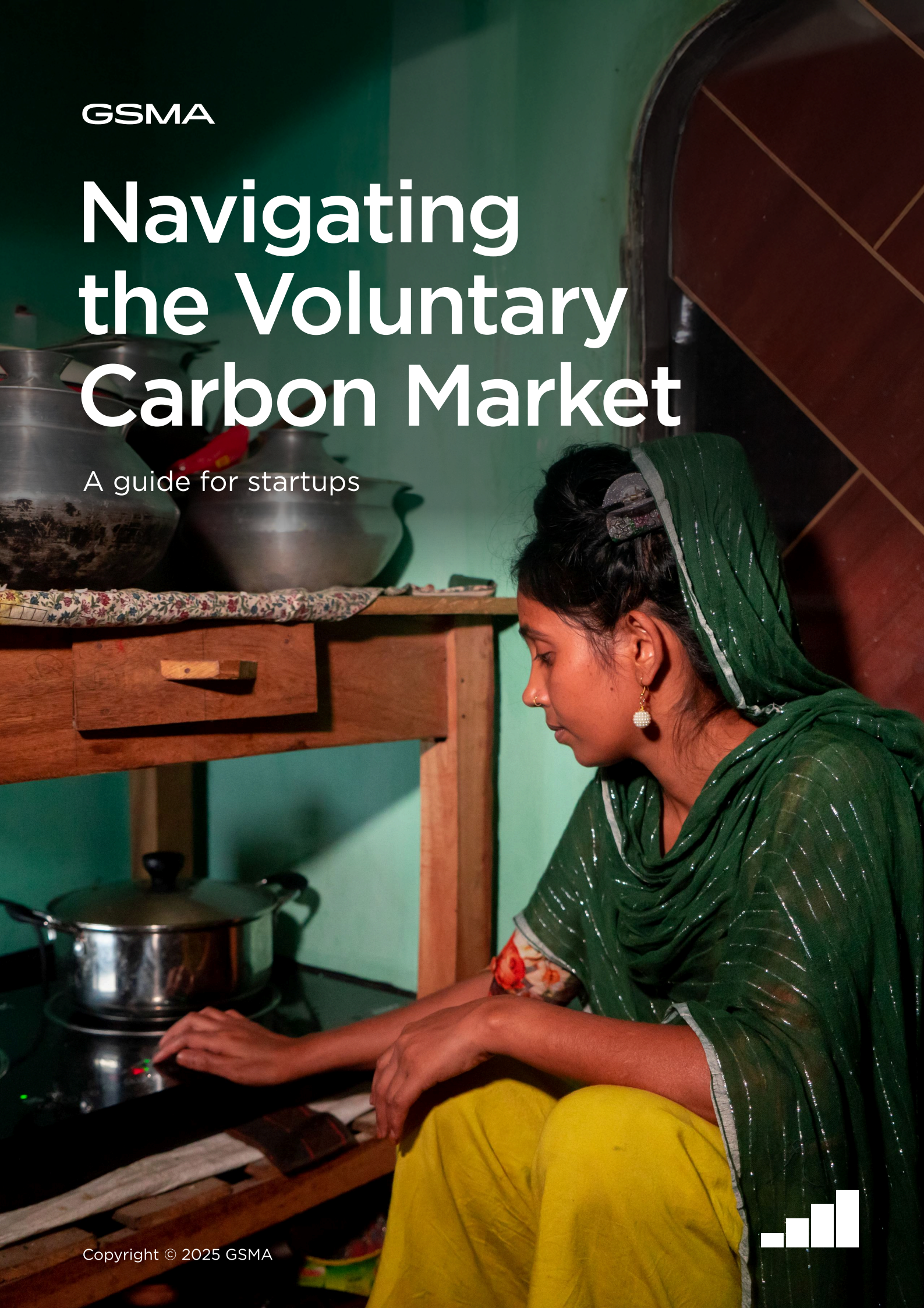
GSMA

Navigating the Voluntary Carbon Market

A guide for startups



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Acknowledgements:

The GSMA would like to acknowledge the contributions of the stakeholders interviewed and those that provided feedback over the course of this research. In particular, the research team is thankful to:

Ayan Deb (Collectives for Integrated Livelihood Initiatives), Ben Jeffreys (ATEC), Benno Guenther (Blue Guardian), Buradum Geteh (Burasolutions Energy Limited), Haroon Dawood (Sanergy), Harry Clemens, Jon Ridley (4RDigital/Cavex), Joslin Lydall, Karim Jabbar (CarbonClear), Louis de Muylder (BBOXX Cook), Mathieu Brun (Engie Energy Access), Micheal Brennwald (Klik Foundation), Micheal Kuntz (Simusolar), Natalie Casey (Koolbooks), Remi Kaupp (Container Based Sanitation Alliance), Tobias Hessenberger (One Acre Fund), Tom Morton.

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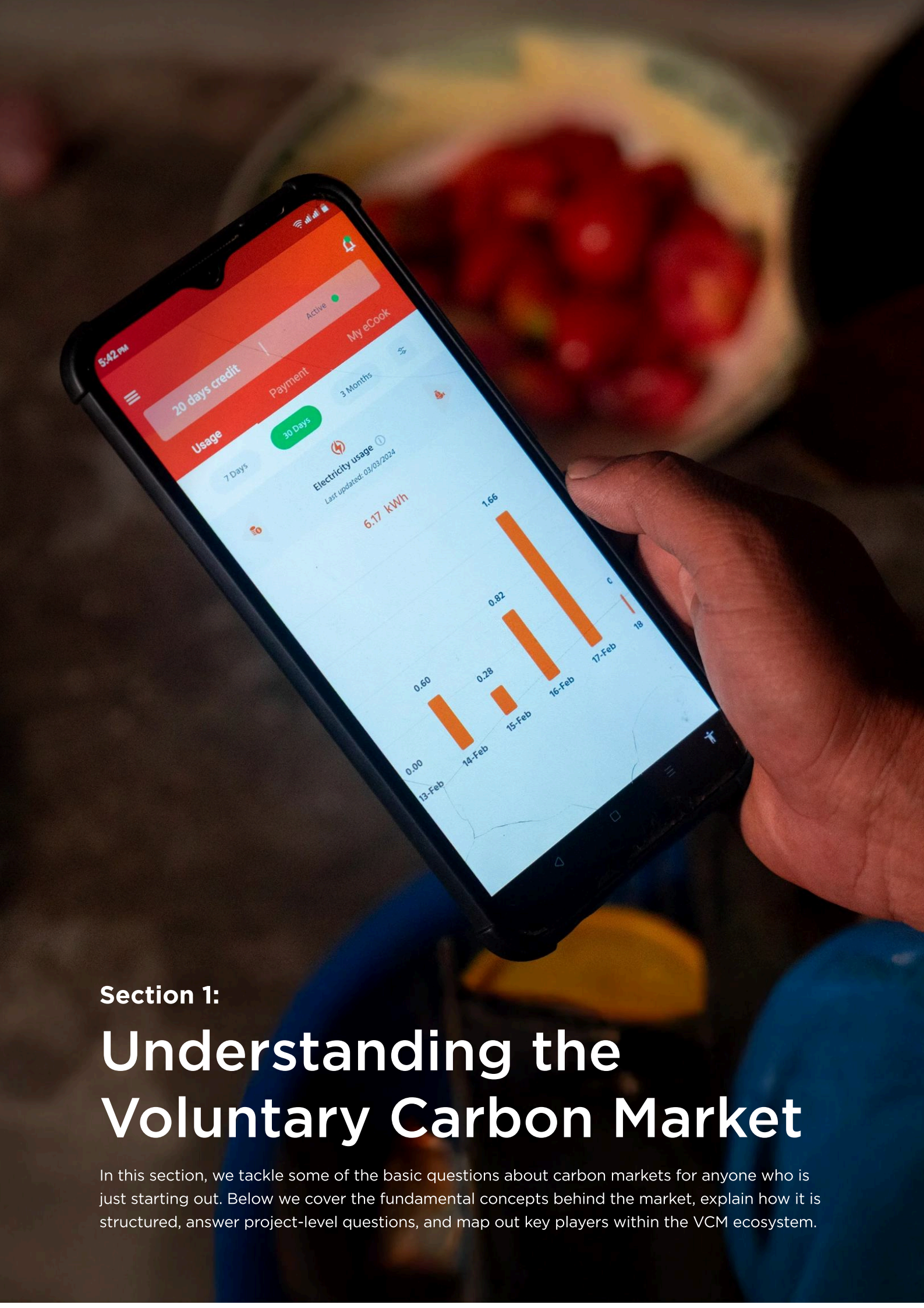
Disclaimer

The Carbon Credits Breakeven Calculator and the VCM Startup Guide are intended to provide broad estimates and should not be relied upon as the sole basis for entering the voluntary carbon market. The outputs from the calculator and the instructions listed on the guide will differ depending on your project's specific details and may differ substantially from actual values. The GSMA makes no representation or warranty with respect to the accuracy or reliability of the outputs of the calculator and instructions in the guide.

Please be aware that the calculations do not cover all potential costs or complexities associated with selling credits and participating in the voluntary carbon market. If you're considering moving forward with a project, we strongly recommend conducting your own due diligence, seeking professional advice and performing additional financial analysis before making any market entry decisions based on the results from the calculator.

Published: February 2025

Contents



Section 1:

Understanding the Voluntary Carbon Market

In this section, we tackle some of the basic questions about carbon markets for anyone who is just starting out. Below we cover the fundamental concepts behind the market, explain how it is structured, answer project-level questions, and map out key players within the VCM ecosystem.

Carbon markets explained

1. What is a carbon credit?

A carbon credit is a tradable certificate or permit representing one metric tonne of carbon dioxide equivalent (CO_2e).

One tonne of emissions is roughly equivalent to:

- One 5,000 kilometre flight (e.g. London to Accra and back, per passenger)
- Driving a petrol car for 3,300 kilometres
- Charging 121,643 smartphones

In terms of generating a carbon credit, one tonne is roughly equivalent to:

- CO_2 an average tree will absorb over 100 years
- CO_2e emissions avoided over a six-month period by switching to efficient cookstoves that require less fuelwood
- CO_2e emissions avoided per toilet in less than three years through improvements in faecal waste management

2. How are carbon credits generated?

There are two main types of credits, based on whether they prevent CO_2 entering the atmosphere (avoidance), or if they remove it from the atmosphere (removal).

Avoidance-based: These credits are generated by substituting processes with low carbon alternatives, such as the distribution of efficient cookstoves to displace the use of traditional cookstoves that are emissions intensive or preventing the conversion of biodiverse forests to farmland. They can also be generated through activities that reduce the emissions for a given process compared to a business-as-usual scenario, such as improving the energy efficiency of a cement manufacturing facility, or carbon capture and storage at a coal-fired power station[1].

Removal-based: These credits are generated by activities that directly take CO_2 from the atmosphere using nature-based methods (reforestation or afforestation) or technology-based methods (direct air capture).

Figure 1: *Generating Avoidance-based Credits*

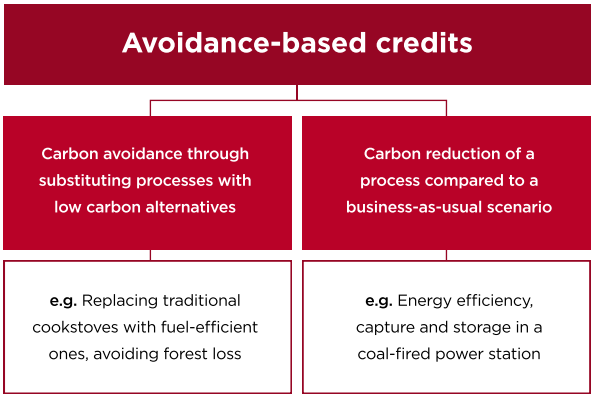
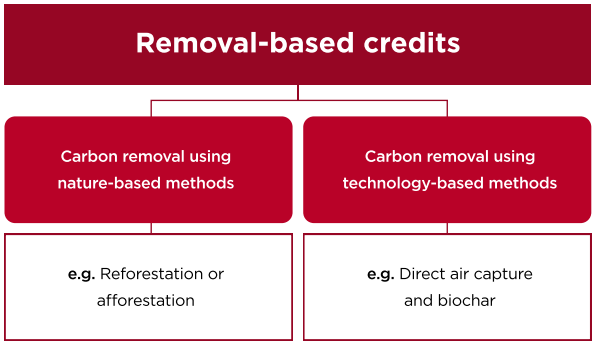


Figure 2: *Generating Removal-based credits*



1. At present, approximately 80% of credits produced in the VCM are avoidance-based.

3. What are the carbon markets?

The global effort to mitigate climate change through the reduction of greenhouse gas (GHG) emissions has given rise to two distinct carbon market mechanisms: i) Compliance markets, and ii) VCM. Both play crucial roles in climate action, but they work differently and serve their own specific functions.

The compliance market is much larger than the VCM. In 2021, around $850 billion worth or credits were traded in the compliance market, compared to roughly $2 billion the voluntary markets. The figures below outline the key differences between the two markets.

The compliance market

These are regulatory frameworks established by governments or international bodies that mandate carbon reductions in carbon-intensive industries. Companies or organisations that emit more than their allocated quota can buy carbon credits from those that emit less, encouraging reductions where they are cheapest. There are around 30 emissions trading schemes operating at the moment, either within a country or region. The EU's emissions trading scheme is the largest globally by value and accounted for 90% of the trades in 2021.

Unique features and benefits

Regulatory oversight: Compliance markets are underpinned by strict legal and regulatory frameworks, ensuring participants meet their emissions reduction targets.

Predictability: With set emissions caps, these markets offer predictability for planning and investment in low-carbon technologies.

Scale and impact: By targeting sectors and geographies with high emissions, compliance markets can drive significant reductions at scale.

Limitations

Flexibility: Mandatory participation and fixed targets can limit operational flexibility for businesses.

Limited scope: Most compliance markets are regional or national, potentially excluding organisations or companies in areas without such schemes.

The voluntary carbon market

This market enables entities to purchase carbon credits on a voluntary basis to offset their emissions. This market caters to companies, organisations and individuals aiming to achieve carbon neutrality or meet corporate social responsibility (CSR) goals, beyond any legal requirement.

Unique features and benefits

Flexibility: Participants can choose when and how much to invest in carbon credits, offering greater operational flexibility.

Innovation and diversity: The VCM supports a wide range of projects, from reforestation to renewable energy, fostering innovation and providing more options for offsetting emissions.

Global reach: Unlike compliance markets, the VCM operates globally, allowing entities anywhere to contribute to global emissions reductions.

Limitations

Volatility: The lack of regulatory caps can lead to price volatility, potentially affecting the predictability of investments.

Quality and verification concerns: Ensuring the quality and verification of carbon credits can be more challenging, requiring robust standards and third-party validation.

While both markets are instrumental in the fight against climate change, they cater to different stakeholders and objectives. Compliance markets are regulatory tools that ensure high-emission industries adhere to legally binding emissions targets, guaranteeing emissions reductions. The VCM, meanwhile, offers a more flexible and global platform for entities to go beyond compliance and support a broader range of emissions reduction projects.

Significantly, the VCM emerges as the key arena where corporations aiming for voluntary net zero emissions targets or similar environmental goals can buy their carbon credits. This helps businesses align their operations with global climate goals, showing the VCM can play a vital role in encouraging corporate efforts towards carbon neutrality.

4. What is the Clean Development Mechanism?

The Kyoto Protocol, adopted in 1998 and operationalised in 2005, set binding commitments on 37 industrialised nations to reduce their emissions. Introduced by the Kyoto Protocol, the Clean Development Mechanism (CDM) was a groundbreaking mechanism that enabled, in the language of the CDM, 'developed' countries to invest in emission reduction projects in 'developing' countries. In exchange, they received carbon credits (certified emission reductions, or CERs) that could count towards their own emission reduction obligations. The CDM has never traded in significant volumes of carbon credits but has a central role in the sector as most methodologies used globally follow those used by the CDM, or have been adapted to fit the requirements of other standards.

CDM projects on afforestation and reforestation can now transition into the Article 6 mechanisms, subject to the approval of the host country and the project's compliance with the new rules.

5. What is Article 6 and why does it matter?

The Paris Agreement is a legally binding international treaty with the goal of limiting average temperature rises to below 2ºC. It was adopted in 2015, replacing the Kyoto Protocol as the main instrument governing the global response to climate change.

Article 6 of the Paris Agreement sets out how countries can pursue voluntary cooperation to reach their climate targets, including the trade of carbon credits. The United Nations Framework Convention on Climate Change (UNFCCC) is the international body overseeing measures related to the Paris Agreement. Article 6 mechanisms will replace the CDM, with two main sections related directly to carbon markets. Both include the creation of a new type of credit that could be traded internationally.

Article 6.2 and ITMOs

This article allows countries to enter bilateral or multilateral agreements trading emission reductions and removals, adjusting for the respective country's climate commitments. These are done with credits called Internationally Transferred Mitigation Outcomes (ITMOs). A country may authorise ITMOs for: i) Use towards a nationally-determined contribution (NDC), ii) International mitigation purposes other than NDC achievement, or iii) For other purposes, which are not defined but generally understood to refer to corporate and other voluntary commitments.

Under the Paris Agreement, every party or country has made a commitment to reducing emissions through NDCs. This means that if a seller country exports credits termed as ITMOs in the compliance markets, it must not use these emission reductions to meet its NDC. This is done through a process called corresponding adjustments, which is a reconciliation process.

The concept of corresponding adjustments has raised discussions within the VCM on whether VCM credits should be counted towards the host country's NDC while also being claimed as offsets by voluntary buyers. This remains an open discussion on how projects on the ground will be affected by Article 6, but it ultimately falls to the host country to define the regulations, policies, and how they would apply to VCM-targeted projects.

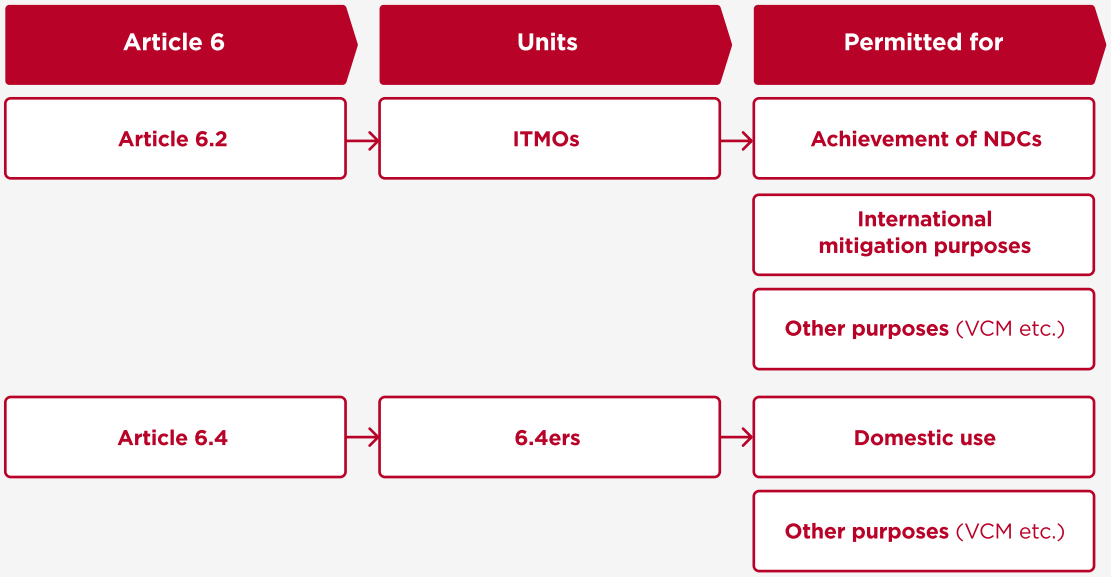
Article 6.4 and 6.4ERs

Article 6.4 aims to create a global carbon market overseen by a United Nations entity, and is the part of the Paris Agreement that is most closely connected with the VCM. It will establish a new supervisory body for the validation, verification and issuance of high-quality carbon credits. Discussions on implementing Article 6.4 have been stagnant in recent years. However, COP29 in Baku marked the adoption of Article 6.4 rules, despite ongoing criticism regarding several points including removal-based credits. As Article 6.4 begins to take effect, it could provide project developers and those generating credits with an additional route to market.

The implementation of Article 6 could lead to more integrated and harmonised national policies regarding carbon markets and mean navigating a more structured (yet possibly more complex) regulatory environment. **Because of this, keeping up to speed on developments in the implementation of Article 6 and national regulations will be crucial to navigating the VCM successfully.**

For example, Article 6.2, as a bilateral market mechanism, requires countries to introduce frameworks, policies, registries, and credit inventories. Some countries have already published their carbon frameworks. For example, Kenya and Ghana in Africa require all carbon projects to seek authorisation regardless of their target markets for credits. Therefore, it's important for project owners and developers to review gazetted carbon frameworks and seek guidance from the designated national authorities in their respective host countries to determine the current status of regulations and what is required to comply accordingly.

Figure 3: *Components of Article 6*



6. Who regulates the VCM?

The VCM is not currently regulated or managed by any single entity. Instead, it operates through self-regulating private and non-profit entities. The full ecosystem is explained in the **Key players in the VCM ecosystem** section.

The key players that enable and provide the foundations for the VCM are **standards and registries, carbon rating agencies and guidance setting organisations.**

Standards

Standards are entities that define the rules, requirements and methodologies for quantifying and generating GHG emissions reductions and issuing carbon credits. Each standard will have its own methodologies for issuing carbon credits based on GHG avoidance or removal projects. At present, any organisation could theoretically issue carbon credits, but the vast majority are issued by a few key players. Throughout this guide, we refer to established and emerging standards to differentiate the players below. We use the term emerging standards to denote the newer standards in the VCM ecosystem.

Established standards are the main registries within the VCM. Examples include: Verra, Gold Standard, the American Carbon Registry and the Climate Action Reserve. Among these, Verra and Gold Standard are the best known worldwide.

Emerging standards are new players who have entered the VCM in recent years, looking to offer alternative routes to generating and issuing credits by harnessing the power of technology. Examples include: CarbonClear, Cavex, and Puro.earth.

Registries

Registries issue carbon credits and track their ownership. When a credit is bought, it is retired from that registry so that it cannot be bought again. Registries are usually managed by the standards that issued the credit.
Examples include: Verra Registry, Gold Standard Impact Registry.

Rating agencies

Rating agencies assess the quality of credits and provide a system to compare different carbon credits.
Examples include: Sylvera, Calyx Global and BeZero.

Guidance setting organisations

Guidance setting organisations provide recommendations on improving the quality of carbon credits. Through benchmarks and key principles, they are integral in bringing credibility, transparency and confidence to the VCM.
Examples include: the Voluntary Carbon Markets Integrity Initiative (VCMI), the Carbon Credit Quality Initiative (CCQI) and the Integrity Council for the Voluntary Carbon Market (ICVCM).

Attributes of a VCM project

7. What are the essential features of a carbon credit?

A carbon credit needs to accurately represent one metric tonne of additional, measurable, permanent and unique GHG offset. According to most standards and guidance bodies, the essential features of a carbon credit include:

Additionality

Additionality means that GHG reduction, avoidance or removal would not have happened without the revenue or incentive generated from the trade of carbon credits. For example, a project distributing fuel-efficient improved cookstoves to beneficiaries practicing open fire cooking can be additional if it is distributed at zero cost to beneficiaries and there is no additional source of revenue other than the sale of GHG credits. Also, such a project can only be additional if it is not implemented as part of a government scheme or supported by multilateral funds. So for a carbon offset to be genuine, it needs to be additional to what could have happened in a business-as-usual scenario. Standards that verify and issue credits have detailed methodologies for determining the additionality of each type of offset activity.

Permanence

The impact of emissions in the atmosphere is long lasting. As such, for GHG emissions reduction or removal caused by a project activity to be effective, they need to be kept out of the atmosphere for an extended period. This is what permanence in the context of carbon credits means. This ensures that the impact of mitigation activities is equal to the impact of emissions.

No leakage

If a project causes an attributable and measurable increase in GHG emissions outside of a project area, it is called leakage. For example, if a project related to sustainable restoration causes a shift in illegal logging from the project area to an adjacent forest, this is leakage. Leakage undermines the impact of the carbon offset activity. Proving the absence of leakage is crucial to ensure that the intended climate impact of a carbon offset project is met.

No double counting

Double counting occurs when a carbon credit is claimed by more than one entity. For the carbon market to be effective, the GHG emissions reduction, avoidance or removal should be counted towards a goal or target only once.

8. What is a carbon credit methodology?

A carbon credit methodology is a set of rules and guidelines that needs to be followed for a carbon offset project or activity to be eligible to generate carbon credits. It provides the blueprint for quantifying, monitoring and verifying GHG emissions reductions. A methodology will include rules for where the methodology can be applied, guidance on calculating baselines and emission reductions, and outline the process for monitoring the project.

Afforestation and reforestation. Methodologies for afforestation and reforestation projects quantify carbon sequestered by new-planted and regenerated forests, measuring biomass growth over time, and carbon capture based on local conditions and species-specific growth rates.

Renewable energy. Projects in renewable energy, such as wind or solar power installations, use methodologies that compare GHG emissions from the renewable sources against those from conventional energy sources (e.g. coal or natural gas) that would have otherwise been used.

Methane capture. For projects aiming to capture methane from landfills or agricultural practices, methodologies involve measuring the quantity of methane captured and combusted, which prevents it from entering the atmosphere as a potent GHG.

Clean cookstoves. Projects distributing clean cookstoves to replace traditional cooking methods involve methodologies that calculate emissions reductions based on the decreased use of non-renewable biomass and improved stove efficiency.

The development of methodologies is a detailed, rigorous and time-consuming process designed to ensure that they reflect best available science and operational practices. Additionally, these methodologies often build upon those established under the CDM.

9. What makes a high-quality carbon credit?

A high-quality carbon credit is subjectively assessed with no set criteria, but it represents credits that adhere to robust standards and undergo rigorous validation and verification processes.

There are several ways to delineate high-quality credits. For example, to identify high-quality carbon credits, the Integrity Council for the Voluntary Carbon Market (ICVCM) has established ten fundamental and science-based principles called the 10 Core Carbon Principles. These principles are:

Source: The 10 Core Carbon Principles - Integrity Council for the Voluntary Carbon Market (ICVCM)

10. What determines the price of a carbon credit?

There is no single, transparent price for each project type in the VCM. Many factors influence pricing, including:

Supply and demand. Like any other market, the primary factor affecting the price of a carbon credit is its supply and demand, which fluctuates based on regulatory changes, market trends, and the availability of high-quality credits.

Cost to generate a carbon credit. Several components contribute to the cost of generating a carbon credit, including the project operation costs, investment to set up the project, and the costs of audit and certification.

Perceived value. The type of emissions avoidance or removals will have a strong influence on the perceived quality value of that credit. Additionally, any 'co-benefits' – e.g. improved livelihoods, biodiversity, and/or impact on one of the SDGs – can add value to the credit.

Avoidance versus removal. Currently, the majority of carbon credits are based on avoidance, but there is a high and growing demand from buyers for removal-based credits, which at present command much higher prices.

Selling carbon credits is largely driven by relationships, and the certification of credits tends to be dominated by a few large standards/registries, although this is changing. This is explained in greater detail in The **market value of credits** section.

11. What is benefit sharing?

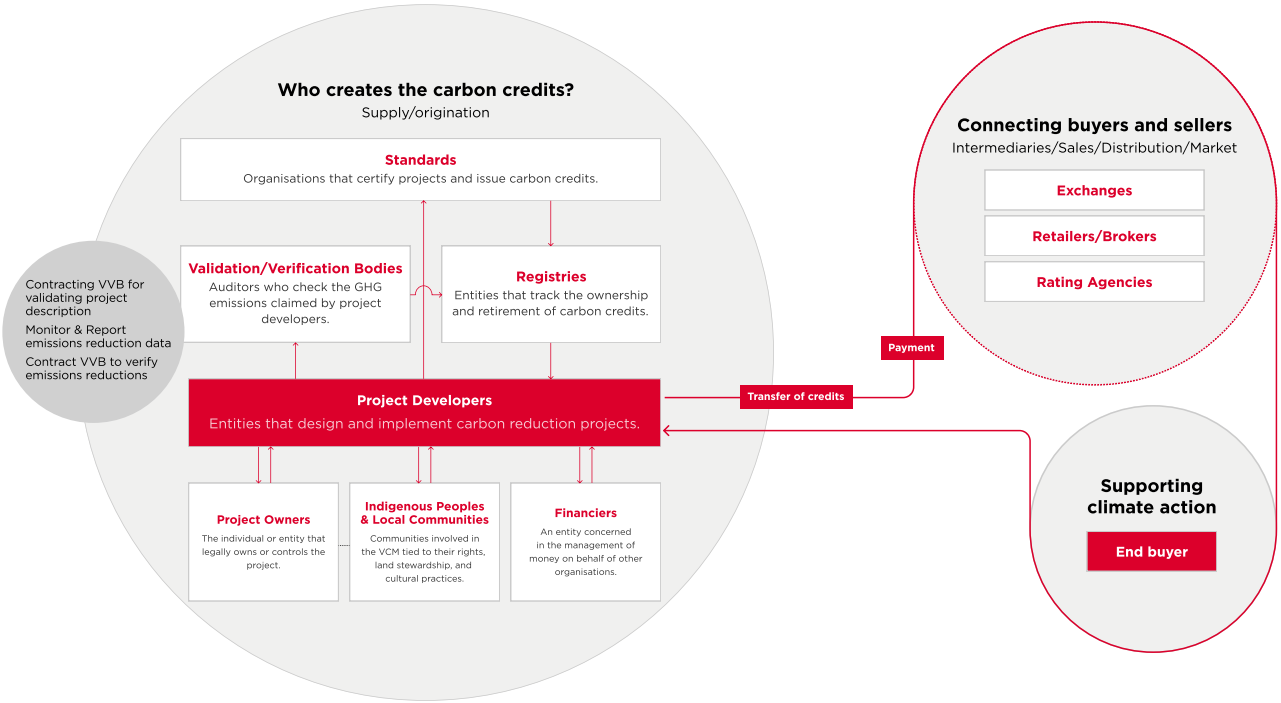
Benefit sharing refers to the distribution of benefits from the sale of carbon credits with the stakeholders involved in implementing the project, including local, affected and interested communities and experts. The idea behind benefit sharing is to acknowledge the role of local stakeholders and to incentivise their current and potential contributions to the emissions reduction activities of the project.

12. What does the VCM mean for Indigenous Peoples and local communities?

Indigenous Peoples and local communities (IP&LCs) are key to effective climate action. There is now clear evidence that land managed by IP&LCs is better preserved. In recognition of their role as custodians of the Earth's natural resources, action on climate must ensure that IP&LCs are both recognised for their crucial contribution and fairly compensated for their involvement and expertise.

Meet the VCM players

Figure 4: *Key players in the VCM ecosystem – based on VCM role and function*



Source: GSMA

Project owner

The person or entity that has legal ownership or control over the carbon offset project. The project owner is responsible for the operation and ongoing maintenance of the project and is the financial beneficiary. An owner can be a private individual, company or other organisation.

Project developer

The person or entity that initiates, develops and manages a carbon offset project. They facilitate the evolution of the project from the conception stage to one where it generates carbon credits.

Examples include: ATEC, Sanergy, Everland, Ostrom Climate, and Finite Carbon.

Standards organisations and intermediary platforms

Entities that define the rules, requirements and methodologies for quantifying and generating GHG emissions reductions and issuing carbon credits.

Examples include: Gold Standard, CarbonClear, Puro.earth, Verra, Plan Vivo, SOCIALCARBON, and Cavex.

Relevant stakeholders

Double counting occurs when a carbon credit is claimed by more than one entity. For the carbon market to be effective, the GHG emissions reduction, avoidance or removal should be counted towards a goal or target only once.

Validation and verification bodies (VVBs)

Third-party auditors who check the reduction, avoidance or removal of GHG emissions claimed by project developers.

Examples include: Earthood, DNV, Aster Global, First Environment, Bureau Veritas (India), EPIC Sustainability, and RINA Services.

Registries

Entities that track the ownership and retirement of carbon credits.

Examples include: Climate Action Reserve, American Carbon Registry, Verra Registry, Gold Standard Impact Registry, and SOCIALCARBON Registry.

Carbon exchanges

A platform or marketplace, like commodities or financial exchanges, where carbon credits are traded. Unlike the direct purchase of a carbon credit from a buyer, in a carbon exchange, carbon credits are transacted many times among various participants including investors, traders, brokers and end buyers.

Examples include: Air Carbon Exchange, Carbon Trade Exchange, Xpansiv, and Climate Impact X.

Rating agencies

Entities that assess the quality of credits and provide a system to compare different carbon credits.

Example include: Sylvera, Calyx Global and BeZero.

Guidance setting organisations

Organisations that provide guidance and recommendations on improving the quality of carbon credits. Through delineation of benchmarks and key principles, they are integral in bringing credibility, confidence and transparency to the VCM.

Examples include: Voluntary Carbon Markets Initiative (VCMI), Carbon Credit Quality Initiative (CCQI) and Integrity Council for the Voluntary Carbon Market (ICVCM).

Broker

An intermediary entity that connects buyers and sellers of carbon credits. They can play several roles to help their clients navigate the VCM, including aggregating credits from several projects, matching sellers with potential buyers who want to offset their emissions, and facilitating agreements.

Examples include: Terrapass, First Climate, Ecosphere+, and Reforestum.

End buyer

The person or entity who purchases the carbon credits, either directly from the developer or through intermediaries like a broker or a carbon exchange platform. Identifying buyers is an important part of the carbon finance journey. The largest buyers in the VCM tend to be corporations looking to offset their emissions to meet climate change mitigation goals and organisational level targets to be carbon neutral or net zero.

Examples include: Delta Airlines, Microsoft, JP Morgan and Unilever.

Section 2:

Assess your project

This section offers step-by-step guidance for startups who want to explore accreditation and sell carbon credits, offering an overview of what is required at each stage of the process. It will help you evaluate whether the VCM is the right fit for your project.

Step I: Check project eligibility

The voluntary nature of the VCM means that there is no uniform set of eligibility criteria for participating in the VCM. Each standards body establishes their own rules and requirements for projects which they register and issue credits for. However, there are three main components that apply across all standards bodies and will determine if your project is eligible for carbon finance.

Components for assessing project eligibility in participating in the VCM		
1. Can the project clearly demonstrate additionality?	**2. Does the project align with an existing methodology?**	**3. Is there a risk of double counting?**

1. Can my project clearly demonstrate additionality?

To demonstrate additionality, you will need to prove that the GHG reductions or removals delivered by your project activities would not have occurred without carbon finance.

The project methodology used by the standards body sets out the specific rules that a project developer needs to follow to establish additionality. If using an established standards body, you will need to demonstrate your project's additionality in the Project Design Document (PDD) required by the standards body. Demonstrating additionality can be challenging as it can be subjective and is reliant on the comparison to a scenario without carbon revenues.

2. Does my project align with an existing methodology?

Carbon credits must be developed in accordance with a methodology set out by the standards body. Methodologies define the parameters and criteria required to calculate a project's emissions reductions. Different standards bodies work with different methodologies, either building on UN CDM methodologies or establishing new ones that follow a similar logic.

You can find examples of methodologies in the links below:

CDM Verra Gold Standard Puro.earth

The standards bodies are not necessarily uniform in their coverage of project types. If your project activities do not fit an existing methodology, in theory you can either work with standards bodies to adapt an existing methodology, or apply to standards bodies to develop/co-develop a new methodology altogether. Both options are time-consuming, with the second option potentially taking several years. Therefore, neither is advisable for early-stage enterprises considering whether to pursue a carbon project or not.

3. Is there a risk of double counting?

Your ability to sell credits will depend on them not being claimed by other parties. You will need to ensure that third parties, e.g. government or a funder, cannot claim credits if they support your project and that end users of your products or services transfer the ultimate ownership of any credits resulting from project activities to you. If not, there is a risk that the GHG emission reductions will be claimed twice or double counted.

Examples where other entities may have a claim on project activities include:

- Nature-based carbon sequestration projects (such as afforestation) where governments or local communities may own the land on which the project is being implemented.
- Projects where a third party, e.g. government or a funder, subsidises project activities or assets.

The regulatory space around carbon credits is fast evolving in many countries, which may have implications for ownership and taxation going forwards. It is important to research the regulatory environment in your country of operation with regards to the implementation of Article 6, as well as any specific laws or regulations relating to the ownership of carbon credits and taxation of carbon revenues.

A recent, albeit extreme example, is Zimbabwe, where all carbon contracts were declared null and void in May 2023 and the government demanded 50% of the profits of carbon credits to reinstate them, although this has subsequently been reduced to 30%.

Step II: Evaluate financial viability

When determining whether to pursue a carbon project, it is essential to consider its potential financial implications for your enterprise. In entering the market, your organisation will likely incur costs that mean a breakeven assessment is needed.

Does it make sense to engage in the VCM?		
1. What number of credits will I generate?	**2. What costs will I incur?**	**3. Breakeven calculator**
Carbon Credits Breakeven Calculator: This calculator, where you can enter values associated with your potential carbon project, will provide a basic cost-benefit analysis. It should be noted the actual number of credits your project will generate will be dependent on the exact technologies and baseline in your proposed project area. **This guidance is only recommended to be used for very initial assessments of the potential financial viability of your project.**		

1. How many credits will I generate?

At a fundamental level, determining the number of carbon credits that a project will generate has two key components: i) Calculating GHG emissions under the project scenario, and ii) Comparing these to the baseline scenario (what they would have been if the project had not happened). Emissions reductions, and therefore carbon credits, are generally calculated as follows:

Total emissions reduction	=	Total baseline emissions	—	Total emissions under project
The difference between the GHG emissions in a project scenario and the emissions in the baseline scenario (without the project) gives the total potential emissions reductions and so the carbon credits.				

How emissions reductions are calculated varies by sector and methodology. Here are some emissions reductions calculator tools that are free and accessible for you to use:

- SE4ALL Mini-Grid Emissions Tool.
- Cost Benefit Model for Clean Cooking in the Carbon Markets.
- Container Based Sanitation Alliance's GHG Emissions Calculator.
- Toolbox for assessing the feasibility of carbon projects for off-grid solar providers developed by CarbonClear.

Estimating your project's emission reductions using data from comparable projects

In most cases, determining the number of credits a project will generate will require a specific study by someone familiar with the market (either consultants or expertise hired in). However, for most companies just starting the journey, this can be prohibitively expensive. The guidance and advice below is for those unfamiliar with the market looking to make a very initial assessment of the potential.

In the early stages of assessing a carbon project's feasibility, it is possible to get a rough estimate of potential emissions reductions by reviewing key figures from comparable carbon projects. PDD and verification documents from past and planned projects include:

- **Figures for total estimated reductions (from PDDs)**
- **Achieved emissions reductions (from verification reports)**
- **The scale of the project**

They are typically available publicly, such as on the Verra Registry and Gold Standard Impact Registry. Together, these figures can be used to estimate the potential credits that you could generate.

The emissions reductions described in PDDs may not reflect the actual number of carbon credits that are generated when the project is implemented. This can be due to a variety of factors, such as variations in the actual number of project implementation units (e.g. cookstoves distributed, tonnes of waste composted, etc.), or differences in actual project emission reductions compared to expectations. Therefore, it may be beneficial to also check verification documents where possible and use the actual achieved emissions reductions as a more realistic benchmark for your enterprise.

Example: Clean cooking enterprise

If you wish to generate credits from a clean cooking project, consider a similar clean cooking enterprise to yours that has previously undertaken a detailed calculation for their PDD.

The following factors need to be kept in mind while identifying similar enterprises:

- The type of cookstove or technology used.
- Contextual factors such as the type of fuel being displaced.

From your review, the following details of the similar enterprise are available from the documents:

- Total clean cookstoves (units) = 10,000
- Total number of years = 7
- Total emissions reduction (tonnes of CO_2e) = 100,000 (100,000 credits)

Total carbon credits per cookstove per year = Total emissions reductions / total units / total years

Assuming the project has similar baseline conditions, we can estimate the total carbon credits per cookstove per year.

- 100,000 / 10,000 / 7 = 1.43 carbon credits per cookstove per year

With this estimate and the scale of your proposed project, you could multiply this by the price of the carbon credits to arrive at a potential revenue figure for the project.

In this example, the estimated emissions reductions can be found in PDDs such as the following extract from Project GS10884 - KOKO Kenya - Ethanol Cookstoves Program - CPA-0001.

Figure 5: *Example of total emissions reductions calculated for Project GS1084 - KOKO Kenya - Ethanol Cookstoves Program*

Year	Baseline estimate	Project estimate	Net benefit
Year 1	157,057	994	**156,063**
Year 2	157,057	994	**156,063**
Year 3	157,057	994	**156,063**
Year 4	157,057	994	**156,063**
Year 5	157,057	994	**156,063**
Total	**785,285**	**4,970**	**780,315**
Total number of years	**5**		
Annual average Over crediting period	**157,057**	**994**	**156,063**

Total number of crediting years

Total emissions reductions, i.e. total carbon credits

General ranges for emissions reductions by carbon project types

Using the comparable projects approach, a numerical range for carbon credit generation for other carbon project types can be derived. The approximate ranges below draw on analysis from a sample of PDDs and verification documents. These ranges are based on summary calculations from past projects and should not be considered as project-specific recommendations.

Before proceeding past the initial appraisal stages, it is strongly advised that you consult with carbon project development experts, whether individuals or companies, and conduct thorough research before making any decisions based on the information provided.

Project type	Approx. ranges of carbon credits produced
Solar lighting	0.05 to 0.15 credits per solar lantern per year
Clean cooking	1 to 5 credits per cookstove per year, with: – 1 to 3 for thermal cookstoves – 3 to 5 for ethanol, solar, or electric cookstoves
Composting	0.25 to 1.5 credits per tonne of waste processed
Household biodigesters	2 to 7 credits per biogas installation per year

Source: Social finance analysis of between six to ten Verra and Gold Standard PDDs per sector

2. What costs should I expect?

In the early stages of assessing a carbon project's feasibility, you need to consider the potential costs and weigh these against potential revenues. There are a variety of costs associated with developing a carbon project. Depending on your chosen route to market, the fee model may vary significantly.

Following an established standard

Under an established standard, you will need to pay a range of variable and fixed fees. These will likely fall in the range of $100,000 to $240,000 in fixed fees plus the variable fees, including:

Pre-feasibility and choice of methodology
($5,000-$15,000, paid to consultants)

Feasibility and PDD development
($40,000-$70,000, paid to consultants)

Project validation
($10,000-$25,000, paid to a VVB)

Project registration fees
($4,500-$10,000, paid to a standards body)

Verification fees
($10,000-$25,000 per verification, paid to a VVB)

Variable credit issuance fees
($0.20-$0.30 per credit, paid to a standards body)

These estimates are based on Gold Standard and Verra 2023 fee schedules and key informant interviews. These estimates do not apply for nature-based solutions projects, which may incur higher costs.

Following an emerging standard/platform

Under an emerging standard or platform, the fees you will pay may vary.

For example, CarbonClear does not charge their partners any registration fees, but uses a **revenue-sharing model** where CarbonClear retains 30% of the proceeds of carbon credit sales (where credits on the CarbonClear platform are always sold at €26; this model is used in the worked examples below).

Other emerging platforms may have different fee models. For example, Cavex is another promising platform aiming to offer convenient revenue sharing terms (e.g. 10%), but who are yet to test their model in the market.

This data is based on information from the CarbonClear website and key informant interviews.

For a comprehensive analysis, you should also consider the overall costs of implementing the project, in addition to carbon project costs such as:

- The cost of your underlying product or service (e.g. cookstoves or solar lanterns).
- Costs related to business-as-usual operations (e.g. salaries, overheads).
- Indirect carbon project costs such as additional staff time spent on project development.
- Additionally, in some countries the government are beginning to add fees or levies to projects per credit produced or as a proportion of revenues.

Refer to **Annex 1** for detailed examples on how an enterprise can work out costs and benefits for selling carbon credits through different routes to market.

3. Breakeven calculator

You can find the calculator at **gsma.com/carbon-credits-breakeven-calculator/**.

Simply enter a few inputs related to your potential carbon project, and it will provide a basic cost-benefit analysis.

It should be noted the actual number of credits your project will generate will be dependent on the exact technologies and baseline in your proposed project area.

Important notes

The calculator is intended to provide broad estimates only and should not be relied upon as the sole basis for entering the voluntary carbon market. The outputs from the calculator will vary depending on your project's specific details and may differ substantially from actual values. The GSMA makes no representation or warranty with respect to the accuracy or reliability of the outputs of the calculator and toolkit.

Please be aware that the calculations do not cover all potential costs or complexities associated with selling credits and participating in the market. If you're considering moving forward with a project, we strongly recommend conducting your own due diligence, seeking professional advice, and performing additional financial analysis before making any market entry decisions based on the tool's outputs.

Step III: Define your go-to-market strategy

Having established whether your project is eligible to generate carbon credits and the project's financial viability, you now need to consider how to get the project off the ground and the credits into the market.

The VCM is not like a stock exchange with transparent prices and established trading platforms. Individual projects have very specific characteristics which significantly impact the value of the credits. Although exchanges are emerging, selling carbon credits is still largely driven by relationships, and the certification of credits tends to be dominated by a few large standards or registries, although this is changing. Navigating this world can be challenging for new entrants.

Key considerations for your go-to-market strategy	
1. Selling carbon credits	**2. The market value of credits**

1. Selling carbon credits

Given that the VCM is predominantly relationship-based, it is not enough to generate credits, you also have to consider how and when you are going to sell them.

Key steps in your go-to-market decision:

Consider the implications of your choice of standard on your sales options. → **Determine your financing requirements and options.** → **Identify your preferred sales channel.**

Consider the implications of your choice of standard on your sales options

The arrangements to sell your carbon credits will differ according to which standards body you use, with each having specific contracting and cost implications.

Established route to market Best for large projects expected to issue and sell high volume of credits.	The established route to market separates the process of developing the project or registering credits from the sale of credits. The high cost of market access via this route means that it is best suited to projects expecting to issue high volumes of credits. **Some additional considerations to note include:** - Enterprises often need to work with a consultant/adviser to navigate the process, adding cost. - The sale of credits under the established route may include selling via a broker, which has its own costs. - Some project developers or brokers offer a holistic service, taking care of both project development and credit sales on behalf of the project owner for a higher fee or margin charged on the carbon credit price.
Alternative routes to market Better for smaller projects.	Newer platforms offer options of smaller volume or aggregated sales and therefore try to tailor to smaller projects. Some emerging platforms (e.g. CarbonClear, Cavex) operate as both standards bodies and sales channels. This allows synergies between the two to decrease both cost and the time-to-market for project developers/ enterprises. Via VCM exchanges: An alternative option can be to sell your credits via VCM exchanges (e.g. ACX, Xpansiv). They can provide market access to a wide range of participants, ensuring transparency and often supporting interoperability between standards bodies, but do not offer the same level of personalised support as brokers do. They also have listing requirements which may narrow your options in terms of standards bodies, project types or verification requirements, and incur fees on transactions, the listing process, and any additional services offered.

Determine your financing requirements and options

Financing considerations for a carbon project extend beyond the costs of accessing the carbon market itself. Project implementation and other expenses also need to be considered.

Given the high up-front costs, project development may require pre-financing. The risk inherent in any carbon project means that the earlier in the process this financing is needed, the larger the share of carbon revenues you may need to give up. However, this may be a necessary cost for many entering the market, as the long time between beginning a project and realising revenues may mean this is necessary for the organisations cash flow.

Figure 6: *Financing options for developing a carbon project.*

Self-financing

Funded by the project owner.

Investor financing

Pre-financing with repayment (debt) or equity stake in the project/company.

Buyer financing

Pre-financing with the option to buy credits at a predetermined discount to the prevailing market price, or to receive part of the credits generated in return for their financing.

Platform funding

In some cases, platforms may offer upfront funding for targeted developments related to their onboarding needs, e.g. digital MRV capabilities.

Grant funding

In rare circumstances, development partners can make funding available for project development. This may have implications on additionality and carbon credit ownership. Given it is not common, this should not be relied on as a primary source of finance.

Identify your preferred sales channel

Possible sales channels for carbon credits include:

Selling directly to a buyer	Working with a broker	Emerging platforms

Selling directly to a buyer

Buyers have the option to purchase credits to retire them, contributing towards their corporate emissions reduction targets. Alternatively, they buy to trade, treating them like a commodity and selling them on to other market participants for profit.

Selling directly to a buyer is an attractive option as you could negotiate a higher price and possibly develop a longer-term relationship with them. However, identifying both interested buyers and the appropriate specific contacts within those organisations can be challenging without pre-existing networks, and developing relationships can take significant resources.

Advantages

As there is no intermediary involved, you may get better pricing terms.

It can result in a long-term purchase arrangement, reducing price uncertainty.

Sometimes the buyer may be interested in financing project development and/or activities as well.

Direct sales can foster long-term relationships with buyers, leading to more stable and predictable revenue streams.

Disadvantages

Requires identifying and building relationships with the relevant people in each potential buying organisation and then negotiating terms directly, which is time consuming, resource intensive and requires strong networks.

The terms you negotiate will depend on the stage in the project development process at which the purchase agreement is made and the implementation/price risk that the buyer assumes; this may imply a (significant) discount to the market price.

Working with a broker

Brokers act as intermediaries and sell credits to buyers, usually transacting large volumes of credits and often packaging them together from more than one project.

Brokers play a big role in selling credits via the established standards. While brokers manage relationships with buyers so sales can be streamlined, you need to consider how much revenue you may forfeit, as brokers will charge a proportion of future carbon revenues.

Advantages

Brokers have established relationships with buyers and experience of operating in the VCM. As such, selling the credits is less resource intensive for you as the enterprise, and the risk of not finding a buyer is removed.

They may also provide project development services as part of a holistic support package i.e. you could outsource all carbon market related processes in return for a share of the resulting carbon revenues.

Disadvantages

You will receive a lower price for the credits than if you sell directly to buyers. The margins demanded by brokers can range from single digits in the case of large projects to as much as 50% of carbon revenues for smaller projects, particularly when the broker combines the project development and carbon sales functions.

You are likely to have less control over how the story of your project is told and how it is presented to buyers.

Working with an emerging platform

Emerging platforms aim to leverage technological advancements to offer enterprises an enhanced value proposition, usually combining carbon credit issuance or registration and a sales channel.

Platforms are an appealing option with significant potential for automation and getting clear terms. However, they are relatively new and untested in the market, and only applicable to certain types of projects.

Advantages

High integrity of credits and transparency of data through improved monitoring (often real-time) and complete data records, thereby addressing concerns related to the quality of credits within the established routes in the VCM.

Lower fees to access the market and lower verification and validation costs compared to established standards bodies.

Quicker time to market than through established standards bodies, e.g. three months with platforms like CarbonClear versus two to three years through established routes.

Openness and set up to work with smaller scale projects.

Disadvantages

Less well-known or established credits and fewer buyers willing to take a risk on them.

The resulting time it takes to find buyers, which is often a joint effort between the platform and the enterprise, makes timelines for selling credits uncertain, but given the lengthy approval process of established standards, it is not necessarily longer overall.

Can cost more overall if trading high volumes of credits.

Key considerations on negotiating terms with buyers

The established route to market will require the project owner to negotiate terms with brokers or buyers.

Pricing

- In a spot-price contract, credits are sold at the prevailing market price at the time of the sale, subjecting the seller to possible future price fluctuations as credits are generated from their project.
- With a forward contract, the price of future sales is guaranteed in advance, removing price uncertainty. But this is likely to be at a discount to the current price and also limits any revenue upside in the event of rising market prices.
- It is possible to structure purchase agreements (also known as offtake agreements) that both limit the downside and allow for upside participation should carbon prices increase in the future. However, this risk reduction is usually reflected in a lower contracted price.

Volume risk

- How volume risk is treated, i.e. who takes the risk if the volume of credits generated is lower than expected. This is specific to each transaction but is something that you should make sure to discuss explicitly.

Revenue sharing

- Emerging platforms with revenue-share models provide more visibility on expected revenues, guaranteeing an agreed share of carbon credit sales revenue to the project or enterprise. Some also offer a fixed price for the carbon credits (e.g. CarbonClear selling all credits at €26).

2. The market value of credits

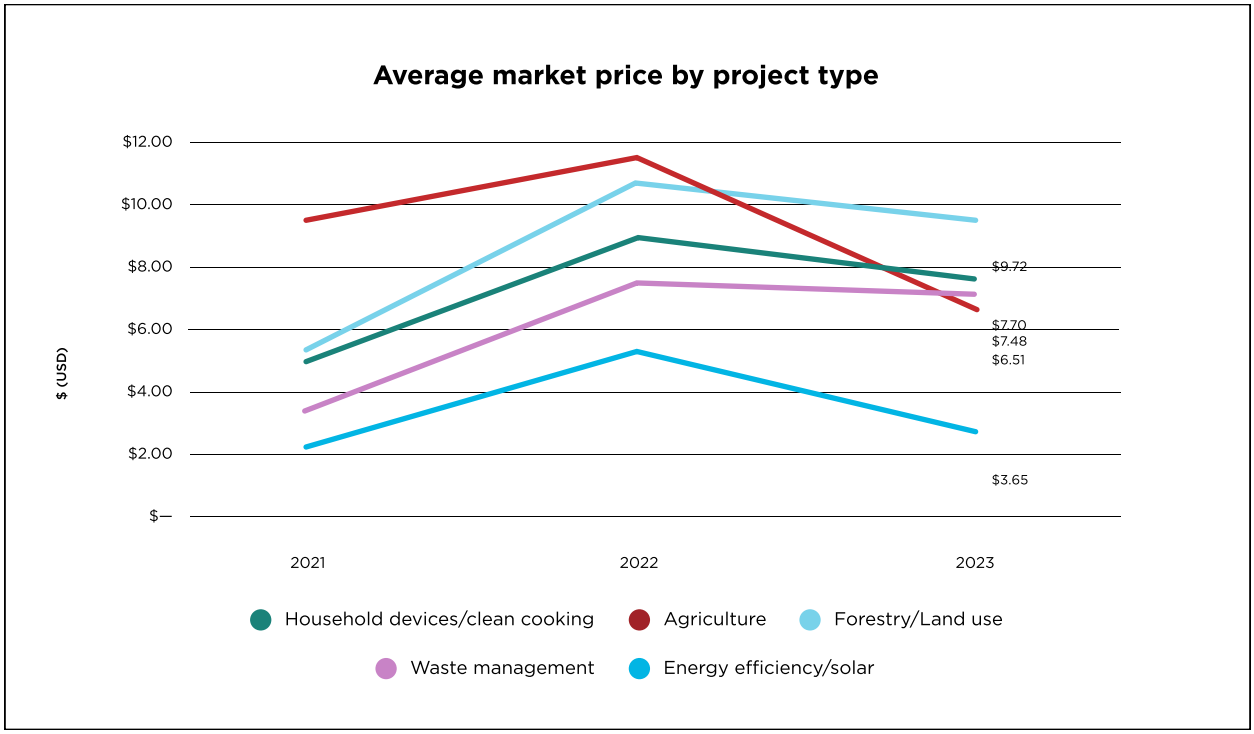
There is no single transparent price for each project type in the VCM and seemingly similar credits can be sold at very different price points.

How have market prices evolved over time?

The prevailing market price for your project type will be a key determinant of the terms you manage to negotiate as part of your go-to-market strategy. Historically, market prices have been volatile, highlighting the complex nature of price setting in the market.

Recently, controversies linked to over-crediting from older clean cooking crediting methodologies, the integrity of REDD+ projects, and harm caused to IP&LCs have put pressure on the price of credits and increased investor uncertainty. This is compounded by uncertainty around the evolution of regulation related to Article 6, once again highlighting the importance of having a strong narrative alongside your carbon project.

Figure 7: *Average market prices by project type*



Source: Ecosystem marketplace 2024 report

What determines the price of carbon credits?

Key factors that can influence the demand for and price of credits:

- **The project category.** Whether it produces avoidance or removals credits. There is generally higher demand for removals credits, but these credits are also less common.
- **The project's geography.** Buyers often want to buy projects in regions where they have operations.
- **The vintage of credits.** Older credit issuances tend to trade at lower prices.
- **The perceived environmental integrity of the credits.** Whether buyers trust that the credit truly reflects one tonne of CO_2e avoided or reduced emissions.
- **The co-benefits of a project.** Benefits in addition to the emissions reductions, often related to health, social and economic outcomes or biodiversity outcomes.
- **Who the buyers are.** Their willingness to pay a premium for higher quality credits.
- **Regulatory influences on the project.** Influence stemming from government policies, emissions cap, verification standards and methodology, compliance requirements or international climate agreements.
- **The economic context of the project.** Economic conditions within which the project operates along with factors such as the energy prices, industry specific emission reduction costs, advancements in carbon reduction technologies and supply and demand of carbon credits.

Key considerations on buyers' willingness to pay more for carbon credits

A range of factors can influence end buyers' interest in higher cost credits.

- Corporates with customer-facing, high reputation business models, e.g. tech companies, are often prepared to pay significant premia for high-quality credits.
- Buyers who have been engaging in the VCM for longer and have more sophisticated carbon offset buying strategies, as well as longstanding commitments to ESG, are more likely to demand high-quality carbon credits with co-benefits.
- You may also come across buyers with a limited budget who build a carbon portfolio dominated by cheaper credits—perhaps from legacy renewable energy projects—but include some high-quality credits as part of a good public relations story.
- Carbon offsetting is usually one of multiple approaches that institutions employ to meet their net zero targets. Information on their respective commitments is usually outlined in their sustainability reports or strategies.
- Rules are tightening on the validity of claims made by corporates towards their net zero targets, e.g. the EU's new greenwashing directive and plans to create a Carbon Removal Certification Framework. Buyers are likely to align their purchasing behaviour with these rules to follow best practice.

Step IV: Plan implementation roadmap

Now that you have decided to enter the VCM, what are the key steps you need to take?

Historically, most projects have followed the established route to market to generate, issue and sell credits.

- Established routes provide a tried-and-tested implementation process that is generally trusted by buyers, but also incurs high costs.
- Emerging platforms seek to harness the power of technology to streamline parts of the process and cut some of the associated costs (not least by cutting out intermediaries, such as brokers, from the process) and are starting to generate interest from newer participants in the VCM.

Here is a breakdown of the established versus emerging implementation route.

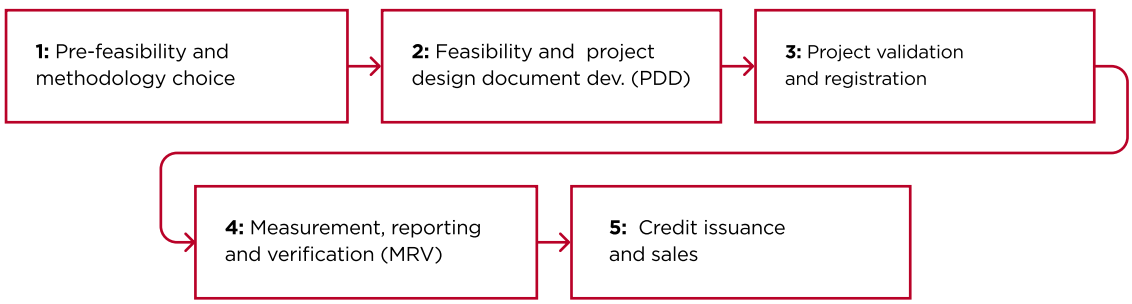
How do I execute my project?

1. Following an established standard	2. Following an emerging standard/platform

1. Following an established standard

If you opt for the established standards body route to market, the process can take between two to four years from starting a project feasibility assessment to when credits are issued, and the total carbon related costs can be around $80,000-$140,000 as an upfront expense and $30,000-$50,000 in recurring/yearly costs during implementation.

Both upfront and recurring costs will vary by project type. The costs of developing larger and more complex projects, such as reforestation projects, will be at the top end of each range, and in some cases may exceed it. If you are doing this for the first time, you are likely going to be working with a consultant project developer and should be prepared to dedicate significant internal resources to the process.



Pre-feasibility and choice of methodology	The pre-feasibility stage involves checking for additionality and doing some basic cost-benefit analysis to assess whether a carbon project makes sense financially, including the volume of operations or market price you need to breakeven. You will need to determine whether a carbon methodology exists to cover project activities. If not, you can apply for a new or revised methodology, but that would take significant time and incur additional costs. At this stage, you can also assess any other aspect of eligibility, such as no double counting and ensuring the permanence of emissions reductions.	Likely cash expenditures: $5,000-$15,000 Likely duration: 3-6 months
Feasibility & PDD development	This stage involves: Developing the project concept (describing the project activities and any applicable technology in detail). Estimating a baseline with the applicable VCM methodology. Establishing an approach to monitoring project activities and emissions reductions over time. Stakeholder consultations are another important part of the project design process. The standards/registries normally ask for evidence that the project activities will not adversely impact local populations or other relevant stakeholders. Sometimes, buyers may require (or project developers may want to include) explicit benefit sharing arrangements with local stakeholders. You will need to provide details of all stakeholder consultations and plans made to meet related requirements in the PDD. These early steps are usually done with the help of consultants who specialise in your sector and have a deep understanding of the requirements from the standards/registries.	Likely cash expenditures: $40,000-$70,000 Likely duration: 3-12 months
Project validation and registration	After the submission of the PDD, you will need a third-party auditor to validate your project. This independent assessment is done by a VVB accredited by the respective standards body. It consists of both a desk review and a field visit to confirm that the project is in line with the applicable standard. Following successful validation, your project will be formally registered as eligible to generate credits under the relevant standards body (registration means it is entered into a publicly accessible database maintained by the standards body).	Validation Likely cash expenditures: $10,000-$25,000 Likely duration: 1-3 months Registration Likely cash expenditures: $4,500-$10,000 Likely duration: 9-24 months

Measurement, reporting and verification (MRV)	This is a required step for standards bodies to be able to issue carbon credits, as it demonstrates your project's carbon emission reductions. You will need to submit a monitoring report to the VVB on a regular basis, along with supporting documents. The monitoring and verification activities can often include in-person and/or phone surveys of customers and therefore can be expensive. Upon successful verification, the VVB will issue a report statement which allows the certification and issuance of your carbon credits. Digital MRV (dMRV) offers an opportunity to decrease some of the monitoring costs, but there are few active metered methodologies (e.g. the Gold Standard Methodology for Metered & Measured Energy Cooking Devices) and the main standards body nonetheless require site visits as part of their verification process. Please note that dMRV providers are usually different from VVB bodies. Project owners/developers often conduct the validation and first verification at the same time to save costs. Monitoring and verification costs for nature-based solution projects can be up to 50% higher (in some cases even more) due to the complex nature of the measurements and equipment required.	Likely cash expenditures: $10,000-$25,000 Likely duration: 3-6 months for each reporting phase
Credit issuance and sales	Your credits will be issued upon the successful submission of the verification report and statement. Credits can start being counted before the date of the project registration but no more than two years prior to the date of registration. Your options for the sale of credits are discussed in the route to market section. Costs associated with the sale of credits will vary depending on your chosen sales channel.	Likely cash expenditures: $0.20-$0.30 per credit Likely duration: 1-3 months

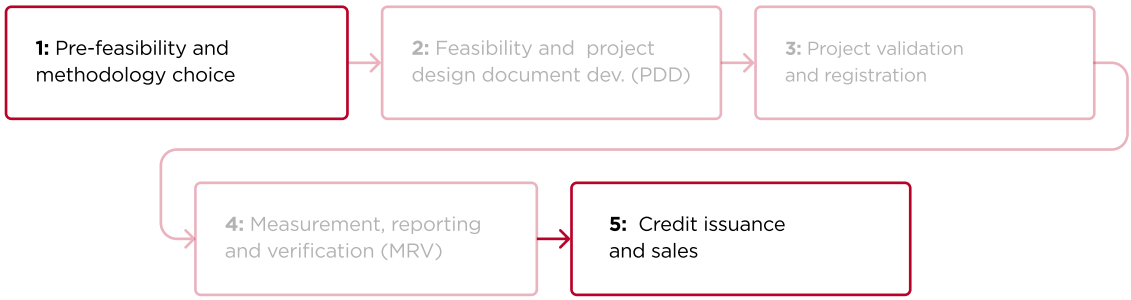
2. Following an emerging standard/platform

Several new players have entered the market in recent years, looking to offer an alternative to the established route. Each has its own value proposition, based on the technology and contracting arrangement used, aiming to cut costs and the time-to-market.

Key efficiency gains include:

- **Digital monitoring, reporting and verification (dMRV).** Making the MRV process automated and cutting the associated costs of monitoring project activities, using technologies such as Internet of Things (IoT), embedded sensors in products or satellite imagery.
- **Automated registration and certification.** Reducing the time and cost to access the market.
- **Smart contracting.** Ensuring automation and visibility of payments among participants and with community groups.
- **Aggregated or micro-sales.** Facilitating the participation of smaller enterprises.
- **Enhanced data analytics.** Improving the integrity and transparency of the process.

The main cost and time reductions come from digitising steps in the credit issuance process. The possibility of implementing dMRV offers a significant reduction in terms of both cost and time as you no longer have to pay for expensive in-person surveys and the MRV process becomes automated. Other reductions include not needing to go through the same PDD development process as for established standards, and validation and registration becoming automated and less time-consuming.



The main drawbacks are:

- **Less well-known.** Not all platforms are endorsed by the International Carbon Reduction and Offset Alliance (ICROA), which is a precondition for certain categories of buyers to engage. Project owners see a trade-off between the improved processes that newer platforms offer and the range of buyers that the established standards/registries give access to.
- **Staffing costs.** The effective integration of data and processes into the platform incurs costs of staff time, although this is not necessarily higher than those involved in the established route.

Risks and considerations

- **Regulatory uncertainty.** The VCM space is constantly evolving and is marked by a fragmented policy landscape. This poses several risks, including a ban on the export of carbon credits, updates to local administrative requirements, and imposition of new taxes. Stakeholders need to keep abreast of the changes to be able to make sound decisions.
- **Market uncertainty.** Over the years, the price of carbon credits has experienced significant price fluctuations. The recent volatility can be attributed to several factors, including the controversies linked to the integrity of carbon offsets. This has shaken investor confidence and contributed to price instability.
- **Reputational risk.** The uncertainty over the integrity of a carbon credit could affect the reputation and credibility of the company, slowing or stalling potential investors.
- **Benefit sharing.** Ensuring fair distributing of proceeds to the local communities involved is crucial for lasting impact. Merely providing technology or equipment can be insufficient and communities must receive a substantial share of the carbon credit revenue to acknowledge their participation and incentivise their long-term support.
- **Barriers to entry.** Participating in the VCM requires navigating complex and multiple stakeholders and non-standardised processes. Additionally, participation requires facing significant financial outlays.

These risks should be considered when entering the market, though it should also be noted that these risks change by sector and geography. This can have costs and benefits. For example, credits in high-impact sectors with significant co-benefits can fetch prices much higher than the averages quoted throughout this guide. Similarly, changing regulations can also have advantages, particularly in reference to Article 6, as these may bring more certainty to the market.

Section 3:

Case studies

This section features best practice case studies from three sectors – clean cooking, solar home systems and sanitation – showing how different organisations have successfully navigated the voluntary carbon market.

Case study I: ATEC

Combining clean cooking with digital MRV

What does ATEC do and where do their emissions reductions come from?

ATEC provide sustainable, affordable and accessible clean cooking products for low-income households across 11 regions in Africa and Asia. With all their stoves IoT-enabled and integrated with a Pay As You Go (PAYGO) system using mobile money, ATEC aim to make modern electric cooking widely available and affordable. The usage data from the stoves provides the evidence to generate 100% verified carbon credits and significant SDG impact for 200 million women in low- and middle-income countries.

ATEC are issuing their first credits from carbon projects in Bangladesh and Cambodia using Gold Standard's (GS's) new Methodology for Metered & Measured Energy Cooking Devices. The emissions reductions come from replacing wood or charcoal burning stoves, which are heavily polluting, with electric induction cookstoves and generating credits which avoid, rather than remove, GHG emissions.

Additionality is demonstrated by induction cookstoves being on the positive list of GS's Community Service Activity Requirements (technologies providing thermal energy to the user that have less than 20% adoption rate among target users). Further, carbon finance enables the deployment of ATEC's PAYGO technology, without which customers would be unable to pay for the devices in instalments, making the stoves unaffordable without carbon finance.

The ATEC product and investing in dMRV

The IoT technology installed in each cookstove provides SIM-connected data on usage and allows users to pay for the device in instalments via PAYGO technology.

ATEC's decision to apply for the metered methodology for their cookstoves was driven by a desire to be at the forefront of integrity and transparency within the VCM. They have previous experience of following the standard approach of sample-based in-person verification of projects with a biodigester project in Cambodia and were keen to look at an alternative. Concerned about claims of over-crediting in the clean cooking sector, they were a pioneer in co-developing and then adopting the new GS methodology.

ATEC's route to market

ATEC have already made agreements for the sale of their resulting credits. To arrange carbon credit sales, ATEC have contacted buyers directly:

- They have entered into a landmark agreement with ENGIE Group, who will purchase up to 11.5 million carbon credits from Bangladesh and Cambodia. This was the first major deal signed under GS's new metered methodology.
- They have also entered into an agreement with FairClimateFund to pilot a carbon credit revenue-share agreement with households, based on verifiable usage data. Through the agreement, FairClimateFund have agreed to sell credits from the project to companies who want to fund fair climate action, with 70% of the credit purchase price to be transferred directly to users as a mobile payment, a process made possible and transparent by ATEC's IoT technology.
- They have entered into a purchase agreement with the KliK Foundation for 100% data-auditable ITMOs to reduce emissions by replacing traditional cookstoves in Malawi. Funded through Article 6.2 of the Paris Agreement, the project is currently undergoing validation. Implementation will begin once it is authorised by the two partner countries, Switzerland and Malawi.

You can find more about ATEC here.

Case study II: ENGIE Energy Access

A different route to carbon credit generation and sales

Acquisition by Ignite Power

Ignite Power announced in January 2025 that it has signed an agreement to fully acquire ENGIE Energy Access. This landmark deal will establish Africa's largest distributor of renewable energy solutions. The newly merged company, to be named "Ignite Energy Access," will operate across 14 African countries, delivering sustainable energy to over 15 million people. You can find more about the deal **here**.

What do ENGIE Energy Access do and how do they reduce emissions?

ENGIE Energy Access is a leading mini-grid and off-grid PAYGO solar energy solutions company in Africa. Operating in nine countries across Eastern, Southern and Western Africa, they have a mission to deliver affordable, reliable and sustainable energy solutions with exceptional customer experience. To date, they have installed over 45MW of solar capacity, serving more than two million customers.

Emissions reductions are created by replacing the use of fossil fuels in various forms, depending on the product they are installing. For off-grid solutions, they are replacing the use of high CO_2-emitting energy sources such as kerosene lamps, diesel generators and candle lights, all of which are dangerous and polluting.

ENGIE Energy Access' first experience with the VCM came via Mobisol, a solar home systems provider they acquired in 2019, who had an ongoing carbon project with Gold Standard in Tanzania. Mobisol's experience was marked by the prolonged time it took to register and then issue credits (over three years), and the limited visibility on the price they might receive. For ENGIE Energy Access, the relatively low level of carbon emission reductions from each individual solar product means that to be cost effective, a carbon project must happen at scale with low fixed costs of project development. In addition, the solar home system industry is based on a business model where solar kits are distributed and sold on credit. This means that to maximise the impact, the cashflow structure needs to generate revenues quickly to get the capital required to finance the continued growth of the distribution business.

The new route to market

Exploring alternative routes to market to scale their use of carbon finance led ENGIE Energy Access to engage with CarbonClear, a new standard designed specifically for the energy access sector, with a transparent, data-driven solution for issuing carbon credits based on an established UN-CDM methodology. ENGIE Energy Access' business model to sell most of their products on credit, paid for by customers in instalments via mobile money, provides a rich dataset updated in real time, on customer product usage and payments. A critical component of the partnership was to integrate their data with the CarbonClear platform. Aside from aligning their data feed, ENGIE Energy Access incurred no additional costs as CarbonClear do not charge joining or registration fees and sales could be facilitated within three months of joining the platform.

Selling their credits

While CarbonClear operates as both a standard, issuing credits using built-in dMRV, and as a sales channel, generating buyer interest is a joint responsibility between the platform and the enterprises using it. In Kenya, ENGIE Energy Access sells their credits through the CarbonClear platform at €26 per credit, at relatively small volumes given the nature of the buyers on the platform at the moment who are interested in high integrity and transparent projects, and are willing to pay a premium for that. Beyond working with CarbonClear to expand the number of buyers interacting with the platform, ENGIE Energy Access also sells credits generated on the platform separately through the ENGIE Group's carbon trading desk.

The main drawback of working with CarbonClear is that the standard is not widely known and does not yet have accreditations beyond their Verified by DNV label, which is a third-party verification that the underlying UN-CDM methodology is applied correctly. Lacking accreditations by bodies such as ICROA or the ICVCM is due to CarbonClear's recent foundation, and the fact that the ICVCM is only now starting to implement their assessment of existing carbon standards and programmes. ICROA accreditation is generally recognised as the industry standard in the VCM for project development, and the Core Carbon Principles (CCP) label being developed by the ICVCM seems to be emerging as an additional requirement for many buyers of carbon credits. These accreditations are however closely aligned with traditional standards and have limited flexibility to include emerging standards such as CarbonClear. This means that some buyers will automatically screen out any credits which are not accredited or endorsed by these organisations, as they consider them to be of insufficient quality. ENGIE Energy Access is continuously working with CarbonClear to showcase how the platform respects the integrity, transparency and additionality requirements for carbon credits. Achieving this will be paramount for the African Carbon Market Initiative to be able to deliver on its promise to mobilise the VCM in favour of projects developed in Africa in general, and for off-grid energy access on the continent in particular.

You can find more about ENGIE Energy Access here.

Case study III: Sanergy

Pioneering carbon credits from container-based sanitation

Who are Sanergy?

The Sanergy Collaborative strives to solve the global sanitation crisis through the power of the circular economy. A member of the Container Based Sanitation Alliance (CBSA) and headquartered in Nairobi, it brings together several actors across the sanitation value chain working to offer better sanitation solutions for communities, reduce landfill, improve the health of residents, catalyse sustainable agricultural and energy production, and spur economic growth.

Sanergy have registered a methane avoidance carbon credit project with Verra using UNFCCC Clean Development Mechanism methodology ACM0022. This initiative is driven by two entities within the Collaborative:

- Fresh Life manufacture low-cost, high quality, branded toilets that are franchised to people in communities who run them as small businesses. Fresh Life provides daily waste collection services, marketing and branding support, as well as training for the entrepreneurs.
- Regen Organics operate a waste treatment plant and convert waste streams into regenerative agricultural and energy products, as well as sustainable eco-fuels, which are then commercialised.

Source of emissions reductions

There is currently no carbon methodology based on the manufacture and distribution of toilets, but there are methodologies related to waste management (e.g. ACM0022). Emissions reductions come as a result of composting the waste which, if untreated, would decompose anaerobically and release methane into the atmosphere. Reductions also come from the short containment time compared to other pit / septic tank toilets. Sanergy is a vertically integrated organisation, supplying both the toilets and treating the waste, which allows them to generate credits from waste management. The number of credits they generate is directly proportional to the weight of waste they treat and also linked to the number of toilets deployed in communities.

Carbon revenue will help Sanergy to become less reliant on development partner funds for its activities. Since the Sanergy Collaborative own the toilets and therefore the waste, ownership of the subsequent carbon credits is not contested. Digital capabilities for monitoring are not required as the main metric for the emissions reductions is the weight of the waste.

Generating credits

The project development process took approximately 24 months, with pre-feasibility work starting in the summer of 2022. Sanergy have employed experts throughout the process. A consultant was recommended to help with the feasibility work and PDD development, and for the verification, they put out an RFP to engage a VVB. Early cost-benefit analysis, based on the volume of waste that they manage, suggested that 30,000 credits annually would be sufficient to justify the carbon costs. These are estimated at approximately $120,000 in upfront costs, and about $50,000 in annual monitoring and verification costs. Sanergy has explored the possibility of outsourcing its MRV work, which would cost approximately $50,000 annually. However, by developing internal capabilities, Sanergy estimates it can reduce these costs to around $25,000 per year. This approach highlights the potential for organisations to build internal expertise and save on operational expenses.

The choice of Verra over Gold Standard was driven by the experience of their consultant and the fact that Verra has lower credit issuance fees compared to Gold Standard. Through the process, they have identified the importance of having qualified internal staff to accompany the project. While employing a consultant, the ability to check and understand the figures going into the project development cannot be underestimated.

Sanergy have started discussions with buyers and are seeing interest in the market for these first-of-a-kind carbon credits, particularly from buyers who have an interest in supporting methane abatement alongside the wide array of co-benefits seen in Sanergy's project, including increasing access to safe sanitation (SDG 6) for residents of informal settlements, and increasing the volume of recycled waste (SDG 12).

You can find more about Sanergy here.

Annex 1: Detailed examples of calculations with costs and benefits

In the examples below, you will see step-by-step how an enterprise can work out the costs and benefits for selling carbon credits through different routes to market. The assumptions underpinning these scenarios are fully explained here. You can choose from the options below, depending on your sector.

Example 1: Clean cooking – SustainaFlame

SustainaFlame wishes to distribute 10,000 improved biomass cookstoves as part of their expansion in Kenya and wants to explore in detail the differences between opting to register their project via an established standard or through an emerging platform.

Let's explore the case of SustainaFlame.

Total carbon credits	=	Number of cookstoves	X	Project lifespan	X	Number of credits per cookstove

Number of cookstoves = 10,000

Project lifespan = 7 years [Estimate based on other clean cooking projects]

Estimated carbon credits per cookstove (range) = 1-3 [Estimate based on data from other cookstove projects and estimated lifespan of the cookstoves]

Total carbon credits (range) = **70,000 – 210,000**

See Table 1 for an overview of sample cookstove projects.

Revenue calculations

Revenue	=	Total carbon credits	X	Market price of a carbon credit

Total carbon credits (range) = 70,000 – 210,000

Market price of one carbon credit (2023) = $7.70

Total revenue (range) = **$539,000 - $1,617,000**

Table 1: Overview of sample cookstove projects

Project ID	Project name	Est. total emissions reduction	Est. number of stoves sold	Crediting period (Years)	Cookstove type	Est. credits generated per year
GS7438	Improved Cookstove Project In Uganda	857,477	75,500	5	Biomass	2.27
GS7142	Conserving the Mulanje Mountains, Malawi - Saving forests and empowering mountain communities with improved cookstoves	257,400	130,000	5	Biomass	0.40
GS7312	Promoting Improved Cooking practices in Nigeria	3,022,600	385,263	5	Biomass	1.57
GS11815	Electric Cooking Program (ATEC)	711,648	489,551	6	Electric	0.24
GS10885	GS10884 - KOKO Kenya - Ethanol Cookstoves Program - CPA-0001	780,315	42,000	5	Ethanol	3.72
GS11440	GS10884 - KOKO Kenya - Ethanol Cookstoves Program - CPA-0002	5,409,465	199,000	5	Ethanol	5.44
GS5227	GS1488 CPA001, Rubavu District in the Western Province of the Republic of Rwanda (DelAgua)	311,668	35,000	7	Biomass	1.27
GS12357	UpEnergy-Social and Climate Impact Programme-Cooking Devices VPA-23 - ICS	219,376	11,200	5	Biomass	3.92
GS11993	African Clean Energy Carbon Offset Programme	38,038	2,500	6	Biomass	2.54

Cost calculations

SustainaFlame worry that if they go with an established standard, the scale of their project may not be large enough to cover their carbon costs, but if they go with an emerging platform, they know the costs will be a percentage of revenues.

A. Opting for the established route to market

The established route to market can take between two to four years to get credits issued, with $80,000-$140,000 in upfront costs and $30,000-$50,000 in recurring costs during implementation.

Total cost = Fixed costs + Variable costs
Fixed cost: One-time fees + (annual fees x number of years)
Variable costs: Per credit fee x number of credits

See Table 2 for a breakdown of the costs.

Net income calculations

Net income = Total revenue — Total costs
Total revenue = $539,000
Total costs = $206,500
Net income = $332,500

Note: This calculation only covers carbon project costs and does not cover their implementation costs (e.g. cost of the cookstoves, salaries, overheads, etc.). It also does not cover the costs associated with using brokers or intermediaries who would absorb a share of future revenues, or the time value of money, which would need to be considered separately.

Table 2: Cost calculations: Breakdown of costs

Project cost type	Estimated fee (USD)	Payment frequency	Fee recipient
Fixed costs			
Pre-feasibility and choice of methodology	$10,000	One-time fee	Carbon project development expert
Feasibility and PDD development	$50,000	One-time fee	Carbon project development expert
Project validation	$20,000	One-time fee	Validation and verification body (VVB)
Account holder fees - Registration	$500	One-time fee	Verra
Project flat registration fees	$3,500	One-time fee	Verra
Account holder fees – Annual	$3,500	$500 annually (x 7yrs)	Verra
Verification fees	$105,000	$15,000 annually (x 7yrs)	VVB
Variable costs			
Variable credit issuance fees	$14,000	$0.20 per credit (x 70,000 credits)	Verra
Total fixed cost		**$192,500**	
Total variable cost		**$14,000**	
Total cost		**$206,500**	

Source: Verra 2023 fee schedule and key informant interviews

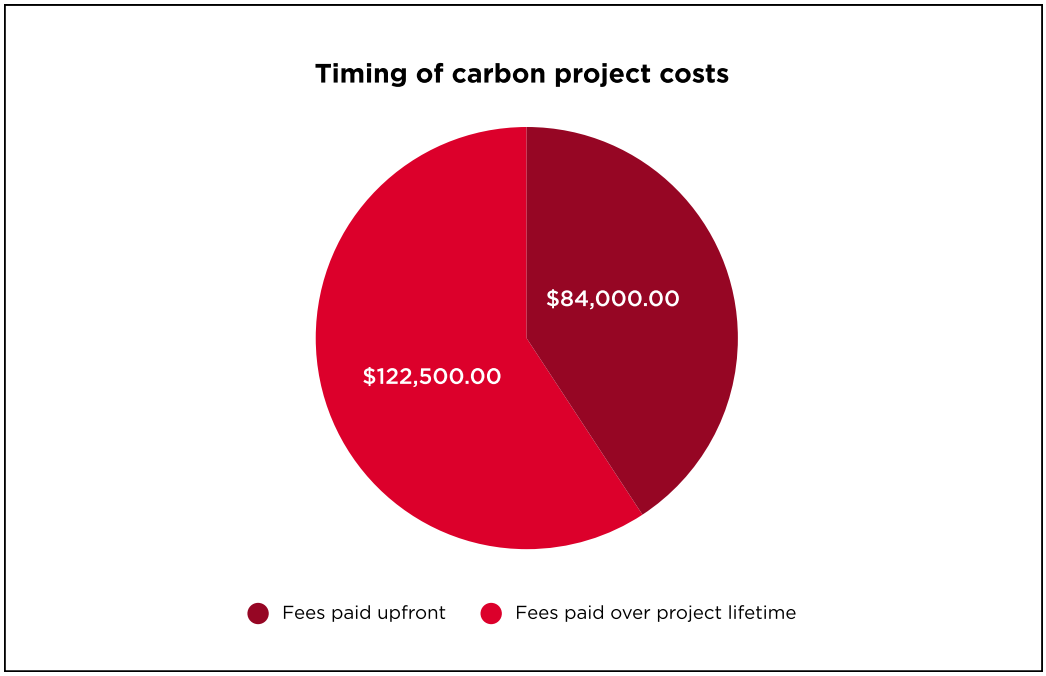
Assumptions:

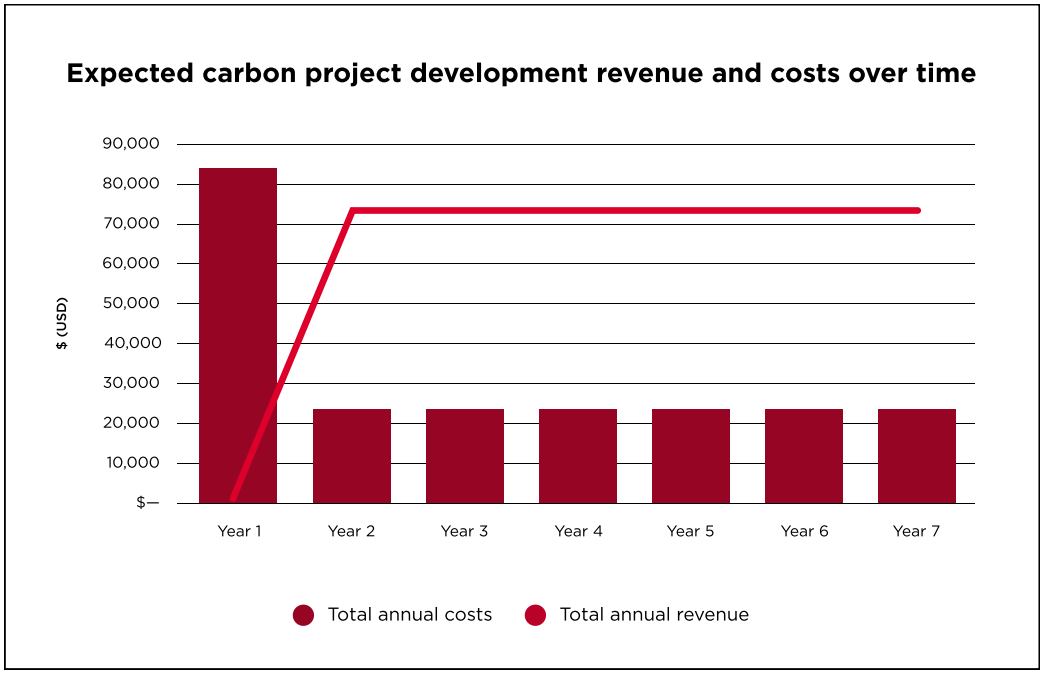
- SustainaFlame considers the established route to market.
- All 10,000 cookstoves are distributed in the first year itself, so revenues are assumed to be earned equally across the lifetime of the project.
- Carbon credits will be generated at the low end of the emission range, i.e. one credit per cookstove per year.

Upfront versus lifetime costs

Upfront fees: $84,000 [Total one-time fees]

Fees paid over lifetime: $122,500 [Variable costs + annual recurring fees]





Source: Social Finance analysis

Note: In reality, costs and revenues may be spread differently over the life of the project depending on several factors, such as the time it takes to develop the project, issue credits, the frequency of verifications, and the pattern of project implementation over time.

Breakeven calculations

Based on the estimated number of credits generated and the estimated costs, SustainaFlame can complete basic feasibility calculations pertaining to their volume breakeven point and potential net income.

Volume breakeven point = **Total fixed costs** / (**Total carbon revenue per cookstove** — **Total variable costs per cookstove**)

Total carbon revenue per cookstove: Market price x total number of credits generated per cookstove per year x number of years

Total variable costs per cookstove: Variable costs per credit x total number of credits generated per cookstove per year x number of years

Total fixed costs = $192,500

Total carbon revenue per cookstove = $7.70 x 1 x 7 = 53.90

Total variable costs per cookstove = $0.20 x 1 x 7 = 1.4

Total cookstove vol. required to breakeven on project costs at the av. 2023 price **= 3,667**

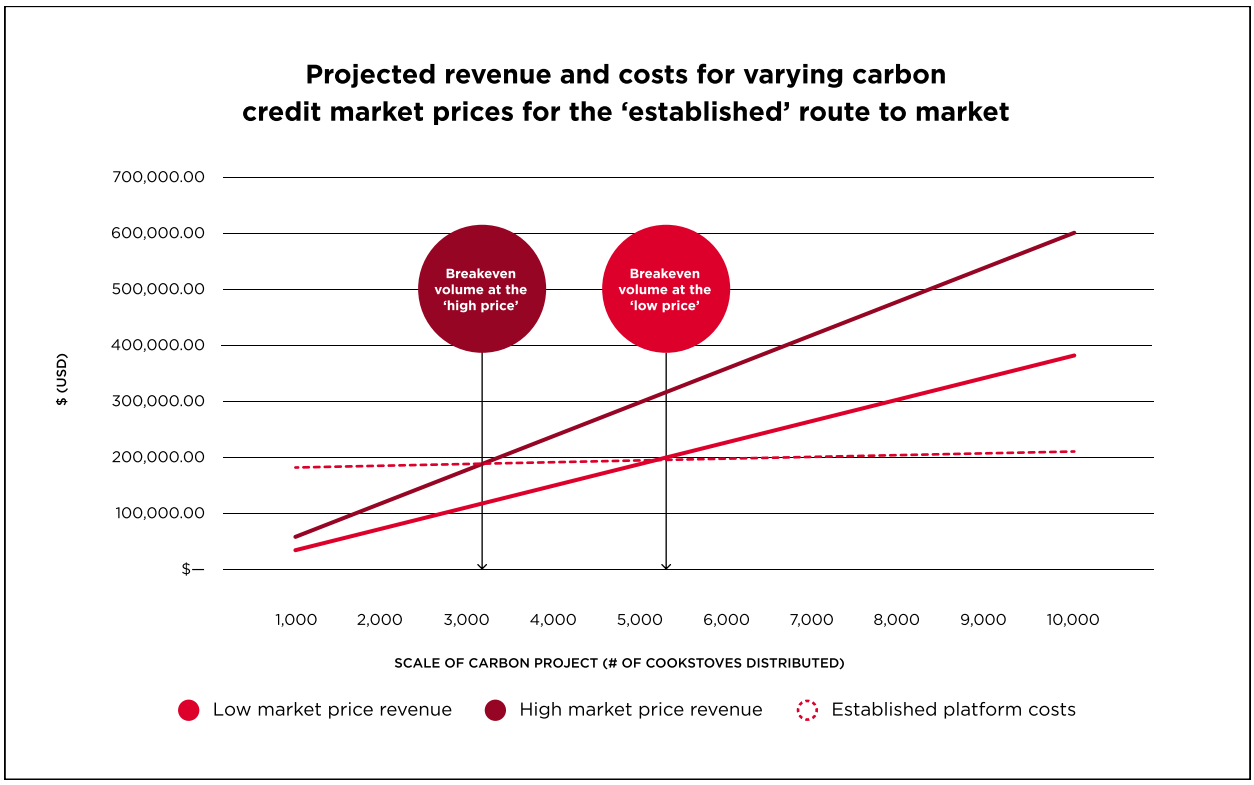
Note: This figure represents the total number of cookstoves that SustainaFlame needs to deploy in a carbon project to breakeven on carbon project development costs only, assuming they can sell their credits at the current market price of $7.70. This calculation only covers carbon project costs and does not cover their implementation costs (e.g. cost of the cookstoves, salaries, overheads, etc.). It also does not cover the costs associated with using brokers or intermediaries who would absorb a share of future revenues, which would need to be considered separately.

Project breakeven analysis

The potential revenue of a carbon project is determined by both the number of credits generated and the price that each credit is sold at. **A breakeven point can thus be identified at the point where the revenue lines and cost line intersect.**

The calculations so far are based on the 2023 carbon credit price of $7.70. Under the established platforms, this project is highly likely to breakeven. The breakeven range for established platforms is based on the revenue potential of selling the credits at a low price of $5.3 and a high price of $8.6 (based on the average market prices of 2021 and 2022). Under these assumptions, deploying the 10,000 cookstoves is likely to return two to three times the $200,000 investment.

Note: These calculations do not factor in the costs of implementing the carbon project itself (e.g. the unit cost of the cookstoves, labour, etc.), nor the costs of using brokers or intermediaries, who are likely to absorb a share of future revenues, or the time value of money. Furthermore, the price SustainaFlame will be able to secure on their carbon credits may vary significantly depending on factors outlined in the route-to-market section.



B. **Opting for an emerging route with a revenue-share model**

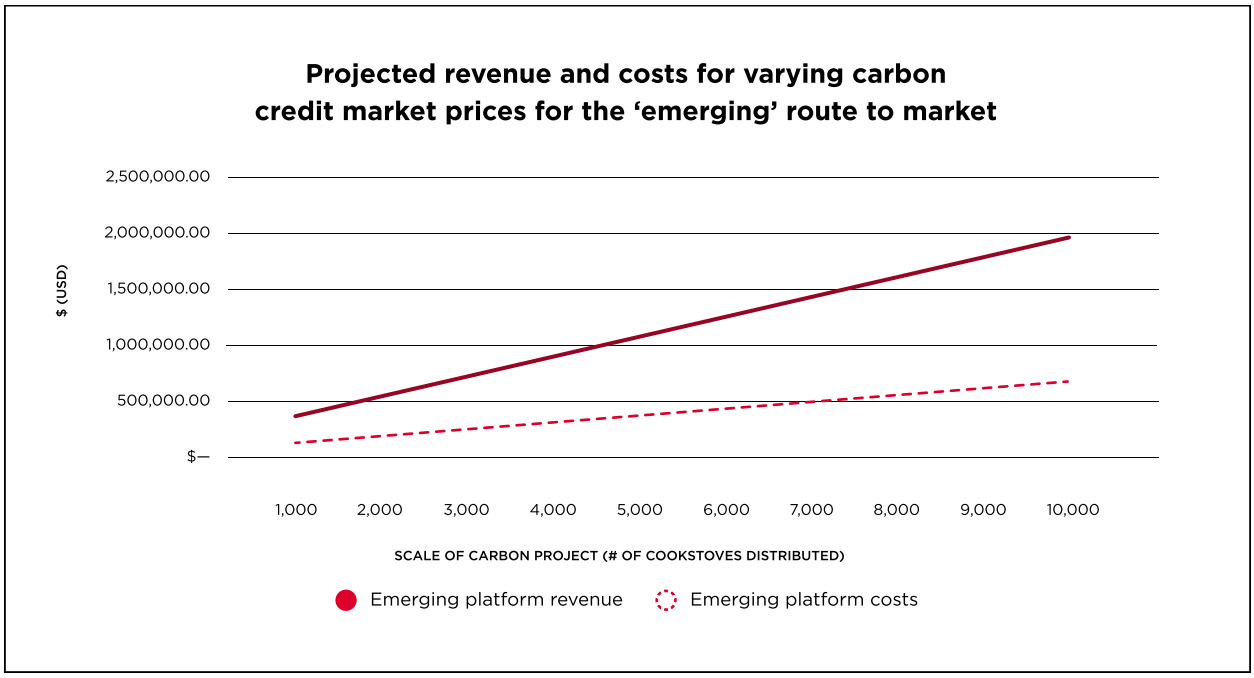
If SustainaFlame opt for an emerging platform—in this case using CarbonClear as an indicative example—they will face no upfront carbon costs but will need to dedicate staff time to integrate their data with the CarbonClear platform. The time to market can be reduced to about three months if integration is seamless. Variable costs will also be eliminated as monitoring and verification will become automated.

It should be noted that emerging platforms currently support limited types of projects. However, they do accommodate clean cooking projects.

In terms of revenues, CarbonClear will get a 30% share of the revenues generated from the sale of all carbon credits, which are sold at a fixed price of €26 on the CarbonClear platform.1 Thus, the revenue potential is positive at all volumes as costs are only incurred if and when carbon credits are sold in the future.

Note: Other emerging platforms may charge varying fees. The CarbonClear model is used here for illustrative purposes only.

Under the emerging route to market, there is no breakeven point (i.e. there is positive net income from the outset) as costs are only incurred if and when carbon credits are sold in the future.



Before deciding on pursuing established versus emerging, SustainaFlame would need to factor in implementation costs as well as any broker or intermediary costs into their feasibility analysis, as both categories can add substantially to costs and may alter the cost-benefit analysis significantly. Several additional quantitative and qualitative factors should be considered to assess whether the established or emerging route to market is more appropriate.

Example 2: Solar lighting – SunHaven Technologies

SunHaven Technologies, an off-grid solar start-up, wishes to distribute 100,000 solar lanterns and wants to explore in detail the differences between opting to register their project via an established standard or through an emerging platform, like CarbonClear, whose methodology covers SunHaven's activities.

Let's explore the case of SunHaven Technologies.

Total carbon credits	=	Number of solar lanterns	X	Project lifespan	X	Number of credits per lantern

Number of solar lanterns: 10,000

Project lifespan: 10 years [Est. based on similar household devices projects]

Estimated carbon credits per solar lantern: 0.05 - 0.15 [Estimated based on similar projects]

Total carbon credits (range) **= 50,000 – 150,000**

Table 3: *Overview of sample household devices projects*

Project ID	Project name	Est. total emissions reduction	Estimated number of project units	Crediting period (Years)	Est. credits generated per year
GS393	SolarAid Microsolar Lanterns Project for Malawi	19,017	27,300	10	0.07
GS5315	GS5304 MKOPA Solar Lighting Programme of Activities - Uganda VPA 2	419,999	652,173	10	0.06
GS7002	Namene Solar Light Company: Solar Lighting Project Zambia 1	209,347	652,000	5	0.06
VCS1324	Lighting up Africa	866,490	3,000,000	10	0.03
GS1059	Rural Education for Development Society (REDS) Photovoltaic Lighting Project	14,230	12,489	10	0.11
VCS2608	SHINE - Distribution of LED lightbulbs in India-2	382,417	340,000	7	0.16

Revenue calculations

Based on the estimated number of credits generated and the estimated costs, SustainaFlame can complete basic feasibility calculations pertaining to their volume breakeven point and potential net income.

Revenue	=	Total carbon credits	X	Market price of a carbon credit
Total carbon credits (range) = 50,000 – 150,000				
Market price of single carbon credit (avg. price for household devices credits 2023) = $7.70				

Total revenue (range): **$385,000 - $1,155,000**

Cost calculations

SunHaven Technologies worry that if they go with an established standard, the scale of their project may not be large enough to cover their carbon costs but if they go with an emerging platform, they know the costs will be a percentage of revenues

A. Opting for the established route to market

The established route to market can take between two and four years to get credits issued, with $80,000-$140,000 in upfront costs and $30,000-$50,000 in recurring costs during implementation. These can be divided into fixed and variable costs.

Total cost	=	Fixed costs	X	Variable costs
Fixed cost = One-time fees + (Annual fees x number of years)				
Variable costs = Per credit fee x number of credits				

See Table 4 for a breakdown of the costs.

Table 4: Cost calculations: Breakdown of costs

Project cost type	Estimated fee (USD)	Payment frequency	Fee recipient
Fixed costs			
Pre-feasibility and choice of methodology	$10,000	One-time fee	Carbon project development expert
Feasibility and PDD development	$50,000	One-time fee	Carbon project development expert
Project validation	$20,000	One-time fee	VVB
Account holder fees - Registration	$500	One-time fee	Verra
Project flat registration fees	$3,500	One-time fee	Verra
Account holder fees – Annual	$5,000	$500 annually (x 10yrs)	Verra
Verification fees	$150,000	$15k annually (x 10yrs)	VVB
Variable costs			
Variable credit issuance fees	$20,000	$0.20 per credit (x 100,000 credits)	Verra
Total fixed cost		**$239,000**	
Total variable cost		**$20,000**	
Total cost		**$259,000**	

Source: Verra 2023 fee schedule and key informant interviews

Assumptions:

- SunHaven considers the established route to market.
- All 10,000 solar lanterns are distributed in the first year itself, so revenues are assumed to be earned equally across the lifetime of the project.
- Carbon credits will be generated at the low end of the emission range, i.e. 0.10 credits per lantern per year.

Net income calculations

SunHaven Technologies worry that if they go with an established standard, the scale of their project may not be large enough to cover their carbon costs but if they go with an emerging platform, they know the costs will be a percentage of revenues

A. Opting for the established route to market

The established route to market can take between two and four years to get credits issued, with $80,000-$140,000 in upfront costs and $30,000-$50,000 in recurring costs during implementation.

Net income	=	Total revenue	—	Total costs

Total revenue = (100,000 credits x $7.70) = $770,000

Total costs = $259,000

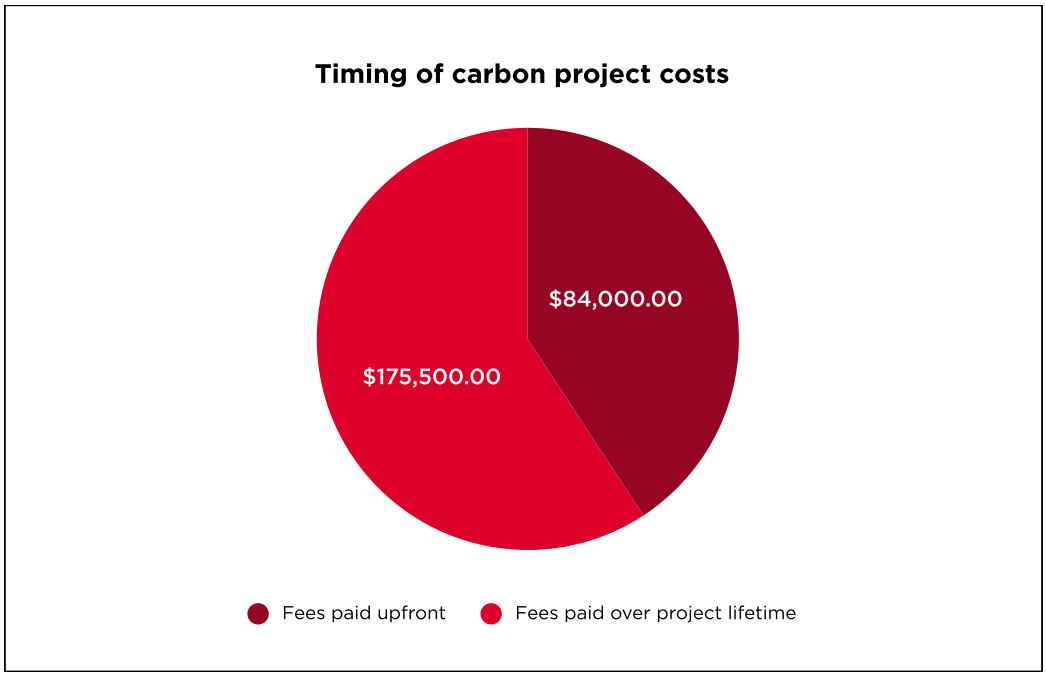
Net income= **$511,000**

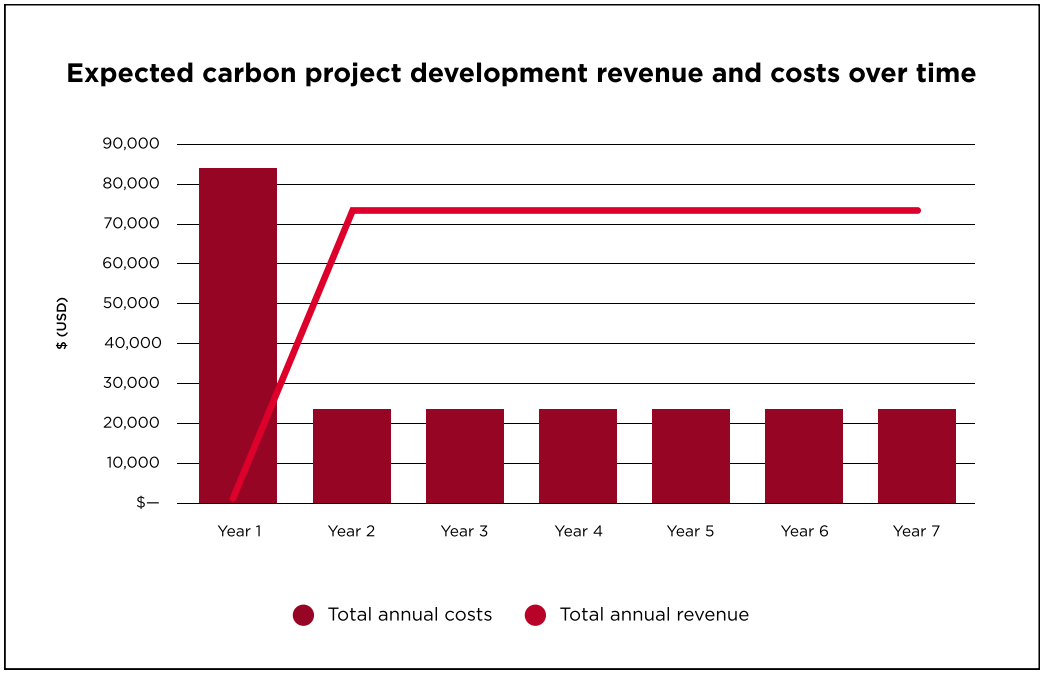
Note: This calculation only covers carbon project costs and does not cover their implementation costs (e.g. cost of the lighting units, salaries, overheads, etc.), nor the costs associated with using brokers or intermediaries who would absorb a share of future revenues, or the time value of money, which would need to be considered separately.

Upfront versus lifetime costs

Upfront fees: $84,000 [Total one-time fees]

Fees paid over lifetime: $175,500 [Variable costs + annual recurring fees]





Source: Social Finance analysis

Note: In reality, costs and revenues may be spread differently over the life of the project depending on several factors, such as the time it takes to develop the project, issue credits, the frequency of verifications, and the pattern of project implementation over time.

Breakeven calculations

Based on the estimated number of credits generated and the estimated costs, SustainaFlame can complete basic feasibility calculations pertaining to their volume breakeven point and potential net income.

Volume breakeven point = **Total fixed costs** / (**Total carbon revenue per cookstove** — **Total variable costs per cookstove**)

Total carbon revenue per cookstove: Market price x total number of credits generated per lantern per year x number of years

Total variable costs per cookstove: Variable costs per credit x total number of credits generated per lantern per year x number of years

Total fixed costs = $239,000

Total carbon revenue per cookstove = $7.70 x 0.1 x 10 = 7.70

Total variable costs per cookstove = $0.20 x 0.1x 10 = 0.2

Total lantern vol. required to breakeven on project costs at the av. 2023 price **= 31,867**

Note: This figure represents the total number of cookstoves that SustainaFlame needs to deploy in a carbon project to breakeven on carbon project development costs only, assuming they can sell their credits at the current market price of $7.70. This calculation only covers carbon project costs and does not cover their implementation costs (e.g. cost of the cookstoves, salaries, overheads, etc.). It also does not cover the costs associated with using brokers or intermediaries who would absorb a share of future revenues, which would need to be considered separately.

Project breakeven analysis

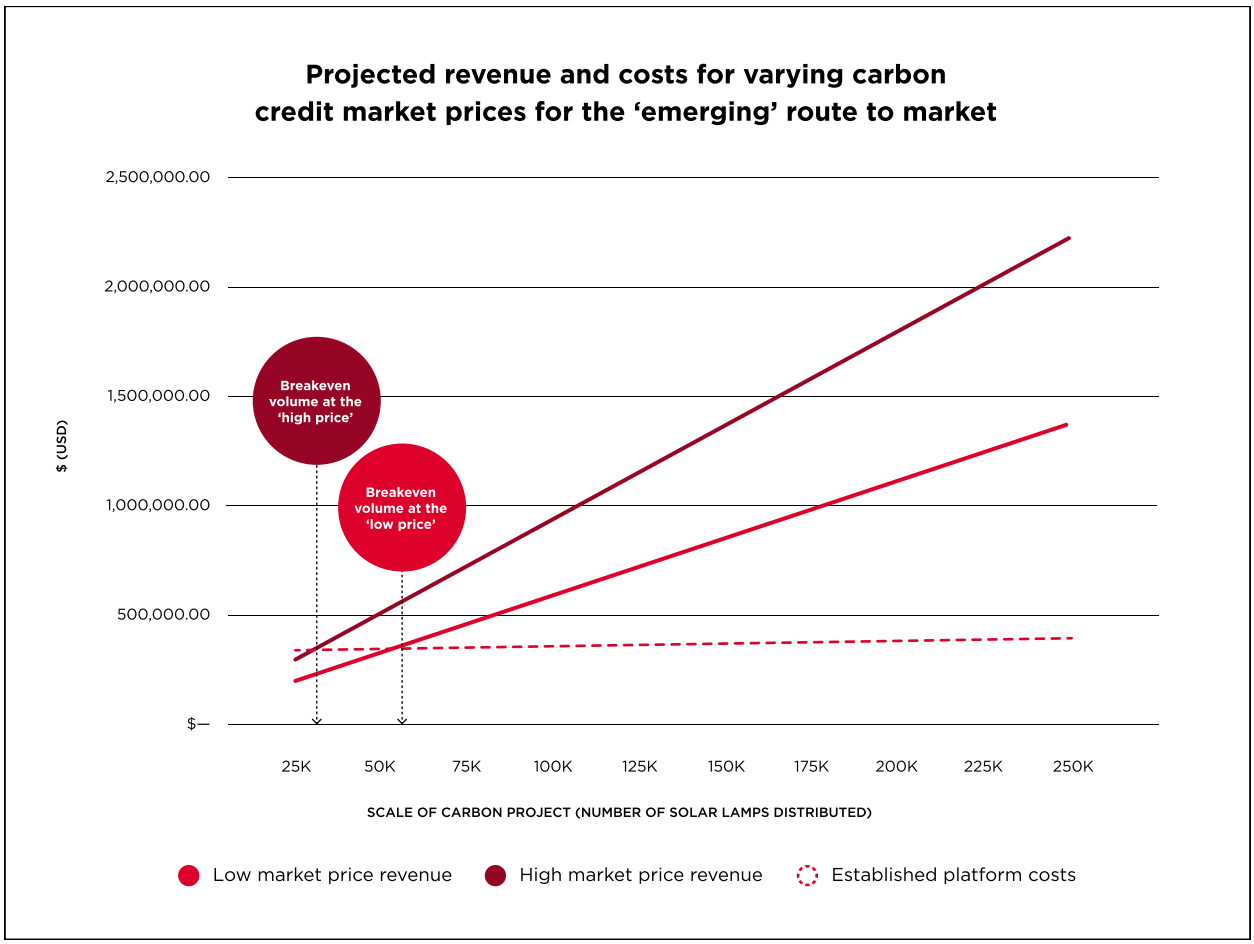
The potential revenue of a carbon project is determined by both the number of credits generated and the price that each credit is sold at. A breakeven point can thus be identified at the point where the revenue lines and cost line intersect. Under the established platforms, if this project were to only sell 50,000 units, it may or may not breakeven depending on prices and the baseline conditions. If the project sold 150,000 units, it would be likely to breakeven. The calculations so far are based on the 2023 carbon credit price of $7.70. The breakeven range for established platforms is based on the revenue potential of selling the credits at a low price of $5.3 and a high price of $8.6 (based on the average market prices of 2021 and 2022).

SunHaven Technologies would breakeven on carbon costs at:

- Approximately 30,000 solar lanterns sold, if it could secure the high price for its credits. This would be equivalent to the 2022 average energy efficiency carbon credit price of $8.55.
- Approximately 50,000 solar lanterns sold, if it were only able to secure a low price for its credits. This would be equivalent to the 2021 average energy efficiency carbon credit price of $5.36 per credit.

Note: These calculations do not factor in the costs of implementing the carbon project itself (e.g. the unit cost of the lighting units, labour, etc.), nor the costs of using brokers or intermediaries, who are likely to absorb a share of future revenues, or the time value of money. Furthermore, the price SunHaven Technologies will be able to secure on their carbon credits may vary significantly, depending on factors outlined in the route to market section.

Assumptions: The high market price assumed in this example uses the highest average annual carbon credit price between 2021-2023. The low market price assumed uses the lowest average annual carbon credit price between 2021-2023. The graph assumes that 0.10 credits are generated per year per solar lantern. This is equivalent to one credit generated in total per solar lantern over the life of the project.



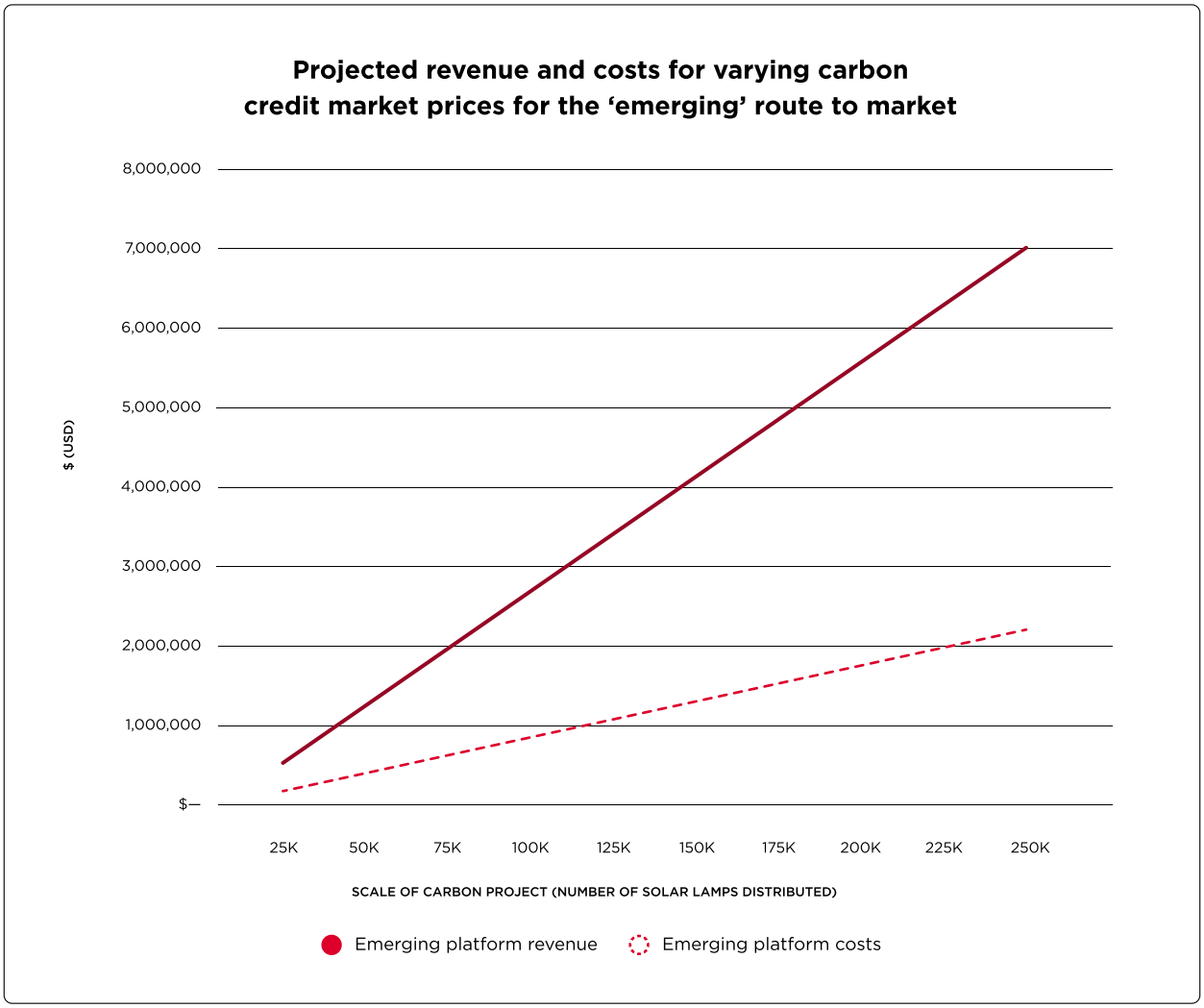
B. **Opting for an emerging route with a revenue-share model**

If SunHaven Technologies opt for an emerging platform—in this case using CarbonClear as an indicative example—they will face no upfront carbon costs but will need to dedicate staff time to integrating their data with the CarbonClear platform. The time to market can be reduced to about three months if integration is seamless. Variable costs will also be eliminated as monitoring and verification will become automated.

In terms of revenues, CarbonClear will get a 30% share of the revenues generated from the sale of all carbon credits, which are sold at a fixed price of €26 on the CarbonClear platform.

Note: Other emerging platforms may charge varying fees. The CarbonClear model is used here for illustrative purposes only.

Under the emerging route to market, there is no breakeven point (i.e. there is positive net income from the outset) as costs are only incurred if and when carbon credits are sold in the future.



Before deciding on pursuing established versus emerging, SustainaFlame would need to factor in implementation costs as well as any broker or intermediary costs into their feasibility analysis, as both categories can add substantially to costs and may alter the cost-benefit analysis significantly. Several additional quantitative and qualitative factors should be considered to assess whether the established or emerging route to market is more appropriate.

Example 3: Organic waste management – BioWaste Systems

BioWaste Systems, an organic waste management start-up, wishes to open a new organic waste management processing facility in Madagascar. Over the life of the project, the facility is estimated to process approximately 100,000 tonnes of organic waste, producing compost.

Let's explore the case of BioWaste Systems.

Total carbon credits	=	Tonnes of processed waste	X	Project lifespan	X	Number of credits per tonne

Tonnes of waste processed = 100,000

Project lifespan = 7 years

Estimated carbon credits per one tonne of waste processed = 0.25 – 1.5 [Estimated based on similar projects]

Total carbon credits (range) **= 25,000 – 150,000**

See Table 5 for an overview of sample organic waste management projects.

Revenue calculations

Revenue	=	Total carbon credits	X	Market price of a carbon credit

Total carbon credits (range) = 25,000 – 150,000

Market price of one carbon credit (2023) = $7.48

Total revenue (range) **= $187,000 - $1,122,000**

Table 5: Overview of sample organic waste management projects

Project ID	Project name	Est. total emissions reduction	Waste processed (tonnes)	Crediting period (Years)	Est. credits generated per tonne of waste
GS2521	Omdurman Landfill Municipal Solid Waste Composting Project (Sudan)	327,525	1,829,520	7	0.18
VCS4468	Weixin Urban and Rural Organic Waste Management Center in Yunnan Province	1,845,600	1,350,500	10	1.37
GS1147	Composting of municipal organic waste in Lome	50,862	245,000	10	0.21
VCS353	Composting of Municipal organic waste in Mahajanga (Madagascar)	149,481	108,000	10	1.38
GS4593	Municipal Waste Composting in Dschang, Cameroon	43,646	83,000	10	0.53
VCS2608	Nanyang Dongjia Composting Project in Fangcheng County	576,460	4,025,000	10	0.14
VCS1817	Reliance Composting Project in Cape Town	491,752	1,277,129	10	0.39

Cost calculations

A. Opting for the established route to market

BioWaste Systems have opted to follow the established route to market as no emerging platforms currently support waste management projects and there are no evident efficiency gains from adopting digital MRV practices.

Total cost	=	Fixed costs	X	Variable costs
Fixed cost = One-time fees + (Annual fees x number of years)				
Variable costs = Per credit fee x number of credits				

The established route to market can take between two to four years to get credits issued, with $80,000-$140,000 in upfront costs and $30,000-$50,000 in recurring costs during implementation. These can be divided into fixed and variable costs.

See Table **6 for a breakdown of the costs.**

Table 6: Cost calculations: Breakdown of costs

Project cost type	Estimated fee	Payment frequency	Fee recipient
Fixed costs			
Pre-feasibility and choice of methodology	$10,000	One-time fee	Carbon project development expert
Feasibility and PDD development	$50,000	One-time fee	Carbon project development expert
Project validation	$20,000	One-time fee	VVB
Account maintenance fees	$7,000	One-time fee	Gold Standard
Verification fees	$105,000	One-time fee	VVB
Variable costs			
Variable credit issuance fees	$45,000	$0.30 per credit (x 150,000 credits)	Gold Standard
Total fixed cost		**$192,000**	
Total variable cost		**$45,000**	
Total cost		**$237,000**	

Source: Gold Standard 2023 fee schedule and key informant interviews

Assumptions:

- BioWaste Systems considers the established route to market.
- The amount of waste managed is equal across all years, so revenues are assumed to be earned equally across the lifetime of the project.
- Carbon credits will be generated at the high end of the emission range, i.e. 1.5 credits per cookstove per year.

Net income calculations

Net income = Total revenue X Total costs

Total revenue = $1,122,000

Total cost = $237,000

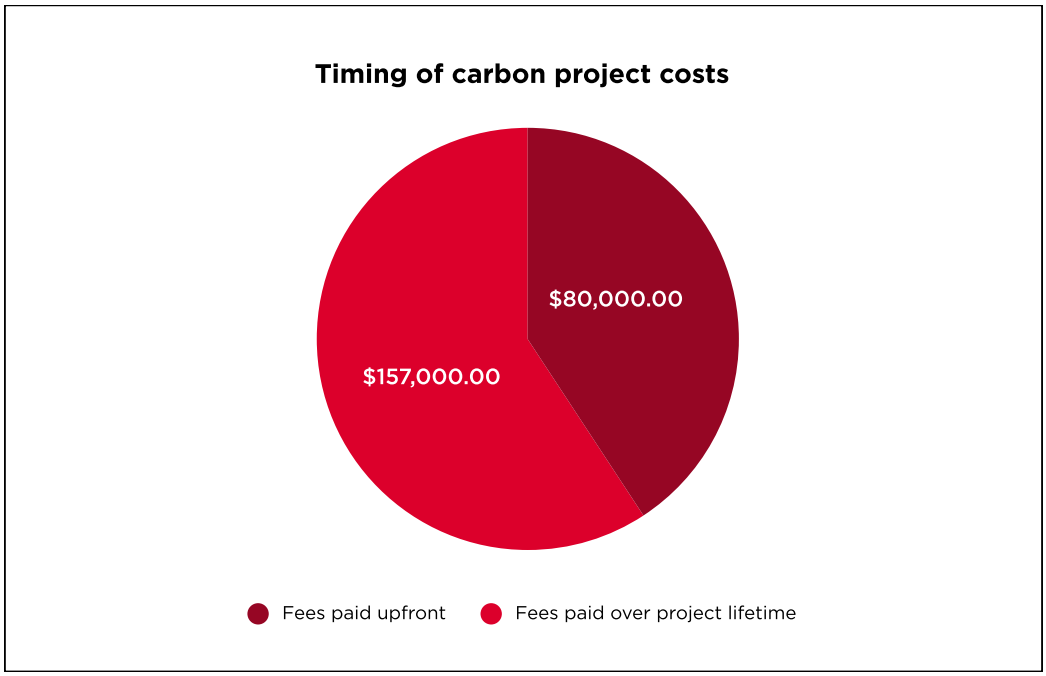
Net income **= $885,000**

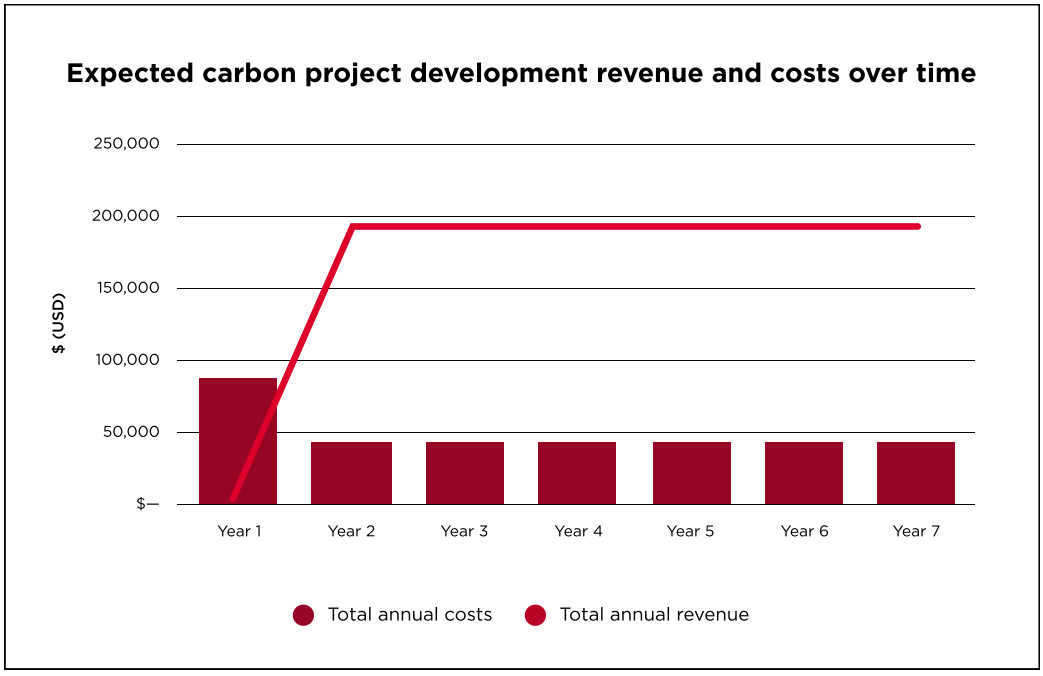
Note: This calculation only covers carbon project costs and does not cover their implementation costs (e.g. cost of the cookstoves, salaries, overheads, etc.), nor the costs associated with using brokers or intermediaries who would absorb a share of future revenues, or the time value of money, which would need to be considered separately.

Upfront versus lifetime costs

Upfront fees: $84,000 [Total one-time fees]

Fees paid over lifetime: $175,500 [Variable costs + annual recurring fees]





Source: Social Finance analysis

Note: In reality, costs and revenues may be spread differently over the life of the project depending on several factors, such as the time it takes to develop the project, issue credits, the frequency of verifications, and the pattern of project implementation over time.

Breakeven calculations

Based on the estimated number of credits generated and the estimated costs, BioWaste Systems can complete basic feasibility calculations pertaining to their volume breakeven point and potential net income.

Volume breakeven point = **Total fixed costs** / (**Total carbon revenue per tonne of waste processed** — **Total variable costs per tonne of waste processed**)

Total carbon revenue per tonne of waste processed: Market price x number of credits generated per tonne of waste processed per year

Total variable costs per tonne of waste processed: Variable costs per credit x number of credits generated per tonne of waste processed per year

Total fixed costs = $129,000

Total carbon revenue per tonne of waste processed = $7.48 x 1.5 = 11.22

Total variable costs per tonne of waste processed = $0.30 x 1.5 = 0.45

Total waste management processing volume required to breakeven on carbon project costs at the 2023 average price = **17,827**

Note: This figure represents the total number of cookstoves that SustainaFlame needs to deploy in a carbon project to breakeven on carbon project development costs only, assuming they can sell their credits at the current market price of $7.70. This calculation only covers carbon project costs and does not cover their implementation costs (e.g. cost of the cookstoves, salaries, overheads, etc.). It also does not cover the costs associated with using brokers or intermediaries who would absorb a share of future revenues, which would need to be considered separately.

Project breakeven analysis

The potential revenue of a carbon project is determined by both the number of credits generated and the price that each credit is sold at. A breakeven point can thus be identified at the point where the revenue lines and cost line intersect.

At the current market price of $7.48, BioWaste Systems will have to increase its target amount of waste processed to over 18,000 tonnes for it to breakeven.

The breakeven range for the established platforms is based on the revenue potential of selling the credits at a low price of $3.6 and a high price of $7.48 (based on the average market prices of 2021 and 2023, respectively).

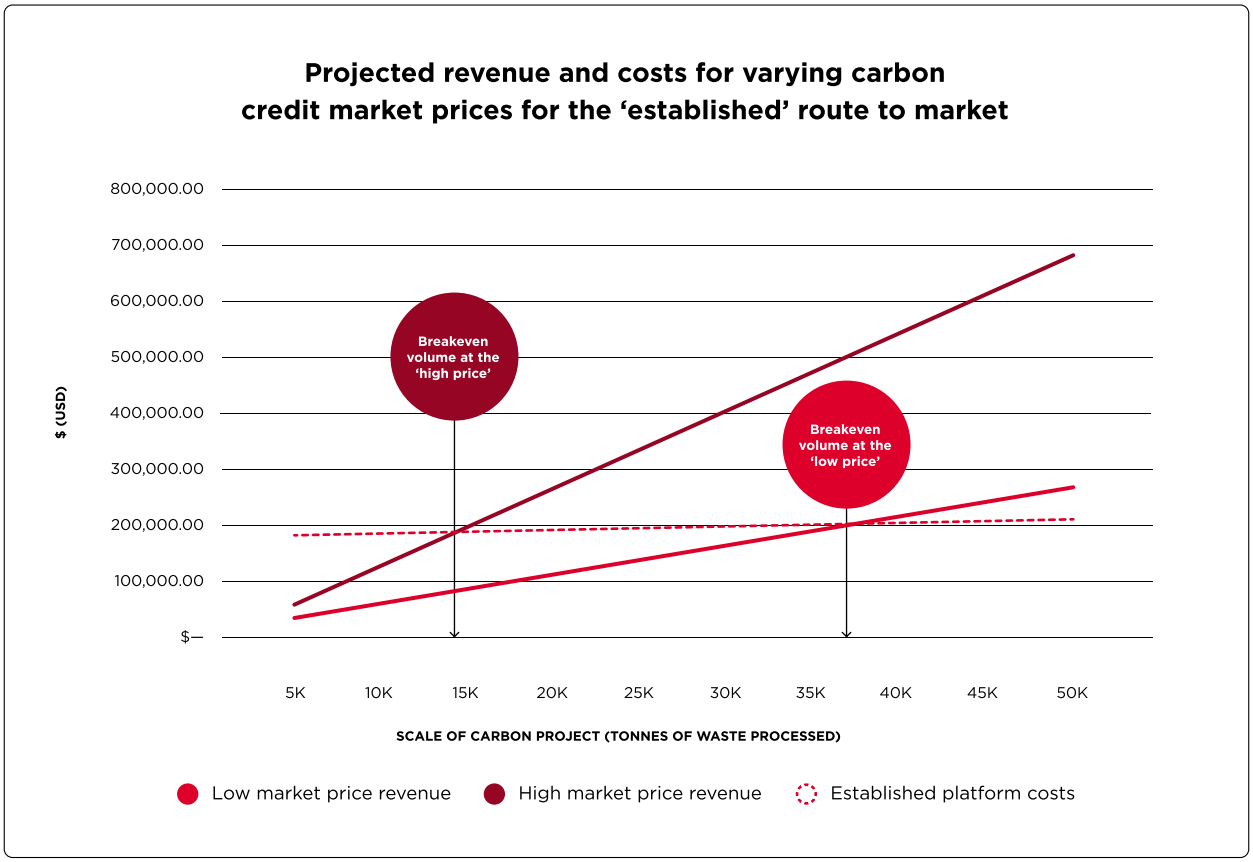
For 10,000 tonnes of waste that BioWaste Systems has planned to process, at the lower end of the estimated carbon credits per one tonne of waste processed (0.25), this project is unlikely to breakeven at the low price of $3.6 and the high price of $7.48. At the higher end of the estimated carbon credits per one tonne of waste processed (1.5), this project will breakeven both at the low price of $3.6 and the high price of $7.48.

Alternatively, BioWaste Systems would breakeven on carbon costs at:

- Approximately 18,000 tonnes of waste processed, if it could secure the high price for its credits. This would be equivalent to the 2023 average waste management carbon credit price of $7.48.
- Approximately 37,500 tonnes of waste processed, if it could secure a low price for its credits. This would be equivalent to the 2021 average waste management carbon credit price of $3.63 per credit.

Note: These calculations do not factor in the costs of implementing the carbon project itself (e.g. the cost of processing organic waste, labour, etc.), nor the costs of using brokers or intermediaries, who are likely to absorb a share of future revenues, or the time value of money. Furthermore, the price BioWaste Systems will be able to secure on their carbon credits may vary significantly depending on factors outlined in the route-to-market section.

Assumptions: The high market price assumed in this example uses the highest average annual carbon credit price between 2021-2023. The low market price assumed uses the lowest average annual carbon credit price between 2021-2023. The graph assumes that 1.5 credits are generated per tonne of waste processed.



B. **Opting for an emerging route with a revenue-share model**

No emerging platforms currently support waste management projects and there are no evident efficiency gains from adopting digital MRV practices.

Selecting between the established and emerging routes to market

No emerging platforms currently support organic waste management projects, therefore BioWaste Systems would need to issue a project under the established route to market.

Going forward, it remains unlikely that a platform such as CarbonClear would support these projects, as the emerging route to market tends to focus on carbon projects with embedded digital monitoring and verification capabilities.

Acronyms and abbreviations

A6.4ERs: Article 6 paragraph 4, emission reduction
CDM: Clean Development Mechanism
CERs: Certified Emission Reductions
CO2e: Carbon Dioxide Equivalent
dMRV: Digital Measurement, Reporting and Verification
GHG: Greenhouse Gas
IP&LCs: Indigenous Peoples and Local Communities
ITMOs: Internationally Transferred Mitigation Outcomes
NDC: Nationally Determined Contribution
PAYGO: Pay As You Go
PDD: Project Design Document
SDGs: Sustainable Development Goals
UNFCCC: United Nations Framework Convention on Climate Change
VCM: Voluntary Carbon Market
VVBs: Validation and Verification Bodies

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