hygiene status, access to food, access to jobs and income, financial status, and material possession [Box 1]*. These criteria are important in one way or the other in the selected communities. This contextual information on how wealth and poverty are perceived and expressed is important for analyzing livelihoods in the selected communities.

Wealth and poverty status of people influence choice of occupation (Table 1). Thus people using water for various activities anticipate that they will experience improvements in their lives such that they can get out of poverty

The use of water for one of the following occupations was common in all the communities except Kokomlemlé: food preparation and vending; construction and bagged [sachet] water vending. In high income areas commercial uses of the treated water are mostly in hospitals, hotels, and restaurants, whereas in medium to low income areas it is mostly for food preparation and vending, operation of public toilets and bath houses, as well as other productive purposes. Since many people in such areas do not have access to their own toilets and bath houses, it becomes an important economic activity in the water-sanitation linkage. Thus any disruption in the flow of water in low income areas will affect people's bathing and the hygienic condition of the toilets, since they lack the capacity for storing water. For those in the food sector disruptions in water flow mean little water for preparation, washing of hands and plates in serving and so health safety standards, if any could be compromised.

**Box 1: Expressions of wealth and poverty forms in seven selected communities of Accra****Social and personal well-being:**

- Family background :whether family is wealthy, average, or poor
- Social obligation: ability to pay children's school fees, take care of children and wife
- Appearance: neatness in physical appearance, the way one talks, wearing of rich or poor clothing
- Relationship with people: whether he or she employs civility in interacting with people
- Begging: receiving alms from others
- Charitable acts: voluntarily gives alms
- Social vices: involvement in prostitution, drug use

**Psychological/mental state:**

- Mental state: worries, thinking about what to eat, fear that wife may leave or children insult him/her, peace or lack of it
- Behaviour: behaviour in the community is considered good or bad
- Social security: whether there are investments for tomorrow
- Knowledge base: understanding of environmental issues

**Access to water and sanitation**

- Level of access, ability to afford cost

**Health and personal hygiene status**

- Strength or lack of it to work or possession of good health
- Personal hygiene: physical cleanliness-occurrence of offensive body odour

**Access to food**

- Ability to buy food or not, eats good quality food or not, number of times meals are taken in a day

**Access to jobs and income**

- Whether the person has a job or a livelihood
- Self sufficiency: economic independence

**Financial status**

- possession of money, higher or low purchasing power, possession of financial investments, borrowing with difficulty or inability to pay back
- ability to afford various cost elements of daily life

**Material possession**

Possession of land, houses [shelter/accommodation], cars and shops

**Table 1: Occupations in the selected communities**

Community	Water-dependent occupation		Non-water dependent occupation	
	Men	Women	Men	Women
Abelemkpe	Water vending [Tanker operators], washing bays, fruit juice production [pineapple juice]; block making,	Pure water vending [sachet water], restaurants, small scale food vending, water vending [from taps], hairdressing	Hospital and hotel staff,civil service, teaching, driving, computer, technicians, professionals, football players, butchers, carpenters, trading, shop assistant, steel benders, electrician, apprentice, masonry, plumbing, Fridge repairing, construction,	Hospital and hotel staff , teaching, civil service, trading, sewing
Dzorwulu	Washing bays, ,	Laundries,	Hospital and hotel	Hospital and

	crop cultivation, staff of mineral water producing company [Voltic]	Restaurants, food preparation and vending, crop cultivation hairdressing,	staff, salaried work, staff of waste management company [Zoomlion], night security, taxi, driving, execution of contracts, labourers, trading, drinking spots attendants, gambling, tailoring, construction	hotel staff, salaried work, trading, fish mongering, hair dressing, sewing
Kokomlemle		Food vending, porridge vending,	Salaried work, teaching and other professionals, commercial car driving trading, masonry,, carpentry, painting, tailoring, graphic designing and	teaching, secretarial work, civil service trading, sewing, hair dressing
Alajo		commercial bathroom operation, food preparation and vending , hair and beauty salon	Salaried workers, security officers, civil service, teachers , factory hands, contractors , barbering, commercial car driving, mechanics, tailors , carpenters, traders	Salaried work, waste management [staff of Zoomlion], trading, sewing, general artisanship
Nima	car wash, informal laundry services	hairdressing, food vending, water vending, informal laundry services	Security jobs, salaried work, driving, civil service, business, hand craft and art work production and vending, business, pure water vending[sachet water], batik tie and dye cloth production, carpentry, masonry, mechanics, welding, tailoring, sports men, electrician	Tie and dye batik production , business, trading, hand craft production, sewing,
North Industrial		Food vending (kenkey), hair dressing	salaried work [few], driving, carpentry, painting, industry, teaching, masonry, cleaning, security,	factory work, teaching, salaried work, trading, fish smoking, and

			trading, mechanics, cobblers, tailoring, barbering, milling,	sewing
Sabon Zongo		Food preparation for vending, pure water vending, hair dressing	Security, salaried work, driving, barbering, business , trading, herbal medicine producers, fabric designers, livestock keeping , scrap dealers, farming ,plastic recycling, tailoring, mechanic, electronics, car spraying, players,	, work with the waste management company Trading , Business, sewing, hair dressing, fashion designing

The water dependent occupations are sources of income for many who engage in one form of water-dependent occupation or the other. In some of the cases, the water dependent occupations contribute significantly to the household income reaching 100% in some case. As a result if water-dependent occupations are managed well it should be an avenue for responding to poverty within Accra. Of critical importance however, is to ensure access to water for various purposes. The next section thus discusses access to water, an important resource in the well-being of people.

### 3.2 Access to treated water

Table 2 below shows access to treated water in the selected communities. Access to treated water varied from one location to the other. Abelemkpe, a high income area had an erratic supply due to the low pressure of water in general. Illegal tapping of water was quite prominent a problem in Nima and mentioned briefly in Dzorwulu. In many instances too, water that is registered as domestic is used for commercial purposes (Abraham *et al.*, 2007) .

Considering the significance of access to water in the livelihoods analysis, the onus lies on all stakeholders to ensure that there is access to water for different occupations.

**Table 2: Access to treated water in selected communities of Accra**

Community	Access	Cost of water <sup>1</sup>	Quality of water	Gender and water collection
Abelemkpe	Majority of houses have tap connection and though the flow of water improved since September	PURC rate for Ghana Water Company Limited [GWCL] connection	Good	Both men and women [couples] are involved in water conservation. In case of shortage

<sup>1</sup> The Public Utilities Regulatory Commission [PURC, 2009] rates for tap water is 0.033 peswas per liter for consumption upto 20,000 liters and 0.04 peswas per liter for consumption beyond 21,000 liters for private use and for commercial use a flat rate of 0.11 peswas per liter is charged. [One hundred Ghana peswas is equivalent to one Ghana cedis] [\$ 1 USD is equivalent to 1.47 Ghana cedis as at June 2009

	2008, there is still some degree of irregularity.			of water, wells, boreholes [very few], storage tanks are used.
Dzorwulu	Most houses have pipe connection. The flow of water is regular and usually it is restored two or 3 days when stopped. Low water pressure occurs on weekdays. There are isolated cases of illegal tapping	PURC rate for GWCL connection	Good	Women [married] usually fetch water, clean, cook, and bath children. Some people rely on stored water in their reservoirs
Kokomlemle	Majority of houses have pipe connection. Others also fetch water from neighbour's pipe connection. Flow of water is regular.	PURC rater for GWCL connection, 0.32 Ghana peswas/litre when fetched from a neighbour's connection	Good	Both men and women [couples] are involved in fetching water, children assist when necessary
Alajo	Majority have in - house pipe connection. The flow of water is regular. Pipes which have been connected as domestic and used for commercial purposes are re-classified into the commercial tariff band by the GWCL.	PURC rate for GWCL connection. 0.32-0.37 Ghana peswas/litre when fetched from a neighbours's connection	Good except when there are leakages on pipeline	Fetching water, washing, cleaning, cooking, and bathing of children are all carried out by women [married], except when they [women] are not available.
Nima	About half of the community may be connected. The flow of water is irregular. Illegal connections occur. It is difficult to access water as it flows in the night.	PURC rate for GWCL connection. 0.44-2.22 peswas/litre. Cost of water rises sharply during no flow periods.	Good except the initial 20-30 minutes after water flow is restored. Stored water develop worms after a week	Both men and women [men living on their own] are involved in the fetching of water and its use for domestic and commercial activities
North Industrial Area	Majority fetch water from neighbour's in-house pipe connection. The flow of water is regular. May take approximately 1 hour to fetch water from elsewhere.	Tap water cost 0.31 peswas/litre and this may increase when flow stops	Good. Stored water smells and develops algae after one week	Women [married] are responsible for washing, cleaning, and bathing of children if available.

Sabon Zongo	About half may be connected; those without connection fetch from public stand pipes or neighbour's residence. The water flow is regular; except a small section with a broken pipe.	PURC rate for GWCL connection 0.31-0.37 Ghana peswas/litre	Good	Men and women [couple] are involved in fetching and using water
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### 3.3 Access to surface water

In the AMA boundary, the use of surface water is limited. Apart from Dzorwulu and a place near Sabon Zongo [car washing and vegetable cultivation] the surface water was not used for any domestic or commercial activity in the other selected communities within the AMA boundary. This was attributed to the extremely poor quality of the water which is documented in existing literature (Amoah *et al.*, 2006, 2005; Biney, 1998; Sonou, 2001; Zakariah *et al.*, 1998). A case is made for a holistic view of water dependent livelihoods in the context of an integrated water resources management where every use is maximized. The parallels drawn, especially in the area of contributions to household income, is to encourage and promote measures to improve surface water quality and water use for productive purposes such as urban farming, floriculture, and landscaping. This is under the objective that enhancing access to water can enhance the occupation of the water dependent poor. Since some sections of the river already are using the water for crop farming, it creates an opportunity for presenting a case on possible uses of other sections of the river or maximise. Since some sections of the river outside the AMA boundary have quality which is suitable for selected domestic and commercial activities. This is important for a city where economic scarcity of treated water is an issue. The polluted nature of the water has resulted in certain perceptions of surface water which is discussed in the next section.

### 3.4 Perception of water quality

Table 3 below shows how people along the Odaw River perceived surface water quality in relation to uses. In general the communities considered the Odaw River as a "river" and stated that beyond the AMA boundary the river is used for various domestic and productive activities [confirmed by personal inspection and communication]. The Odaw River, within the AMA boundary, once served as a source of drinking water [in the 1960s] and for other activities at Abelemkpe, however it is currently perceived to be in a poor state. If the quality improves, some people in the Abelemkpe community might use the water for some activity [such as construction]. Abelemkpe is about a kilometer from the point where the water enters the city.

Various occupations located at the banks of the river are perceived to contribute to surface water pollution of the section of the river within the city. Other perceptions of the pollution in the Odaw River have to do with design problems where wastewater drains are open and connected to the river [a common phenomenon in the country]. The biological resources of the river were also perceived to have been affected negatively such that some specific organisms (such as frogs, water snails, among others) can no longer be seen in many sections of the river within the AMA boundary.

Within the AMA boundary, the river water is perceived as not good for productive activity except in a few locations where it is used for irrigated agriculture, car washing, and for construction. The poor quality also poses health risks to children who play around (Suleiman, 2007). In general the perception in the city was that the river is just a “gutter” conveying wastewater [all gutters in the city convey wastewater] [Box 2].

**Box 2. The gutter feeling**

In Accra, gutters convey wastewater; the understanding is that the water is dirty and unfit for any useful activity. As a matter of fact gutters have an odour and are negatively used as the conduit for solid and liquid waste. Many of them are poorly designed and so are unable to drain well such that water stagnates in them

**Source: Authors’ construction**

A factor that influences public acceptance of using surface water is the risk perception which is often related to public health issues from using the water. The public tends to capture a broader conception of risk, incorporating attributes such as uncertainty, dread, catastrophic potential, controllability, and equity into their risk equation (Slovic, 1998). Indeed, the public have on many occasions raised issues over the type of crops cultivated with urban surface water sources in Accra due to perceived public health risks. Consequently several initiatives on contamination risks reduction have been executed (Amoah *et al.*, 2006; 2005).

Intra-individual processes are central when trying to understand why and when individuals act in favour of the environment or not. Nevertheless, a more complete model of proenvironment behaviour should consider the social context within which values and perceptions are shaped and attitudes developed, reinforced or changed. In this spirit, Stern *et al.*, (1995) (as cited in Oreg and Katz-Gerro, 2006) emphasized the importance of considering the social structures which shape individuals’ experiences and ultimately their personal values, beliefs, and behaviours.

While Oreg and Katz-Gerro (2006), adopt the notion that attitudes guide intentions, which in turn guide behaviour, they also suggest that individual’s worldview (perception) precedes their attitudes, that their personal values precede their world views, and that their position within the social structure precedes their worldview.

Considering the enormous benefits of water resources within cities-clean environment, fresh air, tourism , fisheries, transportation, good health, livelihoods, flood control, and disease control, it is important that people’s perception about water are related to how behaviour and practices can be influenced. Contrary to people’s opinion about the Odaw River, a major irrigated urban agriculture site [Dzorwulu, also the site of the SWITCH-Sustainable Water Management Improves Tomorrow Cities Health- demonstration project] in Accra is along one of the tributaries. There are other locations in Accra where irrigated crop cultivation is practiced using water from other basins.

Thus behaviour relating to water is influenced by people’s perception about water quality. Accra is a multicultural city but traditional norms and belief systems are very weak as compared to the more rural areas where the authority of chiefs and opinion leaders seems to be more recognized (personal communication). The following section explains aspects of the position of communities on behaviour and practices responsible for the current pollution in the Odaw River.

**Table 3: Summary of perception of water quality in the Odaw River basin**

<b>Community</b>	<b>Perception of surface water quality</b>
<b>Abelemkpe</b>	The Odaw River running through the city is in a poor state. Some people in the community also discharge solid waste and human excreta into it. The water was useful in the past. If the river quality improves it could be used for construction
<b>Dzorwulu</b>	Mechanical shops along the river contribute to the pollution load. Open defecation contributes to water pollution. Drains are also connected to the river allowing wastewater intrusion. The River formerly contained water snails and in the past was also good for washing. Today the water is unfit for key domestic activities.
<b>Kokomlemle</b>	People use it for construction, car washing and cultivation at some points on the stretch from source [but not in the community]. In Accra the river is polluted but the source [outside the AMA boundary] is of good quality. People dispose of solid waste in the river. Open defecation contributes to surface water pollution. Contents of pan latrines are frequently discharged into the river. Good quality river water should have no filth in it and the water should be useful for various activities.
<b>Nima</b>	Poor quality river water contains human waste and solid waste. The section of the river outside the AMA boundary is perceived to be of good quality and is clean, not filled with solid waste.
<b>Alajo</b>	Poor quality river water is a source of diseases and is a threat to children's health. The river is just a "gutter" presently based on its content. The community is perceived to contribute to the pollution load. Water is withdrawn from good quality rivers for various activities. Today, the river is seen as a drain for wastewater.
<b>North Industrial</b>	Poor quality river water is choked with waste materials, contains human excreta and solid waste. Good quality surface water is clear and has no wastewater entering
<b>Sabon Zongo</b>	Poor quality water is polluted with plastics, solid waste and human excreta. It is black in colour, has an odour, harmful to human health, especially children, and may contribute to transfer of diseases from animals to humans.

### 3.5 Explanations to the observed behaviour

There is the perception that the water has lost its value because of the large volume of solid waste influx and that it is unfit for any activity in many locations within the AMA boundary. Inadequate solid waste collection facilities in medium to low income communities results in people disposing of solid waste into the environment. This waste is eventually carried by run-off to the river. Sometimes delays in hauling away solid waste containers when they are full leads to disposal at unofficial places since community members would have to return with solid waste under such circumstances. Sometimes solid waste collection containers are inappropriately cited resulting in waste discharges into the river. Some community members also do not cooperate with institutions responsible for solid waste management. The lack of regulations for the activities of the informal sector in solid waste management contributes to the solid wastes discharges at unofficial places in the communities. Parents usually send their children to dispose of solid waste at unofficial places.

Inadequate access to toilet results in people disposing of human waste into the open environment and the river. Some of the public toilets are locked up in the night and therefore the community members

are unable to access it. There are some people who out of fear of the dark are unable to access a public toilet in the night. Some public toilets are untidy for most of the time, discouraging some people from using them. Paying to access a public toilet implies that those who cannot pay will be denied access and therefore these people may resort to “wrapping” human excreta in plastic bags to dispose of in the environment. There is lack of control in some communities for which reason people do as they please. A possible explanation is the influence of urbanization. Unplanned communities are pollution hotspots. The lack of functional youth networks makes it difficult for the youth to be mobilized for any activity to prevent environmental pollution. There is lack of community collective action. In the past communities organized clean-up exercises. This was thought to create awareness and also slowed down any environmental pollution. Today, communities fail to respond to such calls, leaving their surroundings untidy. This has also been explained as a result of the break down of community leadership structures.

There is lack of learning from experiences as people repeat behaviour. The Lack of enforcement of regulations is a key problem in the city of Accra. Many environmental laws are relaxed and therefore polluters are not arrested, fined, nor prosecuted to serve as a deterrent to others in the community. As a result of which people are not dissuaded from acting inappropriately. There are conflict situations with respect to attitudes to the river where people who may insist on the right thing may be abused. The general socio-economic status of persons may also influence their behaviour.

### **3.6 Proposed measures to change the observed behaviour**

The restricted participants of the focus group discussion [FGDs] in the selected communities suggested some actions which could contribute to a change in behaviour. There is the resident and the transient population of Accra and it is important that interventions are aimed at both. In addition, there may be differences among the resident population, according to the locations, practices, access to sanitation and behaviour. Of importance in changing behaviour are: disposal of human excreta and solid waste; economic considerations, behaviour patterns, environmental concerns; social and community action; community collective action; public education; and law enforcement.

#### *Disposal of human excreta and solid waste*

Improvements in access to toilets and solid waste management [access to solid waste collection services] infrastructure could help change behaviours which have negative consequences on the environment. If the activity of the informal sector is regulated, it could make an important contribution to solid waste collection services.

#### *Economic considerations*

It is important for stakeholders to define a social mechanism for the poor to enable them to afford the cost of using the public toilet and accessing solid waste collection services.

#### *Behaviour patterns*

There were some differences in the behaviour at the selected communities. Some behaviour has negative consequences on the environment. Of importance is the tendency for uncontrolled disposal of solid waste into the environment. In general, people hold negative attitudes towards the river. According to the Value-Belief-Norm (VBN) theory of environmentalism, pro-environmental behaviours stem from acceptance of particular personal values, from beliefs that things important to those values are under threat, and from beliefs that actions initiated by the individual can help alleviate the threat and restore the values (Stern *et al.*, 1999). This is in line with Ajzen's (1991) notion that beliefs antecede behavioural intentions, which in turn antecede actual behaviour. The VBN theory of

environmentalism demonstrates that environmental beliefs are anteceded by personal values (Oreg and Katz-Gerro, 2006) where the term value denotes preference in terms of an individual's setting of one thing before or above another because of a notion of 'betterness' (Brown, 1984; Bozionelos and Bennet, 1999).

In many of the instances, it was reported that culprits of surface water pollution got furious and made unpleasant remarks about those who called them to order. This discourages people from discussing negative behaviour in future. The implication is that until individuals form personal beliefs anteceded by certain values, that the river, which is of important value is polluted, it will be difficult to promote behaviour change. Learning from experiences could also aid in defining measures on how to change behaviour. Currently this aspect is neglected in water and sanitation management. A mechanism to let this happen will create opportunities to change.

#### *Environmental concerns*

Some of the communities encounter challenges in the environment especially in the wet season and this was attributed to the poor drainage networks which are under capacity and choked with solid waste. As a result local flooding is common in some of these areas. As part of a holistic plan on environmental management, the responsible AMA departments have to ensure that drains are cleaned regularly.

#### *Social and community action*

Community cooperation with institutions and individuals can promote an improved response to water pollution. In some communities, there were those identified as "champions" and they could be involved in campaigns to change behaviour and practices. The "champions" may be educated, opinion leaders, exemplary or respectable people. The youth constitute a formidable force in the process of changing behaviour. Lack of good youth leadership may inhibit this, thus it is important to strengthen youth associations and groups to play a significant role in community mobilization and information delivery.

#### *Community collective action*

This comprises all activities undertaken by the community with broad community participation, aimed at ensuring community development and unity. Of importance is the regular clean-up exercise which is either initiated by the community or city authorities. Other forms of "community collective action" may be the activities of residents associations, watchdog committees and other income and livelihood oriented Associations.

#### *Public education and law enforcement*

Public education is indeed important for the city to bring about change in behaviour. The education could be formal or informal studies. Public education usually includes the use of the print and electronic media such as radio, television, newspapers, brochures, and use of information vans to share information. The goal is that people will adopt new ways of doing things appropriately. Other forms welcomed by communities are a type of house to house open discussion on causes of pollution. If institutions mandated to ensure compliance are up to the task, it will enhance environmental management to secure water resources for multiple uses. To achieve good results from pollution mitigation, measures adopted should be in tandem with law enforcement. City authorities often may not be in unison with current realities on the ground due to gaps in information. Changes are needed if a clean environment and improved water quality are to be ensured.

## 4 Conclusions and looking ahead

Poverty and wealth are expressed in many dimensions and people aspire to get out of poverty as they embark on their livelihoods. Both treated domestic water and surface water sources are used for various productive activities. Some of the productive activities for treated water are: food preparation and vending, hairdressing, drinks production, operating toilets and bathroom, pure water vending, water vending, washing bays, among others. Livelihood choices varied along the communities with significant similarities. If water dependent–livelihoods are managed well, it should be an avenue for enhancing the income status of the poor. Access to treated water varied from one community to the other with irregularities in flow in some of the communities. Those without Ghana Water Company Limited direct connection paid at least 10 times the Public Utilities Regulatory Commission domestic rate for water.

In spite of the potential offered by surface water, its use is appreciably limited by pollution. This calls for steps to reverse the trend to make good quality water available for productive activities. The perception of water quality suggests that surface water is currently unsuitable for many productive activities in most locations within the AMA boundary. Many people see the river as just a big drain for both solid and liquid waste.

The causes of surface water pollution have been attributed to several structural and institutional challenges such as inadequate access to toilet and solid waste collection services, economic issues, social and political issues, and law enforcement. The unplanned nature of many locations results in lawlessness. The behaviour varied from community to community and is influenced by other socio-economic factors. Behaviour of people in the communities is determined by the attitude towards the surface water and the environment. These attitudes are either positive or negative. To help change attitude towards the water, there should be improved access to toilets and solid waste collection services. It is also important that stakeholders define a social mechanism for supporting those who are unable to afford cost of services. The communities have very important roles to play in the area of social and community action and community collective action such as involving opinion leaders, exemplary people, watchdog committees, and organizing clean-up exercises.

The relationship between water use for livelihoods, access to toilet and solid waste collection services, and water quality is a complex one. There is however no unidirectional relationship between socio-economic status and behaviour, but series of factors allows conclusions to be drawn.

The next stage of the investigation looks at quantifying the contributions of various water-dependent livelihoods to household income; further investigation into the attitudes of people towards the water and measures to address them; and the role of key organizations in the water sector by carrying out an institutional analysis. It is expected that these findings will feed into the SWITCH demonstration and the Learning Alliance in making a case for investments in the water of the future city.

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