CONRAD N. Hilton FOUNDATION

MILLENNIUM WATER ALLIANCE

Learning and Feasibility Study

Carbon Credits for WASH Interventions

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Contents

Glossary

Carbon certification. Refers to the process of registering a project under a carbon standard and generating carbon credits.

Carbon Credit. Represents one metric ton of carbon dioxide equivalent (tCO2e) emissions reduced, removed, or avoided. Carbon credits are issued by carbon standards based on a set of rules, procedures, and methodologies for quantifying emissions reductions. Carbon credits can be sold and generate revenue for an intervention.

Carbon methodology. Outlines how emission reductions or removals are calculated for specific types of projects. It includes a definition of the scope and applicability of the methodology, the calculation of baseline emissions, and monitoring requirements.

Carbon project. Refers to an intervention that is registered or planned to be registered under a carbon standard to generate carbon credits.

Carbon project developer. Refers to a for-profit or non-profit organization that specializes in developing and registering carbon projects. Some carbon project developers may also act directly as project implementers.

Carbon standard (or registry). Refers to an entity that provides rules and procedures for generating carbon credits from climate change mitigation projects, issues and tracks carbon credits issued from such projects in a registry and ensures that each carbon credit is used only once by issuing notices for "retired" carbon credits. Examples include the Gold Standard or VCS/VERRA.

Project Implementer (or Project Owner). Manages and oversees the implementation of the carbon project and can be a government agency, NGO, private sector actor or community group.

Water, Sanitation, and Hygiene (WASH) intervention. The primary objective is to improve public health by increasing the availability of WASH services in households, institutions, and public spaces. These interventions include infrastructure investments, such as the construction of water supply systems or fecal sludge treatment facilities, as well as strengthening the enabling environment for sustainable WASH service provision. This includes activities such as capacity building for water service providers or improving market systems for sanitation and hygiene products.

Acronyms

CBSA	Container Based Sanitation Alliance
CDM	Clean Development Mechanism
GHG	Greenhouse gas
LDCs	Least developed countries
LLDCs	Landlocked developing countries
MWA	Millennium Water Alliance
PDD	Project design document
tCO2e	Metric tons of carbon dioxide equivalents
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Voluntary Carbon Standard
WASH	Water, sanitation, and hygiene

Acknowledgement

The Millennium Water Alliance and its members extend our deepest gratitude to the Conrad N. Hilton Foundation for their generous support, which has been instrumental in the realization of both this feasibility study and the accompanying learning paper. Their commitment to fostering sustainable WASH solutions through innovative funding mechanisms has not only enabled us to undertake this critical research but also to contribute valuable knowledge and practical guidance to the sector. This work stands as a testament to the foundation's visionary approach to addressing global water and sanitation challenges

Executive Summary

The purpose of this learning paper is to introduce the technical aspects associated with carbon credits for WASH interventions, and to provide guidance to project implementers on how to assess whether it is worth exploring carbon certification further.

The WASH sector has significant potential to mitigate climate change, and carbon credits can help partially finance the transition to climate-resilient WASH systems through a performance-based payment system. However, certain sectors related to WASH, such as energy and forestry, are better positioned to take advantage of existing carbon credit opportunities through non-renewable energy, clean cooking, and afforestation projects. This learning paper concludes that, in general, WASH actors should explore and prioritize other sources of climate finance that are more likely to be scalable. However, for specific safe water projects, carbon credits can help generate additional revenue. Carbon credits for methane mitigation from sanitation systems are also expected to become increasingly important in the future.

Most of the carbon credits issued for WASH interventions to date have been generated by avoiding emissions from boiling drinking water, despite the small contribution of boiling water to global greenhouse gas emissions. Many of these carbon credits have been generated based on the concept of suppressed demand, which recognizes that energy poverty leads to the consumption of untreated and unsafe drinking water - and thus allows carbon credits to be generated for households that do not currently boil drinking water. Carbon credits for safe water projects are well established, and revenues from carbon markets have provided substantial funding for many safe water projects in recent years. However, increased scrutiny of carbon markets has led to increased reputational and delivery risks for both new and existing implementers, which need to be carefully assessed. Central to generating carbon credits for safe water projects is the concept of suppressed demand and how it is incorporated into carbon methodologies.

As a specific example, the Learning Paper discusses a safe water project implemented by Conrad N. Hilton Foundation partner Winrock in the Amhara region of Ethiopia that aims to provide chlorinated piped drinking water to 50,000 households (See Annex 1: Part B - Feasibility Study (NatureCo). This intervention meets all the key criteria for partial funding through carbon credits and appears to be financially viable if suppressed demand is considered. This Learning Paper concludes that project implementers should thoroughly examine whether and how suppressed demand can be justified in a public discussion according to the rules of the carbon methodology and the specific local context. If so, it is recommended to reassess the pros and cons, formulate a risk mitigation and response strategy, and engage with carbon project developers to solicit commercial proposals to support the carbon certification process and the sale of carbon credits.

1 Introduction

The primary goal of water, sanitation, and hygiene (WASH) interventions is to improve public health. Moreover, these interventions offer a promising avenue for reducing greenhouse gas (GHG) emissions. By quantifying and certifying emission reductions, WASH projects can unlock new revenue streams. This additional funding can significantly support the implementation, operation, and maintenance of WASH initiatives.

This paper delves into the potential for generating revenue through carbon credits in the WASH sector. Drawing from the experiences of Millennium Water Alliance (MWA) members and partners in Ethiopia, it highlights specific project activities that demonstrate this potential (see Table 1). Additionally, it provides a comprehensive overview of WASH interventions capable of reducing emissions (see Table 4). **Our aim is to demystify the technicalities of carbon credits for WASH projects and offer practical guidance for project implementers considering carbon certification.**

Integrating climate change considerations into WASH interventions is paramount. The goal is twofold: to ensure resilience to climate change and to minimize the sector's carbon footprint. While carbon credits offer a mechanism to generate extra funds, they are not the sole method to highlight a project's environmental benefits. The contribution to reducing emissions stands as a significant action against climate change, irrespective of certification and monetization.

Box 1: Should the WASH sector support carbon credits?

In the wake of the ratification of the Paris Agreement, a significant debate has emerged around the effectiveness and implications of including the WASH sector in carbon credit schemes. Proponents argue that carbon markets have played a critical role in driving investment in climate action and represent a scalable and effective approach that deserves support alongside alternative climate finance mechanisms. Conversely, skeptics raise concerns that reliance on carbon credits may lead to a reliance on indirect mitigation strategies, potentially overshadowing or detracting from direct regulatory measures that are seen as having a more immediate impact. There is also concern that carbon credits may not always result in tangible, additional emission reductions. (see also Box 11)

This learning paper takes a neutral stance and aims to provide objective technical guidance on the revenue-generating potential of carbon credits for WASH interventions. It acknowledges the debate surrounding carbon markets and emphasizes the importance of a balanced and informed approach. MWA encourages its members engaged in carbon crediting initiatives to take a broad view and ensure that claims of emission reductions from WASH projects are based on sound, conservative assumptions. This caution aims to avoid exaggeration of benefits and instead focus on real, verifiable impacts, thus ensuring the integrity of WASH interventions within the carbon market framework.

The following table outlines interventions by MWA members and partners in Ethiopia, illustrating the potential for carbon certification:

Table 1: *Carbon-Certifiable WASH Interventions in Ethiopia*

Interventions	Why could carbon certification be of interest?
Chlorinated Water Supply Schemes: Construction of four piped water schemes providing chlorinated water to public standpoints.	Implementing reliable chlorination at public standpoints can reduce the need for water boiling, offering a clear path to emission reductions. While Ethiopia has yet to register such projects, international examples provide valuable insights.
Transition to Solar Power: Shift from diesel generators to solar-powered pumps (at four multi-village water schemes and at about 35 schools and healthcare facilities).	Shifting from diesel generators to solar-powered pumps cuts emissions, highlighting the environmental benefits of renewable energy adoption in water supply systems.
Chlorine Dispensers Installation: Installed 834 chlorine dispensers in three woredas (districts) in Amhara region from 2017 to 2022 (MWA 2019).	Through the introduction of chlorine dispensers, we can significantly decrease the reliance on boiling, mirroring successful carbon credit generation in other countries.
Household Water Filter Promotion: Household water filter manufacturers to promote their products in Ethiopia.	Replacing boiling with household water filters can lead to carbon emission reductions. Three water filter projects have been registered under the Gold Standard in Ethiopia,[1] one of which has already issued carbon credits as of October 2023.
Local Government Support for monitoring point water sources and in maintaining /rehabilitating them when needed.	Safe water access diminishes the need for boiling, aligning with emission reduction goals. 20 rehabilitation projects have been registered in Ethiopia, 19 of which have already issued carbon credits as of October 2023.[2]
Reforestation for Water Catchment Protection: Rehabilitating 400 ha of land (reforestation) to protect a water supply catchment area.	Reforestation leads to the sequestration of carbon in biomass and therefore removal of carbon dioxide from the atmosphere (if the reforestation is permanent). At least two reforestation projects located in Ethiopia have been registered and issued carbon credits under the Gold Standard (although they are not directly linked to WRM).[3]

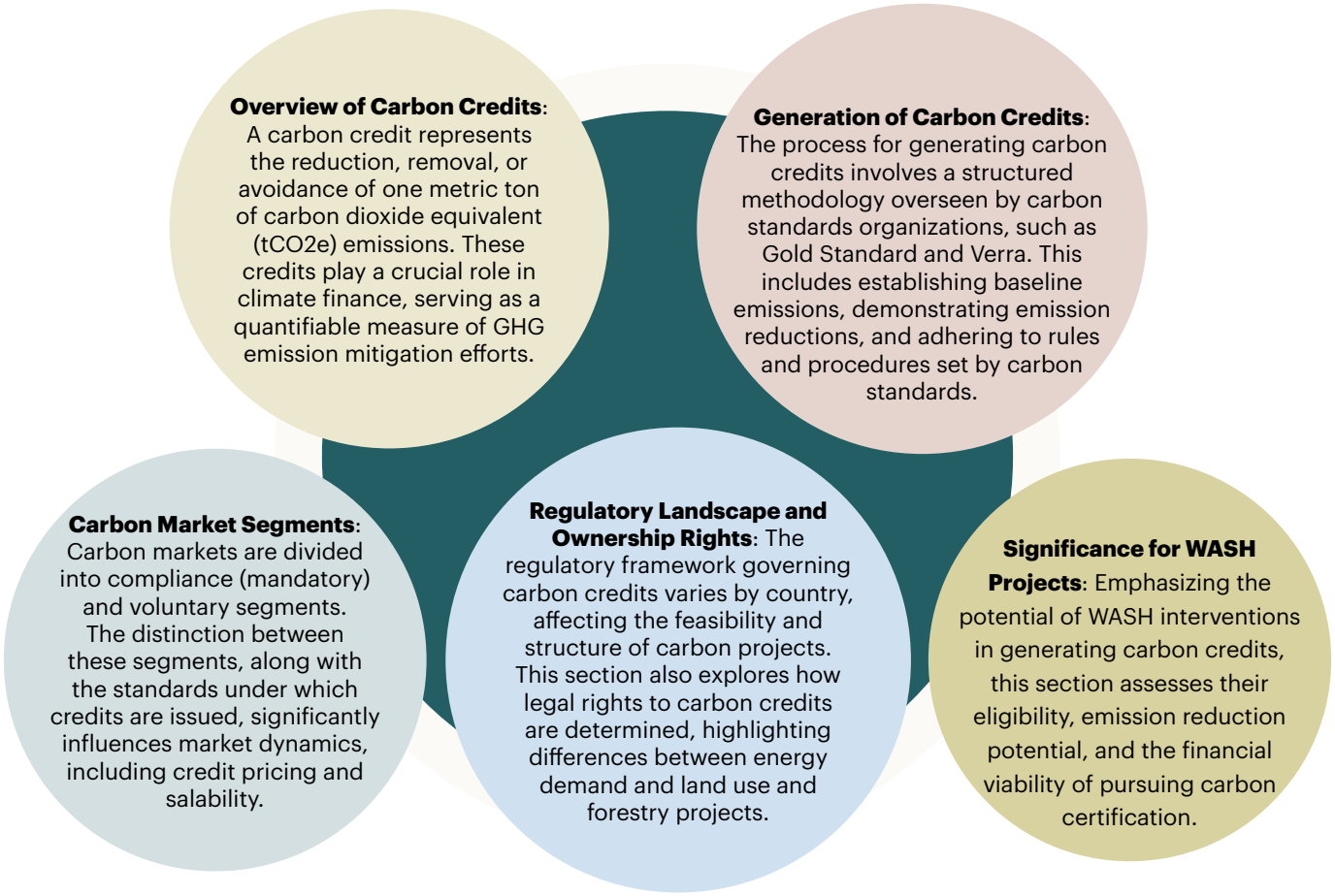
1 Native Hydraid BioSand Water Filter (GS1289): https://registry.goldstandard.org/projects/details/1592
Believe Green Safe Drinking Water (GS7443): https://registry.goldstandard.org/projects/details/1641
Nazava Water Filter Project (GS10824): https://registry.goldstandard.org/projects/details/2781

2 17 projects under GS1247 "Improved kitchen regimes multi-country PoA", for example Southern Ethiopia Community Boreholes (GS5322): https://registry.goldstandard.org/projects/details/1406
Three projects under GS5658 "PoA – Climate finance for sustainable development" for example Resilience with Safe Drinking Water (GS 6749): https://registry.goldstandard.org/projects/details/1505

3 Sodo Ethiopia (GS3007): https://registry.goldstandard.org/projects/details/511
Humbo Ethiopia (GS10220): https://registry.goldstandard.org/projects/details/1922

2 Carbon Markets: The Basics

This section provides a foundational understanding of carbon markets, focusing on the pivotal role of carbon credits in climate finance aimed at mitigating climate change. Carbon credits represent a key mechanism by which GHG emission reductions can be quantified, verified, and financially incentivized. Here, we delve into the essentials of carbon markets, including the generation, regulation, and potential impact of carbon credits, particularly within the context of WASH projects. Key highlights include:



By summarizing the mechanisms, standards, and regulatory considerations pertinent to carbon markets, this overview sets the stage for a comprehensive exploration of how carbon credits can support and enhance WASH projects, with a particular focus on opportunities in Ethiopia.

2.1 What is a carbon credit?

Climate finance encompasses a variety of mechanisms aimed at both **adaptation and mitigation efforts to address climate change (see Box 2)**. This paper focuses on mitigation through the lens of carbon credits. There are other mechanisms suitable for channeling climate finance to WASH activities, but these are beyond the scope of this learning paper.

In theory, any activity that results in the reduction, removal, or avoidance of GHG emissions could be certified to generate carbon credits, assuming it can be credibly demonstrated that these emission reductions are additional—meaning they would not have occurred without the incentive of carbon finance. However, the practical generation of carbon credits also hinges on the emission reduction potential of the intervention type, the simplicity of establishing baseline and project emissions, and the priorities of stakeholders involved.

Box 2: Adaptation vs Mitigation? (Adapted from EEA 2023)

Adaptation refers to actions taken in anticipation of the adverse effects of climate change, aimed at preventing or minimizing potential damage. This process involves adjusting to both present and future impacts of climate change. For WASH, adaptation strategies might include identifying resilient water sources to counteract climate-induced changes in precipitation or enhancing sanitation facilities to withstand increased flooding events.

Mitigation involves efforts to lessen the severity of climate change impacts by reducing or preventing GHG emissions into the atmosphere. It includes human interventions aimed at either decreasing the sources or enhancing the sinks of GHG emissions.

A carbon credit is quantified as one metric ton of carbon dioxide equivalent (tCO2e) emissions that have been reduced, removed, or avoided. These credits are issued by carbon standards based on a comprehensive framework of rules, procedures, and carbon quantification methodologies. Once issued, carbon credits can be sold, generating revenue for the mitigation activity (South Pole 2023). This paper further explores the generation of carbon credits in the subsequent section, "How can carbon credits be generated?"

Carbon markets are categorized into **compliance (mandatory) and voluntary segments (see Box 3)**. The type of carbon standard under which a credit is issued can influence its market price and the ease with which it is sold. Most WASH-related activities generating carbon credits currently participate under voluntary carbon standards like the Gold Standard and Verified Carbon Standard (VCS)/Verra, although some compliance markets do accept credits generated under voluntary standards.

Box 3: Compliance vs. Voluntary Carbon Markets (Adapted from UNDP 2022)

Compliance (Mandatory) Carbon Markets involve entities legally obligated to offset their emissions, regulated by international, regional, or sub-national schemes such as the Clean Development Mechanism, the European Union Emissions Trading Scheme, and the California Carbon Market.

Voluntary Carbon Markets allow private entities and individuals to purchase carbon offsets on a voluntary basis, functioning parallel to the compliance markets.

The regulatory landscape for carbon credits varies by country, as exemplified by Ethiopia's current lack of comprehensive regulations and infrastructure for carbon markets (see Annex 2 - Carbon Trading Legal and Regulatory Framework in Ethiopia (NatureCo)). However, the Ethiopian federal government is in the process of drafting regulations under Article 6 of the Paris Agreement, which pertains to voluntary cooperation and market-based approaches, though its impact on the voluntary carbon market remains uncertain.

Carbon standards also provide rules for determining legal rights to carbon credits:

1. **Energy demand projects:** Rights to carbon credits are transferred from the end users of the GHG emission reduction technology (e.g., household water filters) to the project developer. This is usually done through simple agreements between the two parties in the form of Project Participation Agreements, which include an acknowledgement that carbon rights are being transferred to the project developer. In the case of community water systems, carbon rights waivers can be signed by a community representative on behalf of the end users.

2. **Land Use and Forestry Projects:** Landowners typically own all products generated from the land, including carbon credits generated by carbon sequestration. An agreement between a landowner and a project developer is needed to clarify carbon credit ownership, forest land permanence, and benefit sharing.

2.2 How can carbon credits be generated?

Carbon credits are issued through a structured process overseen by carbon standards—entities that establish the rules and procedures for creating carbon credits from climate mitigation projects. These standards maintain a registry to track issued carbon credits, ensuring each is used only once by issuing notices for "retired" credits (**see Box 4**). Among the voluntary carbon markets, The Gold Standard[4] and VCS/Verra[5] are notable in the voluntary carbon market due to their widespread recognition and usage by buyers. Specifically, VCS has issued 68.5% of credits, and the Gold Standard has issued 20.1%, highlighting their significant role in carbon credit issuance and buyer trust.

This process includes the development and adherence to specific "methodologies" that detail the calculation of emission reductions or removals for various projects, emphasizing the necessity of sustainable development goals and the mitigation of social and environmental impacts. The process spans from project documentation and stakeholder consultation, through validation and registration, to monitoring, reporting, verification, issuance, and eventually, the sale of carbon credits. Each step involves detailed considerations, costs, and associated risks, underscoring the complexity and rigor of certifying carbon credits in efforts to ensure integrity and accountability in climate mitigation projects.

Box 4: What claims can be made with carbon credits?

Purchasers of carbon credits often aim for net-zero emissions, using these credits to compensate for emissions they cannot eliminate otherwise. The market is transitioning from merely "offsetting emissions" to "paying for verified climate contributions," emphasizing the importance of companies reducing their carbon footprint in alignment with science-based targets[6] before purchasing carbon credits for the remaining unavoidable emissions. This approach funds climate action beyond direct operations. To reach net-zero, "carbon removals" are essential for neutralizing residual emissions through means like forestry projects or technical removals. Meanwhile, "carbon reductions" demonstrate practical climate action, like credits from projects reducing the need for boiling water. Buyers are advised to follow guidelines from carbon standards and the Voluntary Carbon Markets Integrity Initiative[7] for making credible claims upon retiring carbon credits.

2.2.1 Carbon Credit Methodologies

Carbon credits are generated through a careful process defined by "methodologies" within each carbon standard. These methodologies detail how to calculate emission reductions or removals for specific projects, including scope, baseline emissions, and monitoring requirements. Stakeholders can work with standards to develop new methodologies as needed. Some standards may allow methodologies from other standards, such as the Clean Development Mechanism (CDM) under the United Nations Framework Convention on Climate Change (UNFCCC) as part of the Kyoto Protocol. Each standard emphasizes sustainable development goals (SDGs), mandates processes to mitigate negative social and environmental impacts, and requires projects to have a positive impact on climate change and

4 Gold Standard: https://www.goldstandard.org/

5 Verified Carbon Standard (VCS) / Verra: https://verra.org/programs/verified-carbon-standard/

6 Science Based Targets initiative (https://sciencebasedtargets.org/)

7 Voluntary Carbon Markets Integrity Initiative (https://vcmintegrity.org/vcmi-claims-code-of-practice/)

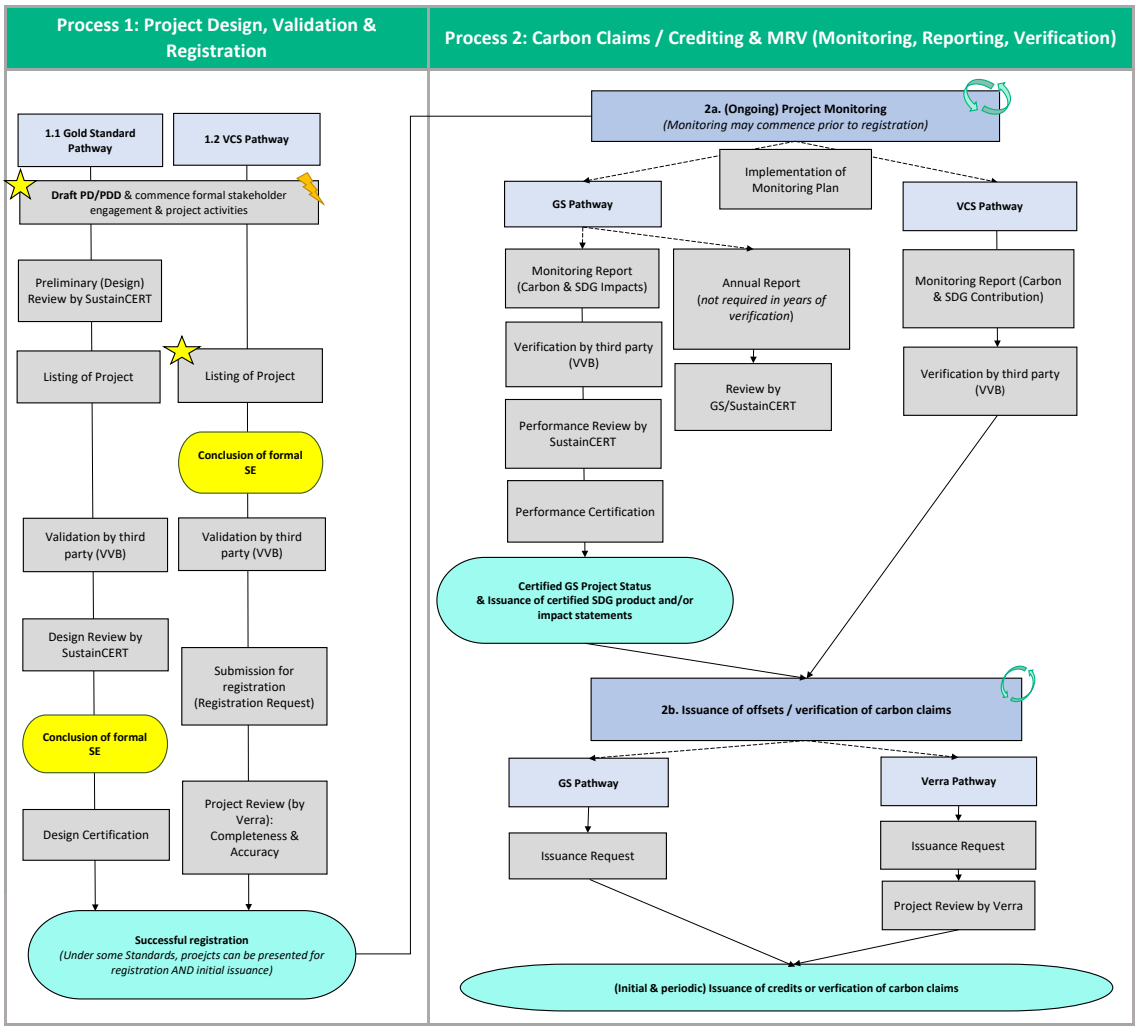
additional SDGs. Table 2 lists selected methodologies that may be relevant to WASH interventions. While several methodologies might apply to WASH interventions, this learning paper particularly focuses on the Gold Standard methodology for emission reductions from safe drinking water supply due to its specific relevance to low or emission-free water treatment technologies. This choice is informed by a comprehensive review of Gold Standard and Verra methodologies conducted as part of the feasibility study (See Annex 6: Registry Comparison and Methodology Section Tool (NatureCo) and the experiences of carbon credit projects, making the Gold Standard methodology the most applicable for the types of projects discussed herein.

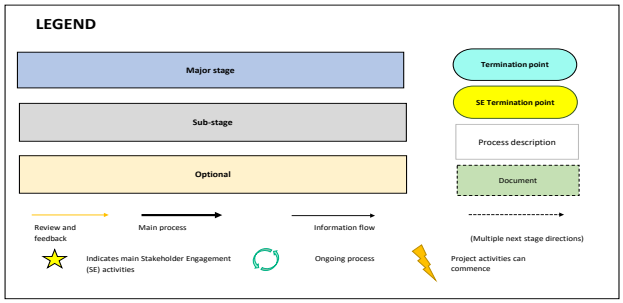
Table 2: *Carbon Methodologies Relevant to Water*

Project Activity	Methodology
Provision of low or emission free water treatment technologies	Gold Standard. Methodology for emission reductions for emission reductions from safe drinking water supply --- version 1.0, 03/05/2021
	CDM. AMS-III.AV.: Low greenhouse gas emitting safe drinking water production systems --- Version 8.0
	CDM. AM0086: Distribution of low greenhouse gas emitting water purification systems for safe drinking water --- Version 5.0
Energy sourcing and operational efficiency of water utilities	CDM. AMS-I.B.: Mechanical energy for the user with or without electrical energy --- Version 13.0
	CDM. AMS-I.F.: Renewable electricity generation for captive use and mini-grid --- Version 5.0
	CDM. AM0020: Baseline methodology for water pumping efficiency improvements --- Version 2.0
Mitigating methane emissions from sanitation systems (CBSA 2023)	CDM. ACM0022: Alternative waste treatment processes --- Version 3.0
	CDM. AMS-III.H.: Methane recovery in wastewater treatment --- Version 19.0
	CDM. AMS-III.D.: Methane recovery in animal manure management systems --- Version 21.0
	CDM. AMS-I.C.: Thermal energy production with or without electricity --- Version 22.0
	CDM. AMS-I.E.: Switch from non-renewable biomass for thermal applications by the user --- Version 13.0
	CDM. AMS-III.F.: Avoidance of methane emissions through composting --- Version 12.0
	CDM. AMS-III.E.: Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment --- Version 17.0
Tree planting and natural regeneration to restore degraded watersheds	Gold Standard. Methodology for afforestation/reforestation (A/R) GHG emission reduction & sequestration, version 2.0, 26.10.2022
	CDM. AR-ACM0003: Afforestation and reforestation of lands except wetlands --- Version 2.0

Carbon standards aim at fostering sustainable development. Therefore, all carbon standards have processes in place to avoid and manage negative social and environmental impacts. Carbon standards have defined safeguarding principles and may require project implementers to conduct a do-no-harm assessment (See guidance in Annex 4 - Safeguarding (NatureCo). The Gold Standard explicitly requires positive impacts not only on climate change (SDG 13) but also on at least two additional SDGs. Indicators for tracking impact on these SDGs need to be defined in the monitoring plan and reported when requesting a carbon credit issuance.

Figure 1: *The flowchart illustrates the Registry's registration process, certification requirements, and payment structure. Each 'process' indicates a key step for both the VCS and Gold Standard requirements/processes before the project can proceed.*





Gold Standard: Certification status is retained by successfully completing ongoing Verification and Performance Reviews. Verification occurs at least every 5 years.

Verified Carbon Standard: Verification is required to be carried out at least every 5 years.

2.2.2 The Carbon Certification Process

Once the project developer has decided to participate in the voluntary carbon market (see Section 4.4 Decision-Making Framework for Carbon Credits in WASH Projects (Go-No Go Decision Tree) to help make an informed decision), the carbon certification process can begin. The external cost of carbon certification (i.e., fees for the carbon consultant, third-party verification, and carbon standard) for a five-year certification cycle is typically around EUR 100,000 plus a margin for carbon credit trading (South Pole 2023). In addition, carbon certification incurs internal costs for staff time, organizing stakeholder consultations, and implementing the monitoring plan (see Box 5).

Box 5: What are the monitoring requirements for a WASH project?

WASH projects must establish a robust monitoring system to ensure the effectiveness and sustainability of interventions. This involves:

Database/Inventory: A comprehensive list of all credited units (e.g., water filters, water points, supply systems), each assigned a unique ID, ideally with geo-referencing, to facilitate precise tracking and verification.

Baseline Survey: Conducted across a representative sample of units, this survey assesses the prevalence of water boiling, suppressed demand (see section 3.1), and the efficiency of stoves used, setting the initial benchmarks for the project.

Monitoring Surveys: Periodic surveys sampled from the database to track usage rates, assess water quality, and measure water consumption. These surveys underscore the project's adherence to high standards of impact and accountability, reflecting a significant level of rigor in evaluating the project's success in achieving its goals.

This paper discusses a planned safe water project in the Amhara region of Ethiopia that aimed to solarize 10 diesel fuel powered borehole and provide chlorinated piped drinking water to 50,000 households (See Annex 1: Part B - Feasibility Study (NatureCo)). For the project, the carbon project certification costs for local carbon capacity building and training, validation and verification audits, and carbon standard fees over a ten-year period were estimated at US$503,394. In simplified terms, the following steps are required for carbon certification and are summarized in Table 3

1. **Project Documentation and Stakeholder Consultation.** The project implementer (likely working with a carbon project developer) will further specify the project type, scope, location, and duration. Planning needs to be supported by a stakeholder consultation process to engage with all relevant stakeholders (see guidance in Annex 6), such as the local community and local government. The team needs to address stakeholder feedback, concerns and suggestions and demonstrate how the project meets the safeguards principles and requirements of the carbon standard (see guidance in Annex 7). The team must also establish the baseline scenario (which may require a baseline survey, see Annex 8), develop a monitoring plan, and demonstrate additionality in accordance with the selected methodology. All of this is then summarized in a **Project Design Document (PDD, see Box 6)** and possibly additional supporting documents (e.g., a report on local stakeholder consultation, a spreadsheet for calculating emission reductions).

This step can typically take six months to a year and costs approximately $30,000 to $50,000 USD (external costs only).

Box 6: What is the Narrative in a Project Design Document (PDD)?

In carbon projects, tracking emission reductions serves as the primary performance indicator, while other project benefits may be reported as co-benefits. The Project Design Document (PDD) for a WASH project is always structured as a project that primarily aims to reduce, remove, or avoid greenhouse gas emissions, with access to safe drinking water and improved health as co-benefits. This may feel strange to many WASH practitioners, but it is inevitably the narrative used in the PDD. However, the actual project design should focus on providing adequate WASH services, and optimizing emissions reductions should never come at the expense of the WASH project basics.

In many cases, carbon certification will be added to an existing intervention, and not all activities may be covered in a PDD. The registered PDD (or PDDs) may only address certain components of the overall intervention. It is advisable to establish robust monitoring and support systems from which information can be drawn for specific reporting at the PDD level, including an overarching input and complaint mechanism (e.g., a customer hotline).

2. **Validation and Registration:** The project team submits the draft PDD to the Carbon Standard for preliminary review and/or listing. In addition, an independent third-party verifier (referred to as a Validation and Verification Body, or VVB) validates the project eligibility, baseline scenario, and monitoring plan against the rules and principles of the Carbon Standard and methodology. Validation may require a site visit by the VVB. Upon receipt of a final validation report, the Carbon Standard conducts a final review of the PDD before formally confirming the project's registration. This step can take six months to a year and costs approximately $20,000 to $40,000 USD (external costs only). The registration is usually valid for a period of five years (also called the "certification period"), after which the PDD must be updated, and the registration renewed.

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3. **Monitoring and Reporting:** The project team collects monitoring data as specified in the monitoring plan in the PDD, including indicators related to safeguards issues (if applicable). At the same time, stakeholder input and complaints must be collected and addressed. After a certain period (i.e., the "monitoring period"), the project team prepares a monitoring report and an emission reduction calculation table that document the actual emission reductions achieved. There is some flexibility in the length of the monitoring period (although certain rules in the standard and methodology must be followed). For safe drinking water projects, a monitoring report would typically be prepared every one to two years. The carbon project developer may only be involved in the preparation of the monitoring report and calculation of emission reductions at a cost of approximately $10,000 USD (external costs only).

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4. **Verification and issuance:** The project team submits the monitoring report, emission reduction calculation table, and supporting documentation to an independent third-party verifier (ITV) to verify the carbon credit claims against the registered monitoring plan and the rules and principles of the carbon standard and methodology. The verification may require a site visit by the verifier (VVB). Upon receipt of a final verification report, the Carbon Standard conducts a final review of the monitoring report before formally issuing carbon credits. This step can take approximately six months to one year and costs approximately $15,000 to $30,000 USD. Step 1 (initiating a project) to Step 4 (receiving carbon credits) typically takes at least two to three years.

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5. **Selling carbon credits:** Once carbon credits are issued, they can be sold to interested buyers. Depending on the type of project, the capacity of the carbon credit trader, the demand for carbon credits, and price expectations, it may take several years to sell (and thus monetize) all the carbon credits. The sales margin for carbon credit trading depends on the investment and risks taken by the carbon credit retailer and is typically between 10% and 50% of the total revenue from the sale of carbon credits, but could be higher if, for example, an investor covers the full costs of project implementation and carbon certification.

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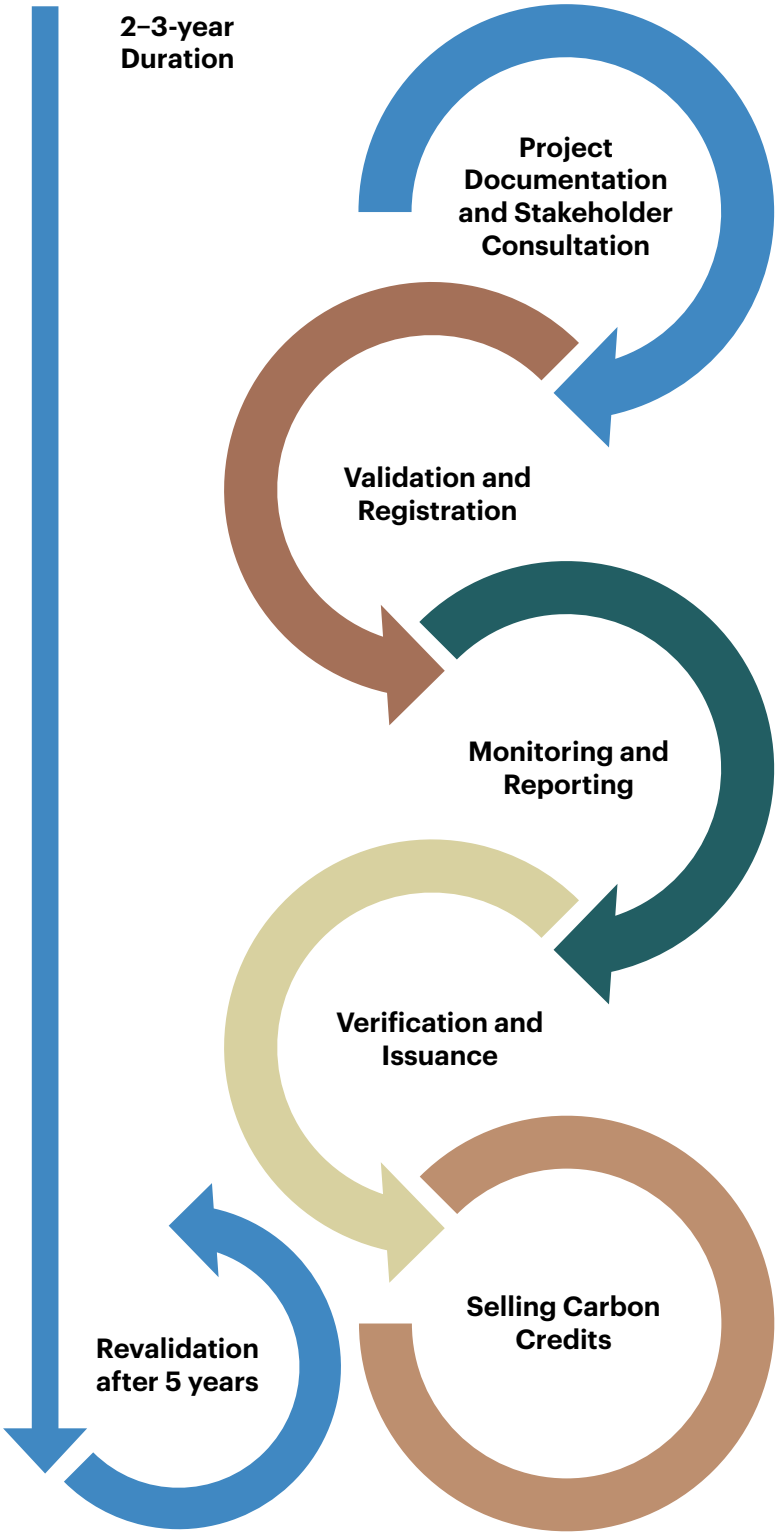
Figure 2: *Steps for Carbon Certification (2–3-year duration with re-validation after 5 years)*



- **Develop detailed project plans and engage stakeholders.**
- Key Considerations: Ensure thorough documentation; engage stakeholders effectively.
- Duration: 3-6 months
- Costs: Staff time, consultancy fees.

- **Third-party assessment against carbon standards; project registration.**
- Key Considerations: Choose an appropriate validator; meet standard criteria.
- Duration: 2-4 months
- Costs: $5,000 to $20,000.

- **Monitor project performance and report results.**
- Key Considerations: Implement robust monitoring; report accurately.
- Duration: Ongoing, annual/biannual reports
- Costs: Monitoring operational costs.

- **External verification of results; issuance of carbon credits.**
- Key Considerations: Ensure data accuracy; comply with documentation.
- Duration: 1-3 months per cycle
- Costs: $5,000 to $15,000 per verification.

- **Market and sell issued carbon credits.**
- Key Considerations: Understand market demand; choose selling strategy.
- Duration: Variable
- Costs: Broker fees (10-15% of sales).

Table 3: *Steps for Carbon Certification (2–3-year duration with re-validation after 5 years)*

Step	Description	Considerations	Duration	Costs	Risk
1. Project Documentation and Stakeholder Consultation	Preparation of detailed project documentation, including objectives, methodologies for GHG emission reduction, and stakeholder engagement.	• Comprehensive documentation to meet standard requirements. • Engaging stakeholders early and effectively.	3-6 months	Varies; initial costs include staff time and potentially consultancy fees for document preparation.	Inadequate stakeholder engagement leading to project delays or non-compliance
2. Validation and Registration	Independent third-party validators assess the project against specific carbon standard criteria. Successful assessment leads to project registration.	• Selection of an appropriate validator. • Ensuring project meets all criteria of the chosen carbon standard.	2-4 months	Typically ranges from $5,000 to $20,000 depending on project complexity.	Failing to meet standard criteria, resulting in additional costs and delays.
3. Monitoring and Reporting	Continuous monitoring of the project's performance against the baseline scenario, followed by reporting of results to the standard body.	• Robust monitoring systems. • Accurate and transparent reporting.	Ongoing, with annual or biannual reporting	Operational costs for monitoring activities; costs can vary widely.	Inaccurate data collection or reporting, potentially leading to disputes during verification.
4. Verification and Issuance	An external verifier checks the reported results. Upon successful verification, carbon credits are issued.	• Accuracy of monitoring data. • Compliance with project documentation and standard requirements.	1-3 months per verification cycle	Verification costs range from $5,000 to $15,000 per verification.	Verification failure due to inaccurate or incomplete data, necessitating re-verification.
5. Selling Carbon Credits	Credits are sold on the carbon market, either directly to buyers or through brokers.	• Market demand and credit prices. • Selection of selling strategy (direct, exchange, broker).	Variable	Transaction fees vary; brokers may charge 10-15% of sales price.	Market volatility risk affecting credit prices and demand. Risk of long sales cycles impacting project cash flow.

2.3 Who participates in a carbon project?

Project Implementer (Owner): At the core of any carbon project are the project implementers, also known as project owners. These entities, which may include government agencies, non-governmental organizations (NGOs), private sector firms, or community-based groups, play a pivotal role in overseeing and managing the project's implementation. They are tasked with ensuring that all end users and project participants (stakeholders), such as water users or landowners, are fully informed about the project's activities. This responsibility encompasses facilitating stakeholder consultations during the design phase and establishing mechanisms for ongoing feedback and grievances to ensure inclusive participation throughout the project (see Annex 6: Stakeholder Consultation (NatureCo) for details). Additionally, it is crucial to establish clear contracts with project participants that specify the ownership of carbon credits.

Project Developer: In many cases, the project implementer collaborates with a carbon project developer, an entity specialized in developing and registering carbon projects. This can be either a for-profit or non-profit organization. Some developers may also act directly as project implementers, while a project implementer may build their own capacity for carbon project registration internally. The relationship between the project implementer and the carbon project developer is formalized through a contract that outlines, among other things, the ownership of the carbon credits. These are commonly referred to as Emission Reductions Payment Agreements (ERPAs)[8].

Third-party Auditor: The selection of an appropriate carbon standard and methodology for the project is a collaborative effort between the carbon project developer and the project implementer. The chosen carbon standard defines the rules, principles, and procedures for generating carbon credits, while the methodology specifies the technical approach. For the project's validation and verification, a third-party auditor accredited by the carbon standard, known as a validation and verification body (VVB), is selected. These auditors, typically private companies, provide the necessary technical services.

Retailers (Traders) and Buyers: After carbon credits are issued, they must be sold. Carbon credit retailers or traders purchase credits from projects and sell them to buyers. Notably, carbon project developers often function as retailers themselves. Traders may hold credits in their registries to resell later. Buyers typically retire the credits to substantiate environmental claims, as detailed in Box 4.

Box 7: How are carbon projects financed?

Financing models for carbon projects offers a wide range of approaches, from traditional to innovative, to ensure both feasibility and sustainability. Central to these models is the principle that financial projections must ensure that carbon registration and monitoring costs (transaction costs) are covered by carbon credit revenues, ideally generating substantial surplus revenues. This revenue is critical to cover a range of expenses, including operations and maintenance, capital expenditures, direct support, and potential distribution of profits to project participants.

NGO-Donor Model: An NGO uses donor funds to underwrite project implementation and carbon registration. Revenues from carbon credits are then used to partially support operations, maintenance, and direct support costs, furthering a sustainability strategy.

Private investor model: Here, a private investor finances project implementation and carbon registration in exchange for carbon credits and seeks a return through their sale.

8 World Bank - What You Need to Know About Emission Reductions Payment Agreements (ERPAs): https://www.worldbank.org/en/news/feature/2021/05/19/what-you-need-to-know-about-emission-reductions-payment-agreements

Hybrid NGO-Investor Model: In this innovative approach, an NGO uses donor funds for initial project implementation (e.g., infrastructure development) and then partners with a private investor to cover registration, possibly including monitoring and auditing costs, and additional costs incurred before the project begins generating revenue. This model allows for risk sharing and leverages the strengths of both the nonprofit and private sectors to ensure project viability and long-term sustainability.

Developer-Retailer Investment: Carbon project developers and retailers can invest in carbon registration or project implementation in exchange for a set amount of carbon credits or a greater share of carbon revenues. This dynamic can encourage further investment in sectors such as WASH, but it is important for project implementers to ensure a fair distribution of carbon benefits and revenues to all stakeholders.

2.3.1 What capacity and expertise are required by an organization for generating carbon credits?

The voluntary carbon market offers a unique opportunity for organizations to contribute to global carbon reduction efforts while supporting their projects financially. However, to successfully navigate this market, organizations must possess or develop certain capacities and expertise, outlined in Table 4:

Table 4: *Organizational Capacity Requirements for Carbon Credit Implementation*

Criteria	Description
Project Implementation Expertise: Organizations must demonstrate the ability to manage large-scale projects effectively.	**Scale of Impact**: Ability to reach tens of thousands of households or manage significant environmental projects (e.g., reaching 30-50K households with safe water or afforestation of thousands of hectares). **Quality Assurance**: Ensuring projects meet exacting standards of impact, such as sustainable access to safe drinking water or the effective management of reforested areas.
Robust Monitoring and Verification Systems: Effective monitoring is crucial for the credibility of carbon credits.	**Advanced Monitoring Systems**: Implementation of sophisticated monitoring technologies and methodologies to collect and analyze data. **Quality Control**: Processes to ensure the accuracy and reliability of data, capable of withstanding rigorous external audits.
Financial Management and Risk Assessment: Given the volatility of carbon credit revenue, organizations need robust financial strategies	**Financial Planning**: Ability to forecast and manage the financial aspects of carbon projects, including initial costs, ongoing expenses, and potential revenue from carbon credits. **Risk Mitigation**: Strategies to address financial uncertainties, including diversifying funding sources and negotiating risk-sharing arrangements with partners.
Legal and Regulatory Compliance: Understanding the legal landscape is essential for organizations to navigate the complexities of carbon markets	**Compliance Knowledge**: Familiarity with national and international regulations governing carbon credits and environmental projects. **Contractual Expertise**: Ability to negotiate and manage contracts related to carbon credit generation and sale.

Criteria	Description
Community Engagement and Social Equity: Projects should be designed and implemented with a strong emphasis on community involvement and benefits	**Inclusive Project Design**: Ensure projects are developed with community input and address local needs and priorities. **Equitable Benefit Sharing**: Systems to distribute the benefits of carbon credit sales fairly among all stakeholders, particularly local communities, and project participants.
Environmental and Social Safeguards: Adherence to high environmental and social standards to ensure projects contribute positively to the environment and society	**Safeguard Policies**: Implementation of policies to protect the environment and local communities from potential negative impacts of projects. **Sustainability Commitment**: Projects should contribute to long-term environmental sustainability and social well-being.

For organizations considering the pursuit of carbon credits, a multifaceted approach encompassing project management, monitoring, financial acumen, legal compliance, community engagement, and adherence to environmental and social safeguards is essential. Building or enhancing these capacities will not only enable successful participation in the carbon market but also ensure that projects have a meaningful and lasting impact.

2.4 What WASH projects can generate carbon credits?

The WASH sector is a significant contributor to GHG emissions, comparable in size to the aviation industry, accounting for approximately 2% of total annual emissions. Depending on the boundaries of the analysis, this impact could be as high as 10% of global carbon emissions (Thomas 2024). Table 5 describes various interventions aimed at reducing carbon emissions within the WASH sector, highlighting their applicability in sub-Saharan Africa and their potential to facilitate carbon credits. These interventions are categorized into five groups, three of which are directly related to WASH activities and two of which are indirectly related:

1. **Energy procurement and operational efficiency:** Transitioning from non-renewable to renewable energy sources to power WASH infrastructure, as well as improving the operational efficiency of water and sanitation systems, is a critical avenue for reducing emissions.

2. **Direct emissions from sanitation:** Addressing and mitigating methane emissions from sanitation systems is critical to reducing the sector's carbon footprint.

3. **Substitution of drinking water boiling (Safe Water):** Facilitating access to safe drinking water can significantly reduce the need to boil water, thereby reducing the carbon emissions associated with this practice.

4. **Eliminating solid fuels for cooking (WASH-related):** Promoting clean cooking solutions is consistent with reducing reliance on solid fuels, thereby indirectly supporting emissions reductions within the WASH sector.

5. **Nature-based carbon sequestration (WASH-related):** Engaging in reforestation efforts related to water resources and disaster risk management not only improves environmental health, but also contributes to carbon sequestration, providing a reciprocal relationship with WASH initiatives.

Table 5: *Green House Gas mitigation potential in the WASH sector*

Intervention type	Emission reduction potential	Relevance for WASH sector in Sub-Saharan Africa	Relevance of carbon credits
Energy sourcing and operational efficiency: Shift from non-renewable to renewable energy to power WASH infrastructure and operate water and sanitation systems efficiently.	**High**. Water and wastewater extraction, distribution, and treatment account for about 4 percent of global electricity consumption and 50 million tons of oil equivalent of thermal energy (IEA, 2016). Global emissions of energy-related emissions (i.e., the use of fossil fuels for energy production) for water extraction, treatment and supply, and wastewater collection and treatment are estimated to be 400 to 550 million tCO2e (GWI 2022, Thomas 2024), or about 1 percent of annual global greenhouse gas emissions.	**Low,** but growing. Countries in sub-Saharan Africa contribute little to these emissions (GWI 2022). However, emissions are expected to rise as services expand and water use increases.	**Low** to **medium**, but possible (see Table 2). However, low relevance in the context of replacing diesel-powered pumps with solar systems: Burning 377 liters of diesel emits one ton of CO2. Replacing this amount of diesel can generate one carbon credit. However, carbon credits can be sold for 5 to 10 USD/ tCO2e, while the cost of 377 liters of diesel is between 250 and 500 USD in most countries.
Note: The adoption of renewable energy to power WASH infrastructure is imperative for utilities and other stakeholders. This transition should be coupled with efforts to reduce water losses and improve pumping efficiency. In the Ethiopian context, promoting the use of solar and low-carbon grid electricity for pumping is essential. Given the reduction in operating costs achieved by replacing fossil fuels with renewable energy, financing models based on these cost savings appear more promising than relying on the relatively modest additional revenue generated by carbon credits. However, the introduction of renewable energy should not be done at the expense of service reliability.			
Direct emissions from sanitation: Mitigating methane emissions from sanitation systems.	**High,** but not well understood. Global methane and nitrous oxide emissions from wastewater, sludge treatment, and on-site sanitation systems are estimated to be 400 to 550 million tCO2 (GWI 2022; Thomas 2024), or about 1 percent of annual global greenhouse gas emissions. A recent meta-analysis found that methane emissions from non-sewered systems are still not well understood, but are estimated to be 377 (22-1,003) million tCO2e/year, or 4.7 percent (0.3-12.5 percent) of anthropogenic methane emissions (Cheng 2022).	**High,** but to be confirmed. Emissions from on-site sanitation systems (which are common in sub-Saharan Africa) can have a significant impact on the climate. In Ethiopia alone, methane emissions from on-site sanitation have been estimated at more than 7 million tons of CO2e/year (Evans 2023).	**Currently medium**, but potentially **high in the future**. Methane capture from wastewater treatment plants is a common project type for generating carbon credits. However, there are no projects that generate carbon credits for improved management of on-site sanitation systems. The Container Based Sanitation Alliance (CBSA) is actively exploring how its members can generate additional revenue through carbon credit generation.

Intervention type	Emission reduction potential	Relevance for WASH sector in Sub-Saharan Africa	Relevance of carbon credits
Note: The WASH sector needs to improve its understanding of methane emissions from non-sewered sanitation and identify specific measures to mitigate and monitor these emissions, such as more frequent emptying of pits and septic tanks to reduce methane release. It is important to note that safely managed sanitation systems are not inherently climate-smart, and global monitoring efforts will need to be adapted to incorporate climate considerations. In addition, carbon credits can only be generated for well-defined interventions where emission reductions can be accurately monitored.			
Replacing the boiling of drinking water: Providing access to safe drinking water.	**Low.** Approximately 600 million people in low- and middle-income countries report boiling their drinking water (Rosa, 2010). Based on an estimate of 0.5 to 1 tCO2e per household per year, the maximum annual emissions are 60 to 120 million tCO2e but are likely to be much lower because many households use electric kettles rather than inefficient wood-burning stoves.	**Medium.** In sub-Saharan Africa, 76 percent of households access water from sources that are contaminated, mainly with fecal matter (WHO 2022). Household water treatment, including boiling, is recommended - at least as an interim measure.	**High,** but could be lower in the future if the rules for the use of avoided demand were to change. A recent publication estimated the potential carbon credit generation from avoided fuel use at more than 218 million tCO2e per year (Thomas 2024).
Note: Despite the comparatively modest emissions reduction potential of replacing the boiling of drinking water, this type of intervention has accounted for a considerable proportion of the carbon credits issued to date. Certification of safe water projects has become standard practice, and the Gold Standard has published a methodology specifically tailored to safe drinking water (see Table 2).			
Eliminating solid fuels for cooking: Promotion of clean cooking options.	**High.** Worldwide, 2.4 billion people rely on polluting open fires or inefficient stoves to cook their food, harming their health, the climate, and the environment. Burning wood fuels produces about 1,000 million tCO2e each year, or about 2 percent of global emissions (CCA 2022). These estimates include emissions from boiling drinking water.	**High.** Firewood and charcoal are widely used for cooking in sub-Saharan Africa. While not directly a WASH intervention, promoting clean cooking solutions is an environmental health intervention with many parallels to market-based approaches to promoting sanitation or household water treatment options.	**High.** Common project type for generating carbon credits, although recent reports suggest that some projects may have been over-credited (Gill-Wiehl 2024). Biodigesters that produce biogas for cooking combine sanitation and clean cooking and can be registered as a carbon project.
Note: Emissions from boiling drinking water can also be reduced by encouraging a shift to cleaner cooking practices. For example, the use of electric stoves powered by clean grid electricity results in a minimal carbon footprint. Eliminating the use of solid fuels, primarily firewood and charcoal, for cooking has significant potential for both climate change mitigation and public health improvements. Currently, there is a shift from promoting fuel-efficient stoves that use less firewood or charcoal to advocating for clean cooking solutions such as electricity, biogas, ethanol, or LPG.			

Intervention type	Emission reduction potential	Relevance for WASH sector in Sub-Saharan Africa	Relevance of carbon credits
Nature-based carbon sequestration: Reforestation related to water resource and disaster risk management.	**Very high.** By 2030, nature-based solutions implemented across all ecosystems can deliver emission reductions and removals of 5,000 to 11,700 million tCO2e per year (UNEP 2021).	**High.** Implementing nature-based solutions is relevant on all continents.	**High.** Common type of project to generate carbon credits, although recent reports suggest that some projects may have over-credited (West 2023).

Note: Reforestation efforts linked to water resources and disaster risk management are not the primary drivers for implementing nature-based carbon sequestration. However, the WASH sector can play a supporting role in the conservation and rehabilitation of ecosystems. The contribution of nature-based solutions to global climate change mitigation requires adherence to strict social and environmental safeguards to avoid harm.

Carbon Financing for WASH in Ethiopia: Opportunities and Strategies

This section outlines the exploration into generating carbon credits from various WASH interventions by MWA members and partners in Ethiopia. Utilizing the feasibility study by NatureCo on the carbon credit potential of 10 water systems in Amhara, we aim to provide a comprehensive overview of potential carbon credit generation through targeted WASH activities. The interventions considered include:

- **Water Purification Interventions**:
  - Multi-village water schemes with chlorinated water
  - Borehole rehabilitation
  - Use of chlorine dispensers and household water filters
- **Operational Efficiency Improvements**: Adoption of solar pumping solutions.
- **Environmental Conservation Efforts**: Reforestation within water resource management (WRM) frameworks.

The focus is on evaluating these interventions for their potential to contribute to carbon credit generation, emphasizing the implications of incorporating suppressed demand in baseline scenarios and assessing the financial viability of these interventions under current carbon market conditions. Through detailed analysis, this section seeks to highlight the critical factors influencing emission reductions, operational efficiencies, and the overarching sustainability of WASH interventions in the context of carbon financing.

3.1 Are the WASH interventions eligible? Any concerns?

In the context of carbon finance for WASH interventions, key concepts such as suppressed demand and additionality are critical for understanding eligibility and ensuring projects contribute to genuine emission reductions.

Suppressed demand refers to the theoretical future demand for energy-intensive water treatment methods, like boiling with non-renewable biomass, in communities currently using untreated water due to lack of access to cleaner alternatives. It is crucial in settings where traditional water boiling is uncommon, enabling projects to account for hypothetical boiling practices to increase the scope of emission reductions.

Additionality, particularly in least developed and land-locked developing countries, affirms that projects would not proceed without carbon finance.

This section emphasizes the importance of a meticulous approach to integrating carbon finance with WASH projects, highlighting the unique challenges and considerations, such as water recontamination risks, that accompany efforts to replace boiling practices, aiming to maximize benefits while navigating complexities, and avoiding potential pitfalls like greenwashing.

3.1.1 Suppressed Demand

Suppressed demand in the context of carbon credits for water security initiatives is a construct that presumes a theoretical demand for non-renewable biomass burning (such as wood fuel) associated with treating water by boiling. This assumption is made even though only a minority of households in some regions actually boil their water for purification, with the majority consuming untreated water. This concept facilitates the generation of carbon credits by projecting a reduction in greenhouse gas emissions that would have occurred due to boiling, thereby supporting climate reparative water infrastructure through economic incentives.

In the Ethiopian context, suppressed demand is a critical consideration for projects that focus on "replacing boiling for drinking water," and is discussed in more detail in Box 9. While the reduction in GHG emissions comes from replacing boiling with alternative safe water treatment methods, less than 5 percent of households in Ethiopia use boiling as a household water treatment method (EDHS 2016). According to the current version of the Gold Standard methodology (see Table 2), suppressed demand principles can be applied by assuming that households currently using unsafe water would have boiled their drinking water in the absence of the WASH intervention. Approximately 80 percent of households in Ethiopia, and possibly more, lack safe drinking water at the household level (ESS WQ 2017). If this statistic is credibly presented in a project baseline report, emission reductions can be claimed for 80 percent of households without safe water, rather than the less than 5 percent that currently boil their drinking water. Finally, to provide a more justifiable method of accounting for suppressed demand, some project developers may take the approach of claiming carbon credits only for the percentage of households without safe water that would likely select boiling as the treatment method, based on the practices observed in the baseline survey (fractional method, e.g., if 80 percent have unsafe water and 20 percent report treating their drinking water, of which 5 percent by boiling, this would result in a fraction of 20 percent of households eligible for carbon credits). See Box 9 for an example.

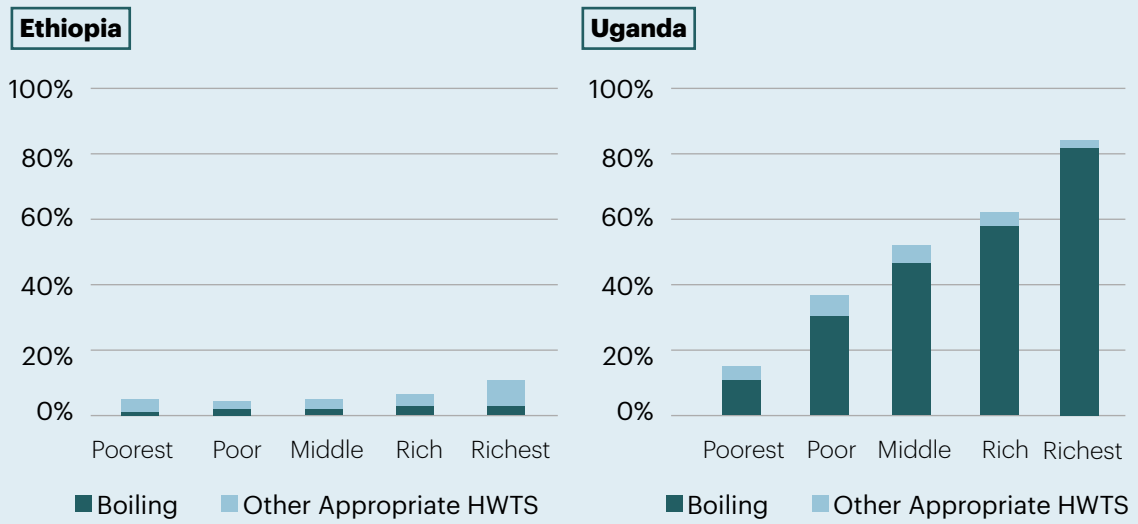
Box 9: Where does suppressed demand come from?

The goal of carbon markets is to finance projects that reduce, remove, or avoid GHG emissions, but also to promote clean and sustainable development. However, the poorest communities typically emit little GHG due to lack of access to energy (i.e., energy poverty). With few emission reductions to achieve, these communities would be systematically excluded from the benefits of carbon markets. This is why the concept of "suppressed demand" was introduced, which allows carbon credits to be generated using a baseline based on energy consumption that meets actual needs, such as boiling unsafe drinking water. Thomas et al. provide some compelling arguments for applying suppressed demand to safe water projects (Thomas 2012, Thomas 2023).

Suppressed demand is accounted for in the latest version of the Gold Standard methodology by assuming that households currently consuming unsafe water would have boiled their drinking water in the absence of the WASH intervention. Figure 3 shows that in Uganda, only 91% of households that treat their drinking water at home do so by boiling, and that richer households are much more likely to boil than poorer households. Providing safe water to poorer households in Uganda is highly likely to avoid future carbon emissions, as these households are likely to have started boiling their drinking water as they have more resources.

However, in Ethiopia, only 34% of households that treat their drinking water at home do so by boiling (see Figure 3). The baseline survey conducted by MWA and NatureCo (see Annex 1) revealed a similar picture: out of 135 households surveyed, only 32 reported treating their drinking water at home. Of these, only one boiled the water, while the others used chlorine (29) and household water filters (2). Thus, even with increased resources and knowledge, most households in Ethiopia would likely choose low-GHG emitting technologies, such as chlorine or household water filters, rather than boiling their drinking water.

Figure 3: *'Households treating water by boiling' and 'Households using an appropriate treatment method' in Ethiopia and Uganda disaggregated by wealth quintile (UDHS 2016 and EDHS 2016, retrieved from STATcompiler, www.statcompiler.com).*



Given the current scrutiny of global carbon markets, there is a possibility that the rules for applying suppressed demand in the Gold Standard methodology may change in the future. Such a change could have a significant impact on the number of carbon credits that can be claimed for safe drinking water projects in Ethiopia. In addition, generating carbon credits from a safe drinking water project poses reputational risks for project implementers without a robust case that can be plausibly explained to the public about how replacing the boiling of drinking water will result in actual emission reductions (see Box 10).

Box 10: How to account for suppressed demand?

For the feasibility study conducted by NatureCo on behalf of MWA (see Annex 1), two main baseline scenarios were established (based on 135 households surveyed, of which 32 reported treating their drinking water at home - one of them by boiling and the others through alternative methods). The first scenario assumes that the proportion of households that boil water would remain constant if all households treated unsafe water, which is 3 percent of households (1 out of 32). The second scenario assumes that proportion of users expected to boil water for drinking would be the same as the proportion of households consuming unsafe water. According to the study's household survey, 76.4 percent of households (103 out of 135) do not use any water treatment method and therefore consume unsafe water. It is assumed that this proportion of households would use boiling as a water treatment method in the absence of the project. Therefore, based on the current version of the Gold Standard methodology and applying the principle of suppressed demand, the proportion of households using boiling as a treatment method would include those actually using it (3 percent) and those assumed to use it in the absence of the project (76.4 percent), for a total of 79.4 percent.

Percentage of households that treat their drinking water by boiling out of those that treat their water at home (1/32 = 3%) + Percentage of households that do not use any water treatment method i.e. suppressed demand (103/135 = 76.4%) =

Percentage of households eligible, taking into account suppressed demand (3% + 76.4% = 79.4%)

If the **fractional method** is used to account for suppressed demand is applied, the calculation would be as follows:

[Percentage of households that treat their drinking water by boiling (1/135 = 0.7%) /
Percentage of households that treat their drinking water by other methods (31/135 = 23.0%)] x
Percentage of HHs that do not use any water treatment method (103/135 = 76.4%) =
Suppressed Demand [(0.7%/23.0%) x 76.4% = 2.4%]

Suppressed Demand (2.4%) +
Percentage of household that treat their drinking water through boiling (0.7%) =
Percentage of households eligible, taking into account suppressed demand using the fractional method (2.3% + 0.7% = 3.1%)

3.1.2 Additionality

Additionally, particularly in Least Developed Countries (LDCs) and Landlocked Developing Countries (LLDCs), affirms that projects would not proceed without carbon finance. Carbon projects must demonstrate that they would not have taken place without the additional revenue from carbon credits to be considered "additional". According to the current version of the Gold Standard's requirements for community benefit activities (Gold Standard 2019), projects implemented in LDCs and LLDCs are not required to demonstrate financial additionality, recognizing that community-based projects in these countries are generally underfunded. Therefore, the WASH interventions implemented by MWA members in Ethiopia can be considered additional.

In countries that are not classified as LDCs or LLDCs, demonstrating additionality could be a challenge for projects involving "multi-village water schemes providing chlorinated water". The provision of safe drinking water may be mandated by national regulations and expected to be implemented within existing budgets. Therefore, it may be less straightforward to demonstrate that the establishment of multi-village water schemes would not have occurred without the additional carbon revenue.

3.1.3 Replacement of Boiling Water (Safe Water)

Relevant to "borehole construction/rehabilitation" projects. In the past, it was assumed that providing safe water at a borehole would eliminate the need for boiling. However, recontamination of water during transport and storage is common. According to a national water quality survey, only 8.4 percent of rural Ethiopian households had access to safe water at the point of collection, while only 1.5 percent had access to safe water at the point of consumption (EDHS 2016). Claiming carbon credits based on suppressed demand when households may still not be consuming safe water poses significant reputational risks for project implementers (see Box 11).

The latest version of the Gold Standard methodology (**see Table 2**) addresses this inconsistency. While the methodology still allows carbon credits to be generated through the installation and rehabilitation of hand pumps and solar-powered pumps, monitoring data must document the microbiological quality of the water in the containers when it reaches the end user. In practice, water supply projects without water treatment are unlikely to meet this threshold. Even with water treatment at the point of collection (e.g., chlorination), meeting the 90 percent threshold is challenging and poses a risk to this type of project, as no carbon credits may be issued in certain years.

Box 11: What are the reputational risks associated with carbon credits?

Since its inception, there has been debate about the pros and cons of carbon credits. A common criticism is that carbon credits enable greenwashing. However, recent research suggests that companies participating in the voluntary carbon market outperform their peers in accelerating climate action (Forest Trends 2023). Still, it is recommended that companies consider the pros and cons and make an informed decision at the organizational level about whether to engage in the voluntary carbon market.

There have also been reports that carbon credits do not deliver what they promise. A study published in 2023 claimed that only 6 percent of carbon credits from forest conservation projects were linked to additional carbon reductions (West 2023), while another study in 2024 claimed that cookstove projects were over-credited by a factor of 10 (Gill-Wiehl 2024). Both studies were widely reported in the media, including by The Guardian. Carbon credits from WASH interventions have also received some attention in the past (e.g., Pickering 2017) and are likely to receive more attention in the future. Although controversial, these articles bring attention and scrutiny to carbon credits. It is the role of project implementers to ensure that a compelling case can be made in response to potential allegations to justify the claimed emission reductions.

3.1.4 Permanence (Reforestation for Water Resource Management)

Relevant for projects under "reforestation as part of water resource management." Nature-based carbon sequestration (e.g., reforestation) has the risk of being reverted. For instance, a community forest may be replanted, and carbon credits issued for the carbon removals, but after 10 years when the trees are tall enough to be used for construction material, the trees may be cut down by the community and the land used again for grazing. Carbon standards have different approaches to manage the risk of reversal and non-permanence, e.g., the Gold Standard requires a fixed 20 percent contribution for a pooled compliance buffer, which remains untouched even after the crediting period.

When implementing reforestation as part of water resource management, it is important to remember that carbon credits are not issued for the planting of trees, but for the permanent establishment of forested areas. Implementing organizations specializing in WASH are well advised to work with organizations with a proven record in natural regeneration and reforestation projects to reduce the reputational risks associated with non-permanent forestry projects.

Box 12: What are other risks associated with carbon credits?

In addition to reputational risks, there are other risks that need to be considered when deciding whether to pursue carbon registration. These risks, which are interrelated in many ways, affect the financing models for generating carbon credits. Project implementers need to carefully manage and mitigate these risks and have a clear understanding with other project stakeholders about who will pay for what (see Box 7) and who will bear what risks.

Risks of under-delivery: Fewer carbon credits are issued than originally expected. As shown in Table 4, certain parameters are extremely sensitive and it is quite possible that a project can only issue, say, a quarter of the amount of carbon credits originally expected. This also includes registration risks, where the project may be rejected for registration by the carbon standard and not issue any carbon credits, and implementation risks, where a project may not deliver the results initially expected.

Monitoring risks: Field data must pass third-party verification. If monitoring data does not meet the quality standards required to pass an audit, carbon credits may not be issued. In some cases, it may be possible to make more conservative assumptions to fill gaps in monitoring data, resulting in underperformance. Finally, monitoring costs may be higher than originally anticipated, for example, if certain surveys need to be repeated or a project database needs to be rebuilt.

Price risks: Carbon credit prices are volatile and may not be sold at the expected price. In recent years, prices for carbon credits from water projects have typically been in the range of $5-10 USD/tCO2e, if they can be sold. There is no guarantee that carbon credits will be sold, and older carbon credits typically sell at a lower price.

Regulatory risks: Governments may ban the generation and trading of carbon credits or decide that all carbon credit benefits belong to the government, both of which have an enormous impact on revenues.

3.2 What is the emission reduction potential of the specific WASH interventions?

This section explores the feasibility study by NatureCo for MWA (Annex 1), focusing on generating carbon credits through the provision of safe drinking water in the Amhara region. Key aspects include:

Project Overview: Introduction of ten solar-powered pumps and chlorination systems targeting 50,000 households across three districts, utilizing the gold standard methodology for emission reductions.

Carbon Credit Potential: The study evaluates carbon credits generation over 10 years, contrasting scenarios with and without suppressed demand. Results indicate:

- **With suppressed demand:** An estimated generation of 730,440 carbon credits.
- **Without suppressed demand:** A significantly lower estimate of 27,600 carbon credits.

Critical Parameters: Discussion on sensitive parameters affecting emission reduction calculations and potential risks for project implementers, such as:

Quantity of safe drinking water provided.
Baseline usage of safe water supplies.
Water quality impacts on carbon credit claims.
Non-renewable biomass fraction considerations.

This analysis highlights the challenges and complexities in leveraging water purification projects for carbon credit generation, underscoring the importance of detailed planning and conservative assumptions in achieving environmental and health objectives.

3.2.1 Replacing boiling of drinking water

The feasibility study investigated the potential to generate carbon credits for the provision of safe drinking water through the installation of ten new solar-powered pumps and the installation of chlorination systems to reach a total of 50,000 households in three woredas (districts) in the Amhara region (see Annex 1). The gold standard "Methodology for Emission Reductions from Safe Drinking Water Supply V1.0" was used (see Table 2).

The results are highly dependent on whether suppressed demand is included in the baseline scenario:

- **With suppressed demand** (i.e., 79.4 percent boiling in the baseline scenario), the project is estimated to generate 730,440 carbon credits over 10 years (1.46 tCO2e/HH/year).
- **Without suppressed demand** (i.e., 3 percent boiling in the baseline scenario), the project is estimated to generate only 27,600 carbon credits over 10 years (0.055 tCO2e/HH/year).

The carbon credits that can be claimed for household water filter or chlorine dispenser projects are expected to be at the same level if the same number of households (i.e., 50,000) are reached.

Emissions Reductions Parameters

Details of the emission reduction calculations can be found in the Feasibility study (see Annex 1). Table 6 below summarizes the most sensitive parameters used in the calculation and highlights risks/considerations relevant to project implementers. It is important to note the sensitivity of certain parameters: by using more conservative assumptions and fully applying suppressed demand, the emission reduction from the project could fall below 2,000 carbon credits over a 10-year period.

Table 6: *Discussion of selected parameters used for the emission reduction calculation:*

Parameter	Description	Reflections
Qy	Quantity of safe drinking water provided by the project in year y. Value applied: 343,100 m3/year (corresponding to 940 m3/day and 94 m3/scheme/day) Based on: • 50,000 households • 4.7 persons/household • 4 Liter/person/day • 10 schemes • 100% usage	The estimated amount of safe drinking water consumed by project end-users (i.e., an average of 94 m3/scheme/day) needs to be compared with the monitored amount of water supplied (based on water meter readings). The 94 m3/scheme/day seems relatively high. For example, if water is supplied through 10 standpipes that are open 8 hours a day, each standpipe must supply 1,175 L/hour and fill one jerrycan every minute. If less than 343,100 m3/year is delivered per year according to the water meter readings, the amount of carbon credits will decrease proportionally.
Cb	Proportion of project end-users who were already using a safe water supply that did not require boiling at baseline. Applied value: 20.6% (with demand-side management) and 97.0% (without demand-side management). Based on a household survey conducted by MWA and NatureCo (see Annex 1 and Box 9).	The value without suppressed demand is the proportion of households using boiling as a treatment method out of the households using a treatment method (i.e., 1 out of 32 households). Suppressed demand is still assumed for some households that do not currently treat their water. Overall, the household survey revealed that only 1 out of 135 households boiled their water (see Appendix 1). Without the use of suppressed demand, Cb would be 99.3% and emission reductions would further decrease by a factor of 3 to 8,575 tCO2e over 10 years.

Mq,y	Modifier for water quality in year y. Applied value: 100%. Based on the assumption that all water supplied will have no detectable E. coli in 100 mL when it reaches the end user's household.	Carbon credits can only be claimed for water that is safe when it reaches the end user. For example, if only 95% of the water is safe, 5% fewer emission reductions can be claimed. This is a relatively small impact. However, if the proportion of unsafe samples exceeds a certain threshold, no emission reductions can be claimed for the corresponding monitoring period. The thresholds are: – Project Year 1: 20%. – Project year 2: 15%. – Project year 3 and above: 10%
fNRB	Fraction of non-renewable biomass. *Note: No carbon credits can be claimed if renewable biomass is used to boil drinking water.* Applied value: 0.753 Based on CDM Tool 30-Calculation of non-renewable biomass share, version 4.0.	Following a discussion on the appropriateness of fNRB values, new default values at the country level were proposed in October 2023 (CDM 2023) for the period 2020-2030. The proposed fNRB value for Ethiopia is 0.36. Using the default value of 0.36 will proportionally reduce the emission reductions, i.e., it would reduce the emission reductions by half.

Box 13: Are carbon credits a results-based financing mechanism?

In general, yes! Carbon credits are issued against robust monitoring data on the amount of safe drinking water delivered to end-users. Once key parameters such as emission factors, prevalence of boiling (including suppressed demand), efficiency of cookstoves used to boil water, and proportion of non-renewable biomass are established, a fixed number of carbon credits are issued for each cubic meter of safe water that is proven to have been consumed. In the example above, including suppressed demand, this is 0.225 carbon credits/m3 of water supplied. In other words, avoiding the boiling of 4,453 L of water on unimproved stoves results in an emission reduction of 1 tCO2e.

However, the values of the baseline parameters vary between projects, making the projects comparable in terms of emission reductions but not in terms of safe water supply. In addition, it is not uncommon for some of the baseline parameters to be adjusted over the course of a five-year crediting period. Therefore, changes in parameters unrelated to measuring the impact of a drinking water project can have a significant impact on the results. For example, a change in the share of non-renewable biomass, as described in Table 4, can increase the amount of safe water needed to generate one carbon credit from 4,453 to 9,314 L without changing the actual project performance.

3.2.2 Energy Sourcing and Operational Efficiency

Emission reductions from diesel saved by installing solar-powered pumps are not included in the above calculation (i.e., the calculation is based solely on the emissions avoided by eliminating boiling for water treatment). Based on a rough estimate by the MWA team, up to 100 L of diesel can be saved for each of the 10 systems (approximately 1,000 L/day in total). Based on a rough calculation (2.68 tCO2e/L diesel), the annual emission reduction for all 10 systems is less than 1,000 tCO2e.

This is well below the threshold of around 50,000 tCO2e usually required to make a project financially viable, and therefore no detailed assessment was made. As described in Table 5, **the cost savings from replacing diesel are much higher than the relatively small additional revenue that can be generated from carbon credits.** Financing models based on these cost savings appear to be more promising, particularly in local contexts where it can be demonstrated that the savings are higher than the full life-cycle costs of alternative renewable energy sources such as solar.

3.2.3 Nature-based Carbon Sequestration

A geospatial analysis of the afforestation/reforestation potential on rangelands and drylands in the Lake Tana Basin was conducted by NatureCo on behalf of MWA (see Annex 3). The assessment estimated 35,000 ha of priority areas for afforestation. A high-level estimate, based on an average of 165 tCO2e/ha aboveground biomass over a project life of 30 years, results in 5.8 million tCO2e that could be sequestered. A reforestation project across the entire Lake Tana Basin would likely be attractive in terms of carbon removal potential. However, a further breakdown of the project to the woreda level or to individual project sites is unlikely to yield carbon removal potential attractive enough for further exploration.

3.3 Is a Carbon Certification financially viable for the WASH Interventions?

The total cost for a 10-year credit period for the 10 water systems evaluated in the feasibility study was estimated at $1,517,539, including:

- **Project implementation costs** $870,155 to procure, transport, and install solar systems, water pumps, and water treatment units at 10 sites.
- **Ongoing costs** of $143,000 for water supply technology maintenance, monitoring, and annual surveys.
- **Carbon project certification costs** $503,394 for local carbon capacity building and training, validation and verification audits, and carbon standard fees.

Using the project implementation and carbon registration costs shown above, this results in a carbon price of $2.08 per tCO2e (with suppressed demand) and $54.90 per tCO2e (without suppressed demand). Therefore, including suppressed demand and considering market prices of $5-10 USD/tCO2e, the project is attractive, even allowing for possible under-deliveries and a sales margin for a trader to sell the carbon credits. However, without suppressed demand, the project is not financially viable at current carbon credit prices.

In comparison to other WASH interventions, the project cost ($1,013,155 for implementation and running costs) is cost effective in itself to provide safe water to 50,000 HHs for 10 years (approximately $2 per household per year). Emission reductions assume that 50,000 HHs with an average size of 4.7 persons consume 4 L/person/day. This corresponds to 3,431,00 m3 of drinking water over the 10-year crediting period and $0.30 per m3. User fees could potentially cover the full cost of the intervention.

Strategies for integrating Carbon Credits in WASH projects

This document aims to demystify the integration of carbon credits in the WASH sector and provide a structured roadmap for project implementers on the path to carbon certification. It delves into a comparative analysis of the emission reduction potential of different WASH interventions to identify those with significant opportunities for carbon financing, with a particular focus on safe drinking water projects for their key role in reducing greenhouse gas emissions by eliminating the need to boil water.

The guidance provided here is tailored to the spectrum of WASH interventions, from broad considerations to the specifics of projects focused on access to safe water, and a decision tree to help guide whether to pursue a carbon credit project. It provides a set of recommendations to help implementers navigate the intricacies of carbon certification processes, ensuring that WASH projects not only promote environmental sustainability but also take advantage of the financial mechanisms available through carbon credits.

Key Recommendations:

Comprehensive assessments of greenhouse gas emissions for all WASH projects to identify those with the greatest mitigation potential.

Prioritize high-impact interventions focusing on interventions with significant emissions reduction potential, such as the use of renewable energy solutions for water treatment and pumping.

Harnessing Suppressed Demand approaches to increase carbon credit generation, particularly for projects that improve access to safe drinking water.

Transition to Renewable Energy from traditional energy sources in WASH operations to minimize carbon footprints and strengthen eligibility for carbon credits.

Strict monitoring and verification standards to validate emission reductions and ensure compliance with carbon certification requirements.

Feasibility of Carbon Certification: Careful assessment of the potential for carbon certification for each project, weighing the scale of intervention against expected emission reductions and the financial and reputational risks involved.

This paper serves as an essential tool for WASH project implementers, providing an in-depth look at the use of carbon credits as a viable mechanism for financing sustainable water and sanitation efforts. By following these guidelines, stakeholders will be well-positioned to make a significant contribution to global climate change mitigation efforts and open new avenues for financing the improvement and expansion of WASH services.

4.1 Leveraging Carbon Credits for climate mitigation in WASH

The WASH sector represents a significant opportunity for climate change mitigation, particularly through the strategic use of carbon credits. Despite competition from sectors such as energy and forestry, WASH interventions, particularly in the areas of methane mitigation and sanitation, have the potential to make a meaningful contribution to environmental sustainability efforts. Responsible for about two percent of global GHG emissions, this sector mirrors the impact of industries such as aviation, underscoring the importance of strengthening its climate resilience. Through a focused examination of carbon finance, this section aims to highlight the potential for reducing emissions in the WASH sector, address the challenges of issuing carbon credits, and advocate for integrated approaches to support climate action.

Key Recommendations:

Expand carbon finance in WASH: Explore and use carbon credits to finance the transition to climate-resilient WASH systems.

Broaden Climate Finance Streams beyond carbon credits to support comprehensive mitigation efforts.

Promote cleaner cooking practices: Transition to electric stoves and reduce reliance on solid fuels to reduce emissions from boiling drinking water.

Integrate reforestation efforts: Combine WASH projects with reforestation and water resource management to increase carbon sequestration.

Address sanitation emissions: Focus on reducing direct emissions from both sewer and non-sewer sanitation systems as a key climate mitigation strategy.

The WASH sector has significant climate change mitigation potential, and carbon credits can help finance part of the transition to climate-resilient WASH systems. However, certain sectors related to WASH, such as energy and forestry, are better positioned to take advantage of existing carbon credit opportunities. Therefore, the WASH sector may consider exploring and prioritizing other climate finance streams, apart from carbon credits for methane mitigation from sanitation systems, which remain relevant and should be pursued.

Globally, the WASH sector contributes about two percent of total annual greenhouse gas emissions, which is comparable to the emissions of the aviation sector. Most WASH-related emissions come from energy consumption to power water and sanitation infrastructure, as well as direct emissions from both sewer and non-sewer sanitation systems. Emissions from sub-Saharan Africa contribute only a small fraction but are expected to increase due to rising energy demand to expand water and sanitation infrastructure to ensure adequate WASH services for all. Currently, no carbon credits have been issued to water utilities for reducing water losses or improving pumping efficiency, nor for effectively treating and disposing of sludge from non-sewered sanitation systems (Thomas, 2024).

Emissions from boiling drinking water with inefficient stoves play a minor role in reducing current global GHG emissions but become more relevant when potential future emissions (i.e., suppressed demand) are considered. However, emissions from boiling drinking water can be addressed by promoting a transition to cleaner cooking practices, such as the use of electric stoves powered by clean grid electricity, which has a minimal carbon footprint. Eliminating the use of solid fuels (primarily firewood and charcoal) for cooking has significant potential to mitigate climate change and improve public health.

Reforestation activities, combined with water resource and disaster risk management, can help sequester carbon from the atmosphere. However, the scale required to make carbon certification financially viable is likely to exceed the scale of reforestation efforts specifically aimed at water resource and disaster risk management.

4.2 Carbon Credit strategies for enhanced WASH sustainability

Utilizing carbon credit strategies in the WASH sector is an opportunity to strengthen sustainability and contribute to climate goals. Key strategies include adopting renewable energy, improving operational efficiency, capturing methane for energy, and exploring carbon credits through reforestation and wetland management. These measures not only reduce greenhouse gas emissions, but also provide an avenue for financing sustainable WASH initiatives through carbon markets. Emphasizing scalable projects with

measurable impacts and manageable transaction costs ensures the viability of carbon certification efforts. This approach aligns WASH projects with broader environmental goals, builds sector resilience, and supports global climate change mitigation efforts.

Strategic Highlights:

- **Adopt renewable energy:** Transition WASH operations to renewable energy sources to reduce emissions and access carbon credits.
- **Optimize Operations:** Focus on efficiency improvements to save energy and costs.
- **Methane Recovery:** Utilize methane from sanitation operations as a renewable energy source.
- **Conservation carbon credits:** Leverage large-scale forestry and wetland projects for carbon financing, ensuring community and ecosystem benefits.
- **Selective carbon certification:** Prioritize projects that offer clear emission reductions and financial feasibility for carbon credits.

4.2.1 Operational recommendations for WASH Carbon mitigation

Water and wastewater utilities should understand and track their GHG emissions and have a plan to reduce their carbon footprint. Having such data will help identify and prioritize specific, locally appropriate interventions that can reduce GHG emissions. These measures are also likely to reduce operating and maintenance costs. While carbon credits are one of the financing options, it is recommended that governments also provide other incentives to encourage such investments (e.g., easy access to finance through dedicated funds, loan guarantees, carbon-related performance targets). Interventions may include:

- **Shifting from non-renewable to renewable energy sources**, including active advocacy for clean grid electricity in the country.
- **Increasing the operational efficiency of water and wastewater systems**, e.g., by reducing non-revenue water and optimizing pumping efficiency, energy consumption can be reduced while still serving the same number of end users.
- **Generating energy by the service provider**, such as using biodigesters in sanitation systems to produce biogas and electricity or installing solar panels on land managed by the service provider (e.g., on land used for fecal sludge and wastewater treatment).
- **Capture methane** at wastewater and fecal sludge treatment plants.

The WASH sector needs to invest in better understanding emissions from non-sewered sanitation, and in identifying specific interventions that can be taken to reduce and monitor these emissions. Carbon credits can only be generated for clearly defined interventions where emission reductions can be reliably monitored. For example, container-based sanitation is known to almost eliminate methane emissions completely through frequent emptying of toilets and effective treatment of sludge. The Container-Based Sanitation Alliance assists its members in accessing carbon credits. New methodologies may need to be developed in the future to facilitate and mainstream carbon certification of climate-smart sanitation activities.

Implementers of water resource management activities such as reforestation and wetland protection should assess the potential for generating carbon credits. Typically, at least several thousand hectares

of land are required to make such projects financially viable. As the scale of water resource management activities at the project level is likely to be too small to make certification financially viable, scaling up to a larger scale, for example led by a regional government agency responsible for natural resource management, could be explored. Careful consideration needs to be given to safeguards and benefit-sharing mechanisms, as forestry projects (unlike the provision of climate-smart water and sanitation services) have a higher risk of negatively impacting local communities (e.g. through changes in land use and land tenure, land use restrictions) and are less likely to provide immediate positive returns to local communities.

Implementers of projects that aim to provide safe drinking water to at least 30,000 to 50,000 households through decentralized household and community systems should assess the potential for generating carbon credits. Although the global potential for emission reductions is limited, carbon credits can be an attractive additional source of revenue for certain interventions. However, carbon credits are not appropriate for pilot and relatively small-scale projects reaching only a few hundred or a few thousand households, as the transaction costs of carbon certification are likely to be too high. Projects that provide water to more than 50,000 households through a single piped water system are also unlikely to be attractive for carbon credits, as the criteria for demonstrating additionality and the application of curbed demand are likely to be major barriers to successful carbon certification. For more information, see the specific conclusions and recommendations below.

4.2.2 Ethiopia-specific WASH Carbon Credit guidance

The WASH sector in Ethiopia should focus on climate adaptation funding to expand WASH services. Climate change is having a major impact on access to water, including more severe droughts and floods. Investments to scale up climate-resilient and climate-smart WASH systems are eligible for adaptation funding and, overall, more likely to be scalable than mitigation funding. Mitigation finance (e.g., carbon credits) may still play a role for specific projects.

The switch from diesel to renewable energy for water pumping in Ethiopia should be promoted, including the creation of a market for quality and affordable products, as well as installation and repair services. However, generating carbon credits for fuel substitution is not recommended due to the huge scale of such a project (which makes it difficult and expensive to operate) and the small revenues that can be generated (compared to the immense savings from no longer paying for expensive diesel). Financing models based on the cost savings of not buying diesel seem more promising, especially in local contexts where it can be demonstrated that the savings are higher than the full life-cycle costs of alternative renewable energy sources. To generate carbon credits, the provision of safe drinking water to avoid boiling should be considered as a carbon mitigation approach.

The idea of a basin-wide reforestation and wetland protection/restoration project should be pursued for the Lake Tana basin. The potential to generate carbon credits on this scale is expected to be attractive and could provide substantial funding for project implementation. Such a project is expected to have a positive impact on water resources in the basin. However, strong government support would need to be secured and appropriate partners with relevant expertise identified, as such an intervention is likely to be beyond the competence of many actors in the WASH sector.

4.3 Leveraging Carbon Credits for Safe Water interventions

To date, most carbon credits issued for WASH interventions have been generated by preventing emissions from boiling drinking water. Carbon credits for safe water projects are well established, and carbon revenues have significantly funded many WASH interventions in recent years. However, increased scrutiny of carbon markets has led to increased reputational and delivery risks for both new and existing implementers. These risks need to be carefully assessed and managed.

Although energy used to power WASH systems and direct emissions from sanitation systems are the largest contributors to greenhouse gas emissions, most carbon credits issued to date have come from replacing boiling drinking water at the household level. Subsequently, carbon credits have also been generated by reducing methane emissions at wastewater treatment plants (Thomas, 2024).

Key Recommendations:

Navigating Increased Market Scrutiny: Implementers must proactively address the reputational and delivery risks associated with carbon credit projects, ensuring transparency and robust project validation.

Methodological compliance: It is critical to adhere to established carbon certification standards and understand the nuances of eligibility, particularly the impact of project scale and the strategic application of curtailed demand.

Prudent carbon credit estimates: Given the variability of emission reduction outcomes and carbon credit issuance, a conservative approach to project financial planning is recommended.

Robust monitoring and verification: Accurate and reliable monitoring of project impacts is essential for carbon credit issuance, requiring a well-maintained database of all project interventions and a focus on scalable, community-level solutions.

Strategic Use of Suppressed Demand: The judicious use of suppressed demand in project design must be defensible and aligned with broader project objectives and market expectations.

Focus on adaptation finance: In regions such as Ethiopia, while carbon credits provide an additional source of revenue for specific interventions, prioritizing climate adaptation funding is critical to scaling up climate-resilient WASH services.

Carbon certification for safe water projects has become widespread practice, and the Gold Standard has published a specific methodology for safe drinking water supply (see Table 2). Eligible activities include the installation of water treatment technologies at the household, institutional and community levels, and the construction or rehabilitation of new water supply systems. However, projects that provide water to more than 50,000 households through a single piped system are not eligible, as they would be considered large-scale projects subject to more stringent regulations.

In many countries, only a small percentage of the population boils their drinking water to make it safe for consumption. The concept of suppressed demand makes it possible to generate carbon credits for households that do not currently boil their water but should do so due to lack of access to safe water. In Ethiopia, for example, the feasibility of a carbon credit project depends on whether and how to apply suppressed demand. Any changes in carbon methodologies regarding the application of suppressed demand will have a significant impact on the amount of carbon credits that can be generated by a safe water project.

Emission reductions are typically difficult to predict, and the actual amount of carbon credits issued is often two to three times higher than initial estimates. Many of the parameters used to calculate emission reductions are extremely sensitive, and it is always possible that a carbon standard may require adjustments, even for registered projects.

Carbon credits are issued for safe water that is consumed, which must be supported by reliable monitoring data. For example, household water filters that are no longer in use do not generate carbon

credits. Registering a carbon project requires a database of all project units, such as household water filters, hand pumps or water supply systems. In general, community-level interventions are more manageable than household-level interventions because there are fewer individual units to monitor, making them more suitable for carbon projects.

In addition to the potential for additional revenue, project implementers should carefully consider the risks associated with generating carbon credits to make informed decisions. These risks include:

- **Reputational risks**, such as public criticism for claiming carbon credits based on suppressed demand, inaccurate monitoring data, or inadequate benefit sharing.
- **Under-delivery risks**, where fewer carbon credits are issued than originally expected, and registration risks, where the project may be rejected for registration by the carbon standard.
- **Monitoring risks**, where field data may not meet the quality standards required to pass an audit.
- **Price risks**, where carbon credits may not be sold at the expected price.
- **Regulatory risks**, where governments may prohibit the generation and trading of carbon credits or decide that all carbon credit benefits belong to the state.

Box 14: Financial Risk Management for Carbon Credit Projects

In managing financial risks for carbon credit projects within the WASH sector, a multifaceted approach is crucial. **Key strategies include:**

- **Diversifying funding sources** to reduce reliance on carbon credit revenue alone, adopting conservative financial projections to account for market volatility, and engaging in forward contracts where possible to lock in carbon credit prices.
- **Establishing robust monitoring and verification processes** can help ensure project deliverables meet carbon standard requirements, thereby reducing the risk of under-delivery.
- **Regularly reviewing regulatory landscapes and potential changes in carbon market policies** is also vital for anticipating and mitigating legal and financial risks.

4.3.1 Operational Recommendations for Safe Water Carbon Credits

Project implementers overseeing initiatives that are expected to provide safe drinking water to at least 30,000 households within one to three years should evaluate the feasibility of generating carbon credits. The following step-by-step guidance will help you make an informed decision about pursuing carbon credits.

Project implementers considering carbon certification should use conservative estimates for financial projections. While it may be theoretically possible to generate 1.5 tCO2e per household per year and sell a carbon credit for $10 USD, it is also plausible that only 0.5 tCO2e will be generated and sold for $5 USD. As a result, the annual revenue per household can vary from $2.5 to $15 USD.

Project implementers seeking to generate carbon credits need to take a broader view and ensure that carbon credits from WASH interventions are based on robust and conservative assumptions and avoid biased or overestimated parameters that aim only to maximize revenue from the sale of carbon credits.

4.3.2 Specific WASH Carbon Credit guidance

The project evaluated in the Amhara region (see Appendix 1) meets all the main criteria and is likely to be financially viable if suppressed demand is used. Project implementers are advised to carefully consider how suppressed demand can be justified and whether organizations would be willing to defend this justification in a public discussion. If so, it is recommended to reassess the pros and cons, develop a risk mitigation and response plan, and reach out to carbon project developers to solicit commercial offers to support carbon certification and sale of carbon credits.

As highlighted in the initial recommendations, the WASH sector in Ethiopia is encouraged to prioritize climate adaptation funding to expand WASH services. Investments aimed at scaling up climate-resilient and climate-smart WASH systems are eligible for adaptation funding and are generally more conducive to scalability than mitigation funding. However, mitigation funding, such as carbon credits, may still be relevant for certain projects.

4.4 Decision-making framework for Carbon Credits in WASH projects (Go-No Go Decision Tree)

STEP 1 **DOES THE PROJECT MEET THE FOLLOWING KEY REQUIREMENTS FOR A CARBON PROJECT?**

1. **Reaches a minimum of 30,000 to 50,000 households.** Smaller projects are unlikely to generate enough carbon credits to make the project financially viable.

   Note: In general, carbon credits are generated for interventions that take place in the future. Although retroactive registration of water systems installed in the past may be possible under certain circumstances, it is best to assume that this will not be possible under Step 1.

2. **Can demonstrate that prior to project implementation, most target end-users were using unsafe water for drinking and solid fuels on inefficient stoves for boiling/cooking.**

3. **Can demonstrate from similar existing (pilot) projects that E. coli is not detectable in a 100 mL sample of drinking water when it reaches the end-users.** If more than 10 percent of water samples exceed this threshold, no credits can be issued.

   Note: Untreated water supplies are unlikely to meet the water quality threshold due to contamination of the water during transport and storage.

4. **Includes decentralized household and community systems, piped or non-piped, where a single system does not serve more than 50,000 households.** Larger systems may not be subject to simplified procedures for demonstrating additionality and allowing for curbed demand, making carbon certification more difficult.

5. **All systems can be tracked using unique IDs,** i.e. an accurate database must be created from which any unit can be randomly selected and visited for monitoring. This is relatively

straightforward for a project with a dozen geo-referenced community water treatment units but can become very challenging when 30,000 water filters are being sold through a market-based network of retailers.

6. For **household water treatment technologies:** Can demonstrate that the technology achieves a 3-star or 2-star performance level according to the WHO International Scheme to Evaluate Household Water Treatment Technologies.

Yes

Go to Step 2

No

For now, there is no need to explore carbon credits further.

If only Criterion 1 is not met, you can reconsider whether you have a donor willing to pay the full cost of certification or a buyer of carbon credits willing to pay a price significantly above the market price.

STEP 2 CAN SUPPRESSED DEMAND BE JUSTIFIED AND DEFENDED?

Carefully consider whether and how suppressed demand can be justified - and whether your organization is prepared to defend the justification in a public debate (see Box 10). Without a strong justification for suppressed demand, the organization is exposed to reputational risks. In addition, Gold Standard rules tend to be adjusted if carbon credits are issued based on unreasonable assumptions. Thus, not having a good justification for suppressed demand can result in a project issuing fewer credits and becoming financially unviable. You can use the following arguments to justify suppressed demand:

- **Low risk.** Most households or institutions actually boil their drinking water to make it safe for consumption (check with DHS STATcomplier12). In such a case, carbon credits can be generated even without considering suppressed demand. In this scenario, it is reasonable to assume that even households that do not currently boil would have boiled if they had the means to do so.

- **Medium risk.** Boiling is generally the most common household water treatment method (e.g., 20 to 30 percent of households report boiling their drinking water), and richer households are more likely to boil (check with DHS STATcompiler, select country and indicator "Households treating water by boiling" and "Households not treating water" disaggregated by wealth quintile). In such a case, it can be argued that as economic development progresses, more and more households would start boiling in the absence of alternative sources of safe drinking water.

- **High risk.** Few households actually boil their drinking water, and other treatment methods (such as chlorination) are more commonly used. Nevertheless, in line with a recent publication (Thomas 2023), it can be argued that "the concept of suppressed demand was not created to reduce emissions in low-income countries, but instead to recognize that energy use and associated health and economic livelihoods in low-income communities are suppressed - arguably

oppressed - by poverty, climate change and extractive capitalism. With per capita emissions in high-income countries still more than 23 times those of a least-developed country, there is a strong equity argument for mitigating this disproportionate cause and effect of climate change."

Yes

Go to Step 3

No

You reached an informed decision to not further pursue carbon credits as a financing option.

STEP 3 DO THE PROS OUTWEIGH THE CONS?

Re-evaluate the pros and cons of receiving carbon credits from the project based on the guidance below. Note the risks and prepare a risk mitigation and response plan, i.e., a plan to reduce the likelihood of a risk occurring and to manage/reduce the impact if it does occur.

Pros

- **Additional funding:** Carbon credits provide additional unrestricted revenue. Use the Financial Model Spreadsheet (Appendix 6) to develop a more detailed estimate of potential revenue. The annual revenue per household should range from $2.5 to $15. Review the calculations if the result is outside this range.
- **Good quality monitoring data:** Generating carbon credits requires solid monitoring data that can withstand third-party verification. Monitoring data (especially on the number of users, quantity, and quality of treated water) is also valuable for managing project implementation.
- **Safeguards framework and feedback mechanism:** The Gold Standard requires the project team to conduct a safeguards assessment and implement an ongoing feedback and grievance mechanism. If this is not already in place, carbon certification will help ensure that the project does not cause harm and that end-users can be more actively involved.

Cons

- **Uncertainty about timing and amount of revenue:** Project registration and carbon credit issuance can be delayed, easily occurring one to two years after the original plan. Carbon credit volumes and prices can easily vary by a factor of two to three (and together by almost a factor of 10).
- **Significant effort and cost:** Generating carbon credits won't be easy or cheap. Expect to create a full-time position for a carbon manager on your side and significant management team involvement - especially until the first issuance is achieved. Be sure to budget for local stakeholder consultation, project database development, baseline surveys, annual monitoring surveys, and ad hoc data requests from the carbon project developer, verifier, or carbon standard. If data is not of sufficient quality, surveys may need to be repeated and the project database updated.

- **Reputational risks:** Projects that generate carbon credits may attract additional media attention. In the coming years, it is likely that some news articles will be published questioning the concept of demand-side mitigation. Implementers need to be prepared to justify their carbon credit claims.

Yes

Go to Step 4

No

You reached an informed decision to not further pursue carbon credits as a financing option.

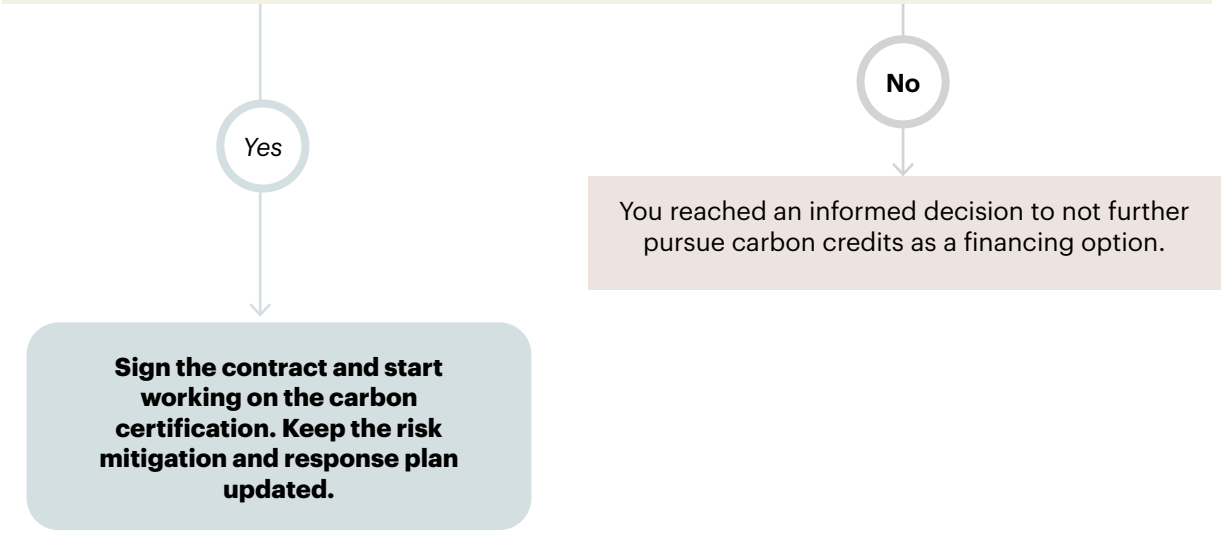
STEP 4 IS THERE A CARBON PROJECT DEVELOPER THAT MEETS OUR EXPECTATIONS?

Contact several carbon project developers and request a quote for their services. Carbon project developers will likely ask for some basic information about the project, make their own calculation of the emission reductions, and then either get back to you with a commercial offer (or inform you that they are not interested in participating in the project).

The following points will need to be discussed and agreed upon with a carbon project developer, usually in an Emission Reduction Purchase Agreement (ERPA):

- **Ownership of generated carbon credits**. Will the credits be issued to a registry owned by your organization or to a registry owned by the carbon project developer? Will ownership change after the initial crediting period?
- **Sale of generated carbon credits.** Does the carbon project developer sell the carbon credits or just support their generation? If the carbon project developer sells the credits on your behalf, what is the sales margin? Do they buy all the credits at a pre-agreed price?
- **Exclusivity.** Will you grant the carbon project developer exclusive rights to sell the VERs? What if they are unable to sell the credits (i.e., you may want to limit exclusivity to, say, one or two years after issuance)?
- **Roles and responsibilities**. Who pays for field data collection and who pays for the verifier and carbon standard fees? Who prepares and conducts the data collection surveys? Who responds to the findings of an auditor or carbon standard?
- **Revenue sharing.** What percentage/amount of the revenue will go to your organization or the carbon project developer? Consider setting a minimum sales price (e.g., the carbon project developer will need your approval to sell GS VERs below this price).

- **Termination of the ERPA**. What if the carbon project developer fails to register your project or issue carbon credits - at what point can you terminate the contract and under what conditions? What if your organization is unable to provide primary data of the required quality?



4.5 Guidance and Recommendations Summary Table

Table 7: *Comprehensive Guide to Carbon Credit Integration in WASH Projects: Key Recommendations and Strategies*

Section	Recommendations
General Guidance	• **Comprehensive GHG Emission Assessments** for all projects. • **Prioritize High-Impact Interventions:** Focus on renewable energy and high emissions reduction potential • **Leverage Suppressed Demand:** Use this approach for projects improving access to safe drinking water • **Adopt Renewable Energy:** Shift WASH operations to renewable sources • **Implement Robust Monitoring:** Ensure accuracy in emission reductions. • **Assess Carbon Certification Feasibility:** Consider the potential benefits and risks.
Climate Mitigation in WASH	• **Expand Carbon Finance:** Use carbon credits to finance climate-resilient WASH systems • **Broaden Climate Finance Streams:** Explore other mechanisms beyond carbon credits • **Promote Cleaner Cooking Practices:** Reduce emissions from boiling drinking water. • **Integrate Reforestation Efforts:** Combine with WASH projects for increased carbon sequestration • **Address Sanitation Emissions:** Target emissions from sewer and non-sewer systems.

Section	Recommendations
Operational Strategies for WASH	• **Understand and Track GHG Emissions** for targeted reduction strategies • **Shift to Renewable Energy Sources**: Including advocacy for clean grid electricity • **Improve Operational Efficiency:** Optimize systems to reduce energy consumption • **Generate Energy**: Explore biodigesters and solar panels. • **Invest in Non-Sewered Sanitation Understanding:** For specific emissions reduction interventions • **Assess Large-Scale Reforestation:** For viable carbon credit generation.
Safe Water Interventions	• **Evaluate Feasibility for Large Populations:** Especially for projects over 30,000 to 50,000 households • **Use Conservative Financial Projections:** For carbon credit generation estimates • **Base Credits on Robust Assumptions:** Avoid biased or overstated parameters • **Manage Risks Carefully:** Including reputational and under-delivery risks.
Ethiopia-Specific Guidance	• **Prioritize Climate Adaptation Funding:** Focus on expanding climate-resilient WASH services • **Promote Renewable Energy Transition:** Especially from diesel to renewable for water pumping • **Explore Basin-Wide Reforestation Projects:** Assess potential for carbon credits in large-scale projects • **Carefully Justify Suppressed Demand:** Ensure defensible use and potential public defense.

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Annexes

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Annex 12: Case Study: DRIP FUNDI - Pioneering Sustainable Water Solutions in Northern Kenya

6.1 Part B - Feasibility Study (NatureCo)

PROJECT FEASIBILITY REPORT

SUSTAINABLE WASH PROGRAM

Prepared for: Millenium Water Alliance

15 December 2023

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6.2 Carbon Trading Legal and Regulatory Framework in Ethiopia (NatureCo)

CARBON TRADING LEGAL AND REGULATORY FRAMEWORK IN ETHIOPIA

Background

As part of the global effort to tackle climate change, carbon finance is one of the tools to mobilize funds for climate action. The carbon market has grown significantly in recent years and countries, such as Ethiopia, wish to harness the opportunities offered by the carbon market to finance climate action while boosting their development. The country has issued over 2 million carbon credits under both the Clean Development Mechanism (CDM) and voluntary carbon market (VCM) standards[1]. To ensure the sustainability of carbon market activities alongside competing national climate commitments under the Paris Agreement, it is necessary to put in place a legal and regulatory framework that will set out the various rules that need to be followed. With a view to developing a carbon project for the Millennium Water Alliance, this document takes stock of the existing legal framework in Ethiopia about carbon trading with a focus on the issue of legal right related to carbon credits.

Carbon trading regulatory framework in Ethiopia

National level

A review of the status of carbon trading regulatory frameworks in Ethiopia was undertaken taking into consideration the institutional environment, existing regulations and regulatory infrastructure.

Responsible authorities/institutions:
The Ethiopian Environmental Protection Agency (EEPA) is responsible for implementing Article 6 of Paris Agreement. In 2021 the EEPA replaced the previous Environment, Forest, and Climate Change Commission (EFCCC), which had served as the country's Designated National Authority (DNA) under the CDM. For voluntary carbon market activities, there is no indication at this stage which government body will serve as the regulatory authority[2].

Institutional/administrative arrangements:
There is no administrative framework in place for implementing Article 6. In its updated Nationally Determined Contribution (NDC), Ethiopia stated its intention to develop institutional capacity to meet Article 6 accounting and reporting requirements, including procedures for authorization. This has yet to be completed[3].

Legislative framework
Ethiopia has several policies related to climate mitigation and adaption (e.g. Nationally Appropriate Mitigation Action, Climate-Resilient Green Economy strategy, National REDD+ strategy)[4], however there is presently no legislation that relates to Article 6, carbon crediting or the voluntary carbon market. The EEPA is planning to develop relevant Article 6 regulations in the future[5].

Regulatory Infrastructure
There is currently no infrastructure related to carbon trading, however Ethiopia plans to develop a national registry[6].

[1] Eastern Africa Alliance On Carbon Markets And Climate Finance, 2023: Carbon market Profile-Ethiopia.
[2] Gold Standard, 2023: Implementing article 6 – an overview of preparations in selected countries.
[3] Gold Standard, 2023: Implementing article 6 – an overview of preparations in selected countries.
[4] Jimenez et al 2017. REDD+ and Carbon Markets: The Ethiopian Process
[5] Gold Standard, 2023: Implementing article 6 – an overview of preparations in selected countries.
[6] Gold Standard, 2023: Implementing article 6 – an overview of preparations in selected countries.

The above description shows there is currently no legal or regulatory framework for carbon trading activities in Ethiopia. However, several projects have been implemented in the country and registered in the voluntary carbon market. The following section describes how these projects have addressed the issue of legal rights.

Legal right issues by VCM project activity type

The issue of legal rights is addressed in different ways depending on the type of activity undertaken, either a Land Use and Forestry project or an energy demand project. The projects consulted during the review address issues of legal rights mainly in the perspective of carbon ownership. However, with Ethiopia in the process of developing regulatory framework, project developers need to be aware of any changes that may occur in terms of:

- **Right to generate carbon credits**: this concerns the requirement for approval of project participants or project intending to qualify for the issuance of carbon credit under various VCM standards.
- **Right to use these credits**: it may concern issues related to the corresponding adjustments and the operating rules of the national infrastructure (national register) in order to avoid double counting.

Land Use and Forestry projects

Land Use and Forestry (LUF) carbon projects are still relatively novel in Ethiopia with only four operating projects. There are currently:

- Two certified afforestation/reforestation projects listed in the Gold Standard Impact Registry, whilst another two are listed as planned.
- One registered REDD project under Verra and two afforestation/reforestation/revegetation projects listed as under development.
- One assisted natural regeneration project listed on the Plan Vivo Registry.

Land tenure laws

To establish legal right to carbon credits for LUF projects, land tenure and ownership is usually a critical factor. In Ethiopia, under Article 40(3) of the Federal Constitution, which relates to the “Rights of Property”, the right to ownership of rural and urban land, as well as all natural resources, is exclusively vested in the State and in the peoples of Ethiopia. Land is a common property of the Nations, Nationalities and Peoples of Ethiopia and shall not be subject to sale or to other means of exchange[7]. The legal instruments that specify the rights a rural landholder or a cooperative may have over an area of land is governed at the federal level by the Federal Rural Land Administration and Land Use Proclamation (No. 456/2005) and then based on the federal laws, regional governments are given the power to enact rural land administration and land use laws, which consists of the detailed provisions necessary to implement the federal proclamation covered in Article 17(1)[8].

There are three different types of land holdings provided in the Proclamations, namely, private holding, state holding and communal holding. The existing reforestation projects registered under Gold Standard and the Plan Vivo Standard operate on communal lands. The federal proclamation defines ‘communal holdings’ as rural land which is given' by the government to local 'residents for common grazing, forestry and other social services. The regional proclamations usually have very similar definitions. For example, the SNNPRS Proclamation[9] defines ’community holdings‘ in a similar manner as ’land which is not designated as state or private holding and is being used by the local community as common holding for the purpose of grazing, forestry or other social services’. Thus, the Regional Proclamations takes into account the existing use of land. There are currently no projects registered where activities are undertaken on private or state holdings and therefore at the time of writing it’s unclear whether voluntary carbon projects could operate on these land holding types.

[7] https://www.abyssinialaw.com/study-on-line/395-land-law/7896-history-of-tenure-system-in-ethiopia#:~:text=Constitution,-Article%2040%20of&text=The%20right%20to%20ownership%20of,to%20other%20means%20of%20exchange.
[8] https://www.abyssinialaw.com/study-on-line/395-land-law/7896-history-of-tenure-system-in-ethiopia#:~:text=Constitution,-Article%2040%20of&text=The%20right%20to%20ownership%20of,to%20other%20means%20of%20exchange.
[9] The SNNPRS (Regional) Rural Land Administration and Utilization Proclamation (No. 110/2003)

Therefore, the definition given under the regional laws allows the designation of the potential project sites as community holdings. The law also provides that holding certificates (title deeds) will also be issued as proof of rural land use rights.

Carbon rights

The Ethiopian Government currently does not have any specific laws regarding carbon rights. Carbon rights were however established during the development of the Humbo Community Reforestation CDM project in 2006 where it was confirmed that those who possess community holdings (land user rights certificates issued from proclamations SNNPR 53/2003 and Federal 456/2005) have the right to all the products produced from the land, and that the products produced from the land would therefore necessarily include sequestered carbon[10].

This interpretation of the legal framework was confirmed at the time through legal counsel by the Environmental Protection Agency (Designated National Authority for the CDM), the Ministry of Agriculture and Rural Development, and the Humbo Woreda Bureau for Agriculture and Rural Development. Therefore, without the development of specific laws that address carbon rights it is assumed that the same ruling made for the Humbo Community Reforestation CDM project can still be applied to new projects until specific laws are developed. It is noted however that this situation may change as the federal government develops Article 6 regulations which may flow through to the voluntary carbon market as well.

Energy demand projects

There are currently 48 energy efficiency (domestic) projects either listed as certified or listed on the Gold Standard Impact Registry with projects evenly split between improved cookstoves and safe drinking water project activities. There are currently no energy demand projects registered in Ethiopia on the Verra Registry.

Carbon rights

In energy demand projects, carbon credits are generated through the adoption of more efficient new cooking energy technologies or use of safe drinking water provided by a zero-emission water supply technology. The approach adopted by the projects currently registered under Gold Standard is to transfer carbon credit ownership from the end-users (e.g. households) of the GHG emission reduction technology to the project developer. In this case the ownership of the carbon credits is bestowed to the actors who are responsible for the GHG emission reductions through the adoption of new practices. The question of ownership is always settled at the project level and is subject to consultation with stakeholders. This is usually done through simple agreements between the two parties in the form of project participation agreements which include acknowledgement that carbon rights are transferred to the project developer.

Overview of water sector regulatory framework in Ethiopia

Access to drinking water initiatives in Ethiopia are framed by several documents of varying scope, including:

- Policy and strategy documents.
- Legislative and regulatory documents, including standards.

The implementation of the policies mentioned in these documents is guided by an institutional environment made up of relevant services. The following table provides a summary of the institutional, policy, strategic and regulatory environment, related to drinking water issues in Ethiopia and will need to be adhered to when implementing safe drinking water projects.

Table 1. Overview of water sector regulatory framework in Ethiopia.

Scope	Document or entity	Purpose
Institutional framework	Federal Ministry of Water, Irrigation and Electricity	Implements the national policy on access to water on a national scale.

[10] https://cdm.unfccc.int/Projects/DB/JACO1245724331.7/view (last accessed on 28 April 2021)

Scope	Document or entity	Purpose
	Water Bureau of the Regional States and Zonal Administration	Implements the national policy on access to water on a regional and zonal scale.
	Municipal water supply utilities	Implements the national policy on access to water on a regional and zonal scale.
	Ethiopian Quality and Standard Authority	Develops specific standards for the approval of product quality, including drinking water.
Policy and strategy framework	Conservation Strategy of Ethiopia (CSE) of 1996.	It is one of the documents that deal with the country's natural resource base. The strategy document is organised in five volumes and was prepared to serve the purpose of developing future national resource policies for the country.
	Environment Policy of Ethiopia (EPE)	Is one of the policies that arose in the process of implementing the CSE. This document contains some important policy guidelines on water resource use and conservation.
	Ethiopian Water Resource Management Policy of 2001	Provided key guidance to achieve the objective of enhance and promote all national efforts towards the efficient, equitable and optimum utilization of the available Water Resources of Ethiopia for significant socioeconomic development on sustainable basis.
	Growth and Transformation Plan (GTP)	This document set targets for urban and rural potable water supply, irrigation developments and industrial water supply.
	National Drinking Water Quality Monitoring and Surveillance and Response Guideline	This Guideline describes basic concepts and elements in water supply with focus to water safety applicable to community water supply universally including cities and towns from source (improved and unimproved) to household level. It outlines the guiding principles necessary to ensure water quality surveillance is effective.
Legal and regulatory framework	Ethiopian Water Resources Management Proclamation-Law No. 197/2000	The key purpose of the Proclamation is to ensure that the water resources are put to the highest social and economic benefit for all people through appropriate protection and diligent management.
	Ethiopian drinking water quality standard-CES 58	Provides, normative references, chemical and bacteriological requirements for safe drinking water.

Summary and recommendations

The review has found that the institutional environment, existing regulations, and infrastructure for carbon markets is currently lacking in Ethiopia, however the federal government is currently working on regulations for Article 6. It is however not clear whether these regulations will also flow through to the voluntary carbon market. In the absence of specific carbon market laws, we undertook a review of existing carbon projects registered under the Gold Standard, Verra and the Plan Vivo Standard to determine how legal rights to carbon credits are currently determined. The key points to take away include:

- **Land Use and Forestry projects**: The right to ownership of rural and urban land, as well as all natural resources, is exclusively vested in the State and in the peoples of Ethiopia. Those who possess land holdings (land user rights certificates) have the right to all the products produced from the land, and that the products produced from the land would therefore necessarily include carbon credits produced by carbon sequestration.
- **Energy Demand projects**: Rights to carbon credits are transferred from the end-users of the GHG emission reduction technology (e.g. households) to the project developer. This is usually done through simple agreements between the two parties in the form of project participation agreements which include acknowledgement that carbon rights are transferred to the project developer.
- For safe drinking water projects there are several policies and legislation that shall be adhered to when designing and implementing them.

Considering the findings from the review the following recommendations have been identified:

- As part of the development of the regulatory framework for carbon trading in Ethiopia the EEPA will have to ensure that a clear definition of the various carbon rights and their inclusion in the future regulations that will govern the market mechanisms provided for under Article 6 as well as the voluntary market, is established.
- Given the lack of certainty in the regulatory environment for carbon markets in Ethiopia, project developers need to be aware of any changes that may occur in terms of the right to generate carbon credits and the right to use these carbon credits. Developing relationships with agencies such as EEPA are recommended to ensure project developers stay across any potential changes.
- Project developers should seek Letters of Approval for their projects from the relevant government agencies, to help ensure the project is aligning with proposed Article 6 regulations currently being developed by EEPA and ensures government buy in to the project. This will also ensure that the project is not at risk of been double counted under any existing jurisdictional REDD+ projects or other government run programs designed to meet their NDC.

6.3 WASH and Agroforestry Potential in Lake Tana Basin (NatureCo)

CARBON PROJECT OPPORTUNITIES AND POTENTIAL FOR WASH RELATED PROJECTS

Overview of carbon project types related to WASH

A review of global carbon registries including VCS, Gold Standard and Plan Vivo Standard was undertaken to identify project types that either directly or indirectly help to deliver safe drinking water to communities in Ethiopia. The criteria used to identify suitable project types included:

- Projects that reduce emissions to treat contaminated water (e.g., chlorination, filtration etc)
- Projects that improve the energy efficiency of water delivery systems (e.g., water pumps)
- Projects that improve the water quality of ground and surface water (e.g., reforestation)

Using these criteria, the following methodologies under VCS, Gold Standard and Plan Vivo Standard were identified as shown in Table 1~~Table 1~~.

Table 1 Standards and methodologies for WASH-related project activities

Standard	Project activity	Methodology
VCS	Tree planting and natural regeneration to restore degraded watersheds	CDM - AR-ACM0003: Afforestation and reforestation of lands except wetlands --- Version 2.0[1] VM0047 Afforestation, Reforestation, and Revegetation, v1.0
	Provision of low or emissions free water treatment technologies	CDM - AM0086: Distribution of low greenhouse gas emitting water purification systems for safe drinking water --- Version 5.0 CDM - AMS-III.AV.: Low greenhouse gas emitting safe drinking water production systems --- Version 8.0
	Switch from diesel-powered water pumps to solarised water pumps	CDM - AMS-I.B.: Mechanical energy for the user with or without electrical energy --- Version 13.0
Gold Standard	Tree planting and natural regeneration to restore degraded watersheds	Afforestation/Reforestation GHG emissions reduction & sequestration methodology
	Provision of low or emissions free water treatment technologies	Emission reductions from safe drinking water supply
	Switch from diesel-powered water pumps to solarised water pumps	CDM - AMS-I.B.: Mechanical energy for the user with or without electrical energy --- Version 13.0

[1] Note VCS currently has a new methodology for Afforestation, Reforestation and Revegetation (ARR) project activities undergoing VVB assessment. If this gains final approval it will replace the CDM methodology.

Potential for carbon projects in Lake Tana Basin

Approach

Based on the WASH-related carbon method types identified in Table 1~~Table 1~~ above, mapping was undertaken to identify areas in Lake Tana Basin where new carbon projects could potentially be developed and implemented.

The mapping process involved key steps:

1. **Identification of suitable land use areas for each project method type.** This was assessed by using data sources (such as the ESRI Living Atlas) to identify appropriate land use types for the different project activities. For example, rangelands and cleared lands were identified as suitable potential areas for reforestation and areas that have low access to piped water was used as a proxy for potential suitable areas for provision of low or emissions free technologies for water treatment.
2. **Identification of eligible areas for each project method type.** This was based on criteria required by voluntary carbon standards. For example, for reforestation projects, lands that have been deforested within the last 10 years are not eligible to be registered under most carbon standards.
3. **Identification of priority areas for each project method types.** This was based on carbon sequestration potential (for reforestation projects) and location of water points for water treatment and pumping technology projects.
4. **Calculation of the total potential likely number of carbon credits** that could be generated under each project method type.

A more detailed explanation of the mapping process and data sources is provided in Appendix 1.

The outcome of the process resulted in the identification of priority areas (hot spots), the calculation of total potential project sizes, and the number of carbon credits that may be potentially generated (where possible). The desktop results provide a guide for future project development and should be further investigated through local knowledge and ground-truthing activities.

Note the mapping was only undertaken for Tree planting and natural regeneration to restore degraded watersheds and the Provision of low or emissions-free water treatment technologies. Due to the lack of

information, it was not possible to use a geospatial approach to examine the potential of switching from diesel-powered water pumps to solarised water pumps.

Results

Provision of low or emissions-free water treatment technologies

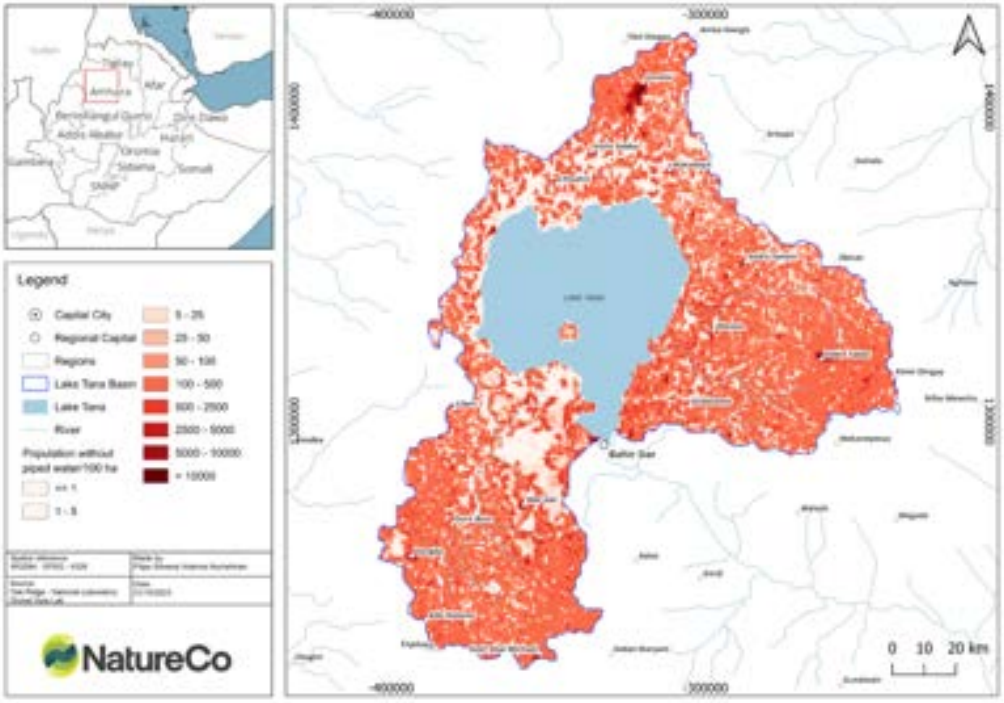


Figure 1

~~Figure 1~~ and Figure 2~~Figure 2~~ show the areas within the Tana Basin that have the highest concentration of population that don't have access to piped water and use biomass fuels for cooking respectively. Both access to piped water and cooking with biomass fuels can be used as proxies to provide an indication of where is the greatest need to improve access to safe drinking water and to provide alternative treatment options to boiling water, noting however that only around 2% of Ethiopia's population boils water as a treatment approach prior to drinking[2].

Further analysis was undertaken using data from the water point data exchange website[3] on the location of water points across the Lake Tana Basin. Figure 3~~Figure 3~~ and Figure 4~~Figure 4~~ show the location of the total number of water points are and the total number of non-functional water points respectively.

The highest concentration of non-functional water points is found in the south-east side of the Lake Tana Basin which indicates great opportunities for borehole rehabilitation projects. However, it's worth noting that the data quality on the water point data exchange ranges from poor to high and is biased towards regions that have more

[2] Central Statistical Agency (CSA) [Ethiopia] and ICF. 2016. Ethiopia Demographic and Health Survey 2016. Addis Ababa, Ethiopia, and Rockville, Maryland, USA: CSA and ICF.
[3] https://www.waterpointdata.org/ (Last accessed 25 June 2023)

regular data entry. It's likely in other regions there is under-reporting and good opportunities for borehole rehabilitation and other water treatment opportunities are likely to be present.

The results of this analysis were largely consistent with a study undertaken by Bogale (2020)[4] that mapped hotspots of unimproved sources of drinking water in Ethiopia with primary clusters located in the Amhara and Afar regions, where the Lake Tana Basin is located (Amhara region).

From these results, we can conclude that there are large opportunities across several regions to provide access to improved water sources and to undertake rehabilitation of non-functional water points. It is however not possible to quantify the potential to generate carbon credits from these projects as insufficient information is available on how many people boil water in the 'hot spot' areas. Therefore, baseline studies of household drinking water habits including water treatment prior to boiling are required to quantify this potential.

The following Figures show the density of population without access to piped water (Figure 1), the density of population using biomass fuels for cooking (Figure 2) and the water points concentration clusters (Figure3).

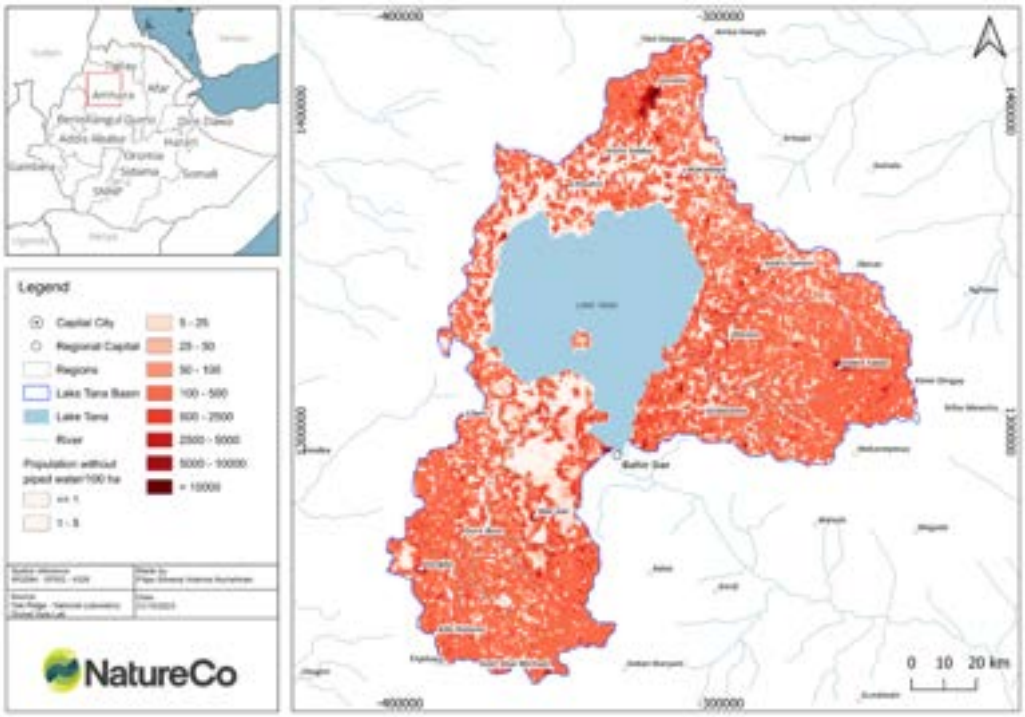


Figure 1 Density of population without access to piped water

[4] Bogale, G. G. (2020) Hotspots of unimproved sources of drinking water in Ethiopia: mapping and spatial analysis of Ethiopia demographic and health survey data 2016. BMC Public Health. 20:878.

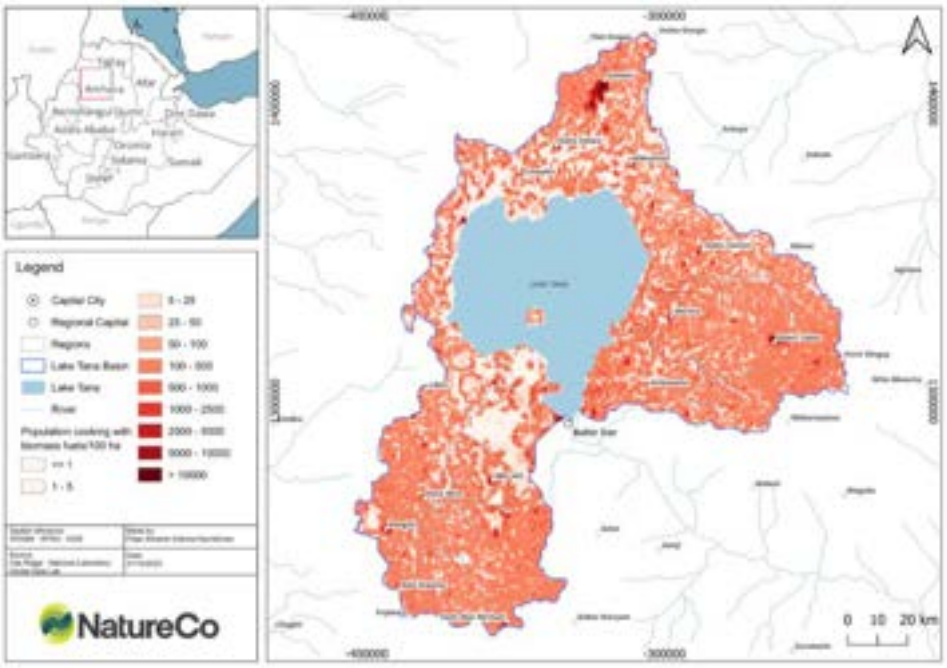


Figure 2 (above): Density of population using biomass fuels for cooking

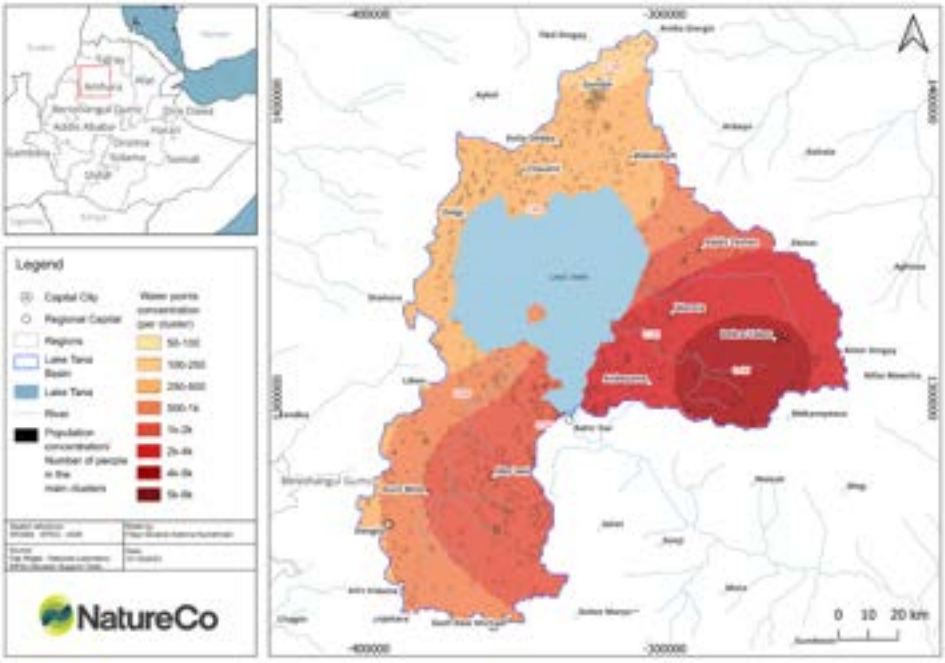


Figure 3 (above): Water point concentration clusters

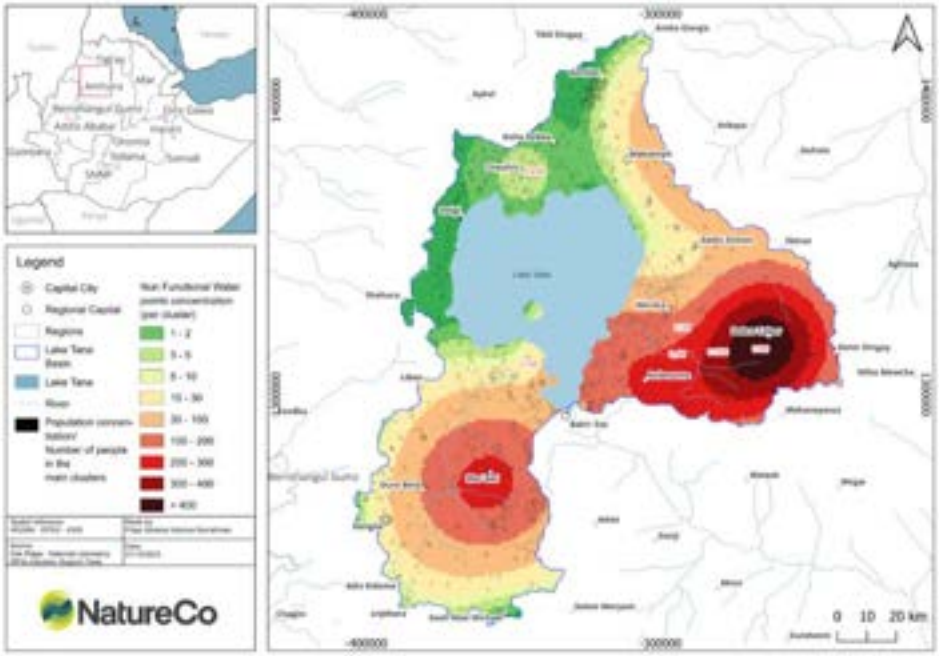


Figure 4 Non-functional water point clusters

Tree planting and natural regeneration to restore degraded watersheds

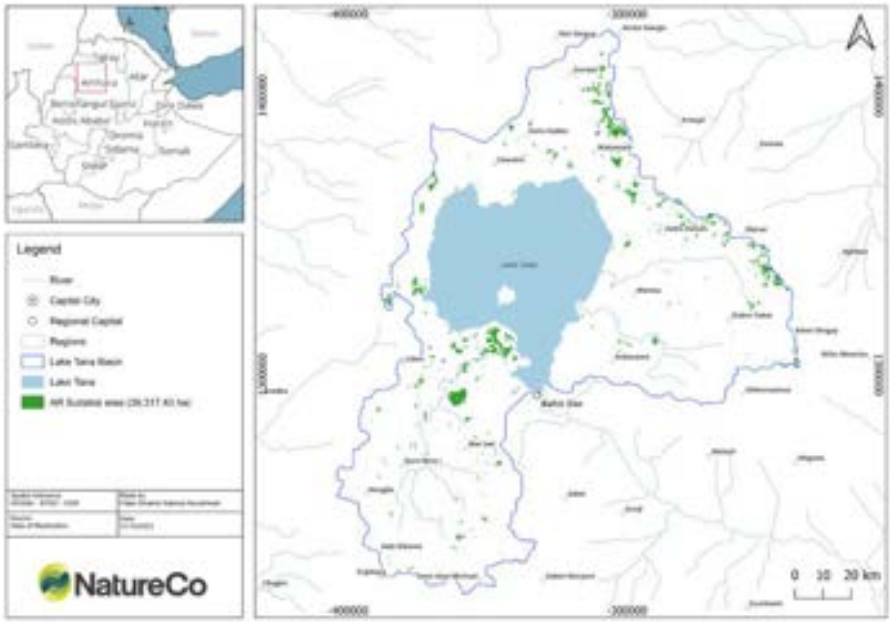


Figure 5~~Figure 5~~ and Figure 6~~Figure 6~~ show there are large areas of land that are both suitable for restoration (39,317.43 Ha) and eligible to generate carbon credits (36,786.03 Ha) at the time of analysis. The Lake Tana Basin is located in the Amhara region, where the highest potential is located in the north-east side of the basins which includes the city of Gondar, Maksenyit, Addis Zemen, and Debre Tabor. These cities also have the highest carbon yield potential in the Lake Tana Basin as shown in Figure 7~~Figure 7~~.

If all eligible areas in the highest carbon-yielding areas were restored, based on IPPC aboveground biomass growth data, approximately 5.8 million tCO_2 could be sequestered over a 30-year period (refer to Table **2**~~Table 2~~). It's important to note this is a high-level estimate and site-specific analysis would need to be undertaken to determine the actual potential of a defined project area.

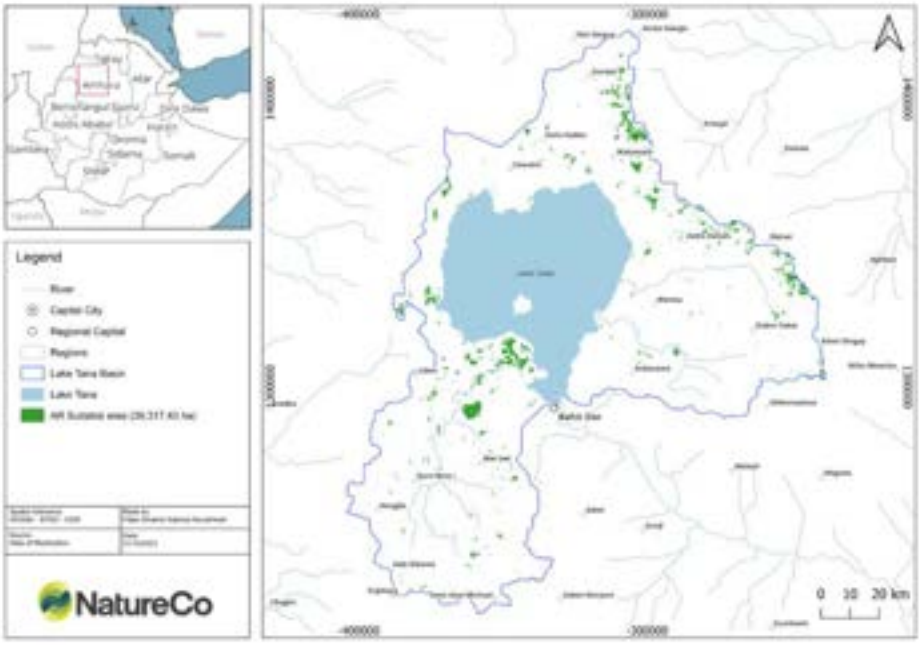


Figure 5 Suitable areas to undertake afforestation and reforestation projects

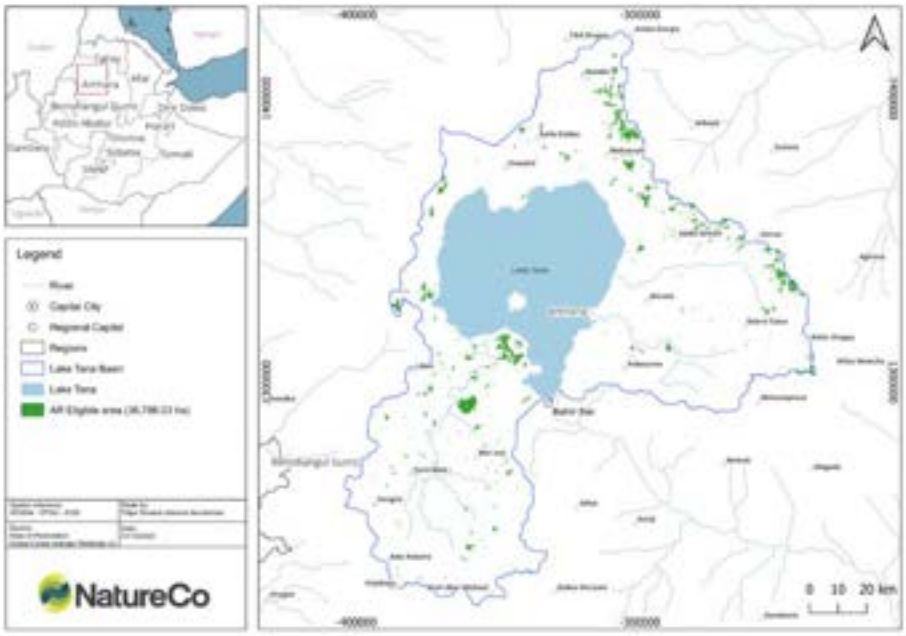


Figure 6 Eligible areas to undertake afforestation and reforestation projects

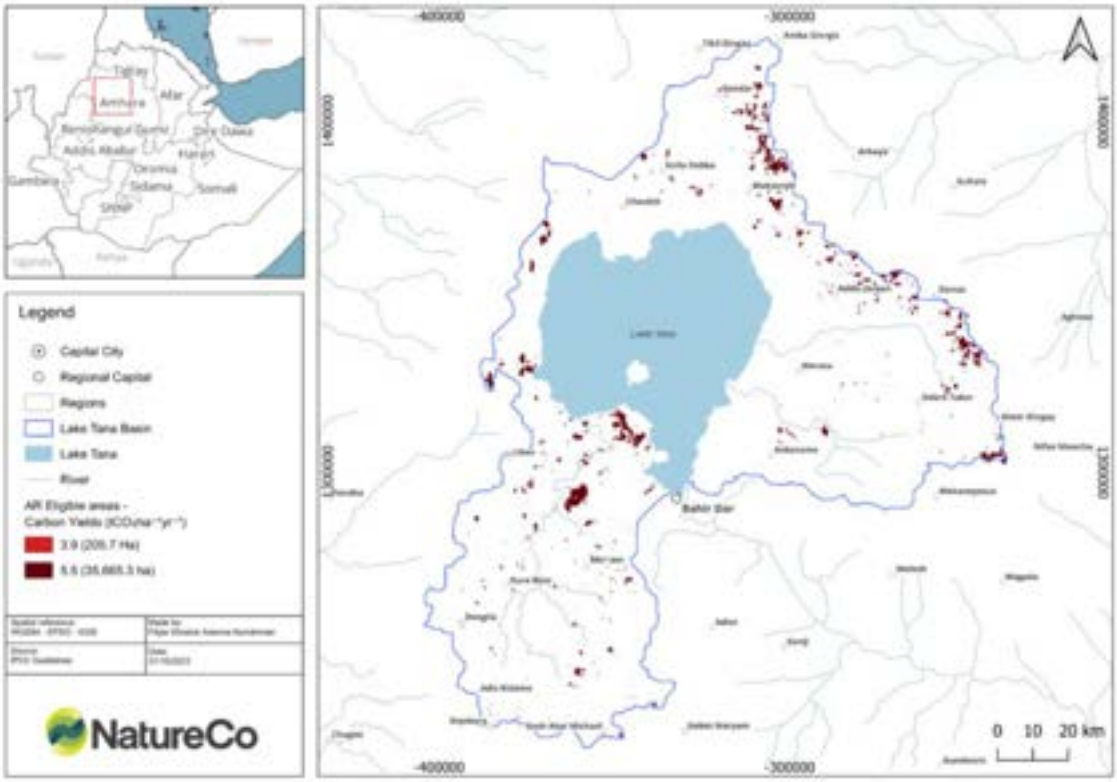


Figure 7 Carbon yields across eligible areas

Table 2: Total suitable area, eligible area, priority areas (carbon yields) and potential carbon sequestration

Afforestation / reforestation - rangelands and barelands	Description / layers	Total amount
Total suitable area	Rangelands and bare soils	39,317.43 Ha
Total eligible area	Remove areas deforested in past 10 years	36,786.03 Ha
Total priority area (carbon)	Areas located in the highest carbon yield areas (>5 tCO_2/ha/yr)	35,665.3 ha
Average carbon yields (aboveground biomass) over project lifetime (30 years) per ha	Adapted from IPCC annual biomass yields	165 tCO_2/ha
Total Carbon Sequestration over 30 years (priority carbon area)		**5.884.774,5** tCO_2e

Market demand for carbon credits

According to several independent analyses, demand for carbon credits is set to increase from $2 billion in 2020 to $40 billion in 2030[5,6,7] and around $250 billion by 2050[8]. Demand has been driven by companies who have set ambitious net-zero targets, with around 20% of the world's largest companies committing to such as target. Purchasing carbon credits will form an important part of how companies meet these targets[9].

Currently carbon credits that reduce or avoid carbon emissions being released to the atmosphere dominate the market. These include projects such as REDD+, renewable energy and energy efficiency projects. However, it is expected that projects that remove carbon from the atmosphere, such as reforestation and technology-based removals will become increasingly more important in the long term[10]. Therefore, given the potential in Ethiopia to restore degraded lands, significant opportunities exist in the market for carbon credits from reforestation projects.

Summary and conclusion

An assessment of the potential to generate carbon credits from WASH-related projects was undertaken. Three main WASH project activities were identified that have associated carbon methodologies including:

- Projects that reduce emissions to treat contaminated water (e.g., chlorination, filtration etc)
- Projects that improve the energy efficiency of water delivery systems (e.g., water pumps)
- Projects that improve the water quality of ground and surface water (e.g., reforestation)

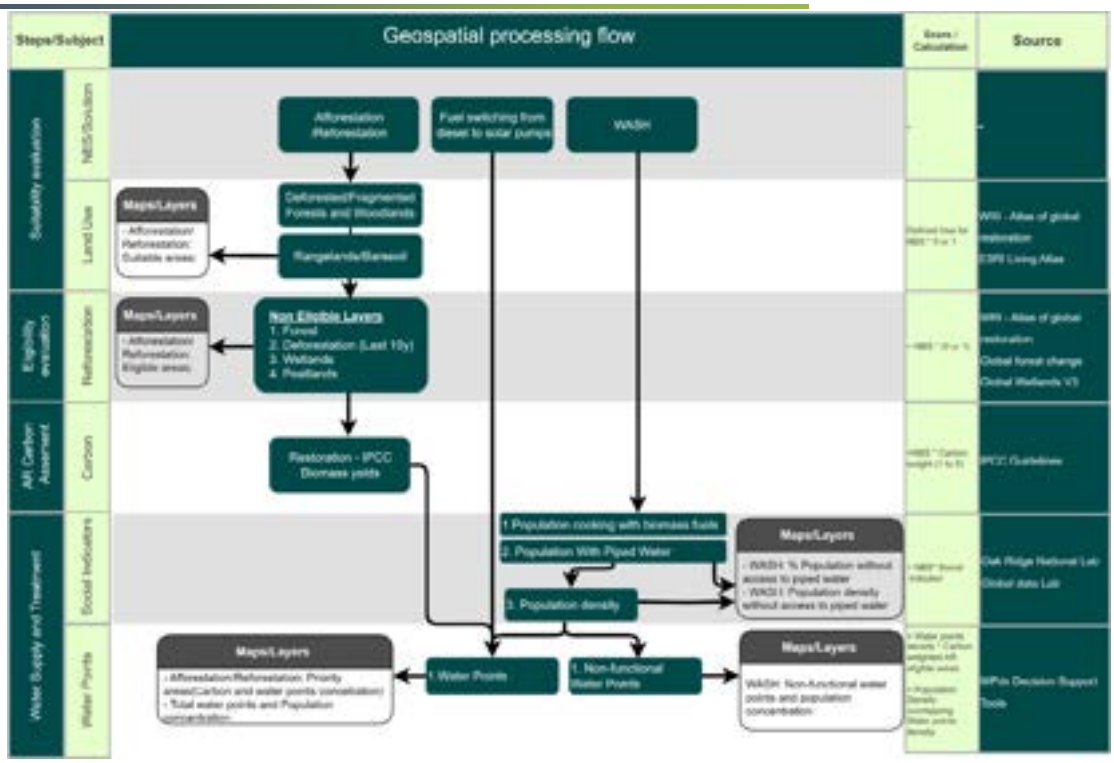
Geospatial mapping was then used to identify where in the Lake Tana Basin has the greatest potential exists for these projects. Regarding projects that reduce emissions from boiling water to treat contaminated water, the south-east part of the Lake Tana Basin present some of best areas for undertaking projects due to the high populations that don't have access to piped water and the prevalence of non-functional boreholes. The latter also presents good opportunities for improving the energy efficiency of water delivery systems as well, particularly if moving from diesel to solar water pumps. Assuming an average household size of 4.7 people, Farta woreda will have 60,670 households, so the carbon credits generated by a potential safe drinking water project will range from 22,358[11] t CO2 to 961,411[12] t CO2 over a ten-year crediting period.

Projects that improve water quality through reforestation showed good potential with around 35 thousand hectares of land available for restoration through tree planting and natural regeneration. An estimated 5.8 million tCO_2 could be sequestered on high carbon yielding eligible areas, however this needs to be further examined through local knowledge and ground truthing, thus very much an indicative estimate at this stage. The city with the highest potential include Gondar, Maksenyit, Addis Zemen, and Debre Tabor.

Future demand for carbon credits in the voluntary carbon market is forecast to reach up to $40 billion by 2030 and potentially $250 billion by 2050. This represents a good opportunity to use the voluntary carbon market to finance this work.

[5] https://www.morganstanley.com/ideas/carbon-offset-market-growth (Last accessed 8 August 2023)
[6] https://www.mckinsey.com/capabilities/sustainability/our-insights/a-blueprint-for-scaling-voluntary-carbon-markets-to-meet-the-climate-challenge (Last accessed 8 August 2023)
[7] https://www.green.earth/press-releases/market-outlook-rapid-growth-in-voluntary-carbon-markets-with-rising-demand-for-high-quality-credits (Last accessed 8 August 2023)
[8] https://www.morganstanley.com/ideas/carbon-offset-market-growth (Last accessed 8 August 2023)
[9] https://www.gihub.org/articles/scaling-up-private-sector-participation-in-carbon-markets/ (Last accessed 8 August 2023)
[10] https://www.morganstanley.com/ideas/carbon-offset-market-growth (Last accessed 8 August 2023)
[11] In this scenario, we will not take into account the principle of suppressed demand, simply considering that the proportion of the population using boiling as a water treatment method is 2%.
[12] In this case, the principle of suppressed demand is applied by considering that the proportion of the population that does not use a water treatment method would have done so if it had the financial means to resort to boiling. In this case, the proportion of the population that is supposed to use boiling as a water treatment method would be 84%+02%, i.e. 86%.

Appendix 1. Geospatial processing flow



6.4 WASH and Agroforestry Potential in Ethiopia (NatureCo)

NatureCo

CARBON PROJECT OPPORTUNITIES AND POTENTIAL FOR WASH RELATED PROJECTS

Overview of carbon project types related to WASH

A review of global carbon registries including VCS, Gold Standard and Plan Vivo Standard was undertaken to identify project types that either directly or indirectly help to deliver safe drinking water to communities in Ethiopia. The criteria used to identify suitable project types included:

- Projects that reduce emissions to treat contaminated water (e.g., chlorination, filtration etc)
- Projects that improve the energy efficiency of water delivery systems (e.g., water pumps)
- Projects that improve the water quality of ground and surface water (e.g., reforestation)

Using these criteria, the following methodologies under VCS, Gold Standard and Plan Vivo Standard were identified as shown in Table 1.

Table 1 Standards and methodologies for WASH-related project activities

Standard	Project activity	Methodology
VCS	Tree planting and natural regeneration to restore degraded watersheds	CDM - AR-ACM0003: Afforestation and reforestation of lands except wetlands --- Version 2.0[1]
	Provision of low or emissions free water treatment technologies	CDM - AM0086: Distribution of low greenhouse gas emitting water purification systems for safe drinking water --- Version 5.0 CDM - AMS-III.AV.: Low greenhouse gas emitting safe drinking water production systems --- Version 8.0
	Switch from diesel-powered water pumps to solarised water pumps	CDM - AMS-I.B.: Mechanical energy for the user with or without electrical energy --- Version 13.0
Gold Standard	Tree planting and natural regeneration to restore degraded watersheds	Afforestation/Reforestation GHG emissions reduction & sequestration methodology
	Provision of low or emissions free water treatment technologies	Emission reductions from safe drinking water supply
	Switch from diesel-powered water pumps to solarised water pumps	CDM - AMS-I.B.: Mechanical energy for the user with or without electrical energy --- Version 13.0
Plan Vivo Standard	Tree planting and natural regeneration to restore degraded watersheds	PM001 Agriculture and Forestry Carbon Benefit Assessment Methodology (Draft)

[1] Note VCS currently has a new methodology for Afforestation, Reforestation and Revegetation (ARR) project activities undergoing VVB assessment. If this gains final approval it will replace the CDM methodology.

Potential for carbon projects in Ethiopia

Approach

Based on the WASH-related carbon method types identified in Table 1 above, mapping was undertaken to identify areas in Ethiopia where new carbon projects could potentially be developed and implemented.

The mapping process involved key steps:

1. **Identification of suitable land use areas for each project method type.** This was assessed by using data sources (such as the ESRI Living Atlas) to identify appropriate land use types for the different project activities. For example, rangelands and cleared lands were identified as suitable potential areas for reforestation and areas that have low access to piped water was used as a proxy for potential suitable areas for provision of low or emissions free technologies for water treatment.
2. **Identification of eligible areas for each project method type.** This was based on criteria required by voluntary carbon standards. For example, for reforestation projects, lands that have been deforested within the last 10 years are not eligible to be registered under most carbon standards.
3. **Identification of priority areas for each project method types.** This was based on carbon sequestration potential (for reforestation projects) and location of water points for water treatment and pumping technology projects.
4. **Calculation of the total potential likely number of carbon credits** that could be generated under each project method type.

A more detailed explanation of the mapping process and data sources is provided in Appendix 1.

The outcome of the process resulted in the identification of priority areas (hot spots), the calculation of total potential project sizes and the number of carbon credits that may be potentially generated (where possible). The desktop results provide a guide for future project development and should be further investigated through local knowledge and ground truthing activities.

Note the mapping was only undertaken for Tree planting and natural regeneration to restore degraded watersheds and Provision of low or emissions free water treatment technologies. Due to the lack of information it was not possible to use a geospatial approach to examine the potential of switching from diesel-powered water pumps to solarised water pumps.

Results

Provision of low or emissions free water treatment technologies
Figure 1 and Figure 2 show the regions of Tigray, Amhara, Oromia, Sidama, Northern parts of SNNP and South West Ethiopia have the highest concentration of populations that don't have access to piped water and use biomass fuels for cooking respectively. Both access to piped water and cooking with biomass fuels can be used as proxies to provide an indication of where in Ethiopia the greatest need is to improve access to safe drinking water and to provide alternative treatment options to boiling water, noting however that only around 2% of Ethiopia's population boils water as a treatment approach prior to drinking[2].

Further analysis was undertaken using data from the water point data exchange website[3] on the location of water points across Ethiopia. Figure 3 and Figure 4 shows the location of where the total number of water points are and the total number of non-functional water points respectively. The results show that the greatest number of water points are located in the same regions identified in

[2] Central Statistical Agency (CSA) [Ethiopia] and ICF. 2016. Ethiopia Demographic and Health Survey 2016. Addis Ababa, Ethiopia, and Rockville, Maryland, USA: CSA and ICF.
[3] https://www.waterpointdata.org/ (Last accessed 25 June 2023)

Figure 1 and Figure 2 along with parts of the region of Somali. The highest concentration of non-functional water points is found in Amhara, Tigray, SNNP and projects in parts of Somali near Jijiga which indicates great opportunities for borehole rehabilitation projects. However, it's worth noting that the data quality on the water point data exchange ranges from poor to high and is biased towards regions that have more regular data entry. It's likely in other regions there is under reporting and good opportunities for borehole rehabilitation and other water treatment opportunities are likely to be present.

The results of this analysis were largely consistent with a study undertaken by Bogale (2020)[4] that mapped hotspots of unimproved sources of drinking water in Ethiopia with primary clusters located in Amhara and Afar regions. The regions of SNNP, Oromia and Somali also had significant clusters scattered throughout.

From these results we can conclude that there are large opportunities across several regions to provide access to improved water sources and to undertake rehabilitation of non-functional water points. It is however not possible to quantify the potential to generate carbon credits from these projects as insufficient information is available on how many people boil water in the 'hot spot' areas. Therefore, baseline studies of household drinking water habits including water treatment prior to boiling is required to quantify this potential.

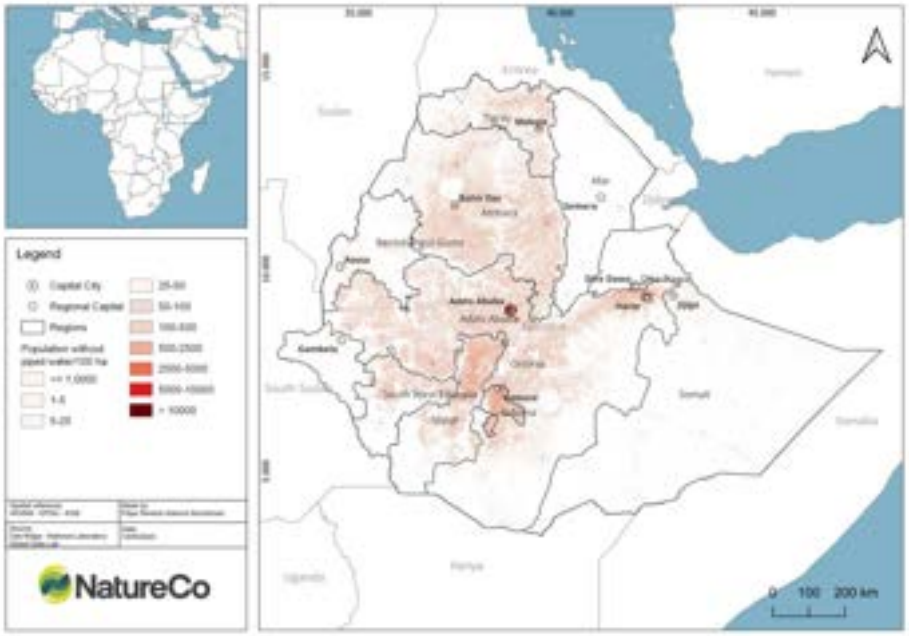


Figure 1 Density of population without access to piped water

[4] Bogale, G. G. (2020) Hotspots of unimproved sources of drinking water in Ethiopia: mapping and spatial analysis of Ethiopia demographic and health survey data 2016. BMC Public Health. 20:878.

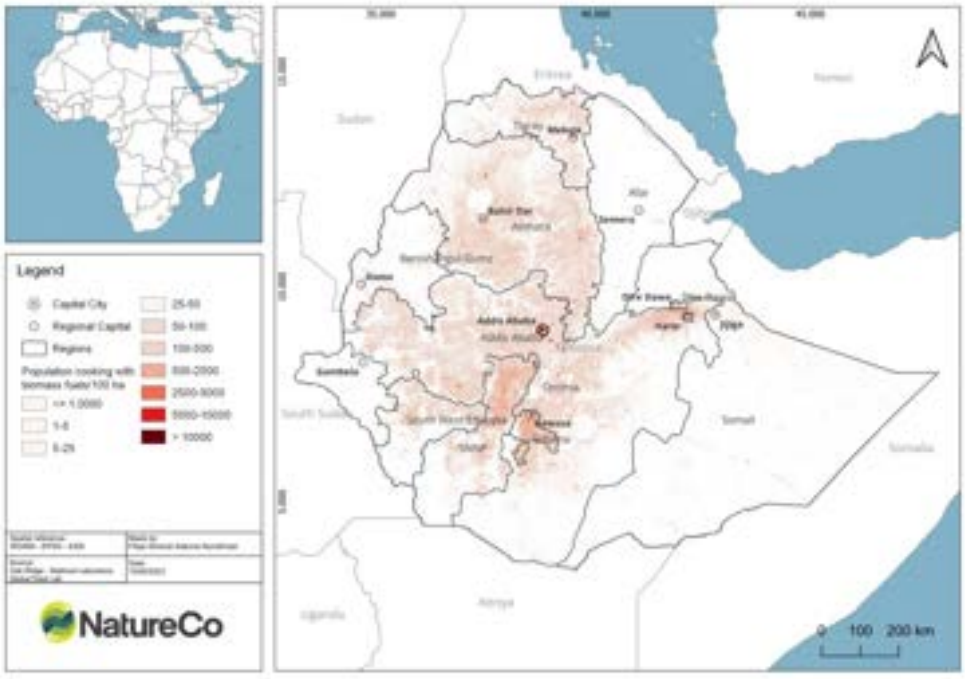


Figure 2 Density of population using biomass fuels for cooking

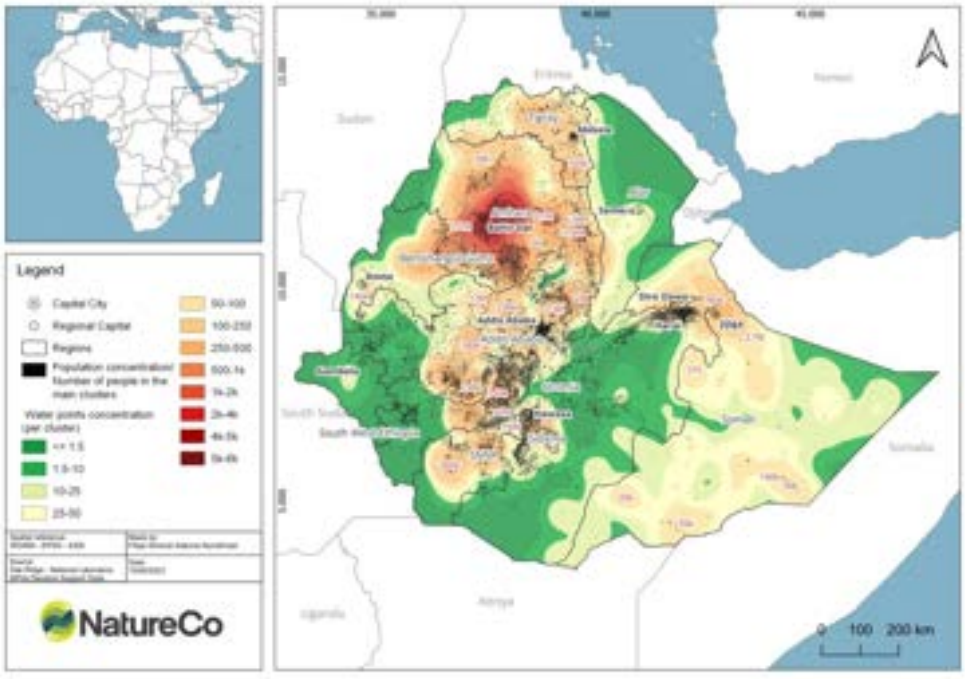


Figure 3 Water point concentration clusters

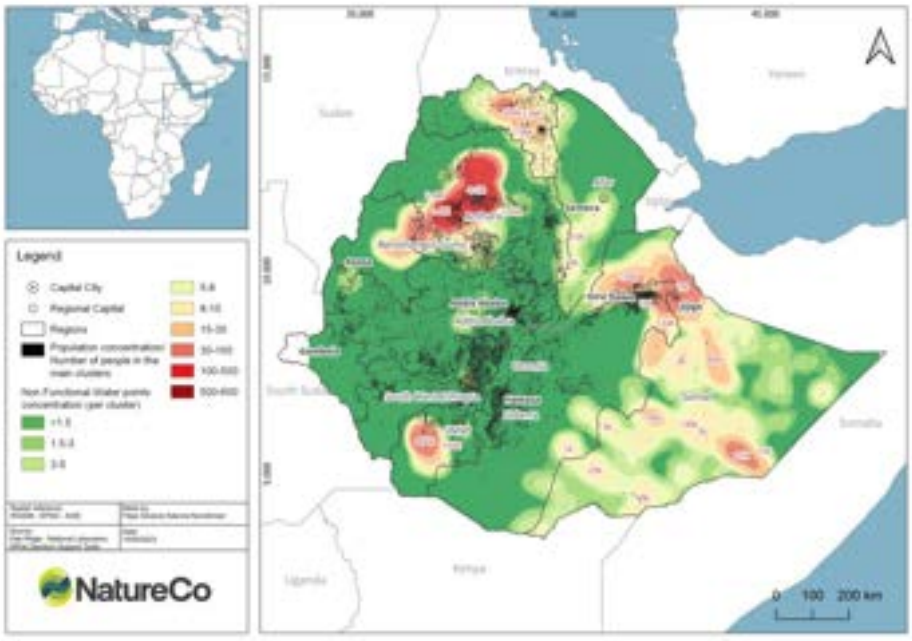


Figure 4 Non-functional water point clusters

Tree planting and natural regeneration to restore degraded watersheds

Figure 5 and Figure 6 show there are large areas of land that are both suitable for restoration (15 million hectares) and eligible to generate carbon credits (14.7 million hectares) at the time of analysis. The regions that have the highest potential include Amhara, Oromia, Tigray, SNNP, Southwest Ethiopia and Gambela. The highest carbon yield potential regions include Amhara and eastern parts of Oromia as shown in Figure 7. The watersheds with the highest potential include Mereb, Tekeze, Abay and Genalle.

If all eligible areas in the highest carbon yielding areas were restored, based on IPPC aboveground biomass growth data, approximately 1.8 billion tCO_2 could be sequestered over a 30-year period (refer to Table 2). It's important to note this is a high-level estimate and site-specific analysis would need to be undertaken to determine the actual potential of a defined project area.

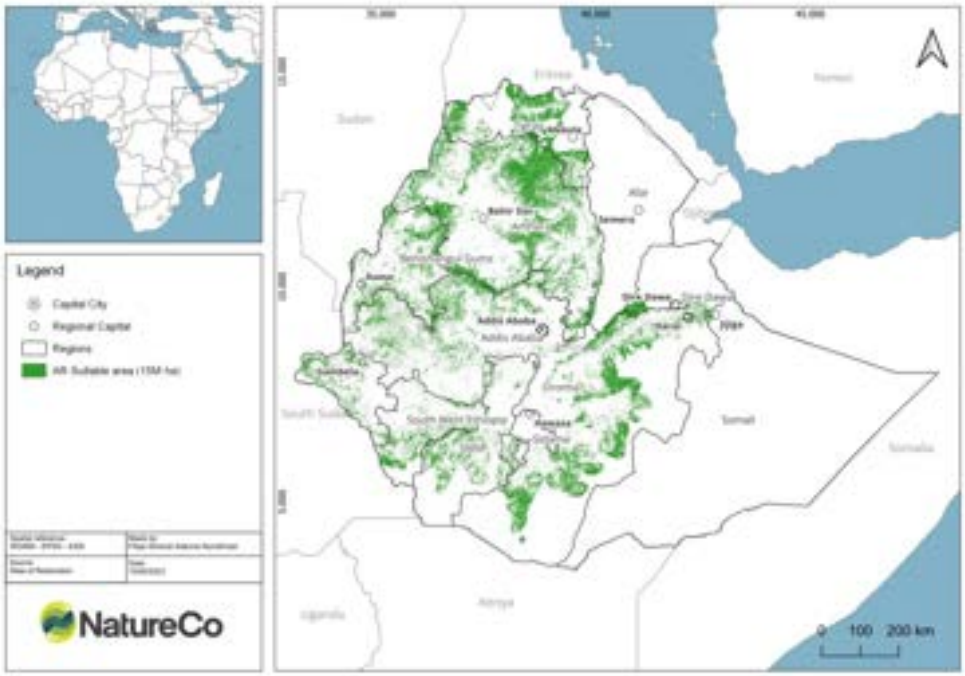


Figure 5 Suitable areas to undertake afforestation and reforestation projects

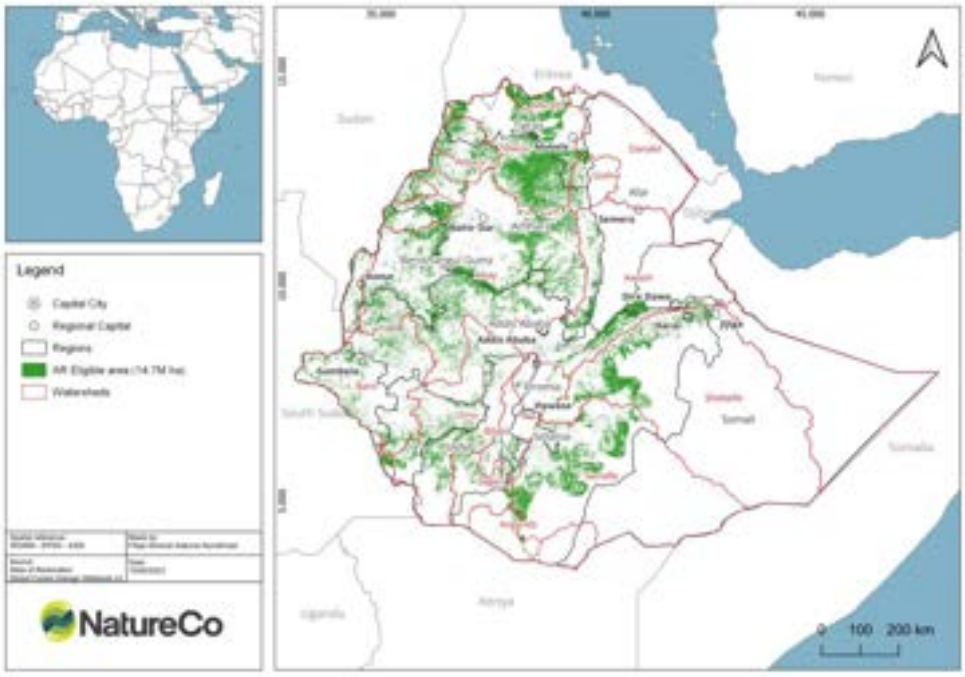


Figure 6 Eligible areas to undertake afforestation and reforestation projects

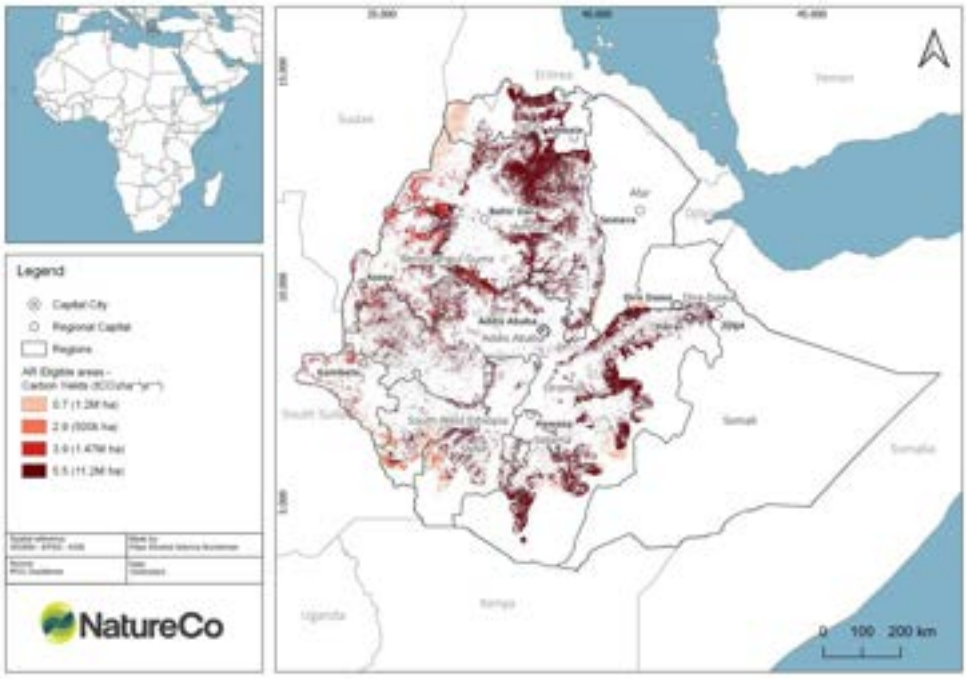


Figure 7 Carbon yields across eligible areas

Table 2 Total suitable area, eligible area, priority areas (carbon yields) and potential carbon sequestration

Afforestation / reforestation - rangelands and barelands	Description / layers	Total amount
Total suitable area	Rangelands and bare soils	15,000,000 ha
Total eligible area	Remove areas deforested in past 10 years	14,700,000 ha
Total priority area (carbon)	Areas located in the highest carbon yield areas (>5 tCO_2/ha/yr)	11,200,000 ha
Average carbon yields (aboveground biomass) over project lifetime (30 years) per ha	Adapted from IPCC annual biomass yields	165 tCO_2/ha
Total Carbon Sequestration over 30 years (priority carbon area)		**1,848,000,000**

Market demand for carbon credits

According to several independent analyses, demand for carbon credits is set to increase from $2 billion in 2020 to $40 billion in 2030[5,6,7] and around $250 billion by 2050[8]. Demand has been driven by companies who have set ambitious net-zero targets, with around 20% of the world's largest companies committing to such as target. Purchasing carbon credits will form an important part of how companies meet these targets[9].

Currently carbon credits that reduce or avoid carbon emissions being released to the atmosphere dominate the market. These include projects such as REDD+, renewable energy and energy efficiency projects. However, it is expected that projects that remove carbon from the atmosphere, such as reforestation and technology-based removals will become increasingly more important in the long term[10]. Therefore, given the potential in Ethiopia to restore degraded lands, significant opportunities exist in the market for carbon credits from reforestation projects.

Summary and conclusion

An assessment of the potential to generate carbon credits from WASH-related projects was undertaken. Three main WASH project activities were identified that have associated carbon methodologies including:

- Projects that reduce emissions to treat contaminated water (e.g., chlorination, filtration etc)
- Projects that improve the energy efficiency of water delivery systems (e.g., water pumps)
- Projects that improve the water quality of ground and surface water (e.g., reforestation)

Geospatial mapping was then used to identify where in Ethiopia the greatest potential exists for these projects. Regarding projects that reduce emissions from boiling water to treat contaminated water, regions including Tigray, Amhara, Oromia, Somali and northern parts of SNNP present some of best areas for undertaking projects due to the high populations that don't have access to piped water and the prevalence of non-functional boreholes. The latter also presents good opportunities for improving the energy efficiency of water delivery systems as well, particularly if moving from diesel to solar water pumps. The carbon credit potential however could not be calculated due to a lack of information regarding the number of people who boil water.

Projects that improve water quality through reforestation showed good potential with around 15 million hectares of land available for restoration through tree planting and natural regeneration. An estimated 1.8 million tCO_2 could be sequestered on high carbon yielding eligible areas, however this needs to be further examined through local knowledge and ground truthing, thus very much an indicative estimate at this stage. The watersheds with the highest potential include Mereb, Tekeze, Abay and Genalle.

Future demand for carbon credits in the voluntary carbon market is forecast to reach up to $40 billion by 2030 and potentially $250 billion by 2050. This represents a good opportunity to use the voluntary carbon market to finance this work.

[5] https://www.morganstanley.com/ideas/carbon-offset-market-growth (Last accessed 8 August 2023)
[6] https://www.mckinsey.com/capabilities/sustainability/our-insights/a-blueprint-for-scaling-voluntary-carbon-markets-to-meet-the-climate-challenge (Last accessed 8 August 2023)
[7] https://www.green.earth/press-releases/market-outlook-rapid-growth-in-voluntary-carbon-markets-with-rising-demand-for-high-quality-credits (Last accessed 8 August 2023)
[8] https://www.morganstanley.com/ideas/carbon-offset-market-growth (Last accessed 8 August 2023)
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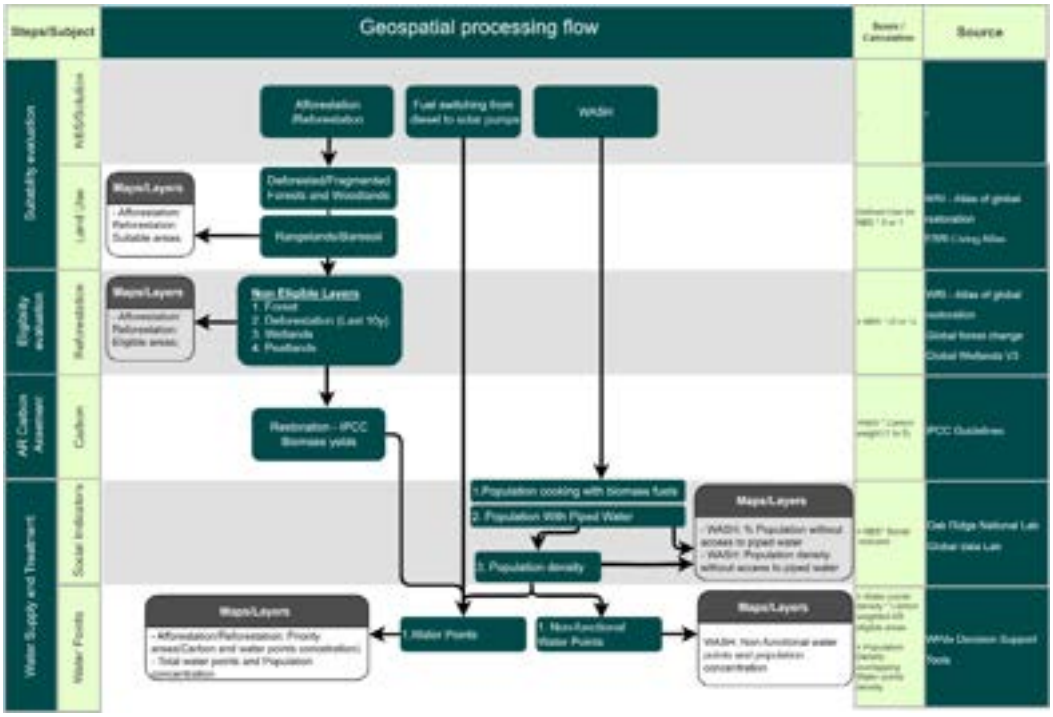
[10] https://www.morganstanley.com/ideas/carbon-offset-market-growth (Last accessed 8 August 2023)

Appendix 1. Geospatial processing flow



6.5 Registry Comparison and Methodology Section Tool (NatureCo)

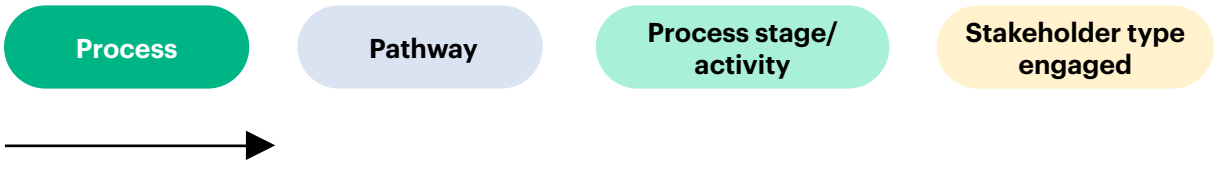
STANDARD AND METHODOLOGY SELECTION INSTRUCTIONS

STEP 1: **Standards Technical Assessment**	The first step is to undertake a technical assessment of relevant standards. This involves reviewing several criteria (e.g. eligible activities, applicable geographies etc) to determine if your project can be developed under the Standards of interest. Separate Tabs are provided for AFOLU and WASH projects. If your project can be developed under particular Standards, the next step is to review the Methods tab to check that the Standards your project qualifies under has a suitable methodology.
STEP 2: **Methodology Review**	Review the Methods tab to check that your project activity meets the applicability conditions and specific considerations.If there is only 1 suitable methodology then you do not need to move to the next step. However, if there are more than 1 Standard and Methologies available then move to step 3 - commercial assessment to determine which one is likely to provide the best revenue.
STEP 3: **Commercial Assessment**	Undertake a commercial assessment where there are two or more viable Standards that you can develop your project under.
STEP 4: **Results and Decision**	The final step involves documenting the results of the assessment and the decision on which Standard and Methodology will be used to develop your project activity.

ACTION: that carbon standards are continously updated, and new methods added, and that this document will need to be updated/revised accordingly

6.6 Stakeholder Consultation (NatureCo)

LEGEND



Main process

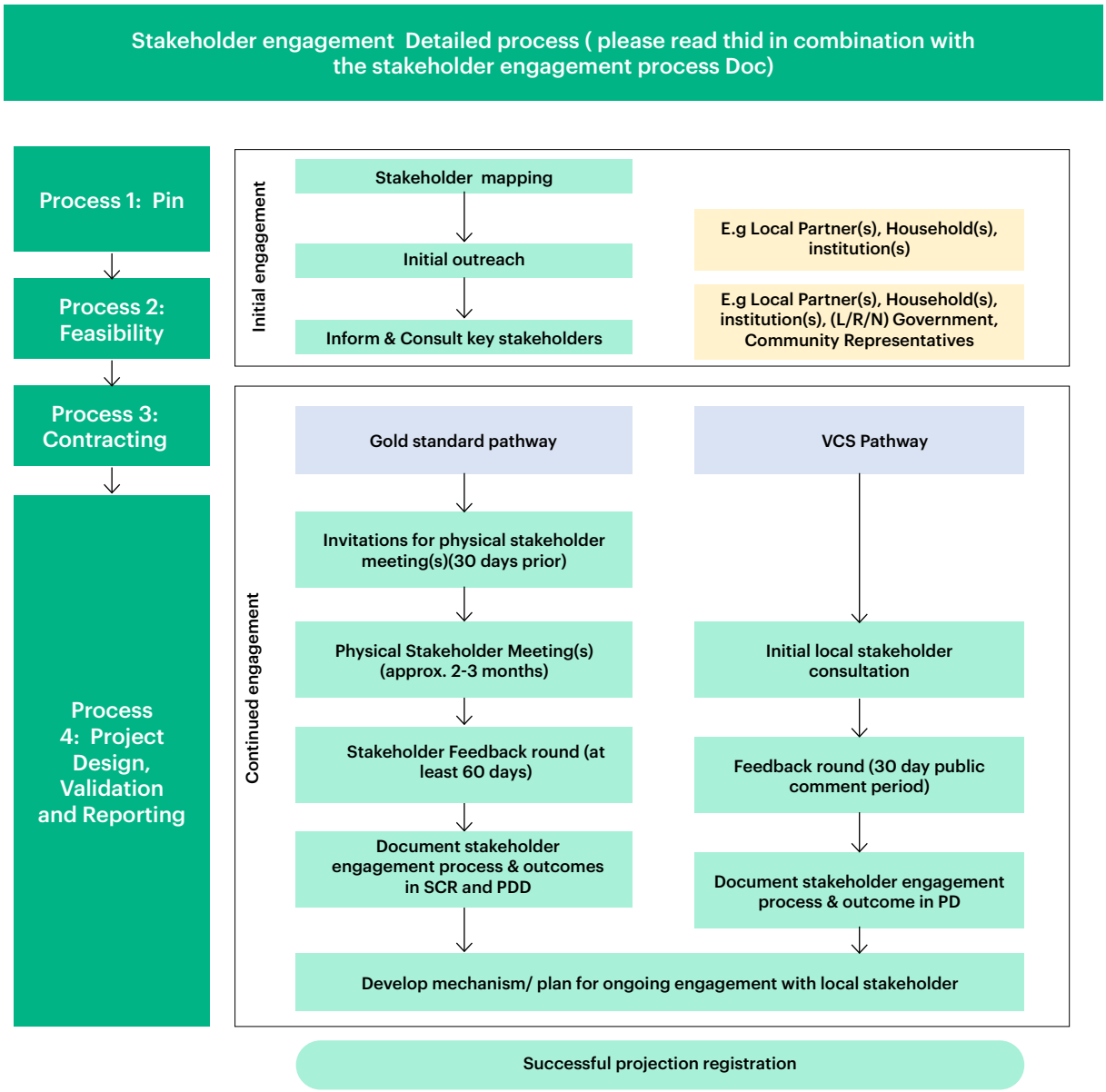
Initial Engagement: Any initial discussions with key stakeholders during the project planning and design phase, and before the commencement of any project activities. Initial engagement also includes the first conversations with local partners and landholders.

Continued and ongoing engagement: Continued and ongoing engagement after initial engagement as well as throughout the life of the project.

Household/Institutions: End-user target with safe water treatment and/or supply technologies implemented.

Responsibilities: Initial engagement is the responsibility of the local partner. The responsibility of stakeholder engagement following this stage will be negotiated between the Local Partner and Carbon Partner.

Note: Consultation shall take place prior to design decisions or implementation / project start to allow stakeholders adequate time to respond to proposed design or action.



6.6.1 Gold Standard Stakeholder Consultation Procedure

NatureCo

STAKEHOLDER CONSULTATION PROCEDURE

Standard: Gold Standard

1.1 Purpose

This document provides an overview of the stakeholder consultation procedures required for Water, Sanitation and Hygiene (WASH) projects seeking carbon credits under the Gold Standard. Stakeholder consultation is a critical component of Project Design Certification, and the project proponent must be able to demonstrate to a third-party validation/verification body (VVB) the process undertaken and what action has been taken to incorporate stakeholder feedback into the project design. The stakeholder consultation process summarized below is based on the requirements under the Gold Standard Stakeholder Consultation and Engagement Requirements v2.1 and Stakeholder Consultation and Engagement Guidelines v2.0.

The main steps in the stakeholder consultation process are outlined in **Error! Reference source not found.**.

Figure 1 - Stakeholder consultation process

1.2 Stakeholder identification and engagement preparation

The purpose of stakeholder consultation is to inform landholders, communities, government officials and other relevant individuals or institutions of your proposed project, to get their consent and participation in the design process, and to ensure their continued feedback throughout your project's life. Such consultations ensure that different categories of stakeholders are represented and involved, and allow them to evaluate impacts, raise concerns about potential negative impacts and provide input on the project design.

The stakeholder consultation process is ideally conducted before the project start date.[1] The initial stakeholder consultation involves a) stakeholder identification and b) stakeholder engagement preparation. If stakeholder consultation occurs after the project start date, then the project can follow a retroactive certification pathway.

1.2.1 Stakeholder identification

The project developer is required to first identify and invite all relevant stakeholders for consultations and comments. It is essential that the stakeholder consultations align with mandatory gender-sensitive requirements to ensure the equal and effective participation of both women and men.

The relevant stakeholders to be consulted must include (but aren't limited to) the following:

[1] The Project start date is the earliest date on which the Project Developer has committed to expenditures related to the implementation of the Project. This does not include the purchase or option to purchase the land upon which a Project is intended to take place.

- Local people, communities and/or representatives who are expected to be directly or indirectly affected (adversely affected or beneficiaries) by the project or may have an interest in the project.
- Stakeholders with land-tenure rights within or adjacent to the project and marginalized individuals and groups.
- Local policymakers and representatives of local authorities.
- National government officials or National Focal Point, for example, Designated National Authority (DNA) or equivalent body.
- Local non-governmental organizations (NGOs), women's groups working on topics relevant to the project or working with communities who are likely to be affected by the project.
- Gold Standard representative at help@goldstandard.org
- Relevant international Gold Standard NGO Supporters with representation in the region and all Gold Standard NGO Supporters located in the host country of the project.

See Appendix A for guiding questions to support the stakeholder identification process.

1.2.2 Stakeholder engagement preparation – invitation and information

It is mandatory that stakeholder consultation consists of a minimum of two rounds of consultation: a physical meeting with stakeholders, and a feedback round (these rounds are detailed further in Section 2).

Once the project proponent has completed the stakeholder identification phase, stakeholder engagement can proceed with an invitation to a physical stakeholder meeting. This invitation must be presented in an open and transparent manner, and provide equal opportunity to each stakeholder to participate in the stakeholder meeting and provide feedback.

A. Invitation

The invitation should state:

- Objective of the consultation
- Meeting date and venue
- How feedback can be submitted for those who are unable to attend the physical meeting (contact details, including phone number and email address)
- Contact details of a local representative
- Covid-19 safety requirements (if necessary).

B. Invitation distribution stipulations

Further stipulations include:

- Stakeholders must be invited at least 30 days before the physical meeting.
- An appropriate invitation method must be selected that takes into account the context of the project, stakeholders, local and national circumstances, and uses appropriate language and measures, and adequate and effective means (e.g., radio announcements or hand-delivered invitations in the local language).
- Stakeholders must be invited in a gender-sensitive manner, with efforts to receive input from women and marginalized groups (see Appendix B).
- The stakeholder consultation must be open to anyone who wishes to attend (the project developer must not deny anyone access to the consultation).
- Both oral and written invitations should be complemented by announcements at places stakeholders visit frequently (e.g., community centres, health centres, places of local worship).
- The project developer must follow up with stakeholders if they did not respond (via email, mail, phone or in person).

C. Information for stakeholders

Before the physical meeting with stakeholders, the project developer must also provide comprehensive information about the project in a way that will ensure the stakeholders understand how the project is likely to impact them. The information must be shared with stakeholders at least a week before the physical meeting, and must include the following:

- A non–technical summary of the project, including information on project design, technology, objectives, scale, duration, and implementation plan (so far as known) and how it is likely to affect the various stakeholder groups.
- Summary of the economic, social and environmental impacts of the project as per the Gold Standard Safeguarding Principles & Requirements (see Appendix E), along with potentially known positive and negative impacts of the project.
- Summary of likely contributions of the project to Sustainable Development Goals (SDGs).
- Other relevant information to help stakeholders understand the project design, implementation and operation.
- A preliminary agenda for the event summarising the different topics that will be discussed in the physical meeting.
- Contact details of a project developer's representative to get further information.
- Means and methods to provide further feedback for those who are not able to join the physical meeting.

1.3 Physical meeting and feedback round

As mentioned in the previous section, the stakeholder consultation must consist of a minimum of two rounds of consultation: a physical meeting with stakeholders, and feedback round that lasts for at least one month (30 days). These rounds are detailed further in this section.

1.3.1 Physical meeting

The physical meeting is the first stage of direct stakeholder consultation, where the project developer can provide further project details and create a connection with the relevant stakeholders. Furthermore, it provides an opportunity for the stakeholders to influence project design, implementation and operation by interacting both with the project developer and each other, and by exchanging views and concerns in a free and transparent manner.

In order to ensure equal and effective participation by all stakeholders, it is important that the project developer selects a place and timing for the meeting that doesn't present any barrier to the attendance of certain stakeholder groups. Depending on the context and project area, it may be appropriate to conduct several physical meetings in different locations to increase the participation of stakeholders.

The project developer is required to conduct the meeting(s) in a way that addresses each of the following key points:

- Providing a summary of the project information (which was shared with stakeholders in advance of the meeting).
- Ensuring that the discussion covers stakeholders' perceptions and expectations about project benefits and potential adverse impacts; how adverse impacts may be avoided and minimized and what the appropriate mitigation mechanisms may be.
- Discussing potential options and agreeing upon an input and grievance mechanism, in order to provide stakeholders with an opportunity to submit any feedback or raise grievances during the entire project life (see section 4 for more details).
- Providing information on the next steps and contact details.

See Appendix C for detailed meeting process guidelines, and Appendix D for examples of questions that stakeholders may ask in the meeting.

1.3.2 Feedback round

Once the physical consultation meeting(s) is completed, the project will proceed to the feedback round, which represents the second mandatory round of stakeholder consultation.

In this phase, the project developer is required to give feedback to the stakeholders regarding the consideration of any comments and concerns that were raised in the physical meeting. The stakeholders are also invited to provide any further feedback or comments during this round.

The feedback round lasts for a minimum of 30 days, and the updated project information must be made publicly accessible (publicly accessible website, online platform or others) and include details on procedure and contact details for submission of further comments. At the end of the stakeholder feedback round, the project developer will consolidate all the comments received, ready for consideration and documentation.

1.4 Consideration and Documentation

The consideration and assessment of feedback and the follow up actions are a critical part of the stakeholder consultation process. After the completion of the two mandatory rounds of stakeholder consultation (physical meeting and feedback round), the project developer will ensure that all comments are well documented and remain in the form in which they were received (i.e., with minimal interpretation or adjustment).

The project developer must provide details on how the stakeholder comments have been taken into consideration, and justify when any comments haven't been included or addressed.

A complete consultation report is required for the Gold Standard preliminary review. The project developer must use the Gold Standard Stakeholder Consultation Report Template (see Appendix E for access link) to document all consultation steps and to demonstrate compliance with the stakeholder consultation and engagement requirements. The report should then be submitted to the Gold Standard at the time of the preliminary review.

Any stakeholder feedback that is submitted after the preliminary review and before the Gold Standard validation must be considered and actioned accordingly.

1.5 Ongoing engagement and reporting

The project will need to set up a mechanism for stakeholders to be able to continue to provide ongoing feedback, input and grievance during the entire project life. During the physical stakeholder meeting, appropriate methods are to be discussed, and the project developer will establish the following methods of input and grievance expression for each project:

Required methods for continuous input and grievance expression include:

- Continuous 'Input & Grievance Expression Process Book'
- Telephone access
- Internet and email access
- Nominated Independent Mediator (NIM) (optional)

All comments, inputs or concerns raised by the stakeholders using the agreed mechanism of continuous feedback (or via any other way) must be recorded by the project developer.

The project developer is required to provide information in the annual report and the project monitoring report in order to provide transparent and regular accounting of the stakeholder interactions throughout the project's lifetime. This will include:

- Concerns that have been identified during the period of project implementation and raised by stakeholders and the measures put in place to address them
- Any feedback was given by stakeholders as part of the project's grievance mechanism.

APPENDIX A: GUIDING QUESTIONS FOR STAKEHOLDER IDENTIFICATION PROCESS

Below is a list of guiding questions to support the project developer in the stakeholder identification process:

- Who are the (relevant) local stakeholders? Do they include women, men or both? Do they include different socio-economic groups? Who else is missing?
- Are there stakeholder groups from which women or men are excluded?
- Which ones? Why? What do they lose through non-participation?
- Are there stakeholder groups composed of women exclusively or men exclusively? If so, what is the focus of these groups? What do women/men gain from them?
- What project activities are men and women involved in and when and where do these activities take place?
- Who is most dependent on the resources at stake (women or men)? Is this a matter of livelihood or economic advantage?
- Who has access to and control of resources and services and decision-making? How are decisions made?
- How do target groups interact with the project developer?
- What are the constraints to access and participation?
- Who has the capacity to contribute to gender equality in the project?
- Who has the capacity to hinder efforts of gender equality in the project?

APPENDIX B: GENDER-SENSITIVE AND INCLUSIVE STAKEHOLDER ENGAGEMENT

Below is a list of considerations for gender-sensitive and inclusive stakeholder engagement:

- Ensure equal and effective participation by both men and women, including considering the suitability of the place and timing of the meeting
- Particularly engage groups that are often marginalized including women, informal sector workers, ethnic minorities, indigenous peoples, disabled or elderly, members of the LGBTQ community
- Apply a gender lens while assessing the relevance and appropriateness of stakeholders' comments
- Consider different gender relationships and roles in the project area (see Gender Equality & Requirement Guidelines, Gender Policy)
- Provide assistance to those stakeholders who are unable or have difficulty to read, write, see or hear

The following list provides examples of guiding questions for gender-sensitive and inclusive stakeholder engagement:

- What measures and actions need to be put in place to ensure equal gender participation in Stakeholder Consultations?
- How should inputs and insights from women and men be sought out, listened to, considered, addressed and documented?
- Is it necessary to make any specific arrangements to ensure that all constituencies are engaged in the consultation? (for example, speak to women and men separately; have focus groups for women and focus groups for men before gathering them together to ensure their meaningful participation; adapt timings to fit with men's and women's working schedules)

APPENDIX C: MEETING PROCESS

Meeting process guidelines for the physical stakeholder consultation meeting are detailed below.

1) Introduce the agenda
    - Keep the agenda of the meeting clear
    - Ensure that all elements listed on the agenda are covered to ensure a meaningful consultation
2) Open the meeting with an introduction of the Project Developer, stakeholders, and the objective of the meeting.
    - Share project information and project details including the location, project technology, and implementation timelines. Disclose relevant information about the Project Developer, implementers, and other parties involved in the project.
    - Arrange a question and answer session to provide stakeholders with an opportunity to ask questions to better understand the project. Provide pen and paper for stakeholders to write down any questions and/or concerns and encourage people to do so.
    - Explain the expected and potential positive as well as negative impacts of the project in a simplified and non-technical manner. Discuss any potential adverse risks of the project. This discussion can be guided by the Safeguarding Principles Assessment (for further information, refer to the Gold Standard Safeguarding Principles and Requirements). Invite the stakeholders to discuss their concerns and how these could be addressed, for instance in a risk mitigation plan. Try to reach a consensus among the stakeholder regarding the final proposed measure(s) to mitigate or minimize the project risks. Ask stakeholders if they think there are any other relevant impacts of the project. Gather as many comments as possible.
    - Discuss the monitoring plan for sustainable development impacts by inviting stakeholders to share ideas on how this could be done in a cost-effective and participatory way. What are the most appropriate ways for stakeholders to monitor the project? Again, consider the abilities and capacity of your stakeholders and be reasonable in expectations.
    - Discuss the mechanism for input and grievance with the stakeholders to decide what are the best methods to raise concerns and/or seek recourse for impacts that occur during the project implementation. At the physical meeting, the Project Developer should discuss potential options, for filing a grievance and the associated procedures and protocols to ensure that stakeholders agree with the selected grievance mechanism.
    - Pay particular attention to feedback received from women or women's groups or other groups who are marginalized or fearful to come forward with a complaint.
3) Explain the follow-up action plan and how stakeholders can access the minutes of the meeting. It is also important to let attendees know how their comments are recorded and how they may find out about the follow-up actions to address the comments. Also, share the information on the Stakeholder Feedback Round.
4) Invite stakeholders to complete the evaluation form.
5) Close the meeting and collect Stakeholder Meeting Evaluation Forms.
6) Record the minutes at the meeting and gather evidence as pictures or if appropriate record a video. These are useful for the Stakeholder Consultation documentation (i.e., Stakeholder Consultation Report). Keep the meeting minutes short and focus on comments received during the meeting. The developer may appoint a trusted individual (for example, a community nurse or school principal) in advance to record the minutes of the meeting.
7) Record the participant list, to register their name and contact details, job or position and sign to indicate they were present.

N.B. Separate stakeholder consultation meetings should be held for each of the project areas.

APPENDIX D: EXAMPLE STAKEHOLDER QUESTIONS

Below are examples of questions that local stakeholders have asked during consultations.

General questions

Q1: Will there be an agreement between the project developer and communities (MoU) for this project?

An MoU will be prepared for all stakeholders included in the project.

Q2: What role will Micro Credit and Saving Institutions have in the project?

In general microfinance institutions can be used to provide finance to households to purchase water filters. The role of micro finance institutions can be decided by the local actors and the user community at large.

Q3: How do we know that our water has a problem in its quality for use?

All stakeholders will have the water quality test results (data) provided. Water is treated and it is safe at the source, but at the treatment plant or reservoir there are all possibilities of recontamination and so there is no guarantee for safe water at all.

Q4: Why does the project only include a few areas in the region?

The project identifies the water improvement needed and repair for water points in the region. The water points that are most feasible to repair are identified in terms of community interest/participation, technical viability, and water access in the community.

Q5: Is this project helpful for women in the area?

The project aims to decrease women's workload due to the provision of safe water, thereby allowing more time for them to engage in other activities.

Technical questions

Q1: If the water filter is installed at the household level, for how long can we use it?

From our experience, if properly used it can work for more than 10 years, but it should be maintained properly. Users are encouraged not to move the filter once the filter is installed.

Q2: Is there enough access to have water filters for our whole district since the problem is wide?

For selected areas of the districts, the project can provide 500 filters per district since this is a pilot project. If we succeed, we will expand the coverage.

Q3: How much water can we can filter each day?

About 40 litres per day. You can filter 20 litres in the morning and 20 litres in the evening.

Q5: How much is the flow rate per minute recommended?

The good flow rate is 400-600 ml per min.

APPENDIX E: REFERENCE DOCUMENT

The below documents are critical for preparing and implementing the stakeholder consultation. While this Stakeholder Consultation Plan was developed based on these documents, they still should be used as point of reference.

- Gold Standard Stakeholder Consultation and Engagement Requirements
- Gold Standard Stakeholder Consultation and Engagement Guidelines
- Gold Standard Gender Equality Guidelines & Requirements
- Gold Standard Safeguarding Principles and Requirements
- Gold Standard Stakeholder Consultation Report Template

6.6.2 Verified Carbon Standard Stakeholder Consultation Procedure

STAKEHOLDER CONSULTATION PROCEDURE

Standard: Verified Carbon Standard (Verra)

1.1 Purpose

This document provides an overview of the stakeholder consultation procedures required for Water, Sanitation, and Hygiene (WASH) projects which are administered by Verra. Stakeholder consultation is a critical component of project design and implementation. Under the VCS Standard, the project proponent is required to conduct local stakeholder consultation prior to validation by a third-party validation/verification body (VVB). Such consultations allow stakeholders to evaluate and raise concerns about potential negative impacts. The project proponent must be able to demonstrate to a VVB that the process undertaken is in line with the VCS Standard requirements. The main stages of this consultation process are illustrated in **Figure 1** below and further discussed in the following sections.

Figure 1: Stakeholder consultation process

1.2 VCS Standard stakeholder consultation process

Stage 1: Initial local stakeholder consultation

The purpose of local stakeholder consultation is to inform landholders, communities, government officials and other relevant organizations of your proposed project and to get their consent and participation in the design process. Such consultations allow stakeholders to evaluate impacts, raise concerns about potential negative impacts and provide input on the project design. The stakeholder consultation process is required to be completed prior to validation as a way to inform the design of the project and maximize participation from stakeholders.

The initial local stakeholder consultation involves both a) local stakeholder identification and background research and b) stakeholder consultation in form of workshops and/or interviews.

Local stakeholder identification and background research

The project proponent is responsible for undertaking a detailed assessment of the local stakeholders that will be impacted by the project. This can either be done in-house or outsourced to consultants. The following information is required to be collected and will be included in the Project Description (PD).

- The process(es) used to identify local stakeholders likely impacted by the project and a list of such stakeholders (e.g., landholders, local communities more broadly, cultural, religious and social groups, local, state and federal government, NGOs, local water management authorities).
- Identification of any legal or customary tenure/access rights to territories and resources, including collective and/or conflicting rights, held by local stakeholders.

- A description of the social, economic and cultural diversity within local stakeholder groups and the differences and interactions between the stakeholder groups.
- Any significant changes in the composition of local stakeholders over time.
- The expected changes in well-being and other stakeholder characteristics under the baseline scenario, including changes to ecosystem services identified as important to local stakeholders.
- The location of communities, local stakeholders and areas outside the project area that are predicted to be impacted by the project.
- The location of territories and resources that local stakeholders own or to which they have customary access.

Stakeholder consultation

Once the project proponent has completed the stakeholder identification and background research, stakeholder consultation can proceed with the identified stakeholders. Some key issues to consider during the engagement process includes:

- All stakeholders must have access to adequate information about the project (for instance in form of a non-technical project description). Access should be provided to full project documentation. Project information including costs, benefits and risks to local stakeholders must be provided in a timely manner to all stakeholders and in a form easily understood by all stakeholders.
- Consultation shall be performed prior to design decisions or implementation to allow stakeholders adequate time to respond to the proposed design or action.
- All communication must be performed in a manner that is a) culturally appropriate, b) inclusive, c) sensitive to all gender identities, and d) respectful of stakeholders' customary and statutory rights.
- Stakeholder input received during the consultation must be considered and can influence project design and implementation.
- A grievance redress procedure must be developed and implemented to address any disputes with local stakeholders that may arise during project planning and implementation, including with regard to benefit sharing. The procedure and documentation of disputes resolved through the procedure shall be made publicly available.

Methods of engagement can include (but not limited to):

- Multi-stakeholder group workshops
- Key informant interviews (e.g., direct consultations with government agencies, experts)

During the stakeholder consultation, the project proponent shall identify the likely natural and human-induced risks to local stakeholder well-being during the project lifetime and outline the mitigation measures to reduce the risks. Risks should include trade-offs with food security, land loss, loss if yields and climate change adaptation. The project should be designed to avoid such trade-offs.

Some key questions that maybe asked by stakeholders are provided in Appendix A:.

Stage 2: 30-day public comment period

All projects are required to undergo a 30-day public comment period. The purpose of this process is to give stakeholders further opportunities to comment on the project design. The date on which the project is listed on

the project pipeline[1] marks the beginning of the project's 30-day public comment period. Projects shall remain on the project pipeline for the entirety of their 30-day public comment period.

Comments will be submitted through the project's page on the Verra Registry. The project proponent is required to review all comments received during the public comment period and will need to either update the project design or demonstrate the insignificance or irrelevance of the comment. The project proponent will need to demonstrate to the VVB what action has been taken. Validation shall not be finalized until the 30-day public comment period has ended and the project proponent's responses evaluated.

Stage 3: Documentation in Project Description

The process for and the results from the local stakeholder consultation and the public comment period (conducted prior to validation) must be documented in the Project Description (PD). The following information that must be included in the PD:

- The procedures or methods used for engaging local stakeholders (e.g., dates of announcements or meetings, periods during which input was sought).
- The procedures or methods used for documenting the outcomes of the local stakeholder consultation.
- The mechanism for ongoing communication with local stakeholders.
- How due account of all and any input received during the consultation has been taken. Including details on any updates to the project design or justification of why updates are not appropriate.

Stage 4: Ongoing stakeholder consultation during implementation

The project proponent is required to implement appropriate mechanisms to ensure communication and consultation with local stakeholders is continued during the life of the project, and to allow stakeholders to raise concerns about potential negative impacts during project implementation (and for the life of the project). These mechanisms will need to be documented in the PD. The process for and the outcomes from ongoing stakeholder consultation also needs to be documented in each Monitoring Report.

The following information will need to be collected and reported which will be verified by the VVB at the end of each monitoring period, and documented in each Monitoring Report:

- The procedures or methods used for engaging local stakeholders (e.g., dates of announcements or meetings, periods during which input was sought).
- The procedures or methods used for documenting the outcomes of the local stakeholder communication.
- The mechanism for ongoing communication with local stakeholders.
- How due account of all and any input received during the consultation has been taken. Including details on any updates to the project design or justification of why updates are not appropriate.

[1] The project proponent is responsible for requesting to list the project with Verra and is required to submit all relevant documents to the Verra Registry. See the VCS *Registration and Issuance Process* for more information on the VCS project pipeline process (see 'Procedural': https://verra.org/programs/verified-carbon-standard/vcs-program-details/).

APPENDIX A: QUESTION LOCAL STAKEHOLDER MAY ASK DURING CONSULTATIONS

Below are the examples of questions that local stakeholders may ask during consultations.

General questions

Q1: Will there be an agreement between the project developer and communities (MoU) for this project?

An MoU will be prepared for all stakeholders included in the project.

Q2: What role will Micro Credit and Saving Institutions have in the project?

In general microfinance institutions can be used to provide finance to households to purchase water filters. The role of micro finance institutions can be decided by the local actors and the user community at large.

Q3: How do we know that our water has a problem in its quality for use?

All stakeholders will have the water quality test results (data) provided. Water is treated and it is safe at the source, but at the treatment plant or reservoir there are all possibilities of recontamination and so there is no guarantee for safe water at all.

Q4: Why does the project only include a few areas in the region?

The project identifies the water improvement needed and repair for water points in the region. The water points that are most feasible to repair are identified in terms of community interest/participation, technical viability, and water access in the community.

Q5: Is this project helpful for women in the area?

The project aims to decrease women's workload due to the provision of safe water, thereby allowing more time for them to engage in other activities.

Technical questions

Q1: If the water filter is installed at the household level, for how long can we use it?

From our experience, if properly used it can work for more than 10 years, but it should be maintained properly. Users are encouraged not to move the filter once the filter is installed.

Q2: Is there enough access to have water filters for our whole district since the problem is wide?

For selected areas of the districts, the project can provide 500 filters per district since this is a pilot project. If we succeed, we will expand the coverage.

Q3: How much water can we can filter each day?

About 40 liters per day. You can filter 20 liters in the morning and 20 liters in the evening.

Q5: How much is the flow rate per minute recommended?

The good flow rate is 400-600 ml per min.

6.6.3 North Mecha, South Achefer, and Fagita Lekoma Local Government Stakeholder Consultation Report – August 2023

The Millennium Water Alliance team facilitated stakeholder consultation meetings with representatives of relevant government agencies in three districts. The meeting was conducted to gather insights and opinions on the carbon credit concept. The purpose of this stakeholder consultation meeting is to inform local government officials and other relevant institutions of the three target districts, to gain their consent and participation in the feasibility study, and to ensure their continuous feedback throughout the assessment process. The stakeholder consultation will help to ensure that various stakeholder groups participate in the process, allow them to assess the impact of the proposed project on the social and economic landscape, allow them to raise any concerns they may have regarding the local community and ecosystem, and provide input on the project design. The stakeholder consultation meeting was conducted prior to the household survey. Most of the participants confirmed that they have a basic awareness of carbon credits, having heard from the mass media specifically about the benefits of tree planting, natural resource management, and the afforestation initiative in general.

The Process: The assessment for the carbon credit feasibility and learning study involved several steps. The first step was a field visit to each district water and energy office to conduct a brief discussion on the project, identify relevant stakeholders, select a convenient venue for the meeting, set a timeline for the stakeholder consultation, and determine the necessary logistics for the meeting. The MWA team carried out this task in collaboration with the district water officials.

Stakeholder identification: After a brief discussion with the respective water and energy offices, the following government agencies were identified as key stakeholders in the carbon credit project at the district level: These government offices were selected based on their organizational roles and responsibilities in planning, implementing and monitoring community development activities; their regulatory roles in overseeing both public and private projects in the community; appropriateness to deal with issues related to carbon offsetting; level of engagement and participation in activities related to organizing women groups, youth groups, business promotion; engagement in resource mobilization and revenue generation for development works; organizations that provide direct services to the community (in rural & urban settings); and those public intuitions that have acceptance and reputation to bring change and innovation among the community.

- Administration Office
- Agriculture Office
- Water and Energy Office
- Health Office
- Environment and Forest Protection Office
- Women, Children, and Social Affairs Office
- Education Office
- Culture and Tourism Office
- Finance Office
- Land Administration Office
- Revenue Office
- Faith Based Organizations (Christian &Muslim)
- Cooperatives Office
- Irrigation and Lowlands Development Office
- Enterprises Development and Labour Office

Preparing for Stakeholder Engagement - Invitation and Information: After identifying the key stakeholders for the carbon credit project, it was agreed that the Water and Energy Office would send invitations to these stakeholders for a brief meeting, stating the objective, venue, and expected time for discussion. Accordingly, a total of 15 organizations per district were invited to participate in the stakeholder consultation meeting. A total of 45 people attended in three districts. Three face-to-face stakeholder consultation meetings were held from July 26 to 28,

with the stakeholder consultation meeting convened separately in each district. For example, the first meeting was convened in Fagita Lekoma Woreda on July 26, 2023; the same was done in South Achefer Woreda on July 27 and finally the meeting was conducted on July 28.

Stakeholder information: Prior to convening the district-level stakeholder meeting, the MWA team provided basic information about the anticipated project to help stakeholders understand how the project is likely to positively impact the community in terms of water source development, rehabilitation, upgrading, or expansion works if the locality is found to be viable for carbon credit schemes. The team made it clear from the outset that the initiative was a carbon credit feasibility study, which could be converted into a project if and only if these districts were found to be viable for carbon marketing. This information was shared with relevant stakeholders prior to the meeting. The message was sent through the Water and Energy Office and included brief explanations about the objectives of the initiative, its benefits, social, economic, and environmental impacts, and the expected procedures and protocols that should be followed to make a given locality eligible for carbon credits.

Stakeholder consultation meeting: The stakeholder meeting was held separately in three districts, with 15 people per district representing relevant government agencies and faith-based organizations. This face-to-face meeting was the first event of direct stakeholder consultation, where the MWA team provided some basic information about the project and established a connection with the relevant stakeholders. In addition, the meetings provided a venue for stakeholders to share ideas that would influence the anticipated project design, development, implementation, monitoring, and evaluation by interacting with both the project developer and owners and by exchanging views and concerns in a transparent manner.

The stakeholder consultations were held in the district assembly halls, where the chief administrator and the head of the water office were designated as the chair and secretary of the meeting. MWA staff supported the facilitators by answering questions and providing basic information on the discussion points. Since MWA selected three districts for the feasibility study, it was necessary to hold the physical meetings in three separate locations to increase stakeholder participation.

The meetings attempted to address each of the following key points:

- Provide a summary of the project information that was shared with stakeholders prior to the meeting.
- Ensure that the discussion covers stakeholders' perceptions and expectations of project benefits, potential adverse impacts, and mitigation measures.
- Discuss potential options and agree on an input and grievance mechanism to allow stakeholders to provide feedback or raise grievances during project implementation.
- Provide information on the next steps and processes required if the context is determined to be eligible for carbon credits.
- Contact details of a representative of the project owner for further information, including means of communication to provide further feedback for those who are unable to attend the stakeholder meeting.

Summary of insights from stakeholders that participated in the meetings

Opportunities:

- The government has established a strong natural resource management system through physical and biological soil and water conservation measures. These include tree planting, terracing, gully

reclamation, construction of check dams, watershed management activities and area closure, which should be considered as a good practice to offset carbon emissions.

- At present, the government has given due importance to the use of renewable energy sources in both urban and rural areas. The use of solar power, wind power, biofuel, biogas, and hybrid technologies to name a few. Thus, the current practice would enable the nation in general and these specific districts to be eligible for carbon credits if evidence-based advocacy and influencing work is conducted on a large scale.

- There is Indigenous knowledge and skills in tree planting, forest protection, rangeland management, controlled grazing and ecosystem management among the rural community that need to be assessed, properly documented, and promoted to generate revenue from global financiers.

- Ethiopia is endowed with abundant natural resources such as arable land with a range of agro-climatic zones, high potential for solar, hydro and wind energy, high coverage of fresh water and a considerable size of young population. This has an immense potential to ensure a green economy if properly tapped which in turn would attract carbon credits.

- If our districts are found to be feasible for carbon credit, both the government and the community would prioritize the water sector to get financed as the water coverage is still low.

- As the regional and local government is facing budget shortage for access to safe water, we need projects to support water infrastructure development works. In addition, there is a strong need for technical and institutional capacity building from development partners.

Concerns:

- Since both districts are in the Blue Nile Basin, where the nation is building the Great Ethiopian Renaissance Dam, participants were hesitant about the use of cloud-based monitoring systems, the application of remote sensors, and sophisticated technologies for the sake of peace and security.

- The concept of carbon credits is interesting if applied fairly in eligible countries and localities. However, most global commitments in this regard seem to be easier said than done when it comes to reality.

Impression:

- Government officials have expressed their willingness to provide necessary support to projects that would generate resources for water infrastructure development, upgrading, rehabilitation and expansion works.

- Carbon credit could be considered as an untapped resource when it is viewed from the context of Ethiopia. Therefore, we need technical and financial support to explore the existing potential that would enable us to generate additional resources to improve water service delivery.

Recommendations: The carbon credit project requires strong commitment from relevant stakeholders and collaborators at various levels. Therefore, it is highly advisable to ensure the participation of each segment of the target population at all stages of the process.

6.7 Safeguarding (NatureCo)

6.7.1 Gold Standard Safeguarding Requirements

SAFEGUARDING REQUIREMENTS SUMMARY

Carbon standard	Gold Standard
Safeguarding Requirement	• Social Aspect (Principle 1, Principle 2, Principle 3, Principle 4, and Principle 5) • Economic Aspect (Principle 6) • Environmental and Ecological Aspect (Principle 7, Principle 8, and Principle 9)

Please note: this document is solely intended for use as a guidance document and should be read and understood in conjunction with the relevant carbon standard and methodology. See Appendix A for more details on the Gold Standard safeguarding principles and requirements.

Purpose

This document provides a brief summary of the Gold Standard Safeguarding Principles and Requirements which are mandatory for all projects. The document highlights the key steps and processes to identify, prevent, and mitigate negative, unintended consequences that may arise from the project including the brief mitigation measures for each principle.

The main steps of the safeguarding principles and requirements assessment process is outlined in Figure 1 and further discussed in the following sections.

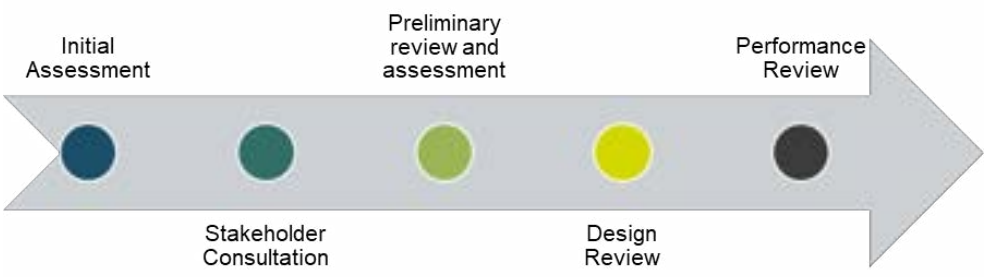


Figure 1: Safeguarding Principles and Requirements Assessment procedure

Key Information

1. **Initial Assessment**
   The project proponent shall undertake an initial assessment for each safeguarding principle (See Appendix B) based on the project scenario using the Gold Standard Safeguarding Principles and Requirements process. Desktop research can be used as an approach for the initial assessment. This assessment will provide an overview of the project activities in accordance with the safeguarding principles questions and requirements as well as proposed mitigation efforts for each principle. An expert stakeholder opinion shall be incorporated in the initial assessment where applicable within the Safeguarding Principle Requirements.

The assessment shall be assessed into three different categories against each principle as follows:

- '**Yes'** – Meaning that the risk or expected issue identified in the assessment question is relevant to the Project and context. The Requirements apply and adherence shall be demonstrated. All information must be included in the Monitoring & Reporting Plan and future Monitoring Reports.
- **'Potentially'** – Meaning that the risk or expected issue may be relevant at some point in the Project's cycle but is not necessarily relevant now and/or may never arise. The Requirements apply but the Project Developer may justify why these Requirements do not need to be demonstrated as being met.
- **'No'** – Meaning that the risk or expected issue is not relevant to the Project. Justification shall be provided to support this conclusion, with evidence provided where required.

The result from the assessment shall be used to re-design and/or propose mitigation when a risk is identified.

2. **Stakeholder Consultation**
   The initial assessment shall be presented during the stakeholder consultation in order to capture missing considerations during the initial assessment. The project proponent shall consider all relevant feedback from stakeholders and adjust the initial assessment.

3. **Preliminary Review**
   The project developer is required to submit the safeguarding principles assessment to SustainCert who conduct a preliminary review. Any issues identified during the preliminary review shall be corrected by the project developer before they can be closed out.

4. **Initial Certification and Design Review**
   The project developer is required to submit the safeguarding principles assessment to a Validation and Verification Body (VVB) who conduct an audit of the project including the safeguarding principles assessment. Any issues identified during the initial certification shall be corrected by the project developer before they can be closed out.

   After the VVB issues the final validation report, the project developer then submits to SustainCert for design review. Once the review is completed the project will be registered.

5. **Monitoring, Reporting and Verification**
   Any safeguarding mitigation measures included in the registered PDD must be monitored for the duration of the crediting period. For each monitoring period a report shall include:
   - An update on the implementation of the safeguarding mitigation measures including information on relative success and failures, or improvements to the proposed mitigation measures.
   - Monitoring and reporting on any key indicators identified, including against pre-set tolerances.
   - Information on any assessment questions answered 'Potentially' or where Requirements call for regular re-assessment.

APPENDIX A: GOLD STANDARD SAFEGUARDING REQUIREMENTS

Safeguarding Principles & Requirements – Gold Standard for the Global Goals

APPENDIX B: SAFEGUARDING PRINCIPLES SUMMARY

1. **Principle 1 – Human Rights**
   This principle highlights the requirement for the project to recognize human rights in the project area and the obligation to follow the existing national regulation and/or the international framework regarding human rights.

2. **Principle 2 - Gender Equality and Women's Rights**
   This principle requires the project developer to promote gender equality and non-discrimination including equal treatment, equal pay for equal work, etc. Any discrimination shall be avoided in order to achieve Sustainable Development Goal 5 that has the goal to achieve gender equality and empowerment for all women and girls.

3. **Principle 3 – Community Health, Safety, and Working Conditions**
   This principle requires the project to anticipate and avoid adverse impacts on the health and safety of the community during the project life including the provision of safe working conditions for workers. The project proponent may need to develop the Environment, Health, and Safety (EHS) procedures for each job (i.e. Job Hazard Analysis, Waste Handling, or Emergency Preparedness) to ensure that the adverse risks are mitigated appropriately.

4. **Principle 4 – Cultural Heritage, Indigenous Peoples, Displacement and Resettlement.**
   This principle requires the project developer to support the protection and preservation of cultural heritage as well as recognize and respect the existence of indigenous peoples in the project area. Any potential damage to cultural heritage sites, disturbance to indigenous people's property, and displacement should be identified and avoided.

5. **Principle 5 – Corruption**
   This principle requires the project developer to avoid any kind of corruption practices that may occur during the life of the project. The project developer may have to establish procedures to create a transparent process for activities that may attract corruption such as procurement of goods and services needed for the project.

6. **Principle 6 – Economic Impacts**

   This principle requires the project developer to create a positive economic impact for the local people. The project developer shall promote equitable, sustainable economic growth, and considerate economic conditions. This may include the identification of available local employees, local community needs, and local priority for providing financial benefit. In addition, the project developer shall establish a process to avoid child labor in the project.

7. **Principle 7 – Climate and Energy**

   This principle requires the project developer to not increase GHG emissions and to use energy efficiently. This may include using alternative sources of energy during implementation of project activities such as replacing fossil fuel-powered machinery with solarised equipment.

8. **Principle 8 – Water**

This principle requires the project developer to include water as an aspect for protection, sustainable management, conservation, maintenance and rehabilitation of natural habitats and their associated biodiversity and ecosystem functions. The project developer may need to identify and analyze the existing water resource conditions of the project area including surface and underground water. This information is needed for designing the project so that the water resource will not be overexploited or disturbed. The analysis includes the impact on natural water flows, potential erosion, and water body instability.

9. **Principle 9 – Environment, Ecology and Land Use**

This principle requires the project developer to pay attention to natural resource conservation and avoid negative impacts on the environment. This includes the protection of soils, avoidance of pollutant release and hazardous materials, protection of conservation areas and critical habitats, and the protection of food resources and animal rights.[1] The project proponent shall undertake a soil and landscape survey to understand the site characteristics, as well as a biodiversity survey to understand the presence of high conservation value areas and critical habitats for certain protected species.

[1] For more detail, available at Safeguarding Principles & Requirements – Gold Standard for the Global Goals

6.7.2 Verified Carbon Standard Safeguarding Requirements

NatureCo

SAFEGUARDING REQUIREMENTS SUMMARY

Carbon standard	Verified Carbon Standard by Verra (VCS)
Safeguarding Requirement	• General requirements • AFOLU-specific requirements

Please note: this document is solely intended for use as a guidance document and should be read and understood in conjunction with the relevant carbon standard and methodology. See Appendix A for more details on the VCS safeguard requirements and guidelines.

Purpose

This document provides a brief summary of the safeguards requirement from the VCS standard. The document outlines that the project proponent must identify and address any negative environmental and socio-economic impacts of project activities and must engage with local stakeholders during the project development and implementation phases.

The main steps of the safeguard requirements are outlined in F**Error! Reference source not found.** and further discussed in the following sections.

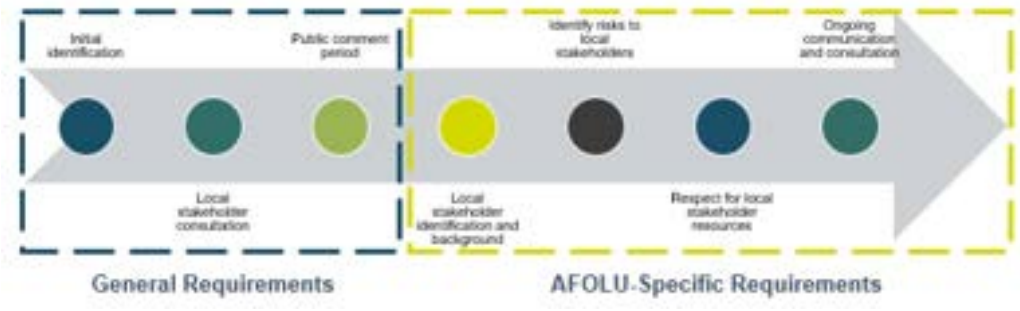


Figure 1: Safeguard Assessment procedure

Key actions

General requirements for all project types

1. **Initial Identification**
   The project proponent shall identify potential negative environmental and socio-economic impacts from the project activities and propose mitigation measures to ensure no net harm. This assessment may be conducted by desktop research based on available information and on a project scenario basis. The information from initial identification should consider local stakeholders, indigenous people's presence, conservation areas, landscape characteristics, socio-economic factors, etc.

2. **Local Stakeholder consultation**
   The initial assessment shall be informed by local stakeholders during consultations. This process is to ensure the initial assessment is evaluated by local stakeholders according to their perspectives, aspirations, and concerns that may be not identified during the initial assessment conducted by the

project proponent. All issues and concerns from local stakeholders shall be incorporated into the assessment and influence the overall design of the project.

3. **Public comment period**
   The assessment shall be made available during the 30-day public comment period on the Verra registry website. This process is to give the public access to the assessment so that they can raise their aspirations and comments regarding the project activities. All aspirations and comments during the public comment period shall be incorporated into the assessment document. This may result in the update of the project design.

AFOLU-Specific requirements

The requirements below are required to be followed if AFOLU (Agriculture, Forestry and Other Land Use) project activities may have impacts to local stakeholders.

1. **Local Stakeholder Identification and Background**
   The project proponent will have to conduct a thorough assessment of the local stakeholders besides what is required in the General Requirements section. At this stage, the project shall include information on local stakeholders at the start of the project which includes:
   - Potentially impacted stakeholders by the project activities.
   - Identification of legal or customary tenure/access rights to territories and resources.
   - A detailed description of the socio-economic aspects of the local stakeholders' group.
   - Any significant changes in the makeup of local stakeholders over time.
   - The expected change in well-being and characteristic under the baseline scenario.
   - Location of communities, local stakeholders, and areas that are predicted to be impacted.
   - The location of territories and resources that local stakeholders own or to which they have customary access.

2. **Identify Risks to Local Stakeholders**
   The project proponent shall identify risks that could potentially occur to the local stakeholders due to the project activities. It is encouraged to include relevant subject matter experts to identify risks in the project, so the project proponent can outline mitigation measures properly.

3. **Respect for Local Stakeholder Resources**
   The project proponent shall pay attention to the existing resources used by the local stakeholders in the project design to avoid future conflicts during the project life. To achieve this, the project proponent needs to recognize, respect, and support local stakeholders' rights and help them to secure their own property. Additionally, the project shall reduce potential damage to the ecosystem on which local stakeholders depend on such as not introducing invasive species during the project activities, promoting native species, and justification if the project will use fertilizer and/or other chemicals for supporting the project.

4. **Communication and Consultation**

   In order to provide access for local stakeholders to raise their issues and concerns, the project proponent shall establish an ongoing communication mechanism during the project life to ensure all potential concerns that may arise from local stakeholders are captured and documented properly. The procedure shall include processes for receiving, hearing, responding and resolving grievances within a reasonable time period, taking into account culturally-appropriate conflict resolution methods. All communication and consultation shall be performed in a culturally appropriate manner and the results of implementation shall be provided in a timely manner and consultation shall be performed prior to design decisions or implementation to allow stakeholders adequate time to respond to the proposed design or action.

VCS SAFEGUARDING REQUIREMENTS

VCS-Standard-v4.4-FINAL.pdf (verra.org)

6.7.3 Safeguarding Assessment

Safeguarding Principle	Summary
General	**No-net harm** • Identify potential negative environmental and socio-economic impacts and shall take steps to mitigate them;
	Local stakeholder Consultation • Conduct a local stakeholder consultation prior to validation as a way to inform the design of the project and maximize participation from stakeholders; • Establish mechanisms for ongoing communication with local stakeholders to allow stakeholders to raise concerns about potential negative impacts during project implementation; • Shall take due account of all and any input received during the local stakeholder consultation and through ongoing communications; • Demonstrate to the validation/verification body what action it has taken in respect of the local stakeholder consultation as part of validation, and in respect of ongoing communications as part of each subsequent verification.
	Public Comment Period • All projects are subject to a 30-day public comment period; • Projects shall remain on the project pipeline for the entirety of their 30-day public comment period; • Comments shall be submitted through the project's page on the Verra Registry; • Shall take due account of any and all comments received during the consultation; • The Validation/Verification body shall not finalize validation until their 30-day public comment period has ended and the project proponent's responses evaluated.
AFOLU Projects	**Local Stakeholder Identification and Background** • Conduct a thorough assessment of the local stakeholders that will be impacted by the project including the information of the process used to identify, identification of any legal or customary tenure rights, description of socio-economics and cultural diversity, significant changes, location of the communities, location of territories and resources, and expected change.
	Risks to Local Stakeholders • Identify likely natural and human-induced risks to local stakeholder well-being expected during the project's lifetime; • Identify the risks for local stakeholders to participate in the project, including project design and consultation; • Not be involved in any form of discrimination or sexual harassment; • Have expertise and prior experience implementing land management and carbon projects with community engagement at the project scale.

	Respect for Local Stakeholder Resources • Avoid negative impacts of project implementation and mitigate impacts when unavoidable; • Recognize, respect, and support local stakeholders' property rights and where feasible, take measures to help secure rights; • Not encroach on private, stakeholder or government property or relocate people off their lands without consent; • Not introduce any invasive species or allow an invasive species to thrive through project implementation; • Justify the use of non-native species over native species, explaining the possible adverse effects of non-native species; • Justify the use of fertilizers, chemical pesticides, biological control agents and other inputs used by the project and their possible adverse effects.
	Communication and Consultation • Take all appropriate measures to communicate and consult with local stakeholders in an ongoing process for the life of the project; • Develop a grievance redress procedure to address disputes with local stakeholders that may arise during project planning and implementation, including with regard to benefit sharing; • Include processes for receiving, hearing, responding and attempting to resolve grievances within a reasonable time period, taking into account culturally-appropriate conflict resolution methods. • The procedure and documentation of disputes resolved through the procedure shall be made publicly available; • All communication and consultation shall be performed in a culturally appropriate manner, including language and gender sensitivity, directly with local stakeholders or their legitimate representatives when appropriate; • The results of implementation shall be provided in a timely manner and consultation shall be performed prior to design decisions or implementation

6.8 Baseline Survey

6.8.1 Baseline Survey Questionnaire

The following survey is a combination of the Gold Standard baseline survey (BS)[9] and household survey (HS)[10] questionnaire for community water supply (CWS) projects that was conducted as part of the feasibility study. It is available publicly through the mWater portal.

9 Gold Standard baseline survey questionnaire for community water supply projects: https://globalgoals.goldstandard.org/429-3-sdws-bs-survey-questionnaires-cws/

10 Gold Standard household survey questionnaire for community water supply projects: https://globalgoals.goldstandard.org/429-5-sdws-hs-survey-questionnaires-cws/

General Info

CWS 1: Date Survey

_____

CWS 2: Name of Surveyor *Hint: Enter full name of enumerator*

_____

CWS 3: What type of location is this?

◯ Household

◯ School

◯ Healthcare Facility

CWS 4: [What type of location is this?] Reference Number

☐ Don't Know

☐ Not Applicable

CWS-BS 4: Community / Village *Hint: Which this household is a part of*

_____

CWS 5: Please record the GPS location of the [What type of location is this?] *Hint: Question includes administrative region i.e., Country, District, etc.*

_____

☐ Don't Know

CWS 6: What is the primary type of premise where the interview is being conducted?

◯ Full-day premises / Boarding School

◯ Half-time premises

◯ Combined

Household / Institutional Information

Please read aloud the prompt asking [What type of location is this?] representative for consent to be interviewed:

My name is [Name of Surveyor] and this is (another surveyor name if applicable). We are doing a survey on drinking water consumption and the practice of water treatment. We would now like to ask you to participate in a survey on drinking water and hygiene. All the information we collect will be kept private. Your name will not appear anywhere in the final report, and no information that may identify you will be contained in the final report without your permission. Participation is voluntary.

Do you agree to participate?

CWS 7: [What type of location is this?] consented to the interview? *Hint: If No, say thanks, stop the interview and select another household*

◯ Yes

◯ No

CWS 8: Respondent's Name *Hint: Enter the respondents' full name in the text field*

_____

CWS 9: Respondent's Sex:

◯ Male

◯ Female

CWS 10: [What type of location is this?] Contact Details *Hint: Enter respondent's telephone number where they can be reached*

_____

☐ Don't Know

☐ Not Applicable

CWS-BS 11: Is the water from the project currently being used in the [What type of location is this?]? *Hint: If no, say thanks to HHs, stop the interview and select another household*

◯ Yes

◯ No

CES-BS 12: What is the number of people in your premise

	Male	Female
Full-day premises/Boarding school		
Half-time premises		

☐ Don't Know

Water sources and Treatment

Definition of sources of drinking water:

- **Piped into dwelling:** also called a 'household connection,' is a piped water supply connected with in-house plumbing to one or more taps (for example in the kitchen or bathroom). **Piped into compound, yard, or plot:** also called a 'yard tap,' is a piped water supply connected to a tap in the compound, yard, or plot outside the house.

- **Piped to neighbor** refers to a household obtaining drinking water from a neighbor's piped water supply (household connection or yard tap).

- **A public tap or standpipe** also known as a public fountain, is a public water point from which people can collect water.

- **Borehole or tubewell:** is a deep hole that has been driven, bored or drilled, to reach groundwater. Boreholes/tubewells are constructed with casing, or pipes, which prevent the small diameter hole from caving in and protect the water source from infiltration by run-off water. Water is delivered through a pump which may be powered by human, animal, wind, electric, diesel or solar means.

- **Protected well:** is a dug well that is protected from runoff water by a well lining or casing that is raised above ground level to form a headwall and an apron that diverts spilled water away from the

well. A protected well is also covered so that contaminated materials (including bird droppings and small animals) cannot enter the well. Water is delivered through a pump or manual lifting device.

- **Unprotected well:** is a dug well that lacks any of the following: a lining or casing that is raised above ground level to form a headwall; an apron that diverts spilled water away from the well; a cover which prevents contaminated materials (including bird droppings and small animals) from entering the well; or a pump or manual lifting device.
- **Protected spring:** is a natural spring protected by a "spring box," made of brick, masonry, or concrete, which is built around the spring so that water flows directly out of the box into a pipe or cistern, without being exposed to runoff or other sources of contamination.
- **Unprotected spring:** is a natural spring that lacks a "spring box" to protect against run off and other sources of contamination (including bird droppings and animals).
- **Rainwater collection:** refers to a system whereby rain is collected or harvested from large surfaces (by roof or ground catchment) and stored in a container, tank, or cistern until used.
- **Tanker-truck:** refers to water sold or distributed by a provider who transports large quantities of water into a community using a motorized truck with a tank.
- **Cart with small tank/drum:** refers to water sold or distributed by a provider who transports a tank or drum with small quantities of water into a community using donkey carts, small motorized vehicles and other means.
- **Water kiosk:** refers to a water point from which water is sold in small quantities. Households typically bring their own containers to be filled.
- **Bottled water:** is sold by commercial providers in small or large bottles or refillable containers. This does not include water from other sources stored in plastic bottles.
- **Sachet water:** is like bottled water but is packaged in a plastic bag rather than a bottle.
- **Surface water:** refers to open water sources located above ground including rivers, reservoirs, lakes, ponds, streams, canals, and irrigation channels.

Note: *W1 refers to the main source only. See expanded questions on use of multiple sources.*

Note: *Drinking water refers to the accessibility, availability and quality of the main source used by households for all usual domestic purposes, including drinking, food preparation and personal hygiene*

Notes on classification:

1. The term **drinking water source** refers to the point from which water is collected (for example the tap or borehole/well/spring) and not the origin of the water supplied (for example surface water or groundwater).

2. **Improved drinking water sources** are those which by nature of their design and construction have the potential to deliver safe water. Improved sources include: piped water, boreholes or tubewells, protected dug wells, protected springs, rainwater and packaged or delivered water.

3. **Packaged and delivered water** can potentially deliver safe water but were previously treated as unimproved due to lack of data on accessibility, availability, and quality. For SDG monitoring the JMP will treat them as **'improved'** and classify them as limited, basic, or safely managed based on the new SDG criteria.

4. **Public taps or standpipes** can have one or more taps. They are typically made of brickwork, masonry or concrete and located in public spaces. Households using privately owned taps in a neighbor's yard should be classified as **'piped to neighbor.'**

5. **Boreholes** from which water is pumped into an overhead tank which supplies households in the same compound, should be classified as **'borehole or tubewell.'** However, boreholes delivering water to an overhead tank which supplies multiple compounds through a reticulated piped system should be classified as one of the types of **'piped water,'** depending on where the household collects the water.

6. **Protected wells** may be fitted with a range of lifting devices (for example motorized pumps, hand pumps, ropes, and windlasses with buckets) but if the well lacks a cover, then it should be classified as **'unprotected well.'**

7. **Rainwater collection** comprises a range of different technologies designed to capture and store rainwater for drinking. Groundwater catchments require filtration and unfiltered surface water should be classified as **'surface water.'**

8. **Water kiosks** are like public standpipes, but with a more commercial approach to collecting fees. **Water refill stations** are like water kiosks, but operators typically provide households with dedicated containers that are then sanitized before being refilled. These should be classified as **'bottled water.'**

9. **Unimproved drinking water sources** are those which by nature of their design and construction are unlikely to deliver safe water. Unimproved sources include: unprotected dug wells, unprotected springs, and surface water.

CWA-BS 13: What is the main source of drinking water for members of your [What type of location is this?] in the dry season? *Hint: Dry Season*

- ◯ Piped into dwelling
- ◯ Piped into compound, yard, or plot
- ◯ Piped to neighbor
- ◯ Public tap / standpipe
- ◯ Borehole or tubewell
- ◯ Protected dug well
- ◯ Unprotected dug well
- ◯ Protected spring
- ◯ Unprotected spring
- ◯ Rainwater collection
- ◯ Tanker-truck
- ◯ Cart with small tank / drum
- ◯ Water kiosk
- ◯ Bottled water
- ◯ Sachet water
- ◯ Surface water - (river, stream, dam, lake, pond, canal, irrigation channel)
- ◯ Other (specify)

_____

_____

CWA-BS 13: What is the main source of drinking water for members of your [What type of location is this?] in the rainy season? *Hint: Rainy Season*

- ◯ Piped into dwelling
- ◯ Piped into compound, yard, or plot
- ◯ Piped to neighbor
- ◯ Public tap / standpipe
- ◯ Borehole or tubewell
- ◯ Protected dug well
- ◯ Unprotected dug well
- ◯ Protected spring
- ◯ Unprotected spring
- ◯ Rainwater collection
- ◯ Tanker-truck
- ◯ Cart with small tank / drum
- ◯ Water kiosk
- ◯ Bottled water
- ◯ Sachet water
- ◯ Surface water - (river, stream, dam, lake, pond, canal, irrigation channel)
- ◯ Other (specify)

_____

_____

If What is the main source of drinking water for members of your {0} in the dry season? is one of Bottled water, Sachet water:

CWA-BS 14: What is the main source of water used by members of your [What type of location is this?] for other purposes, such as cooking and hand washing in the dry season?

- ◯ Piped into dwelling
- ◯ Piped into compound, yard, or plot
- ◯ Piped to neighbor
- ◯ Public tap / standpipe
- ◯ Borehole or tubewell
- ◯ Protected dug well
- ◯ Unprotected dug well
- ◯ Protected spring
- ◯ Unprotected spring
- ◯ Rainwater collection
- ◯ Tanker-truck
- ◯ Cart with small tank / drum
- ◯ Water kiosk
- ◯ Surface water - (river, stream, dam, lake, pond, canal, irrigation channel)
- ◯ Bottled water
- ◯ Sachet water
- ◯ Other (specify)

_____

_____

CWA-BS 14: What is the main source of water used by members of your [What type of location is this?] for other purposes, such as cooking and hand washing in the rainy season? *Hint: Rainy Season*

- ◯ Piped into dwelling
- ◯ Piped into compound, yard, or plot
- ◯ Piped to neighbor
- ◯ Public tap / standpipe
- ◯ Borehole or tubewell
- ◯ Protected dug well
- ◯ Unprotected dug well
- ◯ Protected spring
- ◯ Unprotected spring
- ◯ Rainwater collection

◯ Tanker-truck

◯ Cart with small tank / drum

◯ Water kiosk

◯ Surface water - (river, stream, dam, lake, pond, canal, irrigation channel)

◯ Bottled water

◯ Sachet water

◯ Other (specify)

_____

_____

If What is the main source of drinking water for members of your {0} in the dry season? is any of Piped into dwelling, Piped into compound, yard or plot, Piped to neighbor or What is the main source of drinking water for members of your {0} in the rainy season? is any of Piped into dwelling, Piped into compound, yard or plot, Piped to neighbor or What is the main source of water used by members of your {0} for other purposes, such as cooking and hand washing in the dry season? is any of Piped into dwelling, Piped into compound, yard or plot, Piped to neighbor or What is the main source of water used by members of your {0} for other purposes, such as cooking and hand washing in the rainy season? is any of Piped into dwelling, Piped into compound, yard or plot, Piped to neighbor or None or None or None or None:

CWS-BS 15: What type of piped supply does your household / institution use? *Hint: Piped Water*

◯ Large, piped network managed by a utility

◯ Small, piped network managed by the community

◯ Small, piped network managed by the household / institution

☐ Don't Know

If What is the main source of drinking water for members of your {0} in the dry season? is any of Piped into dwelling, Piped into compound, yard or plot, Piped to neighbor or What is the main source of drinking water for members of your {0} in the rainy season? is any of Piped into dwelling, Piped into compound, yard or plot, Piped to neighbor or What is the main source of water used by members of your {0} for other purposes, such as cooking and hand washing in the dry season? is any of Piped into dwelling, Piped into compound, yard or plot, Piped to neighbor or What is the main source of water used by members of your {0} for other purposes, such as cooking and hand washing in the rainy season? is any of Piped into dwelling, Piped into compound, yard or plot, Piped to neighbor or None or None:

CWS-BS 16: How many hours per day is piped water supplied on average *Hint: Piped water. Write 24 if the supply is continuous.*

_____

☐ Don't Know

If What is the main source of drinking water for members of your {0} in the dry season? is any of Sachet water, Bottled water or What is the main source of drinking water for members of your {0} in the rainy season? is any of Bottled water, Sachet water or None or None:

CWS-BS 17: Is packaged water always available from your main source / supplier? *Hint: Packaged Water*

◯ Yes, water is always available

◯ No, water is available most of the time

◯ No, water is available some of the time

◯ No, water is rarely available

☐ Don't Know

If What is the main source of drinking water for members of your {0} in the dry season? is any of Bottled water,

Sachet water or What is the main source of drinking water for members of your {0} in the rainy season? is any of Sachet water, Bottled water or What is the main source of water used by members of your {0} for other purposes, such as cooking and hand washing in the dry season? is any of Sachet water, Bottled water or What is the main source of water used by members of your {0} for other purposes, such as cooking and hand washing in the rainy season? is any of Bottled water, Sachet water:

CWS-BS 18: In the past 30 days, for how many days was water from packed water unavailable when needed? *Hint: Packaged Water*

_____

☐ Don't Know

CWS-BS 19: Is the water supplied from your main source for drinking usually acceptable? *Hint: If unacceptable, select the main reason*

◯ Yes, acceptable

◯ No, unacceptable taste

◯ No, unacceptable color

◯ No, unacceptable smell

◯ No, contains materials

◯ Other (please specify)

_____

☐ Don't Know

If What is the main source of drinking water for members of your {0} in the dry season? isn't one of Piped into dwelling, Piped into compound, yard or plot and What is the main source of drinking water for members of your {0} in the rainy season? isn't one of Piped into dwelling, Piped into compound, yard or plot and What is the main source of water used by members of your {0} for other purposes, such as cooking and hand washing in the dry season? isn't one of Piped into dwelling, Piped into compound, yard or plot and What is the main source of water used by members of your {0} for other purposes, such as cooking and hand washing in the rainy season? isn't one of Piped into dwelling, Piped into compound, yard or plot:

CWS-BS 20: Where is that water source located?

◯ In own dwelling

◯ In own yard / plot

◯ Elsewhere

If Where is that water source located? is Elsewhere:

CWS-BS 21: How long does it take to go there, get water, and come back? *Hint: If household members do not collect, enter 0 minutes*

Note: *Record the total time taken for a single round trip including queuing.*

_____

☐ Don't Know

CWS-BS 22: Who usually goes to this source to fetch water for your household / institution? *Hint: Select all that apply*

☐ Adult woman - >15 years

☐ Adult man - >15 years

☐ Girl - <15 years

☐ Boy - <15 years

☐ Not Applicable

CWS-BS 23: How many trips did that person make in the last week? *Hint: Number of times in the last 7 days*

_____

☐ Don't Know

CEWS-BS 24: In the last month, has there been any time when your household did not have sufficient quantities of drinking water?

◯ Yes, at least once

◯ No, always sufficient

☐ Don't Know

If In the last month, has there been any time when your household did not have sufficient quantities of drinking water? is Yes, at least once:

CWS-BS 25: What was the reason you were unable to access sufficient quantities of water when needed? *Hint: Main reason for not having enough water.*

◯ Water is not available from source

◯ Water is too expensive

◯ Source is not accessible

◯ Other (please specify)

_____

CWS-BS 26: How is water typically stored in your [What type of location is this?]? *Hint: Select all that apply. If water is not stored, select Not Applicable*

☐ Open container without a lid - Ex. Bucket with no lid

☐ Open container with a lid - Ex. Bucket with Lid

☐ Closed container with a tap - Ex. Water Dispenser

☐ Closed container without a tap - Ex. Jerry Can

☐ Underground tank

☐ Overhead tank

☐ Other (please specify)

_____

☐ Not Applicable

If How is water typically stored in your {0}? is one of Underground tank, Overhead tank:

CWS-BS 27: How many liters does the storage tank hold? *Hint: Enter # of Liters*

_____

☐ Don't Know

If How is water typically stored in your {0}? is one of Underground tank, Overhead tank:

4.16: How many times has the storage tank been filled in the last 30 days? *Hint: Enter number of days*

_____

☐ Don't Know

☐ Not Applicable

CWS-BS 29: Has there been any time in the last 30 days when you have not been able to store sufficient water to meet your needs?

◯ Yes, at least once - Not enough water at least once

◯ No - Enough water

☐ Don't Know

☐ Not Applicable

4.18: How is drinking water stored in your [What type of location is this?]?

◯ In the same container as other water

◯ In a separate container specifically for drinking

◯ Other (please specify)

_____

CWS-BS 30: Have you or any other members of your [What type of location is this?] done anything to this water to make it safer to drink?

◯ I do not treat my water - Treatment

◯ I treat my water - No Treatment

If Have you or any other members of your {0} done anything to this water to make it safer to drink? is I treat my water:

CWS-BS 31: If your [What type of location is this?] treats water for drinking, food preparation and cleaning, how do you treat it? *Hint: Select all that apply.*

☐ Boil

☐ Add bleach / chlorine

☐ Strain it through a cloth

☐ Use water filter - ceramic, sand, composite, reverse osmosis, etc.

☐ Solar disinfection

☐ Let it stand and settle

☐ Other (please specify)

_____

☐ Don't Know

If your {0} treats water for drinking, food preparation and cleaning, how do you treat it? is one of Boil:

CWS-BS 32: Where do you boil water during the dry and rainy season?

	Dry Season	Rainy Season
Closed Room		
Open Room		
Outdoors		
Mixed		
Other		

If Have you or any other members of your {0} done anything to this water to make it safer to drink? is I do not treat my water:

Comments...
_____
_____
_____
_____

CWS-BS 33: Would you treat your water given the proper resources? *Hint: Proper resources - Do they have enough money to treat their water*

◯ Yes

◯ No

If Would you treat your water given the proper resources? is No:

CWS-BS 34: Why would you not treat your water, please explain? *Hint: Select all that apply*

☐ No reason to purify water (in general)

☐ Water from source is already purified

☐ It is difficult to treat water / takes too much time

☐ Purchases safe purified water

☐ Other (please specify)

_____

☐ Don't Know

If Would you treat your water given the proper resources? is Yes:

CWS-BS 35: If your [What type of location is this?] could treat water for drinking, food preparation and cleaning, how would you treat it? *Hint: Select all that apply*

☐ Boil

☐ Chemical (Chlorine)

☐ Chemical (Alum) - PUR Sachets

☐ Water Filter

☐ Clothe Filter

☐ Solar water disinfection - SODIS, Solar Distillation, etc.

☐ Other (please specify)

_____

If Would you treat your water given the proper resources? is not No:

Rank your preferred treatment method *Hint: Order the options be preference by dragging or selecting the arrows.*

_____

Comments...

_____

_____

_____

_____

Has, or will, the water quality be tested for bacteriological contamination during today's visit?

◯ Yes

◯ No

Livestock

5.1: Does your household / institution have any of the following livestock? *Hint: Select all that apply. If no livestock, select Not applicable*

☐ Cows

☐ Goats

☐ Sheep

☐ Pigs

☐ Chickens

☐ Other (please specify)

_____

☐ Not Applicable

If Does your household / institution have any of the following livestock? isn't one of Not Applicable:

5.2: Is the water source for your livestock the same as the one you use for drinking and other needs?

◯ Yes

◯ No

If Does your household / institution have any of the following livestock? isn't one of Not Applicable:

5.3: What is the main source of water for livestock in the dry and rainy season? *Hint: Select all that apply*

	Dry Season	Rainy Season
Piped into dwelling		
Piped into compound, yard, or plot		
Piped to neighbor		
Piped Water - Public tap / standpipe		
Piped Water - Borehole or tubewell		
Dug Well - Protected		
Dug Well - Unprotected		
Spring - Protected		
Spring - Unprotected		
Rainwater collection		
Delivered water - Tanker-truck		
Delivered Water - Cart/w small tank / drum		
Water kiosk		
Packaged Water - Bottled		
Packaged water - Sachet		
Surface Water		
Other		

Comments...

_____

_____

_____

_____

If your {0} treats water for drinking, food preparation and cleaning, how do you treat it? includes any of Boil or If your {0} could treat water for drinking, food preparation and cleaning, how would you treat it? includes any of Boil:

Stove Types

CWS-BS 36: Which types of main stoves do you use, or would you use, most frequently for boiling water?*Hint: Select all that apply*

☐ Three-stone fire or a conventional system for woody biomass lacking improved combustion air supply mechanism and flue gas ventilation system - Traditional or openfire

☐ Other conventional systems using woody biomass - Traditional stove with ventilation

☐ Improved cookstove

☐ LPG - Liquid Petroleum Gas

☐ Other fossil fuel combusting systems - Gasoline, Kerosene, etc.

☐ Electricity

☐ Other (please specify)

_____

CWS-BS 37: Which types of secondary stoves do you use most frequently for boiling water? *Hint: Select all that apply. Select Not Applicable if no secondary stove is used.*

☐ Three-stone fire or a conventional system for woody biomass lacking improved combustion air supply mechanism and flue gas ventilation system - Traditional or open fire

☐ Other conventional systems using woody biomass

☐ Improved cookstove

☐ LPG - Liquid Petroleum Gas

☐ Other fossil fuel combusting systems

☐ Electricity

☐ Other (please specify)

_____

☐ Not Applicable

CWS-BS 38: How often do you use each stove? *Hint: What % of time do they use their Main stove from question 36 compared to the % of time they use their Secondary stove from question 37*

◯ 100% Main Stove - 0% Secondary Stove

◯ 90% Main Stove - 10% Secondary Stove

◯ 80% Main Stove - 20% Secondary Stove

◯ 70% Main Stove - 30% Secondary Stove

◯ 60% Main Stove - 40% Secondary Stove

◯ 50% Main Stove - 50% Secondary Stove

If your {0} treats water for drinking, food preparation and cleaning, how do you treat it? includes any of Boil or If your {0} could treat water for drinking, food preparation and cleaning, how would you treat it? includes any of Boil:

Fuel use

CWS-BS 39: What is the main type of fuel do you use, or would use, for boiling water in the dry and rainy seasons? *Hint: Select all that apply*

	Dry Season	Rainy Season
Wood		
Charcoal		
LPG		
Electricity		
Agricultural Waste		
Other (please specify in comments)		

Comments...

_____

_____

_____

_____

CWS-BS 40: What is the secondary type of fuel you use, or would use, for boiling water in the dry and rainy seasons? *Hint: Select all that apply. If no secondary fuel used, select 'Not applicable'*

	Dry Season	Rainy Season
Wood		
Charcoal		
LPG		
Electricity		
Agricultural Waste		
Other (please specify in comments)		

Comments...

_____

_____

_____

_____

CWS-BS 41: How often do you use each type of fuel? *Hint: What % of time do they use their Main stove from question 36 compared to the % of time they use their Secondary stove from question 37*

◯ 100% Main Fuel - 0% Secondary Fuel

◯ 90% Main Fuel - 10% Secondary Fuel

◯ 80% Main Fuel - 20% Secondary Fuel

◯ 70% Main Fuel - 30% Secondary Fuel

◯ 60% Main Fuel - 40% Secondary Fuel

◯ 50% Main Fuel - 50% Secondary Fuel

Hygiene Survey

Hygiene refers to access to sanitation amenities, equipment, and infrastructure, as well as to the behaviour in respect to regular and correct use of such amenities. It also refers to behaviour that prevents infections from water-related diseases

CWS-HS 11: Last year, did you or any residents ever suffer from water borne diseases and how often does this occur? *Hint: diarrhea, eye pain, etc.*

◯ Never - No residence have suffered from water-borne diseases in the last year

◯ Everyday - Every day, a resident suffers from water-borne disease

◯ Weekly - Weekly, a resident suffers from water-borne diseases

◯ Several times per month - Several times per month, a resident suffers from water-borne diseases

◯ Once per month - Once per month, a resident suffers from water-borne diseases

◯ Once every few months - Once every few months a resident suffers from water-borne diseases

◯ Other (please specify)

CWS-HS 12: Can you please show me where members of your [What type of location is this?] most often wash their hands?

Handwashing facility: refers to a fixed or mobile device designed to contain, transport, or regulate the flow of water to facilitate handwashing. **Handwashing facilities** include sinks with tap water, buckets with taps, tippy-taps, and jugs or basins designated for handwashing.

◯ Observed - Fixed facility in dwelling - sink / tap

◯ Observed - Fixed facility in yard/plot - sink / tap

◯ Observed - Mobile object - bucket / jug / kettle

◯ Not observed - no handwashing place in dwelling / yard / plot

◯ Not observed - no permission to see

◯ Not observed - Other reason (please specify)

If Can you please show me where members of your {0} most often wash their hands? is one of Observed - Fixed facility in dwelling, Observed - Fixed facility in yard/plot, Observed - Mobile object:

CWS-HS 13: Observe availability of water at the place for handwashing. *Hint: Verify by checking the tap/pump, or basin, bucket, water container or similar objects for presence of water.*

◯ Water is available

◯ Water is not available

If Can you please show me where members of your {0} most often wash their hands? is one of Observed - Fixed facility in dwelling, Observed - Mobile object, Observed - Fixed facility in yard/plot:

CWS-HS 13: Observe availability of soap or detergent at the place for handwashing Soap: includes bar soap, liquid soap, powder detergent and soapy water. Ash, soil, sand, or other traditional handwashing agents are less effective and do not count as **'soap.'**

◯ Soap or detergent available

◯ Soap or detergent not available

If Can you please show me where members of your {0} most often wash their hands? is one of Observed - Fixed facility in dwelling, Observed - Fixed facility in yard/plot, Observed - Mobile object:

CWS-HS 15: Observe and record the type of handwashing agents *Hint: Record all that apply*

☐ Soap - Bar / Liquid

☐ Detergent - Powder / Liquid / Paste

☐ Ash / Mud / Sand

If Can you please show me where members of your {0} most often wash their hands? is one of Not observed - no permission to see, Not observed - Other reason (please specify):

Does your [What type of location is this?] currently have water and soap for washing hands?

◯ Yes

◯ No

If Has, or will, the water quality be tested for bacteriological contamination during today's visit? is Yes:

Water Testing

W6: Drinking water quality at the sources

Instructions for enumerator:

W6 forms part of a water quality testing module applied to a sub-sample of 4-5 households per cluster. Samples are collected from the main source (point of collection) and tested for fecal contamination within 30 minutes of collecting the sample.

Can you please show me where the members of your [What type of location is this?] collect drinking water so that I can test the water quality?

◯ Yes

◯ No (please specify the reason)

_____

If Can you please show me where the members of your {0} collect drinking water so that I can test the water quality? is Yes:

Where was the water quality tested? *Hint: Only water quality for the point of collection / water source will feed into the service level calculation*

◯ Point of collection (source)

◯ Point of consumption

◯ Both

If Has, or will, the water quality be tested for bacteriological contamination during today's visit? is any of Yes and Where was the water quality tested? is any of Point of collection (source) or Where was the water quality tested? is any of Both:

Water Quality - point of collection / source

What parameter(s) have been tested and with what methodologies?

◯ E. coli risk - Aquagenx compartment bag test

◯ E. coli - other method

◯ E.coli / TTC - Presence/absence

◯ TTC - other method

If What parameter(s) have been tested and with what methodologies? is E. coli risk - Aquagenx compartment bag test:

Please record the results of the compartment bag test using this question

☐ Compartment 1

☐ Compartment 2

☐ Compartment 3

☐ Compartment 4

☐ Compartment 5

If What parameter(s) have been tested and with what methodologies? is E. coli - other method:

E. coli

_____

If What parameter(s) have been tested and with what methodologies? is E.coli / TTC - Presence/absence:
Did the test indicate whether contamination was present or absent?

◯ Present

◯ Absent

If What parameter(s) have been tested and with what methodologies? is E.coli / TTC - Presence/absence:

What was the volume tested?

_____

If What parameter(s) have been tested and with what methodologies? is TTC - other method:

TTC

_____

If Has, or will, the water quality be tested for bacteriological contamination during today's visit? is any of Yes and Where was the water quality tested? is any of Point of consumption or Where was the water quality tested? is any of Both:

Water Quality - point of consumption

Which parameter(s) have been tested and with what methodologies?

◯ E. coli risk - Aquagenx compartment bag test

◯ E. coli - other method

◯ E.coli / TTC - Presence/absence

◯ TTC - other method

If Which parameter(s) have been tested and with what methodologies? is E. coli risk - Aquagenx compartment bag test:

Please record the results of the compartment bag test using this question

☐ Compartment 1

☐ Compartment 2

☐ Compartment 3

☐ Compartment 4

☐ Compartment 5

If Which parameter(s) have been tested and with what methodologies? is E. coli - other method:

E. coli

_____

If Which parameter(s) have been tested and with what methodologies? is E.coli / TTC - Presence/absence:

Did the test indicate whether contamination was present or absent?

◯ Present

◯ Absent

If Which parameter(s) have been tested and with what methodologies? is E.coli / TTC - Presence/absence:

What was the volume tested?

_____

If Which parameter(s) have been tested and with what methodologies? is TTC - other method:

TTC

_____

End of Interview

CWS-HS 16: Do you have a second phone number?

_____

☐ Not Applicable

8.2: Thank you very much for your time today. We might need to contact you again in the future to confirm your answers or find out some more details. Would it be ok if we contact you by phone?

◯ Yes

◯ No

6.8.2 Sampling Procedure

Suggested sampling procedure to define the sampling size to be applied for the baseline surveys of the Boreholes' rehabilitation project in Kenya.

Target groups: It is suggested to identify the representative sample population. In case the target population is homogeneous, a distinct group is identified as the target population. If potential distinctions are expected e.g., based on geographic location (districts), or rural, peri-urban, urban. Different target groups will be defined.

The samples can be determined based on the boreholes identified throughout the project area to be included in the project and the communities around it.

Target Population: As rough estimate, let us work with 200 boreholes each surveying 1,000 households. In this case, we have an estimated target population of 200,000 HHs

According the methodology,[11] when a baseline and project survey is used the following sample size guidelines should be applied, unless otherwise stated for specific parameters:

Group size	Minimum sample size
<300	30 or population size, whichever is smaller
300 to 1000	10% of group size
> 1000	100

Following the example above, the population is definitely the population size is larger than 1000, thus, the minimum sample size is 100.

Crosscheck

1. One way to start the sample size calculation is to simply assume a typical variation, expressed as a Coefficient of Variation or COV (typically in this context COVs are in the range 0.5-1.0). The previous version of the GS methodology provides a table to choose a provisional minimum sample size using that COV estimate. In this case mid-way value of 0.6 is chosen from the tables below.

Table 3: Sample sizes in cases of SINGLE samples (where the tests are conducted for either baseline or project scenario but not both).

COV	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
90/10 precision	12	26	45	70	101	137	179	226	279

The sample size for a COV of 0.6 that meet 90/10 precision is of 101. This sample size is basically the same as the minimum required by the methodology.

In summary, 101 households shall be randomly sampled from each target group identified group.

If covariance is expected to be higher (e.g., 0.7) the sample size will be accordingly (137).

11 See paragraph 4.2.3

2. The GS methodology indicates[12] that for guidance, project developers may refer to the valid version of the "Guidelines for sampling and surveys for CDM project activities and programs of activities" for the type of sampling approach applicable to their project context. The CDM guidelines include a sample size calculator that can be used by project proponents to determine the sample size considering confidence and precision criteria and the population size. The image below shows the statistical calculation of the sample size for a population of 200,000 with 90% confidence interval and a 10% margin of error, for proportional parameters.

Sample Size Determination for a Proportion Parameter	confidence/precision criterion
Survey design: Simple random sampling	90/10
Calculation method: Precision via confidence interval	

Instruction for using this calculator	
Input information in cells coloured in orange	
Outputs are displayed in cells coloured in green	

Input	Value	Notes
Expected proportion, p	0.7	enter on a decimal scale
Confidence level	90%	e.g. for 90% enter 90
z multiplier	1.645	determined by confidence level
Relative precision	10%	e.g. for 10% enter 10
Population size, N	200,000	
Predicted sample size, n	116	rounded up to nearest integer

Image 1. Sample size calculated for a population of 200,000.

In summary, 116 households shall be randomly sampled from each target group identified group. This sample size is consistent with the first crosscheck made using the COV as starting point. It is also aligned with the minimum sample size of 100 required by the methodology.

Oversampling: Approaching the target population is challenging and given the chances of people refusing to participate in the surveys, incorrect data, or empty households, it is required to include an over-sampling to ensure minimum samples will be achieved. In this case, it is suggested to consider an oversampling of 20%.

Therefore, the sample size required for the baseline survey is 140 from each target group.

How to pick-up households for the surveys? The project participant can prepare a list of identified households served by each borehole. Using this list, that list, a random number generation can be used to select the samples.

In case a list of households is not available, a map can be used to identify the households, organize a list, and apply a random number generation to select the samples.

12 See paragraph 4.2.5

6.9 Safe Water Carbon Yield Model (NatureCo)

BASELINE EMISSIONS PER HOUSEHOLD

$$BE_y = EF_b * ((1-C_b)-(X(_{cleanboil,y}))) * Q_y * M_{q,y}$$

Where:	Value	Description
EF,b	0.000282	Emission factor for the use of fuel to obtain safe water in the baseline (tCO2-e/L)
Cb	14%	Proportion of project end-users who in the baseline were already using a safe water supply that did not require boiling (%).
X(cleanboil,y	0%	Proportion of project end-users that boil safe water in the project year y (%)
Qy	6,524	Quantity of safe drinking water provided by the project in year y (L)
Mq,y	1	Modifier for the water quality in year y
BE,y	1.58	Baseline emissions from the use of fuel to obtain safe water in the baseline (tCO2-e)

The emission factor for the use of fuel to obtain safe water in the baseline

$$EF_b = SE_{w,b,y} * \sum (X_f * (EF_{b,f,CO2} * f_{NRB,f,y} + EF_{b,f,nonCO2})) \div 10\text{^}9$$

Where	Value	Description
SEw,b,y	3,007	Specific energy required to boil water (kJ/L)
Xf	1	Proportion of fuel f used in the baseline (fraction determined based on an energy basis)
EFb,f,CO2	112	CO2 emission factor
f,NRB	0.753	Fraction of non-renewable biomass (Update in Factors tab)
EFb,f,nonco2	9.46	CH4 + N2O emission factor
EFb	0.000282	Emission factor for the use of fuel to obtain safe water in the baseline (tCO2-e/L)

Specific Energy calculation

$$SE_{w,b,y} = 360.83 \div n_{w,b}$$

Where	Value	Description
value	360.83	Default amount of energy required to obtain 1 L of water after 5 minutes of boiling from a first principles approach kJ/l
nw,b	0.12	Efficiency of the stoves for baseline water boiling (%). Weighted average of baseline stove types
SEw,b,y	3,007	Specific energy required to boil water (kJ/L)

Quantity of safe drinking water provided

$$Q_y = \min(Q_{m,y}, Q_{pop,y})$$

Where	Value	Description
$Q_{m,y}$	NA	Monitored quantity of safe water provided by the project in year y (L).
$Q_{pop,y}$	6,524	Quantity of safe drinking water that could be consumed by project end-users in year y (L)
Q_y	6,524	The quantity of safe drinking water provided by the project

Quantity of safe drinking water shall be calculated as follows

$$Qpop,y = \Sigma pHHp,y \times HNp,y \times QPWp \times DOp,y$$

Where	Value	Description
HHp,y	1	Number of premises type p served by the project in year y
HNp,y	5	Number of individuals per premises type p (e.g. household, school) in year y (Update in Factors Tab)
QPWp	4	Volume of drinking water per person per day for premises type p (L). Apply the default value or monitored value through water consumption field tests in the project scenario, capped at 5.5 L per person per day. (Update in Factors Tab)
DOp,y	347	Days the project technology is operational for endusers in premises p in year y
$Q_{pop,y}$	6,524	Quantity of safe drinking water

fNRB Methodology

The fraction of woody biomass that can be established as non-renewable is:

$$f_{NRB} = \frac{NRB}{NRB + RB} \qquad \text{Equation (1)}$$

where

f_{NRB} = Fraction of non-renewable biomass in the applicable area in thte relevant period (fraction or %)

NRB = Quantity of non-renewable biomass consumed in the applicable area in the relevant period (tonnes)

NRB = Quantity of renewable biomass that is available on a sustainable basis in the applicable area in tht relevant period (tonnes)

Parameter	Value	Data Source
f_{NRB}	75.54%	
NRB	72,825,516	
RB	23,580,278	

The quantity of non-renewable biomass consumed in the applicable area (NRB) shall be determined as the difference between the total consumption of woody biomass in the applicable area (H) and the quantity of renewable biomass that can be sustainably harvested in the applicable area (RB):

$$NRB = H - RB \qquad \text{Equation (2)}$$

where

H = Total consumption of woody biomass in the applicable area in the relevant period (tonnes)

The total consumption of woody biomass (H) is calculated using the following equation, accounting for all consumption within the applicable area (not only wood fuel but also timber and industrial consumption):

$$H = HW \times N + CE + NE$$ Equation (3)

where

HW = Average consumption of wood fuel per household, including fuelwood and charcoal, in the applicable area in the relevant period (tonnes/household)

CE = Commercial woody biomass consumption for energy applications (e.g commercial, industrial or institutional uses of woody biomass in ovens, boilers etc) that are extracted from forests or other land areas in the applicable area in the relevant period (tonnes)

Parameter	Value	Data Source
H	96,405,794	
HW	2.42	Data per household based on calculation 5 person/household and 0.917 ton/person.
N	4,175,493	Ethiopia Central Statistical Agency 2007 Census of ETHIOPIA
CE	80,480,075	Ethiopia Forest Sector Review 2017
NE	5,821,025	Ethiopia Forest Sector Review 2017

[see data tables tab for sources of data that can be used for each parameter]

The quantity of renewable biomass available in the applicable area (RB) is estimated using the following equation:

$$RB = \sum (MAI_{forest,i} \times (F_{forest,i} - P_{forest,i})) + \sum (MAI_{other,i} \times (F_{other,i} - P_{other,i}))$$ Equation (4)

where

$MAI_{forest,i}$ = Mean Annual increment of woody biomass growth per hectare in sub-category i of forest areas in the relevant period (tonnes/ha/yr)

$MAI_{other,i}$ = Mean Annual increment of woody biomass growth per hectare in sub-category i of other land areas in the relevant period (tonnes/ha/yr)

$F_{forest,i}$ = Extent of forest in subcategory *i* in teh relevant period (ha)

$F_{other,i}$ = Extent of other land in subcategory *i* in teh relevant period (ha)

$P_{forest,i}$ = Extent non-accessible area (e.g protected area where extraction of wood is prohibited, geographically remote area) within forest areas (in sub-category *i*) in the relevant period (ha)

$P_{other,i}$ = Extent non-accessible area (e.g protected area where extraction of wood is prohibited, geographically remote area) within other land areas (insub-category *i*) in the relevant period (ha)

i = Sub-category *i of forest areas and other land areas 3*

Parameter	Value	Data Source
RB	23,580,278	
$MAI_{forest,i}$	4.09	Ethiopia Forest Sector Review 2017
$F_{forest,i}$	2,900,000	Ethiopia Forest Sector Review 2017
$P_{forest,i}$	6,720,959	Global Forest Watch information regarding 30% of protected area in Ethiopia located in forest area
$MAI_{other,i}$	0.9425	Ethiopia Forest Sector Review 2017
$F_{other,i}$	41,600,000	Ethiopia Forest Sector Review 2017
$P_{other,i}$		No information available

6.10 Case Study: Virridy's Amazi Meza Program in Rwanda

In Rwanda, a country striving for development amidst numerous challenges, waterborne diseases remain a significant public health concern, particularly affecting children under five. Recognizing the urgency of this issue, Virridy, an organization committed to leveraging technology for environmental and public health solutions, initiated the Amazi Meza program. This program is not just an intervention but a transformative approach to providing safe drinking water to Rwandan schools, blending innovative technology with a sustainable financial model through carbon credits.

Overview

The Amazi Meza program targets 1,000 schools across Rwanda, focusing on institutions that serve over 400 students each and depend on water sources contaminated with pathogenic microorganisms. The program's foundation lies in the installation of ultrafiltration treatment systems, specifically the LifeStraw Community Filter, designed to meet the schools' needs for safe drinking water efficiently.

Objectives

The core objectives of the Amazi Meza program are multifaceted:

- **Health Improvement:** Significantly reduces the incidence of waterborne diseases among students, thereby improving attendance and academic performance.
- **Environmental Sustainability:** Lower carbon emissions associated with traditional water purification methods, such as boiling, by introducing energy-efficient filtration systems.
- **Education and Awareness:** Implement comprehensive hygiene education programs for students, emphasizing the importance of clean water and sanitation practices.
- **Sustainable Financing:** Utilize the carbon credit system to fund ongoing maintenance, education, and the expansion of the program, ensuring its long-term viability.

Implementation Strategy

Virridy's approach to the Amazi Meza program is holistic, involving several key steps:

- **Collaboration with Local Authorities:** Engaging district governments and school administrations from the outset ensures that the program aligns with local needs and infrastructure capabilities.
- **Technology Deployment:** The LifeStraw Community Filter, chosen for its effectiveness and ease of use, is installed in targeted schools. This technology can remove 99.999% of waterborne bacteria, viruses, and protozoan parasites without electricity or chemical treatments.
- **Capacity Building:** Training for school staff and local technicians on system maintenance and hygiene practices is a critical component, ensuring the sustainability of the initiative.
- **Monitoring and Evaluation:** Continuous assessment of the program's impact on health outcomes and water quality is essential for measuring success and making necessary adjustments.

Outcomes and Future Impact

The expected outcomes of the Amazi Meza program are ambitious yet attainable:

- **Direct Impact on Health:** By providing access to safe drinking water, the program aims to drastically reduce the prevalence of diarrheal diseases and other waterborne illnesses among students.
- **Carbon Credit Generation:** Projected to generate over 200,000 carbon credits by 2030, the program offers a replicable model for financing similar initiatives worldwide.
- **Educational Benefits:** Improved health outcomes are anticipated to lead to better school attendance rates and academic performance, contributing to broader educational gains.
- **Environmental Benefits:** By reducing reliance on biomass for boiling water, the program contributes to decreased deforestation and carbon emissions, aligning with global climate change mitigation efforts.

Lessons Learned and Best Practices

The Amazi Meza program offers valuable insights into the integration of public health interventions with environmental sustainability efforts. Key lessons include:

- **The Power of Partnerships:** Collaboration between NGOs, government bodies, and communities is crucial for the success and scalability of such initiatives.
- **Innovative Financing Models:** The utilization of carbon credits for funding highlights the potential for sustainable financial mechanisms in public health projects.
- **Community Engagement:** Engaging beneficiaries in the program's implementation fosters ownership and ensures the initiative's sustainability.

Conclusion

Virridy's Amazi Meza program stands as a testament to the potential of innovative solutions to address longstanding public health and environmental challenges. By providing safe drinking water to schools in Rwanda, the program not only improves immediate health outcomes but also sets a precedent for sustainable development practices. As the program progresses, its lessons and successes will undoubtedly serve as valuable blueprints for similar initiatives globally, demonstrating the critical role of integrated approaches in solving complex health and environmental issues.

6.11 Case Study: Water Mission's Carbon Credit Program in Tanzania

In the face of escalating global sustainability challenges, Water Mission embarked on a pioneering journey with the launch of a Carbon Credit Program in November 2021. This initiative sought to align the organization's efforts in providing safe water solutions with broader environmental and social impact goals, particularly focusing on mitigating climate change, and supporting sustainable development in the United Republic of Tanzania.

Program Overview

The Carbon Credit Program was designed with a three-pronged objective: to meticulously measure and quantify the environmental and social impacts of Water Mission's safe water projects, to assess their contribution towards corporate partners' sustainability ambitions, and to evaluate their eligibility for carbon crediting under rigorous international standards. Selecting seven community-based safe water projects in Dodoma and Kigoma for its pilot phase, the program expanded in 2023 to include additional communities, demonstrating a scalable model for environmental sustainability and social impact.

Objectives

The program's objectives were strategically developed to encapsulate a comprehensive impact framework:

- **Environmental Impact Quantification:** To establish a robust mechanism for measuring the reduction in greenhouse gas emissions resulting from the transition to solar-powered safe water solutions.
- **Corporate Sustainability Contribution:** To align project outcomes with the sustainability goals of corporate partners, thereby fostering a collaborative approach to global environmental challenges.
- **Carbon Crediting Eligibility:** To navigate the complex certification process for carbon credits, thereby generating a sustainable funding stream for ongoing and future water projects.

Implementation Strategy

Water Mission employed a meticulous strategy, encompassing project design, community involvement, and certification processes:

- **Certification Pathway:** Utilizing the Gold Standard for the Global Goals (GS4GG) as its certification framework, Water Mission aimed to meet best practice standards for maximizing impact on climate security and Sustainable Development Goals (SDGs).
- **Project Design and Implementation:** Each project was tailored to the community's needs, using advanced technology and solar-powered systems to reduce reliance on nonrenewable biomass for water treatment, thereby cutting greenhouse gas emissions.
- **Community-Led Management:** Emphasizing community involvement, Water Mission ensured that projects were managed and sustained by local communities, enhancing ownership and long-term viability.

Impact and Outcomes

The pilot's success was marked by significant achievements across various SDGs:

SDG 5 (Gender Equality): The reduction in time spent on water collection and purification significantly alleviated "time poverty" for women and girls, enhancing their opportunities for education and economic activities.

SDG 6 (Clean Water and Sanitation): Safe water access was dramatically increased for approximately 26,000 people, with extensive WASH training provided to ensure sustainable hygiene practices.

SDG 7 (Affordable and Clean Energy): The introduction of solar-powered pumping systems contributed to a substantial increase in clean energy usage, totaling over 18,130 kWh.

SDG 13 (Climate Action): The program's shift to clean water provision methods resulted in an impressive reduction of 13,000 metric tons of carbon emissions annually.

Conclusion and Future Directions

The Carbon Credit Program by Water Mission stands as a beacon of innovation in integrating environmental sustainability with community development. Preliminary certification with the Gold Standard in July 2023 marks a milestone in the journey towards achieving broader sustainability goals. As Water Mission prepares for further validation and the issuance of carbon credits, the program's expansion promises not only sustained access to safe water but a healthier planet.

The program's model of leveraging carbon credits for project funding underscores a viable path towards ensuring the long-term sustainability of drinking water services. By reinvesting proceeds into community projects, Water Mission is setting a precedent for how environmental projects can foster both ecological balance and social well-being, paving the way for thriving communities in Tanzania and beyond.

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Water Mission's commitment to leveraging innovative solutions for water sustainability, underpinned by a solid foundation of community involvement and environmental stewardship, showcases a scalable and replicable model for global sustainability efforts.

6.12 Case Study: Drought Resilience Impact Platform - Fixing Uptime Now and Decision Improvement (DRIP FUNDI) - Pioneering Sustainable Water Solutions in Northern Kenya

In the arid landscapes of northern Kenya, where water scarcity is a perennial challenge to community livelihoods and health, the Drought Resilience Impact Platform - Fixing Uptime Now and Decision Improvement (DRIP FUNDI) is emerging as a beacon of innovation and sustainability. Developed by the Millennium Water Alliance, Virridy, and the University of Colorado Boulder, and supported by generous funding from USAID's Bureau of Humanitarian Assistance (BHA), DRIP FUNDI embodies an initiative-taking approach to combating the adverse effects of climate change and recurrent drought. It is more than a program; it is a transformative model designed to ensure that 120,000 residents have sustainable, safe, and reliable access to water, marking a shift from traditional reactive emergency responses to a forward-thinking, resilience-building strategy.

Program Overview

DRIP FUNDI's core mission revolves around the seamless integration of advanced technology, community engagement, and innovative financing to revolutionize groundwater management and water supply reliability. At its core, the program addresses the critical challenge of securing funds for the operation and maintenance of borehole pumps - vital lifelines for accessing groundwater in arid areas. Through pioneering registration under the Gold Standard for carbon credits, DRIP FUNDI is introducing a groundbreaking sustainable financing mechanism. This approach not only promises long-term maintenance and water access beyond the initial funding period, but also represents a significant leap toward environmental sustainability and carbon footprint reduction.

Objectives

- **Beyond Water Supply:** While securing a reliable water supply for 120,000 people in Northern Kenya remains a primary goal, DRIP FUNDI ambitiously aims to elevate the average borehole uptime to an unprecedented 90% annually. This objective underscores a commitment to not just access but consistent reliability, ensuring communities can thrive even in the harshest conditions.

- **Financial Innovation for Sustainability:** The generation of sustainable funding through carbon credits stands as a testament to DRIP FUNDI's innovative approach. This strategy not only underwrites the maintenance and repair of water infrastructure but also paves the way for new financial models in environmental health and sustainable development.

- **A Healthier Environment and Community:** By mitigating the need for traditional water boiling methods, DRIP FUNDI contributes to a substantial reduction in carbon emissions. This environmental benefit, coupled with the socio-economic upliftment of communities, especially in empowering women and girls, illustrates the program's holistic impact.

Implementation Strategy

- **Strategic Partnerships and Registration:** The collaboration with the Autodesk Foundation to navigate the complexities of Gold Standard registration epitomizes strategic partnership. This effort is bolstered by alliances with companies like Mortenson Construction, which purchase carbon credits, highlighting a corporate-social constructive collaboration.

- **Advanced Monitoring and Capacity Building:** The deployment of innovative satellite and cellular-connected sensors for real-time water infrastructure monitoring, alongside comprehensive training

programs for local communities and governments, ensures the sustainability and scalability of water access solutions.

- **Empowered Communities at the Core:** The program's emphasis on community engagement and collaboration with local governments and international partners highlights a model for success rooted in inclusivity and shared responsibility.

Impact and Outcomes

- **Securing the Foundation for Well-being:** The assurance of continuous access to safe drinking water marks a monumental step forward in public health, economic stability, and quality of life for the communities in Northern Kenya.

- **A Sustainable Environmental Footprint:** The shift away from fossil fuel-dependent water boiling practices not only curtails carbon emissions but also aligns with global efforts to combat climate change.

- **Catalyzing Socio-Economic Development:** The liberation of time and resources, especially among women and girls, fosters an environment where education and economic participation can flourish, driving community-wide progress and empowerment.

Conclusion and Future Directions

DRIP FUNDI stands as a pioneering model in the fight against water scarcity and the broader impacts of climate change in drought-prone regions. By harmonizing technological innovation with sustainable finance and community empowerment, the program not only addresses the immediate needs of Northern Kenya's communities but also offers a scalable and replicable framework for global application. The journey of DRIP FUNDI from concept to impact reflects a forward-looking vision where sustainable water management and environmental stewardship pave the way for resilient and thriving communities worldwide.

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As DRIP FUNDI builds on the legacy of the Kenya RAPID and RAPID+ programs, its evolution and expansion into other critical infrastructural and environmental projects underscore the potential for integrated, sustainable solutions to the complex challenges of water management, climate change, and community development. This comprehensive approach, emphasizing technological innovation, financial sustainability, and community engagement, sets a new benchmark for global water resilience initiatives.

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