

Data Driven Decision Support for Securing Kenya's Water Towers



Photo: Chania River flowing through the Aberdares Forest, upstream of the Sasumua Dam. Photo credit: Bancy Mati, 2021

Water Security is espoused in the Constitution of Kenya¹, which recognizes water as a human right and postulates; “Every person has the right to clean and safe water in adequate quantities”. In lieu of this, the National Government bears responsibility for the protection and management of the environment and water resources. This includes sustainable water resources development, management and securing water source areas.

Water Towers in Kenya², refer to the major mountains and highlands which are sources of freshwater including rivers. The Aberdares Mountain Range is one such major water tower. It hosts the Aberdare National Park and Forest Reserve, which hold rich biodiversity and water catchment areas. Trees within the forest sequester carbon, thus providing climate change mitigation while also ensuring water resources conservation. The study area, Sasumua Watershed, drains from this water tower.

Case Study:

A study was conducted in the Sasumua River Watershed of Kenya, as part of a water security project conducted in East Africa and funded by LASER PULSE³. The study sought to provide insights on

- Natural assets in the Sasumua Watershed are at risk from degradation posing future water security challenges to the city of Nairobi.
- Data driven evidence of current situation and projected future scenarios will guide targeted actions to restore Kenya's water towers.
- Data access, analysis and utilization are important components for informing trends of future water security in water towers.
- Protection of water towers is necessary, preferably using a combination of conservation initiatives.
- Multi-faceted approaches that integrate different conservation initiatives are more opportune for watershed protection to assure future water security.
- Engage all stakeholders for conservation of water towers, to improve water security.

Key Takeaways

¹ Republic of Kenya, 2010. The Constitution of Kenya (2010). Government of the Republic of Kenya.

² KWTa, 2016. The Kenya Water Towers Agency (KWTa) Strategic Plan (2016-2020). Government of the Republic of Kenya.

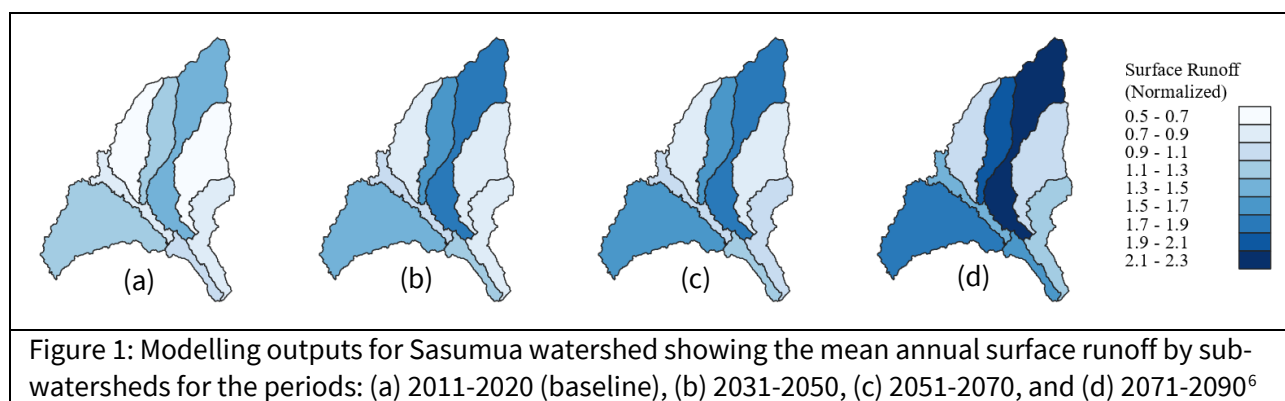
³ See Acknowledgements at end for project information.

contribution of data to decision support systems with the view to improve water resources management and, ultimately, water security. The Sasumua River Watershed is located in Nyandarua County, lying within the headwaters of the Tana River Basin, and covering an area of 136 km², at an elevation that ranges from 2,250 to 3,880 meters above sea level on the southwestern portion of the Aberdares Mountain Range. The watershed receives annual rainfall ranging 1,000 to 1,600 mm, depending on altitude. The Sasumua Dam with a storage capacity of 15.9 million m³, is situated within the watershed and is significant as it contributes approximately 12% of Nairobi’s water supply⁴. Land use in the Sasumua Watershed also includes intensive small-scale cultivation, with parcels of land being less than one hectare on average. The Sasumua River flows first through the Aberdare Forest, then farmlands, then empties its waters into the Sasumua Reservoir.

This study utilized hydrological data collected from national databases of the Water Resource Authority. The Soil and Water Assessment Tool (SWAT, Arnold et al., 1998⁵) hydrological model was used to simulate scenarios of land and water management for a changing climate, projected as future scenarios to year 2090, to estimate future flows and impacts on the watershed.

Water Security cannot be Guaranteed for the Sasumua Watershed in the Future

There are water security threats in the Sasumua Watershed as agricultural activities have encroached on natural ecosystems above the dam. The Jabini urban center sprang up above the Sasumua Dam and with rapidly growing population, it causes pollution threats to water resources. The reservoir water benefits Nairobi City amid shortages for rural people in the watershed. In addition, there is land fragmentation with intensive agriculture and encroachment of catchment areas. This has led to reduced land cover, culminating in increased runoff and soil erosion during the rainy season. These contribute loads of sediments and other pollutants into the river and reservoir. Within the next 70 years, climate change threats accompanied by loss of vegetation cover pose threats of increased surface runoff impacting on the hydrology of the watershed (see Figure 1).



Multi-Faceted Approaches will facilitate Watershed Restoration for Water Security

An analysis of scenarios to reverse degradation and attain water security found that, the Sasumua Watershed will require a multi-faceted approach including riparian buffers, filter strips, terracing, field diversions of runoff, water harvesting and conservation. These initiatives will also support adaptation against future climate shocks (Figure 2). However, taken singly, grass filter (buffer) strips were the most effective. Thus, contour grass buffer strips should be upscaled. Remedial and conservation efforts are instituted in Sasumua Watershed by communities and support organizations, especially the Sasumua Water Resources Users Association (WRUA).

⁴ <https://www.awwda.go.ke/sasumua-dam/>

⁵ Arnold, J.G., Srinivasan, R., Muttiah, R.S., and Williams, J.R. (1998). Large area hydrologic modeling and assessment part I: Model Development. *Journal of the American Water Resources Association*, 34(1):73-89.

⁶ Garibay, V. 2022. *Water Resources Management Solutions for East Africa: Increasing Availability and Utilization of Data for Decision-Making*. PhD Dissertation. Purdue University.

The guiding principles towards sustainable management of water towers in Kenya⁷ requires ensuring accountability, responsibility and equity to support responsible use and exploitation of water, ecosystems and the natural resource base, for current and future generations. The Government of Kenya should engage all stakeholders for coordinated implementation of the proposed measures, to conserve the Sasumua watershed as well as other water towers, and thus, facilitate improving water security in Kenya.

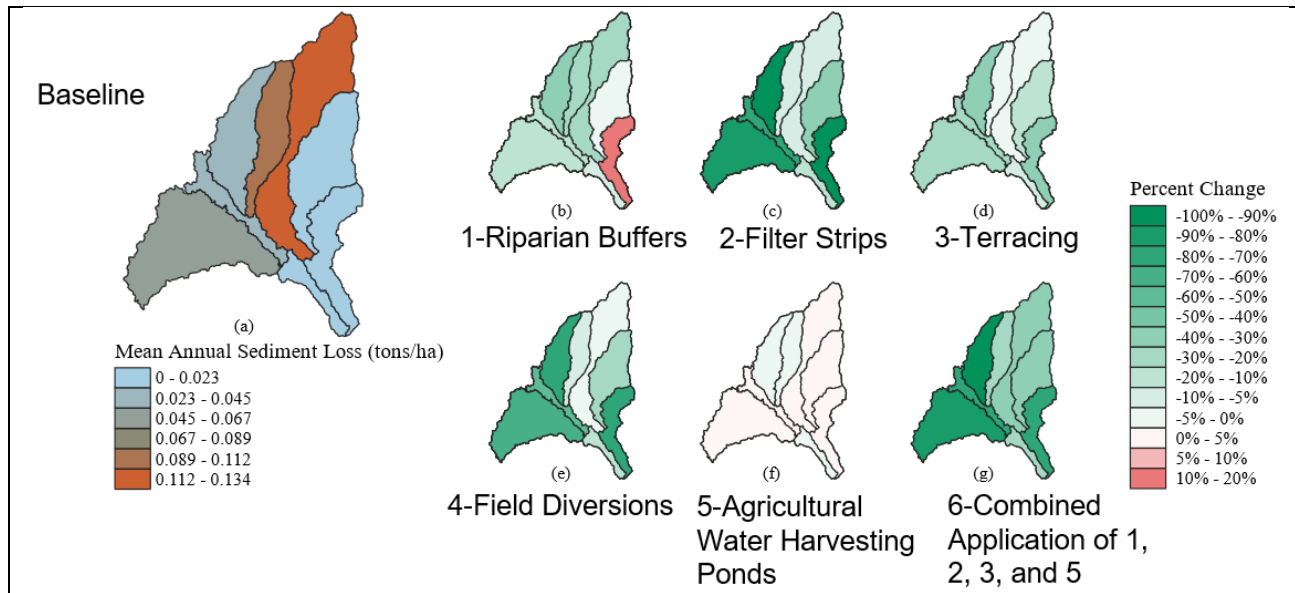


Figure 2: Management approaches for restoration of Sasumua Watershed⁸.

Policy Brief for Kenya

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⁷ Republic of Kenya. 2021. The Water Resources Regulations, Legal Notice No. 170, Government of Kenya

⁸ Garibay, V. 2022. Water Resources Management Solutions for East Africa: Increasing Availability and Utilization of Data for Decision-Making. PhD Dissertation. Purdue University.