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Community perceptions towards the implications of human activity on River Rwizi, Uganda sustainability

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Abstract

This study was undertaken in the cells of Kiswahiri, Buremba and Nyakaizi in Kakoba Division of Mbarara District; in Uganda. The research was done as a baseline study for investigating the possibility of implementing a project for conservation of river Rwizi as a way to restore its natural stability since it is highly depreciating due to degradation hence it is the major source of water in the Mbarara dry corridor of nomadic pastoralists and other cattle keepers. In order to establish the extent of river degradation; a survey on the effects of community activities and peoples' beliefs towards river depreciation was done. The study investigated on perceptions of the community towards river Rwizi degradation in a way to establish the possibility of involving the people into river conservation; in order to reactivate the river from drying, silting and other degradation indicators. This emerging crisis of the river drying up has affected natural; social and economic activities negatively especially in the areas of the river catchment; hence the need for river conservation to save nature in the river catchment; and in other water sources in which Rwizi drains; that connect into world waters such as river Nile and lake Victoria. People appreciate the river since it is a source of water for irrigation and domestic use. The river as well leads to rainfall formation; through evaporation, in addition to provision of water for animals. The anthropological factors have led to continuous reduction in volume and speed of Rwizi profile. The natural vegetation at river banks is getting continuously replaced by agricultural plants and bare lands. The growing of crops next to river banks involve tilling of land and softening soil; making it bare and prone to erosion; parts of agricultural land get deposited into the stream leading to widening of river channel and siltation of the river. Continuous deforestation have left the stream open to evaporation and continuous drying. The major land use activities that have degraded and deteriorated river Rwizi include cultivation, industrialisation and settlements, cattle rearing, sand mining, brick lying, deforestation, urbanization and waste disposal. There is great need for adjusting policy procedures for conservation of the river towards integrating well the current conservation needs and population demands.

Keywords: River Rwizi degradation, human activities and perceptions, river conservation and restoration.

Introduction

Background: River Rwizi has a great environmental impact worldwide since it connects to earthly water sources, for example, drains into Sango Bay wetlands of L. Victoria and river Nile which flows through the northern parts of Africa to the Mediterranean Sea[1]. Soil and water conservation practices have been promoted in many areas of Sub-Africa; however the adaptation rates have remained low[2]. This case is not different with river Rwizi catchment communities. Rural water supply, sanitation and education facilities and services are urgently needed for maintenance of river conservation areas[3]. River Rwizi has been degraded at upper profile where it originates in Uganda hence affecting the catchment areas where it passes. In Uganda, as well as other parts of Africa, major concerns have been expressed about rapid rates of environmental degradation, leading to depreciation of river systems, wetlands ecology and aquatic life[4,5]. There is critical need for restoration of biodiversity conservation within and outside the river bank Humphries 2009[6]. Support systems need to be developed for planning for water resources of river[7]. In the districts of Bushenyi, Mbarara, Ntungamo, and Kiruhura, where r. Rwizi originates; deforestation, soil erosion and wetland destruction are rampant. The people are traditionally cattle keepers, who graze cattle at small scale on hill slopes. The uphill activities have caused soil erosion and mass wasting which leads to silting of the river[8,9]. The continuous burning of vegetation in anticipation of new young and soft grass for animals has caused dry gases that contribute to global warming; which as well affects the river negatively by reducing river volume, leading to siltation. In addition to these hazards, districts are trapped in a spiral of rapidly increasing human and livestock populations. People are trapped in poor methods of farming, land fragmentation, severe shortages of food, water and fuel wood MOFPED, 2003[7]. The emerging crisis of river Rwizi drying; causes lowering of water levels of the river due to climatic changes and environmental degradation[10]. The lack of space for industrial establishment and expansion has forced many investors in Mbarara to establish their industries along the banks of river Rwizi; a case dangerous to water quantity and quality

due to direct dumping-this calls for urgent need to conserve and protect the river diversity; especially protection of the river source. This is necessary in order to maintain multifunctional activities of river system[11].

Problem of study: River Rwizi that serves majority of the districts of western Uganda such as Mbarara, Bushenyi and Ntungamo; has been cut off from its western outlet and the loss in the water level Mugonola, 2013[3] from the swamp above the falls of Mbarara to that of L. Nakivale is about 100 metres, causing a slump in the area along the lakes in the embayment[12]. Protecting Rwizi water resources requires diagnosing threats from local to global[13].

In areas where river Rwizi passes, people are involved in different activities ranging in agriculture, sand mining, bricking laying, deforestation which have greatly led to the river degradation[14]. River Rwizi has lost its water level; the emerging disaster of the river drying up follows reduction in water levels of the river over climate change and environmental depreciation. When it does not rain water pipes of both Mbarara supply plants will have no water to pump from R. Rwizi, the main source of water for the area New Vision 14th July 2009[15]. The Rapid expansion of urban areas and concomitant swelling of urban population (where the land is static) places an enormous strain, thus leading to encroachment of the fragile lands of river Rwizi which in turn leads to social, economic and environmental constraints like global warming. The poor methods of farming on steep slopes and deep valleys along the river, have resulted into mass wasting and soil erosion that end up in the stream causing silting; reducing of river volume and limited humidity which is partly responsible for reduced rainfall and aridity in the area. The lack of space for industrial establishment and expansion has forced many investors in Mbarara to establish their industries along the banks of river Rwizi; a case dangerous to water quality and quantity due to direct dumping-this calls for urgent need to conserve and protect the river diversity; especially protection of the river source. River Rwizi has a great world climatic impact since it connects to earthly worldwide water sources, for example drains into (Sango Bay wetlands of) L. Victoria and River Nile which flows through the northern parts of Africa across Egypt to the Mediterranean sea. This means that degradation of R. Rwizi can accelerate critical worldwide environmental problems. Environmental organisations have acted but human activity is still a threat to the river.

Goal of the study: To find out the effect of people's activities along river Rwizi; and community beliefs and understanding on human activity contribution towards degradation of the river. Establishing the perception of people on the effects of their activities towards the river in a way to design the best and appropriate strategies involving the people in promoting conservation of river Rwizi.

Area of study: The study covered areas of Kakoba division where river Rwizi passes in Mbarara municipality; Mbarara District. Kakoba Division stands at 5,900ft above sea level on steep highland slope faces separated by river Rwizi; where many people practice agriculture and cattle rearing on the slopes, South- East of Mbarara Municipality; in the steep lands of the highlands of western Uganda. Mbarara district has a series of steep landscapes with deep valleys through which the river passes. Mbarara District is 238 km from Kampala; the capital city of Uganda; and, is the major municipal town of western Uganda. Mbarara receives average annual rainfall of 1,200 millimetres. Temperatures range between 17^{o}C and 30^{o}C (UBOS). The local community practice crop farming and peasant livestock keeping. Crops grown include bananas, beans, maize, potatoes and millet. The population in the area is urban-based and has caused poor housing conditions; such as Kakoba division having unplanned and overcrowded settlements with poor sanitation, lack of enough water sources and poor waste management procedures. Mbarara municipality being the main urban centre of the district, over the years its population has increased from 69,208 in 2002 to 547,800 in 2010 (Mbarara District). The 2014 census estimated the population of Kakoba division to be 55,519.

Methodology

The methods of data collection included questionnaire survey, Focus Group Discussions with selected members of the community, interviews with key informants, and participatory observations. Emphasis was put on investigating on the key domains of human activities and river degradation signs. Findings show that human activities have impacted heavily on river to degrade and depreciate its profile extensively.

Questionnaire survey: 168 questionnaires of 28 (90% open ended) questions of which 90% was open ended; were self-administered to the local community. Questions were set following logical sequence of objectives; from more general to the most specific questions.

Focus group discussions – FGDs: In order to get the range of ideas; opinions and behaviours of the community in terms of beliefs, experiences and practices; FGDs were held; where the researchers acted as the moderators. This helped researchers to get used to people's attitudes, characters and behaviours towards the concept of study. FGD guides were made of 15 brief statements to guide the discussion towards human activities degrading the river and way forward for conservation of r. Rwizi. A voice Recorder was used and series of replay were done while researchers were listening and noting. FGDs involved more than 60% of people staying in areas nearest to the river banks, who were mainly the people doing activities along the stream. An extract of the FGDs was written, typed and printed for review and incorporation in data analysis and presentation.

Interview: In order to establish appropriate strategies for conservation of r. Rwizi and its catchment, key informants were subjected to probing interviews towards human activity

implications on the river profile and appropriate procedures for conservation of river Rwizi. Interview copies were distributed and appointments for interviews made. Interview copies of 10 questions balanced well with objectives and probing into administrative challenges of management of r. Rwizi; and relationship between community and local leaders in line with river conservation were asked.

Participatory observation and visualization: This filled gaps where the individuals were not realistic or unwilling to respond fully through other methods like questionnaires. For example observation monitoring and watching of agricultural practice provided situational effects on the river dynamics. Observation checklist, schedules and time tables supported and enhance observation progress while in the field. This helped to confirm, disqualify and fill gaps within data collected through other methods. Tools used during the study included Questionnaire recording sheets, Interview and FGD guides, check lists, observation guides, voice recorders, field notes, work plans, evaluation sheets and regional maps.

Results and discussion

Community perceive the river to exist for people's service; and as being important for domestic purpose, supporting agriculture and other human activities; and is such an area so 'comfortable' for waste dumping; according to a number of respondents. Currently the river supports human activities at continuously reducing rate which are varying; being seasonally high during rain and low or none during the dry seasons since it reduces, dries and silt; and people are aware this is due to river deterioration. For example there is limited water for animal watering and for domestic purposes. Findings reveal that people are aware that the river has low volume and speed; silted and dirty water, which are results of degradation. People agreed that there is need for river Rwizi conservation, in order for the river to maintain its former ecological characteristics and benefits. Recommended measures for conservation and restoration of river Rwizi; given were; growing of trees and forests, controlled agriculture, maintaining strong laws and monitoring and evaluation procedure; and using media to sensitize the community on implications of river degradation and need and importance of conservation.

Human activities that have degraded river Rwizi: When consulted as to whether human activities degrade the river, 100% respondents agreed that human activities have destroyed and degraded the river. The responses are indicated in Figure-1.

The major activities that have degraded the river according to the community include cultivation (90%), sand mining (90%), waste disposal (94%), brick laying (38%) and urban expansion. Farm lands were observed to start from the river bank waters. The reason for brick laying having 38% is because it was found only in Buremba village cell where there is land for soil mixing and enough space for laying the bricks. There other activities not given by the respondents that were observed to degrade the river; they include cattle rearing, sand mining, washing of vehicles and motorcycles in the river that spills oils into the river channel to kill ecological resources of the river.

Tilling of land starts straight from the river side and while this continues, more silt will deposit into the river and reduce the river size afterwards. When cultivation of land goes on parts break and erode into the river hence silting it making the river dirty and slow as a result river channel widens unnaturally. These conditions have led to flooding of the river when it rains as the water cannot settle well in the river channel due to siltation. When cultivation beside the stream continues the river will degrade further and depreciate through loss of water leading to suffocation and killing of ecological resources in the river. Agriculture was observed to be practiced along the banks of the entire catchment of the river. Agriculture along river Rwizi has encroached and destroyed the river wetlands, hence erosion reach directly into the stream since river area is open as the wetlands that used to purify, and control the water entering the river, have been destroyed by human activity. People were found dumping agricultural post-harvest wastes into the stream in order to get rid of them; in this way taking the river as their deposit ground. Cattle and goat rearing has also degraded the river in that whenever cattle graze along the river ends up directed to the stream for watering and drinking. While drinking the animals defecate in the waters hence affecting water quality. After drinking animals go to a particular place near the river banks to rest; and such places of continuous animal resting have ended up becoming bare, accelerating quicker movement or erosion to destroy the river. Cattle rearing contributes a lot as a human activity done on bare hills hence accelerating erosion to the river. For example when watering animals in the river they trod on the grass. Cattle rearing is among the major contributors of bare hills along which erosion flows openly to the river and cause siltation, pollution and other forms of degradation. Immediately after accessing water the animals have points of rest before going back to graze.

Areas as seen in the image above are unpleasant environments caused by human activities, and cattle rearing and resting continuously in a particular place; leading all vegetation to dry up and disappear. When such areas increase it leads to enormous erosion along the river and even lack of vegetation for the animals is already experienced, due to continuous degradation of land by the animals themselves. There is need to control the rate of animal grazing, and to adopt proper measures to maintain and restore the vegetation along the stream. Another activity that has reduced vegetation along the river is deforestation. This leaves the river open to continuous evaporation and reducing the river waters and volume. People cut trees in order to get timber and charcoal. Cutting trees without replacing them has left no more trees in the area. The major trees seen to be grown and cut in the area are Eucalyptus trees. This is because the natural indigenous trees were destroyed in the past; and replaced with eucalyptus that can grow quickly to fulfil people's demands of charcoal making and

firewood. People grow eucalyptus trees as such not really for purpose of conserving the river but to get wood for timber, firewood, and furniture; and to create shade for their animals. The natural trees have been degraded as seen in plate 8; and are replaced by exotic trees that mature quickly, in order to be able to prune returns in a shorter period. Participants of 70% answered that brick laying is also among human activities that have degraded R. Rwizi. This shows that people are aware and concerned that brick laying is one of the major activities destroying the stream. Unpleasant ponds are created through digging soils for making bricks. Many brick laying activities are done at the river banks in order to easily get water for mixing soil. Digging of the lands next to the river, for making bricks destroy the river banks through de-vegetation and creating of unpleasant pond areas in which stagnant water juts down into the river during rains.

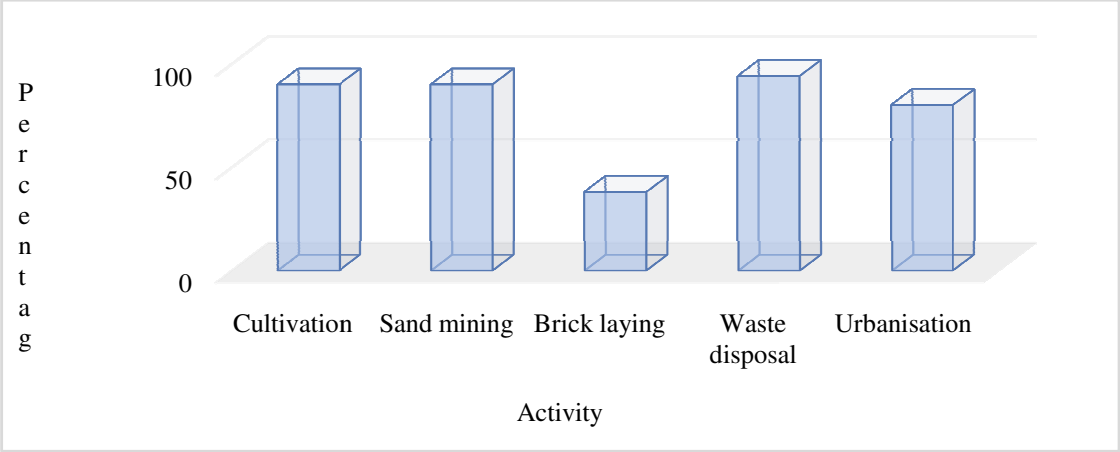

Figure-1: Activities that degrade river Rwizi.

Figure-2: Crop growing and animal rearing along river Rwizi.

Figure-3: Degraded areas through cattle rearing along river Rwizi.

Figure-4: Tree cutting along river Rwizi.

Figure-5: Brick lying at river Rwizi Bank leaves back unpleasant degraded lands.

Another human activity that affect river Rwizi is urbanisation and settlement where people have constructed along the river; to the extent of some buildings being raised at the river channel. Participants answered that urbanisation is among the main human activities that has degraded the river. This shows that R.Rwizi is degraded by urbanisation in the area since the majority of the participants agreed that there is urbanisation along R.Rwizi in the area. Since construction is associated with settlements this means man will impact much on the river by doing all his activities along the stream. As well people construct toilets next to the river bank; when they get full they direct the pipes removing materials toilets and latrine human waste to the stream; using the river as a dumping place. When people are dumping they don't care much that the water they destroy comes back to them for drinking. Also sewerage vehicles collect waste materials and dump into the stream in way of dodging dumping costs as the river is taken as free deposit area. Industrialisation has led to pollution of stream through dumping industrial and domestic waste into the stream. There is need for conservation of the river in order to save people of Mbarara, Uganda and other parts of the world. People use the river for washing vehicles and motorcycles and in this way spill and circulate the oils into the river. This oil suffocates and kills living organisms in the waters of the river. As well dumping of waste within the stream and channel sides makes the water dirty, unpleasant and affects river speed; causing meanders and braided channels; when such indicators are realised at the young river like Rwizi profile in Mbarara, it is an evidence of a degrading stream. Due to such the river will slowly degrade, loose its potential and die away leaving people to miss out all its advantages. Others while dumping in open space on the grass they first dig to level the ground so that the bottles can settle down not to stand on the grass and be seen by people at the upper ground. People were found practicing poor waste management procedures. They constructed interconnected sewerage channels which structured like tributaries of a young river; constructed and directed to river Rwizi. They dump domestic solid waste in the sewerage trenches causing extreme problems of stagnant sewer and unpleasant stinking environment. The down flow of sewerage materials from

Kiswahiri causes seasonal sickness to people of Buremba who consume the polluted waters of the river from Kiswahiri. As well all those kind of deposits degrade the river and destroy living organisms in the stream.

Figure-6: Dumping rubbish in channel flowing into river Rwizi.

The activities of agriculture; tree cutting, brick lying, construction of buildings at river bank, waste dumping along the river; and channeling of sewerage to the major factors leading to degradation of the river. Conservation measures established during the study are indicated in Figure-10.

Figure-7: Wall of a building raised next to the river waters.

Figure-8: Water Bottles dumped beside the river after a function.

Figure-9: Sewerage channeled towards river Rwizi.

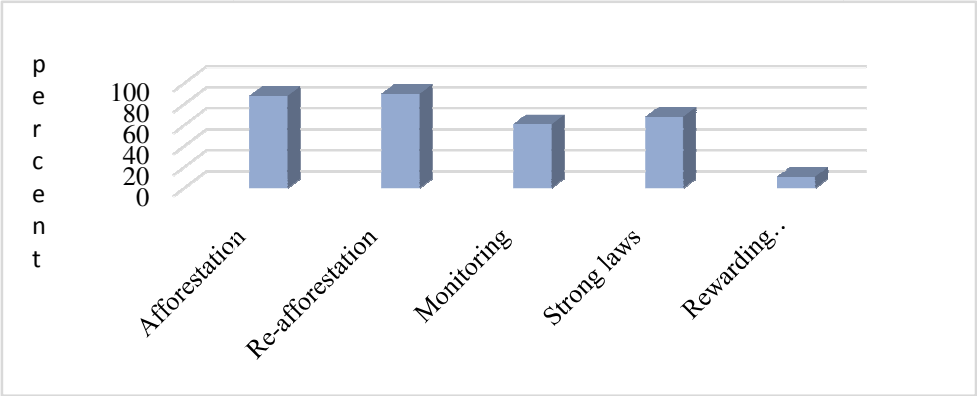

Figure-9: Activities for conservation of river Rwizi.

Sixty eight out of a hundred participants emphasised that proper and strong laws well implemented at the ground will promote practical conservation of the river; while 11% participants believe that rewarding people will motivate them further towards conservation of r. Rwizi. Community sensitization; use of social media like radios, television and newspapers; participatory engagement of resource users; whereby get community members appreciate the challenges they are facing because of degradation and afterwards move on with them to form community plans and get interventions where they participate engaging them using their planning and participatory knowledge in conservation will be a strong way forward for implementation of river conservation activities. 62% participants considered that use of proper monitoring by authorities like Environmental officers especially NEMA as the conservation activities to promote r.Rwizi in the area.

Conclusion

River Rwizi is heavily degraded mainly by human activities which include cultivation, sand mining, waste disposal, urbanisation, deforestation cattle rearing and grazing, charcoal burning. When these activities continue without conservation the river will deteriorate and become degraded beyond restoration and in the end will disappear. Scale of comfort at which people enjoy advantages from the river has persistently lowered; as long as the people still receive services from the stream they don't realise that the river can really disappear; and the disappearing of the stream has great significance to their lives and their coming generations. There is need to emphasize the NEMA policy that *'All human activities must start at 100 metres away from the river'*; in order to conserve and maintain the stream to its former status. Many people are aware about the procedures for conservation but do reluctantly practice. Poor management and week enforcement of existing legislations has retarded people's actions towards the river conservation. Many were found to be aware that river Rwizi is significant to their lives and believe that it is depleted but still water in plenty to support their lives; and seemed not to care much about the coming generations' survival. People take the river as being created to get used by them as the major point; for provision of water; dumping anything that disturbs them, and get rid of it. However people are aware that the river is slowly degrading but the time it may degrade to the worse they will have passed on and left the world, so they seemed not to care much about what will happen with the river afterwards. Some people do not follow up well action plans and activities implementation within the Action Plans. A major policy of resettling of people from near the river; for settlement to start 100 metres from the river is necessary. Practices are going on to make the people near the river get prepared to leave the areas near the river for it to regenerate.

Recommendations: There is a will with the entire community to involve in conservation activities however, some few especially those who have implemented projects that degrade the river do desist. They feel that they have invested a lot of money in land use and don't want to agree to hid to the community requirement. Those who degrade actually put in a lot of money in their projects where they see no returns, so they mobilise others to desist. Those who want to survive at the cost of others and he environment. They instigate people to desist, and confuse others through their pressure groups. They lobby leaders to be on their side telling leaders "Our votes", remember we voted for you-don't impact on us; meaning they may not vote them next time if they affect them. But it is not due to knowledge gap, or that they don't know value attached to Natural Resource and Conservation. Others can take on the interventions agreed upon for conservation but need government hand of funding for full implementation.

People have involved in Participatory River conservation management using the knowledge awareness received within their communities, groups and associations on conservation management. The committee leaders are normally picked from community especially picking those who are genuine and not selfish. District/Government policies, strategies and procedures towards conservation of R. Rwizi should be through integration of National Environment Management (NEMA) Policy, Forestry Policy, Land use Policy, Land Policy. All have an entry point of looking after public resources held in trust for government and Policies therefore should be well backed by

constitution and regulation in order to polish out resistance towards river conservation. What is lacking is political will. Since policies towards conservation are made from bottom-up, stakeholders interests are captured, there is need to promote full political will. There is a need to review policies and update them depending on current changes in peoples' demands and state on natural resources and population increase rate. There is limitation of human resource and finance; as well big money is injected during formulation of policies and those who formulate policies are not the implementers. The challenge of much funds at formulation and less funds at implementation causes a gap in management of implementation activities. This cause people not to take implementation activities serious. It is a big challenge gap which needs adjustment. Some of the policy formulators are degraders–they are reluctant to facilitate activities that inflict them.

Combining livelihoods and interventions of conservation e.g. engaging community to have other interventions of survival and innovating ways of improved agriculture instead of misusing the soils which are leaving them through erosion; will contribute currently towards Rwizi conservation. For example, through using landscape approach to improve agriculture people can offset from wetland to do innovative agriculture uphill to trap the soil leaving them through erosion. In order to fully change peoples' perception it is in necessary to survey the population using the following 3 questions: (a) how have you been surviving on land? (b) What happened? (c) What is the best/way forward? This will make the people realise their effects to the river, and need for conservation through guided investigations. Engaging community to have continuous awareness promotions, proper agriculture practices and use of wetland resources, wise cutting and selling of mulching materials will all conserve and restore the river while people earn money and survive without impacting negatively on the river.

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