Nature for Water FACILITY Local solutions. Global impact.

WORLD RESOURCES INSTITUTE

SIWI

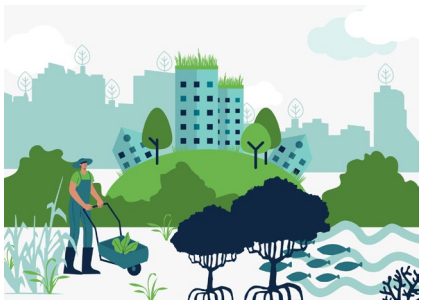
Investigating a Water Fund in Gefersa Watershed, Ethiopia

2024 Feasibility Study Summary Report

Project Overview

Addis Ababa is characterized by a deficit in potable water supply of almost 50%. There is a clear need for action to manage the evolving water landscape: protect current water infrastructure and source new water opportunities. A 2021 study examined the current water resources landscape and appetite for more sustainable water management in Addis Ababa and the potential for Nature-based Solutions (NbS) to contribute to the water security challenge. Building on this work with support from Nature for Water (N4W), Stockholm International Water Institute (SIWI) and Addis Ababa Water and Supply Authority (AAWSA), WRI is exploring how landscape-scale NbS can contribute to long-term water security through an initial Feasibility Study.

NbS are actions to protect, sustainably manage and restore natural or modified ecosystems that address water security challenges effectively and adaptively, while simultaneously providing human well-being and biodiversity benefits (Trémolet et al. 2019).



Effective implementation of NbS requires a sustainable mechanism for collective action that brings together different water users to invest in ecosystem protection and upstream communities within the catchments they depend on. A Watershed Investment Programme (WIP) is an initiative designed to deliver water security ecosystem services by investing in the protection and/or restoration of nature through the implementation of NbS.

The overarching **objective of the feasibility study is to determine the viability of setting up a WIP (or Water Fund*) within the Akaki Watershed, using the Gefersa watershed and its reservoir, as a case study or pilot sub-watershed to test this case**. The core questions the study looked to address included the following:

Gefersa Watershed as a Case Study:

- What are the problem drivers linked to water security that we see in Gefersa?
- What are some of the characteristics of the communities, partners and authorities around Gefersa Watershed that enable *collective action* or potentially create challenges linked to NbS implementation?
- Can NbS solutions have an impact on water security in the Gefersa watershed?
- Which collective action mechanism may be appropriate for the Gefersa Watershed?
- What is the return on investment for a NbS portfolio in Gefersa?

*A Water Fund is the entity / organisation that designs and enhances financial and governance mechanisms which unite public, private and civil society stakeholders around a common goal to contribute to water security through nature-based solutions and sustainable watershed management.

NbS Adoption Questions:

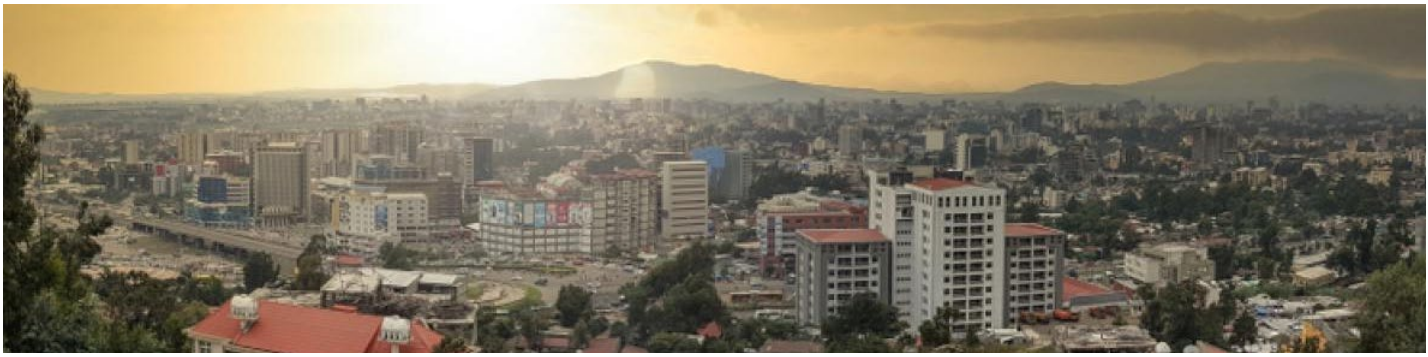
- How does the current policy landscape support the implementation of NbS?
- How can we frame NbS as a solution set among other potential grey solutions in the broader Akaki watershed?

Broader Akaki Watershed Questions:

- What is AAWSA's planning on strategic water interventions?
- How is Gefersa different from the Akaki Watershed? And what does this mean in terms of how we deliver the solutions?
- What is a potential scale up plan for WIP in the Akaki Watershed?

This report forms the final product of the Feasibility Study, and summarises:

- The background to this feasibility study, the importance of the Akaki Watershed and the selection of Gefersa as a phase I location for a potential WIP
- A detailed assessment of the stakeholders and beneficiaries within the landscape, to ascertain their understanding of the key water security challenges as well as their potential commitment to supporting a WIP
- An analysis of the current governance landscape in the water sector in Ethiopia and Addis Ababa, including the key considerations when thinking about the potential for a WIP in Gefersa
- Rigorous scientific modelling to determine the most suitable NbS to address the pressing water security issues in the watershed
- A Return on Investment Analysis that compared the benefits of the priority NbS versus the costs
- Key learnings and lessons learned on the feasibility of a WIP in Gefersa and Addis Ababa, as well as key factors and suggested next steps to strengthen the local enabling environment for NbS and implementation, including suggested next step



The broader Akaki Watershed

Importance of Akaki watershed for Addis Ababa?

Addis Ababa, Ethiopia's capital, **relies heavily on water sources from the Upper Awash Basin, particularly the Akaki watershed**. Addis Ababa is one of the fastest-growing cities in Africa with a current population of around 5.5 million people. Yet water demand far exceeds supply, where the city has **an estimated 50% water supply deficit** (excluding water losses). This deficit is likely to continue to grow as the population increases, without significant interventions.

Challenges facing the Akaki watershed

The Akaki watershed is **under threat from land use changes for agriculture and human settlements**, resulting in rapid forest and shrubland loss. In addition, **uncontrolled boreholes are sunk across the watershed, negatively impacting on groundwater levels**. The changing land use patterns **compromise water quality and availability**, directly impacting Addis Ababa. Poor water quality from urban and peri-urban encroachment, agricultural runoff, and sedimentation, impact water treatment. While groundwater levels are decreasing due to over-abstraction and reduced surface water infiltration.

Focus on the Gefersa Watershed

The **Gefersa watershed forms part of the Little Akaki Watershed**.

The watershed includes a **reservoir and an auxiliary water storage facility**, the latter built as a silt trap and for additional storage. The reservoir provides 30,000 m^3/day of water to Addis Ababa (~2%).

The watershed is characterized by **grassland (21%), farmland (20%), bareland (20%) and forests (17%)**. Remaining forest patches are largely in the Northeast with a small stand around the reservoir. The reservoir is enclosed by urban settlements and agricultural land, with farming activities right up to its edge.

The reservoir has also been identified as an Important Bird Area in Ethiopia – supporting ~60 bird species, including four endemic species and 17 migrant species.

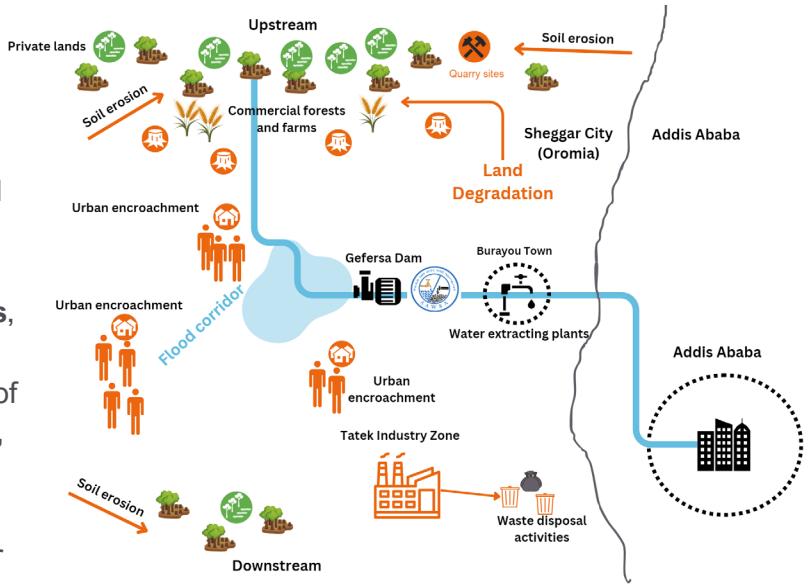
2%
of Addis Ababa'a water supply

20%
of the watershed's land is farmland

~60
Bird species are supported by the Gefersa reservoir

The key water security challenges in Gefersa

The watershed is **under threat from urban and agricultural expansion**, deforestation for firewood and timber, illegal activities, such as mining, as well as more erratic rainfall patterns due to climate change. This has resulted in **high erosion and sedimentation rates**, impacting on **water quality in the rivers, and the reservoir.** High levels of sediment, which cause **high turbidity*, impacts water treatment processes**. In addition, changing land-use and rainfall patterns impact on groundwater recharge, through reduced groundwater infiltration.



Schematics of the water security challenges and their main drivers in Gefersa

Water supply challenges facing Addis Ababa

Water supply to the city comprises both surface and groundwater sources.

18% of water supply comes from surface water reservoirs (Gefersa, Legedadi and Dire) + **31%** of water supply comes from groundwater (particularly Akaki well fields) = **~50%** of total water demand is met

Beyond the supply deficit, some of the water that is currently provided is lost through distribution losses, meaning that likely less water reaches users across Addis Ababa,
Climate change, with erratic rainfall and flooding, further stresses Addis Ababa's limited water resources.

This significant water deficit is a major problem, and the implications for the long-term viability of the city should not be underestimated.

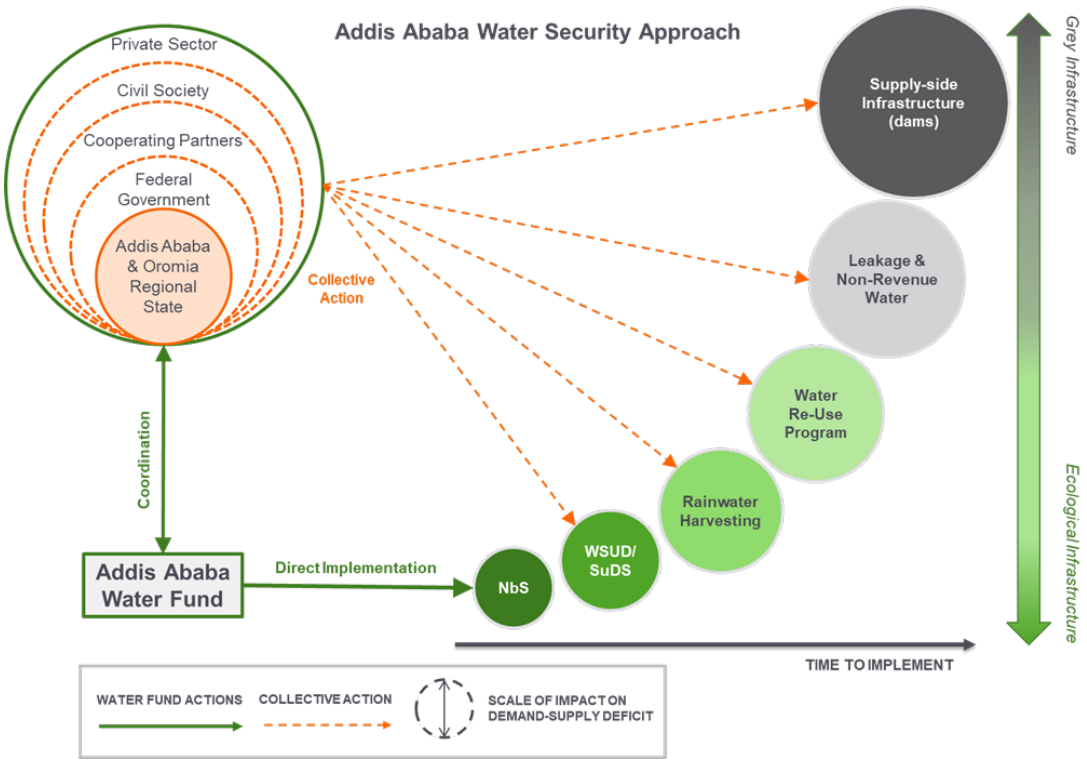
While Gefersa reservoir does not provide a significant portion of water to the city, it is still only one of three reservoirs supplying surface water. Yet high turbidity levels threaten the long-term viability of the reservoir to provide potable water, while ongoing sediment build-up reduces the life of the reservoir.

*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)

The potential role of a Water Fund in the Addis Ababa Context

The 2021 study examining sustainable water management opportunities in Addis Ababa concluded that a **wide range of interventions is needed to tackle the water supply challenges in the city**.

Importantly, this study highlighted the requirement for collaboration in driving and implementing the various grey and green interventions needed



It is clear that while **NbS is only one of many interventions**, it is the overarching long-term program or **Water Fund that creates the environment to bring stakeholders together to provide the multitude of solutions to address the challenges.**

Collaboration Challenges

As outlined above, a WIP or **Water Fund requires collaboration and collective action across a wide range of key stakeholders to succeed**. One of the key enabling conditions is strong stakeholder support towards a unified goal for catchment management and protection. Through the feasibility study, **it was clear that the stakeholder landscape is complex**. Key to note is that Addis Ababa's surface water resources are not managed by AAWSA, but rather by a different administrative authority – Sheggar City, part of the Oromia State. As such, AAWSA has little to no control in managing and conserving the watersheds that the city relies upon for water. There are also overlapping mandates within the water regulatory environment, with stakeholders noting that government departments work in silos with little collaboration. **This apparent lack of coordination and shared vision complicates decision-making, resource allocation, and accountability, ultimately compromising long-term water security initiatives.**

Priority Nature-based Solutions to support long-term water security in Gefersa watershed

A detailed scientific analysis was carried out to determine the potential opportunities for NbS to contribute to the water security challenges experienced within the Gefersa watershed. This involved data collection, analysis, and technical modelling for the Gerfersa watershed and its reservoir. A field mission was conducted to gather firsthand data, observe environmental conditions, and engage with stakeholders to determine the key water security challenge to target. It was concluded that water quality, particularly sedimentation, was the primary challenge affecting the reservoir and should be the focus of the scientific analysis.

Through a multicriteria analysis, priority NbS were identified, along with the priority intervention areas, to address the key water security challenge – i.e. water quality. These interventions included Agricultural Best Management Practices, Sustainable Urban Drainage Systems, and Landscape Interventions.

NbS Portfolio

Soil and Stone Bunds

Hillside Terrace

Contour Farming & Strip Farming

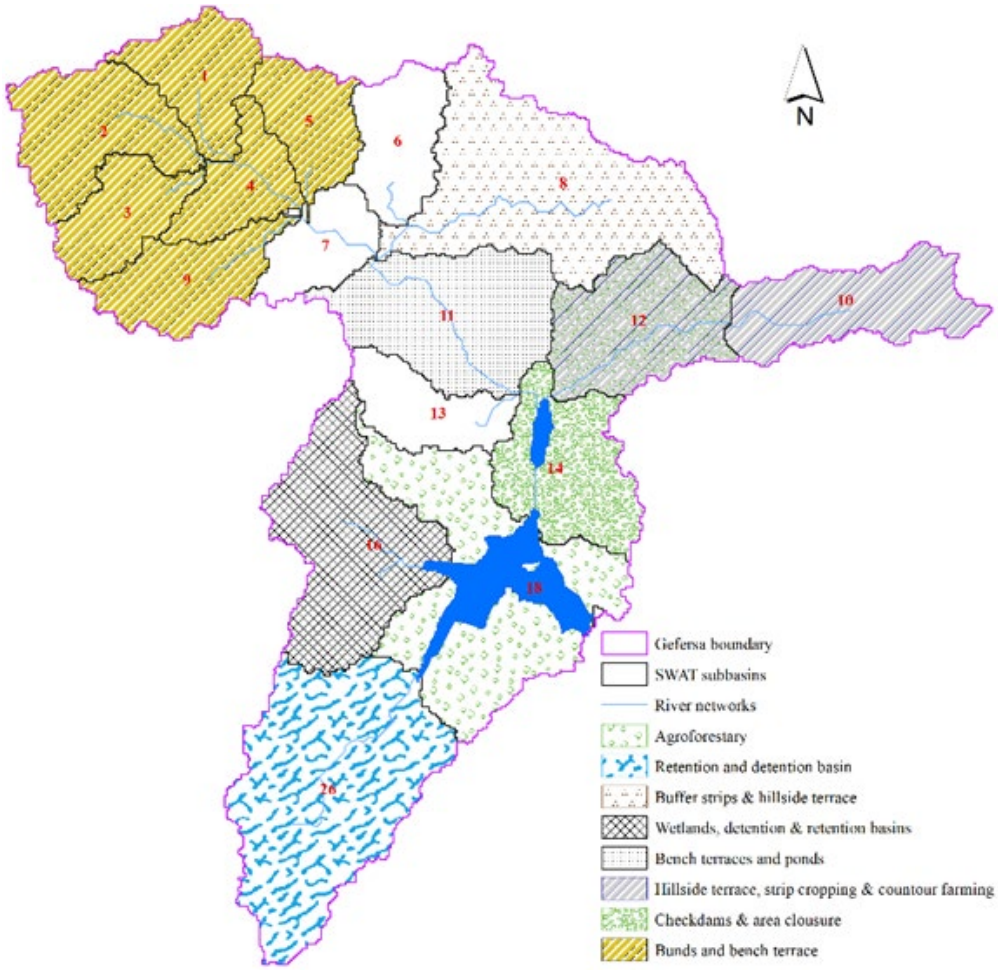
Buffer Strips

Agroforestry

Constructed Wetlands

Area Closure

Retention Basins



Priority sub-catchments where at scale NbS would be targeted

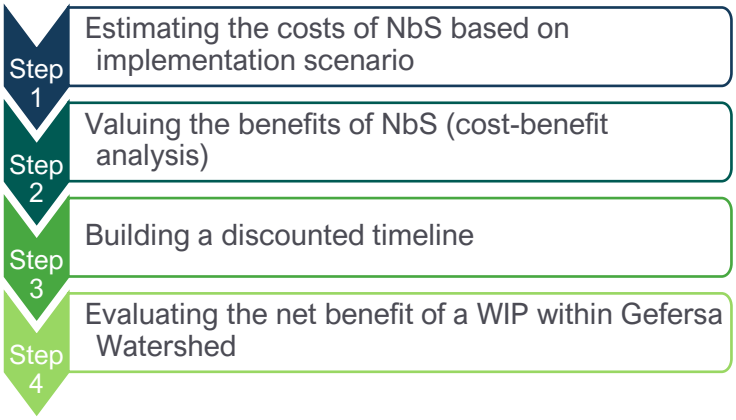
Benefits of implementing NbS in Gefersa watershed:

- Decreased surface run-off by around 15% on average;
- Reduced erosion by 0.25 tonnes per hectare per year on average;
- Reduced sediment inflow into the reservoir by an average of 38% per month, thereby improving water quality.
- In addition, the priority NbS can increase the reservoir's lifespan by ~20 years, securing long-term water availability.
- The priority NbS will also have a positive benefit on groundwater levels, as the net volume of groundwater storage in shallow aquifers can increase by roughly 10% over 20 years.

The science analysis confirmed that NbS can have a positive impact on water security in the Gefersa watershed.

The Investment Case

The Feasibility Study assessed the financial and economic viability of a WIP through the implementation of NbS, using a 4-step process:



Costs for the NbS were obtained through a local team put together by SIWI composed of local experts, as well as publicly available literature and local stakeholder input. Costs were split into three categories: programme costs (linked to the NbS themselves), non-programme costs (required to facilitate the overall programme, and necessary for the programme's execution and success), and WIP operational costs (related to setting up and running the WIP).

The overarching benefits that arise due to the priority NbS as part of the WIP include water security, livelihoods and biodiversity, noting that not all benefits can be quantified in financial terms.

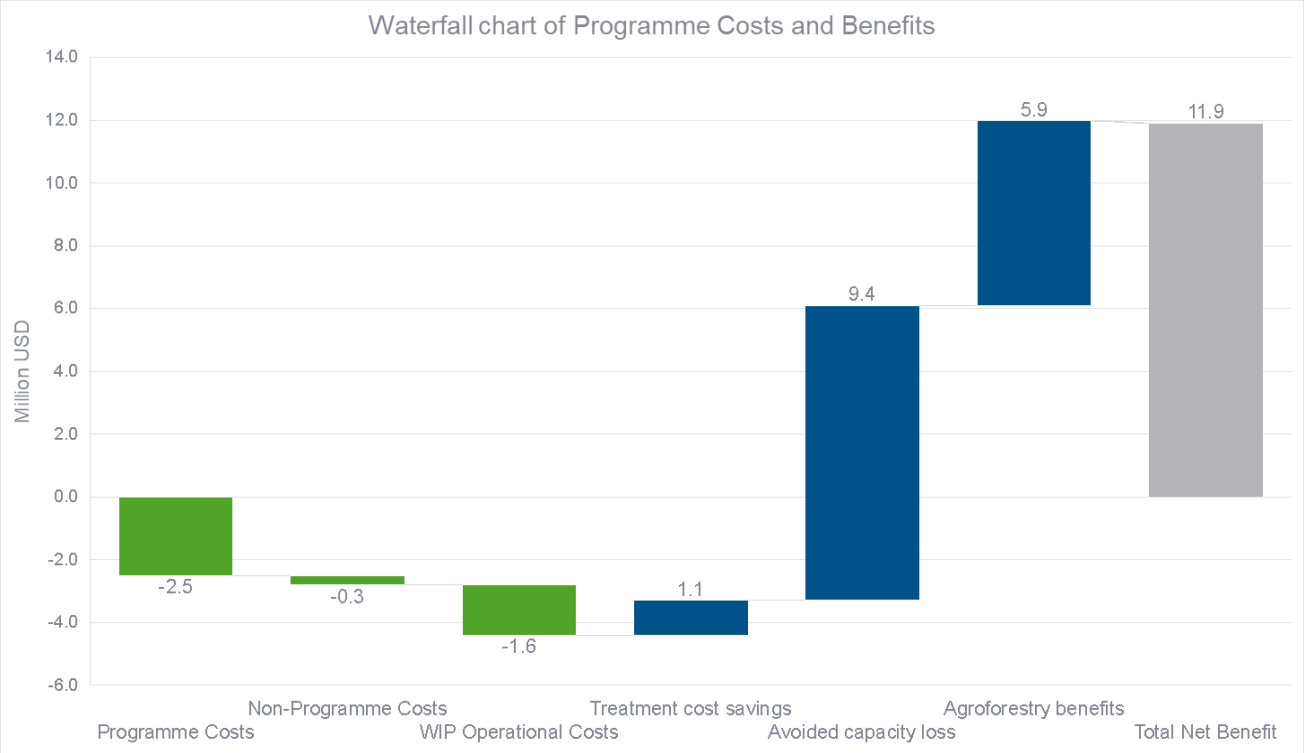
To value the benefits of the NbS, the Return on Investment analysis used the outputs of the scientific modelling and applied data and assumptions from desktop research, stakeholder engagements and direct engagements with beneficiaries.

The table shows the various benefits that were evaluated, the benefit rationale, the beneficiaries, benefit categories and the total undiscounted value of the benefit over the 30-year timeframe of the programme (an undiscounted benefit value is provided as costs are mostly concentrated in the early years of the program, while benefits accrue throughout, thus discounting later benefits skews the overall benefit value).

Benefit Description	Rationale	Beneficiaries	Benefit Category	Total Benefit Value*
Water treatment cost savings	A reduction in sediment reduces treatment costs.	AAWSA	Water Quality Improvement	USD 1.1 million
Avoided reservoir capacity loss	Reduced sediment extends the lifespan of the reservoir (avoided capacity loss), delaying the need to build a new dam and expanding the useful economic life of the current reservoir.	AAWSA	Water Quality Improvement, Water availability	USD 9.4 million
Increased income via agroforestry activities	Agroforestry results in increased income through additional crops for farmers.	Local communities	Livelihoods	USD 5.9 million

*undiscounted value over 30 years

To determine the financial feasibility of the WIP, the NbS benefits were offset against the associated costs. The value of future flows of benefits and costs is determined in present terms. As the impact of NbS interventions take time to be realised, the benefits have been delayed.



The RoI analysis indicates that the programme would cost USD 4.5 million, while the benefits are valued at USD 16.4 million, providing a net undiscounted* benefit of USD 11.9 million.

Key Metrics

Benefit-Cost Ratio (BCR) **2.5**

BCR summarises the overall value for money of the programme. A BCR greater than 1 is an indication of a good investment and the higher the BCR, the more promising the returns

A positive NPV points towards a **worthy investment with the quantified benefits outweighing the implementation** and maintenance costs of the interventions

Net Present Value (NPV) **USD 3.4 Million**

Internal Rate of Return (IRR) **57%**

The IRR showcases **how profitable the investment is**, measuring the interest rate of the NbS portfolio

The economic analysis shows that for every USD 1 invested in NbS, a return of USD 2.5 in benefits is generated over the lifetime of the WIP activities.

*A discount rate of 8% was used in this analysis, based on a similar CBA developed by WRI, Helvetas and the Ministry of Water and Energy in the Koga Watershed, Tana, Ethiopia

Feasibility Study Outcomes

At a minimum, a successful WIP needs five core or enabling elements:

Impactful technical solutions: a Water Fund must be backed by NbS that will have a significant impact on the catchment to address identified water security challenges

Key stakeholder support: a successful Water Fund relies on a strong collective action mechanism, which is dependent on support from key stakeholders in the landscape

Strong financial viability: a Water Fund should maintain a long-term balance between implementation costs and the monetizable benefits of NbS that justify their adoption

Funding potential : a Water Fund should have strong funding potential and/or commitments from various sources that will help ensure its long-term financial sustainability

Dedicated local leadership: a Water Fund must have strong local champions that will take ownership and drive the fund to make it a long-term success

The image below indicates an analysis of these enabling conditions for Gefersa:

Impactful technical solutions
The scientific analysis has indicated that **NbS can have a benefit in Gefersa watershed**, particularly when focusing on **reducing sediment inflow and turbidity levels in the reservoir** – both **monetizable benefits** in the Gefersa context

Key stakeholder support
Stakeholders have shown **some interest in discussing the potential for a WF**, but there is a limited common view on how the programme can improve the local water landscape, **limited interest in owning the initiative**

Strong financial viability
When comparing the costs of the programme with the monetizable benefits, the **potential benefits outweigh the costs**, with gains both for the upstream communities as well as AAWSA with the positive impacts on the reservoir

Funding potential
There are **different funding sources across the water sector** in Ethiopia and Addis Ababa, including **international funding that could support initial stages of a Water Fund**. However, the **presence of strong local leadership is essential to unlock these funds**, which is **currently lacking**

Dedicated local leadership
Differences in views **on how to improve water issues as well as overlapping responsibilities for water resources management make it hard to foster local leadership**. Currently, there is no clear leader or host organisation for a Water Fund, which **makes a potential programme not feasible at this time**

Analysis of the enabling conditions for Gefersa

In the case of Gefersa, **NbS could address water security challenges**, but the **programme lacks committed leadership, clear stakeholder alignment, and coordinated funding**. Despite the strong potential for long-term funding across Ethiopia's water sector and the potential for international funding to kickstart NbS initiatives in Addis Ababa, conflicting mandates and differing perspectives among key stakeholders prevent the necessary collaboration.

Without a clear leadership to create unified, collective action among the diverse stakeholder groups, a WIP is currently not feasible.

Summary of Feasibility Study Results

Looking back at the initial questions that helped set up the engagement, a summary of a selection of the key questions are presented in the table below.

Key Questions	Feasibility Answers
Gefersa Watershed as a Case Study	
What are some of the characteristics of the communities, partners and authorities around Gefersa Watershed that enable *collective action* or potentially create challenges linked to NbS implementation?	• Governance challenges include overlapping mandates and weak collaboration between key stakeholders like AAWSA and Shaggar City. Political and institutional hurdles hinder NbS implementation, with potential legal challenges to the implementation of a WIP across city administrations. Limited experience and lack of local leadership are noted, particularly with limited experience implementing NbS in Gefersa.
Which collective action mechanism may be appropriate for the Gefersa Watershed?	• A working steering committee involving AAWSA, Shaggar City, MoWE, local community representatives, private sector representatives, and a NbS-focussed civil society organization is essential for a WIP. Currently, there is limited collaboration and no steering committee, indicating a need to finalize partners' selection and establish a working steering committee for to build on the collective mechanism.
NbS Adoption Questions	
How does the current policy landscape support the implementation of NbS?	• While Ethiopia supports NbS through initiatives like the Green Legacy Initiative, implementation is limited. Some NbS, like agricultural BMPs, are culturally accepted, but broader adoption of different types of NbS needs more exploration and support.
How can we frame NbS as a solution set among other potential grey solutions in the broader Akaki watershed?	• NbS cannot fully address Addis Ababa's water security challenges alone but can complement grey infrastructure by enhancing its sustainability. Capacity-building and stakeholder engagement are needed to integrate NbS effectively.
Akaki Watershed Questions	
What is the AAWSA's planning on strategic water interventions?	• AAWSA's 10-year plan lacks NbS integration, though there is some interest in agroforestry with small areas of implementation. Commitment to NbS and WIP design remains limited.
How is Gefersa different from the Akaki Watershed? And what does this mean in terms of how we deliver the solutions?	• Governance challenges are similar, but Akaki faces larger water availability issues. Stakeholder selection and steering committee formation are needed to assess the feasibility of scaling Gefersa solutions to Akaki leveraging the same delivery model.
What is a potential scale up plan for WIPs in the Akaki Watershed?	• Conditions for WIP are not ready in Gefersa, making scaling to Akaki premature. However, Gefersa could serve as a phase I demonstration for potential WIP implementation in the broader Akaki watershed.

Suggested Next Steps

Engage Key Stakeholders:
- Collaborate with the MoWE to advocate for the WIP or Water Fund.
- Work with Addis Ababa's Mayor's Office to enhance accountability and engagement with AAWSA.
- Strengthen Shaggar City's policies for upstream conservation and foster collaboration with other government bodies, including the Oromia government.

Strengthen Partnerships and Leadership:
- Request AAWSA to designate a project lead for better coordination and support for WIP initiatives.
- Establish a steering committee with AAWSA and key partners like WRI and SIWI to implement pilot projects in Gefersa.

Enhance Communication and Awareness:
- Develop a communication strategy to share learnings with AAWSA and educate stakeholders about the WIP's benefits.
- Utilize multi-stakeholder platforms to secure buy-in from various government levels and local entities.

Research and Data Collection:
- Conduct detailed groundwater studies to understand and manage this resource effectively.
- Perform scientific analyses to identify NbS impacts on groundwater supply and prioritize intervention locations.

Leverage Existing Initiatives:
- Build on insights from VEI and other projects to improve collaboration with local communities.
- Use MoWE-sponsored platforms to encourage multi-level government cooperation and NbS adoption.

If there is an improvement in the enabling conditions in Addis Ababa and the decision to move forward with a WIP in the local context, the recommendation is to move the WIP design to a 'Design' phase (diagram below). The Design Phase focuses on building a shared roadmap that puts together the proposed actions, such as the NbS Investment Portfolio, into an actionable programme. In this case, the Design phase would prioritize strengthening local leadership and stakeholder support, addressing two key challenges currently faced in Gefersa.

Watershed Investment Programme Development Lifecycle in N4W

Contact Details – Local Leads and Partners

Mulugeta Taye (AAWSA) mulugetataye54@gmail.com

Zablon Adane (WRI) Zablon.Adane@wri.org

Moges Shiferaw (SIWI) Moges.Shiferaw@siwi.org

Contact Details – N4W

Muriel van de Bilt muriel@pegasysinternational.com

Mehdi Mestassi mehdi@pegasysinternational.com

The Nature Conservancy | Nature for Water FACILITY Local solutions. Global impact. | PEGASYS CHANGING LIVES CHANGING WORLDS

AAWSA | WORLD RESOURCES INSTITUTE | SIWI