# Ex-post evaluation of the first mitigation activities of Switzerland under Article 6 of the Paris Agreement

## Bangkok e-bus Program and The Transformative Cookstove Activity in Rural Ghana

12 March, 2026

Commissioned by the Federal Office for the Environment (FOEN)

Incentivizing investment in real climate action

**Commissioned by:** Federal Office for the Environment (FOEN), Sector Climate, CH 3003 Bern
The FOEN is an agency of the Federal Department of the Environment, Transport, Energy and Communications (DETEC).
**Contractor:** Sylvera Ltd

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## Acronyms and Abbreviations

**ADB** – Asian Development Bank
**BAU** – Business as Usual
**BMTA** – Bangkok Mass Transit Authority
**BOI** – Board of Investment (Thailand)
**CAIT** – Climate Action Impact Tool
**CARP** – Centralized Accounting and Reporting Platform (UNFCCC)
**CDM** – Clean Development Mechanism
**CHF** – Swiss Franc
**CMA** – Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
**$CO_2$** – Carbon Dioxide
**$CO_2e$** – Carbon Dioxide Equivalent
**CPA** – Component Project Activity
**DCCE** – Department of Climate Change and Environment (Thailand)
**DETEC** – Federal Department of the Environment, Transport, Energy and Communications (Switzerland)
**DOE** – Designated Operational Entity
**EA** – Energy Absolute Public Company Limited
**EF** – Emission Factor
**EPA** – Environmental Protection Agency (Ghana)
**ESG** – Environmental, Social and Governance
**EV** – Electric Vehicle
**FAO** – Food and Agriculture Organization of the United Nations
**FDFA** – Federal Department of Foreign Affairs (Switzerland)
**FOEN** – Federal Office for the Environment (Switzerland)
**fNRB** – Fraction of Non-Renewable Biomass
**GHG** – Greenhouse Gas
**GSF** – Gold Standard Foundation
**HAP** – Household Air Pollution
**ICE** – Internal Combustion Engine
**ICS** - Improved Cookstoves
**IEA** – International Energy Agency
**IFC** – International Finance Corporation
**IGES** – Institute for Global Environmental Strategies
**IPCC** – Intergovernmental Panel on Climate Change
**IRR** – Internal Rate of Return
**ITMO** – Internationally Transferred Mitigation Outcome
**KPT** – Kitchen Performance Test
**LCA** – Life Cycle Assessment
**LT-LEDS** – Long-Term Low Emissions Development Strategy
**MADD** – Mitigation Activity Design Document
**MDB** – Multilateral Development Bank
**MO** – Mitigation Outcome
**MP** – Monitoring Period
**MR** – Monitoring Report

**MRV** – Monitoring, Reporting and Verification
**NDC** – Nationally Determined Contribution
**NGV** – Natural Gas Vehicle
**O&M** – Operations and Maintenance
**OMGE** - Overall Mitigation in Global Emissions
**PACM** – Paris Agreement Crediting Mechanism
**PoA** – Programme of Activities
**QA/QC** – Quality Assurance / Quality Control
**REDD+** – Reducing Emissions from Deforestation and Forest Degradation
**SDG** – Sustainable Development Goal
**SECO** – State Secretariat for Economic Affairs (Switzerland)
**SEVAL** – Swiss Evaluation Society
**SFOE** – Swiss Federal Office of Energy
**SUM** – Stove Use Monitor
**TER** – Technical Expert Review
**TM** – T-VER Methodology
**TGO** – Thailand Greenhouse Gas Management Organization
**T-VER** – Thailand Voluntary Emission Reduction Program
**UHI** – Urban Heat Island
**UNFCCC** – United Nations Framework Convention on Climate Change
**USD** – United States Dollar
**VER** – Verified Emission Reduction
**VVB** – Validation and Verification Body
**WB** – World Bank
**WHO** – World Health Organization

## Executive Summary

This report presents Sylvera's independent ex-post evaluation of Switzerland's first authorized mitigation activities implemented under Article 6.2 of the Paris Agreement:

- *Project 5004: The Transformative Cookstove Activity in Rural Ghana*, and
- *Project 5002: The Bangkok Electric-Bus Deployment Programme in Thailand.*

The evaluation was commissioned by the Swiss Federal Office for the Environment (FOEN) to determine whether the Mitigation Outcomes (MO) generated by these activities meet the environmental integrity, transparency, and compliance requirements of Switzerland's $CO_2$ Ordinance, the relevant bilateral agreements under Article 6.2 of the Paris Agreement, and the Paris Agreement itself. The assessment responds directly to one of the three questions posed in Postulate 24.3074 by National Councilor Bastien Girod that refers to the real emission reductions achieved through Switzerland's international compensation measures.

Sylvera applied a consistent evaluation framework across five dimensions – Additionality, Carbon Accounting, Monitoring / Reporting / Verification (MRV) System, Sustainable Development, and Legal & Institutional Compliance - using desk-based analysis and on-site verification in Ghana and Thailand. Evidence sources included the Mitigation Activity Design Documents (MADDs), monitoring and verification reports, national authorization letters, interviews with project developers and government counterparts, and third-party datasets.

### Project Findings

Table 1. Key Findings by Pillar and Project

| Criteria | Ghana Cookstove (5004) | Thailand E-Bus (5002) |
|---|---|---|
| **Project Objective** | Deployment of 180,000 improved cookstoves to reduce wood / charcoal use and improve household air quality | Replacement of 1,913 internal-combustion buses in Bangkok with electric buses |
| **Additionality** | Strong – project is not viable without carbon revenue and is not common practice in Ghana's rural regions | Strong – carbon finance improves Internal Rate of Return (IRR) but future policy support may affect need for carbon credits |
| **Carbon Accounting** | Low risk – uses conservative parameters for emission reductions calculations | Moderate risk – excludes life-cycle assessment and lacks periodic baseline reassessment to incorporate changing market landscape |
| **MRV System** | Strong - Robust sampling via Kitchen Performance Tests (KPTs) and digital tracking | Moderate - Direct monitoring of electricity consumption, but survey-based sampling for modal-shift calculations could be more conservative |
| **Sustainable Development Benefits** | High – supports SDGs 1, 3, 7, 8 & 12 (health, jobs, forest protection, clean energy) | Moderate – SDGs 3, 5, 8 & 11; benefits in gender equality and mobility but limited data to verify air-quality improvement |
| **Legal & Institutional compliance** | High - Aligned with Article 6.2 requirements, Swiss Ordinances, and the relevant bilateral agreement terms. | High - Aligned with Article 6.2 requirements, Swiss Ordinances, and the relevant bilateral agreement terms. |

## Legal & Institutional Compliance

Both host countries - Ghana and Thailand - have established authorization systems and are advancing registry transparency. The projects comply with Article 6.2 reporting and tracking provisions, ensuring avoidance of double-counting and respect for host-country sovereignty.

These first two activities show that bilateral cooperation under Article 6.2 can deliver high-integrity, socially beneficial emission reductions when supported by strong host-country engagement and rigorous MRV. Continued improvement in methodological alignment with the emerging Article 6.4 standards and harmonized reporting practices will further strengthen Switzerland's global climate leadership and ensure the environmental integrity of future Internationally Transferred Mitigation Outcomes (ITMO) acquisitions.

Across both activities, Sylvera estimates that Switzerland's first Article 6.2 projects have achieved approximately 99% (Ghana Cookstove) and 88% (Thailand E-Bus) of their claimed emission reductions as real, additional, and verifiable. These figures are based on Sylvera's independent assessment of each project's carbon accounting methods, underlying assumptions, field data, and alignment with Switzerland's $CO_2$ Ordinance and the relevant bilateral agreements.

# 1. Introduction

This report was commissioned by the Swiss Federal Office for the Environment (FOEN) to independently evaluate two Switzerland-authorized mitigation activities implemented under Article 6.2 of the Paris Agreement: project 5004 – The Transformative Cookstove Activity in Rural Ghana and project 5002 – Bangkok e-bus in Thailand.

## Purpose of the Mandate

The purpose of this mandate is to determine whether these authorized and implemented activities — each of which has submitted its first monitoring and verification reports - comply with the requirements set out in Switzerland's $CO_2$ Ordinance, the bilateral authorization frameworks, and the guidance adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA).

Specifically, the evaluation examines whether the projects deliver real, additional, and verifiable emission reductions, uphold environmental integrity, and align with the sustainable-development objectives of the host countries.

The assessment addresses Postulate Girod (24.3074) by providing transparent, evidence-based insight into the effectiveness and credibility of Switzerland's international climate-compensation measures.

## Background on Article 6.2 and Swiss authorization framework

Article 6.2 of the Paris Agreement establishes the basis for cooperative approaches through which Parties can transfer mitigation outcomes internationally (ITMOs) to help achieve their Nationally Determined Contributions (NDCs).

These approaches require rigorous accounting to avoid double counting, ensure transparency, and maintain environmental integrity through corresponding adjustments in national greenhouse-gas inventories.

Switzerland was among the first countries to operationalize Article 6.2 through a national authorization system embedded in the $CO_2$ Act and its implementing $CO_2$ Ordinance (SR 641.711). Under this framework, FOEN coordinates the authorization, monitoring, and reporting of ITMO-generating activities, in cooperation with partner governments through bilateral agreements. Each agreement specifies the procedures for project approval, verification, registry operation, and reporting to the UNFCCC, ensuring that ITMOs used by Switzerland are not simultaneously counted toward the host country's NDC.

## Background of Host Countries

Both host countries, Ghana and Thailand, have demonstrated strong commitment to engaging in international carbon markets and implementing Article 6 of the Paris Agreement. Each is actively pursuing partnerships to establish cooperative approaches, develop mitigation projects, and operationalise frameworks under Article 6.2, Article 6.4 (now the Paris Agreement Crediting Mechanism, or PACM), and voluntary carbon markets. The socioeconomic conditions of each country directly shape their emissions profiles, their domestic capacity to finance climate action, and the role that Article 6 mechanisms play in enabling their NDC implementation.

### *Ghana*

Ghana is a lower-middle-income economy with a GDP per capita of approximately USD 2,390 (World Bank, 2024). General government gross debt stands at approximately 59% of GDP in 2025 (IMF World Economic Outlook DataMapper, 2025), reflecting a fiscal position that limits the government's capacity to finance mitigation activities at the scale required by its NDC without external support. Ghana ranks 145th out of 193 countries on the UNDP Human Development Index (2023), with the majority of the workforce employed in agriculture and the informal economy.

Access to clean cooking fuels and technologies reached 32.8% of Ghana's total population in 2023, up from 31.5% in 2022. Rural access stood at just 14.1%, compared with 48.2% in urban areas (World Bank data, via Clean Cooking Alliance National Markets Intelligence Dashboard, 2025). The majority of the rural population therefore continues to rely on solid biomass — wood and charcoal — for cooking, driving land-use change and deforestation emissions. Ghana's highest-impact mitigation opportunities sit within sectors — forestry, land use, and clean cooking — that are directly linked to energy poverty and rural livelihoods.

Ghana's NDC includes both unconditional and conditional targets. In its updated NDC, Ghana explicitly states its intention to use voluntary cooperation under Article 6.2 to achieve up to 55% - approximately 24 million tonnes of $CO_2$ - of its conditional emission reductions. Without external funding mechanisms, these reductions cannot be delivered. Article 6.2 provides the framework through which Ghana can authorise emissions reductions for transfer to partner countries in exchange for results-based finance. Ghana has signed bilateral cooperation agreements with Switzerland, Sweden, and Singapore, and has authorised up to 5.2 million $tCO_2e$ for transfer as of February 2025.

### *Thailand*

Thailand is an upper-middle-income economy with a GDP per capita of approximately USD 7,100 (World Bank, 2023), but significant structural inequalities persist beneath this aggregate figure. Income inequality remains high, with a Gini coefficient of 43.3% in 2021 — the highest in East Asia and Pacific — and over half of the country's wealth held by the richest 10% of the population (World Bank, 2023).

Thailand's economy is structured around energy-intensive manufacturing and export industries, with exports of goods and services accounting for approximately 70% of GDP (UN Thailand). The energy sector is the dominant source of national emissions, accounting for approximately 82% of total GHG output — 285 $MtCO_2e$ in 2021, excluding LULUCF (Thailand Third Biennial Update Report, UNFCCC), mainly due to the high dependency on fossil fuels.

Thailand's updated NDC targets a 30% reduction in emissions by 2030 and net-zero by 2050, focusing on key sectors including energy, industrial processes (IPPU), agriculture, and waste. Achieving these targets requires large-scale capital investment in energy transition and industrial decarbonisation. According to the IEA's Southeast Asia Energy Outlook 2024, achieving a pathway aligned with the region's climate goals requires over USD 190 billion in clean energy investment by 2035 — five times the level at the time of publication (IEA, Southeast Asia Energy Outlook 2024). Article 6.2 cooperation arrangements with Switzerland, Japan, and Singapore, alongside authorised ITMO pilot activities, provide a mechanism for

attracting private investment and reducing the cost of capital for low-carbon infrastructure at the scale Thailand's targets require.

## Evaluation Approach

Sylvera's analysis applies a comprehensive framework across five areas: Additionality, Carbon Accounting, Sustainable Development, MRV, and Legal & Institutional Compliance. The report combines desk-based and field assessments and the evaluation was conducted in line with the Swiss Evaluation Society (SEVAL) Standards, ensuring a systematic and transparent approach to evaluate the design, implementation and effects of the mitigation activities.

# 2. Methodology

## 2.1. Sources consulted

Sylvera's evaluation draws on a broad evidence base combining official project documentation, host-country data, academic and institutional sources, and direct field verification. The following categories of sources were systematically reviewed and triangulated:

**Primary documentation**

- Mitigation Activity Design Documents (MADDs)
- Validation and Verification Reports (VRs)
- Monitoring Reports (MRs)
- Letters of Authorization from host-country authorities
- Bilateral Implementation and Cooperation Agreements between Switzerland and host countries

**Legal and policy references**

- Swiss $CO_2$ Act (SR 641.71) and $CO_2$ Ordinance (SR 641.711)
- Relevant CMA decisions under the Paris Agreement (Decisions 2/CMA.3 and 6/CMA.4)
- Article 6.2 Reference Manual and PACM methodological guidance (these guidelines were published after the authorization of these activities, and the guidelines themselves do not apply to Article 6.2 activities. Nevertheless, a high-level comparison was conducted as it provides a valuable measure of the activities' alignment with international standards).

**Third-party and external datasets**

- Host-country NDCs and sectoral policies
- National statistics on energy, transport and emissions
- Peer-reviewed and grey literature on baseline assumptions, emission factors and non-renewable biomass (fNRB)
- International datasets from the World Bank, FAO, IEA, UNFCCC and WHO

**Primary field evidence**

- Site visits conducted by Sylvera in Ghana and Thailand
- Semi-structured interviews with project developers, government agencies, validation and verification bodies, investors and community stakeholders

**Limitations and data gaps**

- Financial model transparency: detailed cost data were not available for the Thailand e-bus project.
- Limited direct monitoring: while both projects adhere to best practices, direct monitoring can be improved. For instance, there is an opportunity to enhance monitoring by deploying Stove Use Monitors to track cookstove adoption rates and leveraging digital tools to more effectively capture modal shift behavior towards e-bus usage.

These limitations were explicitly factored into the evaluation through uncertainty scoring and conservative interpretation of quantitative findings.

## 2.2. Evaluation criteria and analytical approach

**Sylvera's evaluation applies a systematic, transparent, and standards-aligned approach, grounded in our proprietary ratings framework and Switzerland's policy and legal compliance criteria for mitigation activities.** This methodology is designed to evaluate whether projects comply with the Swiss $CO_2$ Ordinance, Article 6 of the Paris Agreement, and relevant bilateral authorization frameworks.

**The evaluation mandate was collaboratively defined with FOEN to ensure clarity of scope, purpose, and intended policy use.** It establishes key evaluation questions, timelines, roles, and deliverables, while considering the policy and geographic contexts that influence project outcomes. A formal agreement set out the parameters for resources, communication, and reporting, ensuring transparency and accountability throughout the process.

The assessment framework is structured around **five analytical dimensions**:

1. Additionality
2. Carbon Accounting
3. Sustainable Development
4. Emissions Monitoring, Reporting and Verification (MRV)
5. Legal and Institutional Compliance

**Each dimension is applied using documented parameters, scoring logic, and evidence-based criteria**, ensuring methodological consistency, traceability, and clarity across both project evaluations.

**Data collection follows a rigorous and proportionate approach to guarantee validity and reliability.** The process integrates documentation from project developers and national authorities with third-party datasets and Sylvera's independent research. All data undergo structured quality-assurance checks for accuracy, completeness, and relevance. Identified limitations or data gaps are transparently documented and reflected in corresponding uncertainty scores within the evaluation results.

**Sylvera's assessment within each evaluation dimension draws on a comprehensive set of project documents and stakeholder inputs.** Supplementary evidence was gathered through site visits, interviews, and stakeholder consultations with government bodies, project developers, validation and verification entities, investors, and local stakeholders. These inputs were cross-checked against documentary evidence and third-party data to strengthen the reliability of findings.

**Each assessment dimension applies Sylvera's proprietary evaluation framework, which converts qualitative and quantitative evidence into structured risk and uncertainty levels:** very low, low, moderate, high and very high, for each risk and uncertainty. The risk levels indicate the likelihood that integrity or compliance risks could affect emission-reduction credibility while the uncertainty levels capture the robustness and completeness of available evidence. This scoring system enables consistent,

comparable evaluation results and ensures that judgments are transparently derived from documented evidence.

## Site Visit Methodology

Site visits form a core component of Sylvera's evaluation design. They are used to verify project implementation, cross-check field observations with monitoring reports, and integrate direct evidence into the overall assessment. This enhances confidence in reported outcomes and strengthens the validity, reliability, and contextual grounding of the findings.

Through on-site verification, stakeholder engagement meetings, and targeted interviews, Sylvera gathers primary evidence to validate implementation progress, data quality, and compliance with legal and institutional requirements. Site visits focus on observing project operations, reviewing record-keeping systems, and interviewing a representative range of beneficiaries and local institutions.

Insights from these visits are systematically compared against monitoring and verification data and are used to inform each of the five evaluation dimensions – particularly Additionality, Carbon Accounting, and Sustainable Development, and MRV. All findings from field activities were documented, triangulated with secondary data, and incorporated into the final integrity ratings to ensure that evaluation conclusions are supported by verifiable, in-country evidence.

# 3. Project Specific Evaluation - Ghana

## 3.1. Evaluation Approach

For the Transformative Cookstove Activity in Rural Ghana, analysis was performed using data from public and private project documentation, in particular the Mitigation Activity Design Document (MADD), the first Monitoring Report (MR), the first Verification Report (VR) as well as documentation provided by FOEN and the project proponents. Each component is given a risk score, indicating to what extent the risks of said component have been addressed, and an uncertainty score, which describes how confident Sylvera is in the risk score as a result of the depth and quality of data and documentation provided.

## 3.2. Project Overview

**The Transformative Cookstove Activity in Rural Ghana is a large-scale Article 6.2 program designed to reduce emissions through improved household energy efficiency.** Operating from 2023 to 2030, the project aims to generate 3,231,171 ITMOs by promoting fuel-efficient cooking technologies that reduce wood and charcoal consumption. A total of 180,000 improved cookstoves—Envirofit's Super Saver Wood (M5000) and Super Saver Charcoal (CH-5300) models—will be distributed in three phases of 60,000 units each. Implementation began on April 1, 2023, targeting rural agricultural communities in Ghana's Northern and Western regions through a network of over 400 agrarian shops. The project uses the Gold Standard's *Technologies and Practices to Displace Decentralised Thermal Energy Consumption* (TPDDTEC) methodology (Version 4).

**The project has begun generating and transferring verified emission reductions under its first monitoring period.** Ghana completed its first transfer of 11,733 ITMOs to Switzerland on 7 July 2025 [1], marking an important milestone in operational delivery. Over the full crediting period (2023–2030), the project is expected to issue 3,231,171 ITMOs, averaging approximately 403,896 ITMOs per year. Detailed project specifications are provided in the MADD, with verified carbon results for Monitoring Period 1 (MP1) summarized in Table 2 and the corresponding project area illustrated in Figure 1.

Table 2. MP1 Verified Emission Reductions - Ghana

| Monitoring period one: ITMOs | t $CO_2e$ |
|---|---|
| 1 April 2023 - 31 December 2023 | 6,055 |
| 1 January 2024 - 31 March 2024 | 5,797 |
| Total Verified Emission Reductions generated in the Monitoring Period | 11,852* |

**The first transfer consisted of **11,733 ITMOs**, derived from the total of **11,852** VERs issued in MP1, following some reduction by Switzerland during the conversion of VERs into transferred ITMOs.*

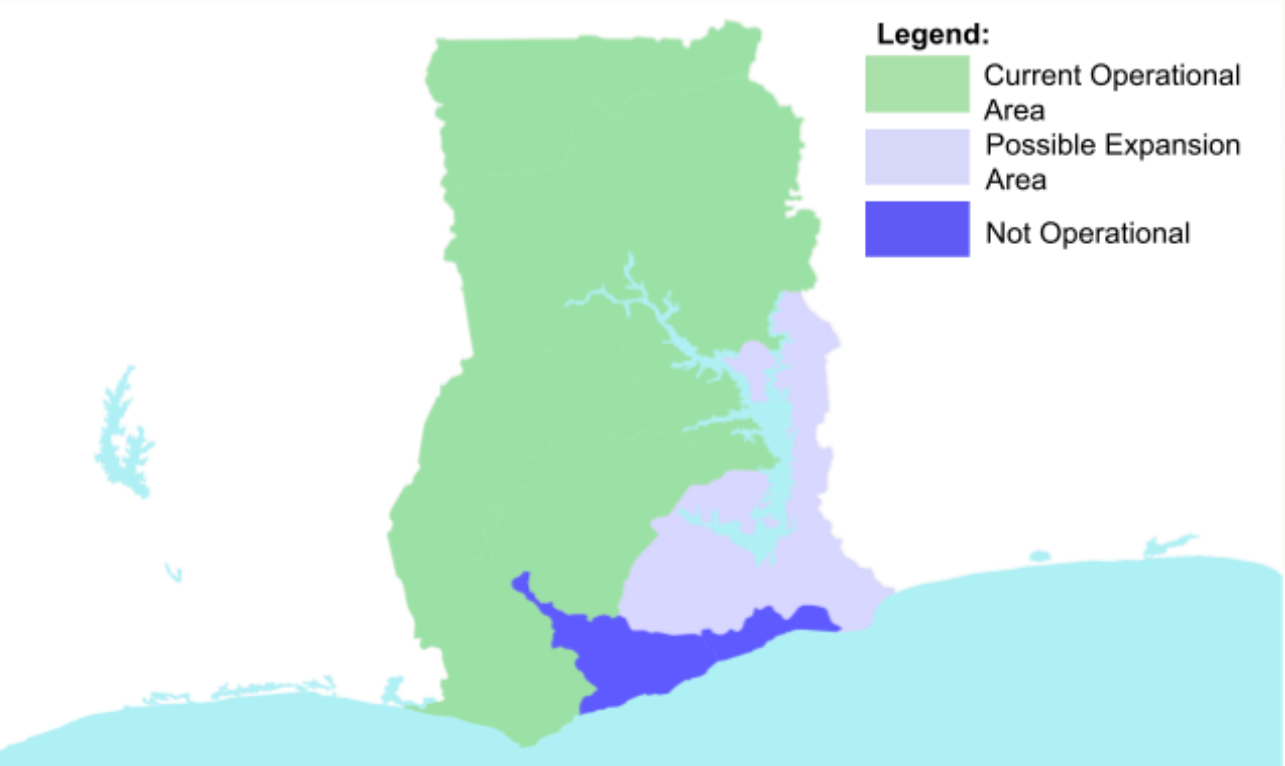


Figure 1. Map of the project activity across Ghana

## 3.3. Summary of Evaluation

**Integrity Risk Score** Low Risk Moderate Uncertainty

Sylvera rates the project with high integrity due to conservative emissions methodologies and strong additionality. The project has a low safeguarding risk score and is expected to deliver significant health and poverty reduction co-benefits but lack robust MRV mechanisms.

**Additionality** Low Risk Moderate Uncertainty

The project demonstrates low additionality risk with moderate uncertainty regarding scale. Common practice analysis shows limited ICS usage, while financial analysis confirms the project requires carbon finance for viability. Despite evolving policies that may encourage ICS adoption during the crediting period, both analyses support the project's additionality.

Table 3. Key Questions for Additionality - Ghana

| Key Question | Evaluation |
|---|---|
| 1. Is there credible, project-specific evidence that the mitigation activity would not have occurred without the generation and use of (ITMOs)? | There is clear evidence that the project would not have occurred without carbon finance. |
| 2. If this element is only partially demonstrated, what measures would be necessary to ensure compliance? | This is clear, however, detailed financial modelling would solidify this outcome. |

**Carbon Accounting** Low Risk Moderate Uncertainty

The project maintains a low carbon accounting risk score through conservative parameter choices and clearly defined accounting boundaries. However, unmonitored leakage introduces some risk.

**Emissions Monitoring, Reporting, And Verification (MRV)** Low Risk Low Uncertainty

The project achieves a low MRV risk score, with some gaps in monitoring data on cookstove uptake rates and stove stacking. The project has rigorous oversight through systematic sampling of ICS distribution and the implementation of Envirofit's usage and performance monitoring protocol.

Table 4. Key Questions for Carbon Accounting and Emission MRV - Ghana

| Key Question | Evaluation |
|---|---|
| 1. Is the baseline scenario reasonable, conservative, and aligned with requirements under the Paris Agreement? | The baseline is reasonable. |
| 2. Is the methodology used for the quantification of emission reductions transparently documented and verifiable? | The methodology used for the quantification of emission reductions is both transparently documented and verifiable. |
| 3. How was monitoring conducted in practice (based on the monitoring report)? | Monitoring was conducted through Kitchen Performance Tests. |
| 4. Is the monitoring plan feasible, reliable, and complete? | The monitoring plan is complete, however it contains some high figures on usage rate. |
| 5. Are the risks of over-crediting addressed and minimized through conservative assumptions and the implementation of the monitoring concept? | Conservative emission factors and fNRB have been chosen to minimize over-crediting risk. |
| 6. Have leakage risks (emissions displaced outside the system boundary) been assessed and mitigated? | The project takes a 5% leakage deduction which is appropriate. |
| 7. Have mechanisms been put in place to prevent double counting or double claiming (especially in light of corresponding adjustments)? | The project addresses this through MADD-documented safeguards ensuring reductions are counted only once. |

**Sustainable Development**

**Safeguarding:** Low Risk Moderate Uncertainty

**& Co-Benefits:** High Impact Moderate Uncertainty

The project has a low safeguarding risk score with moderate uncertainty. Co-benefits delivered include significant health improvements and poverty reduction, particularly supporting UN SDGs 3 (Good Health)

and 7 (Clean Energy). Uncertainty stems from limited details on specific safeguarding measures and incomplete co-benefit documentation.

Table 5. Key Questions for Sustainable Development - Ghana

| Key Question | Evaluation |
|---|---|
| Are the claims of sustainable development substantiated by qualitative or quantitative evidence (e.g. SDG indicators, co-benefit metrics, data)? | Yes, all SDG claims are presented alongside Key Performance Indicators in the MADD. |
| Does the project create lasting benefits beyond 2030 that also continue if no ITMOs are issued and sold after 2030? | The provision of cookstoves and the creations of a supply are likely to remain after the crediting period. |

### Legal and Institutional Compliance Respecting the Sovereignty of the Host Country

Low Risk Low Uncertainty

The project shows strong alignment with Swiss legislation, bilateral agreements, and Article 6 requirements. While some carbon markets experts have noted the close link between cookstoves credits and avoided deforestation, we note that this is open to interpretation and the Federal Council's official explanatory notes (Erläuternder Bericht) clearly states that cookstoves are excluded from the definition of deforestation-related crediting in the Swiss $CO_2$ Ordinance (SR 641.711).

The validation performed by Earthood, a recognized VVB under the Gold Standard crediting program, successfully fulfilled its purpose, and the resulting document has been made public. The verification of the first monitoring report has been completed.

### Key Risk Reduction Measures for Continuous Improvement

Table 6. Risk Reduction Measures - Ghana

| Risk Reduction Measure | Aspect | Impact |
|---|---|---|
| Ensure comprehensive and transparent financial data collection and reporting to strengthen project accountability and verification. | Additionality | Moderate |
| Establish and implement clear, participatory community engagement protocols to guide future consultations and maintain local stakeholder trust. | Sustainable development | High |

## 3.4. Details of Evaluation

### Additionality

Low Risk Moderate Uncertainty

**The Ghana ICS project has a low risk score for additionality, driven by a lack of common practice in Ghana and a negative internal rate of return (IRR) without carbon revenue.**

Sylvera's evaluation of project additionality involves a three-part assessment of **regulatory**, **common practice**, and **financial additionality**. A project must exceed legal requirements, go beyond what is commonly practiced, and demonstrate financial dependence on carbon credit revenues to be deemed additional.

#### Policy & Regulatory Low Risk Moderate Uncertainty

Ghana's cookstove policies provide strong regulatory support but have limited implementation, indicating that the project is additional and dependent on continued carbon market financing. Therefore, this project demonstrates moderate additionality, based on Ghana's track record of incomplete implementation of policy in this area, and reliance on carbon markets for improved cookstove financing.

Ghana's regulatory framework supports cookstove deployment through the National Energy Policy 2010 [2] and market-based clean cooking policies in its Nationally Determined Contributions [3]. The Country Action Plan for Clean Cooking [4] set an unmet 50% LPG transition target by 2015, now reinstated for 2030 with $250 million World Bank support [5]. Current regulations mandate 35% thermal efficiency for charcoal stoves and 25% for wood stoves [6]. The Renewable Energy Masterplan targets scaling improved cookstoves from 1.3 million to 3 million units by 2030 through subsidies and financing [7, 8].

International funding challenges business-as-usual scenarios through the World Bank's $500 million Clean Cooking Fund [9] and $64 million Spark+ Africa fund [10], totaling $2.5 billion in available capital that intensifies technology deployment.

Despite political support, cookstove adoption faces obstacles including unclear timelines, missed deadlines, poor coordination, insufficient resources, and high tariffs reducing competitiveness against traditional methods [11–13]. Policy gaps for off-grid households and inadequate monitoring further limit adoption [14].

Ineffective policy implementation in project areas increases additionality and baseline reliability. Research emphasizes needs for scaled financing, local manufacturing, private investment, and behavioral interventions to reduce costs [14, 15]. Policies have primarily targeted urban areas despite higher rural biomass usage [15].

#### Common Practice Very Low Risk Low Uncertainty

**Ghana's cookstove sector demonstrates strong market foundations but requires carbon financing to overcome adoption barriers and achieve widespread deployment** [16]**.** The majority of Ghana's population relies on traditional biomass, with only 31% using clean cooking technologies concentrated in

urban areas [17]. Household fuel use includes 31.1% wood, 23.3% charcoal, 34.8% LPG, and under 1% electricity [18]. Traditional users employ three-stone hearths while charcoal users rely on coal pots. Commercial woodstoves exist but have limited penetration [18], with adoption highest among educated, married individuals aged 30-39 [19].

Ghana maintains a well-established improved cookstove market [16] with 90% user satisfaction on availability [19], though supply challenges persist in Greater Accra and Upper West Regions due to limited repair networks. Domestic producers manufacture thousands of units annually, prioritizing efficiency of production over emissions reduction.

The cookstove market depends heavily on carbon financing. The Gyapa project has driven market success since 2008 [20], while Ghana's new Carbon Markets Office reinforces carbon markets as essential funding infrastructure for policy implementation [21].

Widespread adoption faces affordability and access challenges, particularly in rural areas using open fires. Achieving 50% market penetration requires substantial government investment as private funding remains limited due to uncertain returns [22, 23]. Rapid population growth outpaces technology adoption, supporting carbon finance needs.

Manufacturing and maintenance gaps limit adoption, especially in northern regions with high biomass dependence and limited infrastructure [19]. Urban-concentrated manufacturing creates distance from rural demand. LPG cookstoves cost 622% more than wood alternatives, strengthening the case for improved cookstove expansion and carbon market support.

### Financial Additionality Low Risk Moderate Uncertainty

**The project demonstrates clear financial additionality as the project distributes the cookstoves at a subsidized price and Sylvera's scenario modeling confirms the necessity of carbon revenue for project viability.** However, the economic feasibility analysis should include more detailed financial modeling, such as net present value calculations, to enable a comprehensive evaluation. Without ITMO revenue, cookstove sales cover only 34% of program costs, resulting in -66% net revenue and negative internal rate of return. With ITMO revenue, sales cover 18% of costs while ITMO revenue contributes 147%, producing +65% net revenue and a 19.93% IRR that exceeds Ghana's country-level risk premium or hurdle rate [24].[1] While evidence suggests potential de-risking finance from the Spark+ Africa Fund [25], this undisclosed external financing does not undermine the demonstrated financial additionality given the project's clear dependence on carbon revenue for viability.

[1] Financial additionality is assessed using Internal Rate of Return (IRR) as it enables consistent comparison of project profitability across projects, independent of size, capital structure, location, or revenue scale. By comparing IRR with and without carbon revenue against country-level hurdle rates, this approach allows an assessment of whether a project would be financially viable in the absence of offset income. Unlike absolute metrics such as Net Present Value (NPV), which are more sensitive to project scale and assumptions and therefore harder to benchmark, IRR provides a more appropriate indicator for evaluating the materiality of carbon finance to project viability. IRR benchmarks should, however, be applied in context, taking into account the country that the project is operating in, as well as the time period that it was calculated.

## Carbon Accounting

Low Risk Moderate Uncertainty

Sylvera assesses the project's carbon accounting through a detailed review of its methodological components, focusing on the fNRB, Emission Factors (EF), Baseline assumptions, and Leakage risks. Risks are evaluated based on criteria including methodological conservativeness, data quality, and potential for over-crediting. The assessment remains provisional, as is common for cookstove projects, due to the inherent difficulty of directly attributing emission reductions to project activities. This stems from challenges in accurately measuring fuel-use reductions, associated forest degradation, and the absence of continuous, real-time monitoring of improved cookstove usage and daily fuel consumption.

**The Ghana ICS project has a low risk score for carbon accounting, driven by the choice of conservative parameters for fNRB and emissions factors for wood and charcoal.**

### Accounting Boundaries

Emission reductions from ICS projects are achieved through:

**Improved Efficiency:** The baseline and project fuels are identical. In the project scenario, fuel use is decreased with more efficient ICS, reducing emissions.

**Fuel Switch:** The baseline and project fuels differ. Emission reductions are achieved using stoves that burn fuels with lower emission intensity and are generally more efficient.

This project credits improved efficiency, but not fuel switch. It distributes Envirofit Super Saver Wood (M5000) and Super Saver Charcoal (CH-5300) to replace traditional three-stone fires which will lower emissions through efficiency gains and reduce biomass fuel use in household cooking.

### Emissions Sources

This project measures all possible emission sources under this project type, leading to a lower risk. This minimizes the risk of over-crediting since no sources are overlooked. The project's spatial boundary covers all of Ghana (MADD v.5.2, p.2), although ICS will not be distributed in Greater Accra and Central (MADD v.5.2, p.4).

### Emissions Quantification

#### Strength of Baseline

Sylvera considers the baseline scenario realistic. Without the project, rural households would continue using traditional low-efficiency biomass stoves, producing higher emissions. Approximately 75% of Ghanaians—around 26 million people—primarily in rural and low-income urban areas, rely on solid biomass fuels for cooking, with 31% of households using wood and 23% using charcoal [26]. Under business-as-usual conditions, 95% of small rural households would continue using traditional biomass stoves through 2030 without intervention. Accelerating policy changes and improved cookstove adoption pose no risk to carbon accounting.

### fNRB values

The fraction of non-renewable biomass (fNRB) measures woody biomass harvested for fuel both directly and through conversion to charcoal that cannot regrow naturally, making it critical for accurate $CO_2$ emission estimates. Inflated fNRB values create major overcrediting risks, as reductions must reflect genuine conservation of non-renewable resources. The project selects 30% fNRB, aligning with the WISDOM database's 28% estimate, which integrates FAO, IEA, and UN data for the calculation of this figure for Ghana. The MoFuSS model projects 2020-2030 fNRB at 35% ± 3%, providing stronger analytical validation through dynamic simulations versus WISDOM's static estimates. Gold Standard retired CDM Tool 30 for fNRB calculations at the end of 2025, shifting to MoFuSS and CDM Tool 33 to reduce overcrediting risk.

### Baseline Emissions Factors

The project uses standardized Emission Factors (EF) that quantify greenhouse gases emitted per unit of activity. The Emission Factor values of 112 $tCO_2e/TJ$ for wood and 165.22 $tCO_2e/TJ$ for charcoal were used, representing methodology default values. Sylvera's analysis confirms rural EF values align with project assumptions. Using WHO data, Sylvera calculated a 2019 weighted average EF for rural Ghana of 104.78 $tCO_2/TJ$ versus the 112 default. With charcoal and wood comprising 93% of rural fuel use [18], the analysis shows minimal baseline alternatives beyond improved cookstove deployment.

### Baseline Stove Efficiency

Fuel savings drive emission reduction calculations by comparing baseline thermal efficiency with replacement stove performance. Local improved cookstoves offer cost advantages but deliver minimal efficiency improvements to the baseline traditional cookstoves. The project conducts baseline Kitchen Performance Tests (KPTs) to determine existing stove efficiency and supplements these with household surveys identifying specific biomass types used. Field-based KPTs provide more reliable data than laboratory methods by capturing real cooking patterns over controlled conditions. The methodology directly measures fuel use differences between project and non-project households over three days, weighing household biomass before and after meals while acknowledging potential behavioral changes from observation [27].

### Project emissions

The project tracks usage data through KPTs using strict sampling protocols. Researchers select a statistically significant, regionally stratified sample per CDM guidelines and apply the lower bound of the 90% confidence interval to ensure conservative emission reduction estimates [28]. Quarterly assessments use sensors for a period of 30 days to verify methodology and enhance data accuracy. Overall, the project applies conservative assumptions in estimating project emissions.

### Leakage emissions

The project appropriately manages leakage risk through a conservative 5% default deduction that adequately addresses potential emission increases from baseline stove usage outside the project boundary.

Cookstove projects face limited but plausible leakage risks when users continue operating or transfer baseline stoves for secondary purposes, generating emissions outside the project boundary. The project mitigates this risk with a conservative 5% default deduction that strengthens emission reduction credibility without requiring costly, large-scale leakage monitoring.

The project does not perform active leakage monitoring but conducts a targeted assessment. Given the small scale of potential leakage and challenges of tracking dispersed rural households, the conservative default appropriately maintains calculation integrity, though leakage monitoring would provide greater certainty.

## Emissions Monitoring, Reporting, And Verification (MRV)

Low Risk Moderate Uncertainty

**Stove Usage and Uptake** The project states that there is a 100% usage rate in the first monitoring report; however, it is only based on an 11% user sample. Overestimating cookstove usage leads to significant over-crediting, making usage rates critical for accurate carbon accounting. The project does not specify an uptake rate; however, since households voluntarily purchase the cookstoves, uptake is inherently self-selected and thus less critical. Nevertheless, projects seldom achieve full adoption, underscoring the need to monitor initial uptake closely rather than focusing solely on later implementation stages[29].

**Stove Stacking** Users sometimes employ baseline stoves alongside improved cookstoves [30], which the project accounts for in kitchen performance tests. This practice can cause over-crediting when continued fuel collection for secondary devices negates efficiency gains from improved cookstoves. Though a small sample, Sylvera identified no evidence of stove stacking during our field visit - the five stove users interviewed as part of the visit all chose to cook the two dishes of their evening meals on the single improved stove, sequentially, because of its improved speed and safety compared to their baseline stoves. During Sylvera's site visit, many users indicated that access to a second stove—primarily to reduce cooking time and enhance convenience—was their sole suggestion for project improvement; however, at the time, the project did not permit the distribution of second stoves, even on a full-cost basis, despite some users expressing both willingness and ability to pay.

**Monitoring Regime** The project outlines a monitoring plan requiring 90% confidence intervals with 10% error margins and minimum 100-unit samples before first verification. Standard deviation must not exceed 60.6% of the mean. The project will conduct a minimum of 66 kitchen performance tests based on ex-ante estimates, with quarterly post-verification testing at one-eighth the initial sample size. The project enhances transparency by providing raw data and employs Envirofit's digital monitoring protocol combining sensor data and digital techniques [31].

**Verification Provider** Earthood Services Private Limited conducted the first verification with Sukanya Phukan as Team Leader, Abhimanyu Singh Wazir as Verifier, and Shifali Guleria as Technical Reviewer. FOEN lists ESPL among approved validators [32], while Phukan and Guleria hold expertise in household energy efficiency projects. Ghana accepts verifiers from multiple accredited sources [33], including CDM-designated operational entities such as ESPL [34].

## Sustainable Development

Sylvera evaluates a project's sustainable development performance by reviewing the design and implementation of key safeguards across environmental, social, and governance dimensions, as well as the project's contribution to UN Sustainable Development Goals (SDGs), also referred to as Co-benefits. Sylvera assesses the project on 11 Safeguards and each of the UN's 17 SDGs, excluding climate action (the primary purpose of the project).

### Safeguarding Low Risk Moderate Uncertainty

Of the 11 safeguards assessed by Sylvera, three are classified as moderate risk, as summarized in the table below and detailed in the following sections.

Table 7. Overview of Safeguarding Components and Risk Scores – Ghana

| Safeguards | Risk Score |
|---|---|
| Community Engagement, Participation, and Transparency | 3 |
| Access to Grievance Redress | 3 |
| Human Rights, Indigenous Peoples, and Local Communities | 1 |
| Equity and Benefit Sharing | 1 |
| Land Rights, Resource Access, and Involuntary Resettlement | 1 |
| Labor Rights and Working Conditions | 3 |
| Cultural Heritage | 2 |
| Gender Equality | 1 |
| Health, Safety, and Security | 1 |
| Environmental Damage and Pollution Prevention | 2 |
| Biodiversity Conservation and Sustainable Resource Management | 1 |

#### Community Engagement, Participation, and Transparency

The project poses a moderate safeguarding risk due to inadequate stakeholder engagement and insufficient community participation. Critical evidence, such as the Environmental Protection Agency approval letter and monitoring reports, is missing, making consultation claims unverifiable. There are no community engagement protocols, stakeholder engagement plan, or documented evidence of meaningful community participation.

### Access to Grievance Redress

The grievance mechanism presents a moderate risk due to structural and accessibility limitations. Although a basic feedback system exists through a local office and email, it is insufficient for the project's scale, lacking independent oversight, community representation, local language support, and integration with traditional communication channels. During the site visit, the project partner, Farmerline, indicated that a grievance mechanism is in place, with all complaints recorded and addressed primarily by local agents responsible for each area. However, this process appears to be insufficiently formalized or documented within the project framework, contributing to the moderate risk rating.

### Labor Rights and Working Conditions

The project presents moderate labor rights risk due to insufficient safeguards and unclear local employment commitments. While the project targets 285 job opportunities (94 in MP1), it lacks detailed provisions for working conditions protection and does not guarantee employment prioritization for residents.

## Co-Benefits High Impact Moderate Uncertainty

Sylvera believes the project contributes to five of the UN SDGs, as shown in the table:

Table 8. SDGs and Impacts - Ghana

| SDG | Impact | Impact Summary |
|---|---|---|
|  | Moderate Impact | The project delivers significant economic benefits through fuel cost savings (average annual GH₵3,400/US$4 per household), job creation (250 jobs), and improved access to efficient cooking technologies via subsidized ICS units (35-60% cost reductions) and an Access Fund for the provision of microloans. |
|  | High Impact | The project significantly improves household health by reducing harmful air pollution through clean cooking technology adoption. Traditional solid fuel cooking generates household air pollution (HAP) that causes pneumonia, acute lower respiratory disease, and stroke [35]. The dissemination of clean cooking units mitigates HAP exposure and promotes healthier home environments. In MP1, 10,170 survey participants reported reduced smoke and particulate matter after adopting ICS technology. While ICS units also produce lower emissions that may reduce carbon dioxide exposure, the extent of this reduction and additional health benefits remain subject to academic debate [36]. |

| SDG | Impact | Impact Summary |
|---|---|---|
|   | High Impact | The project distributes 180,000 clean cooking units in a developing country. These units cut fuel usage by 66% and 58%, and toxic emissions by up to 82% and 56%, offering affordable, cleaner cooking solutions through subsidies and microfinancing. |
|   | Moderate Impact | The project generates significant local employment (up to 285 jobs in microfinance, ICS production, and distribution, with 92 already filled), but local hiring prioritization, compensation, and working conditions are unclear. It boosts the ICS market by increasing supply and training staff in production and repair, as well prioritizing local suppliers for their production inputs. |
|   | Moderate Impact | The project delivers significant environmental benefits by generating emission reduction credits through forest conservation and promoting local manufacturing. Deploying 180,000 efficient ICS units decreases deforestation by reducing fuel consumption and pressure on forest resources, vital for Ghana which has lost 50% of its primary forest since 1950 [37]. Additionally, the initiative incentivizes responsible production by shifting ICS unit manufacturing from China and India to local facilities. |

## 3.5. Legal and Institutional Compliance Respecting the Sovereignty of the Host Country

Low Risk Low Uncertainty

This section assesses the project's compliance and alignment with the requirements and guidelines delineated by Switzerland, Ghana, and Article 6 of the Paris Agreement. The assessment framework is based on the Swiss $CO_2$ Ordinance and $CO_2$ Act, the Ghana-Switzerland bilateral agreement and complementary documents, relevant decisions under the Paris Agreement (i.e. CMA decisions), and the Paris Agreement Crediting Mechanism (PACM) methodological guidelines. It is important to keep in mind that these PACM guidelines were published after the authorization for this activity. Furthermore, they do not apply to Article 6.2 activities. Nevertheless, a high-level comparison was conducted as it provides a valuable measure of the activities' alignment with international standards.

Sylvera leveraged two assessment types: binary compliance checks to confirm adherence to applicable requirements and regulations, and alignment tests to evaluate the project's level of conformity with existing guidelines.

Table 9. Policy Alignment and Compliance Assessment - Ghana

| Policy Documents | Risk Score |
|---|---|
| **Swiss Regulation** | |
| $CO_2$ Ordinance | Low—2 |
| $CO_2$ Act | Low—2 |
| **Bilateral Agreements** | |
| Cooperation Agreement Swiss and Ghana Towards Implementation of the Paris Agreement | Moderate—3 |
| Cooperation Agreement Implementation Roadmap | Very Low—1 |
| **Article 6.2 of the Paris Agreement and Relevant CMA Guidance** | |
| Decision 2/CMA.3 | Low—2 |
| Decision 6/CMA.4 | Low—2 |
| **Other documents - PACM guidelines** | |
| Article 6.4 Additionality Standard | Moderate—3 |
| Article 6.4 Baseline Setting Standard | Moderate—3 |
| Article 6.4 Leakage Standard | Low—2 |

## Swiss Regulation:

*Ordinance for the Reduction of $CO_2$ Emissions ($CO_2$ Ordinance), SR 641.711* [38] Low Risk

**The $CO_2$ Ordinance imposes strict requirements for international carbon credits to ensure the environmental integrity and credibility of climate action.** Projects must comply with regulatory frameworks and operational standards to receive national and international attestations. Projects must: demonstrate economic inviability without attestation revenue, adhere to technical best practices, contribute to host-country sustainable development, and comply with all applicable legal provisions. The framework also mandates verifiable and quantifiable emission reductions. Credits must avoid double counting, remain outside other trading systems, and use conservative calculations to prevent overestimation. Notably, the $CO_2$ Ordinance explicitly forbids activities that contravene environmental and human rights conventions ratified by Switzerland. While the programme doesn't explicitly confirm its adherence to these conventions, there is also no evidence to suggest any conflict with general environmental and human rights standards.

**The project complies with the activity eligibility list included in Annex 2a of the $CO_2$ Ordinance.** Annex 2a of the $CO_2$ Ordinance addresses a specific class of emission reductions, broadly prohibiting the issuance of international attestations for reductions that result solely from the avoidance of deforestation.Clean cookstove projects generate emission reductions by addressing two main sources:

1. Direct Reduction: More efficient combustion of solid fuels (such as wood or charcoal).
2. Indirect Reduction: Lowering the overall demand for fuelwood, which indirectly reduces pressure on local forests and the associated risk of deforestation.

While the project's methodology is inherently connected to reducing fuelwood consumption and, consequently, deforestation pressure, the $CO_2$ Ordinance's Annex 2a exclusion is specifically aimed at projects whose sole mechanism is the prevention of deforestation. Crucially, the Federal Council (which issued the Ordinance) has publicly stated its intent that emission reductions from clean cookstove projects should not fall under the Annex 2a exclusion.Therefore, although the link to avoided deforestation exists, the project's eligibility complies with the Ordinance's requirements, based on the established interpretation of the issuing body.

*Federal Act on the Reduction of $CO_2$ Emissions ($CO_2$ Act), SR. 641.71* [39] Low Risk

**The project's design incorporates measures that are consistent with the $CO_2$ Act's key regulatory provisions, safeguards, and attestation requirements, which effectively mitigates the risk of non-compliance**. The relevant Act's articles are assessed below.

- Article 4.5 authorizes international attestations when domestic reductions fall short, while Article 5 mandates strict anti-double-counting. The project addresses this through MADD-documented safeguards ensuring reductions are counted only once.
- Robust tracking systems reinforce compliance with Article 5. Each ICS unit carries a unique identifier logged in a centralized registry, preventing double claiming across the value chain.
- Article 6's additionality requirement is met through Swiss-linked funding structures. Klik's initial investment is contingent on Swiss involvement, and financial analysis confirms the project is not viable without carbon revenue.
- Permanence requirements under Article 6 do not apply. As the project delivers emission reductions rather than carbon sink activities, it is exempt from permanent $CO_2$ capture criteria.
- Article 6 of the Act requires host-country sustainable development and prohibits negative impacts. While more detailed impact assessments would enhance verification, existing documentation demonstrates adherence to these provisions.

### Bilateral Agreements

*Cooperation Agreement between Switzerland and Ghana Towards Implementation of the Paris Agreement* [40] Moderate Risk

While the project broadly aligns with the Cooperation Agreement between Switzerland and Ghana, some aspects may merit further attention in order to increase confidence in full compliance. The Agreement

establishes foundational requirements for mitigation projects, with a strong focus on environmental integrity and sustainable development.

**Articles 3 and 4: Environmental Integrity and Sustainable Development**

The project largely aligns with the environmental integrity and sustainable development principles of Articles 3 and 4. It meets the core conditions of Article 3 by ensuring that mitigation outcomes are real, additional, verified, and permanent, and it operates within the NDC implementation period. Also, the project incorporates existing and planned national policies into its assessment and meets standards to avoid increasing global emissions. However, a gap exists in leakage control. While the project uses a default factor for leakage, it lacks a comprehensive leakage assessment and ongoing monitoring protocols, which is a requirement of Article 3.4. Also, baseline settings are not fully conservative, as they omit some policy changes and alternative stove use patterns.

For Article 4, the project demonstrates compliance by promoting clean energy and avoiding environmental and social harm, aligning with Ghana's low-emission strategies. The project's assessment also incorporates existing and planned national policies and meets standards to avoid increasing global emissions.

**Articles 5–7: Administrative Compliance**

Articles 5-7 of the Agreement, requiring administrative compliance, have been analysed separately. Articles 5-6 cover the authorization process and form. In this case, the authorization process and the Letter of Authorization (LoA) meet the requirements established in the Implementation Agreement. Article 7 relates to the monitoring and verification documents which have been provided and is analysed in the MRV section above. The monitoring and verification reports have been conducted by approved verification agents. The documents have been published by the project developer in accordance with the terms and conditions of the policy.

*Cooperation Agreement Implementation Roadmap* [40] Very Low Risk

**The project's cookstove activities align with the bilateral agreement's roadmap, which serves as a declaration of intent for the types of projects the involved parties plan to develop.** The inclusion of cookstove projects in this document confirms that the current project falls within the agreed-upon scope. The roadmap also includes timeline-related items, but these are not binding commitments, so they were considered out of scope for this assessment.

### Article 6.2 of the Paris Agreement and Relevant CMA Guidance

*Decision 2/CMA.3* [41] **Low Risk**

**The project's risk of non-compliance with the Article 6.2 guidance is low.** The guidance, outlined in Decision 2/CMA.3, defines what constitutes an ITMO (Chapter I) and sets requirements for environmental integrity (Chapter IV).

The Article 6.2 guidance requires conservative baseline settings, and while some could argue that the project's assumption of continued use of three-stone stoves may not be the most conservative approach,

during the period of confirmed ITMO issuance (to 2030), this seems a reasonable assumption. One other potential source of risk is that the measures to address non-permanence risks may merit further evaluation, as ICS projects are across the country; therefore, this is not necessarily needed, or if it is, without specific location information, this is difficult to analyse.

These factors raise the risk above the lowest possible level. However, a grievance redress mechanism is in place to mitigate potential social impacts, and the project aligns well with the sustainable development goals of both countries.

*Decision 6/CMA.4* [42] **Low Risk**

COP26 in Glasgow (2021) and COP27 in Sharm el-Sheikh (2022) specifically addressed how international carbon markets would operate under the Paris Agreement. These agreements introduced new requirements for countries engaging in Article 6.2, collected in Decision 6/CMA.4. They mandate an Initial Report detailing each cooperative approach, along with Annual and Regular information on their implementation and templates for reporting are available in the UNFCCC Centralized Accounting and Reporting Platform (CARP).

**The project meets the compliance requirements to submit initial reports and annual information** submissions electronically, having provided both materials for the expert technical review and the first monitoring report. The initial monitoring and verification report complied with requirements, including a review of the initial report consistency, accounting, and recording of ITMOs.

### Paris Agreement Crediting Mechanism Standards

While these guidelines are mandatory for methodologies approved under Article 6.4 Paris Agreement Crediting Mechanism (PACM), they are not a formal requirement for those under Article 6.2. Nonetheless, they are widely anticipated to serve as the new benchmark for quality and integrity across the entire carbon market. Consequently, assessing the degree to which projects under Article 6.2 agreements align with the PACM's requirements helps predict a project's long-term integrity and market acceptance. It is important to keep in mind that these guidelines were published after the authorization for this activity and that, so far, the only available standards are for additionality, baseline setting, leakage, and reversals. Any forthcoming standards should be considered in the future.

*Article 6.4 Additionality Standard* [43] **Moderate Risk**

**In general, the project aligns with the PACM additionality standard guidelines and includes a comprehensive regulatory analysis to demonstrate additionality, along with a common practice analysis to support its case. However, the common practice analysis doesn't use the conservative assumptions required by the PACM**, and there are still some transparency issues since not all data and methodologies are fully documented and reproducible. The standard also states that financial additionality should be conducted in one of three ways; the project follows this by conducting a simple cost analysis.

*Article 6.4 Baseline Setting Standard* [44] **Moderate Risk**

**The project generally aligns with the PACM baseline-setting standard, adhering to principles like avoiding double-counting and defining activity boundaries. However, it falls short in two key areas.** First, the baseline assumptions aren't fully conservative due to incomplete data access, which does not align with core PACM requirements. Second, the project does not implement an initial baseline downward adjustment and subsequent annual increase in the downward adjustment of at least 1%, as required by Section 7 of the standard. To fully align with the standard, the project would have to address these issues.

*Article 6.4 Leakage Standard* [45] **Low Risk**

**The project broadly aligns with the PACM leakage standard**. The standard establishes three key requirements:

- Identifying all potential leakage sources.
- Implementing measures to prevent leakage.
- Quantifying and subtracting any remaining adverse leakage effects.

The project successfully identifies potential leakage sources and comprehensively assesses the four main categories outlined in the guidance: baseline equipment transfer, competition for resource use, diversion of production processes/outputs, and environmental GHG releases. However, the project has not implemented specific prevention measures to address these sources. Despite this, a conservative approach is taken by applying a leakage factor to the carbon accounting calculations to address potential impacts, thereby quantifying and subtracting any remaining effects.

# 4. Project Specific Evaluation – Thailand

## 4.1. Evaluation Approach

For the Bangkok Electric Bus Deployment Programme, analysis has been performed using data from public and private project documentation, in particular the MADD and the first Monitoring Report, as well as documentation provided by FOEN, and third-party data. Each component is given a risk score, indicating to what extent the risks of said component have been effectively addressed, and an uncertainty score, which describes how confident Sylvera is in the risk score given as a result of the depth and quality of data and documentation provided.

## 4.2. Project Overview

The Bangkok Electric Bus Deployment Programme, in this report referred to as the Bangkok e-bus Programme, is a seven-year mitigation activity implemented under Article 6.2 of the Paris Agreement, aiming to replace internal combustion engine (ICE) buses with 1,913 electric buses in Bangkok between 2023 and 2030. The project targets a cumulative emission reduction of approximately 615,000 $tCO_2e$ by 2030, applying Thailand Voluntary Emission Reduction Program (T-VER) Methodologies TM-05 [46] and TM-06 [47] for fuel-switching and modal shift emissions, respectively. It is jointly implemented by Energy Absolute PLC (EA) and Switzerland's Klik Foundation, with crediting under Thailand's national registry.

## 4.3. Summary of Evaluation

**Integrity Risk Score** Low Risk Moderate Uncertainty

Sylvera rates the project with high integrity due to conservative emissions methodologies and strong additionality. However, gaps in baseline conservativeness and methodological transparency—particularly around modal shift—limit certainty. Safeguards and co-benefits are moderately addressed.

**Additionality** Low Risk Moderate Uncertainty

The project's strong additionality claim is driven by it being the primary driver of e-bus adoption in Thailand, with electric buses rising from 1.3% to 27% of Bangkok's bus fleet between 2022 and 2024. Financial additionality is moderate, as the project's IRR is only marginally improved by carbon revenue.

Table 10. Key Questions for Additionality – Thailand

| Key Question | Evaluation |
|---|---|
| 1. Is there credible, project-specific evidence that the mitigation activity would not have occurred without the generation and use of internationally transferred mitigation outcomes (ITMOs)? | There is high evidence that the mitigation activity would not have occurred without carbon finance. |
| 2. If this element is only partially demonstrated, what measures would be necessary to ensure compliance? | Provision of greater evidence of financial additionality, including sensitivity analysis on projected lower EV costs and different carbon credit prices. |

### Carbon Accounting Moderate Risk Moderate Uncertainty

While fuel-switching emissions are conservatively calculated, baseline assumptions are static but apply a technical improvement factor of 1% reduction per year. Methodological exclusions of upstream and fugitive emissions in a life cycle assessment and reliance on a short monitoring window under Monitoring Period 1 for baseline estimation introduce moderate risks.

### Emissions Monitoring Reporting & Verification (MRV) Low Risk Moderate Uncertainty

Fuel-switching data is accurately recorded using real-time electricity usage and validated monthly. However, ex-ante modal shift monitoring relies on sparse survey data, presenting a higher risk of bias and uncertainty in future MR cycles.

Table 11. Key Questions for Carbon Accounting and Emissions MRV – Thailand

| Key Question | Evaluation |
|---|---|
| 1. Is the baseline scenario reasonable, conservative, and aligned with requirements under the Paris Agreement? | The baseline scenario is moderately conservative, but is aligned with Article 6.2. |
| 2. Is the methodology used for the quantification of emission reductions transparently documented and verifiable? | The methodology used for the quantification of emission reductions is both transparently documented and verifiable. |
| 3. How was monitoring conducted in practice (based on the monitoring report)? | Monitoring was conducted using monthly electricity data and daily charging data. |
| 4. Is the monitoring plan feasible, reliable, and complete? | The monitoring plan excludes the impact of life cycle analysis (LCA) emissions. |
| 5. Are the risks of over-crediting addressed and minimized through conservative assumptions and the implementation of the monitoring concept? | Over-crediting risks are both addressed and minimised. |
| 6. Have leakage risks (emissions displaced outside the system boundary) been assessed and mitigated? | Leakage emissions have been assessed, but further monitoring is possible. |
| 7. Have mechanisms been put in place to prevent double counting or double claiming (especially in light of corresponding adjustments)? | The project addresses this through MADD-documented safeguards ensuring reductions are counted only once by the TGO. |

### Sustainable Development

Safeguarding: Low Risk Moderate Uncertainty

Co-benefits: Moderate Impact Moderate Uncertainty

The project has established several social safeguards, including grievance redress and labor policies, and demonstrates commitment to advancing multiple SDGs. Strengthening monitoring procedures would

enhance transparency and evidence-based reporting of social outcomes. While current data indicate limited measurable progress under SDG 11 (air quality) and SDG 8 (employment), improved baseline tracking and equity assessments present opportunities to better capture and communicate the project's social and economic contributions.

Table 12. Key Questions for Sustainable Development – Thailand

| Key Question | Evaluation |
|---|---|
| 1. Are the claims of sustainable development substantiated by qualitative or quantitative evidence (e.g., SDG indicators, co-benefit metrics, data)? | Yes, all SDG claims are presented alongside Key Performance Indicators in the MADD |
| 2. Does the project create lasting benefits beyond 2030 that also continue if no ITMOs are issued and sold after 2030? | Improved infrastructure as a result of e-bus deployment is likely to remain after the crediting period. |

### Legal and Institutional Compliance Respecting the Sovereignty of the Host Country

Low Risk Low Uncertainty

The project aligns broadly with Article 6.2 and the bilateral agreement between Switzerland and Thailand. However, it lacks a dynamic baseline reduction factor, posing moderate risks to environmental integrity and compliance.

The validation and verification of the first monitoring report performed by Bureau Veritas Certification (Thailand) Limited, a recognized VVB under the T-VER crediting program and approved by the Parties involved, successfully fulfilled their purpose, and the resulting documents have been made public.

## Key Risk Reduction Measures for Continuous Improvement

Table 13. Risk Reduction Measures – Thailand

| Risk Reduction Measure | Component | Impact |
|---|---|---|
| Conduct a comprehensive Life Cycle Assessment (LCA) of project buses to demonstrate environmental performance and identify opportunities for further impact reduction. | Carbon Accounting | High |
| Strengthen documentation and reporting on the sustainable sourcing and end-of-life management of precious metals in lithium batteries to ensure responsible supply chain practices. | Sustainable Development | High |
| Enhance monitoring quality by increasing survey frequency and implementing data verification safeguards to ensure accurate and reliable reporting. | MRV | High |

## 4.4. Details of Evaluation

### Additionality

Low Risk | Moderate Uncertainty

**The Bangkok e-bus Program has a low risk score for additionality, driven by a lack of common practice in Thailand and a lack of policy incentives for e-bus adoption at the inception of the project.**

Sylvera's evaluation of project additionality involves a three-part assessment of regulatory, common practice, and financial additionality. A project must exceed legal requirements, go beyond what is commonly practiced, and demonstrate financial dependence on carbon credit revenues to be deemed additional.

#### Policy & Regulatory Low Risk | Moderate Uncertainty

**Uncertainty over the Policy & Regulatory environment is driven by a rapidly evolving landscape,** although currently, few policies apply to the Bangkok e-bus Program. Before project implementation, certain policies may have encouraged e-bus adoption in Thailand:

- **The National EV Policy Roadmap (2021)–"30@30"–** introduced a target for Thailand to become a global hub for EV production by 2030, with tax exemptions provided to EV charging operators.
- **The Ministry of Transport's EV Development Plan (2022)** targeted the deployment of 4,412 EV buses in the Bangkok Metropolitan Area by 2030, of which 2,511 existing conventional buses will be replaced with EV buses and operated by Bangkok Mass Transit Authority (BMTA). BMTA also planned to deploy 1,500 e-buses operated under service contracts. Another key e-bus operator in Bangkok is the project's bus operator, Thai Smile Bus (TSB).

Whilst neither of these provides specific subsidies to the project, they raise material concerns regarding the additionality of e-bus deployment long-term.

On the 23rd of February 2024, following the inception of the project, the Thailand Board of Investment (BOI) introduced a comprehensive subsidy package [48] to accelerate the adoption of e-buses and trucks, providing special tax deductions through to the end of 2025. Furthermore, investment incentives provided by the Thai government have aided the establishment of EV production centres in Thailand's Eastern Economic Corridor, including a facility by BYD and plans for a production facility from Isuzu Motors [49].

While no policies directly benefit the project financially, the policy and regulatory environment in Thailand is moving to a favourable market for EV deployment, which adds to the uncertainty score for the policy and regulatory additionality over the course of the crediting period.

#### Common Practice Very Low Risk | Low Uncertainty

**The Bangkok e-bus Program has been responsible for the vast majority of e-bus adoption** in Bangkok over the project's lifetime. In May 2022, 115 of 8,831 buses in Bangkok were electric; however, by September 2024, 2,272 of the city's 8,174 registered buses were e-buses [50]. In December 2024, the Thai Smile Bus

Group reported having registered 2,056 e-buses, approximately 90% of all registered electric buses in Bangkok. Whilst only 1,913 buses were indicated as part of the project activities in the MADD, this data clearly indicates that the activities of the project developer have driven e-bus adoption in the Bangkok Metropolitan Area.

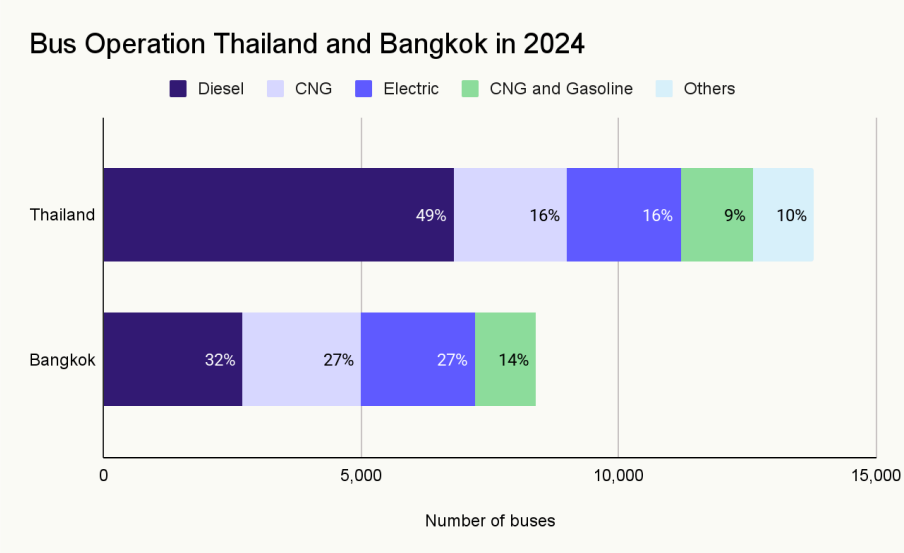


Figure 2. Bus Operations in Thailand (including Bangkok) and Bangkok

The project operates the majority of e-buses in Thailand itself (as shown in Figure 2). Some minor uncertainty is driven by a lack of data on exactly how many of these buses are a result of project activities, with the most recent Monitoring Report only describing e-bus deployment up to 2022.

### Financial Additionality Moderate Risk Moderate Uncertainty

**The project is reliant on carbon revenues for financial viability, although specific risks surrounding the role of ITMOs in the project's economic feasibility exist.**

Using the project's analysis, the IRR[2] rises from 1.33% to 9.3% when including carbon revenue, above the company's benchmark of 5.24%. However, Sylvera was not able to perform additional analysis as the financial model was not disclosed. The ITMO price was set at CHF50.26 (USD 62.15) with an estimated breakeven ITMO price of CHF27 (USD 33.39) [51]. In this analysis, carbon revenues were insufficient to raise the project's IRR above the company benchmark, indicating the reliance of the financial model on an inflated ITMO price.

Furthermore, sensitivity analysis performed by the project developers (Figure 3) indicated that project IRR is most sensitive to changes in ticket revenue and Operations and Maintenance (O&M) costs, with moderate impacts seen from investment costs and carbon revenue, as shown in the graph. This demonstrates that whilst carbon revenue is important for feasibility, it alone does not sufficiently drive financial viability

[2] See footnote 1

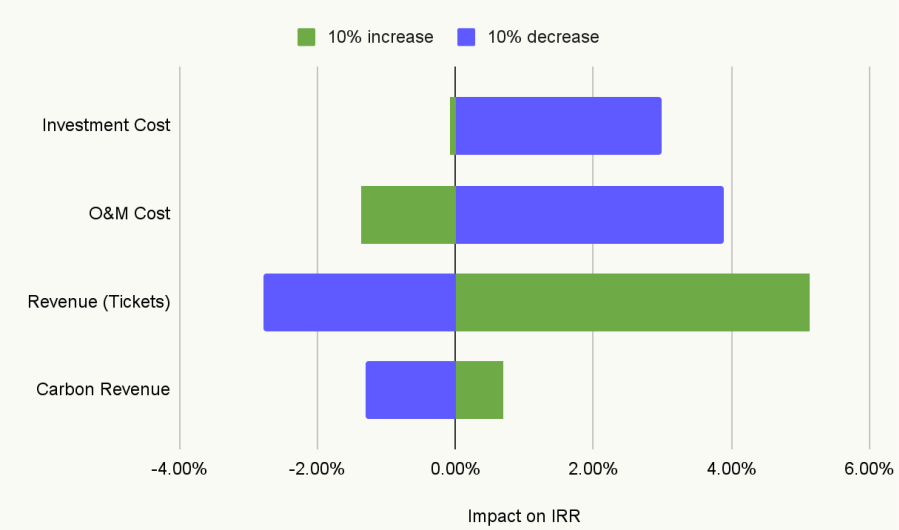


Figure 3. Sensitivity Analysis conducted by the project developers - Thailand

## Carbon Accounting

Moderate Risk Moderate Uncertainty

Sylvera assesses the project's carbon accounting through a detailed review of its methodological components, focusing on the Life Cycle Assessment (LCA), Emission Factors (EF), Baseline assumptions, and Leakage risks. Risks are evaluated based on criteria including methodological conservativeness, data quality, and potential for over-crediting.

**The Bangkok e-bus Program has a moderate risk score for carbon accounting, driven by the lack of an LCA and concerns surrounding baseline modelling.** The Bangkok e-bus Program's first Monitoring Report reported an ex-post emissions reduction of 1,916 $tCO_2e$, compared to an ex-ante reduction expectation of 10,383 $tCO_2e$ for this period. This is explained by delayed e-bus implementation and exclusion of modal shift data due to inadequate survey collection. (As modal shift can be assumed to be greater than zero, its exclusion in the calculations for the first Monitoring Report introduces additional conservativeness.)

### Life Cycle Assessment Moderate Risk Moderate Uncertainty

Exclusion of LCA accounting introduces uncertainty and moderate risk. The T-VER-TM-05 methodology used by the project does not require LCA analysis and exclusively accounts for tailpipe emissions. Sylvera undertook supplementary analysis to evaluate potential LCA emissions for electric buses. This deeper assessment was necessary because the project's focus on operational $CO_2$ emissions from Natural Gas Vehicles (NGVs) may omit broader environmental impacts associated with the full life cycle of electric vehicle deployment. LCA principles include emissions upstream (manufacturing & production) & downstream (disposal) of vehicle usage, and LCAs are considered state-of-the-art for comprehensive accounting of emissions. Given the exclusion of life cycle emissions, Sylvera independently assessed potential LCA emissions using third party-data [52] (shown in Figure 4) to evaluate the potential LCA emissions, without which the project may omit broader environmental impacts.

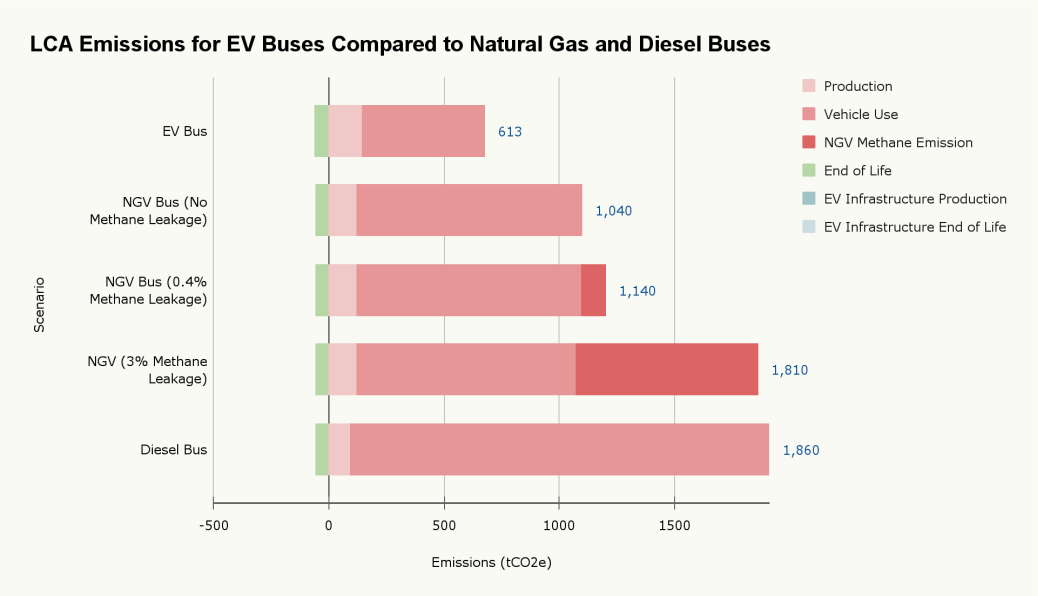


Figure 4. LCA Emissions Compared to Combustion Engines - Thailand

Sylvera's analysis indicated that project emissions would be overestimated if excluding the impact of methane emissions from natural gas vehicles (NGVs); however, when including methane leakage emissions using IPCC [53] & peer-reviewed data [54], exclusion of LCA emissions appears conservative. Incorporation of a full life cycle assessment would improve confidence in the emissions calculations of the project, even given the conservativeness of excluding methane emissions.

### Emissions Factors and Conversion Low Risk Low Uncertainty

**The project's emission factor (EF) methodology is considered very low risk due to conservative assumptions and adherence to industry standards.** Baseline emissions used a conservative EF from NGVs, the least emissions-intensive bus technology used in Thailand, using data independently confirmed by Sylvera to be within internationally accepted ranges. The project also used a national grid EF of 0.4758 $tCO_2e/MWh$, based on 2022 official data, benchmarked as more stringent against emissions factors from the Institute for Global Environmental Studies (IGES) [55]. Furthermore, emissions data from Thailand's Energy Policy and Planning Office [56] show a decrease in Thailand's grid carbon intensity, as shown in Figure 5. Inclusion of real-time emissions factors could increase credited reductions, even if adding an error margin for conservativeness.

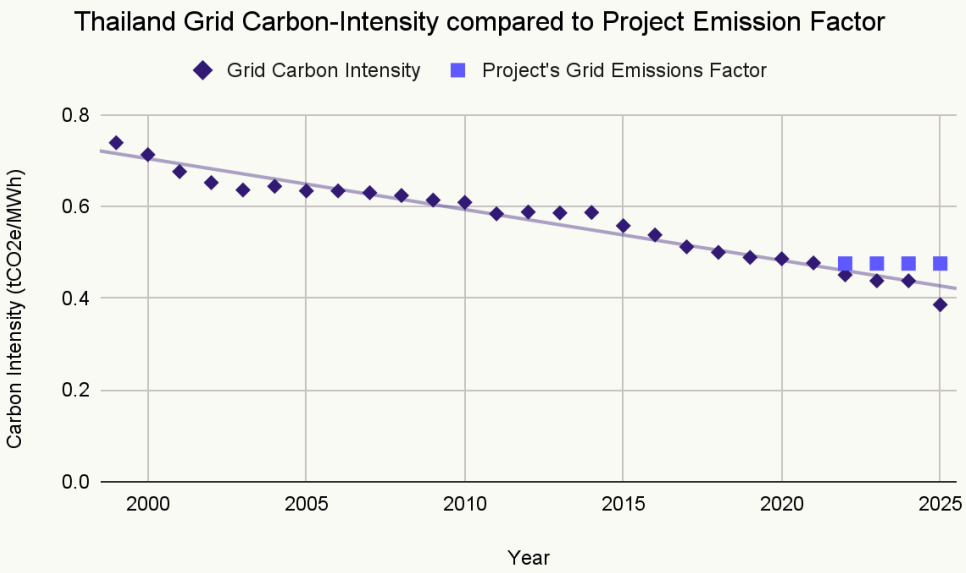


Figure 5: Emissions Factor in Comparison to Thailand Grid-Intensity

**Baseline** Moderate Risk Moderate Uncertainty

**The baseline component is assessed as moderate risk due to methodological limitations and optimistic assumptions regarding vehicle replacement**. The use of a three-month reference period to estimate fossil fuel consumption meets the methodological minimum but is insufficient to establish a robust average. The static baseline includes a 1% downward adjustment for technical improvements, but it assumes no replacement of internal combustion engine (ICE) buses by electric vehicles (EVs) during the crediting period, which may be unrealistic. While the approach aligns with current methodology, updated Article 6.4 guidance recommends incorporating at least a 1% annual baseline reduction, which would reflect fleet efficiency gains. Incorporating this alongside periodic reassessment of EV market penetration would enhance baseline credibility.

**Leakage** Low Risk Moderate Uncertainty

**A low risk score is given for leakage due to appropriate identification of leakage sources; however, uncertainty is driven by a lack of monitoring of the decommissioned engines.** Whilst project documentation specifies that ICE buses are sold for disassembly and recycling, a lack of ongoing monitoring of the end-of-life handling introduces uncertainty as to whether the combustion engines are recycled for non-emissive uses. For the modal shift (TM-06) methodology, a conservative 2.64% is applied to the modal shift calculations, taken from the most conservative previous usage of modal shift values as per the CDM's methodology.

## Emissions Monitoring, Reporting, and Verification (MRV)

Low Risk Moderate Uncertainty

**The Bangkok e-bus Program has a low risk score due to direct monitoring of electricity consumption, although uncertainty is introduced from modal-shift monitoring through surveys.** Sylvera scores Monitoring, Reporting, and Verification (MRV) risks by assessing the reliability of data sources, the robustness of monitoring procedures, and the qualifications of verification entities. Robust monitoring methods build trust and credibility in carbon credits. Direct measurements are preferred to models or assumptions where possible, to demonstrate that credits are backed by tangible removals.

**Monitoring regime:** Daily monitoring of electricity consumption and use of a registered & qualified Validation and Verification Body (VVB) mitigates MRV risks. Whilst not included in the first monitoring report (MR1), Sylvera believes that the use of infrequent surveys to calculate modal shift may introduce material risk to monitoring, further evidenced by the exclusion of this data in MR1.

**Electricity consumption monitoring:** Direct measurement of electricity consumption from e-bus charging stations and the use of an empirically verified baseline emission factor contribute to confidence in the MRV of fuel-switch emissions calculations. Further validation by monthly energy bills ensures data accuracy, and the high frequency of electricity measurement further improves confidence. One concern may be that real-time grid emission factors could vary as a result of renewable energy source intermittency and load usage, which could lead to miscalculation of emissions, as previously discussed in carbon accounting. However, real-time grid EFs will likely be lower than the project EF, and so this is unlikely to be problematic.

**Survey monitoring:** Whilst not used in the first monitoring period, and so not under the scope of an ex-post evaluation, the use of annual survey data to calculate modal shift emissions reductions is considered a risk to project integrity. The risk of introducing bias through encouraging unconservative responses, as well as potentially inaccurate responses and infrequent reporting, leads to concerns that reported emissions reductions could be both inflated and inaccurate.

**Verification Provider:** Verification is conducted by a qualified and recognized entity. Verification was carried out by Bureau Veritas Certification (Thailand) Limited (BVCL), a registered validator under Thailand's T-VER program and the FOEN. The verification team includes technical experts with relevant domain knowledge, including

## Sustainable Development

Sylvera evaluates a project's sustainable development performance by reviewing the design and implementation of key safeguards across environmental, social, and governance dimensions, as well as the project's contribution to UN Sustainable Development Goals (SDGs), also referred to as Co-benefits. Sylvera assesses the project on 11 Safeguards and each of the UN's 17 SDGs, excluding climate action (the primary purpose of the project).

**Safeguarding** Low Risk Moderate Uncertainty

Of the 11 safeguards assessed by Sylvera, three are classified as moderate risk, as summarized in the table below and detailed in the following sections.

Table 14. Overview of Safeguarding Components and Risk Scores – Thailand

| Safeguards | Risk Score |
|---|---|
| Community Engagement, Participation, and Transparency | 1 |
| Access to Grievance Redress | 2 |
| Human Rights, Indigenous Peoples, and Local Communities | 2 |
| Equity and Benefit Sharing | 3 |
| Land Rights, Resource Access, and Involuntary Resettlement | 1 |
| Labor Rights and Working Conditions | 2 |
| Cultural Heritage | 1 |
| Gender Equality | 2 |
| Health, Safety, and Security | 2 |
| Environmental Damage and Pollution Prevention | 3 |
| Biodiversity Conservation and Sustainable Resource Management | 3 |

**Equity and Benefit Sharing** concerns are driven by a lack of clarity on the beneficiaries of carbon finance, as Energy Absolute PCL is the sole direct recipient of carbon revenues and no dedicated monitoring mechanism is currently in place to track commitments such as maintaining high wages or affordable ticket prices. However, bus fares are regulated and adjusted exclusively by the Central Land Transport Control Board under the Department of Land Transport. Energy Absolute does not have unilateral authority to set or modify fares, meaning pricing is governed by an established regulatory framework. While fare levels themselves do not require additional monitoring, equitable access to the e-bus system can be assessed through indicators such as user adoption rates, passenger volumes, and ridership patterns across different demographic and geographic groups to ensure that the service remains accessible and inclusive.

**Environmental Damage and Pollution Prevention** concerns are driven by a lack of data on the disposal of lithium-ion batteries, which produce toxic chemical waste at their end-of-life. Proper disposal is recognized as a key requirement under the MADD; however, the project has not yet provided specific details on its implementation practices. During the site visit, the project proponents clarified that they intend to comply with forthcoming battery and waste management regulations currently being developed by the Pollution Control Department, under the Management of Waste Electrical and Electronic Equipment (WEEE) Act. In the interim, EV bus projects are subject to oversight by the Ministry of Industry. Under the 2023 Notification of the Ministry of Industry, all entities in possession of degraded batteries—whether public or private—are classified as waste generators and must declare such waste through the Department of Industrial Works' electronic manifest system. Degraded batteries must be transferred to facilities holding a Type 106 licence authorised to treat hazardous industrial waste. These regulatory requirements are incorporated into service agreements with manufacturers or lessors, who bear responsibility for ensuring compliant end-of-life battery management in accordance with applicable law.

**Biodiversity Conservation and Sustainable Resource Management** concerns are driven by a lack of data on the procurement of precious metals used in lithium-ion batteries, including lithium and cobalt. Furthermore, no information is available regarding the recycling of lithium.

**Co-Benefits** Moderate Impact Moderate Uncertainty

Sylvera believes the project contributes to four of the UN SDGs, as shown in the table:

Table 15. SDGs and Impact - Thailand

| SDG | Impact | Impact Summary |
|---|---|---|
|   | Moderate Impact | **Health benefits include reduced air pollution and urban heat, but a lack of support from project data contributes to a moderate impact score.** Reduction of the urban heat island (UHI) effect occurs through replacing ICEs with EVs [57, 58] and providing air-conditioned environments, but MR1 saw no measurable decrease in air pollution. However, anecdotal evidence from Thai Smile employees indicated improved health. |
|   | High Impact | **Sylvera's analysis of project data indicates high gender equality.** As part of the commitment to SDG 8, the project activities intend to provide productive employment for all alongside equal pay. Employment data indicate that the project workforce is gender-balanced overall (50% men and 50% women); however, men are disproportionately represented in managerial positions. The project has taken action to mitigate against this, implementing a training program to increase the number of female drivers at Thai Smile Bus. |
|   | Low Impact | **The low impact rating of SDG8 is driven by a lack of baseline data.** Whilst employment is monitored and documented, no baseline scenario of jobs and wages provided by ICE bus operators is given. Furthermore, in the employment data provided, the majority of the employees are provided a base pay below the Bangkok living wage [59], although average wage data, when including bonuses, indicates most achieve pay above the Bangkok living wage . |
|   | Low Impact | **Mixed literature and project data on air pollution drive the low impact rating for SDG11.** The MADD indicates the project will contribute to SDG11.6 - reduction of air pollution. Monitoring of both PM10 & PM2.5 levels in Bangkok in the MR exhibited an increase in levels after implementation of project activities over 3 months. There is also mixed consensus in scientific literature surrounding EV adoption's impact on PM2.5 levels in cities [60, 61]. |

## 4.5. Legal and Institutional Compliance Respecting the Sovereignty of the Host Country

Low Risk Low Uncertainty

This section assesses the project's compliance and alignment with the requirements and guidelines delineated by Switzerland, Thailand, and Article 6 of the Paris Agreement. The assessment framework is

based on the Swiss $CO_2$ Ordinance and $CO_2$ Act, the Thailand-Switzerland bilateral agreement and complementary documents, relevant Paris Agreement decisions, and the Paris Agreement Crediting Mechanism (PACM) methodological guidelines. It is important to keep in mind that these guidelines were published after the authorization for this activity. Furthermore, they do not apply to Article 6.2 activities. Nevertheless, a high-level comparison was conducted as it provides a valuable measure of the activities' alignment with international standards.

Sylvera leveraged two assessment types: binary compliance checks to confirm adherence to applicable requirements and regulations, and alignment tests to evaluate the project's level of conformity with existing guidelines.

Table 16. Policy Alignment and Compliance Assessment - Thailand

| Policy Documents | Risk Score |
|---|---|
| **Swiss Regulation** | |
| $CO_2$ Ordinance | Low—2 |
| $CO_2$ Act | Low—2 |
| **Bilateral Agreements** | |
| Implementation Agreement between Switzerland and Thailand | Moderate—3 |
| Joint Statement on Climate Change Cooperation | Very Low—1 |
| **Article 6.2 of the Paris Agreement and Relevant CMA Guidance** | |
| Decision 2/CMA.3 (and Article 6 Technical Expert Review - TER - reports) | Low—2 |
| Decision 6/CMA.4 | Low—2 |
| **Other documents - PACM guidelines** | |
| Article 6.4 Additionality Standard | Moderate—3 |
| Article 6.4 Baseline Setting Standard | Moderate—3 |
| Article 6.4 Leakage Standard | Moderate—3 |

## Swiss Regulation

*Ordinance for the Reduction of $CO_2$ Emissions ($CO_2$ Ordinance), SR 641.711* [38] Low Risk

**The $CO_2$ Ordinance imposes strict requirements for international carbon credits.** Projects must comply with regulatory frameworks and operational standards to receive national and international attestations. Projects must: demonstrate economic inviability without attestation revenue, adhere to technical best practices, contribute to host-country sustainable development, and comply with all applicable legal

provisions. The framework also mandates verifiable and quantifiable emission reductions. Credits must avoid double-counting, remain outside other trading systems, and use conservative calculations to prevent overestimation.

**The project is largely aligned with the $CO_2$ Ordinance, particularly with Annex 2a.** The Bangkok Electric Bus Deployment Programme implements a shift from natural gas to batteries. This contributes to an improvement in energy efficiency, and investment into such activities is permitted under the $CO_2$ ordinance. Notably, the $CO_2$ Ordinance explicitly forbids activities that contravene environmental and human rights conventions ratified by Switzerland. While the programme doesn't explicitly confirm its adherence to these conventions, there is also no evidence to suggest any conflict with general environmental and human rights standards.

*Federal Act on the Reduction of $CO_2$ Emissions ($CO_2$ Act), SR. 641.71* [39] Low Risk

**The project's design incorporates measures that are consistent with the $CO_2$ Act's key regulatory provisions, safeguards, and attestation requirements, which effectively mitigate the risk of non-compliance. The relevant Act's articles are assessed below.**

- Article 4.5 authorizes international attestations when domestic reductions fall short, while Article 5 mandates strict anti-double-counting. The project addresses this through MADD-documented safeguards ensuring reductions are counted only once.
- Dual data validation from both individual charging ports and monthly bill verification within monitoring reinforces compliance with Article 5.
- Article 6's additionality requirement is met through Swiss-linked funding structures. Klik's initial investment is contingent on Swiss involvement, and financial analysis confirms the project is not viable without carbon revenue. However, this only holds true at the start of the programme in 2022, and it would have to update its additionality demonstration going forward as Thailand plans to incentivize investment in the electrification of its transport sector.
- Permanence requirements under Article 6 do not apply. As the project delivers emission reductions rather than carbon sink activities, it is exempt from permanent $CO_2$ capture criteria.
- Article 6 of the act requires host-country sustainable development and prohibits negative impacts. Existing documentation demonstrates intended adherence to these provisions, although concerns raised around fair wages and air pollution impacts may compromise this.

## Bilateral Agreements

*Implementation Agreement to the Paris Agreement between Switzerland and Thailand* [40] Moderate Risk

While the project broadly aligns with the Implementation Agreement between Switzerland and Thailand, some aspects may merit further attention in order to ensure full compliance. The Agreement establishes foundational requirements for mitigation projects, with a strong focus on environmental integrity and sustainable development.

### Articles 3 and 4: Environmental Integrity and Sustainable Development

The project generally aligns with the environmental integrity and sustainable development principles outlined in Articles 3 and 4. It effectively meets the core conditions of Article 3, ensuring that mitigation outcomes are real, additional, verified, and permanent, and operates within the NDC implementation period. However, there is an opportunity to improve baseline setting by incorporating a reduction factor to account for anticipated expansion in electric vehicle manufacturing.

For Article 4, the project demonstrates compliance by providing local community benefits, including reduced noise & air pollution, reduced traffic, and moderate health benefits.

### Articles 5–7: Administrative Compliance

Articles 5-7 of the Agreement, requiring administrative compliance, have been analysed separately. Articles 5-6 cover the authorization process and form. In this case, the authorization process and the Letters of Authorization meet the requirements established in the IA. Article 7 relates to the monitoring and verification documents which have been provided and are analysed in the MRV section above. The monitoring and verification reports have been conducted by approved verification agents. The documents have been published by the project developer in accordance with the terms and conditions of the policy.

*Joint Statement on Climate Change Cooperation Switzerland-Thailand* [40] Very Low Risk

The joint statement focuses on international cooperation and alignment with international agreements and national climate targets provided in NDCs. Limited details are provided on provisions for project activities; thus, **no non-compliance risk is observed between the project and the joint statement**. Additionally, the recognition of Thailand's roadmap for increased electric vehicle production in this document confirms that the current project falls within the envisioned scope for bilateral engagement.

## Article 6.2 of the Paris Agreement and Relevant CMA Guidance

*Decision 2/CMA.3* [41] **Low Risk**

**The project's risk of non-compliance with Article 6.2 guidance is low.** Decision 2/CMA.3 sets criteria for cooperative approaches, most of which the project currently meets. ITMOs must be real, verified, and additional under Chapter 1. The project delivers measurable $tCO_2e$ reductions through authorized cooperative approaches between Switzerland and Thailand. Reporting obligations under Chapter 4 emphasize conservative baseline setting; however, our analysis indicates some concerns with the chosen baseline. Non-permanence risks do not exist for fuel-switch or modal shift credits, given they avoid carbon emissions rather than storing new carbon. A grievance redress mechanism is in place to mitigate potential social impacts, and the project is aligned with Switzerland's sustainable development objectives.

Both Thailand and Switzerland submitted initial reports, detailing the cooperative approach, to the UNFCCC. The Article 6 Technical Expert Review (TER) team subsequently issued a review report to assess the activity's compliance with the requirements of Article 6.2. During the review process, Switzerland and Thailand provided supplementary information. This information has either satisfied the TER or will be included in future reports as requested.

There are two key issues to note from the TER. Firstly, Thailand's TGO registry system was found to have insufficient tracking features, though this is being updated. Secondly, the TER found transparency lacking in the project's consideration of human rights and there are no known plans to address this through better data and reporting on the project's human rights impacts.

*Decision 6/CMA.4* [42] **Low Risk**

COP26 in Glasgow (2021) and COP27 in Sharm el-Sheikh (2022) specifically addressed how international carbon markets would operate under the Paris Agreement. These agreements introduced new requirements for countries engaging in Article 6.2, collected in Decision 6/CMA.4. They mandate an Initial Report detailing each cooperative approach, along with Annual and Regular information on their implementation, and templates for reporting are available in the UNFCCC Centralized Accounting and Reporting Platform (CARP).

The project meets the compliance requirements to submit initial reports and annual information submissions electronically, having provided both materials for the expert technical review and the first monitoring report. The initial monitoring and verification report complied with requirements, including a review of the initial report consistency, accounting, and recording of ITMOs.

## Paris Agreement Crediting Mechanism Standards

While these guidelines are mandatory for methodologies approved under Article 6.4 Paris Agreement Crediting Mechanism (PACM), they are not a formal requirement for those under Article 6.2. Nonetheless, they are widely anticipated to serve as the new benchmark for quality and integrity across the entire carbon market. Consequently, assessing the degree to which projects under Article 6.2 agreements align with the PACM's requirements helps predict a project's long-term integrity and market acceptance. It is important to keep in mind that these PACM guidelines were published after the authorization for this activity and that, so far, the only available standards were for additionality, baseline setting and leakage. Any forthcoming standards should be considered in the future.

*Article 6.4 Additionality Standard* [43] **Low Risk**

**The project broadly aligns with PACM additionality standard guidelines, but must account for the evolving market penetration of electric buses to maintain additionality over time.** Given the country's rapidly evolving electric vehicle (EV) sector, which is bolstered by domestic manufacturing capacity and strong policy support, electric buses are increasingly viable without carbon credit revenues. In this context, common practice becomes a material risk, and the absence of a common practice review process compromises the credibility of the programme's reliance on climate finance.

*Article 6.4 Baseline Setting Standard* [44] **Moderate Risk**

The project generally aligns with the PACM baseline-setting standard, adhering to principles like avoiding double-counting and defining activity boundaries. However, it falls short in two key areas.

- First, the project assumes that no internal combustion engine (ICE) buses will be replaced before 2030 without carbon finance, overlooking government subsidies and increasing domestic EV production. This creates an inflated baseline by presuming static ICE emissions under a business-as-usual (BAU) scenario, despite clear trends toward improved efficiency and spontaneous electrification.
- Second, it does not implement the initial downward adjustment and subsequent annual downward adjustments of at least 1% required in Section 7 of the standard design to for example reflect expected market developments, such as policy-induced EV uptake.

To enhance alignment with emerging PACM guidance, it would be conservative to include an annual 1 % baseline reduction factor in subsequent monitoring periods. This conservative adjustment would account for market-driven efficiency gains and ensure consistency with the Article 6.4 Baseline Setting Standard.

*Article 6.4 Leakage Standard* [45] **Moderate Risk**

**The project faces a moderate risk of non-alignment with the PACM leakage standard for addressing leakage.** The standard establishes three key compliance requirements:

- Identifying all potential leakage sources.
- Implementing measures to prevent leakage.
- Quantifying and subtracting any remaining adverse leakage effects.

The project identifies potential leakage sources and takes measures to avoid leakage from decommissioned buses; however, it fails to empirically justify its negative leakage reductions from the modal shift component of emissions reductions. The leakage assessment does not address all four primary categories outlined in the guidance - these being baseline equipment transfer, competition for resource use, diversion of production processes/outputs, and environmental GHG releases - competition for resource use and diversion of production processes are likely not applicable, whilst baseline equipment transfer and increases in GHG releases are addressed.

# 5. Cross-cutting analysis

## 5.1. Cross-cutting Analysis Across Project 5002 and 5004

This section synthesises insights from both evaluated mitigation activities to identify systemic patterns, comparative strengths, and recurring risks across Switzerland's early Article 6.2 portfolio. Both projects illustrate that methodological conservativeness and host-country engagement are decisive for sustaining integrity under cooperative approaches.

By analysing the two project types - an energy-efficiency intervention in rural Ghana and a technology-based transport transition in urban Thailand, Sylvera highlights cross-cutting lessons on methodological robustness, data integrity, and policy alignment.

The objective is to distill evidence on what has worked well and where targeted improvements would further strengthen the environmental integrity, transparency, and sustainable-development impact of future ITMO acquisitions. The analysis draws directly from the project-level findings, risk and uncertainty scores, and stakeholder feedback gathered during field visits and consultations.

Table 17. Cross-cutting Analysis

| Key Components | Key Strengths | Continuous Improvement Activities |
|---|---|---|
| **Additionality** | Both projects show low risk overall driven by proof that carbon finance is needed to implement the project and limited policy support<br><br>Both projects target underserved market segments—rural households in Ghana and urban public transport in Bangkok—where limited private sector participation demonstrates that deployment remains commercially unviable without carbon finance, consistent with the financial additionality assessments conducted for each project. | **Ghana Cookstove and Bangkok e-bus:** Ongoing monitoring of policy developments is essential to identify domestic incentives that may influence project eligibility and the level of additionality over time. |

| Key Components | Key Strengths | Continuous Improvement Activities |
|---|---|---|
| **Carbon Accounting** | The Ghana Cookstove (5004) project demonstrates a low overall risk, while the Bangkok e-bus (5002) project presents a moderate risk profile.<br><br>Both projects adopt conservative assumptions in their core accounting; however, the e-bus project's risk level is higher due to the relative immaturity of e-mobility methodologies, particularly the exclusion of LCA in its accounting framework. | **Ghana Cookstove and Bangkok e-bus:** Both projects should apply conservative accounting assumptions and conduct periodic baseline reassessments to ensure the baseline remains robust and reflective of evolving conditions. |
| **MRV** | Both projects exhibit low risk in their emissions MRV, supported by robust methodologies that align with international best practices. Each employs direct measurement approaches—such as KPT and electricity consumption metering—complemented by regular data validation to ensure accuracy and reliability. | **Ghana Cookstove:** Both projects should maximize the use of direct monitoring approaches where feasible—for example, integrating stove use monitors to calculate cookstove usage or adoption rate.<br><br>**Bangkok e-bus:** In contrast, the e-bus project's reliance on sampling surveys to estimate the modal shift introduces higher MRV uncertainty due to potential anthropogenic bias. This could be strengthened by enhancing the robustness of the survey design and reducing potential bias in survey implementation. Additional confidence could be achieved by validating survey results through independent third-party reviews and by triangulating modal shift outcomes with supporting traffic and mobility data. |
| **Sustainable Development** | Both projects present low safeguard risks and demonstrate clear co-benefits such as health improvements, time savings, and cost reductions. | **Ghana Cookstove and Bangkok e-bus:** Stakeholder engagement and ESG documentation are uneven. Strengthening grievance mechanisms, clarifying benefit-sharing arrangements, and improving the traceability of environmental safeguards would enhance overall social and environmental integrity. |

| Key Components | Key Strengths | Continuous Improvement Activities |
|---|---|---|
| **Legal/Institutional Compliance** | Both projects are broadly aligned with Article 6.2 requirements, Swiss Ordinances, and the relevant bilateral agreement terms. | **Ghana Cookstove and Bangkok e-bus:** Compliance is generally strong; however, future alignment with emerging Article 6.4 or PACM guidance will help ensure long-term consistency and robustness. |

## 5.2. Project Implementation

**Both projects demonstrate strong institutional alignment and government ownership.** They are implemented in close partnership with national environmental agencies: Ghana's Environmental Protection Agency (EPA) and Thailand's Department of Climate Change and Environment (DCCE). In both cases, local partners and project developers operate under agreements aligned with Article 6.2 cooperation with the Swiss government. No major compliance issues were identified, and both projects reflect close coordination with their respective authorities.

**Both governments are establishing systems to ensure transparent accounting and compliance with Article 6.2 requirements.** Under these frameworks, ITMOs must be subject to corresponding adjustments and cannot be double-counted toward host country NDCs. Discussions with government stakeholders confirmed that Ghana is developing national carbon registries to manage tracking, authorization, and reporting of mitigation outcomes, while Thailand currently has an operational national carbon registry.

**Strong collaboration between project developers and regulatory bodies supports effective oversight and compliance.** Project developers maintain active engagement with government institutions to ensure regulatory alignment and local stakeholder inclusion. Ghana operates under its national carbon market framework led by the EPA, while Thailand's registry functions under Article 6 are managed under the TGO. As both initiatives represent pioneering ITMO projects in their respective countries, Sylvera's assessment of the project documentations, alongside site visits, and stakeholder consultations confirmed consistent coordination and active institutional support.

## 5.3. Continuous Improvement for Future ITMOs

The evaluation of Switzerland's first Article 6.2 activities provides valuable cross-cutting insights into the conditions required for high-integrity cooperative approaches. Across both projects, **methodological robustness, conservative accounting, and strong host-country engagement** were the key determinants of environmental integrity. In contrast, areas such as **financial transparency, safeguard documentation, and monitoring-data completeness** present opportunities for further improvement.

Future ITMO activities would benefit from targeted enhancements.

- First, technology-based projects should integrate life-cycle assessment (LCA) and apply annual downward-adjusting baselines in line with emerging Article 6.4 and PACM guidance.
- Second, projects should formalise usage-monitoring technologies (e.g. Stove-Use Monitors, telematics) to strengthen MRV reliability and reduce uncertainty.
- Third, developers and host authorities should reinforce safeguard systems, including functioning grievance mechanisms, equitable benefit-sharing frameworks, and gender-responsive reporting.
- Finally, continued progress toward registry interoperability and transparent corresponding adjustments will further enhance confidence and traceability.

Overall, these lessons confirm that Switzerland's bilateral cooperation model is **robust but still evolving**. Incremental methodological and institutional refinements, coupled with stronger data and safeguard practices, will ensure that future ITMO activities continue to meet the highest standards of integrity and transparency.

# 6. Conclusion

## 6.1. How much additional $CO_2$ emissions have been effectively reduced abroad to date through the evaluated mitigation activities?

**Sylvera estimates that Switzerland's first two Article 6.2 mitigation activities have resulted in approximately 14,000 tonnes of additional, real, and verifiable $CO_2$-equivalent reductions to date, based on verified monitoring data.** This estimate is derived from an ex-post integrity assessment and reflects a hypothetical illustration of the additional emission reductions attributable to the project activities. The analysis presented in this section is intended to provide illustrative insights and serve as guidance for enhancing future project performance and design.

This includes 11,852 $tCO_2e$ verified from the Ghana Transformative Cookstove Activity and 1,916 $tCO_2e$ verified from the Thailand E-Bus Programme, both corresponding to Monitoring Period 1. Sylvera's assessment on how much additional $CO_2$ emissions have been effectively reduced abroad to date through the evaluated mitigation activities incorporates a 1% deduction of the verified emission reductions, in line with PACM's best-practice guidance on baseline adjustment. Further details of Sylvera's assessment are provided in the project-specific sections below.

Switzerland has successfully finalized several key transfers of ITMOs into the KliK Foundation's account within the Swiss Emissions Trading Registry. The first milestone occurred on December 15, 2023, with a transfer from the Thailand Greenhouse Gas Management Organization (TGO) registry involving 1,916 ITMOs from the Thailand E-Bus Programme. This was followed on July 7, 2025, by a transfer from the Ghana Carbon Registry (GCR) involving 11,733 ITMOs from the Ghana Transformative Cookstove Activity. Please note that Switzerland voluntarily applies a 2% cancellation of ITMOs for OMGE at the time the units are issued in the Swiss Emissions Trading Registry. Sylvera's assessment estimates an integrity-adjusted achievement of **99% for the Ghana cookstove project** and **88% for the Thailand e-bus project**, based on the overall approaches outlined in their respective MADDs over the project lifetime.

### 6.1.1. Ghana Cookstoves

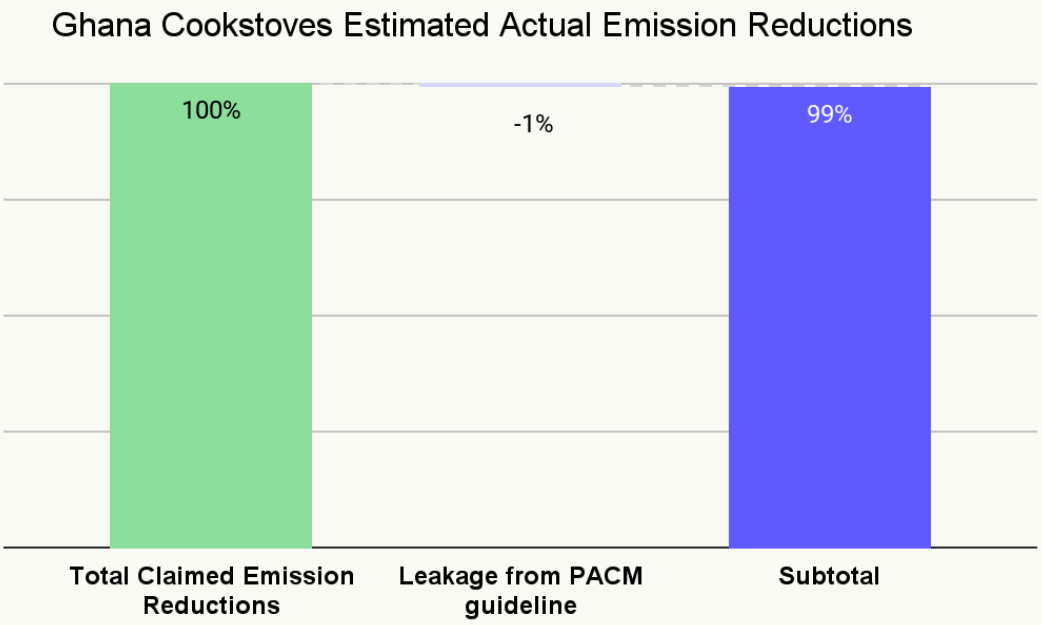


Figure 6. Estimated Annual Reductions for Ghana Project

**The additional $CO_2$ emissions that can be conservatively claimed as mitigated in the Ghana cookstove project applies only a 1% deduction to its claimed emissions reductions, due to its conservative methodological approach and strong empirical validation.** Parameter choices for the fNRB and EF are deliberately cautious. Sylvera's independent review, using WHO data, calculated a weighted average EF of 104.78 $tCO_2/TJ$ for rural Ghana—slightly below the default value of 112—and confirmed that biomass constitutes 89% of rural fuel use, leaving few viable baseline alternatives beyond improved cookstoves.

The project's 30% fNRB assumption is conservative and consistently applied throughout the project lifetime, aligning with the WISDOM database estimate of 28% and validated by the MoFuSS model, which projects 35% ± 3% for 2020–2030. MoFuSS provides a more dynamic and analytically robust estimate than WISDOM, further reinforcing the credibility of the chosen value.

**Fuel consumption is measured using KPTs, which adhere to methodological requirements including a 90% confidence level and quarterly sampling.** Although newer approaches like Stove Use Monitors (SUM) offer continuous measurement of fuel usage and can enhance the adoption rate quantification for this project. Site visits and user feedback confirm widespread stove adoption and significant fuel savings—typically two to three times compared to traditional stoves.

**Combined with conservative assumptions for EF and fNRB and direct data collection through KPTs, 99% of the total emission reduction are considered truly additional.** This figure reflects 1% deduction following the leakage deduction guideline for Article 6.4 / PACM.

### 6.1.2. Bangkok E-buses

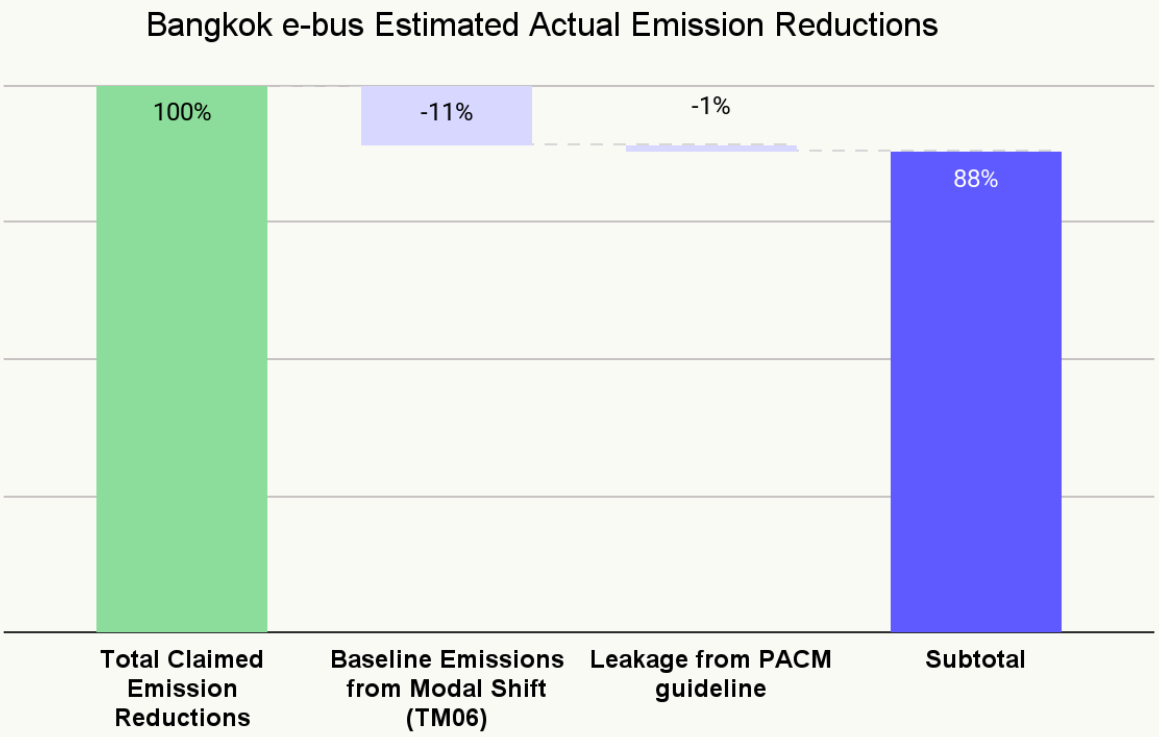


Figure 7. Estimated Annual Reductions for Thailand Project

**The additional $CO_2$ emissions that can be conservatively claimed as mitigated should be limited to the baseline emissions calculated under the TM05 methodology.** This methodology accounts solely for the replacement of NGV buses with electric buses, excluding diesel buses, which still constituted 32% of the fleet in 2024 - indicating a conservative estimate since diesel buses have higher emissions. TM05 is considered conservative because it includes only NGV emissions and also includes the project emissions by applying grid EF from non-renewable sources, as published by Thailand Greenhouse Gas Management Organization (TGO). These factors are updated periodically in accordance with TGO's official data, reinforcing the conservative nature of the emission calculations.

**Sylvera considers the exclusion of the baseline emissions from Modal Shift methodology, TM06 to be the most conservative approach.** The project adheres to the requirements outlined in TM06, which appears largely acceptable, though benchmarking it against best practices is challenging due to its limited application. To date, only 10 legacy CDM projects and 2 Verra projects have used this methodology. The most recent CDM project under TM06 issued credits in 2012, while the most recent Verra project applying the equivalent AM0031 methodology—the City of Johannesburg: Transportation Department in South Africa, VCS 695 —has yet to issue any credits.

Despite meeting the formal requirements by the TM06 methodology, Sylvera identifies concerns with the sampling approach and emissions reduction calculations. The methodology requires passenger surveys to a minimum of 15% of total ridership to assess modal shifts across six vehicle types. Reliance on survey introduces uncertainty due to the potential for anthropogenic bias in the survey design and

implementation. Besides that, passenger transport behavior is highly variable and can change over time. The absence of alternative modal-shift methodologies and the limited issuance of projects under CDM's AM0031 contribute to higher implementation uncertainty.

**Leakage is not explicitly accounted for in TM05, prompting the inclusion of a 1% deduction based on Article 6.4/PACM guidelines.** This adjustment, applied by Sylvera, serves to compensate for the exclusion of lifecycle or end-of-life emissions in the project's scope.

**As a result of these conservative assumptions and adjustments, only 88% of the total ex-ante emission reductions are considered truly additional.** Figure 7 reflects deductions for TM06 overlaps (c. 11%), and the 1% leakage adjustment.

## 6.2. Forward-looking Considerations for Future ITMOs Implementation

The evaluation confirms that both activities deliver genuine, additional, and verifiable emission reductions and that Switzerland's bilateral framework functions effectively to uphold environmental integrity. To further enhance quality and consistency across future cooperative approaches, FOEN and partner countries may consider implementing the following targeted enhancements:

1. **Methodological alignment** – Apply consistent accounting standards across all future activities, including LCA for technology-based interventions and periodic downward baseline adjustments to capture evolving market and policy conditions.
2. **Data quality and MRV reliability** – Promote greater use of direct, digital monitoring tools and standardised QA/QC procedures to minimise uncertainty.
3. **Safeguards and social inclusion** – Require explicit documentation of grievance mechanisms, community benefit-sharing, and gender-sensitive reporting.
4. **Institutional strengthening** – Continue supporting host-country registry interoperability and ensure consistent corresponding-adjustment reporting across all bilateral partners.

Implementing these measures will strengthen Switzerland's leadership in implementing high-integrity cooperative approaches, reinforcing both the environmental and social integrity of future ITMO acquisitions and ensuring full alignment with the principles of the $CO_2$ Ordinance, the bilateral agreements, and the Paris Agreement.

## 7. Alignment with SEVAL Standards

Sylvera has included below an ex-post evaluation of whether this report aligns with SEVAL standards, These Standards serve as a basis for the planning and implementation of evaluations and are a reference for quality monitoring throughout the evaluation as well as for judging the quality of an ex-post evaluation.

The quality of the evaluation is assessed under four criteria, with 27 sub-criteria to evidence alignment.

- **Utility**: An evaluation targets the defined purposes and information needs of the intended users. Evaluations should be informative, effective and be conducted at an appropriate time. Evaluators should become familiar with the audiences of the evaluation and their information needs, then plan and carry out the evaluation according to these needs, and finally present their results clearly and in good time.
- **Feasibility**: An evaluation should be planned and carried out so that it is adapted to the existing circumstances, well thought-through and cost-effective. The goal should be to reach the greatest possible acceptance by the various stakeholders. Usually, evaluations involve a large number of people and can be time-consuming for everyone involved. Consequently, they should only use as many resources, material, staff, time and money as required for achieving the purpose and answering the evaluation questions.
- **Propriety**: An evaluation should be conducted in a legally and ethically correct way and carried out in a respectful and unbiased manner. Evaluations affect many people and organizations in different ways and may even constitute an imposition. Propriety requires that the rights of those involved be protected, that stakeholders be treated with respect, and that evaluations be carried out with due sensitivity with regard to ethical and legal issues. Propriety also requires an unbiased and impartial attitude on the part of the evaluators and consideration for the legitimate interests of the stakeholders.
- **Accuracy**: An evaluation should provide appropriate, valid and applicable information that is developed using methodologically robust tools. The assessment provided must have a logical connection to the information collected.

To evidence our alignment with SEVAL requirements, Sylvera has laid out the 27 sub-criteria and cross-referenced in this report where specific criteria is covered:

Table 18. SEVAL Criterion

| SEVAL Criterion | SEVAL Expectation | Alignment Status | Evidence in this Evaluation |
|---|---|---|---|
| **A1. Openness and impartiality** | Evaluation is open to all possible results and reports them impartially. | ✓ | Balanced assessment of both projects with explicit risk and uncertainty scoring. Sylvera is independent of project financing or ITMO outcomes. See section 3–section 5 (Project Evaluations) and section 6 (Conclusions). |

| SEVAL Criterion | SEVAL Expectation | Alignment Status | Evidence in this Evaluation |
|---|---|---|---|
| **A2. Transparency** | Purpose, procedures, and basis for judgement are disclosed so results are verifiable. | ✓ | Full description of evaluation purpose, scope, and methodology (section 1–section 2). Data sources, assumptions (fNRB, EF, IRR), and limitations clearly stated. Editable datasets provided in section 8.3. |
| **A3. Stakeholder consideration** | Identify and consider the interests of all relevant stakeholders. | ✓ | Stakeholder mapping and engagement through site visits in Ghana and Thailand (section 8.4–section 8.5). Consultations with project developers, government agencies, and local communities integrated into findings. |
| **A4. Intended use and users** | Evaluation planned and communicated to meet user needs. | ✓ | Designed to inform FOEN, SECO, SFOE and FDFA under Postulate Girod 24.3074. "Key Risk Reduction Measures" and cross-cutting lessons structured for direct policy use (section 4–section 6). |
| **A5. Proportionality (cost-benefit)** | Evaluation effort proportionate to expected benefits. | – | Scope and resource allocation focused on material risk areas (baseline conservativeness, MRV, safeguards). Budgeting and cost efficiency fall outside this deliverable's scope (section 2). |
| **A6. Evaluator competence** | Evaluation conducted by qualified and experienced professionals. | ✓ | Multidisciplinary team of carbon-accounting, sustainable-development and Article 6 experts. Field verification demonstrates applied technical competence. Team credentials referenced in section 2 and section 8.4–section 8.5. |
| **A7. Quality assurance** | Continuous quality control during design, analysis and reporting. | ✓ | Dual-analyst review system, peer review of findings, and use of accredited validators (Earthood Services). QA processes described in section 2 and section 5. |
| **A8. Legal compliance** | Compliance with applicable legal and regulatory frameworks. | ✓ | Dedicated analysis of compliance with the Swiss $CO_2$ Ordinance, bilateral Article 6.2 agreements and UNFCCC CMA decisions (section 3.6 Ghana; section 4.5 Thailand). |
| **A9. Privacy and confidentiality** | Protect data and ensure informed consent. | ✓ | Confidentiality assured through disclaimers; all field interviews conducted with informed consent and anonymised in reporting (section Disclaimer; section 8.4–section 8.5). |
| **A10 Ethics** | Uphold ethical principles and cultural sensitivity. | ✓ | Ethical safeguards embedded in social and gender assessments; local cultural contexts considered in fieldwork and reporting (section 4.3 & section 5.4). |

| SEVAL Criterion | SEVAL Expectation | Alignment Status | Evidence in this Evaluation |
|---|---|---|---|
| **A11 Respect** | Treat all stakeholders fairly and impartially. | ✓ | Balanced representation of host governments, developers, and affected communities; respectful integration of differing stakeholder perspectives (section 4–section 5). |
| **A12 Honesty** | Transparently acknowledge limitations and uncertainties. | ✓ | Methodological gaps (e.g. limited MR data, missing LCA, incomplete grievance procedures) openly reported with quantified uncertainty scores (section 3–section 5; section 6). |
| **B1 Clarify object, purpose, questions & use** | Define object and intended use clearly. | ✓ | Object = two Article 6.2 projects; purpose and questions stated in section 1 Introduction and answered in section 7. |
| **B2 Consideration of context** | Reflect relevant political, economic, and social context. | ✓ | Detailed national context integrated into analysis (e.g. Ghana clean-cooking policy gaps; Thailand EV roadmap and NDC framework) (section 4.2 & section 5.2 Additionality). |
| **B3 Timeliness** | Ensure results are available in time for intended use. | – | Minimal: evaluation aligned with FOEN's Article 6 reporting cycle; completion precedes next ITMO authorization window, though no schedule reference in text. |
| **B4 Evaluation agreement** | Define scope, roles and resources in a written agreement. | – | Outside scope: contractual ToR with FOEN exist but not reproduced; mandate referenced in section 1. |
| **B5 Appropriate evaluation design** | Design suited to object and purpose. | ✓ | Consistent five-module framework (Additionality, Carbon Accounting, MRV, Sustainable Development, Legal Compliance) applied to both projects (section 2). |
| **B6 Scientific approach in data collection & analysis** | Apply sound and ethical analytical methods. | ✓ | Empirical testing (KPTs, IRR modelling, grid EF benchmarking); uncertainty explicitly modelled; conservative assumptions consistent with Article 6.4 standards (section 4.3–section 5.5). |
| **B7 Reasonable data collection** | Collect only data necessary to answer evaluation questions. | ✓ | Uses project documentation, verified MR and site evidence; avoids redundant data collection (section 2; section 8). |
| **B8 Validity & reliability of data collection** | Ensure validity and reliability for intended purpose. | ✓ | Ghana KPT and usage data verified by Earthood; Thailand electricity data validated monthly by VVB; triangulation with third-party datasets (section 4.3 & section 5.5 MRV). |

| SEVAL Criterion | SEVAL Expectation | Alignment Status | Evidence in this Evaluation |
|---|---|---|---|
| **B9 Quality & relevance of information** | Maintain systematic checks for accuracy and relevance. | ✓ | Emission factors, financial sensitivities, and baseline assumptions cross-checked; conservative adjustments applied (1 % leakage deduction) (section 4.3–section 5.3). |
| **C1 Complete & fair assessment** | Present strengths and weaknesses openly. | ✓ | Integrity risk scores present balanced evidence (e.g. Ghana co-benefits vs. community gaps; Thailand strong MRV vs. missing LCA) (section 4–section 5; section 6). |
| **C2 Transparent assessment & justified conclusions** | Link conclusions clearly to evidence. | ✓ | Quantitative reasoning shown (99 % verified reductions for Ghana; 88 % for Thailand) and uncertainty explained (section 7.1). |
| **C3 Useful recommendations** | Provide actionable and feasible guidance. | ✓ | Specific guidance shared in "Key Risk Reduction Measures" tables (e.g. baseline factor, LCA, grievance systems) (section 4 & section 5). |
| **C4 Adequate reporting** | Clear, understandable, and suited to target audiences. | ✓ | Structured flow (Executive Summary → Evaluations → Cross-cutting → Conclusions) and plain-language presentation (section 3–section 7). |
| **C5 Documentation of the evaluation** | Provide supporting documentation for verification. | ✓ | Data tables, visuals, expert bios and site visit records enable third-party verification (section 8.3–section 8.6). |
| **C6 Access to evaluation results** | Ensure stakeholders can access findings. | – | Report delivered to FOEN and partner agencies; public release to be determined by FOEN policy (section 8). |

# 8. Appendices

## 8.1. Source list and full references

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## 8.2. Authorizations and project documents

| Category | Documentation | Source |
|---|---|---|
| **Swiss $CO_2$ Ordinance & $CO_2$ Act** | Ordinance for the Reduction of $CO_2$ Emissions ($CO_2$ Ordinance), SR 641.711 | Climate Change Laws |
| | SR 641.711<br>Ordinance of 30 November 2012 for the Reduction of $CO_2$ Emissions ($CO_2$ Ordinance) | Fedlex<br>*note this version is under preparation and is not available as of January 9th 2026 |
| | 641.71 Federal Act on the Reduction of $CO_2$ Emissions ($CO_2$ Act) | Fedlex |
| **Bilateral Agreements - Ghana** | Cooperation Agreement Switzerland-Ghana Implementation Paris Agreement | FOEN |
| | Cooperation Agreement Ghana Implementation Roadmap | FOEN |
| | Letter of Agreement Ghana (Interpretation of Art. 10) | FOEN |
| | Joint Statement on Climate Change Cooperation Switzerland-Thailand | FOEN |
| | Implementing Agreement to Paris Agreement between the Swiss Confederation and the Kingdom of Thailand | FOEN |
| **Article 6.2 of the Paris Agreement and Relevant CMA Guidance** | Article 6.2 Reference manual for the accounting, reporting and review of cooperative approaches | UNFCCC |
| | Decision 2/CMA.3 | UNFCCC |
| | Decision 6/CMA.4 | UNFCCC |
| | Thailand's Article 6, paragraph 2, initial report | UNFCCC |
| | Report on the technical expert review under Article 6, paragraph 2, of the Paris Agreement of the initial report referred to in chapter IV.A (Initial report) of the annex to decision 2/CMA.3 of Thailand | UNFCCC |
| | Report on the technical expert review under Article 6, paragraph 2, of the Paris Agreement of the initial report referred to in chapter IV.A (Initial report) of the annex to decision 2/CMA.3 of Thailand. Addendum | UNFCCC |
| | Switzerland Initial report referred to in decision 2/CMA.3, annex, chapter IV.A (Initial report) | UNFCCC |
| | Report on the technical expert review under Article 6, paragraph 2, of the Paris Agreement of the initial report referred to in chapter IV.A (Initial report) of the annex to decision 2/CMA.3 of Switzerland | UNFCCC |
| | Report on the technical expert review under Article 6, paragraph 2, of the Paris Agreement of the initial report referred to in chapter IV.A (Initial report) of the annex to decision 2/CMA.3 of Switzerland. Addendum | UNFCCC |

## 8.3. Data tables and visuals

## 8.4. Site visit summary - Ghana (14-16 October 2025)

### 8.4.1. Overview

From the 14th to 16th of October 2025, the Sylvera team conducted a site visit to Accra and the Upper West Region of Ghana to verify the implementation and impacts of the improved cookstove (ICS) project. The primary objectives of the visit included physical verification of project activities—such as observing ICS units in use, confirming that the type and number of cookstoves distributed matched project documentation, and cross-checking field observations with the project's monitoring reports. The team also sought to identify any evidence of stove stacking through direct household visits.

To further assess household fuel use and behavioral changes, the team examined whether users had adopted new clean fuel sources (e.g., LPG canisters) and whether the household surveys used to monitor fuel switching were representative of the broader target population. The site visit also aimed to ensure that cookstoves were functioning correctly, being used for their intended purpose. Photographic documentation of cookstoves, usage practices, and household settings was collected as part of the impact verification process.

**Stakeholder Engagements**

During this visit, the Sylvera team met with key institutional and implementation partners to discuss project progress, monitoring procedures, and data quality. These included:

- Envirofit – Project developer and cookstove provider
- Farmerline – Distribution partner responsible for field logistics and household engagement
- Environmental Protection Agency (EPA) – Ghana's environmental regulatory body overseeing national compliance and carbon project frameworks

To complement these meetings, the team traveled to Tumu in the Upper West Region, on the 15th and 16th of October where Envirofit facilitated field interviews with five cookstove recipients. Discussions were also held with local distribution agents to gain insight into on-the-ground implementation and user engagement processes. These interviews and observations were instrumental in verifying the project's monitoring procedures, household adoption patterns, and the overall effectiveness of the cookstove distribution model.

### 8.4.2. Key Findings

The site visit provided valuable data and context to strengthen Sylvera's assessment of the project's integrity—covering Additionality, Carbon Accounting, MRV, and Sustainable Development—as well as its alignment with policy and compliance frameworks.

**Distribution and Operational Model**

Farmerline manages last-mile distribution for the cookstove project in Ghana and Côte d'Ivoire, leveraging its existing agricultural network of rural agrovets and agro-champions. The same infrastructure used for input delivery and farmer training supports efficient cookstove storage, demonstrations, and sales. Area selection is coordinated with Envirofit, which identifies target regions while Farmerline advises on local feasibility. Agents are well-trained and familiar with digital data tools such as QR codes and mobile

scanning, ensuring accurate, traceable record-keeping. After-sales support is handled by the same agents, with users able to report issues via the agent, agrovet, or 399 call center. Most reported defects are minor and resolved within a week, often on-site.

The partnership between Envirofit and Farmerline effectively leverages Farmerline's established infrastructure and digital systems but faces challenges in inventory management and demand forecasting, leading to occasional stock shortages. In northern regions, communal cooking practices suggest that one stove per household may not be sufficient, indicating the need for multi-stove distribution models.

**Capacity, Data Systems, and Gender Engagement**

Farmerline oversees around 50 agents across the country, supported by two Account Managers who ensure training quality, data accuracy, and user engagement. Each stove is digitally linked to a household through serial number tracking, supporting transparency and monitoring. Early product issues have been resolved following factory improvements by Envirofit, and complaints are now minimal. Women are central to project uptake—approximately 75% of users are women, supported through eight women's groups and local cooperatives. However, around 60% of agents are male, highlighting an opportunity to expand women's participation in field sales and demonstrations.

**Cookstove Use in Tumu, Upper West, Ghana**

All respondents reported significant improvements in fuel efficiency, affordability, and household wellbeing. Charcoal consumption has decreased by an estimated 50–75%, resulting in considerable cost and fuel savings. The improved stove's efficient combustion allows users to burn smaller charcoal pieces—unlike traditional models that require larger lumps—and emits far less smoke, enabling safe indoor cooking and reducing exposure to harmful pollutants. Cooking has also become faster and more convenient, eliminating the need to collect firewood.

Most users reported using the Super Saver Charcoal Stove (CH-5300), which suits the readily available charcoal supply in the Tumu area. Users found the stove easy to operate following brief agent-led demonstrations and reported no safety incidents. Stoves were purchased under a subsidized scheme at 180 Ghanaian cedis (around CHF 13, or US$ 18), compared to the market price of 600 Ghanaian cedis (around CHF 45, or US$ 56)during Monitoring Period 1, making affordability a key factor in uptake. Several respondents noted that neighbouring households have shown interest after observing the stove's performance, indicating strong potential for peer-driven adoption. Most respondents expressed interest in purchasing more than one cookstove, noting that the current restriction of one unit per Ghanaian ID card limits their ability to meet household cooking needs. Overall, the interviews demonstrate high user satisfaction, substantial economic and health co-benefits, and the critical role of targeted subsidies and community-based demonstrations in driving sustained use and wider dissemination.

All findings and supporting evidence from the site visit have been incorporated into Section 3 of this report.

## Envirofit factory visit in Accra


DANGER
ENVIROFIT


ENVIROFIT

## Household interviews - road conditions in Tumu, Upper West Ghana

## Household interviews: recipients of cookstoves


50 kg
ETG
AGRI INPUTS

## Household interviews: Older cookstoves

## 8.5. Site visit summary - Thailand (9-10 September 2025)

### 8.5.1. Overview

On the 9th and 10th of September 2025, the Sylvera team conducted a site visit to Bangkok, Thailand, to verify the implementation and impacts of the e-bus project. The objectives of the visit included physical verification of project activities—such as observing e-buses in operation and cross-checking route data against the project's monitoring reports—as well as impact verification through photographic documentation of buses, charging infrastructure, and operational activities. The visit also aimed to assess environmental and social impacts through stakeholder consultations and field observations.

To evaluate the project's operational effectiveness and reliability, the team conducted semi-structured consultations with local stakeholders, including drivers. These discussions focused on short-term observed benefits such as reduced exposure to air pollution, lower noise levels, improved commuting experiences, and the number of individuals benefitting from the e-bus deployment.

During this period, the Sylvera team visited e-bus terminals, charging stations, and conducted a comparative ride on a diesel bus to better understand the operational differences. The team also interviewed key on-site stakeholders, including male and female local bus drivers, Thai Smile Bus employees at terminal locations, and charging station operators.

**Stakeholder Engagements**

On the 10th of September, the Sylvera held a roundtable meeting with a range of institutional stakeholders to discuss the project's progress, governance, and monitoring framework. These included representatives from the Swiss Embassy, the Department of Climate Change and Environment (DCCE), the Thailand Greenhouse Gas Management Organization (TGO), and Energy Absolute (EA). Participants included:

- Sophie Steiner Kernen, Deputy Head of the Political and Economic Section
- Krittaya Chunhaviriyakul, Director of Climate Measure and Mechanism Section, DCCE
- Chonticha Nithitsuttibuta, National Senior Expert, DCCE
- Sunaree Changin, Environmentalist (Practitioner Level), DCCE
- Marisa Kongngoen, Project Coordinator, DCCE
- Paweena Panichayapichet, Senior Technical Expert, Carbon Credit Certification Office, TGO
- Sathit Niamsuwan, Technical Expert, Carbon Credit Certification Office, TGO
- Pornpawee Kittitanaphan, Technical Officer, Carbon Credit Certification Office, TGO
- Mongkol Kijlerdphon, Vice President, Sustainable Development Department, EA
- Naipaporn Jirapatchaikul, Manager, Sustainable Development Department, EA
- Nithi Terdkiatburana, Regional Lead, Technical, Sustainable Technologies, Climate Projects – SEA, South Pole

### 8.5.2. Key Findings

The site visit provided valuable data and context to strengthen Sylvera's assessment of the project's integrity—covering Additionality, Carbon Accounting, MRV, and Sustainable Development—as well as its alignment with policy and compliance frameworks.

**Additionality and Policy Alignment**

Stakeholder consultations offered further clarity on Thailand's policy environment for EVs, which currently prioritizes the commercial EV segment. The project remains insulated from these policy incentives, as specified in the MADD, confirming that it does not receive any government support. At present, the project also falls outside the scope of Thailand's unconditional Nationally Determined Contribution (NDC) measures. Under current rules, only conditional NDC initiatives—those lacking direct government support—are eligible for international carbon finance.

**Common Practice and Market Context**

To further substantiate the project's additionality claims, stakeholders shared updated data on e-bus deployment in Bangkok. Sylvera noted that the Bangkok Mass Transit Authority (BMTA) has announced plans to procure approximately 1,520 e-buses by 2032, which could potentially influence the project's common practice assessment. However, this remains a long-term target rather than a confirmed procurement plan. Moreover, common practice will be reassessed at each crediting period, with the next review scheduled post-2030, meaning there is no immediate impact on the project's eligibility. As of December 2024, 2,056 electric buses were registered under the Thai Smile Bus Group, accounting for over 90% of all e-buses in Thailand. This concentration underscores the limited market penetration of electric buses beyond a single major private operator.

**Environmental Safeguards and Lifecycle Considerations**

In response to Sylvera's feedback regarding the absence of a LCA, project proponents provided additional information on their waste management plans. While LCA requirements are not yet integrated into T-VER methodologies, the project will be expected to comply with forthcoming regulations. The DCCE is currently drafting legislation on battery and waste management, which will apply to this and similar projects once enacted.

**Registry Development and Human Rights**

The project team also shared updates on ongoing developments in the T-VER registry system, including the introduction of enhanced tracking functions and mechanisms for recording Corresponding Adjustments. In addition, they provided further details on the project's social initiatives, covering human rights policies, fair and inclusive employment practices, passenger accessibility, and employee well-being and accountability measures.

All findings and supporting evidence from the site visit have been incorporated into Section 4 of this report.

## New e-bus: air-conditioned interior, cashless payment, improved accessibility



Scan Q.R Code
15.00


BIG MOTOR SALE
ห้ามยืน
NO STANDING AREA

## E-bus terminal: parking, charging station and worker's lounge


OPEN 24
HOURS

## Older diesel bus

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