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Assessment of Physical Structure with Geological Features Interaction to Flooded Area "Mucuruzi Village"

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***Abstract*— Mucuruzi Area is located at South-West of Kigali city, it is the area found between hills with average altitude, Muzuruzi village lays on Nyabugogo valley alongside of Nyabugogp River**

It is a thickly, clouded and congested area with commercial activities movement and infrastructure development, it can be considered as among the area which receives great amount of sediments especial in rain seasons due to its geographical positions, drainage system, urbanization development and physical planning of neighbouring villages.

This research carried out the assessment of physical structure with Geological features interaction to flooded area". The aim of this research was to assess whether the flood occurring on that area is highly influenced by Physical structure or there are some geological features involved in flood disasters , moreover the methodologies used were only focused on elevation distribution where it recorded for topographical contour map to topology analysis, consequently the study confirmed that interest area recognizes enormous flood prone due to sediments depositions which gradually flattering the existing topology in the extent where drainage deviated to its routine and urbanization development contributes frequently to the disorientation of water when it comes to rain heavily, however physical structure can't be totally neglected regardless the causations of flooding on that area, but its contribution is absolutely uncritical if the rest of man-made activities are well controlled , monitored with proper management plan.

Keywords— *Physical structural, Elevation, flood, Mucuruzi Village*

I. INTRODUCTION

Flooding occurs most commonly from heavy rainfall when natural watercourses do not have the capacity to carry excess water. However, floods are not always caused by heavy rainfall. In valley areas, water inundation can be caused by the movement barrier of water and the flexibility of sediments, if a dam fails or any other water body control, triggered for example by an earthquake, blasting the downstream area will flood, even in dry weather conditions.

The process of urbanization, environmental destruction and climate change are among the causes of the continuous increase of flood hazard events and the associated losses worldwide; mainly due to the increasing impervious surfaces and the exposure of people and their wealth [1]. Urban impervious surfaces, houses, roads, and many more reduce the infiltration capacity of the former rural catchment [2]. This results into the upsurge in the amount of water available for runoff and leading to flash floods. In addition to the increase of the impervious surfaces, there is the soil compaction. According to the research done [3]. the infiltration capacity of the soils can reduce up to 70 to 99 percent due to the compaction induced by construction activities. Besides, some
other unintended activities like moving trucks and humans also increase compaction [4]. On the other hand, the urbanization process influences the positive trends in total losses associated with flood hazard. As reported [5]. the floodplains being the preferred places for urbanization, continuous increase of the population and their properties in those flood prone areas significantly increase the impacts of flood regardless of the change in the intensification of the frequency of hazardous flood events.

II. STUDY AREA

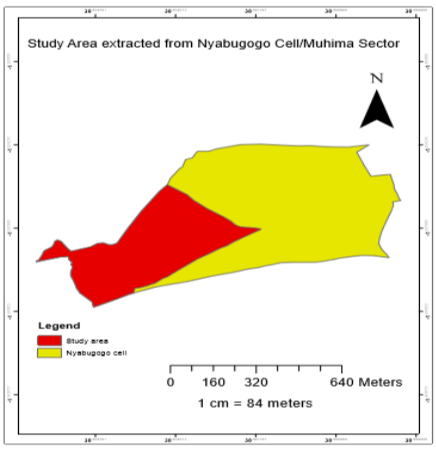

Fig.1.1. Study Area

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A. General overview

Mucuruzi village study area is estimated to be 60000m2 as surface, it is located in Muhima sector, Nyarugenge District Kigali city which is capital of Rwanda; it is known among other well-known flooded area within Kigali city. It also considered as commercial Centre with tremendously significance in dynamic movement of Rwanda's economy especially revenue income of Kigali city

B. Climate of Nyarugenge District

Rwanda is laying in the central plateau, it recognizes humid and relatively mild climate due to the variation of latitude, rain falls and bimodal pattern. About 40% of annual rain occurs during rainy ranging between February to May, followed, by long dry season which lasts 3months, the mean annual precipitation at an average of 1700m altitude at above Mean Sea Level is 1200mm And the Mean annual temperature is 19oc, the amount of rainfall increases with the increasing of

Altitude from East to West [6].

The first influence on the climate of Rwanda is the Inter Tropical Convergence Zone (ITCZ) which brings together the Atlantic westerlies (wind) and Indian Ocean Easterlies (wind) and the dry North-East and South-East monsoon winds. Another influence on the climate of Rwanda is the high-altitude relief in the North-western part of Rwanda because of their elevated altitudes.

Nyarugenge's climate average monthly data from 30 years

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Night	21°c	22°c	21°c	20°C	19°C	20°C	20°C	21°C	21°C	21°C	20°C	20°C
Night	13°c	13°c	13°c	13°C	13°C	12°C	12°C	13°C	13°C	14°C	13°C	13°C
Precipitation	46mm	63mm	110mm	134mm	127mm	72mm	26mm	19mm	25mm	27mm	27mm	26mm
Rain days	19	20	27	27	26	22	17	19	25	27	27	26
Dry days per day	12	8	7	3	5	8	14	12	5	4	3	5

Fig.2.1. Nyarugenge's climate average monthly data from 30 years

C. Geomorphology of Nyarugenge District

The geomorphology of Nyarugenge is characterized by several mountains and also has varying geographical features ranging from gentle hills to high hill tops and long ridges, with rivers (Nyabarongo and Nyabugogo) and valleys running between the ridges.

III . METHODOLOGY

Assessment has been carried out using geological and mapping instruments such GPS compass and other related tools.

All data collected have been compiled in excel worksheet and used to produce a topographical map using ArcGIS software. All Geological features located or interact with study area were deeply analyzed straight forward on the field.

The survey method was used for collecting terrestrial data, combination of satellite imagery with computer aided mapping method was used for creating topographic maps.

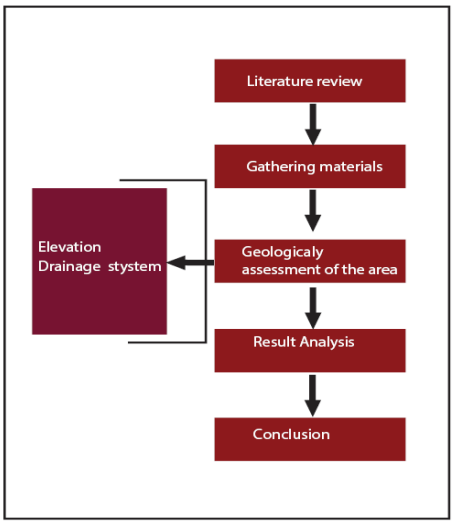

Fig.3.1. Research plan alignment

IV . RESULTS AND DISCUSSION

Image. 4.1. Mucuruzi Village flood.

Image. 4.2. Nyabugogo River far away view

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Image .4.3. Nyabugogo River closer view

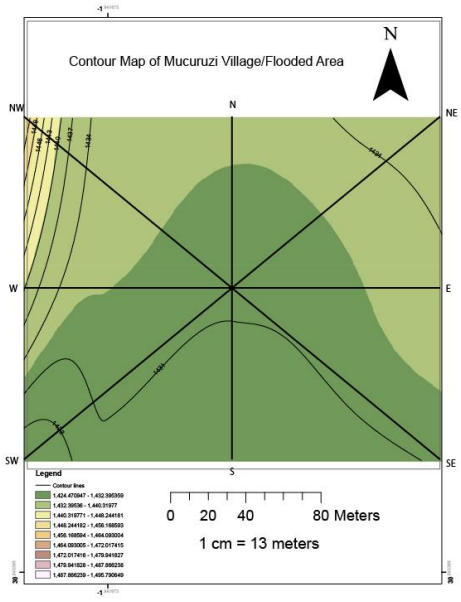

Fig.4.1. Contour Map of Mucuruzi Village

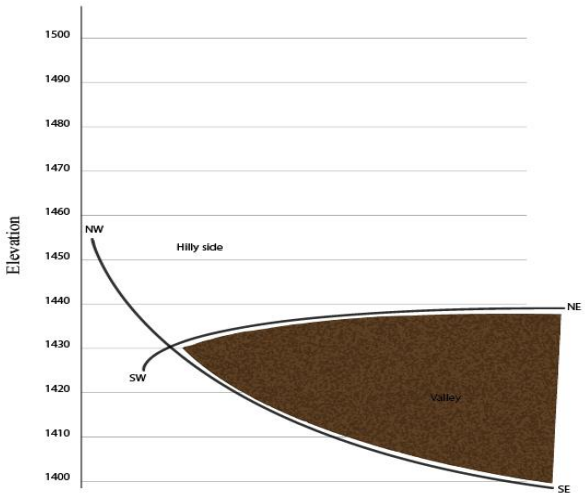

Fig.4.2. Cross -section based on contour map of Mucuruzi Village

Observation concludes that there is a sudden decrease in slope due to sediment deposits and construction activities going on in the concerns area, the highest elevation varies between 1430-1450m, where the lowest elevation varies between 1420-1430m, Topographical maps shows the NW trend with high elevation where trend SW-NE represents the average elevation, many man made channels are available,

it Eventually said that those channels can probably have significance and substantial impact on the causes of flood in that area.

Only one considerable geological feature which is Nyabugogo River was found and its contribution can be considered even though is not playing potential role in Mucuruzi villlage flood causations.

Research findings are important for a couple of reasons. First, global warming and especially increasing of sediments deposit are expected to exacerbate the problem of flooding in many of the locations Second, there is a continuing trend towards in-creased urbanization around the village, especially in suburbs of Mucuruzi Village.

This research found that low elevation locations concentrate much of the economic activity even in poor urban areas with erratic weather patterns highlights the tragedy of the recurring crisis imposed by flooding.

IV . CONCLUSION

It will not be a mistake to say that the main cause of flood in Mucuruzi Village can't be targeted on physical structural of the area rather

Based on our findings we suggest that in some circumstances, part of the aid and reconstruction efforts should be targeted at moving economic activity away from the most flood-prone areas to mitigate the risk of recurrent humanitarian disasters. Furthermore, research about the dynamic movement of sediments deposited on Nyabugogo valley should conducted Consequently physical structure is the aspect which has to be less mentioned regardless the causations of flooding on that area, even its contribution is absolutely uncritical the rest of man-made activities should be well controlled, monitored with proper management plan.

V . ACKNOWLEDGMENT

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