RAINWATER HARVESTING TOWER

Author: Tare Egbedi
Institution: TEG Design Studio

INTRODUCTION

Recognized for having Africa's largest economy and a growing technology hub, sutainability is a topic that is relatively new to Nigeria. In recent years, the gradual rise in flooding as a result of heavy percipitation during the June to October season has raised concerns about developing flooding preventative measures. With a unique climate, Nigeria's weather condition is segregated into three zones which are the tropical monsoon, tropical savana and Sahelian hot. The southern region is the most densely populated, since it lies on the tropical monsoon zone, this region is the most affected during the raining season. The two other zones are warmer, as the central region is the tropical savana, which means it receives sporadic rainfall while the nothern region is Sahelian hot which has a shorter rainy season between June to September.

Nigeria is home to Africa's third largest river, Niger, it stretches from Sierra Leone to Guinea right into Nigeria. The main tributary for this river is Benue river which is situated in Nigeria. During the yearly seasonal rainfall the two coastal states Niger and Benue are the most affected.

Recognized as a natural form of collecting water, rainwater harvesting is the process of storing rain from the roof into a tank, pit or cistern. Rainwater harvesting has been used for centuries, local communities in south Asian countries like India use local materials to design economical solution for rainwater retention. In recent years, African countries have taken initiatives to develop rainwater harvesting in local communities, this can be seen in countries like Kenya and Uganda. The triangular part in this building is an open tank that collects and stores rainwater. The major benefit of harvesting rainwater is that it reduces the demand on clean water. The collected water is mainly used in irrigation for gardens along with providing water suppy for toilet and washing machine.

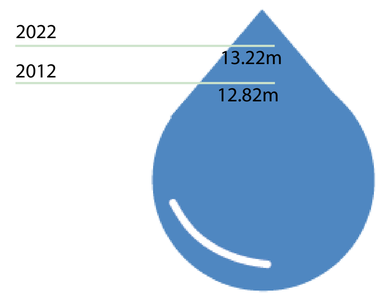
With the world population expected to grow in 2050 to an estimated 9.7 billion, global food will need to increase by 70%. The rainwater harvesting tower utilizes the rooftop to grow vegetables while it collects rainwater. Urban agriculture is a creative farming solution that will help meet the high demand for food. An added advantage to the green roof is that it helps keep the building cool because plants in the roof capture and store carbon dioxide which is the largest contributor to climate change.

The waterfall will be one of the first design attraction that introduces Itana residents to water sustainability. It will operate using rainwater that has been harvested, which represents water sustainability as the building is a symbol of ecological awareness and proactive design to combat energy consumption while protecting the environment. This atrium space is designed to feel almost like a tropical forest.

As a gathering space, the seating stairs has some vegetation which will use the rainwater for irrigation. As a flood proof zone, the atrium can withstand high level of water with minimal damage. During a flood the most affected floors is the first and second floor, in this building these floors have minimal furniture as it's more of a studio space for recreational activities and lounging. Local materials such as concrete and clay will be used as it is easily accessible.

FINDINGS

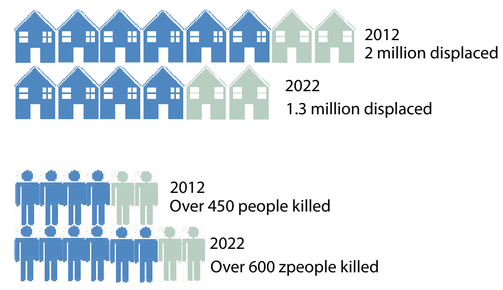
In 2012, the country was hit by what was considered the worst flooding in over 40 years,water levels measured at 12.82 meter. A decade later in October 2022 rainwater level rose to 13.22 meter in low-lying communities close to river Niger and Benue. A major cause of the rise in water level was the additional water released from the Lagdo Dam in the neighbouring country Cameroon. The Nigerian government were informed ahead that excess water will be released, which would flow through the river Niger. A Nigerian project known as Hausa Dam was to be construced in 1982 to mitigate excess water from the Lagdo Dam, unfortunately it was never realised. This shows that a large scale infrastructure project in a developing nation like Nigeria can be challenging to construct. Instead designing flood proof buildings is a more tangible preventitive measure.



As a developing country and one of the most populous nation in the world, addressing a natural disaster such as flooding is challenging for the Nigerian government. The nation has 36 states each with it's own regulation, poor urban planning and inadequate drainage systems are among the issues that exasperte the devastation. The 2012 flooding hit 30 states, the most affected were Adamawa, Taraba , Plateau and Benue state. While in 2022 three more states were affected which shows the possible impact of climate change as the sea level is rising.

IMPACT

Sadly, the worst part of flooding is the damages it inflicts. In 2012 over 2 million people were displaced from their home, although the number are not fully completed but in 2022 over 1.3 million people were displaced. One unique type of settlement in Nigeria is the coastal communities, it's not a master planned community, instead houses are made from low-cost, inexpensive or recycled materials. This low-income and sometimes considered slum communities are densely populated, examples in Lagos include Makoko, Iwaya, and Ogudu while in Port Harcourt Andoni,Bundu, Captain Amangala, Emenike. These communities are vulnerable to the rise in sea levels caused by climate change and recent figures shows that 20% of Nigerians live in marine and coastal environment.



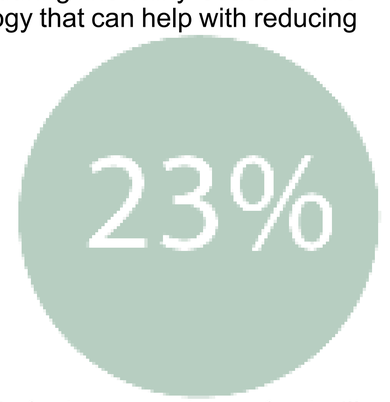
LOCATION

The world population will gradually increase in the next couple of years, in 2030 the global population is expected to be 8.5 billion. While Nigeria is predicted to become the third most populous nation in the world by 2050, with a population of 401.31 million, this is a massive increase compared to its current 2022 population of 218,541,212 million. Nigeria's population increases by 4.1% yearly which affects the demand for land and housing, as a developing nation Nigeria has an abstract urban planning management. In 2015 the government developed 17 UN Sustainable Development Goals, one of which was sustainable cities and communities. In 2022, the UN's analysis of Nigeria's actions revealed that there is little to no policy and standardized systems created to protect marine and coastal system, while the only policy to curb urban sprawl dates back to 1980 which commenced the development of multifamily apartment, this type of dweling favored metropolitan communities such as Victoria Island, Ikoyi, Ogba for medium income families and individuals.

The Rainwater Harvesting Tower will be located in a new master planned community called Itana, Lagos, Nigeria. It's a sustainble and technologically advanced city. Lagos is located in the southern region of Nigeria, which receives a significant amount of rainfall during the rainy season. This high-rise building is designed to use multiple environmental technology that can help with reducing our impact on the environment.

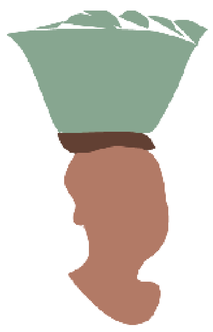
OPPORTUNITY

The global pandemic in 2020, along with political instability in 2022 has led to soaring prices in household goods such as food. During the flooding, food prices inflated by 23% in October 2022 these prices were expected to dramatically increase by December 2022. During the flooding in 2012, 152,575 hectare of farmland were damaged, while in 2022, 266,000 acres of farmland were submerged in the flooding. An important food commodity is rice, in 2022, 10,000 acre of rice farmland were flooded which put a strain on the livelihood of farmers while increasing the demand for rice .



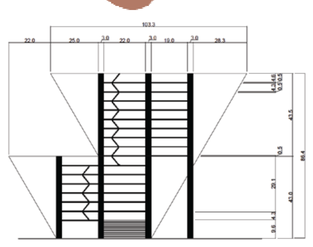
With resources becoming more scarce finding innovative solution to retain freshwater and grow food will become essential for our future.

DESIGN CONCEPT

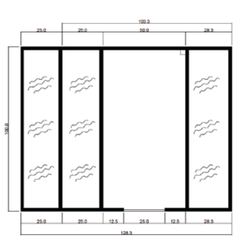


When it relates to food in Lagos, Nigeria, the traditional place to purchase food is from an outdoor street market, generally there are women in the market carrying produce on their head with the rattan basket. The rattan basket is commonly used by small traders to transport and sell goods' along the streets or in a market. The Rainwater Harvesting Tower pays homage to these women, as the triangle shape is a simplified illustration of the rattan basket.

Itana digital residents' mentioned during a survey that food should be incorporated in the building design. This tower will provide facilities to produce, share and learn about food.



Elevation



Plan

CONTACT INFORMATION

Author: Tare Egbedi
Email: tare_102@outlook.com
Institution: TEG Design Studio