

## SURFACE STORM SEWAGE DRAINAGE SYSTEM, NIGERIAN CITIES CHOICE FOR STORM DISCHARGE

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### ABSTRACT

Throughout Nigeria, from small to large cities, surface open channel storm sewage drainage system is the choice for rain water disposal. Even municipals with flat terrain, with all constrains in sloping the storm drain, they invest on the open channel storm drainage system, still. These open channels accumulates debris, solid materials, some of the solid objects are deposited into the channels by the city inhabitants. Besides the solid objects, there are also large deposits of silt and sand that flows into these open drain channels. The debris, silt and sand deposited into the open drain channels stays there permanently with no attempt of removing them by the local city authorities. In effect, you have stagnant water with solid objects, silt and sand deposit in the open channels, this becomes permanent home for mosquito, frogs and all types of insects. At some point, the stagnant water generates extreme bad odor, circulating through the wind around the community. At this point, it has become environmental pollution issue, a public health problem for the inhabitants. This is the situation in most Nigerian cities with the surface storm sewage drainage system. People get infected by malaria every day from mosquito attack, yet municipal government authorities allow these surface storm sewage drainage system to stay with stagnant water without cleaning them. Take for example, Yenagua, the capital city of Bayelsa State, Nigeria, a coastal city with major flooding problem due to seasonal heavy rain fall. The city's choice for storm drain is the surface open storm sewage drainage system. Throughout the city, wherever there is any storm drainage, it is the open channel

storm sewage drainage system. The city has a flat landscape and therefore, it is almost impossible to slope the surface storm sewage drainage system to enable the water drain away into the river and creeks. In addition to this problem, the roads in the city are constructed and elevated above ground level for the convenience of the automobile. As a result, there is constant stagnant ground water on both sides of the roads in the city. These elevated roads seems to imply a construction that gives preference to the automobile. This is constantly creating flooding whenever it rains heavy, the rain water backs-up to the buildings and flows into the river as well. The buildings get flooded time after time from the heavy rain fall. As it happens in other cities with surface storm sewage drainage system, the surface storm drainage in Yenagua are constantly receiving debris, solid objects sometimes from human inhabitants, depositing them and when heavy rain falls, these solid objects are injected into the drain channels along with the rain water. Therefore, most of these surface storm sewage drainage systems are clogged with solid objects with rain water.

They become very good home for mosquitos, frogs, snakes and all types of insects. This is a major health problem and financial cost on the city inhabitants, they facing with constant malaria infections, due to the presence of the mosquitos. The stagnant water generates diseases and each time the city inhabitants are infected with disease, they bear the financial cost for treatment. When people get sick, they do not go to work as a result, it reduces work productivity and subsequently, it lowers the economic base of the city. Therefore, this letting of debris, solid objects, silt, sand and stagnant water to stay in the surface storm sewage drainage system must be properly addressed by the local municipal authorities. They need to periodically clean up the surface drain channels to avoid the constant environmental pollution in the community. Better yet, they should invest in underground storm sewage drainage system.

**Keywords:** Surface Storm Drainage, Open Channel Drainage, Storm water Overflow, Flooding, Blockage, Debris

## INTRODUCTION

Surface storm sewage drainage system is designed to drain heavy rain fall and ground water. To collect water from hard surfaces such as paved streets, sidewalks, parking lots and ground water due to excess rain fall. Surface storm sewage drainage systems are also built to channel rain water from roofs of residential buildings and commercial buildings through the building gutters and downspouts. Storm drains are used to channel water away both in small residential communities to large municipal environments due to heavy rain fall. These storm drains are street gutters constructed with cast in-place concrete to collect storm water on roads, express ways and cities that experienced flooding due to heavy rain fall, especially in coastal communities. The storm drainage system is designed to drain storm water into streams and rivers. With increasing development in urban centers, it has caused problems with increased flooding after heavy rain fall. With the continue urbanization, areas of vegetation on the grounds are replaced by concrete, asphalt, or roofed buildings, as a result, these areas loses its ability to absorb rainwater. Therefore, the water from heavy rain fall is instead directed into open surface water drainage system, often, the open drainage systems gets overloaded, causing flooding.

The City of London Adaptation Strategy (2010) identifies the climate changes that we are expected to see in the City in the next century. These includes an increased magnitude and frequency of intense rainfall events causing flash flooding and heavier average winter Precipitation. These changes are expected to put us at a greater risk of surface water flooding. Surface water flooding has been highlighted as one of the most serious flooding challenges that London will face in the near future due to the lack of understanding around this topic and inconsistent historical records. This follows intense rainfall where water is unable to soak into the ground or enter a drainage system. **Lucy Frazer.(2014).**

This is a scene that is common in many parts of Delhi. Open drains built right in the olden times still flow freely not only posing a potential health hazard but also painting an unpleasant picture of the city. Inside northeast Delhi's Janta Colony, each by lane is an obstacle course of health hazards. From the often overflowing open drains that line the narrow alleys to low – hanging wire and

parcels of garbage strewn carelessly along the streets, the residents face a sanitation crisis that warrants immediate attention. Drains full of waste water run past houses, barely a few inches from the doorways. **Akshay Gupta, et al.(2017) open drains.**

A storm water system with open channels for the discharge of rainwater exists in most urbanized areas. The channels usually drain off rainwater into rivers, canals, lakes, and ocean. Discharge of domestic wastewater, untreated storm water into rivers, lakes, canals, leads to surface water pollution thereby spreading of pathogens. The open channel drainage system collects debris of all types, all types of solid wastes are commonly deposited into the open channel drain system. These debris can easily cause blockage of the open channel storm drainage system. When the surface open channel drainage system is blocked, it retains stagnant water with debris as a result, it creates mosquito infested ponding water that moves to no where. It does not drain the water, the water does not flow away, therefore, it becomes a breeding ground for mosquitos, even frogs hence a major environmental pollution situation. It is a major public health problem. Debris flow are among most common geological disasters in China. Destruction of the drainage channel outlet. Destruction of the drainage caused by debris flow abrasion. **Jiah – gang chen, et al. ( 2014).**

Surface storm sewage drainage system comes with enormous disadvantages. The solids must be regularly removed and the system has to be cleaned, otherwise, it will establish a breeding environment for all kind insects. If it is not regularly cleaned, it will generate bad source of odor. The blockage or clogging will induce water flooding in the community due to water spill-over. As stated earlier, there is the risk of environmental pollution that may result to health risk for the human inhabitants. The identification of “critical drainage areas” to quantify “hotspot” flood and pollution risk associated with extreme event urban surface runoff is central to storm water management plans and water framework directive catchment planning. An innovative geographic information system – based 1D – 2D modeling analysis coupled with a drainage assessment tool is described

which addresses this methodological requirement. **J. Bryan Ellis, Christophe Viavattene. ( 2013).**

As mentioned in the executive summary, it could be a temporary solution to transport wastewater (greywater or even black water) in open drainage systems. Open drains are not a satisfactory technology for transporting sewage, even by when the solids have been removed by some form of septic / interceptor tank, even sullage is likely to carry fecal feces contamination from laundry wastes, hand and body washing etc., albeit the contaminations being lower this should be considered. There are two reasons why open drains are unsatisfactory for sewage transport. 1. People can easily come into contact with the wastewater, with its potentially high pathogen content. 2. Since it is almost impossible to keep storm water out drains, any flooding will be floodwater merged with diluted sewage (World Bank, 2011). Very often open drains/channels are misused for depositing litter, excreta and household sewer lines are sometimes illegally connected to open drainage systems. **CORCORAN,et al.(2010).**

However, there are some advantages on the surface storm sewage drainage system. The reinforced concrete cast in-place for the surface open channel drainage system is low in cost. Construction materials such as cement, reinforcements and formwork, for example, are available in the local community. Construction process is very simple and possible employment opportunities.

## **CONCLUSION**

City after city throughout Nigeria, the choice for storm sewage drainage is the surface storm sewage drainage system, despite the overwhelming disadvantages associated with the system. The open channel stormwater drainage system, often gets clogged with debris, as a result, the system overflow whenever there is heavy rain fall event, streets and houses get flooded. When the open channel drainage system gets blocked with debris, sand, sediments and objects with stagnant water, the system becomes mosquito infested area including other insects. This becomes health and environmental pollution issue. The open channel

drain system needs constant cleaning and maintenance regiment to let storm water flow. Cities that are not on coastal line have engaged on open sewage drainage system as a result, they have major problems as to where to channel the storm water to, since they do not have rivers and streams to drain the storm water into. There are well documented connection between stormwater particles and pollutants in association with urban runoff stormwater. Therefore, Nigerian cities needs to invest in proper underground storm sewage drainage system that is fed with drop inlets for more effective storm water drainage discharge.

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