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Reducing river and environmental pollution with sewage treatment

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Abstract

In spite of the pressing need for the sustenance of a healthy environment to save our planet from destruction, Nigeria is yet to wake up from its slumber. Environment issues including sanitation in particular are given low priority with subsequent attendant outbreak of epidemics resulting in high mortality rate in the country. Cursory view of sewage treatment in the country was undertaken, taking Ibadan city as a typical example, various methods adopted by the various socio-economic groupings in the city in combating the sanitation problem was reviewed. Reasons for their interventions are analyzed. Suggestions are offered for the adoption of sustainable development based on agenda 21 of the 1992 earth summit (a non-binding, voluntarily implemented action plan of the United Nations with regards to sustainable developments) as the solution to poor sanitation in the country. Samples of water were taken around major rivers at Ibadan for analysis. The research concluded that Lack of sewage collecting and disposal facilities impacts negatively on the environment Quality of is life debased, property is undervalued and many otherwise productive man-hours are lost to ill health. The introduction of a sewerage system in the planned parts of our cities will reduce the cost expended on sanitation by the individual. The paper also calls for the establishing of an appropriate coordinating institution for effecting the implementation of agenda 21 and asks for the political will of government as a most necessary ingredient.

Keywords: River; Pollution; Environmental; Sewage; Treatment

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1. Introduction

In the last thirty years, water sully has acquired a place of prominence in every annual budget of government be it federal, state or local. But not so for sewage which in an equally significant environmental issue as water. During the water and sanitation decade of 1981-1990 water and sanitation were expected to have been provided for a large percentage of the population in every country of the world by the end of the period. Up to date, the Nigeria attempt on sanitation provision to urban and rural dwellers was practically zero. Despite this, individuals and corporate bodies spend a lot of money to ensure they are not submerged by their own foul water. Lack of access to basic sanitation is harmful to the environment and health of the people and often leaves a lifetime legacy of disease and poverty (Gajendragadkar, 1973). The environmental and health risk associated with accumulation of toxic metals from anthropogenic sources has attracted significant scrutiny of their levels in the aquatic environment (Ahmed et al., 2003). Toxic metals occur naturally in the environment but chaotic human activities have crucially changed their geochemical cycles and biochemical balance, which has resulted in their accumulation in living organisms (Duruibe et al., 2007). The adverse effects of toxic metals, by the pollution of natural water has influenced ecosystem and caused environmental risks and threat to humans (Cajaraville et al., 2000; Ravera et al., 2001). The health risk associated with toxic metal poisoning in man and the ecosystem are of great concern to environmentalist. Therefore, the demand for incessant monitoring to alleviate the issues faced by environmental contamination by toxic metals is crucial

At a recent world toilet day, Nigeria is said to be at 19th century level in terms of environmental sanitation and that is why diseases such as cholera, typhoid and other enteric diseases keep occurring in epidemic proportions claiming many lives (Augustine, 2016). The figures of Nigerians without toilets or doing open defecation ranges from 35 million to 56 million or more because even those people with built structure to take care of the problem at one point bring the content from out individual homes to the open in the form of dumping it into the bodies of either flowing or stagnant water (Goveti, 1996). These water bodies where content of toilets are dumped serve as water for drinking or for irrigation, the dangers of poor sanitation and dirty water have been known for around 150 years, yet 72 per cent of the population does not have a basic toilet to use in Nigeria (Ojo, 2016). According to UNICEF, every year, an estimated 124,000 children under the age of 5 die because of diarrhoea, mainly due to unsafe water, sanitation and hygiene (UNICEF (Nigeria) and Tebutt, 1971). Lack of adequate water and sanitation are also major causes of other diseases, including respiratory infection and under-nutrition. It is also reported that many schools in Nigeria lack safe, private toilets and hand-washing facilities. This affects enrolment and performance, particularly in the case of girls (Tokun, 1983). The impact of water, hygiene and sanitation falls disproportionately on women and girls, the main carriers of waters. The economic impact of poor sanitation and hygiene cost the Nigerian economy the equivalent of almost 1.3 per cent of gross domestic product. 3.575 million people die annually due to water related diseases (Tokun, 1979), 43% of water related deaths are as a result of diarrhoea, 98% of water related deaths occur in the developing countries, about 884 millions of people lack access to safe water supplies, water related diseases affects the world population more than diseases by other causes as a whole, less than 1% of the world fresh water is available for direct human use, poor people

living in slums pay five to ten times more for water than those in the cities, only 62% of the world population has access to improved sanitation and 1.2 billion people live without sanitation facilities (Lukenga, 2015).

In the older zones of our cities, pit latrines of all types are used for getting rid of human faeces. The pit latrines are usually undersized, poorly constructed and fill rapidly requiring evacuation and construction of new ones. The evacuated faces are buried nearby. Night soil bucket types were for many years in use and the night soil used to be emptied into stream and rivers or into the sea for a town by the seaside.

The planned zones of the towns and cities use the more modern method septic tanks and soak ways to get rid of their excreta. Whatever method is adopted in both zones of the cities, the gray water from kitchens, laundries, bathrooms, is just allowed to flow freely to the surroundings (4). However there are sewage treatment facilities in new towns. In Lagos, there exist 65 small sewage treatment plants installed by individual schools, tertiary institutions, business houses. Some of these include the University of Lagos, trade fair centre, navy centre, Apapa, First bank, Marina and Baptist school, Surulere. In addition to these, there are some government operated sewage treatment plants shown in Table 1.

Table 1. Existing Lagos State Government Operated Sewage Plants

S/N	SEWAGE SCHEME	USERS	YEAR of AWARDED	EST. POPULATION	COST N(10^6)	SEWER LENGTH
1	Victoria Island	Domestic	1976	100,000	12	50
2	Amuwo Odofin (Package plant)	Low Cost Housing	1982	10,000	1.2	14
3	Iponri (package plant	Low Cost Housing	1982	10,000	1.2	9
4	Alausa (Oxidation Ditch)	Offices	1980	3,000	1.5	12.5
5	Oke Afa (Activated sludge)	Low Cost Housing	1983	40,000	3.6	27.8
6	Abesan (Oxidation Ditch)	Low Cost Housing	1991	50,000	17.3	36
7	Festac Treatment Plant		1975	75,000		

Source: *Damolad Associates, 2015*

Most of these treatment plants are packages which have broken down owing to poor maintenance. During the construction of the kanji dam, the new settlement centre for the displaced people had oxidation ponds for

sewage treatment. The pond has not been maintained since and the buildings that sprang up thereafter use septic tanks for their faces. In a few other cities in the country there are isolated sewage treatment plants in the same pattern as for Lagos.

Scattered all over the country, in institutions, and research centers, sewage disposal facilities exist, but inadequate maintenance prevents their continuous and efficient performance. Industries all over the federation are guilty of discharging their raw effluent into stream. Only a few of these industries treat their wastes. It can be deduced from the afore-going that Nigerians do not bother that much about getting rid of their liquid wastes. The negative environmental impact of lack of central sewage treatment facilities is to government inconsequential.

It is therefore the purpose of this paper to create awareness in the nation for the need to prevent pollution of the rivers and the environment by taking urgent measures to treat the nation's sewage. The adoption of agenda 21 in the 1992 earth summit as a ready tool for treating our sewage cost-effectively is suggested. Ibadan is here chosen as a typical illustration of what averagely occurs in most other towns. The nature of the problem in the city and the attempts to solve them by the various socio-economic sectors of the city will be discussed.

1.1. Magnitude of the problem in Ibadan

Of the 450 million liters of sewage generated in Ibadan only 2.0 million liters is treated. The untreated sewage in the planned parts of the city flows into septic tanks and soak-away system while in the unplanned inner core pit latrines are used. In both planned and unplanned zones, the gray water from bathrooms, kitchen and laundry is to flow into road drains, open places, and finally into the streams. The lack of a sewage disposal system in the city results in a thoroughly filthy environment. The family compounds stink. Road drains which carry combined storm water and sewage give terrible stench to the atmosphere especially in the dry season when the sewage gets easily septic.

2. Analysis of the issue

2.1. Institutional

In the early 1940s the native authorities used to be in charge of sanitation. A lot of changes have since taken place. In early 1970s, the ministry of works and transport sewerage division was saddled with the responsibility of sanitation including solid wastes and drainage. Towards the end of the decade the Ibadan wastes disposal board (WDB) was established. Later this was changed to environmental protection agency (EPC) and now it is called state environmental protection agency (SEPA). The duties of SEPA include river training and sewage disposal. It has a non technical general manager and three engineers. The reason for changing the names of the boards is not clear but it does not augur well for continuity. At no time either as IWDB, or EPC, or SEPA does the establishment have enough technical personnel. Under the IWDB a total of

20km of sanitary and storm sewers was laid in 1980. Somehow subsequent state environmental protection agencies have not virtually claimed ignorance of the existence of these sewers nor has any of them shown interest in sewage matters. The effective evacuation of flood by storm sewers in areas that used to be submerged in Dugbe area does not arouse any interest.

2.2. Political

Sewage collection and treatment is given low priority by government. A civilian government in the 1979 – 1980 eras preoccupied with finding money to find their free health care delivery programme affirmed their disinterestedness in the sewer construction contract or in fact in preventive medicine.

2.3. Social/Attitudinal

Nigerians are not used to getting rid of their sewage flows in any organised or scientific way. They seem to have cast their lot with living in a filthy environment. The case with which they settle to lunch by the side of a road side drain full of foul, smelly, septic sewage is a pointer to this. In family compounds, people eat, play and sleep outside among pit latrines, graves, shallow hand dug wells and smelly drains.

3. Impact of the problem

3.1. Communities

Communities suffer from various diseases such as hookworm, tapeworm, fever, largely as a result of very poor sanitation. Open wells, human graves, septic tanks and soak ways are randomly located such that in places the soak ways drain into the wells turning the wells into secondary septic tanks. A cholera epidemic occurred at Oke Foko in 1974 claiming over 200 lives. The erosion gorge network in the inner core serves as receptacles for human faeces and wastes from bathrooms and kitchens. Septages from rotten garbage heaps also flow into these gorges or road side drains and finally into the rivers.

Tables 2 to 4 indicate the pollution loads of the three main rivers flowing through the city and Fig 1 shows the Ibadan river network. It will be observed that the suspended solids and the BOD content of both the Ogunpa and Kudeti rivers are much higher than those of Ona River. The suspended solids content for each of the rivers is not too high but while the maximum BOD for rivers Ogunpa and Kudeti is about 68mg/i, the maximum for Ona is only 6.1mg/1. Also maximum coliform counts for Ogunpa and Ona rivers are as high as 30 million/ 100ml, the maximum for Ona River is only 1,100/100ml. The figures confirm the pollution loads in both the Ogunpa and Kudeti rivers which make them give putreceous odour all the year round.

Table 2. Result of Analysis of Water Samples for Ogunpa River Wet Season (April – October, 2016) Averages

Sampling Points	Temp ^{o}C	pH Values	S. S. Mg/1	BOD mg/1	Coliform Counts Per 100ml Sample
A1	24.6	6.9	11.0	3.4	4.9×10^3
A2	25.5	7.1	25.8	8.4	33.8×10^3
A3	26.1	7.2	50.5	33.7	13.1×10^6
A4	26.2	7.2	78.6	67.3	24.1×10^6
A5	26.1	7.8	80.6	67.9	34.9×10^6
A6	25.8	7.3	74.0	39.7	13.6×10^6
A7	24.9	7.1	41.1	17.0	8.2×10^6

Source: *Field Survey, 2016*

Tables 3. Result of Analysis of Water Samples from Kudeti River Wet Season (April – October, 2016) Average

Sampling Points	Temp ^{o}C	pH Values	S. S. Mg/1	BOD mg/1	Coliform Counts Per 100ml Sample
B1	26.2	7.1	129.9	68.4	23.4×10^6
B2	26.3	7.2	83.1	23.1	22.4×10^6
B3	26.0	7.2	60.9	12.2	14.0×10^6
B4	25.8	7.3	74.39	39.7	13.6×10^6
B5	24.9	7.1	41.1	17.0	8.2×10^6

Source: *Field Survey, 2016*

Table 4. Result of Analysis of Water Samples from Ona River (2016)

Sampling Points	Temp ^{o}C	pH Values	S. S. Mg/1	BOD mg/1	Coliform Counts Per 100ml Sample
January	23.0	7.2	52.0	6.1	1,100
February	27.3	7.2	48.2	6.0	600
March	26.0	7.3	44.3	4.9	140
April	26.0	7.1	40.0	3.3	550
May	25.0	6.9	31.0	2.2	290

Table 4. *Cont.*

Sampling Points	Temp °C	pH Values	S. S. Mg/1	BOD mg/1	Coliform Counts Per 100ml Sample
June	24.0	7.2	29.0	2.1	300
July	24.0	7.2	29.7	2.8	380
August	24.5	6.9	48.0	2.5	580
September	25.0	7.1	34.0	2.9	340
October	26.0	7.4	42.0	3.0	430
November	25.0	7.4	48.0	3.5	350
December	24.0	7.3	52.9	5.9	780

Source: *Field Survey, 2016*

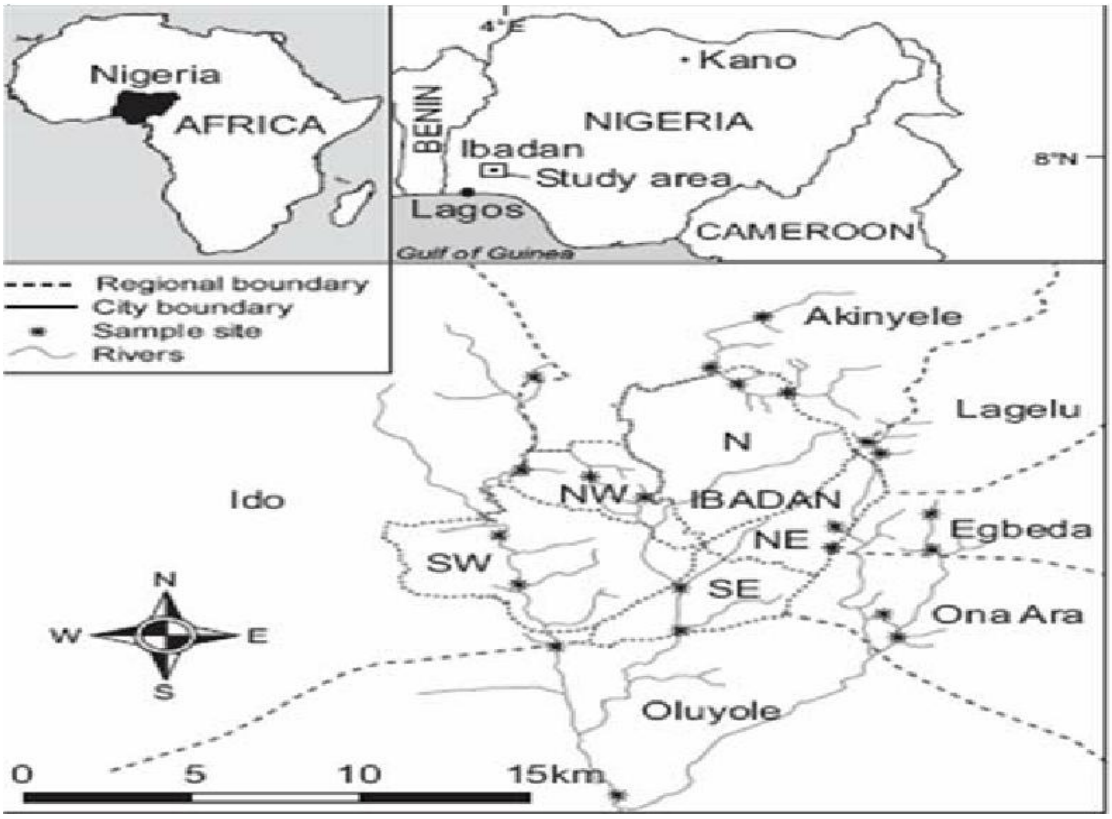

Figure 1. Ibadan Rivers Network

Lack of sewage collecting and disposal facilities impacts negatively on the environment Quality of life is debased, property is undervalued and many otherwise productive man-hours are lost to ill health.

4. Current interventions

Waste in whatever form, solid or liquid cannot be tolerated and so must be disposed of somehow. Solid wastes can be stored in the house for a while before disposal, sewage cannot be equally treated. Various ways of disposal are adopted by the various sectors of the economy.

4.1. Community

Communities have for a long time been using pit latrines and dunghills. These dunghills are fast becoming extinct. Recently aqua privies and vented pit privies are developed. In the medium and low density areas of the community septic tank and soak away systems are prevalent. In most cases only the toilet waste is made to flow into the septic tanks while the gray water from the kitchens and the bathrooms are allowed to drain to the surroundings or into the soak ways. In the inner core also the gray water from washings and baths flow to the surroundings.

4.2. Private sector

In Ibadan, most industries discharge their untreated trade effluent into rivers nearby but they collect their domestic sewage into septic tanks. Some of them however treat their industrial effluents prior to discharging them into streams.

4.3. The Premier Hotel

The Premier Hotel does not operate a treatment plant for its sewage for lack of adequate space in their premises. The sewage is collected into a central collection point and dosed with caustic soda and potash to reduce the volume of sewage in the tank to be emptied from time to time.

4.4. Cocoa house

The sewage here first flows into a primary settling tank and finally into a secondary settling tank having been aerated on its way to the second tank. It is a form of activated sludge system. The effluent is discharged into the side drain of the Oke Bola – J. Allen main road. The noxious odour given out by the discharge queries the efficiency of BOD removal of the plant.

4.5. IITA

IITA has a single unit of sewage treatment plant which is presently operating above its design capacity which is not immediately available. The method of treatment is the Contact Activated sludge process, otherwise referred to as the continuous-aeration activated sludge process. The plant consists of a combination of fabricated and packaged steel structures installed inside concrete channels and retaining structures of maximum depth of up to 5.50m. The treatment plant derives its raw sewage sources from residential

buildings, offices, laboratories, etc. within the IITA community. Storm water is however excluded from this arrangement as the various existing collectors and drainage channels drain the storm water and discharge it into the IITA Lake. Raw sewage from various locations within the community enters through the screening zone where the solids transport are broken down and the grits/sediments removed by the pulsating racks into an adjacent temporary storage compartment. The screened sewage then gravitates towards the treatment chamber via a 250mm diameter steel pipe. The treatment plant is divided into two compartments. The first outer compartment is the aeration chamber while the second inner compartment is the settling chamber. The treated clarified water drains into a manhole where heavy dosage of chlorination is simultaneously applied. The mixture then flows through a pipe to the stabilization pond so provided to allow a sufficient retention period for re-aeration and settling before discharging into a stream downstream of IITA Lake. Oxygen demand tests are periodically/randomly carried out on the effluent from the sewage treatment plant to ensure that the BOD is kept below 4mg/1. IITA emphasizes that although the end product is very clean visually, but nonetheless cannot be safe for drinking due to the fact that the plant is operating above its design capacity.

4.6. University of Ibadan

The University of Ibadan initially adopted the tricking filter method for treating its sewage. The system is now in a state of disrepair and, a new method employing the use of water hyacinth is adopted for treating all the 1017m^3 / day sewage flow. The efficiency of this method is about 80% BOD removal. The treated effluent is discharged into an Ona river tributary.

4.7. University College Hospital (UCH)

The UCH employs a combination of trickling fitter and activated sludge methods to treat its foul water. The treated effluent is analysed in the laboratory to ensure that the effluent meets potable water standard. If it falls short, the effluent is then subjected to chlorine penetration in chlorine oozing chambers after which the effluent is discharged into Ogunpa River.

4.8. Local government

In the early 1950s, the Native Authority provided public toilets in a few locations within the city. They were the pour flush types and well maintained till water shortage rendered them unusable. The Ibadan North-West local government constructed a public toilet in Ayeye about ten years ago. It consists mainly of pit latrines – 8 units for females and 8 for males. Since this facility is located in a market place, it is used largely by the market community and by some residents in the area. Chemicals are occasionally dosed into the latrines to digest the faeces. A fee of N3.00 is levied per person using the toilet. Daily revenue of N50.00 to Nl00.00 is generated. This means only about 30 people use this facility daily. If a superior means of fee collection can be installed much higher revenue will most likely be realised.

4.9. State government

The World Health Organisation (WHO) in partnership with the state government was interested in solving the problem of sewage collection and treatment in Ibadan especially because of the size of the city. In 1969, the consulting engineering firm of Messrs MacLaren International Limited in association with Messrs. Urwick, Currie and Partners Limited both of Canada acting as consultants to the WHO started the feasibility studies for wastes disposal and drainage for the city. Their report came out in 1971 in four volumes: Volume III of the report dealt with the sewering of the city.

In 1978, government awarded the contract for laying of the storm, sanitary and trunk sewers in the business district of Gbagi, Dugbe and Onireke. This was in accordance with suggestions given in the Vol. III report. In this contract a total of 20km of both storm and sanitary sewers were laid with diameters varying from 100mm to 300mm. A 3.0km long trunk sanitary main 1200mm diameter was laid from Ita Moya to the Ibadan Grammar School. Construction stopped in 1980 for lack of funds. The design of sanitary sewers for the areas of Oke Bola, Oke Ado and Molete together with their linkage to the 1200mm dia. trunk main involving inverted siphons had been completed since 1977. The preparation of tender documents had also been completed. The design of the trunk main from the Ibadan Grammar School to the site of the sewage treatment plant at Idi Ayunre including the design of the treatment plant and the contract documents were also completed in 1977.

For reasons not unconnected with aesthetics the location of the sewage treatment plant had to be shifted some 12.0km further downstream from the Ibadan Grammar School surround to Onigambari near CRIN. With the new treatment plant location, not only can the sewage from Gbagi – Dugbe – Molete areas be treated but also the sewage from the lower basin of Ona river such as Oluyole layout, federal government low cost housing scheme, Ago Taylor, Odo Ona and Moor Plantation plus that from upper Ogunpa river basin secretariat, Agodi government quarters, Orita Basorun can all be treated in the same treatment plant. In fact the plant capacity estimated to be 324,100m/day was already designed to accommodate all these flows. The sum total is if what was designed had all been constructed then the entire area from Onireke to Molete can be connected to sanitary sewers and their septic tank/soak away systems can be discarded while new bui1dings will no longer need septic tanks.

4.10. Ineffective intervention

The prevailing intervention by communities in the city inner core cannot be effective because poorly constructed under sized pit latrines are used with a high rate of collapse. There are too many pit latrines in each compound indicating poor planning and cause for polluted environment. There is such a great shortage of space that wells, septic tanks and soak ways and human graves can be placed within 5.0m of one another. The septic tank and soak away system is only seemingly effective and it can be expensive to maintain especially in water logged or low lying areas where it is not cost-effective at all. A company in Warn spends N20 million a year to maintain their septic tank and soak away system. Industries have largely been reluctant to commit any capital sums to treat their trade wastes. There is no guarantee that the trade wastes treated by

the few industries which care to comply with regulations attain the minimum quality specified. Enforcement of foul water management regulations by FEPA or SEPA is a necessary ingredient that is badly wanton.

Intervention by academic and research institutions has to be done in lieu of a citywide sewage treatment facility. It is hence an added burden for which very little fund is available for maintenance. They therefore break down sometimes for four to five years before financial aid for rehabilitation is made available. Expectedly the state government intervention is the only citywide attempt but it too is ineffective. The 20km network of sanitary sewers laid in Gbagi, Dughe and Onireke areas since 1981 is abandoned. No government has any interest in resuscitating it. It cost N14 million to provide and lay those sewers in 1980 but rehabilitating them alone now will cost more than N50 million.

The cost estimate in 1978 of providing and laying 80km of 200mm to 450mm diameter sanitary sewers from Oke Bola to Molete to serve a population of 100,000 and constructing a 324,100m^3/day sewage treatment plant together with 12.0km of 1200mm dia. trunk sewer and pumping station was N58 million. It was considered then too expensive. Now it will cost about N1.0 billion. Government will take this to be a mission impossible.

5. Possible interventions

The ineffectiveness of the private and public interventions calls for other solution. More actors and implementing agencies should be brought in to take part in this exercise. The roles which will be assigned to these actors will be discussed later in this paper.

5.1. Proffered solution

5.1.1. Sustainable development

The patently most feasible solution is the adoption of sustainable development which is defined as improving the quality of human life while living within the carrying capacity of supporting ecosystems. The agenda 21 of the United Nations Conference on Environment and Development (the Earth Summit) held in Rio Dc Janeiro in June 1992 lays a solid foundation for sustainable development It encourages that water resources be planned and managed holistically to prevent shortage of water or pollution of water sources. Basic human needs must be satisfied, ecosystem must be preserved and water users must be appropriately charged. AU countries must have action plans for water management based on catchment basins and efficient water use programmes. These could include integration of water resource with land use planning and conservation activities, demand management through pricing or regulation, conservation, re-use and recycling of water. The concept of agenda 21 will now be applied to solve the sewage disposal problem in Ibadan.

5.1.2. Application of Earth Summit Agenda 21

The city can be zoned into the un-sewerable unplanned old city and the planned new zone encompassing the old part.

5.1.3. Old city

As stated earlier, the old city depends mainly on pit latrines and river banks for disposing of their sewage. Comfort stations consisting of large septic tanks with allowance for bathing and laundry to serve about 10 – 15 families will go a long way to removing faeces from family compounds and streams. This system was introduced in the mid-1970s but it failed because of shortage of water supply and because it was handed down as a necessary social service from government to the communities.

This time the communities will be consulted to declare their intention to want the facilities. They must also be free to state the level of service they want and their willingness to own and pay for the facilities and sustain them.

For effective operation for each comfort station; a well will be provided with an overhead tank. The pervasive water shortage may likely put the well under pressure from the beneficiaries but it should still be able to serve the comfort station. The communities, the LG, any NGO, and external funding agencies will be sensitized to contribute fund for developing the station while the communities will be expected to charge users economic levies for operation and maintenance.

5.1.4. Planned zone

The households in the planned parts of the city depend mainly on septic tanks and soak away pits. These tanks are emptied about once in 10 years or less. Therefore they seem to be performing satisfactorily. But only toilet flushings flow into the septic tanks while the gray water from the kitchen, bathrooms, laundry are allowed to flow out elsewhere to become non-point pollution sources. If these are discharged into the septic tanks they will highlight the inadequacy of the system. In these planned parts of the city, it is easy to collect the individual household sewage including their gray water into a sewer and can it away from the neighbourhood.

The inhabitants of the neighbourhood must declare their interest in owning and paying for the services. Whereas each household will pay fully for connecting his sewage to the neighbourhood sewer, all the residents of the neighbourhood will collectively pay for the sewer. The sewer will convey the sewage across neighbourhoods and into the sewage treatment plant. By the time the trunk sewers reach the treatment plant, the stakeholders will now include not only residents but also local governments, private sector, NGOs, informal sector, state government, who all will contribute their shares of the project cost. In practice, there are complicating factors to be taken account of including transaction costs of collection of revenues at different levels and the interconnectedness of several of the benefits.

It is envisaged that the seeming success of the septic tank and soak away systems will make the residents slothful at imbibing this new system. It is however definite that once it is started with time those who object to it at first will eventually connects to it.

5.2. Financial feasibility

5.2.1. Hidden sanitation economy

As a matter of fact sewage facilities are expensive to construct and operate and maintain and the state of the economy now is such that the GDP is only $200. There is mass poverty. In e of us, a huge sum of money is spent on sanitation by the informal private sector. In Ibadan, it costs about N5, 000 to dig a pit latrine. Conservatively, there are 50,000 pit belies dug every year which amounts to a colossal sum of N250 million. It costs an average of N20, 000 to evacuate a pit latrine and because of the rapidity with which they fill up, not much less than 20,000 need evacuation yearly. This is another sum of N80 million.

Similarly, there are not less than 100,000 septic tanks and soak ways in the city. At a cost of N150, 000 to construct a septic tank and soak away system, a sum of N5 billion has been in invested in this sanitation exercise. And to maintain them a minimum sum of about N2 billion is spent annually. In Summary, the inadequacy of the formal institution to provide sanitary services has compelled the informal sector to expend such unthinkably large amount of money to provide and maintain services themselves. This sum conveniently dwarfs the cost needed by government to provide these services. It can be concluded from this that to organise community services, which in effect will cost the individual much less, will be acceptable and beneficial to all. There is an enormous reservoir of resources that can be drawn on at reduced costs for all.

5.3. Coordinating institution

The State Environmental Protection Agency (SEPA) is currently responsible for ensuring a healthy and sustainable environment in the state. It is however yet to tackle this problem effectively. Really, it is yet to be aware of the full import of this. The inability of government to finance and maintain large projects is now obvious. The necessity for people to decide on the level of service that is within their capability to develop and maintain is now the only solution to their environmental problems.

The State Environmental Protection Agency therefore should be strengthened to face this new challenge effectively. It has to reach out to the communities to know their environmental needs and help them to attain them. The role of the local government is critical. It is their responsibility to reach the grass root and they should play a major role in interpreting the agenda 21 and formulation of a of action plans to suit their environment. The Sustainable Cities Programme (SCP) wherever they exist is wholly engrossed with community sustainable environmental projects. SEPA, SCP and LG can profitably cooperate to successfully find lasting solutions to the problems of environmental hazards in the city. They will need to sensitize not only communities but also NGOs, SGs, private sector, banks, and financing agencies to be involved in this enormous task. An actor – specific strategies and action plan will need to be worked out to aid the

implementation of this scheme. It will also serve as a means of institutionalising this concept of environmental planning and management and refocusing in the light of experience.

6. Conclusion

The adoption of the concept of sustainable development will go a long way to solving the problem of lack of sewage collection and disposal in the country. The stench in the unplanned zones of our cities will reduce and so will occurrence of the rampant faecal-based diseases such as diarrhoea, roundworm, ringworm, hookworm and tapeworm. The level of hygiene in these areas will improve and the need to urgently get rid of their sullage from kitchen and bathrooms may well follow. The non-point pollution sources will reduce resulting in more liveable neighbourhoods. The excreta collected from these core areas can be recycled to produce fertilizers and biogas, both economic commodities. Wells will no longer be secondary septic tanks. The introduction of a sewerage system in the planned parts of our cities will reduce the cost expended on sanitation by the individual. Huge sum of money will be available for the individual to spend on more pressing needs or for taking part in other rewarding sustainable projects. The sustainable nature of the projects will ensure increased capital recovery.

The chances of obtaining loans from external financing agencies will be bright. They will like to encourage us in our attempt to create a sanitary environment and they will be certain that the loans will be repaid due to enhanced capital recovery from the projects. The general demand for a healthy environment will rise and all the three tiers of government will have to include the provision of sanitation facilities in their annual budgets. All the agencies responsible for an improved environment will learn to localise the terms of agenda 21 to the benefit of the community and the nation. The depleted estuarine environment will get a face lift. Whereas Nigeria failed to provide sanitation to all during the 1981 – 1990 Sanitation Decade, the implementation of agenda 21 will be the beginning of our sanitation provision. Our rivers will live. Our national environment will turn to a healthy one to live in. Political will by government is paramount for without it progress will be slow.

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