GreenCape

AngloAmerican Foundation

OPPORTUNITY BRIEF

# Black Soldier Fly Agriculture

## De-risking through carbon markets

# 1 Introduction

**We find ourselves in a period defined by interconnected crises that pose significant threats to global stability. Chief among these is climate instability driven by anthropogenic climate change.**

These new challenges give rise to new markets, and the ongoing climate crisis and escalating global emissions are no exception. This has spurred the development of mechanisms aimed at curbing greenhouse gas (GHG) emissions, including carbon markets. One innovative carbon mitigation solution able to benefit from carbon credits is Black Soldier Fly (BSF) agriculture.

BSF embodies the principles of the circular economy by doing more with less, and plays a key role in mitigating climate change by reducing the resource intensity and carbon footprint of products and services throughout their lifetime.

Innovators are leveraging BSF larvae to convert organic waste destined for GHG-generating landfills into high-value, resource-efficient and low-carbon agricultural inputs, notably animal feed and soil amendments.[1]

The climate crisis has created an opportunity for BSF farmers to leverage their carbon-efficient credentials to drive sustainability while also unlocking carbon credit-based revenue streams to strengthen the business case.

This opportunity brief introduces the reader to BSF agriculture, the role BSF agriculture plays in climate mitigation, and the opportunities and challenges facing South Africa's BSF sector in capitalising on carbon markets.

A circular economy seeks to maximise the value of products, materials, and nutrients for as long as possible. This includes optimising the nutrients embedded in both animal feed and human food. When food waste prevention and retention are not possible, beneficiation must be a priority. This is not only a societal and environmental imperative, but a strategic business decision for enhancing resilience and maintaining competitiveness.

## Intended audience

- BSF farmers seeking new revenue streams
- BSF farmers investigating carbon credits
- Farmers wanting to de-risk regenerative agriculture transition
- Animal feed brands looking to decarbonise products

## Opportunity brief discusses

- Introduction to carbon credits
- Carbon credit regulations
- Benefits of carbon credits
- Carbon project registration
- Challenges impacting carbon projects
- Overcoming the challenges

[1] GreenCape (2025). Black Soldier Fly Agriculture: Upcycling South Africa's Organic Waste into Local, Climate Friendly and Resilient Feed for Livestock, Pets, and the Soil. Online: https://greencape.co.za/library/industry-brief-bsf-agriculture-upcycling-organic-waste/

# 2 Background

**The climate crisis is one of the most pressing challenges of our time, driven by the rapid accumulation of GHGs in the Earth's atmosphere. While climate change has been a recurring feature throughout Earth's history, the cause of the current crisis is attributed to human activities such as burning fossil fuels, deforestation, and industrial processes.**

Global temperatures have risen by ±1.1°C since the pre-industrial era, leading to negative consequences for human wellbeing, ecosystem stability, and economic growth.

The scientific consensus, as outlined by the Intergovernmental Panel on Climate Change (IPCC),[2] warns that limiting global warming to 1.5°C above pre-industrial levels is critical to avoiding catastrophic impacts. However, current global emissions trajectories are far from aligned with this target, necessitating urgent and transformative action.

GHG emissions are categorised into three scopes to better understand and address their sources:

- Scope 1: direct emissions from owned or controlled sources, such as fuel combustion.
- Scope 2: indirect emissions from purchased electricity, steam, or heating.
- Scope 3: all other indirect emissions across the value chain, including raw material extraction, transportation, and product use.

Agriculture, whilst a critical sector, contributes between 25 - 30% of global GHG emissions. It is largely through methane[3] produced by livestock, nitrous oxide[4] from the incorrect use of fertilisers, and carbon dioxide ($CO_2$) from processing, deforestation, and land-use changes. These emissions span all three scopes, depending on the stage of the value chain, from harvesting to processing and packaging, to distribution.

Landfills also represent a major source of GHG emissions, primarily due to the decomposition of organic waste, which generates methane under anaerobic conditions (the absence of oxygen). Landfills contribute roughly 3-5% of the overall global emissions. This percentage can vary by country or region depending on waste management practices, the amount of organic waste sent to landfills, and the implementation of methane capture systems.

To address the climate crisis, governments, businesses, and civil society are increasingly adopting a range of climate mitigation initiatives aimed at reducing GHG emissions and enhancing carbon sequestration. However, achieving the necessary scale of emissions reduction requires not only technological and behavioural changes but also strong economic and policy frameworks and tools.

One such tool is the carbon market, a system that puts a price on carbon emissions and their equivalents to encourage reductions in a cost-effective way through the trade of carbon credits, where one credit represents the reduction of one metric tonne of GHG emissions. As the world races to meet the goals of the Paris Agreement,[5] carbon markets- and, in some cases, including South Africa- carbon credits will play an increasingly important role in mobilising resources, fostering innovation, and enabling a just transition to a low-carbon future.

Whilst international demand for carbon credits remained stagnant in 2024, the carbon market is expected to grow from $1.4 billion in 2024 to between $7 - $35 billion in 2030 and as high as $250 billion by 2050. This demand will be driven by companies accelerating efforts to meet their 2030 Paris Agreement emissions targets.[6]

While local demand is high, it is expected to grow significantly from $17.2 million in 2023 to ±$88.9 million by 2030.[7] This will be driven through the introduction of Phase 2 and Phase 3 of South Africa's Carbon Tax Act, and more specifically the offset allowance increase from 5% to the proposed 20% - 25%.

This provides a promising, albeit complicated, opportunity for South Africa's BSF sector to leverage its low-carbon credentials to increase carbon mitigation revenue streams, and ultimately strengthen the business case for the burgeoning sector.

[2] The IPCC is the United Nations body for assessing the science related to climate change.

[3] Methane is a GHG with a global warming potential (GWP) 27 – 29 times higher than $CO_2$ over a 100-year timeframe. Online: https://ghgprotocol.org/sites/default/files/2024-08/Global-Warming-Potential-Values%20%28August%202024%29.pdf

[4] Nitrous oxide is a potent GHG with a GWP of 273 times higher than $CO_2$ over a 100-year timeframe. Online: https://ghgprotocol.org/sites/default/files/2024-08/Global-Warming-Potential-Values%20%28August%202024%29.pdf

[5] UNCC (2025). The Paris Agreement. Online: https://unfccc.int/process-and-meetings/the-paris-agreement

[6] MSCI (2025). Frozen Carbon Credit Market May Thaw as 2030 Gets Closer Online: www.msci.com/www/blog-posts/frozen-carbon-credit-market-may/05232727859

[7] Horizon (2025). South Africa Voluntary Carbon Credit Market Size and Outlook. Online: www.grandviewresearch.com/horizon/outlook/voluntary-carbon-credit-market/south-africa#:~:text=The%20South%20Africa%20voluntary%20carbon,revenue%20generating%20project%20in%202023

# 3 The opportunity

GreenCape has developed a number of knowledge products that introduce South Africa's BSF sector and the opportunities that it presents.[8] In summary, global innovators are leveraging BSF larvae to upcycle low-value organic waste into high-value, resource-efficient, low-carbon agricultural inputs. As such, BSF farming presents multiple avenues for generating carbon credits or reducing carbon liabilities:

## 2.1. Organic waste landfill diversion

Leveraging BSF larvae to treat organic waste otherwise destined for methane-producing landfills is considered a short-term pathway for accessing carbon credits, especially when multiple activities apply under a single project. This opportunity is only relevant to BSF projects outside of the Western Cape and is predicted to grow significantly from 2026 as the demand for credits is expected to increase.

In landfills, organic material decomposes in anaerobic conditions, leading to the release of methane. The diversion of organic waste from landfills facilitates methane avoidance, and is a criterion for offset projects. These credits, can be sold on carbon markets.

A crucial step is to align a project with an adequate methodology under a recognised standard. Whilst there are currently no BSF specific methodologies for methane avoidance, there are methodologies that BSF projects can align with. For example, there are two methodologies that are active under the Verra's Verified Carbon Standard (VCS) programme that can be applied to BSF projects. These include: alternative waste treatment processes (ACM0022)[9] and avoidance of methane emissions through composting (AMS-III.F).[10]

It is important to stress that this opportunity is only relevant to non-Western Cape-based solutions. This is largely due to legal mandate eligibility (Section 6). The Western Cape's Department of Environmental Affairs, and Development Planning (DEADP) mandated a provincial organic waste landfill restriction by 2027,[11] effectively banning the disposal of organic waste in Western Cape landfills. As a result, carbon credit projects based on landfill diversion would not be eligible in the Western Cape.

This is one of many challenges that may affect BSF-based carbon offset projects. Section 7 discusses these challenges further and provides recommends to overcome these.

[8] GreenCape (2025). Black Solider Fly Agriculture: Upcycling South Africa's Organic Waste into Local, Climate Friendly and Resilient Feed for Livestock, Pets, and the Soil. https://greencape.co.za/library/industry-brief-bsf-agriculture-upcycling-organic-waste/

[9] UNFCC (2024). ACM0022: Alternative waste treatment processes – Version 3.0 . Online: https://cdm.unfccc.int/methodologies/DB/AUR5PLW743TS0OOCWRS55XXT86WV4J

[10] UNFCC (2024). AMS-III.F.: Avoidance of methane emissions through composting – Version 12.0. Online: https://cdm.unfccc.int/methodologies/DB/NZ83KB7YHBIA7HL2U1PCNAOCHPUQYX

[11] DEADP (2018). Diversion Targets for Organic Waste in the Western Cape. Online: https://orasa.org.za/wp-content/uploads/2016/11/DEADP-organic-waste-landfill-ban-letter-July-2018.pdf

## 2.2. Alternative protein production

Using BSF larvae as a novel feed ingredient for livestock and pet food presents a long-term pathway for BSF farmers indirectly benefiting from carbon credits. However, this opportunity primarily benefits the off-take clients rather than BSF farmers themselves. As a result, the opportunity will require establishing a strategic partnership with off-take partners looking to reduce their carbon liability and enhance their performance allowances.

BSF-based protein meal is a carbon-efficient alternative to conventional feed proteins such as soybean meal and fishmeal, particularly when organic waste is used as a feedstock. Conventional protein sources contribute significantly to Scope 3 emissions due to deforestation (imported soybean meal), transport, and processing. By comparison, BSF meal generally has a lower carbon footprint.[12]

Replacing carbon-intensive feed ingredients with BSF-based alternatives can lower the overall emissions of feed products and, in turn, reduce the carbon footprint of farming practices. In regions where sustainable feed alternatives are incentivised, these emission reductions could translate into carbon liability reduction or carbon credits.

South Africa's demand for carbon-efficient activities is expected to grow in the long term due to the Carbon Tax Act. While the agriculture, forestry and other land use (AFOLU) sector is currently excluded from Phase 2 of the Carbon Tax Act, it is expected to be included in Phase 3. Scope 3 emissions may also be included in Phase 3, further incentivising the inclusion of carbon-efficient feed ingredients.

Internationally, the demand for carbon-efficient agricultural solutions is rising. The European Union (EU) Green Deal, particularly the Farm to Fork Strategy, aims to reduce the carbon footprint of agriculture, including animal feed. The EU's sustainability reporting under the Corporate Sustainability Reporting Directive will ensure sustainability reporting transparency, while the EU Deforestation Regulation will ensure that imported soy and other feed products are not linked to deforestation. In the United States (US), the Inflation Reduction Act (2022) promotes climate-smart agricultural practices, while initiatives like the Science-Based Targets Initiative and the GHG Protocol require food companies to reduce Scope 3 emissions - including those from feed - rather than simply offsetting them.

Another indirect international opportunity arises from Carbon Border Adjustment Mechanisms (CBAM), with major export markets. Australia, Turkey, Japan, the US, and the United Kingdom are exploring to align carbon pricing and prevent carbon leakage, whilst the EU's CBAM is currently being implemented. It covers sectors like iron, steel, aluminium, and cement, and is set to expand to plastics and chemicals by 2026, and may include agriculture by 2030.

South Africa's carbon-intensive energy mix makes it especially vulnerable to CBAM, posing challenges for exporters, but also creating opportunities for low-carbon alternatives such as BSF meal. However, it is important to note that voluntary carbon credits are not accepted to offset CBAM liabilities, as CBAM is tied to the EU Emissions Trading System, which requires direct emissions reductions rather than offsets. Therefore, the opportunity lies not in using carbon credits to reduce CBAM exposure but to integrate BSF protein to reduce the carbon footprint of feed.

This is one of many challenges that may affect BSF-based carbon offset projects. Section 6 discusses these challenges further and provides recommendations to overcome these.

## 2.3. Soil carbon sequestration

Using BSF larvae frass as a novel soil amendment presents a long-term opportunity for BSF farmers to indirectly benefit from soil carbon-based carbon credits. However, this advantage primarily applies to off-takers and users of frass - such as commercial farmers - rather than BSF farmers themselves. As a result, unlocking this potential will require strategic partnerships with off-take partners interested in developing carbon offset projects focused on soil carbon sequestration.

BSF frass (insect manure) is a nutrient-dense, microbial-diverse, carbon-rich organic fertiliser that introduces stable carbon compounds into soil, promotes microbial communities, and improves soil structure, leading to greater carbon aggregation and microbial biomass.[13] These are key to sustaining long-term carbon sequestration and storage projects. BSF farmers can explore carbon credit registration by demonstrating measurable improvements in soil carbon sequestration through frass application. By aligning with recognised carbon credit methodologies, partner farmers could generate additional revenue streams while promoting soil health and sustainability.

One approach is to develop a new carbon credit project. This approach requires significant scale, rigorous data collection, and adherence to established methodologies. The process is lengthy and resource-intensive, making it a long-term strategy for BSF farmers who can justify the investment.

A faster and more practical option is to incorporate BSF frass into existing soil carbon projects through a formal project expansion or revision process. This allows project developers to avoid the full registration process while ensuring compliance with carbon credit standards for additionality and monitoring.

For example, AgriCarbon supports farmers in implementing regenerative practices that sequester carbon. It recently became the first regenerative farming programme in South Africa to receive Verra-certified carbon credits. The programme includes 29 farmers across 17 582 hectares, resulting in the issuance of 39 207 tonnes of carbon credits. By aligning with such initiatives, BSF farmers can participate in established carbon credit frameworks without starting from scratch.

Whilst not directly a BSF opportunity, it requires working closely with farmers looking to capitalise on soil carbon credits. This is one of many challenges that may affect BSF-based carbon offset projects. Section 7 discusses these challenges further and provides recommendations to overcome these.

12 The environmental impact of Fishmeal and Hermetia illucens (Black Soldier Fly) larvae meal in aquaculture feed, utilising Life Cycle Assessments under South African conditions - https://scholar.sun.ac.za/server/api/core/bitstreams/114a58de-bf35-4dea-9391-8cae56ba2794/content

13 GreenCape (2024). Opportunity Brief: Waste to frass to fertiliser. Online: https://greencape.co.za/library/opportunity-brief-waste-to-frass-to-fertiliser/

# 4 Carbon markets

**Carbon markets are trading systems in which $CO_2$ emissions, or equivalent ($CO_2e$), are commodified and given a price per tonne, allowing them to be traded. These markets are designed to reduce GHG emissions by creating a financial incentive for organisations to lower their carbon footprint. By putting a price on carbon, the real costs of GHG emissions are accounted for in the market. Emissions in these markets are referred to as carbon credits, and one carbon credit represents one metric tonne of $CO_2e$. Every carbon credit is traceable, finite, and is typically issued by regulatory bodies or certification programmes and can be traded on carbon markets.**

## Carbon allowances

A regulated permit issued by a regulatory body that represents the right of an emitter to emit a stipulated amount of emissions. Companies that exceed the allotted allowance must either purchase carbon credits to compensate for the excess or face penalties. Those companies that reduce their emissions below their allotted allowance are typically given the opportunity to sell the excess carbon credits to other companies unable to meet their targets. Carbon allowances are linked to mandatory markets. The carbon price is driven by supply and demand.

## Mandatory carbon markets

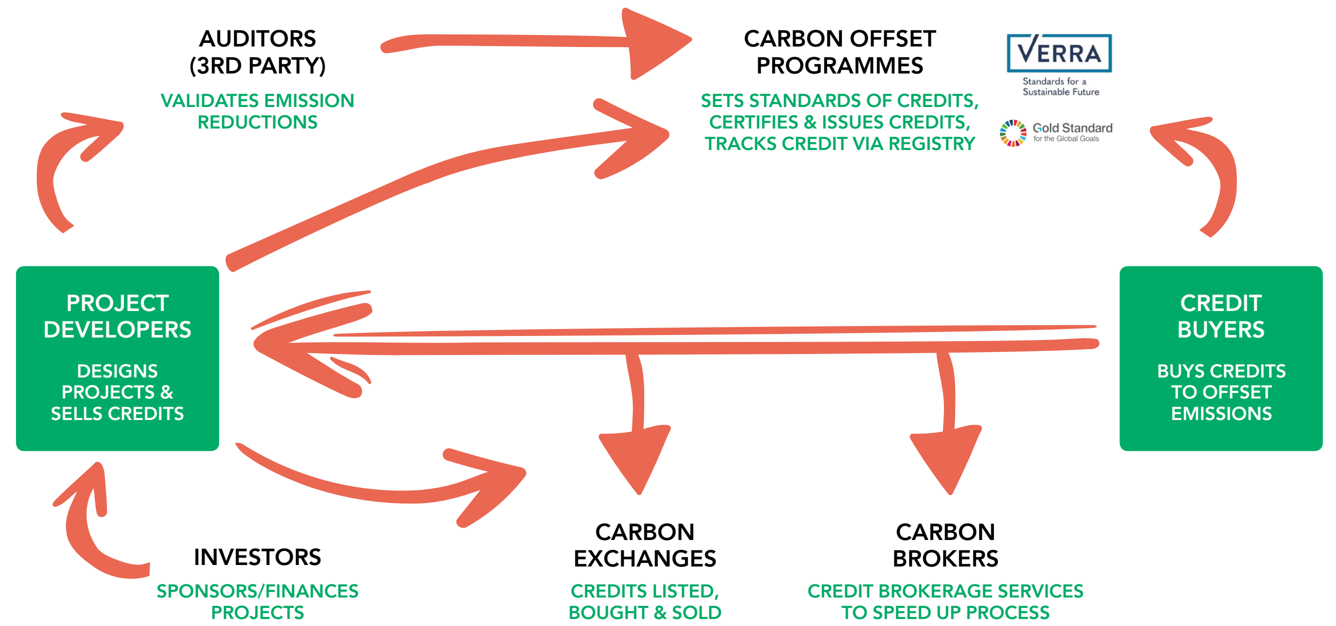
Regulated markets operate under government oversight and function as a system of "permission slips" to emit GHGs. Common examples include a 'cap-and-trade system', 'baseline-and-credit' system, and of particular relevance to the South Africa landscape, a 'carbon tax' system, which sets a fixed price (a tax) on carbon emissions by taxing entities based on the amount of $CO_2e$ they emit.

## Carbon offsets

A carbon offset represents a verified reduction or removal of emissions from projects outside a company's direct operations. Companies or individuals buy these credits to compensate for their emissions, effectively reducing their net carbon footprint. Offsets are typically traded in voluntary markets, unless used in mandatory markets. They fund projects that avoid, reduce, or remove emissions, while allowing buyers to balance their pollution while supporting green initiatives. The carbon credit price is driven by project quality, additionality, and certification.

## Voluntary carbon markets

Voluntary markets operate independently from government oversight, and there is no legal obligation to participate. These markets enable organisations to take accountability for their own emissions. To offset their emissions, companies can purchase carbon credits from verified offset projects that reduce or remove GHG emissions. Voluntary markets are flexible enough to allow the trading of credits across borders, enabling entities in developed economies to support projects in developing economies.




* CAPITAL FLOW

Figure 1: Provides a summary of a carbon credits ecosystem. Carbon markets rely on two distinct instruments to regulate and reduce emission

# 5 South Africa's Carbon Tax

**South Africa has adopted a 'carbon tax' approach to regulate carbon emissions, diverging from the 'cap-and-trade' or 'baseline-and-credit' systems used in other jurisdictions. The Carbon Tax Act (Act 15 of 2019) was introduced to align with South Africa's Nationally Determined Contributions (NDCs) under the Paris Agreement. The tax is grounded in the polluter-pays principle, currently requiring emitters to take responsibility for their Scope 1 (direct) emissions.**

**Carbon price:** The carbon tax was initially set at R120 per tonne of $CO_2$e and was adjusted annually for inflation. The rate has risen from R159 per tonne in 2023 to R236 in 2025, and is expected to increase to R462 by 2030.[14]

**Affected sectors:** Schedule 2 of the Carbon Tax Act outlines GHG emission thresholds for activities within identified sectors. Companies exceeding these thresholds are liable to pay the carbon tax. Sectors impacted include energy, manufacturing, mining, transport, and industrial processes. Agriculture and waste management are only partially affected for now.

**Tax-free allowance:** To facilitate a smooth transition and maintain competitiveness, emitters are granted numerous tax-free allowances, which reduce their effective tax rate. These allowances are designed to phase out over time, incentivising gradual emissions reductions. The types of allowances include:

- Basic tax-free allowance
- Trade exposure allowance
- Performance-based allowance
- Carbon budget allowance
- Offset allowance

**Offset allowance:** The Carbon Tax Act permits emitters to offset between 5 – 10% of their taxable emission liabilities by purchasing offset credits from registered carbon projects through voluntary markets.

**Offset administration system:** South Africa's government has set up the Carbon Offset Administration System (COAS) to track the ownership of credits and allow companies to retire the credits to offset their tax liability.

**Recognised offset standards:** The South African government stipulates that only carbon credits from programmes of activities registered through the Gold Standard, VCS, and Clean Development Mechanism (CDM) qualify within the South African compliance tax market. No credits from other registries can be used to offset carbon tax in South Africa. However, this is expected to change in future iterations, with the development of the domestic standard framework.

**Phase 1 (2019-2026):** The Carbon Tax Act is being rolled out in three phases, with allowances gradually being reduced, leading to higher carbon tax liabilities for companies that fail to reduce emissions. Phase 1 focused on major $CO^2$e emitters and allowed for high allowances to ease the transition. Initially planned to end in 2022, Phase 1 has been extended until 2026.

**Phase 2 (2026-2030):** Initially planned for 2023, Phase 2 was postponed to 2026. A discussion paper has been published for public comment,[14] and outlines proposed plans for:

- Higher carbon tax rates
- Replacement of carbon budget allowance with an increase in carbon offset allowance
- Removal of budget allowance
- Higher carbon tax rates (R640/t$CO_2$e) on exceeded carbon budget[15] allocations
- Increased carbon offset allowances
- Reduced basic tax-free allowances
- Domestic standard framework consideration
- Exclusion of AFOLU and waste activities

**Phase 3 (beyond 2030):** While the details are not yet defined, it is expected that Phase 3 will align with South Africa's Net Zero 2050 commitments and global climate targets, and could include:

- Higher carbon tax rates
- Reduced or eliminated tax-free allowance
- Emphasis on carbon offset allowances
- Expanded scope to more sectors, including AFOLU and waste activities
- Taxation on indirect Scope 3 emissions
- Integration with global carbon markets

The carbon tax framework is expected to drive demand for carbon credits across various sectors as companies seek to mitigate their rising tax liabilities. This creates opportunities for the BSF sector to leverage its carbon offsetting credentials to generate additional revenue streams and strengthen the business case in South Africa. These opportunities are discussed in more detail below.

14 National Treasury (2024). Phase two of the Carbon Tax Act. Online: www.treasury.gov.za/public%20comments/TaxationOfAlcoholicBeverages/Phase%20two%20of%20the%20carbon%20tax.pdf

15 A carbon budget refers to a legally binding or voluntary limit on the total amount of GHG emissions that a company, sector, or country is allowed to emit over a specific period. If a company exceeds its allocated carbon budget, it becomes liable to pay a higher carbon tax on the excess emissions.

# 6 Carbon project registration

**In order for BSF solutions to capitalise on carbon credit trading, the carbon credits must be registered. Registering carbon credits for trading involves a formal process to ensure that the emission avoidances, reductions and sequestration are real, measurable, additional, permanent, and independently verified. The key steps in this process are discussed below and summarised in figure 2. A summary of the carbon credit stakeholder ecosystem is illustrated in figure 1 above.**

**Step 1 - Pre-feasibility:** Assess a project's viability by identifying opportunities, evaluating alignment with carbon standards, estimating emissions reduction potential, and undertaking preliminary financial and risk assessments.

**Step 2 - Project design:** The project developer compiles a Project Design Document (PDD) providing: a description of the project, baseline emissions, demonstration of additionality,[16] monitoring methodology, and the expected emissions avoided, reduced or sequestered. It is at this step that a methodology is selected that is relevant to the proposed project.[17] It is common to adopt methodologies that are endorsed by recognised standards, such as: Gold Standard, VCS, CDM, or South Africa's COAS, which oversees carbon offset projects under the Carbon Tax Act (Section 5).

**Step 3 - Listing project:** The project developer opens a registry account and submits a project listing request to the chosen standard. The standard reviews the PDD and other submitted documents, and may request revisions before approving the project for validation.

**Step 4 - Validation:** An accredited third-party auditor[18] assesses a project's compliance with the chosen standard. The auditor's validation report is submitted to the standard for approval.

**Step 5 - Registration:** The validated PDD and validation report are submitted to the respective standard for registration. Once approved, the project is officially registered, allowing carbon credits to be issued upon verification of emissions avoidance, reduction or sequestration.

**Step 6 - Monitor:** Once operational, the project follows the approved monitoring plan, tracking emissions avoided, reduced or sequestered. Any deviations from the monitoring plan may require approval from the standard.

**Step 7 - Verification:** At designated intervals, an accredited third-party auditor verifies the emission avoidance, reduction or sequestration. The auditor submits a verification report to the standard for credit issuance.

**Step 8 - Credit issuance:** Upon verification, the standard issues credits proportional to the tonnes of $CO_2e$ avoided, reduced or sequestered. The credits are then deposited into a registry account, managed by the project developer or a designated entity, and are uniquely serialised to ensure traceability and prevent double counting.

**Step 9 - Trading:** Issued credits can be sold through various channels: direct sales by project developers; carbon exchanges (JSE Ventures Carbon Market, Green Asset Exchange, Credible Carbon);[19] brokers or auctions. When a carbon credit is used to offset emissions, it is retired from circulation to prevent reuse and double counting.

**Step 10 - Annual reporting:** The project developer submits an annual report to the standard, detailing project performance and any updates to ensure ongoing compliance.

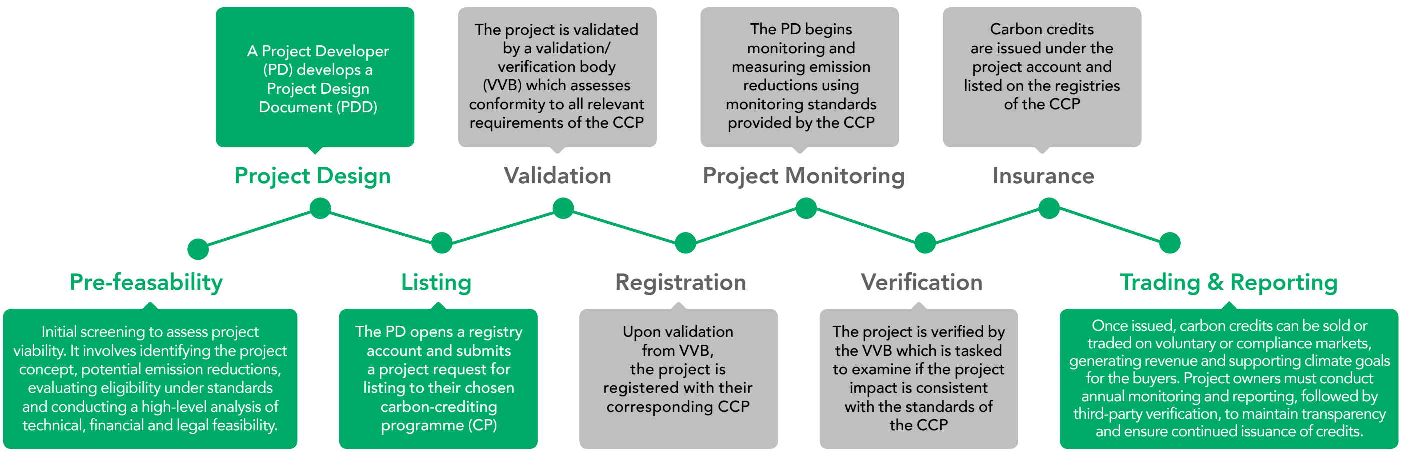



Figure 2: Typical carbon credit project lifecycle Source: Adapted and expanded from Ureca (2024)

[16] An additionality refers to GHG emission reductions or removals from carbon offset projects would not have occurred in the absence of the incentive created by carbon credit revenues.

[17] If no existing methodology fits a given project, a new methodology must be developed and approved by the respective standard.

[18] Standards tend to list of accredited auditors on their websites.

[19] Carbon exchanges offer platforms that provide access to premium pricing opportunities, ensuring projects get competitive returns for their carbon credits.

# 7 Challenges and recommendations

**Carbon offset projects face numerous challenges that may impact their development, eligibility and financial viability. These challenges range from limitations in local and international standards, high upfront costs, to legal and regulatory barriers. These challenges are discussed further in the context of BSF-related projects, along with potential strategies for overcoming them.**

**High upfront costs:** Developing carbon offset projects that align with recognised and credible standards require significant upfront investments before carbon credits can be generated and sold to recover the costs. These costs are highly variable on a number of factors, such as the project type, the chosen carbon standard, the complexity of the project and the host country's regulatory environment. The cost of small projects can start at a minimum of R1 million and exclude continued monitoring.

To mitigate these upfront costs, some investors, formal carbon credit developers and carbon brokers may take on the upfront financial burden or risk by covering these initial costs in exchange for an agreed upon share of the revenue from the sale of carbon credits.

Another strategy to reduce upfront costs for an individual project is to bundle multiple activities under a single programme of projects. By partnering with other companies offering similar solutions, the total project development costs can be shared, thus reducing the financial burden on each individual partner.

Another option is to integrate new activities into an existing registered project by expanding the project scope through a formal project revision or expansion process. This approach allows project developers to avoid the full registration process from scratch while also ensuring compliance with the relevant standard's requirements for additionality and monitoring.

**Cost of verification vs price of credits:** The price of carbon credits in South Africa are not linked to the current carbon tax rate, or at least the effective tax rate. As the carbon tax increases so should the financial incentives to register carbon offset projects. However, due to the immaturity of the local carbon market, credit prices are unpredictable, creating uncertainty for project developers and buyers.

**Limited approved standards:** While voluntary carbon markets are relatively liberalised, only carbon credits issued under the Gold Standard, VCS, and CDM are eligible for South Africa's carbon tax offset allowances. This excludes local methodologies and increases reliance on costly international certification processes, which can be prohibitive for small projects.

To address this challenge, a draft Framework for Domestic Carbon Offset Standards has been proposed by South Africa's National Treasury. Once implemented, the framework is expected to reduce registration costs and improve the viability of local projects. The relevant authorities aim to finalise and publish the framework for implementation before the end of the 2024/25 financial year.

**Limited local standard auditors:** Compliance with international standards, a necessity to be eligible for South Africa's carbon tax offset allowances, requires third-party verification. South Africa lacks local third-party auditors. As such, registering offset projects requires outsourcing standard validation to international auditors. The costs of hiring an independent third-party auditor can be prohibitive, notably for small and community-based offset projects.

**BSF-specific methodology:** BSF agriculture offers climate mitigation benefits such as reducing organic waste landfilling (contributing to landfill methane avoidance), lowering embedded carbon in feed products and supporting carbon removal through soil sequestration. However, the lack of dedicated methodologies under the major carbon credit standards - Gold Standard, VCS, or CDM - for insect farming limits the ability of BSF-related projects to generate standardised and recognised carbon credits.

Until a BSF-specific methodology is developed, project developers must rely on existing methodologies, such as ACM0022[20] and AMSIII. F,[21] which, while applicable, may not fully capture the unique benefits of BSF farming.

**Legal mandate eligibility:** Credible standards stipulate that activities already required by law cannot be counted toward offset credits or project eligibility.[22] Specifically, activities that facilitate the diversion of food waste from methane-producing landfills in areas with legal mandates prohibiting the landfilling of organic waste cannot generate carbon credits.

[20] UNFCC (2024a). ACM0022: Alternative waste treatment processes - Version 3.0 . Online: https://cdm.unfccc.int/methodologies/DB/AUR5PLW743TS0OOCWRS55XXT86WV4J

[21] UNFCC (2024b). AMS-III.F.: Avoidance of methane emissions through composting - Version 12.0. Online: https://cdm.unfccc.int/methodologies/DB/NZ83KB7YHBIA7HL2U1PCNAOCHPUQYX

[22] See Section 3.2.2 of Gold Standard's - Reduction in methane emissions from landfills through decentralised organic waste processing methodology. Online: https://globalgoals.goldstandard.org/standards/441_V1.0_WMH_Reduction-in-methane-emissions-from-landfills-through-decentralised-organic-waste-processing.pdf

This is particularly relevant to the Western Cape, where the provincial 2027 organic waste landfill restriction will render carbon credit projects focused on diverting organic waste from landfills ineligible for carbon credits.

Additionally, organic waste collected in areas with legally mandated sorting and/or treatment, but then transported to another area without such mandates, will not be eligible for credits.

When establishing offset projects, focus must be placed on regions where waste treatment is not a mandatory requirement to qualify for carbon credits, especially if landfill diversion is the primary approach for earning them.

**Project development complexity:** Developing an offset project is a complex process requiring compliance with rigorous standards that can be challenging. Activity owners may lack the expertise to design, implement and verify offset projects under the strict standards.

To streamline project development and ensure compliance, many project owners outsource key aspects to experts, such as carbon consultants or specialised project developers. While this incurs additional costs, the expertise and tacit knowledge help navigate regulations, optimise methodologies and improve the likelihood of successful registration and credit issuance. Section 8 provides a non-exhaustive list of reputable experts and service providers.

It is worth noting that the time required to register a carbon project depends on a number of factors, such as the project type, the chosen carbon standard, the complexity of the project and the host country's regulatory environment. As a result, a project registration can range from 2 – 5 years before credits are traded.

**Additionality eligibility:** In carbon projects, additionality ensures that emissions reductions would not have occurred without the financial incentive of the carbon credits. Proving this can be difficult, and must follow the recognised standards, undergo third-party verification, use transparent baseline calculations and prove the project would not be viable without carbon credit revenue. Meeting the criteria strengthens the project's eligibility for carbon credits.

**Unstable voluntary market prices:** Carbon offset credits trade on carbon exchanges within the voluntary markets, where carbon prices fluctuate due to supply-demand dynamics, policy changes and market sentiment. These price instabilities can impact project viability, as a significant drop in credit prices may render a project financially unsustainable.

To mitigate price volatility, project developers could secure long-term off-take agreements with credit buyers at pre-agreed prices. Project developers could also explore mandatory markets to ensure a stable demand for credits, as they often have stricter requirements and higher price floors than voluntary markets. Diversifying revenue sources across voluntary and mandatory markets enhances project resilience against price volatility.

**Credit quality risks:** Carbon credit buyers, especially those on the voluntary market, are increasingly scrutinising carbon offset projects to mitigate greenwashing risks. Projects with verified environmental, social and governance aligned co-benefits, biodiversity conservation, social impact, ownership and community development are more attractive to buyers and often command higher prices.

To maximise value, project developers should integrate measurable co-benefits and ensure transparency in impact reporting, making credits more appealing to buyers seeking broader sustainability contributions.

**Market access:** Accessing carbon credit markets in South Africa has been challenging, particularly for small-scale and community-based projects. Barriers include limited local trading platforms, high certification costs and the need for specialised knowledge to navigate carbon standards and verification processes.

To overcome this, project developers often partner with carbon brokers or aggregators, to facilitate market access by handling credit issuance, certification and sales. In South Africa, several platforms support carbon credit trading, providing liquidity and market linkages for local projects. These platforms help streamline transactions, connect buyers and sellers and enhance the visibility of high-quality carbon credits in both voluntary and regulatory markets. See Section 8 for a non-exhaustive list of reputable experts and service providers.

**Limited domestic demand:** The South African carbon tax market currently allows for up to 10% offset use in Phase 1 (until 2025). While demand from major emitters remains uncertain, these emitters prioritise in-house decarbonisation over purchasing offsets.

Looking ahead, Phase 2 of South Africa's carbon tax is expected to drive greater demand for offset credits by increasing the tax rate liability, reducing overall allowance, whilst raising the offset allowance threshold from 5% to 20%. This will place a significant cost burden on emissions emitters, thereby incentivising

# 8 Key contacts

**The following table provides a list of key stakeholders relevant to BSF farming in South Africa. These contacts are essential for ensuring compliance with the above mentioned regulations.**

| CARBON CREDIT STANDARDS | ADMINISTER | WEBSITE |
|---|---|---|
| Verified Carbon Standard (VCS) | Verra | www.verra.org |
| Gold Standard | Gold Standard Foundation | www.goldstandard.org |
| Clean Development Mechanism | UNFCCC | https://cdm.unfccc.int/ |
| Credible Carbon Standard | Credible Carbon | www.crediblecarbon.com |

| CARBON CREDIT TRADING PLATFORMS | ADMINISTER | WEBSITE |
|---|---|---|
| JSE Carbon Credit Exchange | Johannesburg Stock Exchange | www.jse.co.za |
| Carbon Offset Administration System | Department of Mineral Resources & Energy | www.carbon.energy.gov.za |
| Green Asset Exchange | Green Asset Exchange | www.greenassetexchange.com |
| Credible Carbon | Credible Carbon | www.crediblecarbon.com |

| CARBON PROJECT DEVELOPERS (SOUTH AFRICA FOOTPRINT) | WEBSITE |
|---|---|
| Anthesis (formally Climate Neutral Group) | www.anthesisgroup.com |
| Atmosfair | www.atmosfair.de |
| Brundtland | www.brundtland.co.za |
| Credible Carbon | www.crediblecarbon.com |
| Green Asset Exchange | www.greenassetexchange.com |
| Promethium | www.promethium.co.za |
| Tasc | www.tasc.je |

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