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POLICY BRIEF

Issue 1 / May 2022

Tackling the Problem of Sedimentation on Water Reservoirs in Zambia

Bringing Together Evidence and Policy Insights

Two-third of the 17 Sustainable Development Goals (SDGs) (such as 1, 2, 3, 3, 14 and 15) are water-dependent. Hence, addressing sedimentation issue that affect water quantity and quality is critical to the successful implementation of SDGs in Zambia by 2030. Dams' reservoirs are beneficial instruments in ensuring water security and climate change adaptation through impact attenuation.

KEY MESSAGES

- There is need for enforcement of buffer zones along streams, rivers and around dam reservoirs to allow vegetation to grow and act as natural sediment traps.
- Soil conservation-based land management practices such as Climate Smart Agriculture (CSA) should be promoted as a vehicle to reduce soils erosion in catchment areas.
- There is need for a community-based program to periodically dredge deposited sediments in community reservoirs to ensure community water security and adaptation to climate change and variability.

INTRODUCTION

The need to ensure rural community water security in Zambia, both in wet season and dry season has resulted in the construction of small dam reservoirs. Dams have important functions of sustaining livelihoods of rural local communities through multiple uses such as: (i) enhanced domestic water security, (ii) increased agriculture yields of smallholder farming, (ii) fish farming opportunities, and (iv) water for livestock to mention but a few. However, dam reservoirs are adversely impacted by sedimentation. ***Sedimentation is the process by which particles of soils and rocks settle to the bottom of the water reservoirs due to soil erosion in the catchment area leading to reduced reservoir volume and water quality, and thus threatening community water security (Gregory and Edzwald, 2010).*** Sedimentation reduces water-storage capacity of reservoirs and affect reservoir water quality. Thus, Response to diverse effects of sedimentation on water resources and national economy requires close dialogue and interaction among the research community, policy makers and beneficiary communities. Whilst this problem is partly caused by natural erosion, over 80% is attributed to human activities due to landuse activities and changes on the upstream of the catchments (Muchanga et al. 2019).

METHODOLOGY

This brief is based on the finding of selected sediment surveys undertaken on eighty-three (83) dams in Southern and Lusaka Provinces of Zambia during SASSCAL 1.0 research portfolio Task 109. The data was collected through bathymetric survey using hydrographic boat (Figure1), sediment coring and measurement of water quality. The initial storage capacity data were collected from Key informants. Analysis of data was done using Surfer and Excel Software. The deposited sediment volume was estimated by subtracting the measured storage capacities from the initial storage capacities of reservoirs.

Fig 1. Bathymetric survey, Mayobo Dam (Source: SASSCAL Task 109)

RESULTS

- The Sediment sources are mainly from Agricultural land (35%) grazing land (26%), deciduous forest (22%) and range-brush land (17%) (Figure 2). Cultivated fields and grazing areas are the most hazardous (61%) in terms of erosion and sediment yields.

- The study also revealed that substantial reservoir volumes have been filled up by sediments (Figure 3). Thus, reservoirs quickly get filled up with water at the onset of the rainy season, but do not hold adequate amount of water due to reduced storage capacities leading to community water insecurity.

- It was also established that some dams dry up completely especially in dry season (Figure 4), implying that dam reservoirs during this period, they no longer support the social economic activities that depend on them when reservoir utilization is most critical during this period.

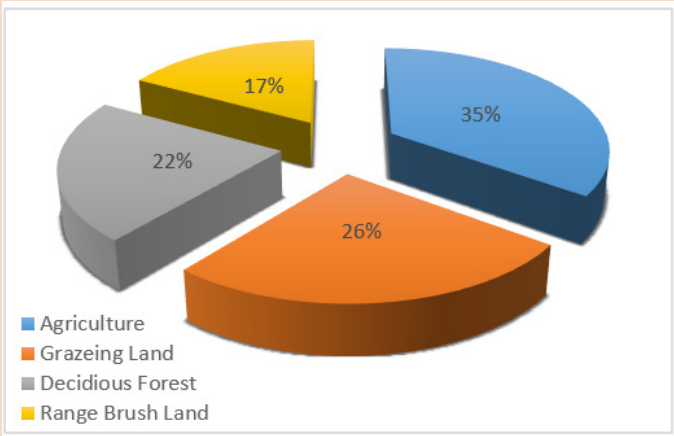

Fig 2. Sources of sediments, leading to sedimentation

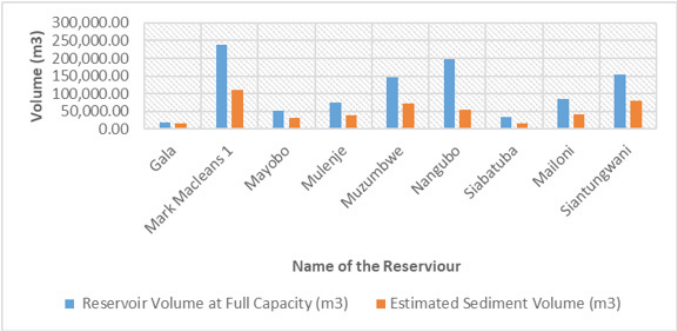

Fig 3. Reservoir Volume Vs Sediment Volume

- It was further observed that sedimentation also affected water quality as deposited sediments contain nutrients, and trace metals, for example physio-chemical results of analyzed water samples (at Environmental Laboratory at the University of Zambia) for some dams such as Katondwe, Silverest had pH less than 6.5 and Sulphates greater 250mg/l of which both are outside permissible limits for drinking water by World Health organization (WHO).

Fig 4. Nteme Dam: Accumulated sediments on dry reservoir bed: (Source SASSCAL Task 109).

"Sedimentation reduces reservoir volume and affects water quality, hence threatening community water security, this is worsened by the effects of climate change"

CONCLUSION

There is need to proactively address the issue of sedimentation on water reservoirs, as this would contribute to strengthening of rural water security. Rural community development in Zambia can be slow and difficult if a water supply and availability for rural communities cannot be assured in both rain season and dry season especially with the effects of climate change on water security.

CALL-TO-ACTION

Fig 5. Water security for Livestock (Source: SASSCAL Task 109)

- Water Resources Management Agency (WARMA) should strictly enforce 50 meters buffer zones along streams, rivers and around reservoirs to allow vegetation to grow and act as natural sediment trap. In accordance with Statutory Instrument (SI) 1 of 2000 (supported by the second schedule (1) of Zambia Water Resource Management Act No. 21 of 2011.
- There is need for government through the Ministry of Agriculture and Livestock encourage and promote an integrated approaches to managing landscapes such as Climate Smart Agriculture (CSA) by creating incentives for CSA. This could be done by supporting enabling policy frameworks, strengthening national and local institutions, enhancing funding, and financing options, and implementing CSA practices at field level.
- There is need to for a community-based program to periodically dredge deposited sediments in community reservoirs to ensure community water security and adaptation to climate change and variability.

Acknowledgement: Southern African Science Service Center for Climate Change and Adaptive Land Management (SASSCAL) is grateful for the financial funding by The Germany Ministry of Education and Research (BMBF) for supporting Project Task 109 research work through SASSCAL Research Portfolio 1.0. Project Sub-Grant Number 01LG1201M. Thanks, are also due to the entire SASSCAL Task 109 Project Team for research activities.

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