



**PACKAGING SCIENTIFIC RESULTS TO PROMOTE SOCIAL ACTION AGAINST DEGRADATION OF RIVER BUFFER ZONES AND WETLANDS THROUGH VALUE CO-CREATION:** A case study of River Rwizi in Mbarara City, South-Western Uganda.

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New Welfare Services—Sustainable Service Design as a driver for regional development

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Disclaimer: All pictures in this essay were taken by me except the one of flooding at Little Stars nursery school in figure 2.

## Acronyms and Abbreviations:

CMC	Catchment Management Committee
CMP	Catchment Management Plan
CMO	Catchment Management Organisation
DWRM	Directorate of Water Resources Management
FDC	Flood Frequency Curve
Km <sup>2</sup>	Square kilometers
M <sup>3</sup> /s	Cubic meters per second
MWE	Ministry of Water and Environment

## 1.0 Introduction

Uganda's natural resource base is one of the richest and most diverse in Africa. People's livelihoods are inextricably linked to sound natural resource management and both water and land are basic resources for virtually all socio-economic activities. Because of the significance of agriculture to rural livelihoods, water and land are the most important assets for many households. Located in a trans-boundary water system, the River Nile both as an upstream and downstream state, 98% of the country area is within the Nile Basin and about 70% of the country's renewable water resources is externally generated. The complexity of managing transboundary water resources, in this context, therefore becomes critical and the need for strengthening regional collaboration is a matter of necessity.

Rapid population growth and improving living standards have increased the pressure on Uganda's water resources and per capita availability is reducing day by day. Spatial and temporal variability in precipitation is another challenge and the country faces increasing occurrences of floods, landslides and droughts. The Directorate of Water Resources Management (DWRM) undertakes specific area water resources quantity and quality monitoring and development plans and regulates allocation to different uses to ensure its ability to adequately meet all current and future needs. Further effort is put on helping different stakeholders to comply with the regulations on water use and development to eliminate over exploitation and conflict.

The essence of how science and technology contribute to society is the creation of new knowledge, and then utilization of that knowledge to boost the prosperity of human lives, and to solve the various issues facing society without compromising the environment's ability to support life and development. Communication and storytelling are important parts of sustainable value co-creation and delivery, particularly in the perception of the sustainability of the value created and delivered when the gap between information generation and response by the communities is closed.

Packaging the benefits of river bank protection through the lens of innovative service delivery could discourage degradation and minimize climate change impacts in River Rwizi catchment. Public organizations or institution like DWRM could consider viewing the general public as clients with its service targeting to satisfy their needs (Grönroos, 2020). This approach could be the game changer to achieve adoption by stakeholders and trigger social action against river ecosystem degradation as the needs of society are increasingly complex (Makmur, 2023) and individuals tend to avoid social exclusion (Kwon, 2022).

### 1.1 Purpose/Problem

Government of Uganda has employed several approaches including provision of alternative income generating activities and incentives to communities so as to restore degraded river banks, wetlands and other fragile ecosystems so that their functions are adequately realized. However, there have been incidents of resurgence with detrimental activities like agriculture, settlements, brick making, and untreated waste discharge among others.

Communities need to recognize that the value-in-use of the river buffer zone and surrounding wetland is much higher than its value-in-exchange for selfish individual gains. These activities of individuals that lead to destruction of common goods hence negatively impacting the community should be rejected by the people who are directly affected. Most efforts to express the importance and value of river buffer zones and wetlands try to bring out their monetary value related to ecosystem services but these seem to remain quite abstract to an individual or community deriving their livelihood directly from the resource hence such scientific results need to be packaged in way that communities relate with and promote social action against degradation. The success of DWRM and its partners lies in the river buffer zone and wetland degraders' understanding of the problems they bring to themselves by their degrading actions and the potential benefit from the common good that they would otherwise enjoy by protecting these ecosystems. This calls for all community members, who have different levels of education, influence, and status to be accorded a voice to shape their own lives through clear and candid interpretation of scientific results to enhance commitment to decisions made and responsibility for outcomes.

This study seeks to qualify the buffer zones' 'value-in-use' by using data, knowledge, skills and existing institutional arrangements to contribute to value co-creation of water and wetland resources. It will enhance the role of scientific or biophysical knowledge in contributing to socio-ecologically robust knowledge co-creation, decisions and actions towards resolving river bank and wetland degradation so that scientific practices become more orientated towards societal platforms. The main outcome is a tool that will be present scientific results in a meaningful and relatable format as an informational measures to shape individuals' decision-making to willingly leave, restore and protect these ecosystems (Kwon, 2022; Hampton et. al., 2023).

## 1.2 Research questions

- i. What observed changes could compromise ecosystem functions?
- ii. Do degraders know the dangers of their actions?
- iii. What value do communities attach to protecting the river and its buffer zone?
- iv. How can government present this value as more orientated towards societal platforms to trigger individual/societal willingness to protect river buffer zones?

## 1.3 Methods and Materials

This study integrated both quantitative and qualitative research methods to provide a holistic approach combining and analysing the statistical data with deeper contextualised insights.

The data and materials used were obtained through both secondary and primary sources. The secondary data were gathered from Ministry of Water and Environment (MWE) and remote sensing while primary data was obtained through field observations, measurements, surveys and questionnaire.

Statistical and satellite data analysis techniques were used to make deductions from the data sets.

## 1.4 Scope

Rwizi catchment is located in the South-Western Uganda and has a total area of 8,554 km<sup>2</sup> spanning over eleven districts of Buhweju, Bushenyi, Sheema, Ntungamo, Mbarara, Isingiro, Kiruhura, Lyantonde, Lwengo Rakai and Kyotera. The Catchment is mainly drained by river Rwizi, which forms a complex system of wetlands and streams finally discharging into Lake Victoria, the source of the River Nile.

River Rwizi is the source of water supply for over 5 million people in Mbarara City and surrounding towns. Socio-economic development within the catchment is linked to sound management of natural resources however, pressures from rapid population growth, extension of arable land and settlements complicate the management of water and related resources. Compliance to regulations has only achieved so much with reported cases of resurgence into previously restored wetlands and river buffer zones.

The Rwizi Catchment Management Plan (CMP) highlights specific water resources issues with research and scientific studies showing that the situation will continue to get worse in the face of climate change (MWE, 2020).

This study focused on only five (05) wards of Mbarara city (Ruti, Katete, Kamukuzi, Kakoba and Ruharo) bordering the main river channel. Figure 1 shows the location of Mbarara city within the Rwizi catchment in Uganda.

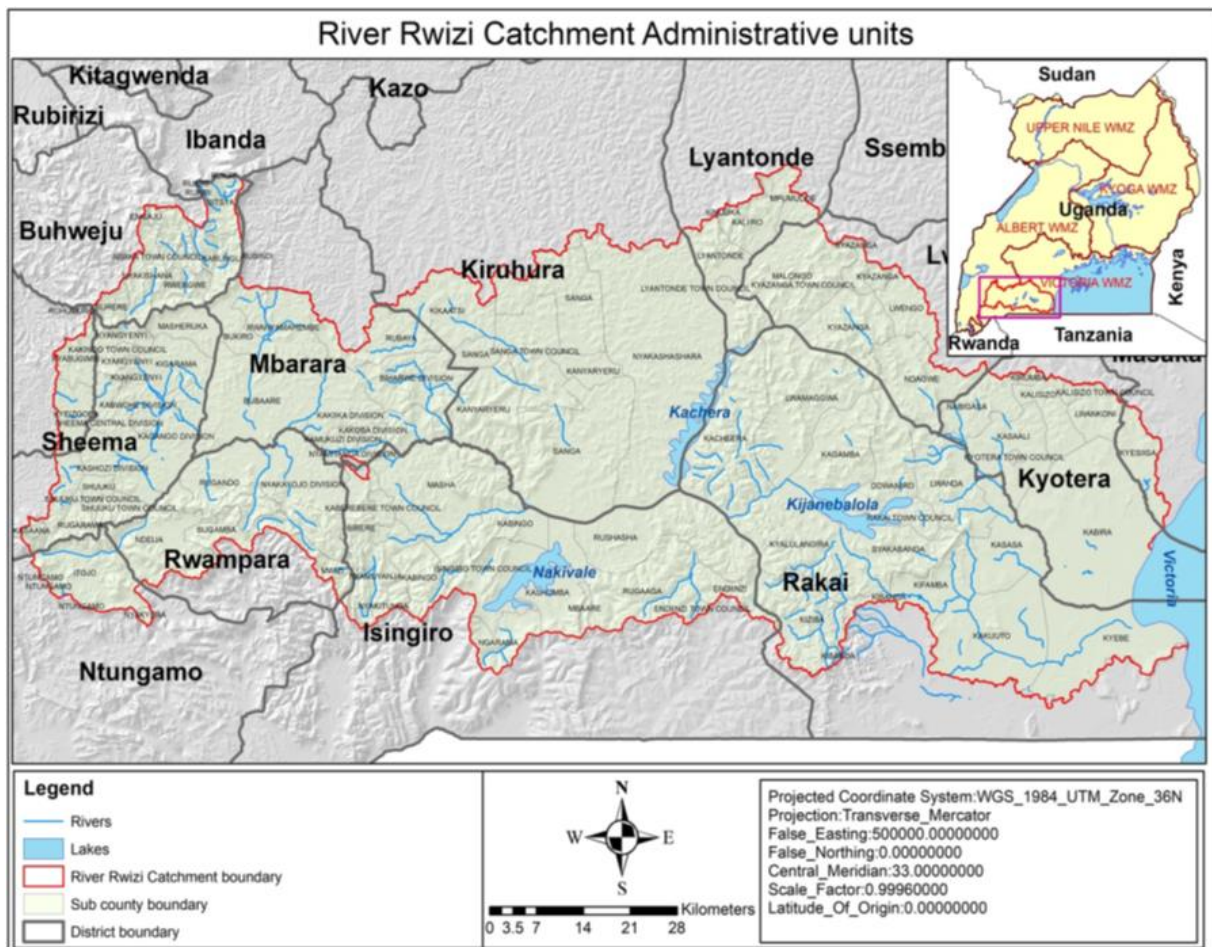


Figure 1: Location of Rwizi catchment in Uganda

### 1.5 Situation Analysis

In May 2023, the River flooded leading to death of 4 people, displaced many, and cut off access to some villages like Katete. The National Water and Sewerage Cooperation intake at Ruharo was also submerged and had to be closed to carry out emergency repair works, disrupting water supply. Figure 2 below shows some of the impacts of flooding of River Rwizi.

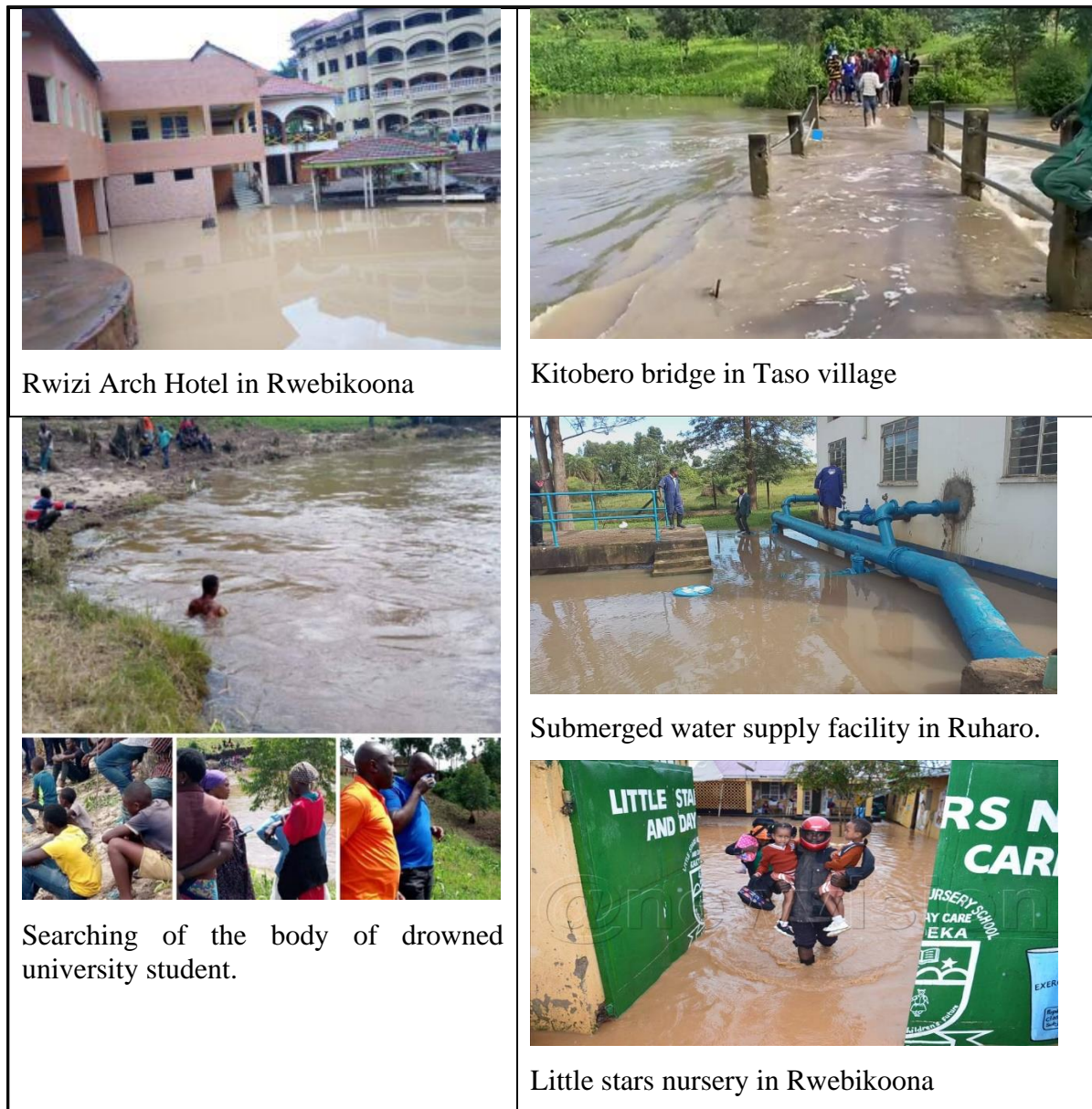


Figure 2: Impacts of flooding along River Rwizi in Mbarara City.

The long-term Rainfall trend for Mbarara City (figure 3a) shows that the second rainy season of the year (Sep-Oct-Nov-Dec) is usually wetter than the first (Mar-Apr-May). With the flood of May 2023 causing so much havoc, there is concern on what the future of flooding in the city will be like in the face of climate change.

Moreover, the May 2023 flood was approximately  $106.691 \text{ m}^3/\text{s}$ , just  $\frac{1}{4}$  of the flood in the same season in 2001 and 2011, likely to return after 40 and 15 years respectively using Gumbel Distribution in figure 3b. The land use analysis in Rwizi catchment and specifically Ruharo, Kamukuzi, Kakoba, Ruti and Katete wards of Mbarara city shows an increase in built-up areas and crop land against a decrease in vegetation and tree cover as shown in figure 4.

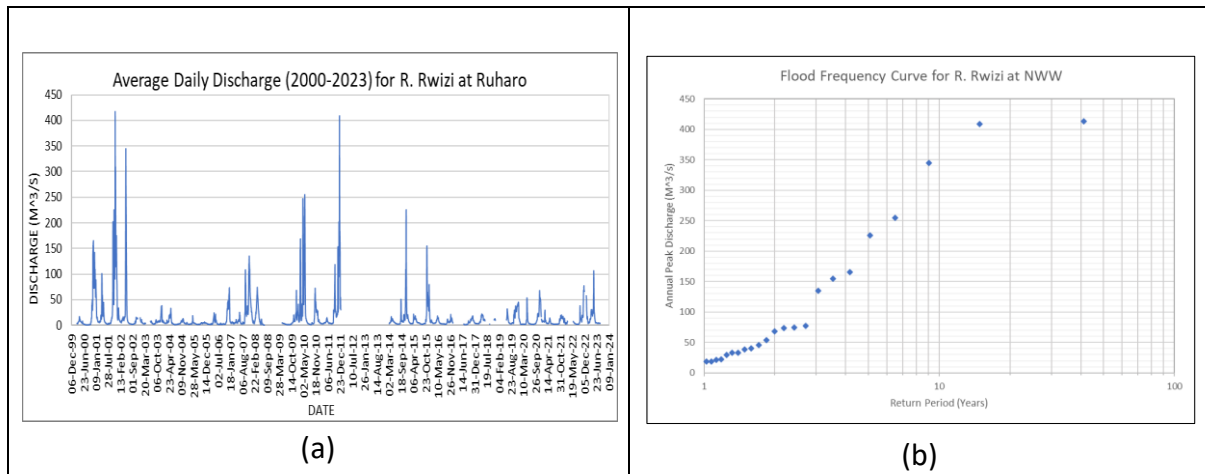


Figure 3: Long term flow of R. Rwizi at Ruharo NWW (a) and corresponding FDC (b)

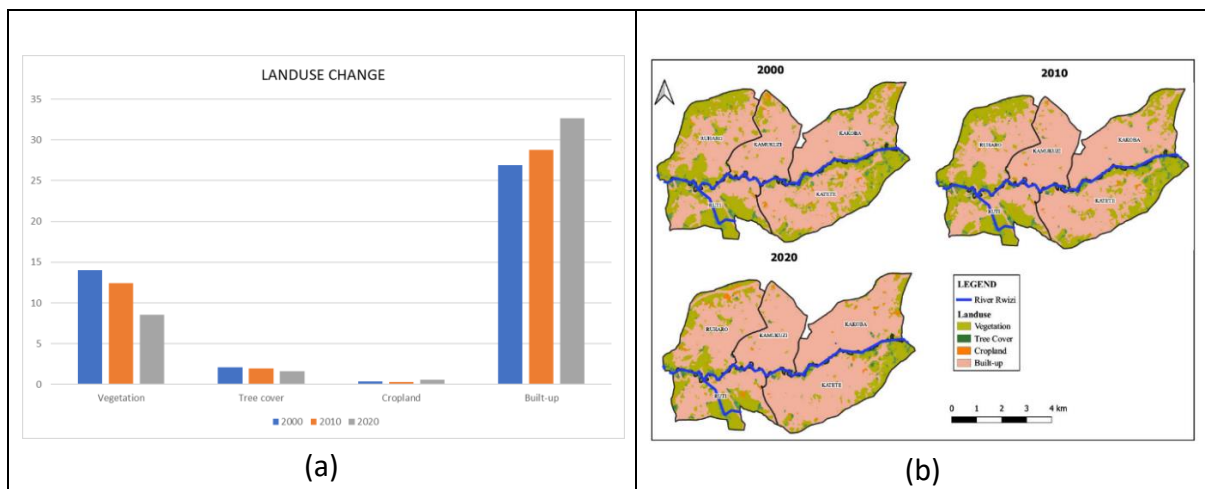


Figure 4: Graphical (a) and spatial (b) landuse change analysis in the study area.

Through field observations, a number of degrading activities were identified as seen in the photographs in figure 5.





Figure 5: Observed degrading activities in the study area.

## 2.0 Sustainable Service Design Analysis

Grönroos, 2020 defines service as a phenomenon of providing help to another person's or organization's relevant processes in a way valuable to this person or organization. In line with this, Stephen L. Vargo, 2020 argues that people buy the application of specialized skills hence value is in the service offered by the product and not the product itself. Scientific results need to be packaged for the customer/degrader or potential degrader to easily understand and relate at their level. Such information when well understood and relatable could be a basis for 'promise making and promise keeping' emphasizing the service river buffer zones and wetlands offer to communities as in the 'Promise theory'. If these promises resonate well with the degraders' life, situations, activities, and needs through value-co-creation, DWRM and its partners become relevant to such communities and the ultimate goal to protect these fragile ecosystems will be achieved.

### 2.1 Theoretical framework

This study examined how sustainable service design could be used to package scientific results to promote social action against river buffer zone and wetlands degradation. A tool was designed and tested in five wards of Mbarara city located along the main River Rwizi system.

The findings from the community interviews were analysed in relation to the scientific results using qualitative statistical tools.

The analysis was based on foremost different theoretical/analytical perspectives on public service management, governance and leadership in society.

## 2.2 Governance as service and leadership in public organizations.

The Catchment Management Organizations (CMOs) constituted by DWRM are a good platform for coordinating actors and facilitating value-co-creation activities. These are management committees at different levels of the catchment (including sub-catchment and micro-catchment management committees) which should be leveraged to provide a service that satisfies the customer's ecosystem (life, situations, activities, and needs) and influences their perceptions towards river bank/wetland protection. However, in this text I would like to discuss if these CMOs should adopt a collective leadership style articulated by Alvehus et. al., 2020. This leadership style is co-constructed among an extended group of colleagues, rather than the actions of individual leaders alone. Although the CMOs are generally hierarchical (Raelin et. al., 2020) and could be seen to promote a one-man takes-it-all scenario, avenues that allow democratic dynamics to play out and flourish could be adopted for collective leadership. This approach seems to provide a platform for social action because it requires members to participate equally in the leadership processes in their community through open dialogue. It is evident that the communities that degrade river banks and wetlands are of different class and status and the non-elites many times feel left out in community decisions. Protection of river banks and wetlands requires that their accrued benefits be considered as a common good. The leadership dynamics of the different CMOs could seek to empower the communities into common understanding and social action so much so that the led can demand their common needs from their leaders.

## 2.3 Sustainable service management

The wetlands policy in Uganda allows economic demonstration that can attract communities to value wetlands. Individual users however, benefit in wetland agriculture for example, but the whole community is devastated by floods, poor water quality, and diseases among others related to the actions of the few. Understanding the benefit of ecosystem services enables value proposition and co-creation in ecological economics and sustainable entrepreneurship, contributing to more sustainable solutions otherwise termed 'Sustainable Development' (Aagaard et. al., 2020; Stål et. al., 2016). In particular, scientific results should be packaged to present opportunities in river buffer zones and wetland protection and correlate those opportunities to the magnitude of environmental problems. The environment, and in particular river buffer zones/wetlands benefits should be viewed in the three lenses of opportunity i.e., scientific results should show the *current problem*, point to *ability to create a solution* and possibility of *introducing a new product to the market* at a profit by employing new innovative means-ends framework. This tool could aim at unpacking knowledge regarding river buffer zones and wetlands in order to help communities envisage possible opportunities for improved livelihood. The human limitation in dealing with the non-linear processes of the biosphere where river buffer zones and wetlands are critical actors should be clarified and communities helped to articulate the logic of value delivered by protecting river buffer zones and wetlands i.e., how these ecosystems remedy the pains that they face or create benefits in a sustainable business sense where value proposition, creation and capture are related to the co-action (social action).

## 2.4 Understanding risk management in services

DWRM has made strides towards building resilience of communities and infrastructure against climate change related risks through protecting sensitive ecosystems and implementing early warning systems in the most vulnerable areas. Throughout the country, it is evident that communities and individuals closest to these sensitive ecosystems are the biggest threat but also the most affected when disasters occur therefore empowering them to protect the resources could be the game changer. Data analysis and field observations in the study area show evidence of flooding, poor water quality, massive siltation and poor solid waste disposal among other challenges posing risk to humans, livestock, property and infrastructure by aggravating climate change and related natural hazards.

Dekker et. al., 2016; Eldh et. al., 2022; and Le Coze et. al., 2015 agree that risk should not always be avoided because some risks lead to gains. They argue that the perception of the value of what is at risk is what should guide on how to deal with different types of risk for example whether you are risking your life, your money or some else's life or their money. They also argue that risk creates both individual and collective challenges and that even with the best measures in place, accidents are prone to happen sometimes. It is eminent that people's understanding of risk cannot always be logically explained, and research results are not coherent. Within human risk perception, it is known that people generally ignore the statistical likelihood of bad things to occur. They rather rely on the seriousness of the outcome when judging risks. As a consequence, risk in dreadful events with low likelihoods is overestimated, such as terrorist attacks and natural disasters. In parallel, people tend to underestimate ordinary events with higher likelihoods, such as sickness, accidents or flash floods which occur almost every rainy season.

DWRM's efforts to avoid or reduce risk are towards predicting occurrence and magnitude, building resilient communities, systems and infrastructure and promoting organizational social safe guards for all employees and players faced with risk in the work place related to various social, cultural and historical conditions. Just like a tourist would think about their family and be careful in unfamiliar territory, this tool should focus individuals to consider the shared benefit as a community and be cautious of their selfish actions that might degrade the river buffer zones and wetlands hence putting many people at risk. The river buffer zone and wetlands play the role of an insurance company to which risk is transferred and should therefore be viewed as such. The ecosystem can only offer this service if it is protected and conserved to absorb the shock from nature which would otherwise destroy life and/or property.

Dekker's concept of the "Just culture" brings out the aspects of rule violation based on error, deliberate violation, negligence or recklessness that point to bye-law formulation. In some instances, communities might engage in degrading activities because they lack knowledge, are unaware of boundaries, intentionally neglecting guidelines or being blinded by short term gains with thought that the negative impacts of their actions will find when they are long gone.

DWRM needs to accurately conceptualize what the community worries are and use scientific results to respond to them with emphasis on symbolic value (cultural and social identities) following Le Coze's argument that management is to participate not to introduce new routines. The tool should ensure that the culpability concept is made clear and the question of whether or not the degrader's action was done knowingly or unknowingly does not arise hence social action leads to penalty and restoration once guilt is established. The community offers accountability which is forward looking as opposed to holding someone accountable for events that have already happened. Disrupting the ecosystems presents a very high risk and whether or not people will be rational should not determine how this risk is managed. To test this tool, it was essential to target a smaller community with the same cultural beliefs and social construct like the one in the five selected wards of Mbarara city.

### 2.5 Gender and equality in the service industry.

Acker, 2006; Adib et. al., 2003; Freidenvall et. al., 2021 and Johansson et, al., 2017 articulate gender equality in the form of equal rights, opportunities and responsibilities in all aspects but Adib also introduces the concept of intersectionality that solving everything at once can be too complicated as compared to tackling what is most important at a time and argues that other aspects of identity such as nationality, race, ethnicity, or social class could impinge on women's construction in the work place. Gender dynamics is very crucial in the protection of river buffer zones and wetlands given that women, girls and youths are closest to these resources in most communities in Africa. In Uganda, the addition of points to every female joining university and higher levels of learning, introduction of a political position that can only be occupied by a woman (woman member of parliament) for each district, 30% of positions in Catchment Management Committees (CMCs) targeting women are among efforts of affirmative action to promote gender equality. There are however, glaring barriers to achieving this for example, although there is provision for women to occupy at least 30% of positions in the CMCs, severally, this has not been realized because in addition to this affirmative action, the composition of the members is based on prior positions in political and technical office. Women, because of the inequality at the grass roots are not usually privileged to be in such positions/class or status so even when the committee is supposed to have 30% women, there are few or no women in the pool. These committees end up with male dominance despite the efforts for inclusiveness because as Acker put it, class in itself is discriminative.

It is important to note though that CMCs are a good platform for a flat team structure (Alvehus et. al., 2020) in the sense that several sub-catchment management committees together work under the CMC. By adopting the 30% slot for women and not tagging it to prior technical or political positions, more women will be brought to the discussion table on matters that affect them dearly to enrich the value co-creation process.

### 3.0 Counter arguments:

Equality is defined as the state of being equal, especially in status, rights, or opportunities while equity refers to the quality of being fair and impartial.

I have heard jargons in my country that “what a man can do, a woman can do even better”, but there has not been any evidence of this at any level. Some women who have got into positions previously dominated by men have also ended up in similar scandals related to poor performance, corruption and abuse of office like their male counterparts. From the definitions, maybe activists should be advocating for gender equity as the goal instead of equality. Women, by their nature and culture cannot do all things that men can do and neither can men do all the things women can do with ease. Whereas a male truck driver will easily and quickly change a flat tyre, a woman would do so with so much difficulty and might have to seek help from a man to be sure that the job has been done satisfactorily. This could be the main reason the gender equality concept is often the loser as Freidenvall put it.

As a business case, gender equality should focus on technological advancement to enable women and men carryout same tasks without difficulty for example, automatic cars as opposed to manual ones.

### 4.0 Results:

#### 4.1 Tool for social action

From scientific study and research, the following elements were found to be crucial in promoting social action.

- Identifying the major problem/outcome and aggregating related events in time.
- Verifying the problem with the community’s biggest concern.
- Understanding what community interests are at stake and establishing ways to relate their biggest concern to cultural beliefs and other social constructs.
- Painting the future of “Business as usual” against a proposed change.
- Clear expression of the promised benefit from ecosystem protection and conservation.
- A call to action (create a simple, clear slogan in local language).
- Continious documentation, feedback, and platform for dialogue without leaving the illiterate/marginalized groups who cannot read and/or write behind.

The linkages in these elements were harnessed to develop the tool in figure 6 to package scientific results towards promoting social action against degradation of river buffer zones and wetlands.

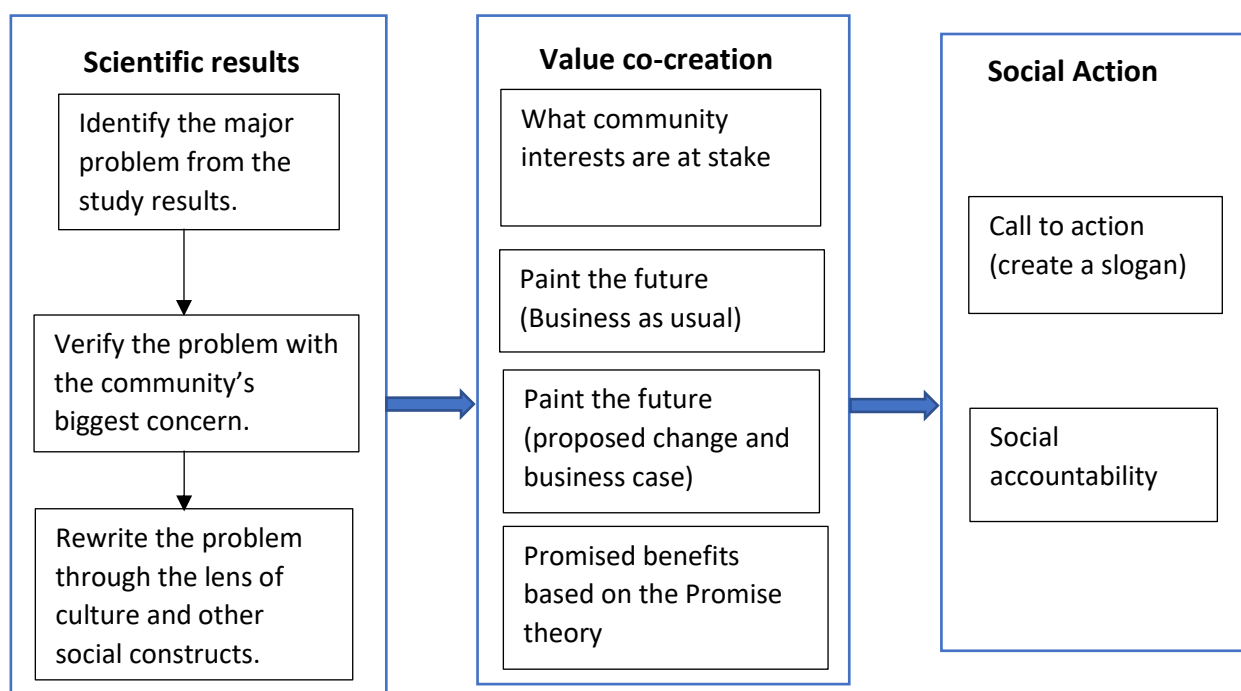


Figure 6: Tool showing steps for packaging scientific results to promote social action.

#### 4.2 Testing the tool in River Rwizi, Mbarara city.

As an implementation tool for this framework, a questionnaire was designed with carefully thought-out questions to capture data on community perceptions from the scientific results, value co-creation and avenues for social action and accountability. The questionnaire targeted all categories of community members including shop attendants, hotel owners, households and selected Rwizi CMC members to determine whether the questions were placed in the best order, would be understood by all classes of respondents or whether additional or more specific questions were needed or whether some questions needed to be eliminated. The instructions to the respondents were also checked for adequacy to achieve the required results. A cross-sectional research design was used and respondents (17 male, 13 female) selected for this pilot survey were broadly representative of the different social class of the affected community who would be targeted for implementation of the developed tool.

The findings show that 43% of the community is worried about flooding while 57% are mainly worried about poor solid waste management. 93% attribute value of protecting the river ecosystem to them as individuals and the community at large as provision of water of adequate quality and quantity. In addition, 63% perceive that the degraders do not know the dangers of their actions and hence affirm the need for innovative ways for information sharing to the lowest level stakeholders.

## 5.0 Conclusions/Recommendations

Communities will now benefit from scientific results and be empowered from relating such results to their life, situations, activities, and needs. This tool closes the gap between science and action in that it provides a framework to package results from scientific studies and research in a way that will promote social action. This study brought out the key dynamics for sustainable service design through the different modules which have been analyzed to develop a framework towards social action. It presents opportunities of how a public organization or institution like DWRM should view the general public as clients with its service targeting to satisfy their needs. Sustainability will not be achieved by the managers and regulators seeking compliance from the people without necessarily considering their ecosystem or satisfaction from the service of the regulating institution. The water managers should consider presenting the public to the organization with a focus on satisfying their needs through providing valued service. This approach could be the game changer to achieve compliance by stakeholders and trigger social action against ecosystem degradation.

It is pertinent that the CMOs position themselves as offering a service to the community through the protection of river buffer zones and wetlands and not be seen as only regulating their use on behalf of DWRM.

The roles, behavior, expectations and attributes associated with being male or female are quite distinct and many times hinder the equality narrative, favoring in my opinion equity. We lose a lot of time, resources and compromise quality when we try to be equal in all aspects yet when we leverage the unique gender strengths, we could build a strong business case for sustainable development.

Social action also strengthens risk management as it provides a platform for knowing and reporting cases and restorative justice can be understood by all community members. It should be noted that for effectiveness, this tool should target a small homogenous community with similar cultural and social constructs. Further research for bigger heterogenous communities is recommended.

## Appendix:

**Ministry of Water and Environment, Victoria Water Management Zone.**

Plot 1 Mbarara-Kabale road, P. O. Box 575 Mbarara, 0772921034

### **Questionnaire for leaders and communities living along river Rwizi in Mbarara city.**

*From the flow trends of River Rwizi at Ruharo New Water Works in Mbarara city, two major peaks are observed in 2001 and 2011 however, a lower peak in 2023 caused more devastating flooding impacts including loss of lives, damage of bridges and cut off of water supply.*

1. What changes have you observed around River Rwizi and its wetlands?.....  
.....
2. Which categories of people do you think are the main degraders of the buffer zone in the areas around Mbarara City?  
.....  
.....
3. Do river buffer zone and wetland degraders know the dangers of their actions?  

Yes	No	Not sure
-----	----	----------
4. What value do you as an individual get from protecting River Rwizi and its buffer zone?.....  
.....
5. What value does Mbarara city and surrounding towns get from protecting River Rwizi and its buffer zone?  
.....  
.....
6. In your view, what would make you willingly protect river banks and wetlands even if you had a land title?  
.....  
.....
7. Please look at the following list of environmental issues, and circle three that worry you most as an individual. Please only circle three issues from the list:
  - Industrial pollution
  - Flooding
  - Poor solid waste management
  - Construction in river banks
  - Farming in river banks
  - Changing weather patterns
  - Water scarcity
  - Extinction of species



- Population increase
- Soil erosion

8. Do you think these issues are affecting or going to affect you, personally? If so, how? Please elaborate for each of the three

.....  
 .....

9. How do the selected issues relate to the social and cultural norms? Please elaborate for each of the three.

.....  
 .....

10. How do the selected issues relate to your religious beliefs? Please elaborate for each of the three.

.....  
 .....

11. Do you think the pattern of weather is generally changing? If so, why do you think this might be?

.....  
 .....

12. What has been your biggest challenge in executing your role as a Rwizi CMC member in the community where you live?

.....  
 .....

13. In your view, is it possible to innovatively transform river Rwizi buffer zones and wetland material into new marketable goods and services? If so, give examples of such goods or services which would have local market.

.....  
 .....

14. Who takes responsibility when life is lost in a flood, when property is lost or damaged?.....

.....  
 .....

15. Can the community anticipate these risks and are there mechanisms to avoid them?

.....  
 .....

16. What value is under threat when a crisis occurs or what incident would act as a warning that we are too close to a crisis?

.....  
 .....

17. In your view which gender uses most the river buffer zone and wetland areas for their economic activities?      Men                                  Women                                  Youth

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