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The Use of Waste Glass Experimental Model to Prevent Lethal Oceanic Waves and Flooding from Lagos Areas

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Abstract
A resistance glass material model is made to prevent the lethal oceanic wave paths that are characteristically flooding the Lagos State coastal line during oceanic rise due to climate change as resulted from global warming. The experimental model made from waste glass material matrix would prevent the oceanic wave paths due to glass resistance material that structural glazed the concrete made of iron rods, With over ten million people that are currently living in a densely populated areas of Lagos coastal line could be somehow perished in the nearest future due to recent rapid rise of the oceans globally. The rising ocean waves need to be adequately checked through some proper preventive measures. Various examinations were therefore conducted on the glass structures experimental made. Results were obtained and eventually analysed to check the oceanic lethal currents rise. Both theoretical and empirical frameworks were intensively studied to guide in the preventive measure of the expected oceanic destructive surges and coastal line floods especially in between the months of July and November annually. Besides, global warming; human activities and pollution are major responsible factors that have also contributed to the erosional problems and flooding of Lagos coastal line and beaches. These factors mentioned have also helped in raising the oceanic temperature to 26^0C presently. Care should be taken not to further increase the temperature to 27^0C; otherwise tropical environment disturbances like heavy rainfall and floods should be expected in Lagos state. The experimental glass with matrix model is therefore designed and constructed to prevent the ocean wave forces and loaded sediment materials through the structural strength and durability resistance in an economical process.

INTRODUCTION

Philosophically human race do not inherit the earth planet from their ancestors, but the globe is borrowed from the present and unborn children. Therefore, the earth needs to be carefully sustained and preserved for the next generations for reasonable use. However, human activities and urbanization has resultantly increased the 70 per cent of the earth surface covered by oceanic water. If world population will grow to 9 billion by the year 2050 from the present more 7 billion in 2012. This will result in rapid vegetation usage with sharp reduction from the present vegetable land. Therefore, 50 per cent more food will be needed. While 45 per cent increased energy will also be required; and 30 per cent water will be seriously demanded for use. Resultantly, the global development model is therefore unstainable to achieve this required sustainability agenda for a new political economy globally (United Nation,2012).

Various researchers conducted have shown that earth's average temperature is rising sharply with extremes in weather. This has also caused the melting of ice caps and various glaciers from their residents. Analytically, climatic conditions and current human activities have resulted in the death of over 5500 species and coral reefs. All human and natural problems that are affecting the earth planet and are somehow related to climate change are requiring pragmatic approaches to be permanently solved. But all world political and economic leaders must be willing to participate objectively and reasonably. Most researchers believe the chief cause of climatic problem is the burning of hydrocarbon which produces above 75 per cent of carbon dioxide into the air through manufacturing, social and other industrial activities for the past 200 years. Large scale deforestation has also contributed to climate change through urbanization, industrialization, farming activities and other infrastructural facility expansions. Therefore, rapid reduction of global forest encourages more carbon dioxide from the huge emissions already created by the fossil fuels burnt; because only few vegetables and trees left over could absorb the large greenhouse emissions. Technically, this process slow down the escape of heat from earth into space. These resultantly cause earth temperature to rise sharply. If the present rate of global warming continues; and the production of carbon dioxide is not curtailed properly the earth's average temperature will continue to rise higher than a decade ago.

Predictably, within the next fifty years the consequences of extremes in weather conditions will be unpredictable. Today, the economics of low lying coastal areas where human activities, dense population and huge investments should be carefully protected because the higher ocean levels or surges Therefore preventive measures would be used in tackling the Atlantic ocean rise and surge at the Nigerian beaches and Lagos.

Geographically, Nigeria has about 853 kilometers of coastal line that boarder the Atlantic ocean with many estuarine into the ocean. However, Lagos State being the commercial and former capital of Nigeria has a special interest to Nigerian political and economical leaders, Lagos landmass is geologically made up of large

expansive sedimental wetlands adjoining creeks with about ten lagoons formed as a result of depositional sand and clay over the centuries. Principally, the dominant Guinea current that is operating along the coastal line of North West African coast to Cameroon republic is somehow responsible by transporting most sedimentary sand, gravels and clay into Lagos lands that created beaches, creeks and lagoons. From the ten lagoons of Lagos state a harbour was created. Between 1901 to 1930 various mole were constructed because there was no natural rocky shore in Lagos. The constructed moles therefore serve as harbour breakwaters and protectors to the Lagos harbour from both ecological and natural sediment thaw or situation.

HUMAN ACTIVITIES ON OCEAN COASTAL LINE AT LAGOS STATE

Increase in ocean surges is carried by the sand mining, dredging, filling, reconstruction of moles and construction works at the Atlantic City. Importantly, continuous erosion of Lagos shoreline is also caused by the abandoned ship wrecks littering Lekki beach in Lagos. Another factor is the climate change as are result of global warming. However, Eko Atlantic city project is a scheme embarked upon by the Lagos State government to save Victoria Island environment from continuous erosion due to the creation of east and west moles that caused erosion in the axis. The developers initiatively recouped money spent on the lost\tab land that was reclaimed through the Atlantic Ocean city project. Although there may be a problem on the environment impact assessment (EIA) of Eko atlantic City on the rural Community which depend on the environment for occupation and residency. There is a need for a periodical stake holders assessment and joint integrated coastal zone management study for the entire Lagos shoreline to understand the dynamics of Atlantic ocean and its environment. construction works and habitat modifications have obstructed the natural sediment regime and the ocean water current. According to Onyema, (2012) such large scale habitat and land dredging, sand mining and fillings; with the case of negative modified effects of shipwrecks have affected the dynamics of Lagos coastal areas. Asides, heavy sea storms, hurricanes and continental sediments from gulf of guinea currents over the years. All the aforementioned activities have led to loss of lives, land mass, infrastructural facilities, industries and house. Therefore, 20 years of extensive long time risk assessment analyses of the entire Lagos shoreline is required for critical studies.(Ayeyemi, 2012). When the coming atlantic oceanic currents are displaced by constructing huge land mass called Eko Atlantic city on their paths. The giant ocean waves will create kinetic energy from the displaced area to anther and somehow find their levels at some other communities, environment and regions. But the lethal currents would surely affect other communities and environment. Therefore there is a need to consider the speed flow of such ocean current. When such water current exceeds certain critical value and flow that is not laminar; then the irregular, chaotic and turbulent ocean currents could be continuously changing and be so lethal in nature (Young, 2008).

The effect of global warming has led to climate change with a consequent rise in sea level globally. This has increased the volume of the kinetic energy of the Atlantic ocean current wave research conducted shows large construction have also increased the erosional and other environmental problem. With the creation of both east and west moles at Lagos harbour serious erosional problem had been reported along Lagos axis. Major area are ;bar beach, Kuramo, Apese, Lekki and Alfa beach. At frontline areas and communities erosional has taken above ten metres yearly by the Atlantic Ocean. Unfortunately, this has not been checked for some past years has therefore activated serious ocean surges that led to the series of material lost significantly. Recent studies of the last decade have shown frequently ocean overflowing the beach and some communities. This should still be expected at all these aforementioned areas within the month of August to December of every year; due to high tide and ocean volume with its rapid current at the gulf of Guinea downstream. Lagos has two closed lagoons with high ecological, economical and tourism potential. Kuramo lagoon and other should be protected from continuous organic pollution. Summarily there is the need to protect Lagos coast line in areas where human activities have caused damaging effects. Lagos state Environmental pollution Agency (LSEPA) has noted the industrial solid and liquid pollution is given both the public and state government a serious concern. About 60 per cent of this pollution comes from over 300 industries within Lagos state (Shabi, 2012). Industrial waste needs to be properly managed perhaps through recycling process. It takes glass bottle 500 years to be decomposed when thrown into ocean. While e-waste like computer or a television set that contains lots of harmful chemicals also takes several years to decompose in ocean. Most of these solid industrial wastes are very dangerous to the environment and public health. Cleaner environment is required for this present generation of human race and the coming generations of Lagosians. Advisably, the state could partner with the Environmental Protection Agency (EPA) or with Non-Governmental Agencies (NGA) to curb the industrial pollution within Lagos state. While a policy to encourage waste generation to wealth generation could be promulgated instead of dumping wastes to lagoons or ocean. Realistically and ecologically structural permanent solution of hard engineering coastal management structures is suggested to protect the entire Lagos coast line stretch. Glass structures are researched upon to be used as structural permanent solution for these beaches and coastal communities' fence. This is necessary rather than the temporary dredging of sand to maintain the coastal line yearly. Economically, to reclaim land lost to the Atlantic Ocean, this engineering approach of glass glazing is

designed to be employed in protecting the sea walls, grypness, barrages and barriers permanently in Lagos-State of Nigeria.

MATERIALS AND METHOD

FLOOD RESISTANCE GLASS MANUFACTURING

Flood resistance glass manufacturing process starts from 100 per cent batch calculating and composition where: silicon=72.8%; Alumina=1.4%;Iron compound=0.15;Calcium carbonate=8.2%; Magnesium Carbonate= 3.8%; Sodium Carbonate =12.8% Potassium Carbonate =0.8%; sulphate= 0.3% (Button, 1993).

Characteristically, this is typical of common commercial soda-lime-silica glass. As the temperature rises to 660^0 C, evaporation occurs from the moisture contained in the glass batch composition as the liberation of CO, and water vapour from chemical bound water. Heating is caused mainly by endothermic and exothermic reaction, But heat consumed in completing these chemical reactions amounts to 25% of total heat required to melt glass batch materials to 1500^0 C (Doyle, 1979).

Eutectic mixture of (Soda-lime-silica composition) flat glass are reactions of sodium with calcium carbonates formed at 775^0C and sodium slicate with silica formed at 800 ^{0} C. This further reacts with the additional soda to precipitate the metal silicate at temperature below 840^0 C. Soda ash as a flux melts at 850^0C has a rapid and violent reaction within glass melt to liberate CO and water vapour all these process act as a stirring medium and thus develops a refining effect on the glass melt between 1000 ^{0}C to 1200 ^{0}C temperature, dissolution of the remaining materials proceed very rapidly and all silica would have been dissolved in the melt for mutual solution of the liquid phases. At this stage glass melt becomes much more viscous and rich in silica. All the crystalline materials must have disappeared and been incorporated into the melt. At 1200^0 C temperature, glass is formed either by floating or drawing sheet of glass production method because of the economical and technical reasons. Glass to be employed could be cut into various sizes and annealed where stresses within the glass could be relaxed. The glass should be toughened for more strength because of the work expected due to oceanic surges and sedimental load impact. Importantly, all the shaping, drilling and cutting of a toughened glass should be done before the glass is eventually toughened. Technically, the glass toughened surface compressional force will be employed to prevent the oceanic waves strength and the resultant oceanic flood impact. Where the flood or surge impact would be massive and destructive for better strength therefore, the toughened glass surface would be further laminated to withstand oceanic impacts for several times or period. Such processed laminated glass would have a bending strength that would be five times stronger than annealed glass. Conclusively, toughened annealed thick glass is used to glaze concrete massive wall to prevent the flood or oceanic surge in this model project.

RESULTS AND DISCUSSION

Design model was finally adopted and used in his experimental research work for both Lagos oceanic surges and flood problems within the coastal areas. Technically, three main methods of modelling were analytically considered in the study: mathematical modelling, was examined where equations were developed and tested with some stated assumptions. For Lagosian coastal flooding or tsunami problems if occurred, it is possible to define some reasonable equations to technically restrict the oceanic flood problem significantly. If the surge, flood or tsunami impacts have been identified, subsequent solution would lead to "optimum" solution for the oceanic problems. Secondly, scale modelling method was also illustratively considered. This involves the creation of two dimensional (20); with three dimensional (3D) Scale models. As practically illustrated in this project by means of an architectural linkage with a triple mechanism where civil, material and structural engineering were idealistically applied; and structurally modeled in a three dimensional way. Simulation method aided by computers was also considered. In summary, the illustrative scale modelling was employed because of its easy illustrative educative and understandable method of presentation. A prototype glazed concrete structure was eventually produced (Figure)

However, Glass strength and durability properties were used to design the material to resist the oceanic surges and flood. All the structural and other engineering calculations were strictly scientific so that a prototype made could be reproduced in the research study. If glass as an engineering material could last about 5000 years without disintegration inside ocean. Then glazing a structural concrete with flat glass specially made for fencing could definitely provide durability and strength required for a wall fence planted to provide security and protect Lagos coastal areas from oceanic surge, sea rise and flood impacts. To satisfy other coastal countries with these similar aforementioned oceanic problems structural design specifications that were carefully considered and adjusted. This was done in terms of glazed structural model height, capacity of the disturbing winds and oceanic surges and flood impacts. Other factors considered were the topography and roughness of a place terrain. Naturally, oceanic currents or wind waves comes in that have size, speed and time duration. All these factors need to be technically and carefully, calculated for the glazed structural model to withstand various problems such as earthquakes and tsunamis in particular.

In many countries, especially within the pacific and Indian oceans, researches into earthquakes, oceanic speeds and wind velocities have generated significant data for reasonable predictions. These data were rarely exceeded at realities ( ). For better accuracy in oceanic and wind prediction, national standard and code of practice should be provided ( ).

The research model was therefore designed in a manner to control both the wind and oceanic pressures. These currents are expected to swirl around the erected structural model with irregular forces constantly lilting the glazed structural model. For durability of this structure calculations were made for the worst design pressure, suction or destructive forces from storms, hurricane and tornadoes to be frequently or constantly litting the structural model in assumption. Glass strength and loads from both wind and ocean depending on the time scale. Due to dynamic wind and oceanic pressures, the design and composition of flat glass also vary from topographic countries to low land countries. But loading on the glass model was considered to be roughly uniform for Lagos State coastal area because of low land area, no natural barks, with only two harbours as found in Victoria Island of Lagos.

Glazed structures that were designed to prevent oceanic floods or surges should also be designed to resist any earthquake destructive forces. Understandably, earthquakes are a result of the planet's tectonic plates shifting and relieving pressures meet. While the earth's plates are constantly moving in some way, occasionally this movement is great enough to cause an earthquake due to plates colliding with one another or because the edge of one plate slips underneath the edge of a neighboring plate. Occasionally, such a shift in the earth's tectonic plates is so great that it produces a massive earthquake, causing devastating amount of damage to properties worth trillions of dollars with great loss of millions of people globally. In certain places within the pacific and Indian oceans Tsunami usually follows earthquake as happened in 2004 at Sri-Lanka and the recent oaten in year 2011 at Japan. Globally, earthquakes and tsunamis occurred without or with little warning. some that stand out as the biggest and deadliest quakes since the turn of the twentieth century have magnitude of 8.6 to 9.5 as measured by Richter scale developed in 1934 instead of using mercalli scale developed in 1902 but inaccurate due to people's perceptions and magnitude exaggeration of events.

The world has received Tsunamis with speed of 105 Kilometers per hour and 25 meters high that followed very high magnitude earthquake. Other lethal oceanic currents have raced down millions of people and destroyed properties worth trillions of dollars as found in the year 1556 at China, another one was found at Portugal in 1755 also in the year 2004. Research findings have led some scientist to believe that global Tsunami is a distinct possibility in future (Science 2010).

Conclusively, glazed structural design was constructed ( ) and used as a model to prevent or withstand high magnitude oceanic surges and flood at Lagos coastal areas of Nigeria. Glass structural designs are also considered for future development in housing; civil and material engineering. Recently, the rate of disasters and earthquake, flood and oceanic surge is rapid due to climate change. Consequentially, climate change without prevention will definitely be a threat to the less-privileged people in the undeveloped nations of the world. Resultantly, these poor countries would have been flooded due to ocean rise. All their assets must have been completely washed away by these floods. Consequently, foods and shelters would be very expensive to purchase. With little infrastructural facilities remaining in place for these people, life will be very unbearable due to climate change in the world. Understanding these explanations would make it even hard to persuade the advanced and rich western European countries, America and Canada to take these climate change problems "that is not their own" seriously (Schelling 2005).Today, climatic change problems of ocean rise do not scare these Americans and most European nations because of the various engineering materials they have researched upon. Glazed concrete structure could be used to provide shelters in the flooded area. Aside, it use in oceanic fencing in the research project.

CONCLUSION

The signs of the recent Lagos shoreline overflow were already with Lagos for so many decades back and may still be there until the right things are done. Climate change has been happening for a long time from carbon dioxide phenomenon. The rate of change is alarming over 250 years. If the emissions remain unchecked the oceans will be more acidic than anything experienced in the past 20 million years in about 40 years' time.

The oceans have absorbed 30 percent of carbon dioxide that humans have added to the atmosphere since the beginning of the Industrial revolution and nearly 80 percent of the heat generated by those gases. Statistically, world's oceans absorb some 30 million metric tons of extra carbon dioxide daily; roughly twice the amount of carbon dioxide emitted each day by the United States of America. However, ocean sediments and deep water are major enormous potential reservoirs that oceans have as natural buffers to help with change.

Solutions could be found to all these pollution problems on Lagos coastline by carrying out all the necessary hard and soft engineering coastal designs, constructional works, research activities and management system that would chiefly mitigate the effects of Atlantic oceanic lethal current on Lagos shorelines.

Other approaches that could reduce the pollutant atmospheric carbon dioxide concentration are:(1) To

maintain 350 ppm of carbon dioxide in the atmosphere. (2) Corals and other animals preservation in the oceans. (3)Stoppage of deforestation and (4)Reforestation programme. (5)Non overfishing (6)Promoting of energy efficiency (7)Low carbon fuel (8)regulating carbon releases

Importantly, there is a need to implement the mitigation plans of environmental impact assessment of these aforementioned programmes and projects technically to the letter. Most significantly, enlightment must be provided for the Lagosians, especially the shoreline people need to develop an environmentally friendly coastal culture as achieved in Lebanon, coastlines of Netherlands, Dubai, Biloxi Beach of Mississippi and Malibu Beach of U.S.A and Beaches of Belgium. These could be done without devastating the nature and environment. Environmental consequences of Lagos state with their ecological, economical and tourism potential are enormous to the Nigerian economy. The coastline should therefore be protected now not in the future.

REFERENCES

Awake publication (2005). Natural disasters are they getting worse. Awake July 22, 2005. Watch tower Bible and tract society of New York. Pp. 5-9.

Awake publication (2007); Living in high rick areas Awake September 2007. Watchtower bible and tract society of new York pp.3-6.

Awake publication (2012); The 2012 japan tsunami. Awake December, 2012; watchtower bible and tract society of new York pp. 14-20.

Awobodu,k. (2012); Rising to challenge of weather threat. The nation newspaper, lagos Nigeria. 22/02/2012.

Adeyemi, D. (2012); Fresh fears over continuous erosion of lagos shoreline. Nigerian national mirror. www.nationalmirror-online.net retrived on Tuesday, January 31, 2012.

Baiyewu, l. (2012); Half persons missing, one dies as ocean surge sacks lagos beach. Nigerian punch newspaper, August 19,2012. Pp.8.

Button,D and brian, p. 91993); Glass in building butterworth-Heinemann Ltd. Oxford. United kingdom.

Childs, P.R.N. (1988); Mechanical design. John wiley and sons inc. new York.

Dada, f.o.a. (2007); world environmental issues. Nigeria social studies atlas macmillian publishers Ltd, oxford. Britain. Pp. 62.

Derck, s (1998); understanding structures. 2nd Edition macmiliam press Ltd. London.

Dolye, J.P. (1979); Glass making today. Red hills portcill press. New York united state of America.

Doren, H.V. (1954); Industrial design. Mc graw-hill book company inc. new York U.S.A.

Editorial from other land. (2012); Global warning in our backyard. Nation newspaper. Lagos. 4/7/2012.

Environmental homes. (2008); Flood houses of the future winners. The guardian newspaper. Lagos. 29/12/2008.

Fernado, H.j. (2008); 107ft long wave tank for oceanic motions. Environmental fluid dynamics programme directorate. Arizona state university, in tempe.

Fischer, d. (2008); how climate change is killing our oceans. New Nigerian newspaper. Lagos 20/11/2008. Pp. 26.

Fischer, d. (2008); How climate change is killing our oceans. New Nigerian newspaper. Lagos. 20/11/2008.

George, l. (1984); The theory and practice of metal work longman publishers, London. U.K.

Hurst, K.S. (1999). *Engineering Design Principles* Arnold publishers, London. U.k.

James, G. (1995). *Design and technology*, Cambridge University Press. Cambridge. U.K.

Jim, B. (1997). Pressure, *key science physics,* Stantey Thornes Publishers Ltd., London. U.K.

Ndikanwu, M. (2012). Ocean Surge at Kuramo Beach.

Ndiribe, O. (2002). The Bar Beach: Going, Going….. *The vanguard newspaper*. Lagos. Nigeria 19/11/20002.

Nigerian Institute for Oceanography and Marine Research. (2012). Storm Surges and Beach Erosion at Victoria Island: A Critical Assessiment of its State. The Niomr Report. Nigerian Research. Victoria Island, Lagos. Nigeria.

Mathews, C. (2010). Case studies in Engineering Design. John Wiley and sons Inc., New York.

Oguntola, S. (2012). Ocean surge: Fashola promises innovation solutions. The Nation on Sunday August 26,2012.

Onyema, i. (2012). Tackling ocean surge at karamu beach. The punch newspaper. Nigerian punch newspaper publications. Lagos. September, 2012. Pp.15.

Oyeleke, M. (2012). Floods coming in oyo, edo, 21-states. Erosion, flood and coastal zone federal ministry of environment, Abuja.

Shabi, R. (2012). Fashola clerics to tackle noise pollusion. Nigeria punch newspaper lagos, Nigeria. 24th September, 2012.

Schelling, T.C. (2005). The economics of global warming. Department of Economics and school of public policy. The university of Maryland. Maryland U.S.A.

Science Guardian, (2010). Researchers to forecast earthquakes with mathematical patters. The guardian newspaper. Lagos. 9/12/2010. Pp.33.

Spence, R.J.S. and Cook, D.J. (1983). Building Materials in developing countries. John Willey and Sons. New York. U.S.A.

Wright, R.T. (1990). Manufacturing systems. The Goodheart –Wilcox Company Inc. U.S.A.

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