



An investigation into the potential of using Sustainable Drainage Systems (SDS) in West Africa using Lagos, Nigeria as a case study.

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Introduction.

- With flooding incidences and their devastating impacts increasing across the globe, the need for an effective drainage method cannot be over emphasised.
- While many developed and some developing countries have implemented a sustainable way of managing flooding problems by the adoption of Sustainable Drainage Systems, Sub-Saharan Africa is still at a loss as to how to manage its flooding problems. The concept of Sustainable Drainage is very alien in these parts.
- The choice of Lagos as study location is primarily on the basis that it possesses factors which are similar to most other West African countries. These factors include similarities in climate, culture, urban pull. Hopefully the success achieved from SDS can be extrapolated and applied in other Sub-Saharan African countries.



What are sustainable drainage systems?

SDS can simply be defined as

- A set of techniques that pick off from where conventional drainage leaves off, because while conventional drainage systems are designed to remove water as quickly as possible to rivers and focus primarily on the quantity of runoff. SDS on the other hand manages the water at source in sustainable ways, while taking into consideration quantity, quality as well as amenity, (DTI, 2006; Environment Agency, 2008).
- It has been described as a mimic to nature's way of handling runoff.



Why the need for SDS in Lagos Nigeria?

- Increase in flooding incidences and of greater significance has led to growing negative impacts from flooding in this area.
- The Nigerian government seems to be unaware as to how to manage/control flooding, hence the citizens are left to their fates.
- SDS have been adopted in various countries, including ones which share similar climatic characteristics with Lagos, which have been proven to be effective in the sustainable management of runoff.
- Those most affected by the floods are the poor, and simple SDS techniques could alleviate their suffering cost effectively.

Recent Flood in Lagos Nigeria



Research Aims and Objectives

- To explore the potential of using sustainable drainage (SDS) technique(s) to manage storm runoff in West Africa

Objectives

- 1. Investigate the potential of using SDS in tropical areas, by identifying where, and what SDS have already been used successfully. Investigate current and historical use of SDS in tropical areas, with a focus on location and structure
- Aim 2 :Assess the appropriateness of SDS in West Africa using Lagos, Nigeria as a case study.

Objectives

- 2.1 Investigate the flooding history of Lagos and identify those areas most prone to flood, and why.
- 2.2 Use GIS to map the characteristics of the area to include: topography, soil type, underlying lithology, vegetation, drainage, roads, buildings, informal settlements, occurrence of SDS and informal drainage.
- 2.3 Investigate the appropriateness of the use of GIS in decision making for SDS in West Africa



Methodology

- **Field Observation, administering of questionnaires and Interviewing of residents.**

Four Locations in Lagos were selected; the criteria for selection was tailored around accessibility to these areas, land use, topography and climate

- **MAKOKO:** an illegal slum settlement with shacks located along the coast line
- **IWAYA:** a poor community which has been encroached by slum settlements
- **ILAJE:** a poor community which has been encroached by slum settlements
- **IJORA:** a business and industrial area but which has also been encroached by illegal slum settlements
- **Use of GIS and ArcGIS to determine the characteristics of the sites and the appropriate SDS to be proffered.**
- **Data Analysis**
 - SPSS: Quantitative Data
- **Intervention Technique:**
 - Observe the residents receptiveness to the idea of SDS
 - Select and suggest appropriate SDS device(s) based on results from pilot/field visit.

Current Findings (Pilot)

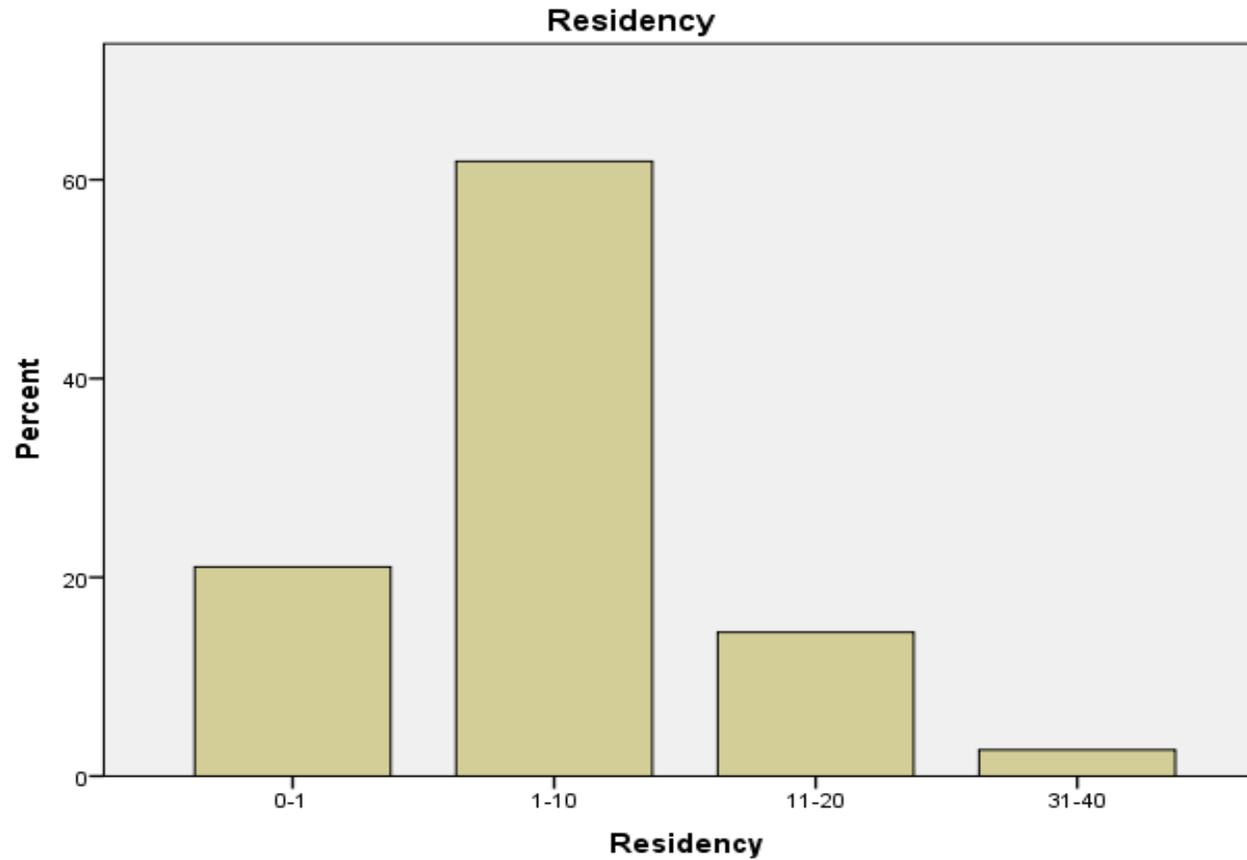
- The topography of Lagos is flat and low lying which poses a difficulty as Sustainable Drainage Devices have been proven to be more efficient and effective in areas characterised by steep rises or slopes.

Upon inspection of selected sites:

- Land cover type is mostly built up., with small homes consisting of concrete, corrugated roofs and wood.
- Soil type and texture varied from loamy clay to loose sandy sediments, used to sand fill most of the flood plains areas which are now built up.
- Flooding in the area ranged from moderate to severe, and residents blamed it on the rains and blocked drains

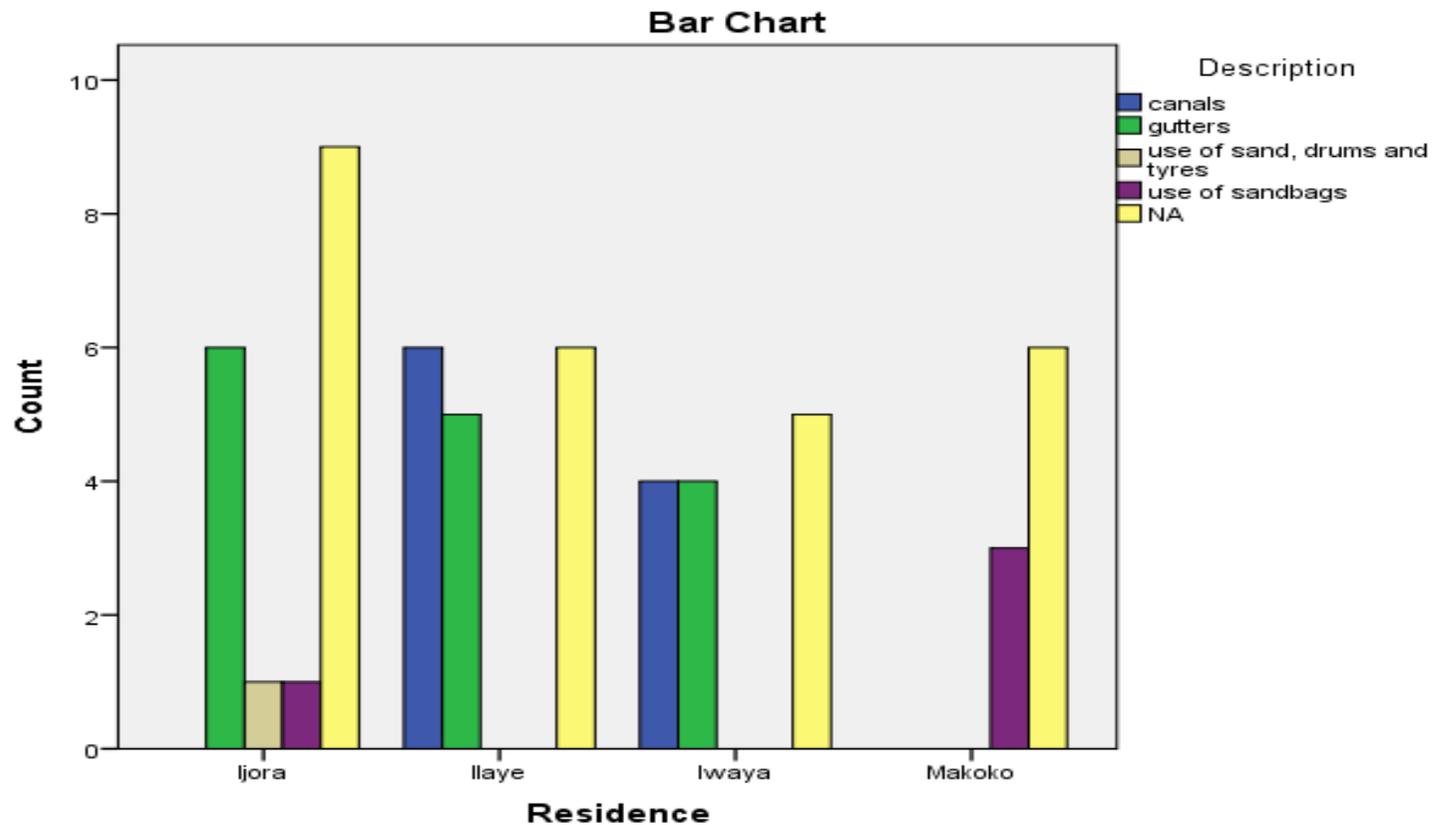
Current Findings

80% percent of residents have been residing in the area for between 0-10 years

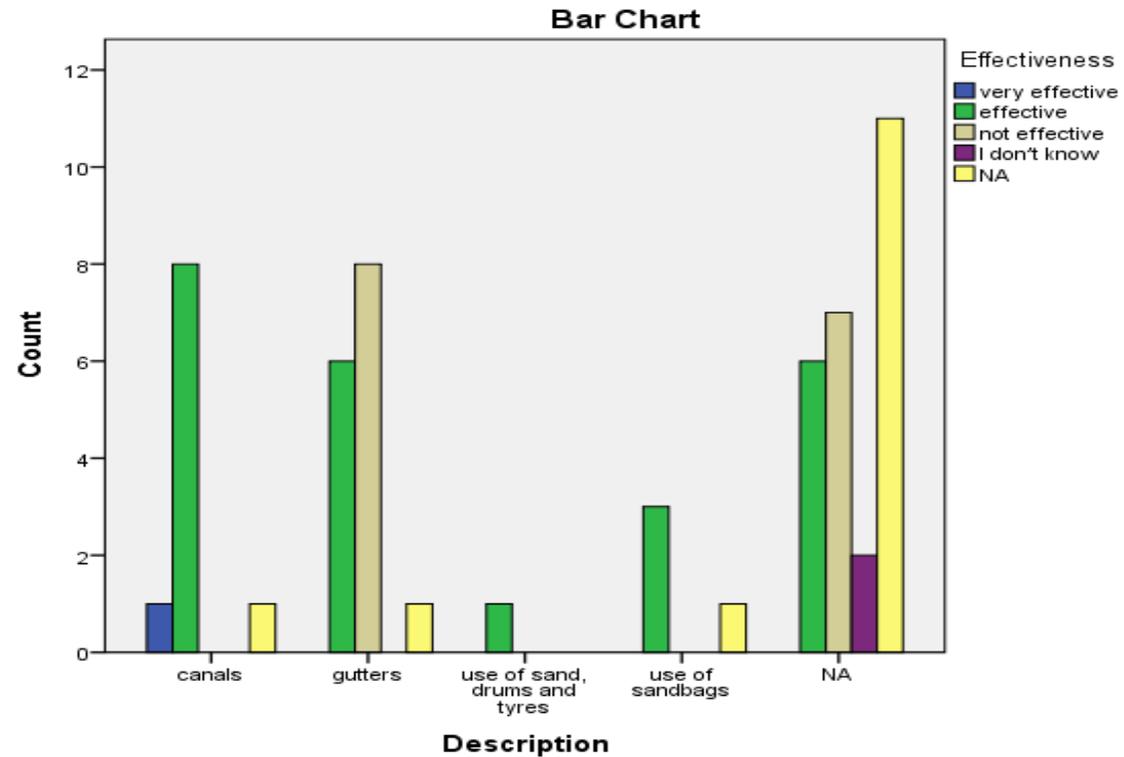


Current Findings

Residents in **MAKOKO** have improvised ways of managing the floods: sand bags and tyres were sited in most homes and residents insist they have been quite effective.



Current Findings



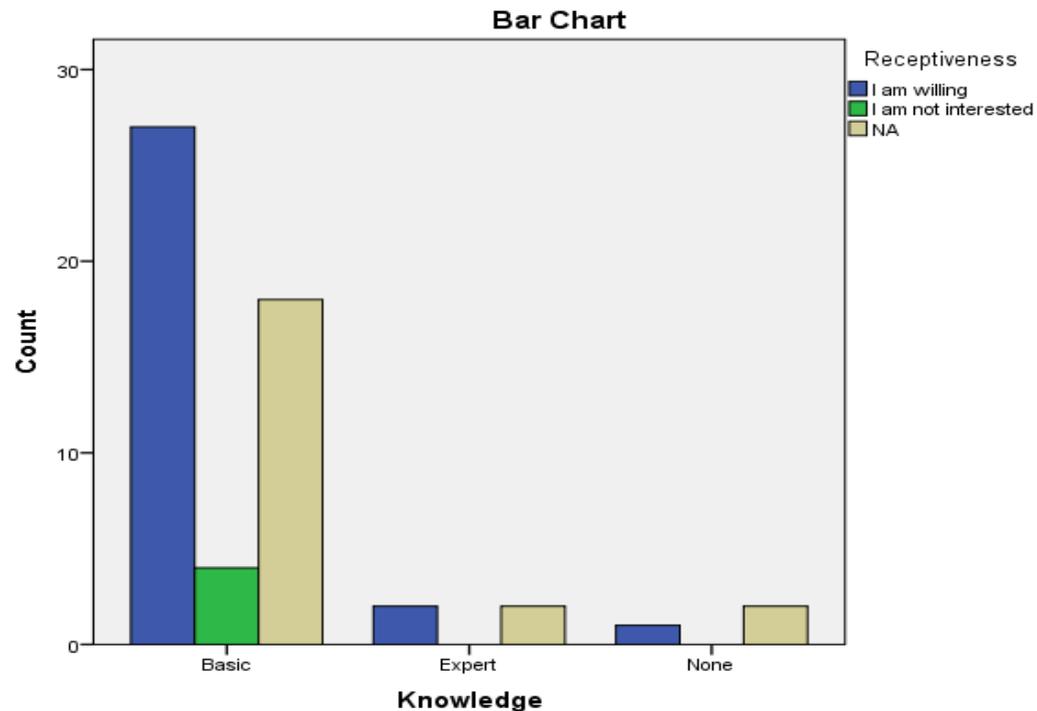
Areas that had access to conventional drainage complained that these gutters contributed to the flooding.

Current Findings

Findings also showed a greater proportion of these communities had basic knowledge of flooding defence system and these were acquired personally

A higher percentage of residents were receptive to the idea of implementing simple SDS to manage their flooding problems.

Also a greater percentage of residents agreed on personally managing and maintaining their devices without external help.





Current Findings

- Finally findings from field observation show a shortcoming in the appropriateness of GIS as a decision making tool for SDS in Lagos Nigeria.
- Google Earth was not accurate or effective in most of the areas considered
- Validation process showed individual buildings and open spaces were not accurately represented on Google Earth maps, and the images were also quite unclear. Hence the inaccuracies with what was on ground.
- **Factors:**
 - Cloud cover and time of satellite by-pass
 - Angle and elevation at which the images were captured as well as poor picture resolution.



What is the Plan?

Involve the collaboration of all stake holders in the community to ensure implementation, maintenance and continuity of SDS.

Also encourage the use of simpler SDS techniques, which can be designed and maintained at relatively low cost, e.g.

- Good house keeping
- Use of sand bags
- Rain water harvesting

Encourage the use of localised raw materials in the design of devices for cost effectiveness.



Conclusion

- Developing countries like Brazil, Malaysia and India have implemented the SDS concept and have had success with its ability to manage runoff sustainably.
- The Monwabisi Park project, which is similar to this, where simpler SDS devices were implemented to alleviate the suffering experienced from flooding, proved promising. Makoko's site conditions are a replica of Monwabisi; this in practice means there exists the potential for Sustainable Drainage in Lagos as well.
- The willingness perceived from the residents to change their circumstances by implementing SDS also offers some real potential.

- Thank you!

- Any questions

