Enhancing Resilience Through Integrated Watershed Management:

Lessons from the Titukulane Project in Malawi

Key Messages:

- **Watershed interventions drive transformative change:** Integrated watershed management significantly improved soil retention, water availability, and agricultural conditions. For instance, Lungwena Watershed in Mangochi District captured 3,433 m^3 of soil during the 2023/24 rainy season, and groundwater levels rose in 87% of surveyed areas, supporting irrigation and household water needs.
- **Socio-economic resilience through Cash-for-Work:** Beyond immediate financial relief, CfW payments enabled households to invest in agriculture, join VSLAs, and start small businesses, fostering long-term economic stability. However, challenges in digital payment systems highlight the need for improved financial literacy and revised payment mechanisms to ensure equal access.
- **Community engagement ensures sustainability:** Strong community participation, backed by tailored training for over 7,000 households, demonstrated the power of local ownership in implementing and maintaining soil and water conservation techniques. Women and youth played pivotal roles in diversifying income sources, such as beekeeping and agroforestry.
- **Data gaps hinder policy and planning:** Hydroclimatic data remains a critical gap, limiting the ability to scale interventions effectively. Strengthening institutional capacities for data collection and sharing, alongside targeted investment in hydroclimatic monitoring tools, is essential for adaptive management and evidence-based policymaking.

Introduction

The *Titukulane* program implemented watershed interventions in Zomba and Mangochi districts to address critical challenges in soil conservation, water resource management, and socio-economic resilience. These interventions focused on restoring degraded landscapes, enhancing agricultural productivity, and improving water availability for agricultural and domestic use. The program actively engaged over 7,000 households across 23 watersheds, highlighting a strong commitment to community-driven approaches in building sustainable solutions.

This policy brief is based on an evaluation that utilized a mixed-methods approach to analyze the outcomes of these interventions. The study combined quantitative methods, such as satellite imagery analysis (Normalized Difference Vegetation and Water Indices), soil erosion measurements using calibrated soil pegs, and sediment traps installed in representative soil and water conservation structures. These quantitative insights were supplemented by qualitative methods, including focus group discussions (FGDs) and household surveys, capturing community experiences and perceptions.

The evaluation focused on eight sampled watersheds: Sungusya (TA Chowe) and Nanyani (TA Namavi) in Mangochi, as well as Sikamu (TA Mlumbe), Kaselema (TA Chikowi), Tayamba (TA Malemia), Ninje (TA Jalasi), Kaolatsitsi (TA Chilipa), and Fikila (TA Nkapita) in Zomba. These watersheds were selected based on their varying geographical and socio-economic characteristics, ensuring a representative analysis of the program's impacts.

This approach provided evidence-based findings on changes in vegetation cover, water retention, soil health, and socio-economic conditions, forming the foundation for the actionable recommendations presented in this policy brief.

Key Findings

Environmental Restoration

Watershed interventions have shown measurable success in restoring degraded landscapes across the targeted regions. Soil and water conservation structures, such as swales, check dams, and trenches, have played a critical role in reducing soil erosion and improving vegetation cover. Sediment trap data indicates significant soil retention volumes, such as ~3433.67m³ in Lungwena Watershed, after the 2023/24 rain season highlighting the effectiveness of these measures.

Table 1 Predefined volumes for SWC structures

Structure	Length (m)	Width (m)	Depth (m)	~Volume (m³)
Swale	5	0.4	0.6	1.2
Deep trench	5	1	1	5
Check dam	n*	1*	n*	n*

n*= varies where n= any positive value in m.

Additionally, satellite-based Normalized Difference Vegetation Index (NDVI) analysis shows incremental improvement in vegetation greenness, with Lungwena registering a +0.2 change in NDVI values over two years of intervention. These findings underscore how physical conservation structures are helping communities stabilize their environments and mitigate soil degradation while laying the groundwork for long-term ecological sustainability.

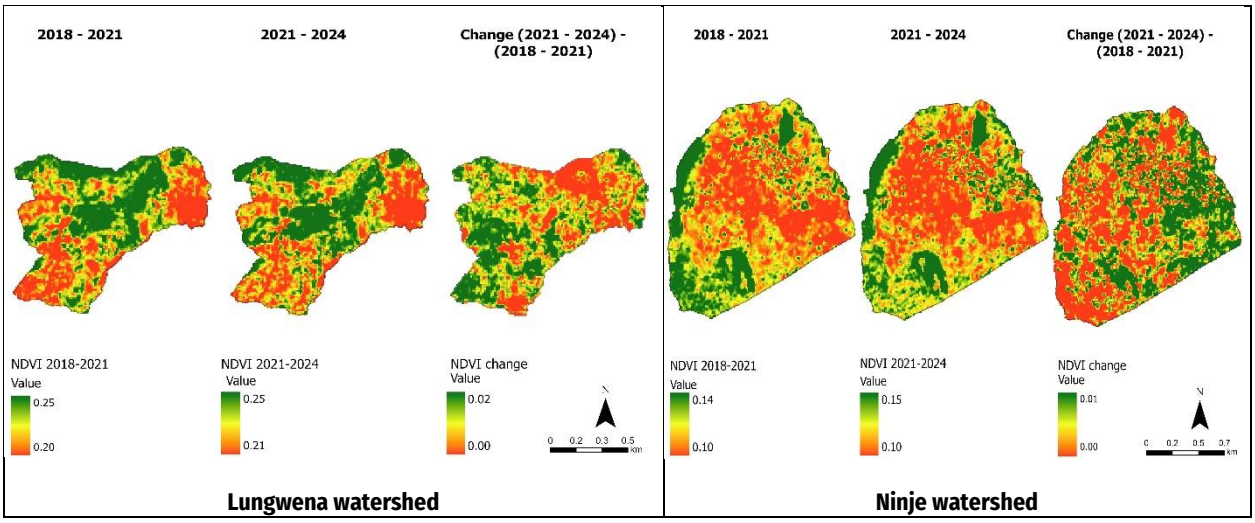

Figure 1 Normalized Difference Vegetation Index for Lungwena and Ninje watersheds

Agricultural Diversification and Productivity

Watershed interventions have positively influenced agricultural practices, with a notable shift toward diversified and climate-resilient cropping systems. Post-intervention data shows substantial changes in crop selection. Farmers across targeted watersheds reported adopting leguminous crops such as soya and horticultural crops, which improve soil fertility and reduce reliance on single crops prone to environmental risks. Additionally, improved soil moisture and nutrient retention, facilitated by swales and contour ridges, have enhanced crop resilience to climatic variability. These findings align with broader global objectives of enhancing agricultural productivity while building resilience in vulnerable farming systems.

Water Resource Management

Access to water for both domestic and agricultural use has significantly improved as a direct outcome of watershed management efforts. Conservation structures, such as swales and deep trenches, have contributed to enhanced groundwater recharge, with communities reporting faster recovery times for boreholes and wells during the dry season. For instance, in Nanyani Watershed, groundwater levels rose from 6 meters to 3 meters, reducing the burden on women and children who previously had to walk long distances for water.

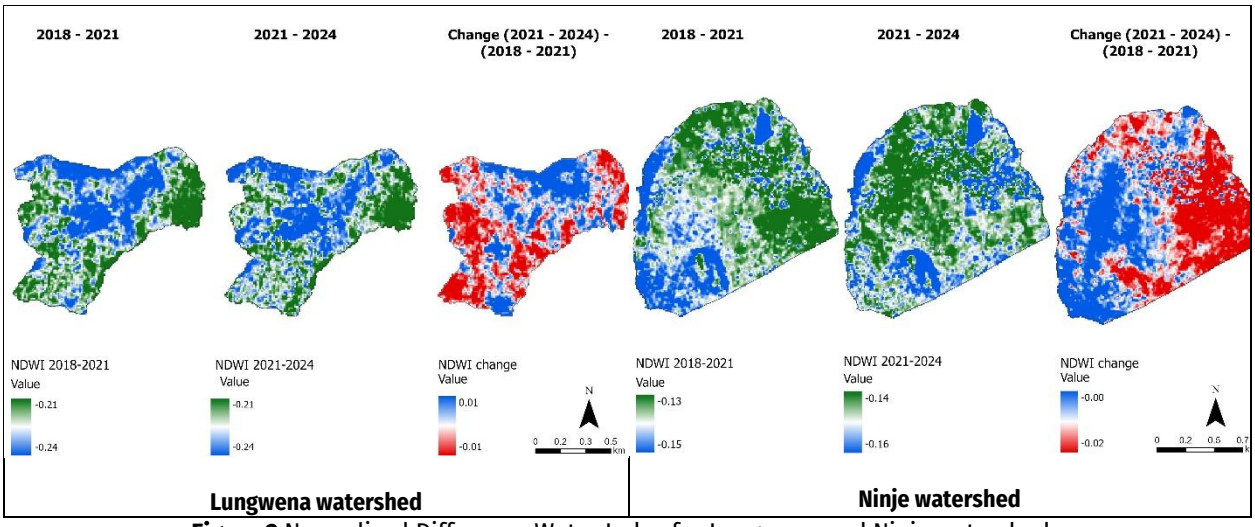

Figure 2 Normalized Difference Water Index for Lungwena and Ninje watersheds

Similarly, normalized difference water index (NDWI) data reveals improved water retention in areas where conservation structures were implemented. Participants noted that increased water availability has supported year-round farming and irrigation, reducing the vulnerability of agricultural activities to drought conditions.

Soil and Water Conservation Outcomes

Quantitative evidence highlights the success of conservation structures in controlling soil erosion and retaining topsoil. Data from soil sediment traps indicate that watersheds with higher densities of conservation structures captured more soil, reducing land degradation during the 2023/24 rainfall season. For example, Lungwena captured ~3433.67m³ of soil, compared to ~1518.5m³ in Nanyani.

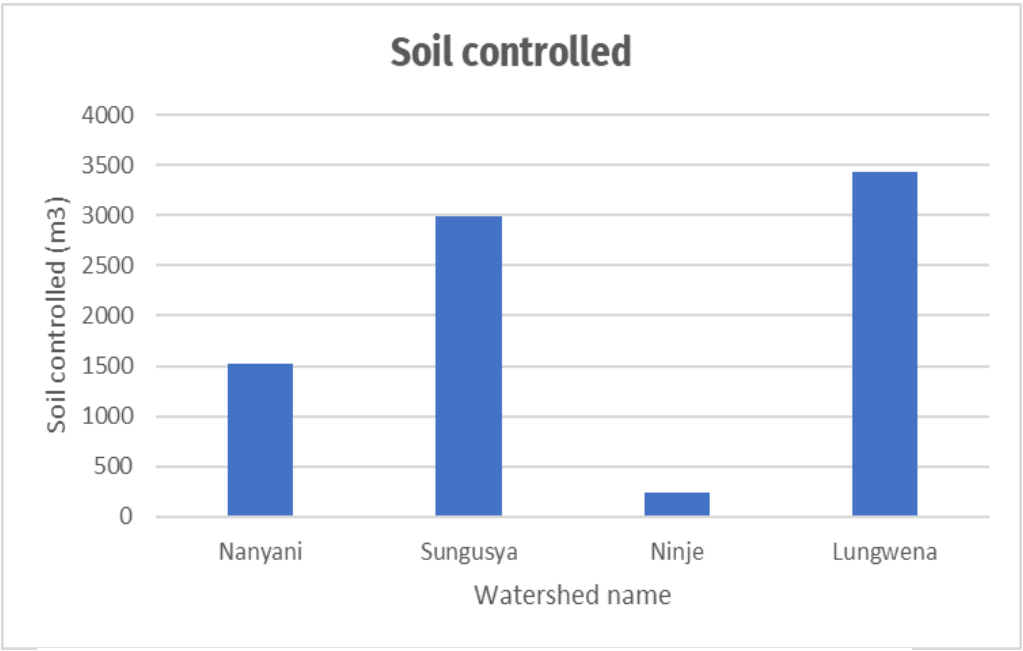

Figure 3 Soil Volume Captured by SWC Structures

Participants also reported visual improvements in soil fertility, with erosion-prone areas now supporting healthier crops. These findings underscore the importance of scaling up conservation structures to ensure widespread benefits.

Cash-for-Work (CfW) Payments and Financial Literacy

The Cash-for-Work (CfW) program played a vital role in improving the socio-economic resilience of participating households by providing immediate financial relief and opportunities for reinvestment. Participants widely utilized CfW payments to purchase essential items, such as fertilizers (58%) and food (72%). In Sikamu and Lungwena watersheds, some participants reinvested these funds into Village Savings and Loan Associations (VSLAs), enabling them to establish small businesses and purchase livestock. This reinvestment helped diversify income streams and supported the transition from subsistence to sustainable economic activities.

Despite these positive outcomes, several challenges with CfW payment systems emerged. For example, participants, particularly in Nanyani and Ninje watersheds, reported financial losses due to low digital literacy and exploitation by mobile money agents. Agents charged high withdrawal fees or, in some cases, claimed the funds were not credited, depriving participants of their earnings. This highlights the need for enhanced training in digital payment systems to safeguard participants from fraud.

Adequacy of CfW Payments

Concerns regarding the adequacy of CfW payments were voiced across all watersheds. Participants highlighted that the payments, although helpful, did not match rising market prices for essential commodities. For instance, respondents in Sikamu watershed noted that their earnings were insufficient to purchase a sustainable amount of maize or fertilizer, impacting their ability to meet basic household needs. This gap underscores the importance of aligning payment scales with inflation rates to ensure meaningful support for participating households.

Diversified Livelihood Opportunities

In addition to CfW, Titukulane's initiatives introduced alternative livelihood options such as beekeeping and irrigation, enabling participants to generate supplementary income. For example, 20% of respondents across the watersheds engaged in beekeeping. Women were central to these activities, taking leadership roles that empowered them economically and socially. Furthermore, some participants utilized CfW earnings to establish small trading businesses, creating a ripple effect on household income and community resilience.

Recommendations for Policy Considerations

Based on findings from the Titukulane project, the following recommendations aim to address observed challenges and enhance the sustainability, efficiency, and overall impact of future watershed management programs. By implementing these actionable strategies, policymakers and implementers can ensure long-term community resilience and socio-economic development.

I. Strengthening Training and Capacity Building

1. **Build Financial Literacy for Digital Payments**: Low financial literacy contributed to challenges with e-transfers, as reported in Sikamu and Ninje watersheds, where participants faced issues such as blocked SIM cards and exploitation by mobile money agents. Capacity-building programs should equip participants with practical skills to manage mobile payments independently and avoid reliance on intermediaries. Training should emphasize digital finance concepts, basic troubleshooting of SIM-related issues, and methods to verify transactions for greater security.
2. **Expand Agricultural Extension Services**: The shortage of Agricultural Extension Development Officers (AEDOs) was cited as a limitation in sustaining training outcomes. Increasing the number of trained AEDOs and providing them with mobility resources, such as motorcycles, will ensure continued technical support to farmers. Regular refresher courses and community-based extension systems (e.g., training Lead Farmers) can sustain capacity-building efforts, as seen in the success of Titukulane's water harvesting and farming practices training.

II. Improving Payment Modalities and Management

1. **Address Barriers to E-Transfers**: Many participants expressed a preference for cash payments due to difficulties accessing e-transfers, such as blocked SIM cards and high withdrawal fees from mobile money agents. Future programs should offer hybrid payment systems that include both cash and e-transfer options, particularly in areas where mobile network coverage or digital literacy is limited. Strengthening partnerships with mobile money providers to improve transparency and simplify processes will also address participant frustrations.
2. **Empower Community Leadership in Watershed Management**: Community leaders in the Lifa watershed demonstrated how proper orientation can improve local enforcement of sustainable practices. Leaders should be trained on monitoring watershed structures, applying local bylaws, and mediating conflicts over land use. Their involvement should extend to planning and evaluating interventions, ensuring long-term community ownership.
3. **Develop and Disseminate Standardized Watershed Management Manuals**: Participants noted inconsistencies in the technical guidance provided across watersheds.

Comprehensive manuals should be developed to harmonize soil and water conservation practices, incorporating region-specific variations in climate, soil types, and topography. These guides can be distributed to community leaders and AEDOs for consistent implementation and monitoring.

III. Enhancing Market Access and Resource Management

1. **Strengthen Market Linkages and Infrastructure**: Participants in Sikamu and Lifa watersheds reported challenges in accessing markets for their surplus produce, undermining the economic gains of increased agricultural productivity. Improving transport networks, constructing local storage facilities, and establishing market information centers will enhance farmer profitability. Collaboration with private sector actors can further open value chains for high-value crops such as legumes and horticultural products.
2. **Improve Access to Hydroclimatic Data**: Farmers often lacked accurate rainfall and water availability data, affecting planting and harvesting decisions. Strengthening the capacity of institutions like the Water Resources Authority to install and maintain rainfall and river gauges will fill critical data gaps. Free, user-friendly platforms for sharing hydroclimatic data will enable communities to make more informed agricultural and watershed management decisions.

IV. Supporting Livelihood Diversification

1. **Promote Income-Generating Activities (IGAs)**: Diversification of livelihoods has proven effective in improving household incomes and reducing vulnerability. Beekeeping, agroforestry, and livestock farming, introduced in Sikamu and Nanyani watersheds, enabled participants to reinvest in farming and household needs. Future programs should integrate IGA training with business management and marketing skills to maximize benefits. Support should also include access to microfinance or grants for scaling these activities.
2. **Foster Partnerships for Continuous Research and Innovation**: Research institutions can provide evidence-based insights to refine watershed interventions, ensuring they remain adaptive to changing climatic and socio-economic conditions. Collaborating with universities and NGOs to test innovative approaches (e.g., new crop varieties or water conservation technologies) will improve community resilience and program outcomes.

V. Policy and Practice Adjustments

1. **Align Cash-for-Work (CfW) Payments with Market Prices**: Participants in Sikamu watershed reported that current CfW wages were insufficient to cover rising costs of living, limiting their ability to meet basic needs or invest in farming inputs. Payment structures should be periodically reviewed to reflect local inflation and commodity prices, ensuring they provide meaningful support to participating households.

2. **Reduce Dependency on External Aid**: While CfW programs were well-received, concerns about dependency were raised. Emphasizing long-term skills development and promoting Village Savings and Loan Associations (VSLAs) can foster financial independence. For instance, participants in Lungwena watershed successfully used VSLA funds to start small businesses, demonstrating that savings mechanisms can enhance resilience and reduce reliance on aid.

This policy note was written by Fundi Kayamba-Phiri and Paul Sululu with contribution from Suresh Babu.

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