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BUSINESS CASE

YALA RIVER CATCHMENT

World's first women-led Water Fund: Investing in Nature-based Solutions for water security

OCTOBER 2023

Nature for Water FACILITY

The Nature Conservancy

W.W.A.N.C — Women in Water and Natural Resource Conservation

Foreword

FOREWORD TO THE RIVER YALA WATER FUND BUSINESS CASE

ADEMOLA AJAGBE, REGIONAL MANAGING DIRECTOR – THE NATURE CONSERVANCY, AFRICA

The Yala River catchment serves as a lifeline, sustaining over 1.7 million people in Western Kenya. It supports human livelihoods and plays a crucial role in preserving our environment. This vibrant ecosystem supplies water to both local communities and industries, while also nurturing local biodiversity and ecosystem services within the forests and wetlands.

Over 90% of the land within this catchment area is under the stewardship of smallholder farmers, highlighting its critical role in the local economy and agriculture. However, it is imperative to acknowledge that while agriculture is a vital livelihood, expanding agricultural practices pose a potential threat to the delicate balance of the ecosystem. Embracing sustainable and regenerative agriculture becomes paramount in this context, offering a pathway to optimize production while employing environmentally friendly techniques. This approach not only supports the farmers in increasing their yield and income but also ensures the preservation and enhancement of the natural resources upon which they depend on.

In this context, the Yala River Water Fund emerges as an exceptional opportunity. It not only aims to enhance water quality in the catchment area but also uplifts smallholder farmers by equipping them for a better future. What makes this initiative particularly inspiring is its dedication to meaningfully involve women in its operations – setting a global precedent as the first women-led water fund—a remarkable achievement. I commend all who have made this possible including the Ministry of Environment, Climate Change and Forestry, Mama Doing Good, International Fund for Agricultural Development (IFAD), Nature4Water Facility, County Government of Nandi, Women in Water and Natural Resources Conservation, Masinde Muliro University of Science and Technology, Moi University amongst others for a job well done in bringing this water fund to fruition.

As a representative of TNC in Africa, I am excited to see initiatives like the Yala River Water Fund take root, which stand at the intersection of environmental conservation, gender equality, community empowerment, and climate resilience. This water fund is a significant stride towards achieving our 2030 goals for climate change and biodiversity loss, by tackling climate change, protecting water and lands, and providing food and water sustainably. In partnership with communities, decision-makers, and global allies, we are laying the groundwork for a brighter, more sustainable future for all.

Ademola Ajagbe.

Regional Managing Director, The Nature Conservancy – Africa Region.

Acknowledgements

The River Yala Water Fund is a partnership between Women and Water in Natural Resources Conservation (WWANC) and The Nature Conservancy (TNC). The Partners are grateful for the technical support provided by the Nature for Water Facility through generous support from its funders and donors.

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PEGASYS
CHANGING LIVES CHANGING WORLDS

Contents

List of Abreviations

Ag BMPs	Agricultural Best Management Practices
Ksh	Kenyan Shilling
NbE	Nature-based Enterprises
NbS	Nature-based Solutions
NGO	Non-governmental organization
WWANC	Women in Water and Natural Resources Conservation

Executive Summary

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Executive Summary

The River Yala Water Fund's shared vision is to safeguard critical ecosystems that can preserve the integrity of water within the Yala River catchment, while also enhancing livelihoods in the region and promoting women in conservation. The Yala River is a vital water source that sustains both human and natural ecosystems. However, the river's catchment is under pressure from poor land-use practices, which are having a direct impact on the long-term security of this water source.

This Business Case was developed alongside a local non-governmental organisation (NGO), Women in Water and Natural Resources Conservation (WWANC). It presents an innovative, community-led Water Fund approach, driven by women, that leverages the experience of thousands of smallholder farmers to improve water security, conserve remaining biodiversity and support resilient livelihoods. This can all be achieved through Nature-based Solutions (NbS), specifically Agricultural Best Management Practices (Ag BMPs), and will be the World's 1st Women-led Water Fund.

The River Yala Water Fund is looking to unlock financial investment in both the short- and long-term that can enable the implementation and stewardship of this approach now and into the future.

THE YALA RIVER CATCHMENT

The Yala River catchment, within western Kenya, is the lifeblood of the region. The Yala River flows into Lake Victoria. Its catchment passes through six counties and covers 3,139 km^2. Its source is the Mau Forest Complex, the largest closed-canopy montane forest ecosystem in East Africa, and one that is considered to be the most important of five key water towers in Kenya.

The river and its catchment support more than 1.7 million people. Its waters support ecosystem services such as fertile land for agriculture and a range of natural resources, for example, fish, timber, firewood and medicinal plants. They also provide regulating services, such as climate and flood control, and help to sustain forests and wetlands. The tea plantations in Nandi County alone employ more than 6 000 people with annual crop production around 500 000 megatons, equating to an annual economic value of USD 82 million. It is also the main river feeding the Yala swamp, which in 2010 was estimated to have an economic value of USD 1.20 billion[1].

The Yala Swamp[2] complex, on the northeast shore of Lake Victoria is the largest Kenyan freshwater wetland and together with the King'wal Swamp, the wetlands provide habitats for the endangered Sitatunga antelope and the Grey Crowned Crane bird.

Land use in the Yala River catchment is predominantly rural, with 90% of the land being used for smallholder agricultural activities[3].

Four water companies extract water from rivers within the catchment to provide drinking water to towns located both within and adjacent to the catchment. These companies supply water to meet the increasing demands of domestic, commercial, and industrial water users. Hence, they depend on the Yala River catchment as a sustainable source of clean water.

THE CHALLENGE

The Yala River catchment is under pressure from forest degradation, combined with rapid settlement and agricultural land expansion that has led to the adoption of poor land-use practices. These are affecting the quality of water in the Yala River and it is deteriorating rapidly. Local counties including Kakamega, Nandi, Vihiga and Siaya, are already classified as water insecure.

Poor land-use practices within the Yala River catchment are the main drivers of increased sediment levels within the river.

The main drivers of deteriorating water quality and water insecurity are the current farming and community land-use practices. These practices encourage a loss of vegetation cover, exposing topsoil to erosion that reduces the quality of the farming land and increases the amount of sediment that reaches the river. Sediments have a significant impact on water quality. Suspended sediments act as a transport medium for pollutants, reducing plant growth and lowering oxygen levels. Settled sediments smother aquatic organisms and clog channels, reducing the Yala River's natural flow capacity. Increasing sedimentation therefore threatens the survival of the Yala River catchment system and the population that is reliant on it

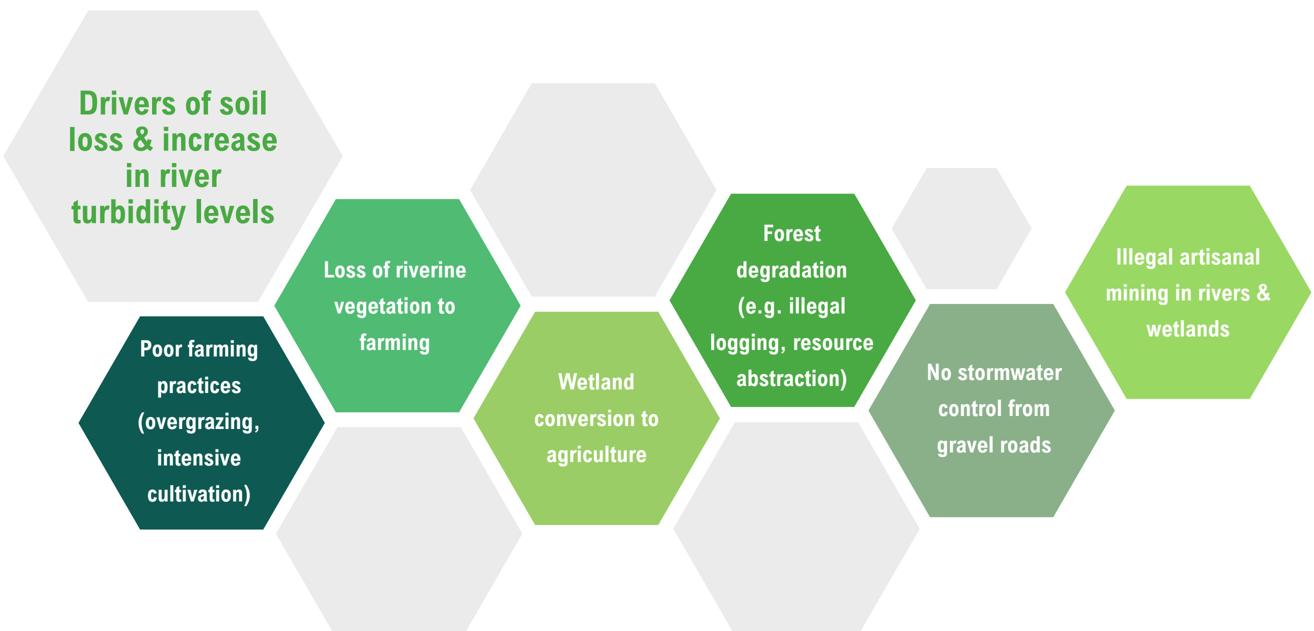

Fig 1 Poor land-use practices within the Yala River catchment

CHALLENGE TO AGRICULTURAL PRODUCTIVITY – Farming productivity (crop yields) drop by an average of 2% annually[4] as nutrient-rich soil continues to erode and wash away into rivers and wetlands. This is directly affecting farmers' livelihoods.

CHALLENGE TO WATER QUALITY FOR HUMANS – Increased sediment in the Yala River has increased turbidity[5] levels. Current levels across the catchment are between 200 NTU and 800 NTU[6]. These figures are well above the standard maximum of 5 NTU for drinking water. The high levels of turbidity directly affect water treatment processes and associated costs for the four main water companies, linked specifically to:

- Increased flocculant use and electricity;
- Increased maintenance frequency, reduced lifespan of equipment (e.g. filter media) and increased backwashing, desludging of intakes, lagoons or drying beds; and
- Loss in processed water (i.e. saleable water) due to the need to backflush equipment more regularly.

CHALLENGE TO WATER QUALITY FOR AQUATIC LIFE – The Yala River's high turbidity levels also affect the aquatic life. Turbidity above 150 NTU at any time or 50 NTUs as a monthly average is harmful to aquatic life[7], meaning the Yala River is often more than 500% over acceptable limits.

THE SOLUTION

The River Yala Water Fund proposes a women-led, community-based implementation approach. This approach is the mechanism through which degraded land and polluted water can be addressed to conserve ecosystem integrity, improve water quality and enhance farming outputs as well as bolster resilience to climate change. The Water Fund aims to safeguard the land and water resources within the Yala River Catchment, whilst not undermining local livelihoods.

Nature-based Solutions are actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously benefiting people and nature.

NbS enable the protection, sustainable management and restoration of natural ecosystems while also addressing societal challenges. By implementing priority NbS in the Yala River catchment, the key ecological impacts would include:

- A reduction in rich soil loss of more than 200,000 tonnes per year, and
- A reduction in suspended sediments in the river of more than 40%.

[5] Turbidity is one of the parameters for drinking water. Turbidity is the measure of relative clarity of a liquid and makes water cloudy or opaque.
[6] Daily turbidity levels as recorded by KANAWASCO between 2020 and 2022 in the upper catchment within Nandi County.

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Agricultural Best Management Practices (agrofrorestry, cover cropping, Fanya juu, terracing, riparian buffers and woodlots) across 42 746 ha to increase groundcover, improve soil structure, retain nutrients and moisture, increase infiltration, and decrease erosion and sediment run-off. >16 000 farmer households will benefit through higher value crops, increased productivity and reduced soil loss.

Forestry rehabilitation across 687 ha to preserve the remaining natural forests will help to reduce sedimentation and increase water availability during drier periods, due to improved infiltration. In addition, important forest ecosystems and habitats will be conserved.

Wetland restoration across >5 500 ha to re-establish the hydrology, plants and soils, whilst improving sediment trapping and pollutant removal. Freshwater biodiversity and ecosystem functioning will improve, along with other benefits, such as lower flood risks, groundwater recharge and maintaining dry season flows.

An extensive gravel road network exists across the catchment. By installing 537 km of stormwater control measures, such as vegetated retention ditches, alongside these roads, sediments can be intercepted before reaching the rivers and wetlands.

Fig 2 Priority NbS for the Yala River catchment

The success of the Water Fund in supporting this approach depends on the collective action of many stakeholders throughout the catchment and a clear prioritization of the water sources that need most urgent attention. The scale of interventions that are required at a community level far exceeds the ability of any one organisation or county and the capacity of the Water Fund to support the implementation of these interventions will be key to their success.

A core tenet of the River Yala Water Fund will be the community-based approach, and in particular, the empowerment of women who have an important role to play in implementing these solutions.

THE INVESTMENT CASE

This Business Case assessed the financial and economic viability of a Water Fund through the implementation of Nature-based Solutions in the Yala River Catchment using a 7-step process.

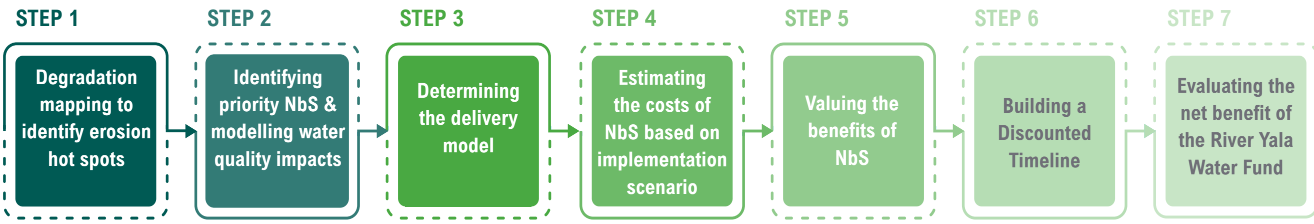

Fig 3 7-step process followed

Over a 30 year period, the results show that a lifetime investment of USD 112 million in NbS unlocks benefits worth USD 405 million. This equates to a net benefit of USD 292 million over the same period [8].

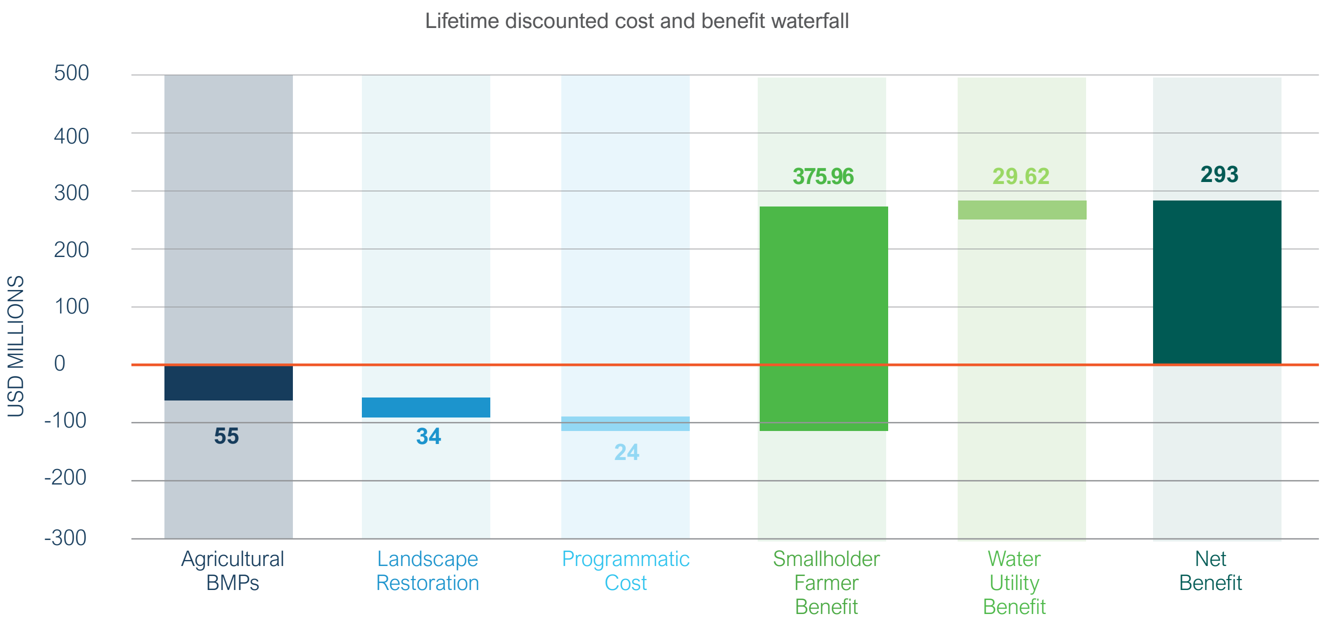

Fig 4 Waterfall chart showing lifetime costs and benefits of investing in Ag BMPs and NbS (land restoration)

[8] All values have been discounted at a rate of 6,52%.

The benefits are incrementally unlocked over several years as uptake of NbS increases, especially among smallholder farmers. The full benefit is expected to be realised after a ten year period, with a strategically phased implementation process. The main benefits include:

REDUCED SEDIMENT IN THE RIVERS - The primary benefit is the reduction of more than 200,000 tons of sediment per year from reaching the rivers and wetlands. This will see a reduction in sediment load in the rivers, reducing water turbidity levels by between 35% and 42% across the catchment[9 10].

REDUCED COSTS AND INCOME GAINS TO WATER COMPANIES - Water companies benefit directly through reduced treatment, operational and maintenance costs as well as income gains from saved process water. This equates to direct benefits in the form of both cost savings and income gains across the water companies of USD 29 million.

ADDITIONAL HOUSEHOLD INCOME - Smallholder farmer benefits are valued at USD 376 million in the form of additional household income. Increased revenue from the cultivation of higher value crops and the on-farm retention of soils and nutrients, ensures long-term productivity of the land is preserved. In addition, Nature-based Enterprises (NbE) provide an opportunity for individual farmers to generate more than USD 1,700 per year in additional revenue from alternative livelihoods, such as beekeeping and tree nurseries.

RESTORATION OF FOREST AND WETLAND ECOSYSTEMS - Over 6,200 hectares of biodiversity would be restored across forest and wetland ecosystems.

IMPROVED RESILIENCE TO CLIMATE CHANGE - Ag BMPs specifically protect farming activities by encouraging a move to more sustainable farming practices for more than 16,000 farming households. As such, this will improve resilience to future climate shocks. Improved water quality will ensure a consistent water supply in the long-term for the catchment's growing population.

Long-term funding mechanism through the carbon market – High-level estimates show that there is potential to generate around USD 200,000 annually with a total income of around USD 4.5 million. Due to uncertainty as to the feasibility of this revenue it has not been accounted for in the model at this stage.

This Business Case shows that for every USD 1 invested in NbS, a return of more than USD 3.5 is generated over the lifetime of the River Yala Water Fund's activities.

[9 10] Turbidity levels are not fixed and fluctuate due to various factors, such as rainfall which typically causes an increase in turbidity levels due to an increase in run-off. This reduction accounts for the inclusion of vegetated retention ditches alongside identified roads, however, it is assumed, and encouraged, that the County Governments implement these important road drainage interventions.


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MOVING FORWARD

The River Yala Water Fund has already begun taking significant steps, having secured USD 400 000 to kick start pilot activities within Nandi County for the first 2 years. A further USD 4 million 'likely' near-term funding has also been identified to be rolled out over the next 5 years. This initial funding will help to capacitate the Water Fund's structure and design. Importantly it will enable the implementation of initial NbS that will help attract further funding and interest. The River Yala Water Fund will also link with upcoming programmes, such as the Kenyan Government backed One Million Tree Growing Campaign.

SETTING UP FOR SUCCESS

The Water Fund's long-term success is underpinned by the active participation of smallholder famers, at scale. To ensure this, farmers need to recognise the long-term benefits they gain from NbS. This is achieved through the support of the Water Fund's partner organisations who provide farmers with access to markets, logistics support and training.

The shared vision of the River Yala Water Fund is to enhance livelihoods and promote women in conservation alongside safeguarding critical ecosystems to preserve the integrity of the water within the catchment that is vital to so many. To succeed, the River Yala Water Fund requires sufficient short- and longer-term investment, as well as the commitment and cohesion of a broad spectrum of stakeholders.

Introduction

01

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1. Introduction

This Business Case for the Yala River presents an innovative, community-based Water Fund approach, driven by women, highlighting the most impactful Nature-based Solutions (NbS) and incorporating Agricultural Best Management Practices (Ag BMPs). These interventions aim to control erosion and sediment run-off, thereby helping to restore the degraded landscape and critical ecosystems in the catchment, and simultaneously enhancing livelihood benefits to smallholder farmers.

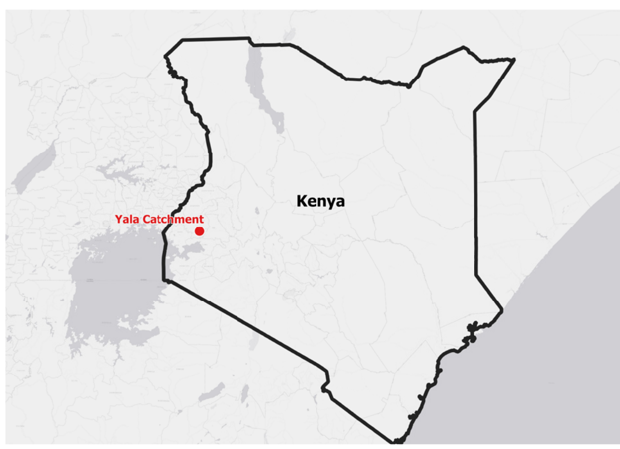
WWANC, a local, women-led NGO, has already mobilised key stakeholders of the Yala River into a steering committee to enable better custodianship and more effective management of the catchment and the water and natural resources within it. To further support the efforts of WWANC, the Nature for Water Facility provided technical support as part of a Feasibility Study to determine the viability of setting up the World's first women-led Water Fund. There is considerable evidence that the meaningful involvement of women in delivering NbS increases both their effectiveness and sustainability[11].

The Water Fund will support Nature-based Enterprises (NbE) as a means of alternative income to improve community sustainable livelihoods as well as drive partnerships with local conservation groups.

Exploring the Yala River Catchment

The Yala River is one of the main Kenyan rivers draining into Lake Victoria[12]. The river and its catchment traverses six counties and covers an area of 3,139 km^2. It supports in excess of 1.7 million people. The catchment provides ecosystem services (fuel wood, livestock fodder, water, fish, medicinal plants), regulating services (climate and flood control) and sustains the remaining forests and wetlands.

The Yala River has its origins in the South Nandi Forest and flows for 219 km before reaching the eastern shores of Lake Victoria. The Mau Forest Complex, particularly the Northern Tinderet Forest, serves as the primary source of the Yala River's catchment area. The Mau Forest Complex is the largest closed-canopy montane forest ecosystem in East Africa and one of five key water towers in Kenya[13].



Surface runoff is dictated by seasonal weather conditions, with stream flow mimicking the two rainy seasons. There are higher river flows between March and May, and again between October and December[14]. Of the remaining pockets of natural ecosystems, indigenous forests cover only 14% of the catchment, while wetlands cover 9%.

There are two key wetlands within the Yala River catchment. The King'wal Swamp is located in the upper part of the catchment and the Yala Swamp is positioned at the end of the catchment. The Yala Swamp is the largest freshwater wetland in Kenya. It is approximately 207 km^2 in area and one of only a few large wetland ecosystems found in the Lake Victoria Basin. Both wetlands provide habitat for the endangered Sitatunga antelope and the endangered Grey Crowned Crane, with only 334 individuals counted in Nandi County during a 2023 survey.

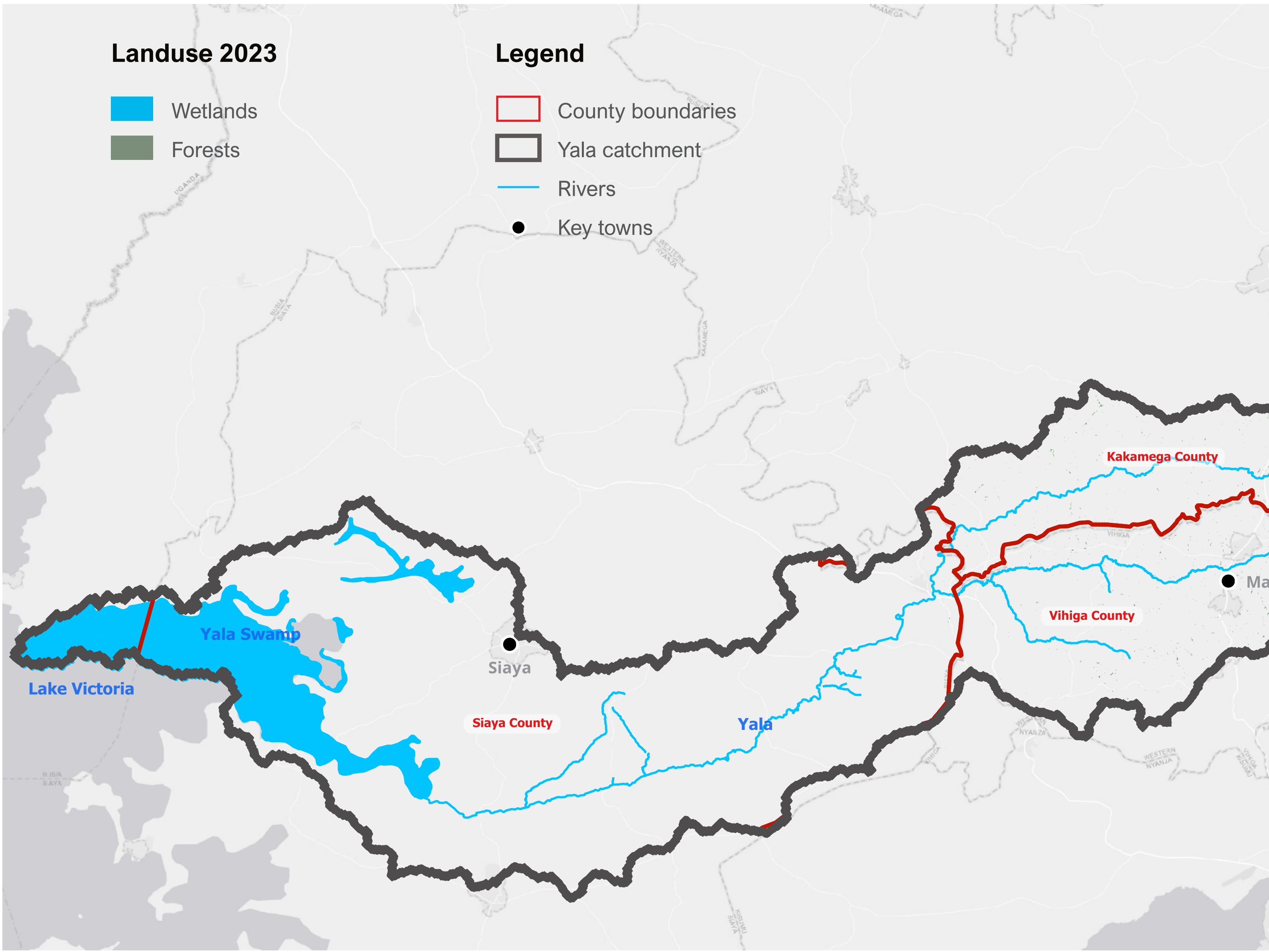


Fig 5 Rivers and remaining forests within the Yala River Catchment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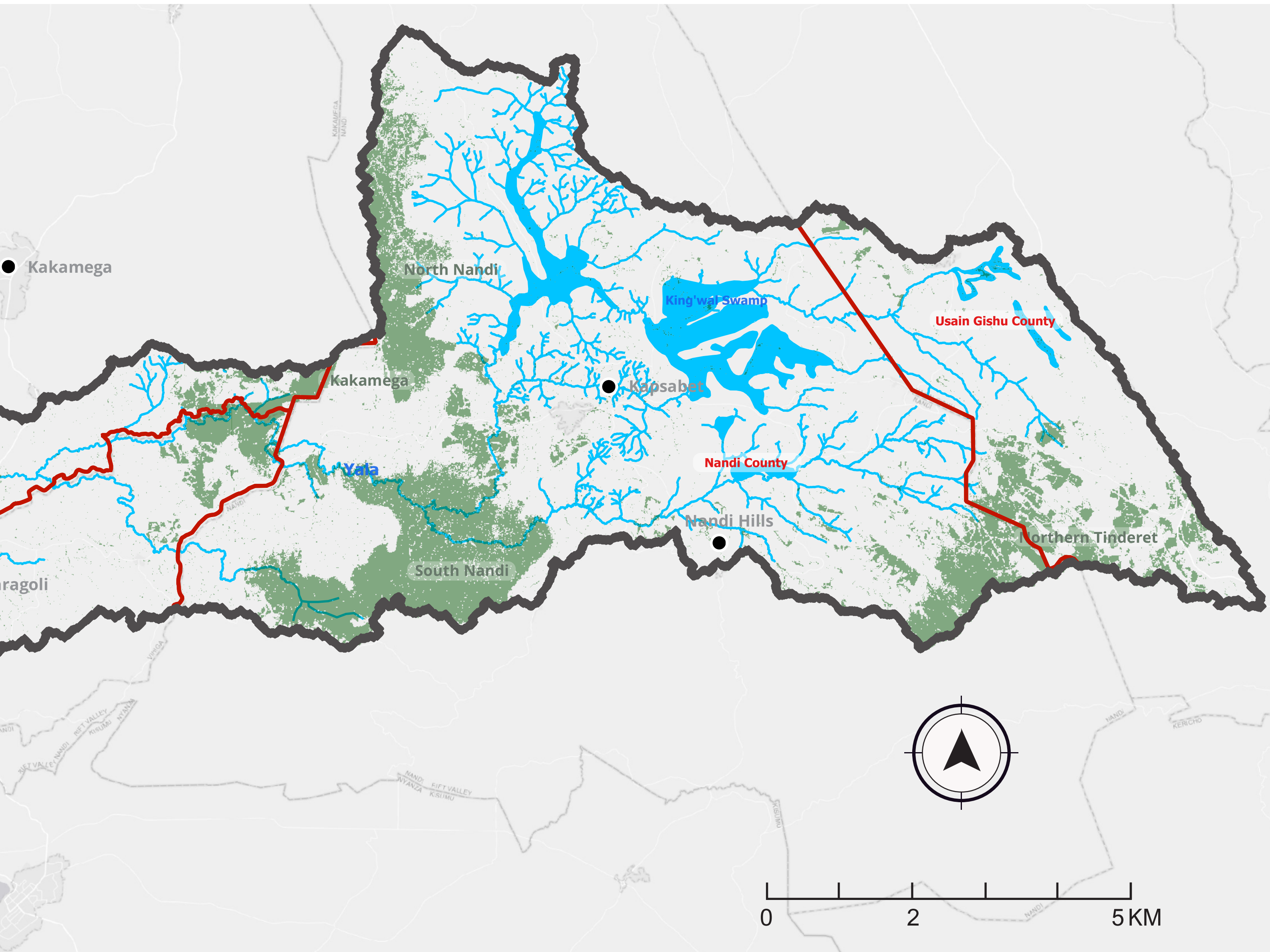

Kakamega
North Nandi
King'wal Swamp
Usain Gishu County
Kakamega
Kapsabet
Yala
Nandi County
Nandi Hills
Northern Tinderet
South Nandi
ragoli
0
2
5 KM

The Yala Swamp complex provides an extraordinarily rich and diversified ecosystem, home to several unique, sensitive, and endangered plant and animal species[15]. It is internationally recognised as an Important Bird and Biodiversity Area. The Yala River is the main river of two[16] that feed into the swamp and play a critical role in regulating climate, water flow and water quality on the northeastern shores of Lake Victoria[17]. In 2010, the Yala Swamp was estimated to have an economic value of USD 1.20 billion[18] - accounting for more than 2.5% of Kenya's Gross Domestic Product (GDP).

Small-scale subsistence farming is the predominant land-use across the catchment, accounting for around 90%[19] of the land-use. The livelihoods of more than 300,000 households come from smallholder farming,

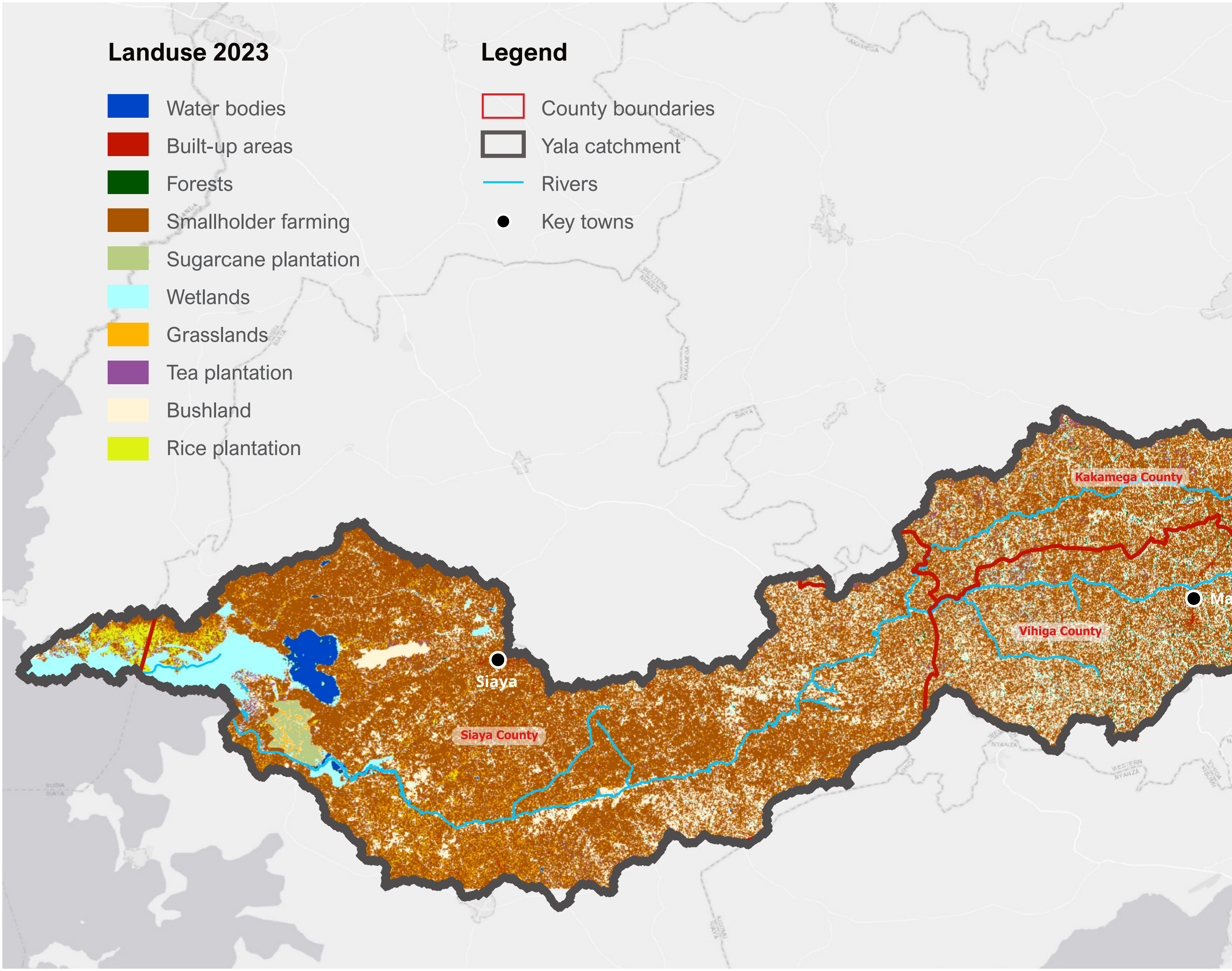


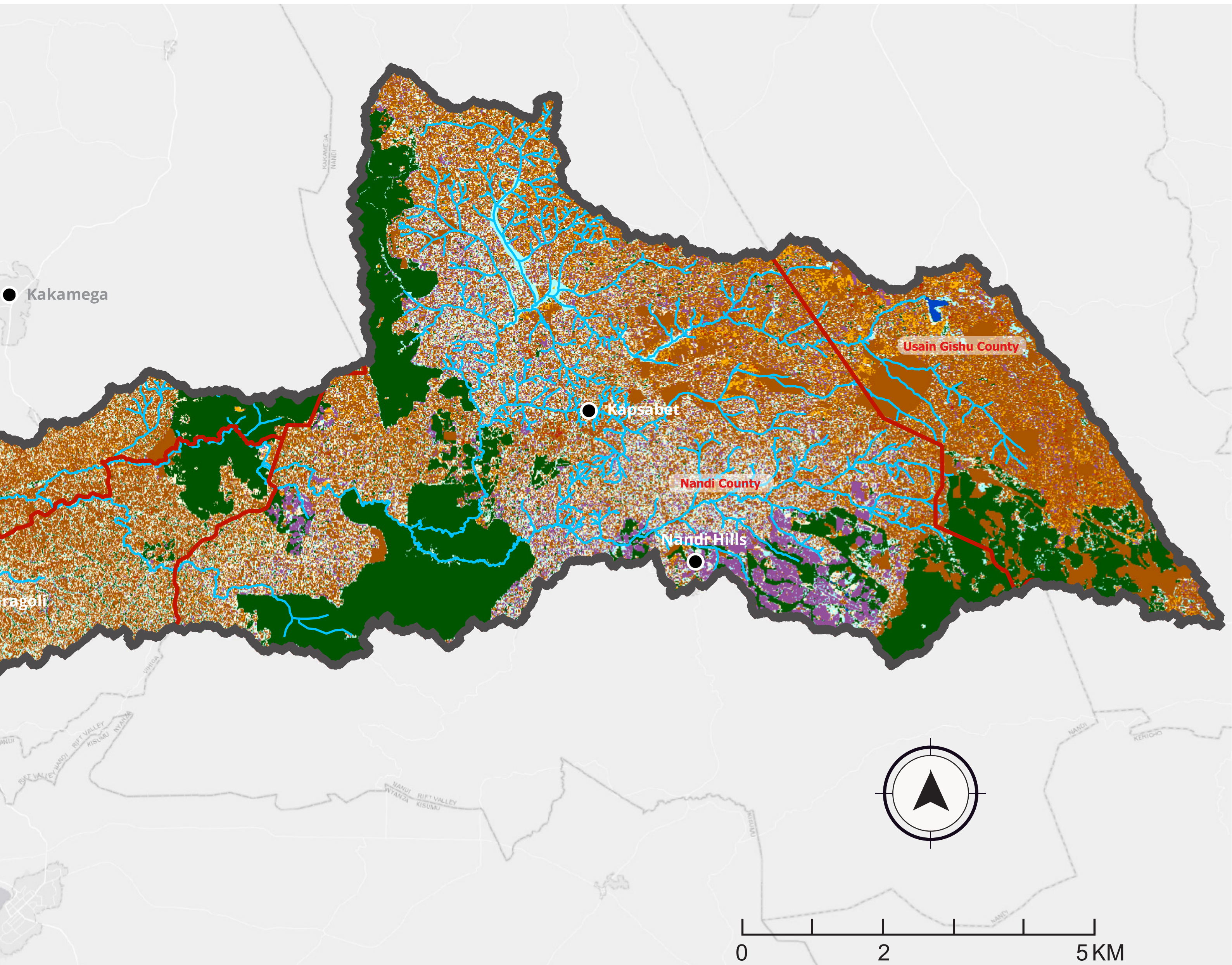
Fig 6 2023 land use across the catchment

[16] Nzoia River is the second river feeding into Yala Swamp.

which accounts for 70% to 80% of the catchment's population. Commercial farming focuses mainly on tea in the middle and upper catchment, with the tea plantations in Nandi County employing more than 6,000 people. The annual crop production is around 500,000 megatons, which equates to an annual economic value of USD 82 million. Commercial sugar cane crops are found in and around the Yala Swamp.

While there are limited irrigation schemes within the catchment, the Yala River is a crucial source of water for commercial farmers.

Four water companies, who supply water to towns within and adjacent to the catchment, rely on the Yala River for water to fulfil the increasing demands of domestic, commercial, and industrial water users.



NORTH NANDI FOREST

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The forest stretches for around 30 km from north to south and is between 3 to 5 km wide. Drainage is mainly eastwards into the King'wal and Kimondi river systems, which flow through the South Nandi forest into the Yala river. Both North & South Nandi Forests are transitional between the lowland forests of West and Central Africa and the montane forests of the central Kenya highlands.

10 500 ha is a gazetted forest area, with around 8 000 ha indigenous, closed- canopy forest. The remainder consists of cultivation, scrub, grassland, tree plantations and tea. Around 160 species have been recorded in the forest[20].

KAKAMEGA FOREST

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Kakamega Forest is a mid-altitude tropical rainforest, the easternmost outlier of the Congo Basin forests. It has a rich diversity of trees and is home to globally-threatened species, restricted-range species and Guinea-Congolian Forests biome species, many species of which are found nowhere else in the country.

Only an estimated 10,000 ha of the overall gazetted area is still closed-canopy indigenous forest, of which some 3,200 ha is designated National Reserve. The forest falls in an agriculturally rich area, making it vulnerable to human pressures[21].

SOUTH NANDI FOREST

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South Nandi Forest was once contiguous with Kakamega Forest. It is drained by the Kimondi and Sirua rivers, which merge to form the Yala river.

South Nandi Forest was gazetted in 1936 as a Trust Forest originally covering +20,200 ha. To date, around 13,000 ha is closed-canopy forest, the rest being scrub, grassland or cultivation, with ±2,200 ha excised for settlement.

The forest is transitional between the lowland forests of West and Central Africa and the montane forests of the central Kenya highlands. The forest has high agricultural potential and is under threat for cultivation[22].

BIODIVERSITY IN THE CATCHMENT

>40 mammal species

>600 bird species

>487 butterfly species

242 bee species

320 ant species

72 dragonfly species

600 moth species

137 fruit-fly species

72 land snail species

PREDOMINANT SMALLHOLDER CROPS

Maize >90%

Beans +/-68%

Bananas +/-49%

What Drives Catchment Degradation?

The quality of water within the Yala River is deteriorating due to ongoing land pressures in the Yala River catchment that have led to the adoption of poor land-use practices. These practices result in a loss of vegetation cover, which exposes the topsoil to erosion and enhances sediment-laden run-off.

Some of the land-use practices that contribute to this erosion include:

- Poor farming practices – for example, growing the same crop year after year, using fertilizers, intensively cultivating land, overgrazing, cultivating steep slopes
- Removal of riverine vegetation for farming activities
- Loss of wetlands to agricultural activities
- Forest degradation due to illegal logging, resource abstraction, grazing and the conversion of natural forests to plantations or for agriculture
- Illegal artisanal mining within rivers, wetlands and forests
- Lack of formal stormwater infrastructure alongside the numerous gravel roads to contain sediment-laden run-off

There are several direct impacts of this loss of vegetation cover and increased erosion to the Yala River, both upstream and downstream.

Upstream – among farmers:

When farmland loses topsoil, plant nutrients, such as nitrogen, phosphorous and potassium decline, which results in a corresponding decline in potential crop yields. Crop yields have been seen to drop by an average of 2% annually[23] as nutrient-rich soil continues to erode and wash away into rivers and wetlands, directly affecting farmer livelihoods. To replace these lost nutrients, additives, such as manure and fertiliser are required to grow future crops, but at a cost to the farmer.

Downstream – among water users:

The increased sediment-laden run-off has led to increased turbidity[24] levels in the rivers. This has a significant impact on water quality. The elevated turbidity levels pose a significant treatment challenge to the four water companies, resulting in:

- Increased water treatment costs due to increased flocculant use and electricity.
- Increased maintenance frequency, reduced lifespan of equipment (e.g. filter media), increased backwashing, desludging of intakes, lagoons or drying beds, shutdowns during extreme rain events at certain plants – resulting in increased costs.
- Loss in processed water (i.e. saleable water) due to the need to backflush equipment more regularly.

[24] Turbidity is one of the parameters for drinking water. Turbidity is the measure of relative clarity of a liquid and makes water cloudy or opaque. Unit of measurement is NTU.

Suspended sediments act as a transport medium for pollutants, reducing plant growth and lowering oxygen levels, while settled sediments smother aquatic organisms and clog channels, thus reducing the Yala River's natural flow capacity.

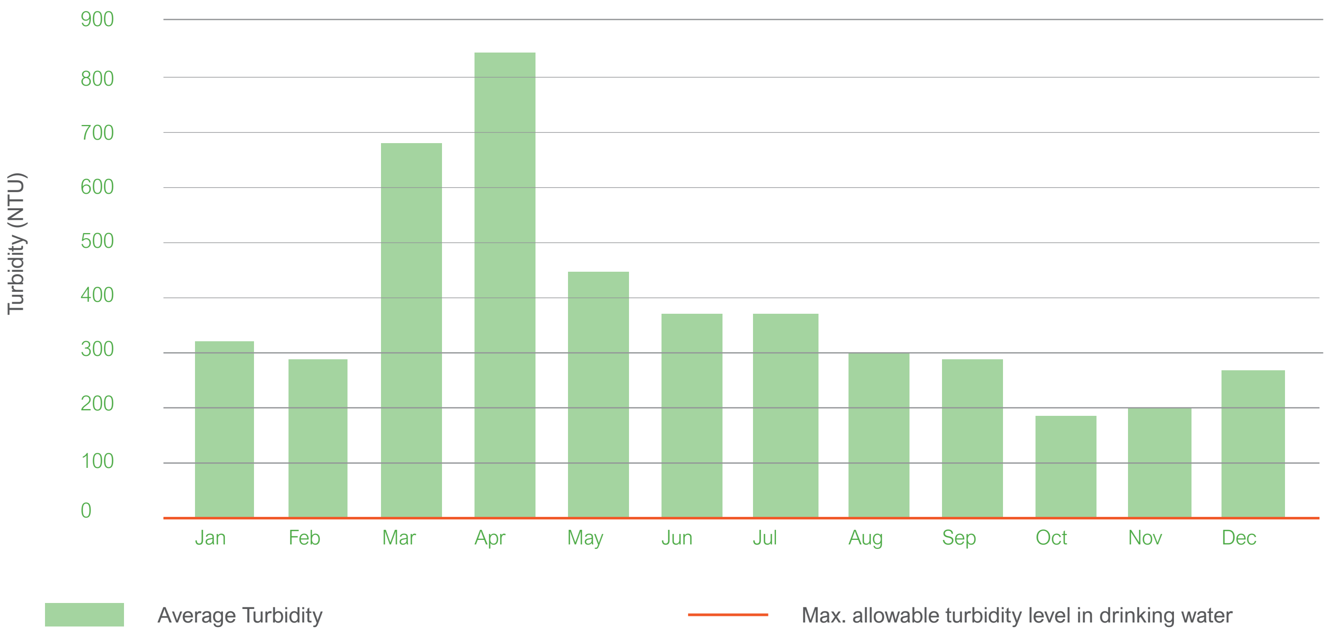

Fig 7 Average monthly raw water turbidity levels for 2022, as recorded by Kapsabet-Nandi Water and Sanitation Company

Raw water quality data from the upper catchment show turbidity levels[25] ranging between 200 and 800 NTU[26] (see Figure 7). Kenya's Water Quality Regulations (2006) for recreational use allows for a maximum level of 50 NTU for turbidity and a maximum of 5 NTU for drinking water. Furthermore, turbidity above 150 NTU at any time or 50 NTUs as a monthly average is harmful to aquatic life[27]. The Yala River is often more than 500% over acceptable limits.

The findings from recent doctoral-level research on the ecological integrity of the King'wal Swamp highlights the impacts that catchment activities are having on downstream aquatic ecosystems in the wetlands. The study shows that the different human activities, such as agriculture, grazing, settlement, and brick making, undertaken alongside the wetland have proportional negative impacts on the status of the wetlands' current biological integrity[28].

[25] Turbidity levels are effected by rainfall and tend to spike due to increased run-off into rivers.
[26] Daily turbidity levels as recorded by KANAWASCO between 2020 and 2022 in the upper catchment within Nandi County.

A Community-based Approach

02

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2. A Community-based Approach

The predominant smallholder farming characteristics of the catchment require an innovative, community-based approach. This approach will necessitate individual farmer buy-in and uptake to improve water quality, conserve remaining biodiversity and support resilient livelihoods.

Two existing water funds in Kenya provide good examples of what is possible. The Upper Tana-Nairobi Water Fund in Kenya has successfully shown that a largely smallholder farmer implementation approach can work. A total of 51,400 households are implementing climate smart conservation activities. Progress to date includes 77,404 ha of land under sustainable land management; 3.6 million agroforestry trees have been planted; 212 ha of public forest has been rehabilitated; 316 km of riparian buffer lands are now fully conserved; and 52 km of rural road shoulders are conserved. These activities have all helped to achieve a more than 50% reduction in sediment concentrations in rivers and more than 50% of beneficiaries have recorded increased agricultural yields.

Following on from the success of the Upper Tana-Nairobi Water Fund, the Eldoret-Iten Water Fund also relies on the uptake of activities by smallholder farmers to generate much needed water security benefits. While still in its infancy, this younger Water Fund has managed to reach more than 10,000 direct beneficiaries. Through the Fund, 524,347 trees have been planted, and more than 540 ha of farmland has been restored through sustainable land management. Forest restoration has also been undertaken, covering an area of 150 ha.

While the River Yala Water Fund is learning from the achievements of these two local water funds, its own success depends on multi-stakeholder collaboration across the catchment, drawing on the combined skills, knowledge, resources and capacity of all the organisations involved.

Figure 8 depicts the ways in which farmer uptake and buy-in can be achieved at scale. The concept relies on various partners who can assist with mobilisation in each county, driving education, sensitisation and training, and ensuring skills are transferred from communities and their leaders down to the individual farmers.

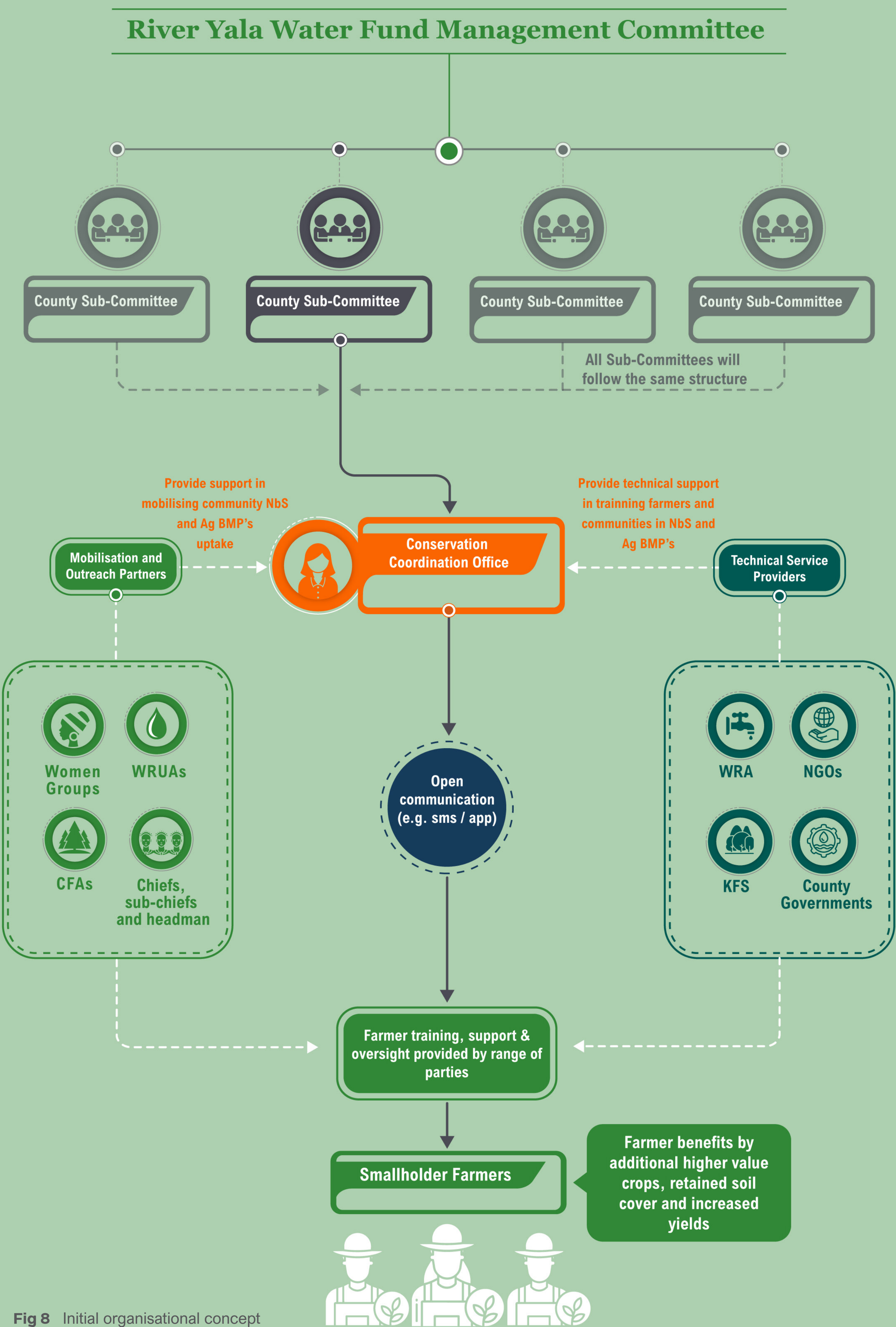

Fig 8 Initial organisational concept

A Women-led, Nature Solution

03

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3. A Women-led, Nature Solution

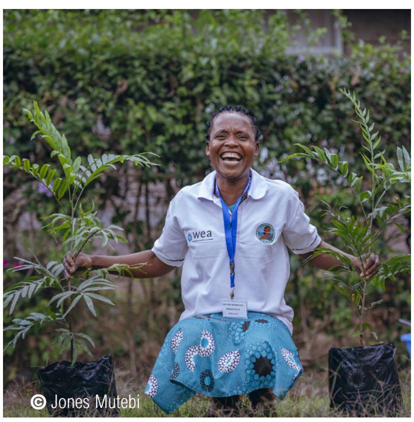
NbS can help to protect, sustainably manage and restore ecosystems while also addressing societal challenges effectively through adaptation. NbS thus provide an opportunity to reverse the poor land-use practices in the Yala River catchment, without undermining livelihood activities and socio-economic development. Such solutions also have the potential to offer important opportunities to empower women, by viewing them as agents of change within their communities[29]. This is especially evident in the Yala River catchment.

Successful NbS in the Yala River catchment relies on the active and meaningful participation of local communities, with the needs of women and other vulnerable groups being clearly considered and addressed[30]. While it is critical that the catchment's water resources (and the ecosystem services it provides) be protected, this must be achieved without worsening existing social inequalities nor displacing local smallholder farmer livelihoods.

Women's ongoing livelihood-related responsibilities are compounded by the increasingly prevalent impacts of climate change on water and food security[31]. This is true across the Yala River catchment, where women and girls bear a disproportionate responsibility for securing food, water and fuel for their families. Women are therefore significantly more vulnerable than men to the effects of climate change due to their reliance on natural resources. These vulnerabilities manifest in many ways. Agriculture – an important employment sector for rural women worldwide – is typically hardest hit by droughts, and heatwaves. Without access to critical resources, women lack the adaptive capacity to recover from, and respond to, such shocks and stressors[32].

Recognising this, the local women's group and NGO, WWANC, has drawn on their experience implementing women's empowerment initiatives across East Africa. They have identified important roles for women to play spearheading watershed protection activities in the catchment.

WWANC has formed, trained and empowered 170 self-sustaining women's groups, impacting 150,000 women across the region.



This includes actively educating and uplifting women to equip them with the necessary knowledge and skills on sustainable farming and Ag BMPs and giving them the confidence to actively promote such interventions. A key finding from a 2018 study[33] on empowering women in agriculture in western Kenya, found that women's empowerment in agriculture can spur increased maize productivity among smallholder farmer households – the study found that an increase in women's empowerment by just 1% led to a 6.4% increase in maize yield[34].

The Water Fund will provide a mechanism through which the challenge of degraded land and water in the Yala River catchment can be addressed in order to conserve ecosystem integrity, improve water quality and enhance farming outputs, while at the same time fostering greater gender equality and empowering women to become agents of change. Meaningful interventions will be created by the River Yala Water Fund with its women-led, community-based approach to implementation. It will consequently be established as the World's first women-led Water Fund.

Harnessing the Power of Nature for a Sustainable Future

04

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4. Harnessing the Power of Nature for a Sustainable Future

This Business Case summarises the findings of a robust feasibility study that assessed the scientific validity and economic viability of establishing a Water Fund in the Yala River catchment. Following a 7-step process, the study identified the land-use practices across the catchment that challenge both water security and livelihoods. It also demonstrated how a focus on priority NbS could reduce many of the challenges, whilst improving local livelihoods and ensuring that smallholder farmers are more resilient to climate change shocks.

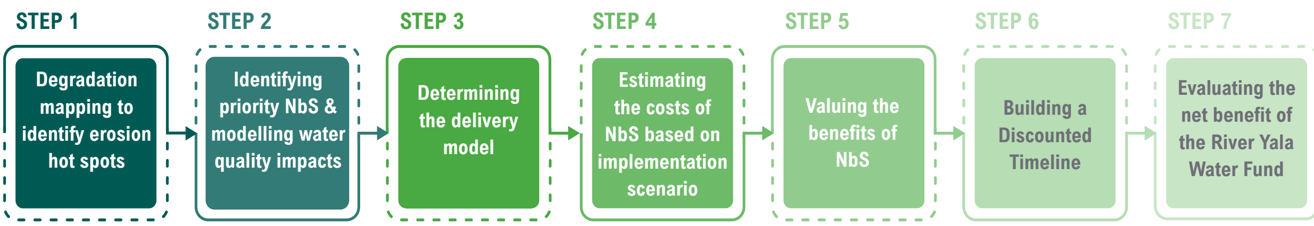


Fig 9 7-step process followed

STEP 1 Identifying degradation hotspots within the catchment

Stakeholder engagements, a review of literature and field visits highlighted that sediment within the Yala River is the most pressing water security issue within the catchment. To understand where most of the sediment originates, the following approach was taken:

Land-Use – Land Cover Mapping – used to accurately map the different land uses (units) across the entire catchment.

Land Degradation Mapping – used to identify soil erosion hotspot areas. The Revised Universal Soil Loss Equation (RUSLE) is a widely used empirical model for estimating soil erosion that was used to estimate annual soil loss in tons per hectare for the different land use units across the catchment. Annual soil loss was then categorized into six classes to represent the different soil loss areas, and to rank the erosion risk areas ranging from very low to extremely severe. Hotspot areas were classified into high, severe and extremely severe groupings.

Identifying priority NbS

A multi-criteria analysis identified the most suitable NbS interventions to reduce erosion and sediment transport from hotspot areas. The existing land use, topography and soils for each hotspot area were evaluated. A longlist of potential NbS was then proposed and shared with different stakeholders to obtain feedback on their feasibility, effectiveness and acceptability based on on-the-ground experience, community buy-in and expert knowledge. Three priority NbS interventions were then identified – agricultural best management practices (Ag BMPs), forest restoration, wetland rehabilitation with vegetated retention ditches a later addition (see Figure 10).

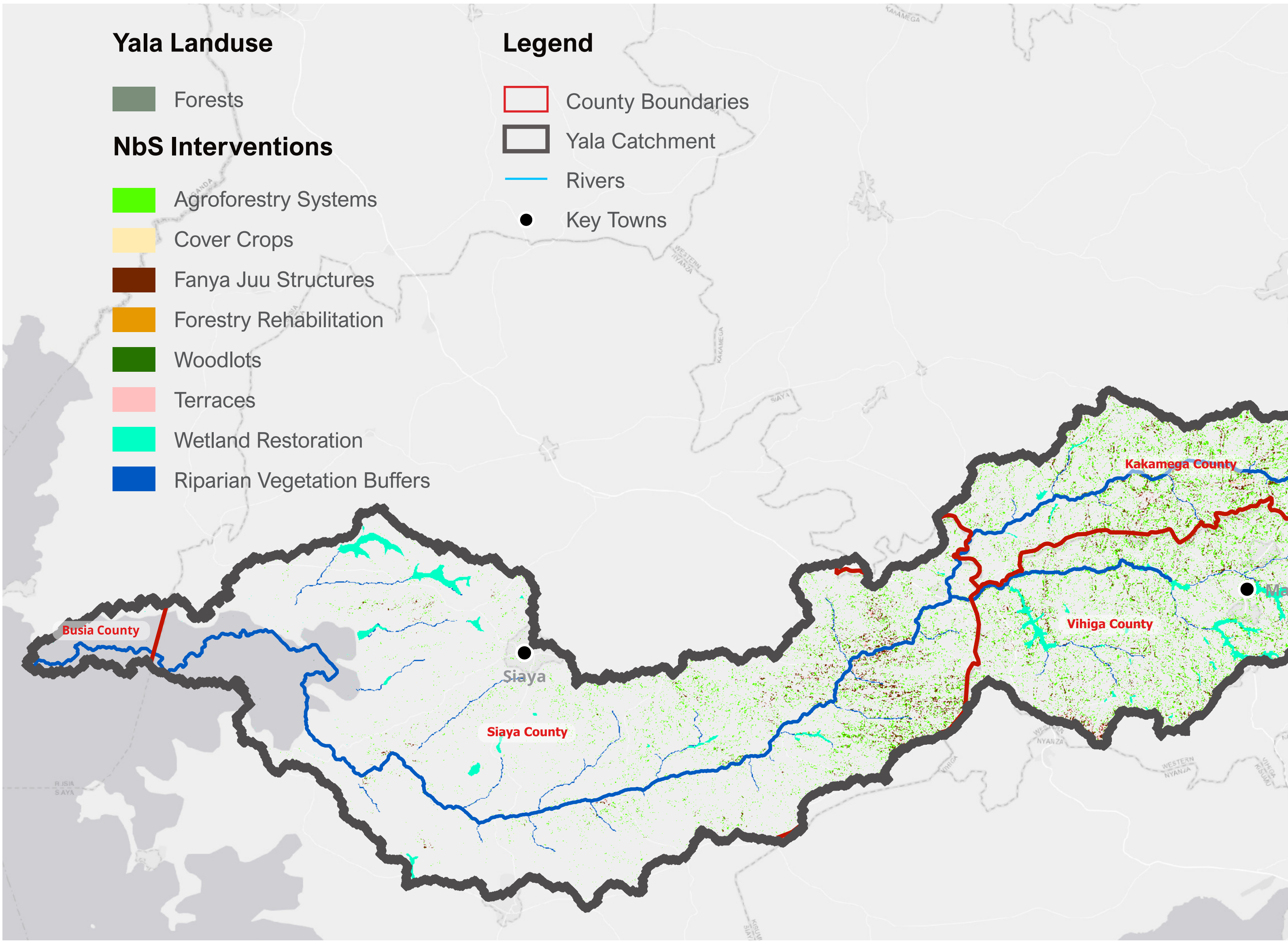
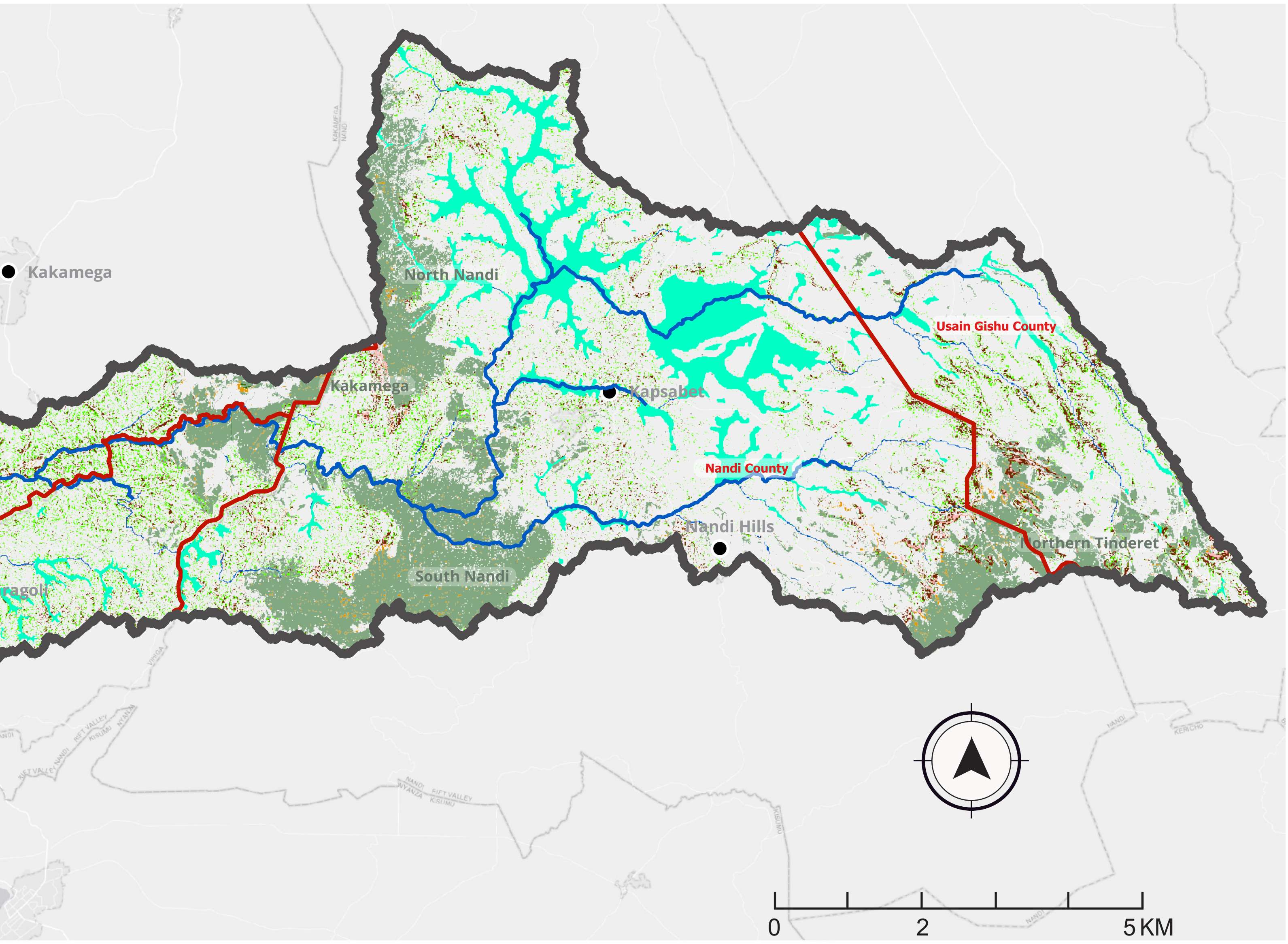


Fig 10 Proposed NbS across the Yala River catchment


© Solomon Karanja


Kakamega
North Nandi
Kakamega
Kapsabet
Usain Gishu County
Nandi County
Nandi Hills
South Nandi
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0
2
5 KM

1) Agricultural Best Management Practices (Ag BMPs)

Ag BMPs include agroforestry, cover cropping, Fanya Juu, terracing, riparian buffers and woodlots across 42 746 ha to increase groundcover, improve soil structure, retain nutrients and moisture, increase infiltration, and decrease erosion and sediment run-off.

>16 000 farmer households will benefit through higher value crops, reduced soil loss and increased productivity.

Education and training plays an important role in this intervention to ensure uptake of activities for the long-term.

Ag BMPs incorporate six specific activities in the Yala River catchment, many of which will need to be combined to improve their effectiveness in trapping and reducing sediment. These include:


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- Agroforestry – to cover 6,814 hectares. Agroforestry uses trees in various applications to prevent soil erosion and reduce risk of floods and landslides. Trees are typically planted within crops, within livestock or pasture or both for various benefits (e.g. livestock fodder, fuel, food, income). Recommended trees include avocado, macadamia, banana and tamarillo. These have a current market price of between two and six times higher per hectare than maize, which is currently the staple crop.
- Cover crops – to cover 17,312 hectares. Planting of additional crops with a primary purpose to improve soil health and to keep soil in place. Cover crops can be planted amongst crops or after harvesting (e.g. grasses, beans, herbs). Recommended cover crops include legumes, which are a high value crop.

- Fanya Juu – to cover 463 hectares. Formation of bunds, where soil excavated from trenches below is placed along contours, acting as a barrier. Fanya Juu structures help to reduce water and soil loss and enhance growing conditions for plants and crops. Grass may be planted to stabilise the bund.
- Terracing – to cover 802 hectares. Undertaken on slopes of varying degrees to prevent soil erosion and to reduce the speed of overland water flow. The slope is reshaped by moving soil to create steps with level platforms on which crops are planted. Terracing improves crop yields by ensuring soil nutrients are retained and not washed away.

- Riparian buffers (within agricultural land) - to cover 17,259 hectares. Revegetation of riparian zones to create vegetated buffer strips to retain much of the soils eroded elsewhere in the catchment, preventing soil from reaching rivers. Recommended cover vegetation includes a combination of agroforestry trees and napier grass. Napier grass can be used as fodder on-farm or sold as livestock feed.
- Woodlots – to cover 95 hectares. Planting of trees for domestic or commercial purposes to release the pressure on primary forests. The recommended tree includes *grevillea robusta* to provide timber and fuelwood.

2) Forest Restoration

FOREST RESTORATION aims to restore 687 ha of natural forest cover by planting additional indigenous trees, removing weeds and alien plants, and encouraging people and livestock to stay away from forested areas.

This will help to enhance biodiversity and conserve the last remaining forests and their important ecosystems within the catchment.

Sensitization and education plays an important role to ensure communities understand the reasons behind the need to protect and conserve the remaining forests.

3) Wetland Rehabilitation

WETLAND REHABILITATION across >5 500 ha to re-establish the hydrology, plants and soils, whilst improving sediment trapping and pollutant removal. Freshwater biodiversity and ecosystem functioning will improve, along with other benefits, such as lower flood risks, groundwater recharge and maintaining dry season flows.

Activities to facilitate restoration to include reshaping the land, removing ditches and barriers, removing alien invasive vegetation and crops and planting suitable wetland vegetation.

4) Vegetated retention ditches alongside roads

An extensive gravel road network exists across the catchment with limited stormwater infrastructure. By providing VEGETATED RETENTION DITCHES alongside 537 km of such roads, sediment-laden run-off can be intercepted and prevented from reaching rivers.

The sediment load reductions from vegetated retention ditches have been accounted for in the model, however, it is assumed, and encouraged, that the County Governments implement these important road drainage interventions.

It is proposed that pilot activities begin in Nandi County – Figure 11 identifies the NbS interventions that are needed.

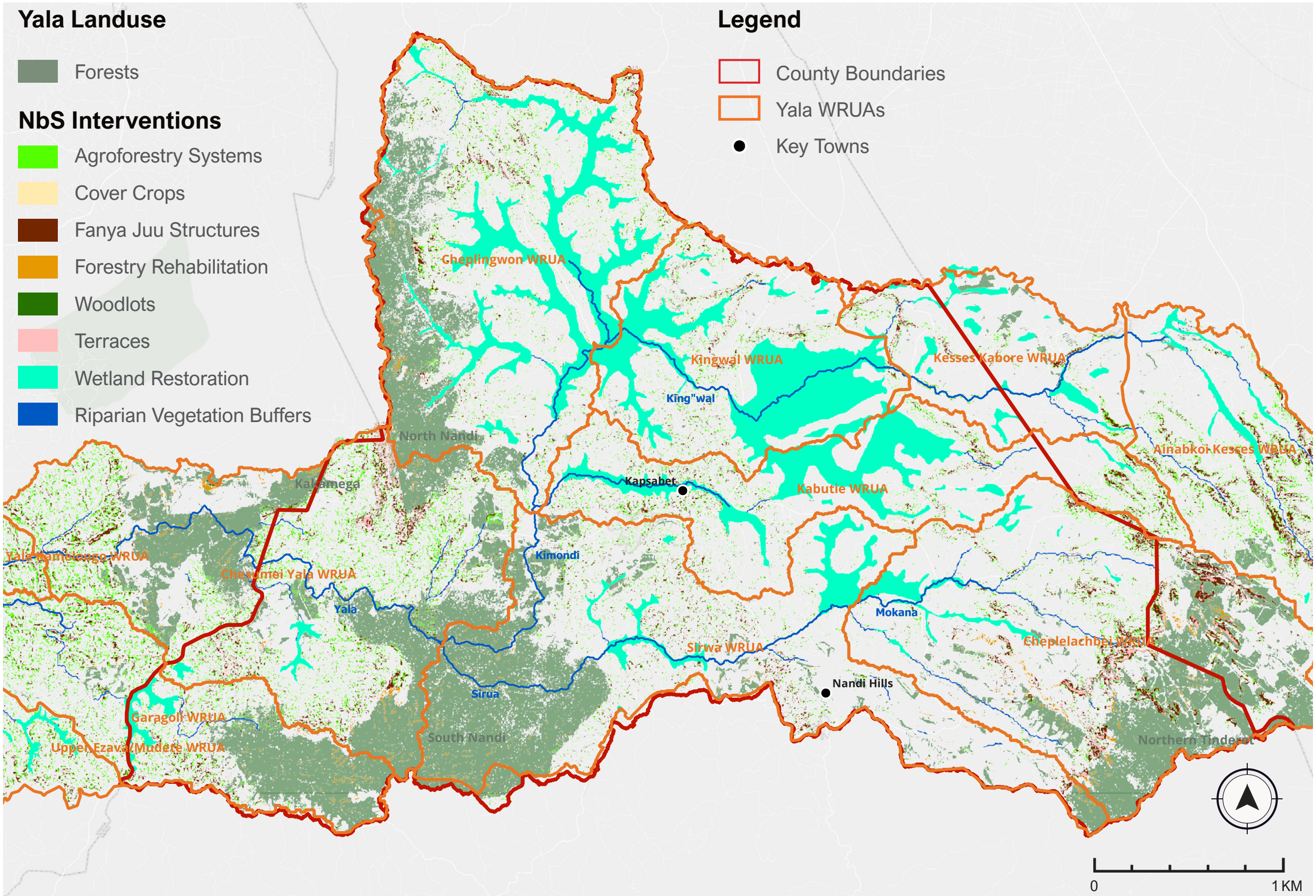

Fig 11 Proposed NbS within Nandi County

Modelling water quality impacts

To assess the potential water quality improvements, a modelling exercise was conducted, focusing on priority NbS. The objective was to gauge their effectiveness in reducing erosion and sediment transport within the catchment. The model estimated the expected reduction in sediment loads that would likely reach the rivers as a result of implementing these NbS.

To establish the magnitude of the improvement, the outcomes of the priority NbS modelling was compared to current conditions. This comparative analysis quantified the percentage reduction in sediment load and the subsequent decrease in water turbidity once the NbS interventions were implemented across the entire catchment.

Our model shows that implementing priority NbS will prevent more than 200 000 tons of sediment per year from reaching the rivers and wetlands. This leads to a reduction in sediment load, reducing water turbidity levels by between 35% and 42% across the catchment[35]. This will ensure that water treatment plants can operate closer to their design standards and prevent periods of shutdown at certain plants during the two rainy seasons.

A community-based approach to the delivery model is needed to implement NbS at scale, across the Yala River catchment where smallholder farming is the predominant land-use. This has proved effective in other African water funds with similar land-use characteristics. The delivery model will vary slightly, depending on the NbS in question. However, sensitisation, education and community buy-in are key across all interventions[36].

1 Agricultural Best Management Practices

- Uptake by more than 16,000 individual farmers is needed to ensure impact and will hopefully be expanded over time.
- The Water Fund will support mobilisation partners in training and upskilling of farmers through community-based meetings and on-site workshops to maximise the reach.
- Assumptions were made around the number of community engagements per county needed to reach the smallholder farmers.
- Each participating farmer will in turn be provided with equipment and materials as a means of incentivising uptake. To calculate the costs associated with materials (e.g. higher value crop seedlings, manure), a set quantity of each input required per hectare was assumed, based on academic and grey literature around the costs of the specific Ag BMPs.
- Equipment costs are once-off upfront costs, provided to each farm.
- Long-term maintenance requirements are linked to ongoing support and additional materials, such as manure.
- Each smallholder farmer will in turn provide the labour for activities on their land, for both implementation and maintenance phases.

2 Forest restoration and wetland rehabilitation

- The Water Fund will support labour costs associated with initial activities (e.g. planting, weeding, clearing, monitoring) as well as any oversight needed by partner organisations.
- Mobilisation partners will help to sensitise the community and farmers.
- Nature-based Enterprises will be the incentive to encourage farmers to move out of sensitive areas. All costs associated with set-up would be borne by the Water Fund, however, ongoing support to farmers will be needed from partner organisations to help ensure long-term income is achieved.
- Costs for seedlings are assumed on a per hectare basis.
- Long-term maintenance is associated with activities such as weeding, watering and replacement of any plants that may not have survived. However, once the natural system is established it is assumed that maintenance requirements will taper off and become more conservation focused.
- Support from key partners, such as Kenya Forest Service and Water Resources Association is needed to help collaborate with local associations.

[36] The delivery model does not account for the vegetated swales, as this is assumed to be a function of the various County Governments as part of road maintenance activities. Future planning for road maintenance and associated budgets will need to be discussed further with the relevant departments.


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STEP 4 Estimating the costs of NbS based on implementation scenario

The costs to implement and maintain NbS in the hotspot areas were determined over a 30 year period. We calculated the per hectare costs associated with each intervention multiplied by the area over which the intervention was modelled. Both the initial implementation costs as well as the long-term maintenance costs were considered for each NbS. **Implementation costs** account for the costs to transition, set-up and implement. **Maintenance costs** account for the ongoing upkeep of the interventions to ensure that long-term impacts are achieved.

Geographic Area	• Size of land area (ha) under cultivation
Activities and Materials	• Seeds, seedlings and fertiliser / manure • Earthworks - structural measures such as terracing and Fanya Juu • Maintenance (additional fertilizer, seeds or seedlings)
Crop Species	• Agroforestry tree species - Avocados, Macadamias, Banana, Tamarillo • Cover crops - Beans and legumes • Napier grass • Woodlot species - *grevillea robusta*

Fig 12 Cost factors for Ag BMPs

Geographic Area	• Size of land area (ha) and location of restoration or rehabilitation
Activities and Materials	• Site clearing, planting, weeding and fencing • Seeds and seedlings (trees / aquatic vegetation) • Maintenance activities (weeding, trimming, replacing plants, surveying)

Fig 13 Cost factors for NbS (forest rehabilitation and wetland restoration)

In addition to these costs, there are programmatic costs. These are costs that are not explicitly linked to each intervention. Instead they cover the operational requirements of the Water Fund and the equipment that will enable and/or incentivise uptake. Equipment could include water pans, training, sensitisation, monitoring and transportation costs for support staff. The costs relate to the type of delivery model for each NbS (outlined in Step 3).

Programmatic Activities	• Training and sensitisation of communities and farmers • Equipment (e.g. tools, water pans) • Transport • Monitoring and evaluation • Operational activities (staff costs, etc.)

Fig 14 Water Fund programmatic costs

A conservative approach to implementation was adopted for the analysis. We assumed fewer smallholders would implement NbS than could be reasonably expected from the experience of other, similar water funds. A phased uptake approach was also assumed – similar to other global water funds. An initial 30% implementation is assumed in the first five years, followed by a further 30% over the next three years (Year 6 – Year 8), and a further 30% uptake over the two years thereafter (Year 9 – Year 10). Full smallholder implementation capacity would therefore be reached after Year 10. Implementation costs of the different Ag BMPs and NbS are based on the percentage uptake for each given year and range from USD 206 per hectare to USD 1,500 per hectare[37].

After implementation, maintenance will be critical to ensure the benefits of NbS continue to be realised in the long-term. Maintenance costs are annual costs, which begin in the year immediately after implementation. Maintenance costs of the different Ag BMPs and NbS are therefore calculated as an annual cost per year from Year 2 to Year 30 and range from USD 281 per hectare to USD 3,900 per hectare, depending on the NbS type (see Figure 15).

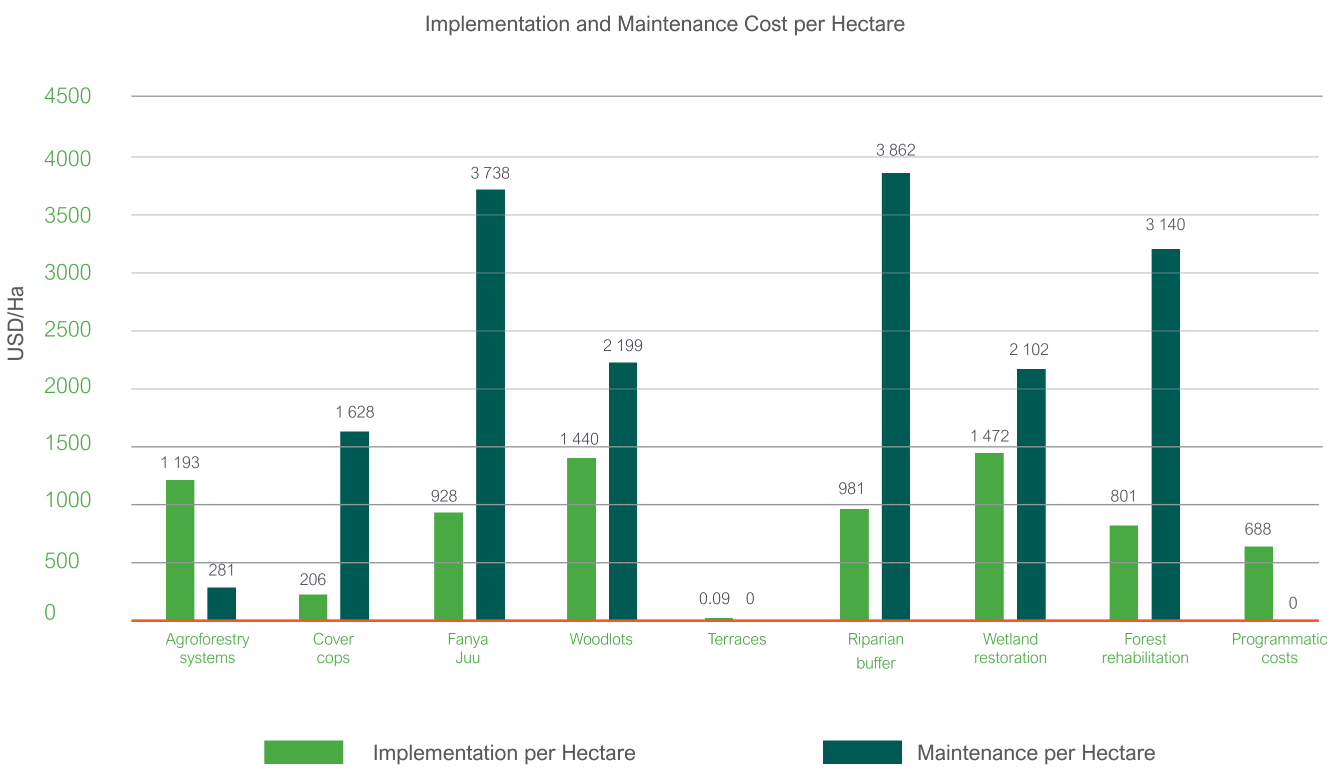

Fig 15 Implementation and maintenance costs per intervention. (Note the minimal agricultural input for terraces outside of grass stabiliser and labour makes the cost appear low. Equipment for terracing is provided for in the programmatic costs).

[37] The costs have been expressed in Kenyan Shillings (KsH) and USD. For the purposes of this business case, all values are expressed in USD. Exchange rate of KSh 140 to USD 1 was used based on exchange rate as determined in June 2023.

Priority NbS help to deliver water security, livelihoods, ecosystem restoration and carbon benefits. These have been valued in monetary terms. Other direct and indirect benefits may arise in the future when data becomes available which could further bolster the current cost-benefit profile.

Water security

Implementation of NbS within the catchment leads to enhanced water quality by decreasing the volume of sediments reaching rivers over the 30-year period.

Improved water quality downstream improves efficiencies at Water Companies. The potential for water scarcity is reduced ensuring economic prosperity and resilience.

Livelihoods

Participating Smallholder farmers benefit from higher value crops and increased yields through implementing Agricultural Best Management Practices.

The Water Fund opens up access to markets and opportunities for co-operatives to reduce costs and increase revenue. Nature-based Enterprises provide the incentive to change certain farming practices.

Ecosystem Restoration

The Water Fund will see the restoration and rehabilitation of remaining critical forests and wetlands across the catchment.

Improved functioning of ecosystems contributes to the provision of ecosystem benefits and services, bolstering both climate resilience and protecting livelihoods.

Carbon

Agroforestry practices that involve tree planting, coupled with the restoration of forests and wetlands, enhance the landscape's ability to capture and store carbon.

The carbon market provides an opportunity to generate a long-term financing mechanism to help fund activities.

Fig 16 Benefit framework for the River Yala Water Fund

Water Security

The priority NbS directly benefit the catchment's four Water Companies due to reduced turbidity levels at the various abstraction points. Cost savings and additional revenue were identified as follows:

- Cost savings associated with:
  - Reduced treatment costs due to lower turbidity levels between 32% and 42% (reduced flocculant and electricity usage).
  - Reduced maintenance requirements and extended lifespan of equipment (e.g. filter media).
  - Reduced backwashing frequency.
  - Reduced desludging of lagoons or drying beds and disposal requirements.
  - Reduced shutdown periods during extreme turbidity levels (specific plants).
- Increased availability of water to sell due to process water savings (less treated water needed for backwashing).

Livelihoods

Positive impacts would be felt by more than 16,000 smallholder farmers across the catchment. Participating farmers could start to see benefits from year 3 reaching up to USD 477 per hectare per year[38] by Year 10.

The broad benefits identified include:

- Increased revenue due to higher value agroforestry and cover crops planted.
- Avoided annual average crop yield loss of 2% through soil retention.
- Increased resilience to climate change and extreme weather events.

Table 1 - Current market prices of proposed higher value crops

Crop	Market Price (KSh/ha)
Proposed additional agroforestry trees	
Avocado[39]	1,040,000
Macadamia[39]	740,000
Tamarillo[40]	2,100,000
Banana[41]	480,000
Proposed additional cover crops	
Legumes (beans)	240,000
Napier Grass	114,163
Typical current crops	
Maize[39]	360,000
Vegetables[39]	480,000
Coffee[39]	650,000

In addition, two Nature-based Enterprises, beekeeping and tree nurseries, have been identified as potential livelihood incentives for farmers. The intention being to encourage farmers to move farming activities outside of wetlands and away from riverbanks. Assuming a minimum of five beehives and one tree nursery per hectare, farmers could generate a starting income of approximately USD 1,700 per hectare per year. This number accounts for the opportunity cost of having to give up 1 hectare of farmland in a case where a farmer relocates from within a wetland. The opportunity cost of agriculture decreases over time due to an assumed reduction in yield of 2% per annum due to soil loss. Figure 17 shows the net positive benefit to smallholder farmers upon uptake of two NbE, beekeeping and tree nurseries, where it is assumed farmers will change practices and forego agricultural activities in the priority wetland areas. Support from partners and others will be needed to drive this by creating the necessary markets and ensuring that NbE are effectively implemented and managed to be able to provide an alternative income.

Fig 17 Potential alternative economic opportunities from two Nature-based Enterprises – beekeeping and tree nurseries

Ecosystem Restoration

Restoration activities in more than 6,200 hectares of forest and wetlands could restore functionality and biodiversity in these key ecosystems, ensuring the ongoing delivery of vital ecosystem services (e.g. sedimentation trapping, groundwater infiltration, lowering flood risks).

Carbon Offset Market

Potential benefits through the carbon offset market were considered at a high-level as a means of generating long-term financing through the sale of carbon credits from the additional biomass planted. Due to the rigorous requirements, such as individual farmer consent, and operational costs, this benefit has not been included within the model. However, it is still an important potential revenue stream for further interrogation.

A further opportunity exists to partner with the Eldoret-Iten Water Fund as they are currently undertaking a carbon feasibility assessment and plan to register a Project Idea Note. By combining efforts, the transaction and other associated costs could be reduced, improving the viability of this funding mechanism. High-level estimates show that approximately 26,000 tonnes of carbon could be sequestered each year, with a potential annual revenue of around USD 200,000.


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Figure 18 presents one implementation scenario to showcase how the costs may arise and benefits might accrue. However, consideration should be given to on-the-ground factors that may provide alternative implementation scenarios as the Water Fund progresses. Importantly, this includes the magnitude and timing of funding that can be raised.

The annual time series of costs and benefits that the Yala River Water Fund would deliver to both smallholder farmers and water companies were discounted to ascertain the present value of future costs and benefits (Figure 18).

For smallholder benefits, the timeline accounts for the dynamics relating to the growth of different agroforestry crops and considers the lifespan of each respective tree, its harvest potential and time until full maturity. Where trees reach the end of their crop bearing years, the model accounts for the time taken to replace the tree until harvesting can resume. This is evident in Years 9 and 10, 17 and 18 and 25 and 26, where benefits decrease temporarily.

The timing for water companies to see the advantages of sediment reduction in the rivers accounts for a lag while interventions establish across the catchment – for example, vegetative cover. From Year 10, the benefits to water companies stabilize as we assume complete NbS uptake.

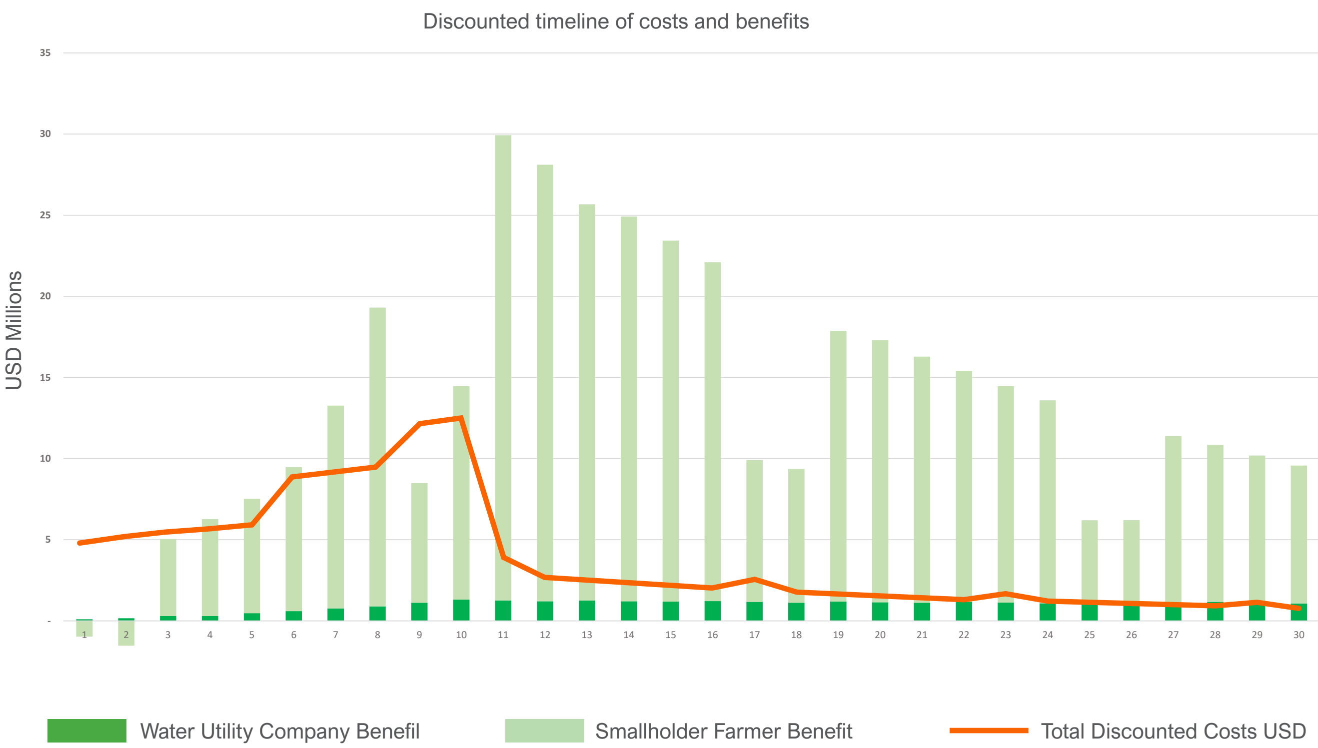


Fig 18 Discounted timeline of costs and benefits for the River Yala Water Fund

STEP 7

Evaluating the net benefits of the River Yala Water Fund

Over a 30 year period, the results of this Business Case show that a lifetime investment of USD 112 million in NbS unlocks benefits worth USD 405 million. This equates to a net benefit of USD 292 million over the same period[45].

Benefits are likely to be incrementally unlocked over several years as the uptake of NbS increases, especially among smallholders. With strategically phased implementation, the full benefit is expected to be realised after a ten-year period, which is when uptake is assumed to be its highest.

In order to understand the economic return on investment of the Water Fund, the following metrics were used.

Benefit-Cost Ratio (BCR)

3,6

The Benefit-Cost Ratio (BCR) is a way to determine if an investment is a good idea financially. It looks at all the benefits the investment will bring compared to how much it will cost. If the BCR is more than 1, the benefits outweigh the costs, so it's probably a good choice. The higher the BCR the better – it means the investment looks even more promising.

Net Present Value (NPV)

USD 292 million

The Net Present Value (NPV) of an investment helps us know if it will bring in more money or cause a loss in the future.

It is calculated by subtracting all the costs from the returns, or in this case benefits, expected to accrue over the investment period (30 years). Consideration is also given to how much money is worth over time. If the NPV is positive, one is making more money than one is spending.

Internal Rate of Return (IRR)

15%

The Internal Rate of Return (IRR) is a percentage that tells one how much profit or benefit one might gain from investing in something. If the IRR is high, it means one could potentially make a significant return on investment. If the IRR is low, on the other hand, it suggests that one might not get back as much as you put in.

[45] All values have been discounted at a rate of 6,52%.

The financial and economic appraisal of the NbS presented in this Business Case shows that for every USD 1 invested in NbS, a return of more than USD 3 is generated over the lifetime of the River Yala Water Fund's activities.

BENEFITS

Water quality

The primary benefit is the reduction of more than 200,000 tons of sediment per year from reaching the rivers and wetlands. This will reduce the sediment load, thereby reducing water turbidity levels by between 35% and 42% across the catchment[46]. This reduction accounts for the inclusion of vegetated retention ditches alongside identified roads. It is assumed and encouraged, that the County Governments implement these important road drainage interventions.

Improved water quality will ensure a long-term, consistent supply of water, supporting more than 1.7 million people across the catchment.

Water utility benefit

Water companies benefit directly through reduced treatment, operational and maintenance costs as well as income gains from saved process water. This equates to a direct benefit in the form of both cost saving and income gains across the water companies of USD 29 million over 30 years.

Smallholder farmer benefit

The Ag BMPs specifically protect farming activities by encouraging a move to more sustainable farming practices for more than 16,000 farming households. This will in turn improve farmer resilience to future shocks from a changing climate.

Smallholder farmers benefit significantly from the introduction of sustainable farming practices. Benefits to this group are valued at USD 376 million over 30 years, in the form of additional household income. This is due to increased revenue from the cultivation of higher value crops and the on-farm retention of soils and nutrients ensuring long-term productivity of the land is preserved.

In addition, two Nature-based Enterprises, beekeeping and tree nurseries, have been identified as potential alternative livelihood incentives for farmers. A participating farmer could generate a minimum additional revenue of USD 1 ,700 per year by taking up NbE, which corresponds to the average annual food bill for two people in Kenya.

Landscape Restoration

More than 6,200 hectares of biodiversity would be restored across forest and wetland ecosystems.

Access to the carbon market

A further potential long-term funding mechanism could be realised through access to the carbon market. High-level estimates show that there is potential to generate around USD 200,000 annually, with a total income of around USD 4.5 million. Due to uncertainty as to the feasibility of this revenue, it has not been reflected in the results of the Business Case.

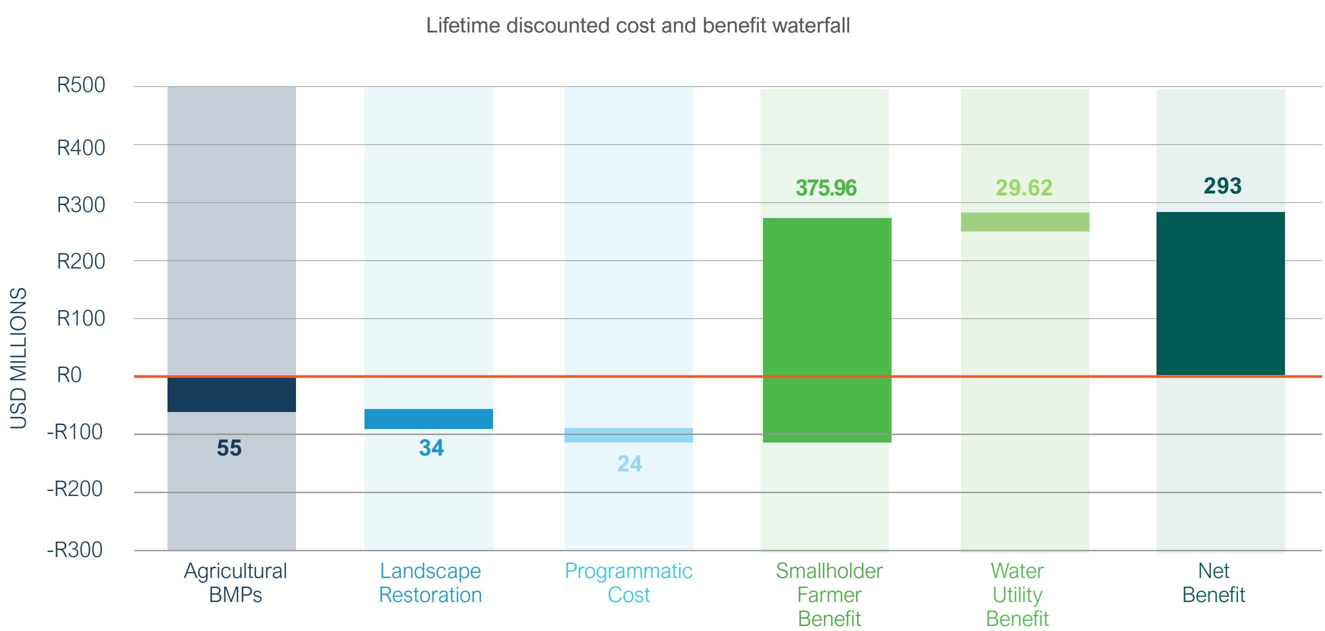
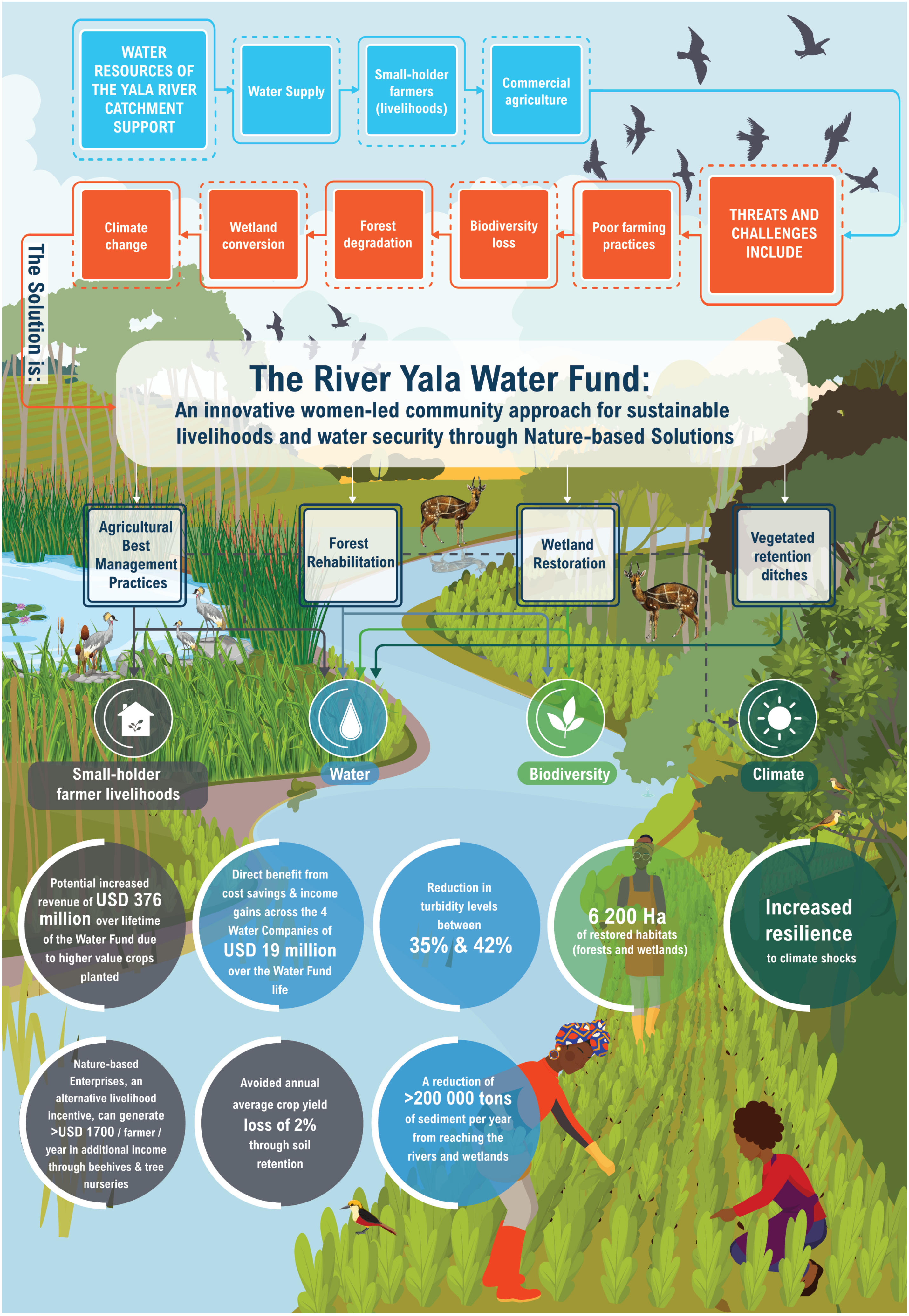


Fig 19 Waterfall chart showing lifetime costs and benefits of investing in Ag BMPs and NbS (land restoration)


WATER RESOURCES OF THE YALA RIVER CATCHMENT SUPPORT
Water Supply
Small-holder farmers (livelihoods)
Commercial agriculture
THREATS AND CHALLENGES INCLUDE
Poor farming practices
Biodiversity loss
Forest degradation
Wetland conversion
Climate change
The Solution is:
The River Yala Water Fund:
An innovative women-led community approach for sustainable livelihoods and water security through Nature-based Solutions
Agricultural Best Management Practices
Forest Rehabilitation
Wetland Restoration
Vegetated retention ditches
Small-holder farmer livelihoods
Water
Biodiversity
Climate
Potential increased revenue of USD 376 million over lifetime of the Water Fund due to higher value crops planted
Direct benefit from cost savings & income gains across the 4 Water Companies of USD 19 million over the Water Fund life
Reduction in turbidity levels between 35% & 42%
6 200 Ha of restored habitats (forests and wetlands)
Increased resilience to climate shocks
Nature-based Enterprises, an alternative livelihood incentive, can generate >USD 1700 / farmer / year in additional income through beehives & tree nurseries
Avoided annual average crop yield loss of 2% through soil retention
A reduction of >200 000 tons of sediment per year from reaching the rivers and wetlands

Moving Forward

05

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5. Moving Forward

The River Yala Water Fund is commencing with pilot activities within Nandi County to showcase proof of concept, while also linking with upcoming programmes, such as the Kenyan Government backed One Million Tree Growing Campaign. An initial USD 400 000 is being rolled out over the first two years, while a further USD 4 million 'likely' funding will cover the first five years. This initial funding will help to capacitate the Water Fund's structure and design. Importantly it will enable the implementation of initial NbS that will help attract further funding and interest.

Initial activities will include:

- Training and upskilling of County Extension Officers and others needed to obtain buy-in and uptake from communities and individuals.
- Education and sensitisation, training and skills transfer to smallholder farmers – imperative to the success of the Water Fund.
- Implementation of Ag BMPs and NbS within pilot sites identified through the science analysis.
- Monitoring and Evaluation of pilot sites to serve as an important means of communicating outcomes.
- Capacitating the Water Fund in terms of its governance and organisational structure.

Long-term sustainable funding solutions are then needed to ensure that activities continue throughout the life of the Water Fund. Funding solutions may include:

- Funds from County Integrated Development Plans for catchment management activities.
- Proposed water tariffs ring-fenced specifically for catchment management activities.
- Corporate Social Responsibility donations (e.g. from Kenya Association of Manufacturers members).
- Carbon credits through the sale of verified carbon offsets.

The Water Fund's long-term success is underpinned by the active participation of smallholder famers, at scale. To ensure this, farmers need to recognise the long-term benefits they gain from NbS. This is achieved through the support of the Water Fund's partner organisations, including County Governments, Water Resources Authority, Kenya Forestry Services and other government institutions, private sector and industry by:

- Ensuring access to markets for smallholder farmers.
- Providing training around quality standards, accreditation requirements for export, etc.
- Providing shared logistics support to lower operational costs to farmers.
- Helping to establish co-operatives for specific produce.
- Working with the private sector (e.g. through the Kenyan Manufacturers Association, an active partner on the Yala Water Fund Steering Committee).
- Providing basic training on managing finances, marketing produce, finding markets and buyers, etc.

The shared vision of the River Yala Water Fund is the protection of critical ecosystems, the enhancement of livelihoods and the promotion of women in conservation, that preserves the water resources upon which so many rely. To succeed, the River Yala Water Fund requires adequate sufficient short-term funding, as well as the commitment and cohesion of a broad spectrum of stakeholders.

Next Steps

Following the Business Case, the programme will move through detailed design and implementation before the Water Fund will deliver Ag BMPs and NbS at scale across the catchment.

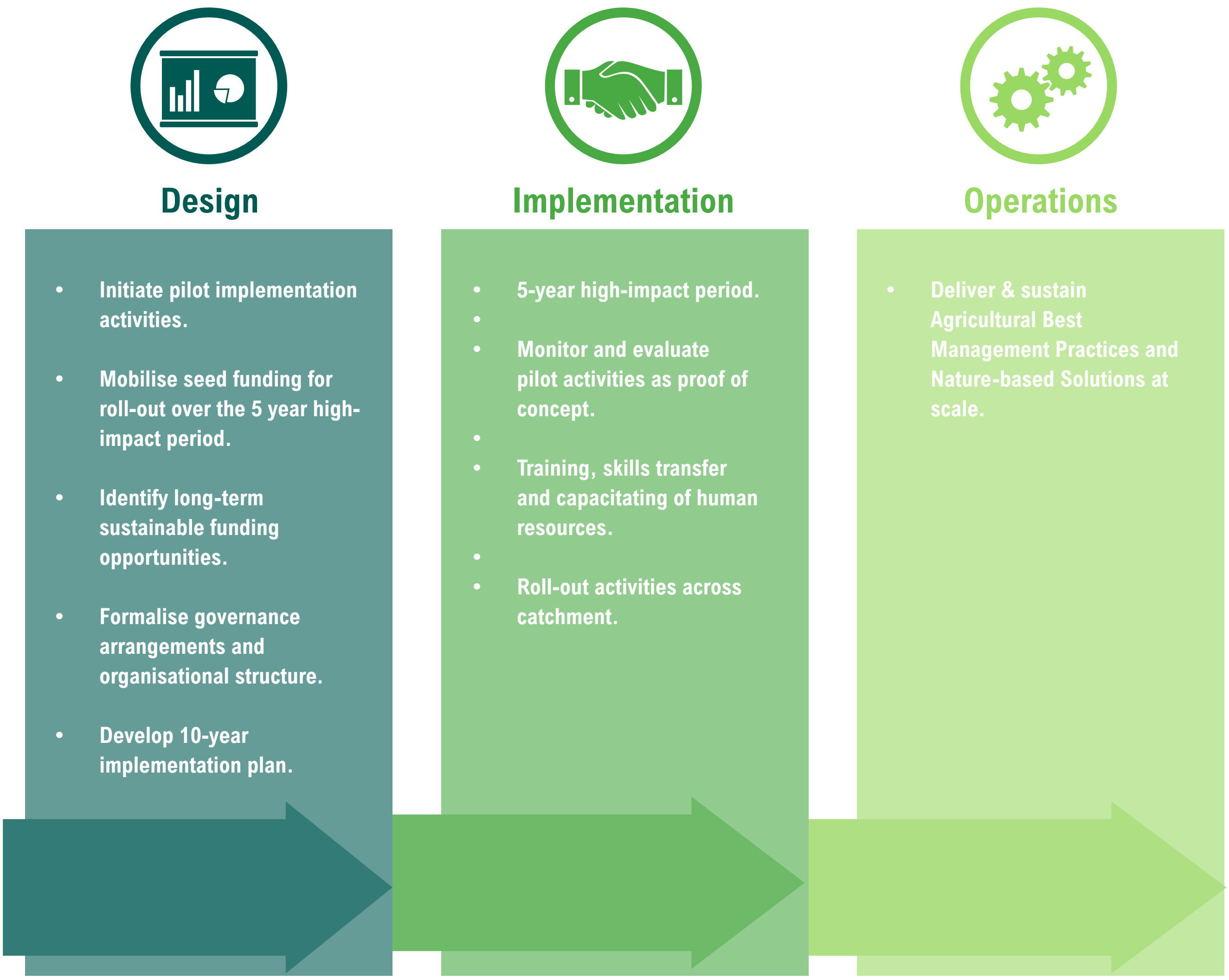

Fig 20 Next steps for the River Yala Water Fund

End Notes

1. Ong`anya, D. 2023: The Economic Benefits of Yala Wetland Resources in the Lake Victoria Basin, Threats and Management Strategies for Sustainable Development. African Journal of Education, Science and Technology, 7(3), Pg 65-75. https://doi.org/10.2022/ajest.v7i3.833.
2. Swamp also refers to a wetland.
3. Kenya Bureau of Statistics, 2019: 2019 Kenya Population and Housing Census, Volume IV – Distribution of Population by Socio-economic Characteristics
4. Ellis-Jones, J., and Tengberg, A. 2000. The impact of indigenous soil and water conservation practices on soil productivity: examples from Kenya, Tanzania and Uganda. Land Degradation and Development 11:11 - 36.
5. Turbidity is one of the parameters for drinking water. Turbidity is the measure of relative clarity of a liquid and makes water cloudy or opaque. (https://www.usgs.gov/special-topics/water-science-school/science/turbidity-and-water)
6. Daily turbidity levels as recorded by KANAWASCO between 2020 and 2022 in the upper catchment within Nandi County.
7. Interstate Commission on the Potomac River Basin. Water Ways: Stream Ecology and Monitoring. August 2017. https://www.potomacriver.org/wp-content/uploads/2017/09/WaterWays-ChemistryInfoCardsHS.pdf.
8. All values have been discounted at a rate of 6,52% Fenichel, E.P., Kotchen, M.J., Addicott, E.T., 2017. Even the representative agent must die: Using demographics to inform long-term social discount rates. July 2017. Working Paper 23591 (http://www.nber.org/papers/w23591).
9. Turbidity levels are not fixed and fluctuate due to various factors, such as rainfall which typically causes an increase in turbidity levels due to an increase in run-off.
10. This reduction accounts for the inclusion of vegetated retention ditches alongside identified roads, however, it is assumed, and encouraged, that the County Governments implement these important road drainage interventions.
11. GIZ, 2021. Toward gender-responsive Ecosystem-based Adaptation: Why it's needed and how to get there. Germany.
12. Odhengo P., Matiku P., Muoria P. K., Nyangena J., Waweru P., Mnyamwezi E., Munguti S., Odeny D., Wahome, K., Ashitiva D., and Nelson P. 2018. Yala Delta Strategic Environmental Assessment. Siaya and Busia County Governments, Siaya and Busia
13. Rehabilitation of the Mau Forest Ecosystem. A Project Concept prepared by the Interim Coordinating Secretariat, Office of the Prime Minister, on behalf of the Government of Kenya, September 2009.
14. Odhengo P., Matiku P., Muoria P. K., Nyangena J., Waweru P., Mnyamwezi E., Munguti S., Odeny D., Wahome, K., Ashitiva D., and Nelson P. 2018. Yala Delta Strategic Environmental Assessment. Siaya and Busia County Governments, Siaya and Busia
15. Ong`anya, D. 2023: The Economic Benefits of Yala Wetland Resources in the Lake Victoria Basin, Threats and Management Strategies for Sustainable Development. African Journal of Education, Science and Technology, 7(3), Pg 65-75. https://doi.org/10.2022/ajest.v7i3.833.
16. Nzoia River is the second river feeding into Yala Swamp.
17. Yala Delta Landuse Plan, 2019
18. Ong`anya, D. 2023: The Economic Benefits of Yala Wetland Resources in the Lake Victoria Basin, Threats and Management Strategies for Sustainable Development. African Journal of Education, Science and Technology, 7(3), Pg 65-75. https://doi.org/10.2022/ajest.v7i3.833
19. Kenya Bureau of Statistics, 2019: 2019 Kenya Population and Housing Census, Volume IV – Distribution of Population by Socio-economic Characteristics.
20. http://datazone.birdlife.org/site/factsheet/north-nandi-forest-iba-kenya)

21. http://datazone.birdlife.org/site/factsheet/6445
22. Strengthening the Protected Area Network within the Eastern Montane Forest Hotspot of Kenya. Proposal ID: 00051074, Project ID: 00063423
23. Ellis-Jones, J., and Tengberg, A. 2000. The impact of indigenous soil and water conservation practices on soil productivity: examples from Kenya, Tanzania and Uganda. Land Degradation and Development 11:11 - 36.
24. Turbidity is one of the parameters for drinking water. Turbidity is the measure of relative clarity of a liquid and makes water cloudy or opaque. Unit of measurement is NTU (Nephelometric Turbidity unit) (https://www.usgs.gov/special-topics/water-science-school/science/turbidity-and-water).
25. Turbidity levels are effected by rainfall and tend to spike due to increased run-off into rivers.
26. Daily turbidity levels as recorded by KANAWASCO between 2020 and 2022 in the upper catchment within Nandi County..
27. Interstate Commission on the Potomac River Basin. Water Ways: Stream Ecology and Monitoring. August 2017. https://www.potomacriver.org/wp-content/uploads/2017/09/WaterWays-ChemistryInfoCardsHS.pdf.
28. W.S. Wanjala, 2022. Socio-economic status and bioassessment of the ecological integrity of King'wal wetland, Nandi County, Kenya. A Thesis submitted to the School of Science, University of Eldoret, Kenya. October 2022.
29. ILO, 2022. Presentation on "Nature-Based Solutions that Promote Gender Equality What are the gender-related benefits and opportunities for nature based solutions in the infrastructure?"
30. World Bank, 2023. Gender and Inclusion in Nature-Based Solutions. World Bank, Washington, DC.
31. UN, 2019. 'Women-led Climate Resilient Farming' Model (WCRF). Accessed February 2022. https://sustainabledevelopment.un.org/partnership/?p=31017.
32. IFAD. 2020. Building women's resilience and livelihoods. Accessed February 2022. https://www.ifad.org/en/web/latest/-/story/building-women-s-resilience-and-livelihoods.
33. Diiro GM, Seymour G, Kassie M, Muricho G, Muriithi BW, 2018. Women's empowerment in agriculture and agricultural productivity: Evidence from rural maize farmer households in Western Kenya. PLOS ONE 13(5): e0197995. https://doi.org/10.1371/journal.pone.0197995.
34. IFAD. 2020. Building women's resilience and livelihoods. Accessed February 2022. https://www.ifad.org/en/web/latest/-/story/building-women-s-resilience-and-livelihoods.
35. This reduction accounts for the inclusion of vegetated retention ditches alongside identified roads, however, it is assumed, and encouraged, that the County Governments implement these important road drainage interventions.
36. The delivery model does not account for the vegetated swales, as this is assumed to be a function of the various County Governments as part of road maintenance activities. Future planning for road maintenance and associated budgets will need to be discussed further with the relevant department.
37. The costs have been expressed in Kenyan Shillings (KsH) and USD . For the purposes of this business case, all values are expressed in USD. Exchange rate of KSh 140 to USD 1 was used based on exchange rate as determined in June 2023.
38. Dependent on size of implementation area, ongoing farmer maintenance, climatic conditions, timing and harvesting.
39. https://www.linkedin.com/pulse/top-20-most-profitable-crops-grow-profits-per-acre-kenya-trend/
40. https://www.richfarmkenya.com/2017/04/the-great-shortage-of-tree-tomato.html
41. Kathuri, D. et al. 2021. Adoption of Banana (Musa spp) Production Technology among Small-Scale Farmers in Embu West Sub-County, Kenya
42. Nashon G Wafula
43. Kenya Forest Service
44. All values have been discounted at a rate of 6,52%. Fenichel, E.P., Kotchen, M.J., Addicott, E.T., 2017. Even the representative agent must die: Using demographics to inform long-term social discount rates. July 2017. Working Paper 23591 (http://www.nber.org/papers/w23591).
45. Turbidity levels are not fixed and fluctuate due to various factors, such as rainfall which typically causes an increase in turbidity levels due to an increase in run-off.
46. Aether, 2023. Inspired by Handbook on institutional arrangements to support MRV/transparency of climate action and support. Consultative Group of Experts. UNFCCC. June 2020

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