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Incorporating Social Aspects in City and Regional Planning to Cope with Flooding and Soil Erosion, in Kenya

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Abstract: *In the recent past, urban growth and expansion has been astronomical due to rapid population growth. Nevertheless, the growth hasn't taken into consideration social and environmental factors. This has led to increased casualties due to lack of preparedness as a result of natural calamities. There is generally, poor planning and lack of infrastructure to cope with more frequent and heavy rains coupled with absence of people centred resilient mechanisms and disaster management strategies. Further, it is widely known that flooding due to poor urban planning has immense negative social-economic effects but it remains a challenge to measure those effects, not only for individuals but also for the county or even the national economy. The proposed paper seeks to focus on social planning as a strategy in coping with flooding and soil erosion in city and regional planning. Social planning helps to emphasize the use of rational problem solving techniques, and data driven approaches to identify and determine social problems consequently helping communities to determine ways of improving their quality of life. In this regard, social planning should be considered as a strategy in the quest to try and come up with viable solutions to the perennial problem of flooding and soil erosion as a result of the heavy rains. The authors propose the involvement of community members in construction of gulley's and embankments, advocating for reforestation and proper farming methods to avoid soil erosion leading to sedimentation. The paper ends with suggestions on peoples' input in social planning with a view of promoting urban community ownership to mitigation measures of flooding and soil erosion in city and regional planning.*

Keywords: *Social Aspects, Flooding, Social Erosion, City and Regional Planning, Kenya*

1. BACKGROUND

Flood is a natural phenomenon but human activities and interventions such as uncontrolled urbanization coupled with increased population have increased the damages and losses caused by floods. Urbanization aggravates flooding by limiting where run-off can flow and the increased impervious layers in urban areas obstruct the natural channel thereby shortening the time taken by flood water to flow into river (Thecla, 2014).

Kenya has experienced much more frequent floods in the recent past because of the escalating trends of urbanization and astronomical expansion of urban population increasing the number of cities without proper planning and drainage facilities and a lack of consideration for social and environmental factors. Notably, the recent El-Nino rains in 2015 led to loss of life (human and animal), severe damage to property and infrastructure and disrupted commercial and economic activities in towns like Narok where there was massive flooding and soil erosion. Flooding also leads to destruction of social amenity structures such as water supply and sanitation leading to the widespread of diseases such as cholera and other water borne diseases due to poor sanitation (Adeloye & Rustum, 2011). Statistics jointly published by the United Nations Children's Fund (UNICEF) and the World Health Organization (WHO) states that most hospital admissions are as result of water borne or water washed diseases and the problem is further worsened by flooding (WHO & Unicef, 2000).

Despite the immediate hydrological cause of flooding being well known to be the long and persistent rainfall on already saturated or nearly saturated soil which results in increased runoff, which can exceed the carrying capacity of rivers and other conveyance structures, and can breach physical defence there is the absence of people centred resilient mechanisms and disaster management strategies (Adeloye & Rustum, 2011). Further, human activities exacerbate the effects and impacts of flooding by modifying the physical and environmental characteristics of the catchment area. Notable among the modifications is the reduction of the infiltration capacity of catchment due to paving and erection of structures (Pauleit, Ennos, & Golding, 2005).

Additionally, another anthropogenic effect of flooding which is a very common occurrence in Kenya and other developing countries is the construction of structures/buildings in flood plains, on wetlands and waterways within

our cities with utter disregard of the dangers posed by these actions which impede the free flow of rivers during heavy rains subsequently causing them to burst their banks leading to flooding like what happened in Kenya in early 2016. Characteristic of most urban areas in developing countries like Kenya is inadequate infrastructural provision such as roads, drainage systems and waste collection and handling facilities which poses a grave danger in case of heavy rainfall as a result of climate change which is predicted to result in more intense, flood-causing storms in many parts of the world (IPCC, 2007).

The increased incidence of flooding as witnessed in Kenya in the recent past and to a greater extent the whole of Africa and other third world countries can be attributed to the above named factors. However, there is a dearth of knowledge on the influence of the specific factors making it difficult to design a proper and sustainable solution to the already big problem of flooding which if not checked might grow worse. Developing sustainable and lasting solutions to the problem of flooding in the world requires gaining knowledge about flooding and flooding mechanisms. Efforts have already been put in place to achieve this but more often than not the tools and plans for flooding mitigation cannot be transferred wholesomely to other regions due to different climatic and hydrological settings. For example, through the Flood Risk Management Consortium in the UK, there has been the development of new paradigms for modelling flood propagation in rivers and flood plains in the UK, as well as flood inundation extents in urban areas, among others (Néelz et al., 2006; Pender, 2006).

2. STORM WATER MANAGEMENT STRATEGIES

Over the years, there has been installation of underground pipes, canals, dams, dikes and diversions to act as structural interventions to regulate the flow and/or to convey the water as quickly as possible away from the development, therefore preventing flooding locally. However, a general problem with this approach is that by increasing the speed of runoff, it can change the flooding regime of the catchment and so, although flooding may have been prevented upstream, the flooding problem might actually be exacerbated further downstream (Carmon and Shamir, 2010). Increased rates of water flow can also lead to soil erosion and damage the river's flora and fauna. Pollutants from the built up areas in the wetlands and waterways affect the quality of water as they are washed into rivers or infiltrate groundwater systems and thus can harm fish and wildlife and can cause long-lasting damage to groundwater quality (Bekele and Argue, 1994; Roy et al., 2008). Cleaning up and identifying these pollutants is hard because of their nature to diffuse.

Structural solutions which for a long time have been used in most countries to mitigate the effects of flooding in the long term have thus been found to be unsustainable because they can lead to environmental degradation, they are costly and, most importantly, they are time consuming. A paradigm shift has been silently being implemented from the traditional structural interventions to sustainable urban drainage systems (Suds) to deal with the flooding issue.

'Suds, or best management practices, are a collection of non-structural flood management approaches that aim as much as possible to maintain the predevelopment natural drainage pattern of a site and to treat runoff in an endeavour to remove pollutants. They comprise a number of simple design interventions and other measures, which can either be applied alone or in combination, and include the following' (CIRIA, 2000 in Adeloye & Rustum, 2011).

Preventive measures: these are measures that reduce the volume of overland runoff such as rainwater and runoff harvesting and recycling, collection in water butts and underground storage tanks.

Filter strips and swales: these are vegetated landscape features with smooth surfaces and a gentle downhill gradient to drain water evenly off impermeable surfaces.

Infiltration devices: these are below-ground or surface structures that drain water directly into the ground. Examples include soakaways, infiltration trenches, swales with infiltration and infiltration basins. These may be used at source or the runoff may be conveyed to the infiltration area in a pipe or swale.

Filter drains and permeable and porous pavements: these are permeable surfaces, which allow rainwater and runoff to infiltrate permeable material placed below ground to store water before discharge.

Basins and balance ponds: these are structures designed to hold water when it rains. Basins are free from water in dry weather, ponds contain water at all times and are designed to hold more when it rains; examples include

detention basins, balancing/attenuation ponds, flood storage reservoirs, lagoons, retention ponds and wetlands/reed beds.

If properly operated, Suds have proved to deliver many benefits, as outlined in; these include (CIRIA, 2000; 2001in Adeloye & Rustum, 2011):

Enhanced groundwater recharge leading to improved yield of aquifer systems, abatement of possible saltwater intrusion in coastal aquifers and enhanced base flow discharges in hydraulically connected river systems

Protection and enhancement of water quality through pollutant trapping and degradation processes of otherwise difficult-to-control diffused sources

Flood peak attenuation thus reducing the risk of downstream flooding

Reduction in potable water demand deficiency through rainwater harvesting

Improving amenity through the provision of public open space and wildlife habitat.

3. WAY FROWARD

"All countries are vulnerable to climate change and instability in weather patterns, but the poorest countries and the poorest people within them are most vulnerable, being the most exposed and having the least means to adapt." (Douglas et al., 2008). Despite this, people centred resilient mechanisms and disaster management strategies can be used to solve the perennial problem of flooding and soil erosion. Use of the Suds could be an effective way of incorporating community members to come together and get trained on what suds are and their importance in the fight against flooding in the community. Both the county governments and National Government should set stricter laws on construction of structures on waterways and stiffer penalties be charged to those found flouting the set regulations. All riparian areas should be gazetted and be protected by the law from construction of any sort on them. The community should be trained on waste management practices because many researchers have found out that despite the drainage system not being able to accommodate the needs of the population, existing drainage systems are always water clogged as a result of blockages that are occasioned by solid waste that has been dumped in them.

It is also recommended that a flood warning system be devised so as to warn the community of an impending flood thus mitigating the impacts of floods on human life. Construction of flood diversion channels by community members which involves the construction of artificial channels along main river channels to divert part of the discharge during flood flows. All structures that lie along water channels should be demolished to let the water follow its natural course (Adetunji & Oyeleye, 2013). Indiscriminate dumping of waste should be a great offence carrying high fines and the government should make a provision for proper waste management scheme for the community. This could be further strengthened by a course being introduced to school going children in their formative years on waste disposal and management practices to ensure the nest generation are well versed on matters waste management. There should be regular monitoring of disaster zones by development control of all planning authorities within an area and reduction in building plan approval charges.

4. CONCLUSION

Though flooding and soil erosion have diverse effects on our living environment, the effects can be reduced and properly managed through a binary approach by the adoption of both preventive and remedial actions to combat the devastating effects of flooding on our built and social environment. The above stated measures could be adopted to achieve a safe, conducive, pleasant and aesthetic environment both for living and working free from the dangers of flooding.

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