

Research report

One product, four SDGs: How Sistema.bio's impact unlocks finance to reach farmers at scale

Accelerating the environmental and economic impact of biogas digesters for smallholder farmers in emerging markets

Prepared by Sistema.bio | November 2023



TRIPLELINE

Shell Foundation | 

 Transforming
Energy
Access



Document Control

Document title	One product, four SDGs: how Sistema.bio's impact unlocks finance to reach farmers at scale
Reference no.	WOR-2393J
Prepared by	Alex Eaton, Stephanie Zayed
Checked by	Clare Grist, Ekaterina Shaleva, Zsafia Kovacs
Date	November 2023

This report is the copyright of Shell Foundation and has been prepared in collaboration with Triple Line and Sistema.bio. The contents of this report may not be reproduced in whole or in part, nor passed to any other organisation or person without the specific prior written permission of Shell Foundation.

The authors used reasonable skill and care in checking the accuracy and completeness of information in the report. However, the views and information shared in this report are of the authors not those of Shell Foundation or FCDO.

Acknowledgements

This report would not have been possible without the financial and business support from the UK's Foreign and Commonwealth and Development Office and Shell Foundation.

Cover: *Sistema.bio*

Contents

Executive Summary	2
1 Introduction	4
2 Approach and methodology	5
3 Context analysis	7
3.1 SDGs underfunding and cost of inaction	7
3.2 Household biodigesters and their impact on SDGs	9
3.3 Impact-based financing mechanisms	10
4 Findings	11
4.1 Methodologies used for measuring SDG impacts	11
4.2 Monetizing impact	16
4.3 Contract structures for impact monetization	23
4.4 Challenges	24
5 Lessons and recommendations	26
6 Conclusion	28

List of abbreviations

ADALYs	Averted disability adjusted life years
DALYs	Disability adjusted life years
ERPA	Emissions Reductions Purchase Agreement
GHG	Greenhouse gas
KPI	Key performance indicator
PM	Particulate matter
RBF	Results-based financing
SDG	Sustainable Development Goal
VCM	Voluntary carbon market
VVB	Validation and Verification Body

Executive Summary

The Sustainable Development Goals (SDGs) have been established as a roadmap of goals to ensure that universal human development is achieved while the ecological integrity of the planet is maintained, but there have been challenges in raising enough dedicated funding for SDG projects. Sistema.bio is a social enterprise that aims to use a market-based approach to create progress towards the SDGs by working directly with small farms around the world. Home to over 2 billion people, small farms, of which there are estimated to be over 500 million around the world,¹ have limited access to energy, agricultural inputs and waste management systems. These issues relate directly to SDGs 3 (Health), 5 (Gender), 7 (Clean and Affordable Energy) and 13 (Climate Action), all of which are SDGs that need an increase in funding if they are to be achieved by 2030.

Sistema.bio operates in Latin America, India, and Africa and provides access to innovative biogas technology, training, and financing for smallholder farmers. This technology has measurable impacts on several SDGs and the company has developed multiple projects and investment structures that quantify these impacts in order to create an additional revenue streams. Revenues from impacts can then be used to reduce the price of technology and service to the end user, removing a key barrier to scaling impact to more farmers and their families. By the end of 2023, Sistema.bio has installed biogas technology in over 100,000 farms around the world, generating significant impacts towards the SDGs, in large part by utilizing additional revenue from impacts and using this to reduce costs for small farmers.

The report explores the current state and trends in impact-based financing to identify potential opportunities for Sistema.bio and similar social enterprises looking to increase and quantify the positive externalities² of their operations. The report builds on past research and learnings from recent pilots.

For this report, Sistema.bio sought to answer two research questions:

1. What are the main SDGs Sistema.bio's technology impacts and how can these be best measured and quantified?
2. What role do innovative financing mechanisms play in scaling up biogas solutions, and which structures are most ideal for a company like Sistema.bio?

For the first research question, the report outlines the main SDGs Sistema.bio's technology impacts (SDG 3, 5, 7 and 13) and provides recommendations for how each can be best measured and quantified.

Given that **SDG 3** has the largest reporting burdens of all of the SDGs, the following approaches are recommended:

- Use of a Gold Standard aDALY methodology, if the project has an outcome buyer for the impacts;
- If the project has carbon projects active or in its pipeline, include SDG 3 as a co-benefit or label in the certifying standard using available tools in the standards, such as the SDG Impact Tool from Gold Standard for the Global Goals to define indicators, or implement W+ standard methodology to monitor self-reported health improvements;
- If the project is not generating carbon credits, explore impact platforms such as Outcomes X to review the feasibility of selling health outcomes through there.

SDG 5 requires field level data, but is based largely on more simple surveys and observation and largely is driven by perceptions of the beneficiaries. Given that SDG 5 outcome market is not yet fully developed, the following approaches are recommended:

¹ Small farms represented as those who have two hectares or less. Lowder, Sanchez, Bertini. (2021). Which farms feed the world and has farmland become more concentrated? Accessible at: <https://doi.org/10.1016/j.worlddev.2021.105455>.

² Externalities are consequences of an activity that affects others (people, nature, air, water) without this being reflected in the cost of the goods or services involved.

- If the project has identified an outcome buyer for SDG 5 impacts, identify a methodology that aligns with requirements of outcome buyer or consider making modifications that suit the desired outcomes;
- If the project has carbon projects active or in its pipeline, include SDG 5 as a co-benefit in the certifying standard, by implementing W+ standard methodology to monitor self-reported gender equality improvements. The Verified Carbon Standard from VERRA allows projects to gain a W+ label;
- If the project is not generating carbon credits, explore platforms such as W+ or Outcomes X to review the feasibility of selling gender outcomes through these.

SDG 7, one of the better funded SDGs for energy practitioners, has more established RBF programs with well-developed rules and regulations. Therefore it is recommended that:

- Programs that have been published with RBF indicators should be identified and these indicators should be followed closely to ensure technology and monitoring methodology align;
- If the project has carbon projects active or in its pipeline, include SDG 7 as a co-benefit in the certifying standard, projects must ensure they are tracking the amount of people that are using a given technology or service.

For **SDG 13**, there are a number of independent registries where carbon reduction projects can be included to generate carbon credits for sale. Some concrete steps for choosing include:

- Confirming whether the project has a carbon credit buyer that is able to “pre-purchase” carbon credits or will buy them vintage, or as issued;
- If they are vintage sales, a project must secure financing that will cover the implementation, registration, validation and verification steps required for each methodology. It is possible that project will not generate cash for 3-4 years after starting implementation, so proper alignment with the financing is required;
- Registration should consider whether a project is aiming for voluntary carbon credits or compliance carbon credits, which will change the type and source of registration and monitoring requirements.

For the second research question, the report outlines the currently available financing mechanisms to scale up biogas solutions and discusses if and how Sistema.bio’s has leveraged them to increase its reach. These mechanisms are grouped in impact bonds, impact standards and registries including carbon credit and social impact registries, and results-based financing schemes. The type of contract structure within these mechanisms will dictate how and when the monetization of impacts will happen but each has its advantages and disadvantages depending on what a company wants to capitalise on. The contract structures discussed are a brokerage agreement, a long-term offtake agreement and traditional results-based financing grant agreement.

Over the past four years, Sistema.bio has participated in several impact-based financing mechanisms. The report summarises the main challenges of successful impact quantification and monetization and provides lessons for the company and recommendations for other organisations working in the same space. Challenges relate to questions around who will pay for the impact in the outcomes market, transaction costs, questions around what to measure, how to measure it and where to report it, uncertainty around pricing and finding the right innovative financing mechanism for impact monetization. Lessons include the fact that innovative financing mechanisms take time, the need to take extra time to align stakeholders before starting projects, the need to make impact a clear part of your core business and the fact results-based financing is based on trust and requires high internal integrity. The report also provides specific lessons for choosing an impact funding approach for each SDG (3, 5, 7 and 13).

1 Introduction

Home to over 2 billion people, small farms,³ of which there are estimated to be over 500 million around the world, have limited access to energy, agricultural inputs and waste management systems. Farmers broadly rely on biomass for cooking, have poor manure management practices, and make use of chemical fertilizers – or have access to no fertilizer at all – to grow crops. Small farmers are the most vulnerable in the face of poor indoor air quality⁴, climate change effects⁵, soil degradation,⁶ price rises in energy and fertilizer inputs⁷, and gender inequalities⁸. These issues relate to Sustainable Development Goals (SDGs) 3 (Health), 5 (Gender), 7 (Clean and Affordable Energy) and 13 (Climate Action).

Globally, however, there is a funding gap of \$4 trillion to reach the SDGs by 2030. The United Nations Conference on Trade and Development (UNCTAD) identified five constraints to close this gap, one of which is, not surprisingly, economic and financial barriers, such as those linked to high initial capital costs and high-risk perception in several SDG sectors, inefficient use of incentives and limited markets in developing countries.⁹

Innovative, flexible financing mechanisms that unlock capital for organizations that deliver on social and environmental outcomes can play an important role in addressing this barrier and closing the funding gap.¹⁰ Social enterprises well positioned to measure and quantify their impact can access the capital they need to scale by monetizing their outcomes while building the structures necessary to generate commercial income and become financially sustainable.

Sistema.bio is a leading social enterprise operating in Latin America, India, and Africa that provides access to innovative biogas technology, training and financing for smallholder farmers. It was founded in 2010 in Mexico, and today operates from four regional hubs in Mexico, Colombia, India, and Kenya. In 2020, IPE Triple Line published a report – [Demonstrating the potential of biogas to contribute to the SDGs](#) – which mapped the impact of biogas on smallholder farming and the funding mechanisms in which the technology could be expanded. Since then, Sistema.bio has tested and explored several funding models to leverage the impact the technology has on the SDGs and make it more affordable and accessible for farmers around the world. They have done that through acknowledging the importance of being able to quantify their impacts, determining where their work can be scaled, and leveraging innovative financing mechanisms to allow them to reach underserved communities around the world.

This report is the second part of the series that **explores the impact of biogas technology deployed at smallholder farms on the Sustainable Development Goals (SDGs) and consolidates Sistema.bio's recent learnings on impact-based financing structures that may enable them to accelerate the adoption of their technology by smallholder farmers.**¹¹ Building on the theory of change

³ Small farms represented as those who have two hectares or less. Lowder, Sanchez, Bertini. (2021). *Which farms feed the world and has farmland become more concentrated?* Accessible at:

<https://doi.org/10.1016/j.worlddev.2021.105455>.

⁴ IFAD (2019). *Renewable energy*. Accessible at: <https://www.ifad.org/nl/renewable-energy>.

⁵ IFAD (2019). *Ensuring environmental sustainability and building resilience to climate change*. Accessible at:

<https://www.ifad.org/en/climate-and-environment>.

⁶ Ibid.

⁷ FAO (2015). *The economic lives of smallholder farmers: An analysis based on household data from nine countries*. Accessible at: <https://www.fao.org/3/i5251e/i5251e.pdf>.

⁸ IFAD. *The Issues*. Accessible at: <https://www.ifad.org/en/issues>.

⁹ UNCTAD (2022). *Closing investment gap in global goals key to building better future*. Accessible at:

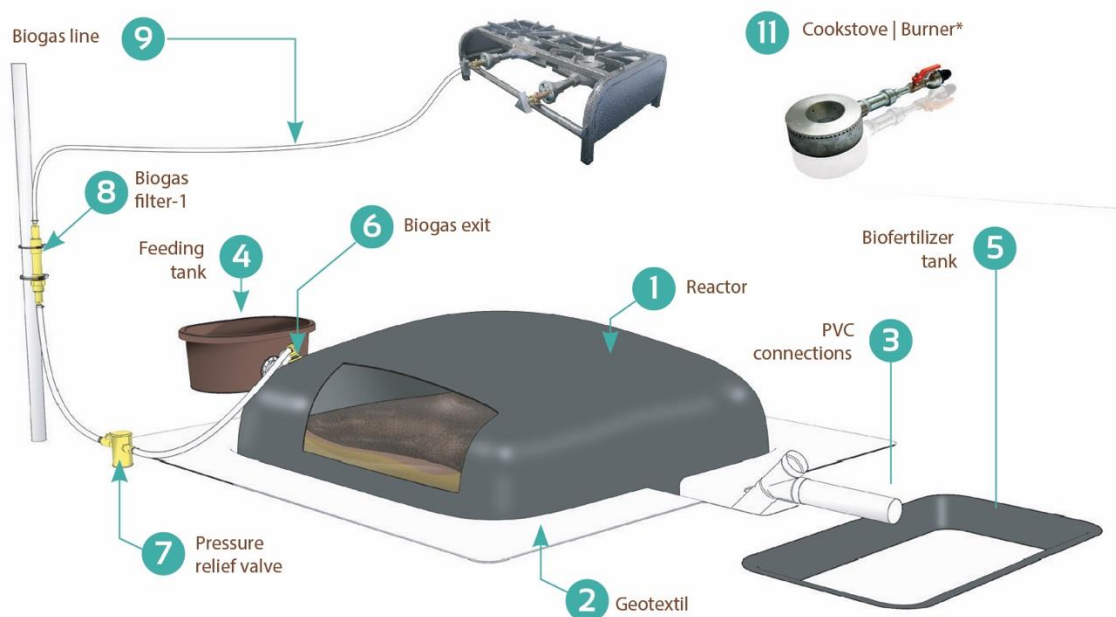
<https://unctad.org/news/closing-investment-gap-global-goals-key-building-better-future>.

¹⁰ ESMAP (2023). *Building Evidence to Unlock Impact Finance: A Field Assessment of Clean Cooking Co-benefits for Climate, Health, and Gender*. Accessible at:

<https://www.esmap.org/Building-Evidence-To-unlock-Impact-Finance-Benefits>.

¹¹ The report builds on Roots of Impact's definition of impact-linked financing, financial solutions for market-based organizations that directly link financial rewards to the achievement of positive social (and environmental) outcomes,

that was developed from the first report on household biogas technology and its SDG impacts, this research will specifically focus on SDGs 3, 5, 7 and 13, and discuss potential funding mechanisms that donors can provide in order for companies such as Sistema.bio to be able to scale their operations in biogas technology and ultimately, their contributions toward the SDGs.



- Variety of sizes**
- Easy operation & maintenance**
- Pre-Fabricated kit**
- Modular**
- Durability**

Figure 1 Sistema.biogas displaying its components and main features.

The report is structured as follows. Section 2 sets out the research questions and the approach of this learning report. Section 3 provides an overview of the main SDG impacts Sistema.bio has contributed to and the current context of the impact quantification and monetization opportunities in the social enterprise space. Section 4 discusses the key findings of the research, Section 5 shows emerging lessons and recommendations, and Section 6 provides a conclusion.

2 Approach and methodology

The purpose of this research was to understand: the (1) SDG impacts that Sistema.bio generates and the methodologies it uses to quantify these impacts, including potential barriers and gaps to these measurements, and (2) the types of financing mechanisms that can best support the scaling of its biogas technology for use by farmers around the world. The report explores the current state and trends in impact-based financing to identify potential opportunities for Sistema.bio and similar social

and use it interchangeably with impact-based financing. Accessible at : <https://www.roots-of-impact.org/wp-content/uploads/2019/01/Roots-of-Impact-BCG-Accelerating-Impact-Linked-Finance-2019.pdf>.

enterprises looking to scale the positive externalities¹² of their operations. The report builds on past research and learnings from recent pilots.

For this report, Sistema.bio sought to answer two research questions:

1. What are the main SDGs Sistema.bio’s technology impacts and how can these be best measured and quantified?
2. What role do innovative financing mechanisms play in scaling up biogas solutions, and which structures are most ideal for a company like Sistema.bio?

To answer these research questions, the following approach was undertaken:

Approach	Key activities	Outcomes
Literature review	Desk review of academic and grey literature on SDG measurement, impact quantification, and results-based financing mechanisms for social enterprises.	Summary of the SDGs and methodologies to measure them applicable to Sistema.bio. Overview of available mechanisms to monetize SDG impacts
Semi-structured interviews with internal staff, partners, and stakeholders.	Sistema.bio conducted ten semi-structured interviews to capture the perspectives, views and opinions of several experts in the social enterprise impact-based financing space. We identified stakeholders that had already worked on pilots with Sistema.bio and they recommended other key people to talk to, coming from multilateral organizations, non-profits, and social enterprises. They were selected based on their trajectory and expertise on quantifying and monetizing SDG impacts.	Overview of the perspectives, views and opinions of several experts in the social enterprise impact-based financing space
Data analysis and consolidation of recent studies, surveys and data collection at Sistema.bio.	Sistema.bio worked with 60 Decibels to conduct customer insights surveys in its three main geographies of operation, Mexico (n = 202), Kenya (n = 278), and India (n = 266). The goal of these surveys was to gather data around farmer profiles, impact outcomes and customer satisfaction. They were carried out as part of Sistema.bio’s commercial strategy between 2021 and 2022 to better understand clients’ perceived impacts of the technology and challenges.	Summary of main results and insights on SDGs 3, 5, 7 and 13

¹² Externalities are consequences of an activity that affects others (people, nature, air, water) without this being reflected in the cost of the goods or services involved.

<p>Review of current Sistema.bio pilots and projects successfully quantifying and monetizing SDGs</p>	<p>This research also reviewed Sistema.bio’s current projects that are successfully monetizing SDG outcomes, including their impact monitoring and financing structures. Specifically:</p> <ul style="list-style-type: none"> • Four carbon credit projects registered and certified on Gold Standard (SDG 13) • One health and gender impact bond in process of getting certified on Gold Standard (SDG 3 and 5) • Two energy access results-based financing projects (SDG 7) 	<p>Summary of the benefits and challenges of each mechanism and structure of the project.</p>
---	---	---

Limitations

This report only focuses on four of the many SDGs that biodigesters have been shown to have an impact on (see Section 3.1). The report does not seek to provide a fully inclusive range of impacts of biodigesters but focus on providing a deeper understanding of the SDGs that are included and the financing mechanisms available to advance these.

3 Context analysis

Before delving deeper into the key findings of this research, the report introduces the current state of challenges in progressing toward SDG 3, 5, 7 and 13, and the funding gaps or costs of inaction for each. In addition, it provides a summary of the existing body of research that demonstrates how household biodigesters contribute to the SDGs and how impact-based financing mechanisms are currently used as a driver for social enterprises to scale their operations.

3.1 Sustainable Development Goals’ challenges and cost of inaction

The Sustainable Development Goals (SDGs) evolved from the Millennium Development Goals that had been the global blueprint defined in 2000 to reduce extreme poverty around the world; in 2015 the United Nations presented the 2030 Agenda for Sustainable Development, which put forward 17 interlinked goals –the SDGs – to serve as an updated shared blueprint for sustainable development globally. Each goal has specific targets and indicators against which to measure progress ahead of 2030. Progress against these goals is varied; and geopolitical, climate and health challenges, such as the COVID-19 pandemic, have hindered the attainment of many of these targets, ultimately affecting the most vulnerable populations. Below, we describe certain issues, framed under the main SDGs this report focuses on, and the general cost of inaction of not addressing these.

3.1.1 SDG 3 – Ensure healthy lives and promote well-being for all at all ages

This SDG’s focus is on improving global health through 13 targets, including target 3.9: “By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.” One of the key indicators in this target is to measure improvements through reduction in mortality rate attributed to household air pollution. In the context of clean cooking, using biomass as a primary fuel source for cooking has well-known and documented negative effects on health. There are 2.4 billion people who continue to rely on open fires and

inefficient biomass stoves for cooking.¹³ Household air pollution, specifically, can cause health problems such as chronic respiratory disease, acute lower respiratory infections, lung cancer, stroke, and cardiovascular disease,¹⁴ and yearly leads to 3.2 million premature deaths around the world.¹⁵ While there has been progress on reducing the number of annual deaths from indoor air pollution, it is still one of the leading risk factors for mortality globally, and the cost of not achieving universal clean cooking on health is calculated to amount to US\$1.4 trillion, considering the costs associated with household air pollution health conditions, burns suffered by household members cooking with biomass, and chronic or acute physical ailments that can happen while collection fuel.¹⁶

3.1.2 SDG 5 – Achieve gender quality and empower all women and girls

This SDG's focus is on achieving gender equality through six targets, including target 5.4: "Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate." Women in farms typically bear disproportionate responsibility for unpaid care work at home,¹⁷ and rural women's tasks can add up to 16 hours every day.¹⁸ Generally, women are responsible for cooking in the household, which makes them more susceptible to the negative health effects of using biomass in open fires or inefficient cookstoves. Cooking with biomass – as opposed to cleaner fuel sources – also takes up more time for preparing the firewood or charcoal, and cleaning utensils which end up dirty and covered in soot. In addition, in rural areas women usually are responsible for procuring firewood (and water), a task which can take up to four hours every day.¹⁹ The cost of not achieving universal clean cooking on gender is calculated to amount to US\$0.8 trillion, considering time poverty and other disproportionate effects that cooking with dirty fuels have on women and girls.²⁰

3.1.3 SDG 7 – Ensure access to affordable, reliable, sustainable and modern energy for all

This SDG focuses on access, affordability, and sustainability of energy services, and is framed under five targets, one of which is 7.1: By 2030, ensure universal access to affordable, reliable and modern energy services. Cooking, lighting and heating are the most common energy needs of rural households, yet 2.4 billion people lack access to clean cooking fuels and technology, and while between 2010 and 2020 the global rate of access to clean cooking increased by 1% every year on average, there are regions in the world where there are actually more people without access to clean cooking, as gains in percentage of people gaining access do not keep up with population growth.²¹ Only about 76% of the population is projected to have access to clean cooking fuels and technologies by 2030. Research suggests that US\$4.5 billion is needed to achieve universal access of clean cooking annually, yet annual commitments average around US\$130 million.²² Overall, the cost of

¹³ ESMAP (2022). *Tracking SDG 7: The Energy Progress Report 2022*. Accessible at :

https://trackingsdg7.esmap.org/data/files/download-documents/sdg7-report2022-full_report.pdf.

¹⁴ ESMAP. 2020. *The State of Access to Modern Energy Cooking Services*. Accessible at:

<https://documents.worldbank.org/en/publication/documents-reports/documentdetail/937141600195758792/the-state-of-access-to-modern-energy-cooking-services>.

¹⁵ WHO (2022). *Household air pollution*. Accessible at: <https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health>.

¹⁶ ESMAP (2020). *The State of Access to Modern Energy Cooking Services*. Accessible at:

<https://documents.worldbank.org/en/publication/documents-reports/documentdetail/937141600195758792/the-state-of-access-to-modern-energy-cooking-services>.

¹⁷ UN Women (2015). *Progress of the world's women 2015-2016*, Available at:

http://progress.unwomen.org/en/2015/pdf/UNW_progressreport.pdf.

¹⁸ World Bank, FAO & IFAD (2009). *Gender in agriculture sourcebook*. Washington, DC. Accessible at:

<https://documents1.worldbank.org/curated/en/799571468340869508/pdf/461620PUB0Box3101OFFICIAL0USE0ONLY1.pdf>.

¹⁹ FAO (2011). *The State of Food and Agriculture*. Accessible at: <https://www.fao.org/3/i2050e/i2050e00.htm>.

²⁰ ESMAP (2020). *The State of Access to Modern Energy Cooking Services*. Accessible at:

<https://documents.worldbank.org/en/publication/documents-reports/documentdetail/937141600195758792/the-state-of-access-to-modern-energy-cooking-services>.

²¹ ESMAP (2022). *Tracking SDG 7: The Energy Progress Report 2022*. Accessible at :

https://trackingsdg7.esmap.org/data/files/download-documents/sdg7-report2022-full_report.pdf

²² CPI (2021). *Engizng finance*. Accessible at: <https://www.seforall.org/system/files/2021-10/EF-2021-UL-SEforALL.pdf>.

inaction of not achieving universal clean cooking for all is estimated at \$2.4 trillion (this figure comes from the negative externalities on health, gender and climate that are presented in sections 3.1.1, 3.1.2, and 3.1.4).

3.1.4 SDG 13 – Take urgent action to combat climate change and its impacts

This SDG places a focus on the challenge of combatting climate change focusing on greenhouse gas emissions reduction, resilience and adaptivity, and education. Agriculture is responsible for over a quarter of greenhouse gas emissions, and specifically, poor manure management is a key contributor to agriculture-related GHG emissions, contributing 1.8Gt of CO₂ emissions annually.²³ On the other hand, GHG emissions from unsustainable harvesting and incomplete combustion of wood fuels for cooking amount to a gigaton of CO₂ per year.²⁴ The cost of inaction of not achieving universal clean cooking on climate is valued at US\$0.2 trillion, but more broadly speaking, the cost of inaction of not US\$178 trillion over the next 50 years.²⁵ In 2019 and 2020, about US\$632 billion per year was dedicated to global climate finance, but this annual average is not sufficient to limit global warming to well below 2 °C above preindustrial levels. To meet climate action goals to avoid catastrophic events, the world needs an increase of at least 590% (to US\$4.35 trillion) in annual climate finance by 2030.²⁶

3.2 Household biodigesters and their impact on SDGs

When a biodigester unit is installed in a household, it produces three key outputs: (1) biogas, a clean and renewable energy, (2) biofertilizer, a soil amendment and (3) a waste treatment system. The following benefits are derived from using the technology: biogas displaces existing energy costs, time spent collecting firewood and reduces health risks for women who cook with biomass. Second, the biofertilizer improves nutrients-access to plants and soils, reduces costs and improves the health of soils, damaged by previous application of chemical fertilizers. Finally, waste treatment reduces the greenhouse gases from manure left in open space whilst also reducing odours, flies, and water contamination. Figure 2 outlines the impact pathways that household biodigesters have on several SDGs:²⁷

²³ Ahmed, Justin, et al. (2020). *Agriculture and Climate Change: Reducing Emissions through Improved Farming Practices*. McKinsey. Accessible at: <https://www.mckinsey.com/~/media/mckinsey/industries/agriculture/our%20insights/reducing%20agriculture%20emissions%20through%20improved%20farming%20practices/agriculture-and-climate-change.pdf>.

²⁴ Bailis, R., D. Broekhoff, and C.M. Lee, (2016). Supply and Sustainability of Carbon Offsets and Alternative Fuels for International Aviation. Stockholm Environment Institute Working Paper 2016-03. Accessible at : http://assets.wwf.org.uk/downloads/sei_wp_2016_03_icao_aviation_offsets_biofuels.pdf.

²⁵ Deloitte (2022). *The turning point*. Accessible at: <https://www.deloitte.com/global/en/issues/climate/global-turning-point.html>.

²⁶ CPI (2021). *Global Landscape of Climate Finance 2021*. Accessible at: <https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2021/>.

²⁷ The report notes there are other relevant SDGs which are targeted by using biodigesters

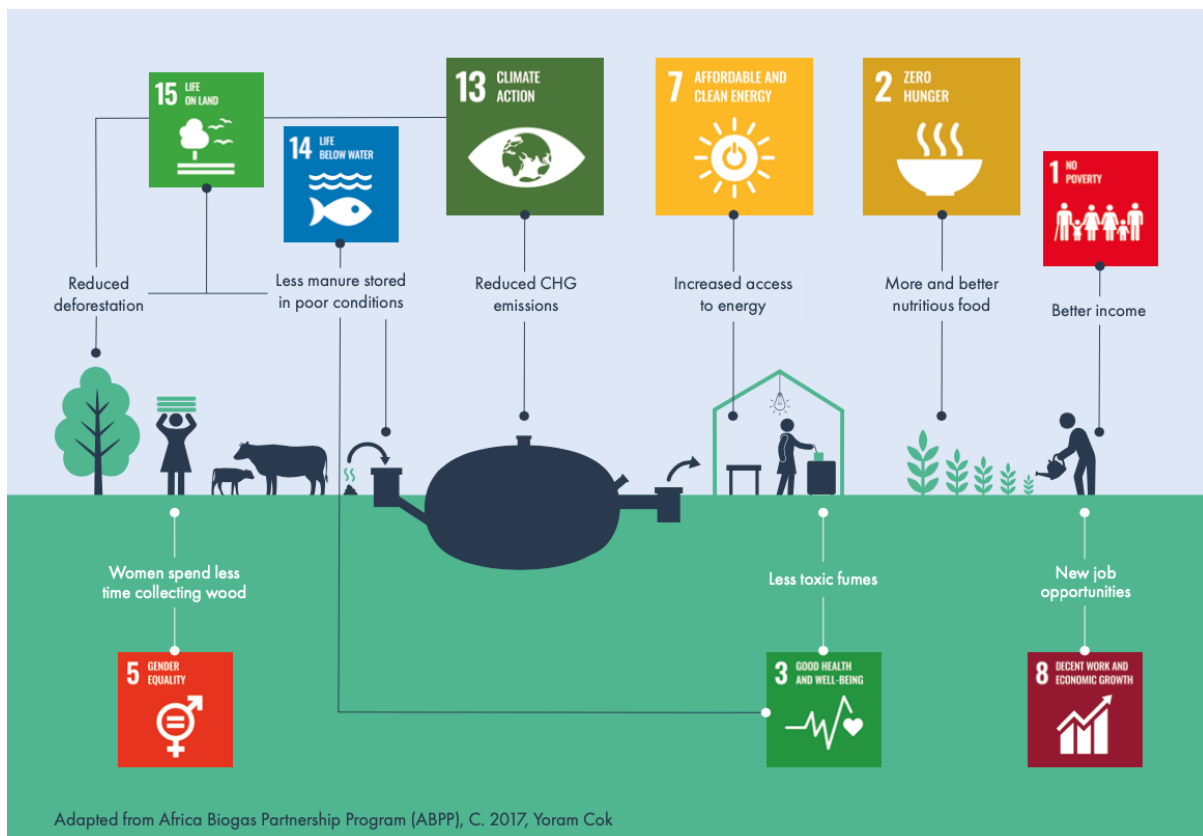


Figure 2 Household biogas's contributions to the SDGs, from IPE Action Brief on 'Demonstrating the Contribution of Biogas to the Sustainable Development Goals (SDGs)'

Other research has also demonstrated the positive impact of household biogas on the SDGs. For example, the World Bank published a report in 2019²⁸ which identified the main impacts household biogas could have, specifically health (SDG 3), economic savings (SDG 1), climate benefits (SDG 13), and gender aspects (SDG 5). In addition, another report²⁹ commissioned by Gold Standard, describes the monetized 'shared value' (co-benefits) from improved cookstove solutions (ICS) projects within the Gold Standard Foundation (GSF) portfolio, and maps these to SDGs, specifically SDGs 1, 3, 4, 5, 7, 8, 13 and 15. It shows that biogas projects in particular have a larger average net benefit per project than cookstove projects, largely driven by health impacts and livelihood benefits (cost and time savings).

After outlining the current state of SDG underfunding and how household biogas can contribute to the achievement of certain SDGs, the report outlines how impact-based financing mechanisms are currently used as a driver for social enterprises working on biogas technology to scale their operations and contributions toward the SDGs.

3.3 Impact-based financing mechanisms

Social enterprises and similar organizations have a mission to make progress on the SDGs, typically by designing products and services catered towards customers that are hard to reach, are at the bottom of the pyramid, and may not be included in the financial system. Often, these products and services have positive externalities on individuals, the environment, and societies. Impact-based financing mechanisms are instruments that value these externalities and pay social enterprises for generating them through their services. However, oftentimes, while the social and environmental

²⁸ Freeman, Katie Kennedy; Seppala, Juha Antti Kalevi. (2019). The Power of Dung: Lessons Learned from On-Farm Biogas Programs in Africa (English). Washington, D.C.: World Bank Group. Accessible at : <http://documents.worldbank.org/curated/en/468451557843529960/The-Power-of-Dung-Lessons-Learned-from-On-Farm-Biogas-Programs-in-Africa>.

²⁹ Vivid economics (2019). Valuating the benefits of improved cooking solutions'. Available here: https://www.goldstandard.org/sites/default/files/vivid_economics_ics_valuation_june2019.pdf.

value of these products and services is big, the cost of private funding may outweigh the monetary return, and thus, a key question that social enterprises face is: “Can they generate enough revenue and attract enough investment to cover their costs and grow their activities?”³⁰

Impact-based financing mechanisms allow social enterprises to get funding or investment from governments, development finance institutions, foundations, impact investors, and other stakeholders for the social and environmental impacts they generate.^{31,32} This learning report dives into some of the available mechanisms in Section 4.2.

It is important to note that there are challenges to monetizing impact for social enterprises, for example (1) internal resources required to build and maintain a rigorous, well-designed monitoring and evaluation framework that allows for regular impact measurement, (2) legal and accounting capacity to report on impact-based financing mechanisms, and (3) internal time and resources needed to source financial institutions willing to engage in innovative impact-linked financing mechanisms. All these efforts can be very costly, take time and require specialised resources. These challenges are further reviewed in Section 4.3.

4 Findings

4.1 Methodologies used for measuring SDG impacts

Based on the literature review, stakeholder interviews and consolidation of insights from recent pilots that were conducted as part of this research, below is a summary of Sistema.bio’s impacts and specific methodologies used to measure impact within the household biogas space. This section also provides lessons learned on the benefits and limitations of use of impact measurement methodologies.

4.1.1 SDG 3

There are several research efforts that show how smoke in the household negatively affects health, more specifically women and children who are more exposed to cooking with firewood or charcoal, with relevant work published in Mexico, Kenya and India, where Sistema.bio operates.^{33,34,35,36} PM 2.5³⁷ densities in air quality measurements combined with time exposure of individuals to it have a direct correlation with the resulting health impacts, measured in disability adjusted life years (DALYs).³⁸

When households adopt biogas, they will typically displace fuel sources that create indoor air pollution, reducing smoke in their home and therefore reducing the levels of PM 2.5. If the baseline DALYs linked to indoor air pollution and the PM 2.5 concentration reduction can be measured, then a measure of averted disability adjusted life years (ADALYs) can be used to show the impact of using

³⁰ Bugg-Levine et al. (2012). *A New Approach to Funding Social Enterprises*. Accessible at: <https://hbr.org/2012/01/a-new-approach-to-funding-social-enterprises>.

³¹ Ibid.

³² Joffree, L. (2022). *Better terms, better impact – but can impact-linked finance overcome a chicken-and-egg situation?*. Accessible at: <https://www.pioneerspost.com/news-views/20220322/better-terms-better-impact-can-impact-linked-finance-overcome-chicken-and-egg>.

³³ Dakua et al (2022). *Exposure to indoor air pollution and the cognitive functioning of elderly rural women: a cross-sectional study using LASI data, India*. Accessible at: <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-022-14749-7>.

³⁴ Indoor Air (2011). *Exposure to indoor air pollutants (polycyclic aromatic hydrocarbons, toluene, benzene) in Mexican indigenous women*. Accessible at: https://www.researchgate.net/publication/51707526_Exposure_to_indoor_air_pollutants_polycyclic_aromatic_hydrocarbons_toluene_benzene_in_Mexican_indigenous_women.

³⁵ Batres et al (2011). *Indoor Air Pollution in Mexico*. Accessible at: https://www.researchgate.net/publication/221917200_Indoor_Air_Pollution_in_Mexico.

³⁶ Dida et al (2022). *Factors predisposing women and children to indoor air pollution in rural villages, Western Kenya*. Accessible at: <https://archpublichealth.biomedcentral.com/articles/10.1186/s13690-022-00791-9>.

³⁷ Particulate matter of 2.5 micrometers; exposure to this can affect both the lungs and the heart.

³⁸ One DALY represents the loss of the equivalent of one year of full health

biogas. This metric comprises the amount of healthy life saved due to an intervention (including time spent free of illness and avoided premature death).³⁹

This impact value depends on three main variables, (1) the baseline fuel type;⁴⁰ (2) the degree to which a household displaces this baseline fuel,⁴¹ and (3) the emissions associated with the technology used.⁴²

There are a few methodologies or approaches to measure health impacts that derive from using biodigesters. The World Bank's Energy Sector Management Assistance Program (ESMAP) conducted a methodology review to quantify health benefits from clean cooking interventions. The study found the Gold Standard's Methodology for ADALYs⁴³ is the first publicly available, transparent, and certified methodology developed to quantify – and certify – the health benefits of clean cooking interventions.

The Women Organizing for Change in Agriculture and Natural Resource Management (WOCAN), also has a methodology to measure and certify health impacts from interventions, through its own standard, W+, which “is the first women-specific standard that measures women's empowerment in a transparent and quantifiable manner, gives a monetary value to results and creates a new channel to direct financial resources to women”.⁴⁴ With a primary focus on women's health, this methodology relies on self-reported improvements in health comparing responses from users of clean cooking technologies versus non-users.⁴⁵

Sistema.bio has used Gold Standard's Methodology for Averted Mortality and Disability Adjusted Life Years from Cleaner Household Air to develop a Clean Impact Bond (see **Case Study 1** in Section 4.2.2). The methodology requires using the HAPIT tool, which estimates aDALYs by modelling the baseline health burdens associated with PM 2.5 exposure and includes the health risks of developing lung cancer, ischemic heart disease, stroke, chronic obstructive pulmonary disease, and acute lower respiratory infection. The company decided to use the methodology because it is reliable and complete, and its reporting requirements overlap with the Gold Standard methodology Sistema.bio uses to quantify emissions reductions, allowing both carbon credits and health impact certificates (in the form of aDALYs) to be in the same reporting cycle.

However, there is a large monitoring and survey cost to correctly implement Gold Standard's health methodology, as projects need to measure PM 2.5 densities in a sample of households and this involves specialized equipment and enumerators. In addition, the methodology requires multiple rounds of surveys. For projects that do not intend to certify health impacts through Gold Standard and that have the certainty that they can commercialise them separately, this is a large burden that may not pay back.

The market for SDG 3 impacts alone is not as developed as the market for SDG 13 impacts (as carbon credits), and thus in many cases the high costs associated with the methodologies described above are not sustainable.

4.1.2 SDG 5

The use of a biodigester to promote gender equality and female empowerment has been evidenced by Sistema.bio and other organizations (HiVOS, SNV)⁴⁶ in the biogas field, mainly because the use of

³⁹ IFC (2023). Clean Impact Bond: Mobilizing Finance for Clean Cooking. Accessible at: https://www.ifc.org/wps/wcm/connect/publications_ext_content/ifc_external_publication_site/publications_listing_page/clean-impact-bond-mobilizing-finance-for-clean-cooking.

⁴⁰ Households cooking primarily with biomass will have a higher baseline of indoor air pollution as compared to households cooking with LPG or electricity.

⁴¹ Typically households will engage in stove stacking, which refers to using a combination of multiple fuel sources and stove types for cooking.

⁴² In this case, a biogas stove has effectively zero PM2.5 emissions, but some improved cooking solutions still have some emissions.

⁴³ Gold Standard (2017). Methodology for Averted Mortality and Disability Adjusted Life Years (aDALYs) from Cleaner Household Air. Available at: <https://globalgoals.goldstandard.org/standards/PRE-GS4GG-Energy/401.3-adalys-cleaner-household-air.pdf>.

⁴⁴ <https://www.wocan.org/learning/the-wplus-standard/>.

⁴⁵ WOCAN (2015). W+ Standard: Financing women's organizations and entrepreneurs using climate finance and markets. Available at: <https://www.wplus.org/about-the-w-standard/w-presentation-2022/>.

⁴⁶ HiVOS: Human institute for Development Cooperation. SNV: Netherlands Development Organisation.

biogas for cooking can lead to time savings derived from fuel procurement, building fires, cooking, and cleaning pots and utensils. These benefits typically favour women, who disproportionately carry the burden of domestic tasks in the household. Measuring time savings, however, is not in itself sufficient to expand women's empowerment, but improving women's agency to decide what to do with the time savings is.⁴⁷

There is a gap in methodologies and approaches that aim at measuring how biogas interventions create improvements for women, because it is not a straightforward measurement as some others may be. The most notable exception is the WOCAN designed W+ Standard that measures women's empowerment, focusing in six dimensions: (1) time savings, (2) income and assets, (3) education and knowledge, (4) leadership, (5) food security, and (6) health. The W+ is a standard biogas projects could use to measure impacts and monetize them.

Gold Standard also published 'gender-responsive guidelines'⁴⁸ that projects seeking to generate Certified SDG ImpactsTM⁴⁹ must abide by. This is not a methodology to measure impact, but it gives project developers a framework for the type of consultations, data, and reports they must have to claim Certified SDG Impacts linked to gender.

Combining all these approaches, Sistema.bio and its partners co-created a methodology that used elements of the W+ methodology and Gold Standard's Gender Equality Guidelines & Requirements, together with learnings from past research to quantify the impact on women for its Clean Impact Bond (see **Case Study 1** in Section 4.2).⁵⁰ The resulting methodology uses a comprehensive household study to determine time savings and net quality hours gained by women from the use of biogas. The stakeholders in this bond decided to focus on time use as the pathway to measure a specific dimension of gender benefits. Using survey data, this led to "Quality Hours" as the primary measurable outcome, defined as the hours per week spent by the primary cook on income-generating activities, producing goods they would otherwise buy, educational activity, and rest and leisure.⁵¹

This methodology is comprehensive and robust, but implementing it may be prohibitive for projects that have not secured financing for these impacts.

4.1.3 SDG 7

Biodigesters contribute to clean, just and sustainable energy access by providing (1) increased access to clean energy, including clean cooking, (2) increased affordability of energy by creating a new energy source from an existing waste stream, and (3) improving reliability and sustainability of energy access by supporting an on-site source of energy that uses readily available inputs.⁵² There are multiple approaches to measure and report on increased energy access, affordability, reliability and sustainability; the United Nations defined five targets with specific indicators to measure progress against this goal. The most relevant in the context of household biodigesters and similar clean energy and clean cooking community initiatives is Target 7.1 By 2030, ensure universal access to affordable, reliable and modern energy services, and its indicator 7.1.2, Proportion of population with primary reliance on clean fuels and technology, which is broadly the indicator used by established results-based financing (RBF) programs lined to SDG 7.

⁴⁷ Building Evidence to Unlock Impact Finance: A Field Assessment of Clean Cooking Co-benefits for Climate, Health, and Gender (English). Washington, D.C. : World Bank Group.
<http://documents.worldbank.org/curated/en/099051123130561434/P17423201c1bc105d0a4da0803634916bb0>.

⁴⁸ Gold Standard (2017). Gold Standard Gender Equality Guidelines & Requirements. Available at:
https://www.goldstandard.org/sites/default/files/documents/gs_gender_equality_guidelines_consultation.pdf.

⁴⁹ Gold Standard (2022). Certified SDG impacts for result-based finance. Available at:
<https://www.goldstandard.org/impact-quantification/certified-sdg-impacts>.

⁵⁰ IFC (2023). Clean Impact Bond: Mobilizing Finance for Clean Cooking. Accessible at :
https://www.ifc.org/wps/wcm/connect/publications_ext_content/ifc_external_publication_site/publications_listing_page/clean-impact-bond-mobilizing-finance-for-clean-cooking.

⁵¹ Ibid.

⁵² IPE Triple Line (2020). *Demonstrating the potential of biogas to contribute to the SDGs*. Accessible at:
<https://shellfoundation.org/learning/demonstrating-the-potential-of-biogas-to-contribute-to-the-sdgs/>

Specifically, Sistema.bio has participated in two SDG 7 RBF programs: one through RVO (Netherlands Enterprise Agency)⁵³ and another as part of the AECF REACT (Africa Enterprise Challenge Fund's Renewable Energy and Adaption to Climate Technologies) program. Both offer payment upon third-party verifiable results on access to reliable and clean energy for cooking in Kenyan farming households, measured as the number of people that have newly acquired clean energy access for clean cooking. Access is defined as a member of a household that has new access to clean cooking technology. Specifically, AECF has established a methodology to verify number of households with new access⁵⁴ and based on it, will pay entities based on a previously established contract.

Biogas projects that seek to show their contribution towards SDG 7 should track the number of people in each household served and ensure that biogas units are properly sized for the number of people to be able to meet most of their cooking needs. Sistema.bio calculates its SDG 7 impact in all projects by documenting the number of people in the household, as reported by the end user. In addition, access should also include adoption, by continuing to monitor households' long-term adoption of the clean fuel.

4.1.4 SDG 13

The use of biodigesters is an effective and recognised mechanism to reduce greenhouse gas (GHG) emissions⁵⁵ that are present in the baseline conditions of most farms that raise cattle, dairy cows, pigs and other livestock. In baseline conditions, animal waste is a well-documented source of methane emissions, a powerful GHG. The baseline energy use of the farm and household is also a GHG emissions source, where biomass fuels have high emissions profiles, but even "clean" fuels such as liquified petroleum gas have some associated GHG emissions. Finally, the use chemical fertilisers and some farming practices creates additional GHG emissions.

Biogas technology receives the fresh manure and organic waste from small farms, and methane that would have otherwise been emitted into the atmosphere is captured inside the biodigester. This methane gas is "destroyed" when it is burned, releasing energy which can be used for cooking, heating or running engines. This eliminates the warming potential of methane, while also creating a clean energy source. This displaces other sources of fuel and further reduces the emissions that would have otherwise been released from these fuels. Finally, once the methane has been extracted, the resulting effluent from biodigesters is a powerful organic fertiliser that reduces the use of chemical fertilisers and sinks carbon into the soil.

There are several methodologies to quantify emissions reductions, such as an original series of *Clean Development Mechanism* methodologies from the Intergovernmental Panel on Climate Change. Biogas projects that will certify emissions reductions through Gold Standard have historically used *the TPDDTEC v.3.1 methodology*⁵⁶, which includes an Annex on measuring emissions reductions derived from improved manure management. On October 2022, Gold Standard released a new methodology for project activities that recover and use methane from manure and agricultural waste, *Methodology for animal manure management and biogas use for thermal energy generation v.1.1*.⁵⁷ There are other methodologies to capture the environmental impact of the use of household biodigesters, such as CDM methodologies 'AMS I.E: Switch from non-renewable biomass for thermal applications by the user - Version 12.0', and AMS-III.D.: *Methane recovery in animal manure management systems -- Version 21.0*.

⁵³ NEA (2021). *Increasing access to biogas*. Accessible at: <https://projects.rvo.nl/project/nl-kvk-27378529-sdg7210024>.

⁵⁴ The methodology is based on receiving a full client database from the entity, conducting a phone audit to verify energy access (includes questions to verify if the person is a customer, time for which they've had access, whether they continue to have access, etc.) Based on this initial audit they conduct in-person visits to verify cases where the report does not match the phone audit.

⁵⁵ Project Drawdown (2021). *Biogas for Cooking*. Accessible at: <https://www.drawdown.org/solutions/biogas-for-cooking>.

⁵⁶ Gold Standard (2021). *Technologies and Practices to Displace Decentralized Thermal Energy Consumption v.3.1 methodology*. Available at: https://globalgoals.goldstandard.org/standards/407_V3.1_EE_ICs_Technologies-and-Practices-to-Displace-Decentralized-Thermal-Energy-TPDDTECConsumption-.pdf.

⁵⁷ See: <https://globalgoals.goldstandard.org/433-ee-ics-methodology-for-animal-waste-managment-and-biogas-application/>.

Sistema.bio previously used Gold Standard’s TPDDTEC V.3.1 and is now transitioning to Gold Standard’s new Methodology for animal manure management.

The table below summarizes all methodologies described above including on how to measure SDG 3,5, 7 and 13 impacts, and when applicable, the results Sistema.bio has quantified using these in its own portfolio:

Table 1: Summary of Methodologies and Sistema.bio impact

SDG	Methodologies / frameworks applicable to biodigester use ⁵⁸	Sistema.bio impact work
SDG 3 Good Health and Wellbeing Target: 3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	Methodology for Averted Mortality and Disability Adjusted Life Years (ADALYs) from Cleaner Household Air–Gold Standard	<ul style="list-style-type: none"> Reductions in exposure to PM2.5 associated with biogas adoption was estimated to generate 578 ADALYs per year for every 10,000 homes with a functioning biodigester⁵⁹
	W+ questionnaire – Health domain	<ul style="list-style-type: none"> Sistema.bio has not used this methodology.
	Self-reported impacts	<ul style="list-style-type: none"> In Mexico, when prompted to describe how their quality of life had changed since installing a digester, 14% households reported it improved due to less smoke emissions in the home⁶⁰. In India 46% households reported air quality inside homes improved.⁶¹ In Kenya, 55% of households said their own or family’s health improved since having a Sistema.bio digester.⁶²
SDG 5 Gender equality and women’s empowerment Target: 5.4 Recognize and value unpaid care and domestic work through the provision of public services, infrastructure	Self-reported impacts	<ul style="list-style-type: none"> In Kenya, 89% of female respondents that time spent on cooking each day decreased since starting using the biodigester, 99% of which reported improved quality of life because of the biodigester.⁶³
	Clean Impact Bond methodology - (1) time savings on cooking and fuel-related activities and	<ul style="list-style-type: none"> Women using biodigesters spend 99 minutes less, on average, than women not using

⁵⁸ Some of these, specifically, self-reported impacts are not methodologies per se but rather avenues in which Sistema.bio has been able to evaluate its impact on SDGs. Further work on indicator and methodology refinement is possible to avoid inevitable biases that may come from self-reported data and assessments.

⁵⁹ Building Evidence to Unlock Impact Finance: A Field Assessment of Clean Cooking Co-benefits for Climate, Health, and Gender (English). Washington, D.C. : World Bank Group. <http://documents.worldbank.org/curated/en/099051123130561434/P17423201c1bc105d0a4da0803634916bb0>

⁶⁰ 60 Decibels Farmer Insights Sistema.bio Mexico (2021).

⁶¹ 60 Decibels Farmer Insights Sistema.bio India (2021).

⁶² 60 Decibels Farmer Insights Sistema.bio Kenya (2022).

⁶³ Ibid.

and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate	(2) increase in the time female cooks spend on productive tasks and/or rest and leisure due to use of biodigester	biodigesters on cooking and fuel-related activities. ⁶⁴ <ul style="list-style-type: none"> Women using biodigesters gained 47 minutes on average on Quality Time per day.⁶⁵
	W+ - 6 domains	<ul style="list-style-type: none"> Sistema.bio has not explicitly used this methodology⁶⁶.
<p>SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all</p> <p>Target:</p> <p>7.1</p> <p>By 2030, ensure universal access to affordable, reliable and modern energy services</p> <p>7.2</p> <p>By 2030, increase substantially the share of renewable energy in the global energy mix</p>	<p>Indicators used:</p> <ul style="list-style-type: none"> Access to clean energy Affordability Reliability 	<ul style="list-style-type: none"> Access to clean, renewable energy for 319,000 people⁶⁷
<p>SDG 13: Climate Action</p> <p>Target 13.2 Integrate climate change measures into national policies, strategies and planning</p>	<ul style="list-style-type: none"> Methodology for animal manure management and biogas use for thermal energy generation v.1.1⁶⁸ 	<ul style="list-style-type: none"> Biodigesters reduce between 9 and 70 tCO2e on average, depending on geography, units' size, and baseline conditions at the farm.⁶⁹

4.2 Impact-linked mechanisms to unlock finance

4.2.1 Mechanisms

Sistema.bio conducted a literature review of the mechanisms currently available to monetize the impacts identified in previous sections. This section summarizes each mechanism, if Sistema.bio has leveraged them, and how.

⁶⁴ IFC. (2023). *Clean Impact Bond: Mobilizing Finance for Clean Cooking*. Accessible at: <https://www.ifc.org/en/insights-reports/2023/clean-impact-bond-mobilizing-finance-for-clean-cooking>.

⁶⁵ Ibid.

⁶⁶ This methodology, however, informed the methodology used in the Clean Impact Bond.

⁶⁷ Sistema.bio (2022). Annual Report. Accessible at: <https://sistema.bio/wp-content/uploads/2022-Sistema.bio-Annual-Report.pdf>.

⁶⁸ This methodology was released in October 2022. Sistema.bio projects registered before that date are using the previous methodology Gold Standard had approved for household biodigesters, 'Technologies and Practices to Displace Decentralized Thermal Energy Consumption v.3.1'.

⁶⁹ Projects available in Gold Standard's impact registry: <https://registry.goldstandard.org/projects/details/3160>; <https://registry.goldstandard.org/projects/details/3415>; <https://registry.goldstandard.org/projects/details/3726>.

4.2.2 Impact bonds

An impact bond is a results-based, financial contract between an investor, an outcome funder and a service provider to deliver social or environmental services.⁷⁰ According to the Brookings Institute, impact bonds can be seen as a series of contractual agreements which ensure payment for social or environmental outcomes achieved; and up-front repayable finance provided to the service provider by a third party, the repayment of which is (at least partially) conditional on achieving specified outcomes.⁷¹

Case Study 1

Clean Impact Bond

SDGs: 3, 5

What: Sistema.bio is participating in an impact bond designed to mobilize finance to support the scaling up of the production of clean cooking solutions by quantifying and selling health and gender co-benefits to outcome buyers. The bond is designed to develop a replicable approach to monetize SDG 3 and SDG 5 impacts in a similar way in which SDG 13 (carbon credits) impacts are sold in a market, as these impacts are being quantified, audited and certified through Gold Standard and following a similar approach to the one taken to issue carbon credits.

Who: Technology provider (Sistema.bio), investor who provides upfront capital for the intervention (BIX Capital); a secure outcome buyer who will pay for improvements in averted ill health and mortality and increase in quality time saved for women (Osprey Foundation); impact certifier (Gold Standard), independent auditor (CarbonCheck), among several others.

Methodologies:

- SDG 3: Gold Standard's Methodology to Estimate and Verify Averted Mortality and Disability Adjusted Life Years (ADALYs) from Cleaner Household Air
- SDG 5: Own project methodology

Price per impact: SDG 3: \$1,816/aDALY; SDG 5 \$1 per added Quality Hour, maximized at \$500,000

Impact on Sistema.bio operations: Revenue from SDG 3 and 5 impacts is meant to allow the company. To decrease the price of the technology to reach farmers at the bottom of the pyramid.

Challenges: High transaction costs to identify methodologies and conduct surveys to quantify impact; unclear market for health and gender impacts.

Generally, the investor provides upfront capital to a project developer, who implements the intervention that aims to generate pre-defined outcomes. Once these outcomes are achieved, the outcome funder or buyers pays the investor back, with a premium or interest. The investor gets its return on investment while the outcome buyer only pays once the impact is generated.

Impact bonds are attractive because they ensure public or philanthropic funding is funnelled only into interventions that demonstrate measurable positive results through previously defined performance measures. The risk of this funding is transferred to the investor rather than the funder. Some of the

⁷⁰ GPRBA (2020). *Impact Bonds Primer*. Accessible at: <https://www.gprba.org/impact-bonds-primer>.

⁷¹ Gustafsson-Wright, E., Paynter, E. (2023). *Social and development impact bonds by the numbers: July 2023*. Accessible at: <https://www.brookings.edu/research/social-and-development-impact-bonds-by-the-numbers>.

advantages of this mechanism include (1) transparency, as they allow for verification of the quality of the intervention, (2) shifting the focus to the outcomes rather than the input or outputs, and (3) providing upfront capital to implement the intervention. The market for impact bonds has been growing, with over US\$462 million invested in 239 impact bonds by mid- 2022⁷², but only 36 of these have been in the health sector and 4 in the environment sector.⁷³

4.2.3 Impact standards and registries

Another mechanism to monetize impacts are registries that standardize data to improve outcomes. They are based on consistent, structured data being reported into a centralized database according to strict protocols. Data can be self-reported, through surveys,⁷⁴ and more recently, using digital monitoring, reporting, and verifying mechanisms. Registries typically have a marketplace that allows project developers sell the certified impacts. Similarly, there are third-party marketplaces that rely on impact registries to sell verified outcomes. Project developers, such as social enterprises, can rely on registries to certify the social and environmental impacts their product or service generates and use marketplaces, intermediaries, brokers, or direct buyers to obtain financing from these outcomes. Leveraging carbon financing through the carbon market is perhaps the most advanced impact-based mechanism to date, with the voluntary carbon market (VCM) having channelled \$1.2 billion in 2022⁷⁵ to environmental projects.

Carbon credit registries

The most known impact registries are carbon registries which focus on certifying SDG 13 impacts, typically in the form of carbon credits or verified emission reductions. Some of these registries include Gold Standard, VERRA, American Carbon Registry, Climate Action Reserve, among many others. These registries record the ownership of the carbon credits that are issued and allow organizations to issue, track, manage and trade credits. Credits can only be retired once, thus ensuring that the environmental impact is not counted multiple times by several organizations. Some benefits of carbon registries are (1) the transparency, as developers need to pass a series of reviews and third-party verifications and make the most of the project information publicly available to issue credits, and (2) standardization as they provide methodologies and processes that projects must follow.

⁷² Ibid.

⁷³ IFC. (2023). *Clean Impact Bond: Mobilizing Finance for Clean Cooking*. Accessible at: <https://www.ifc.org/en/insights-reports/2023/clean-impact-bond-mobilizing-finance-for-clean-cooking>.

⁷⁴ Saul, J (2022). *Why the Social Sector Needs an Impact Registry*. Accessible at: https://ssir.org/articles/entry/why_the_social_sector_needs_an_impact_registry.

⁷⁵ WEF (2023). *The Voluntary Carbon Market: Climate Finance at an Inflection Point*. Accessible at: https://www3.weforum.org/docs/WEF_The_Voluntary_Carbon_Market_2023.pdf.

Case Study 2

Voluntary carbon market

SDGs: 13

What: Sistema.bio is leveraging Gold Standard’s impact registry to monetize its SDG 13 credits in the platform several projects in India, Latin America, and Africa. This monetization allows Sistema.bio to offer its technology at a discounted price, compared to the absence of impact monetization, enabling affordability so that farmers at the bottom of the pyramid can access the technology and Sistema.bio can reach more farmers at scale.

Who: Technology provider (Sistema.bio), impact certifier (Gold Standard), independent auditors (CarbonCheck, KBS Certification, TÜV Nord, among others)

Methodologies: Gold Standard’s Technologies and Practices to Displace Decentralized Thermal Energy Consumption v.3.1 and Methodology for animal manure management and biogas use for thermal energy generation v.1.1

Price per impact: between \$6 and \$30 per carbon credit

Impact on Sistema.bio operations: Participation in the voluntary carbon market has allowed Sistema.bio to install in 2023 the same number of units it had installed between 2010 and 2022, significantly scaling the pace at which the technology is adopted. This is mainly through direct price reductions to the technology due to carbon financing.

Challenges: Steep learning curve to adopt methodologies and align data collection, high transaction costs to design and certify projects and to monitor and verify carbon credits.

Table 2: Summary of Projects to create revenue from SDG 13 Impacts

Country	Program and covered period	Partnership	Number of units
Kenya	2019-2022	Brokerage agreement	6,000
Mexico	2021-2023	Emissions Reductions Purchase Agreement (ERPA)	3,000
India	2022-2023	ERPA	40,000
Uganda	2022-2024	ERPA	5,000
Kenya	2023-2024	ERPA	5,000
Malawi	2023-2026	Mitigation Outcomes Purchase Agreement (MOPA)	10,000

Carbon credit registries + co-benefits

Given the growth of the carbon market in recent years, another way social enterprises can earn more revenue is by measuring SDG co-benefits within a traditional carbon credit project. Projects that reduce GHG emissions and also have positive impacts on other SDGs, aside from SDG 13, and can

monitor these and claim them as co-benefits⁷⁶. For example, projects or interventions may use this framework to generate W+ labelled carbon credits through Verra's Verified Carbon Standard (VCS), an internationally-recognized greenhouse gas (GHG) crediting program. Alternatively, projects that are also generating carbon credits may leverage other existing tools within certifying standards (i.e. Gold Standard for the Global Goals), such as the SDG Impact Tool, which provides indicators to track if a project wants to claim health co-benefits.

Buyers in the carbon market will typically pay a premium price for projects that have strong co-benefits attached to it. For example, a survey by WOCAN in 2021 found that 67% of respondents believed buyers would be willing to pay a premium price for GHG credits with women's empowerment co-benefits⁷⁷. Ecosystem Marketplace⁷⁸ also found that credits sold from projects with co-benefits either embedded by the carbon standard or as added certifications had a clear price premium over the global 2021 EM Global Carbon Price benchmark of \$4.00 / tCO₂e.⁷⁹ This approach, however, does not mean specific SDG impacts (outside of SDG 13) are individually monetized (i.e. they are not considered tradeable assets individually).

Sistema.bio indirectly uses this approach to reach better carbon credit deals with buyers, given the SDG co-benefits it includes in all its carbon credit projects. While there is no direct comparison of what the price per tCO₂e would be if Sistema.bio did not tie its projects to any co-benefits, it is fair to assume, based on past experiences and conversations with actual and potential buyers that the price would be lower if the SDGs were non-existent.

Social impact registries

There are registries that verify outcomes for other types of projects targeting several SDGs. For example, Outcomes X⁸⁰, in partnership with the Impact Genome Registry (IGR)⁸¹, have a registry for social outcomes. To monetize impacts through this registry, projects must submit their impact quantification and methods. This is then verified by Outcomes X and Impact Genome, who do a thorough review and if the project meets previously set criteria, they generate Verified Impact Units, assets which can be sold in their marketplace. In short, they have the infrastructure to standardize, price, trade, and report on social impact credits. Another example is the W+ Standard, developed by WOCAN, a women-specific standard that measures, verifies and certifies women's empowerment in a transparent manner, giving monetary value to SDG 5 outcomes. Similarly, Gold Standard also has pathways to certify other SDG impacts aside from emissions reductions in the form of carbon credits, including Renewable Energy Certificate Labels, Water Benefit Certificates, Gender Equality Impacts, Improved Health Outcomes, and Black Carbon Reductions.⁸² Likewise, projects can generate assets under Verra's Sustainable Development Verified Impact Standard (SD VISta) Program; assets are tradeable units that represent a project's unique sustainable development benefits that can be quantified using one of the program's methodologies.⁸³

Sistema.bio is following this approach through Gold Standard to generate Gender Equality Impacts and Improved Health Outcomes in the Clean Impact Bond (**Case Study 1**). It has not explored registering and certifying its impacts through other registries given the preference to manage impact

⁷⁶ Registries may name these differently. For example, Verra uses the terms 'labels', which are SDG impacts affixed to a tradable social or environmental unit, such as carbon credits: https://verra.org/wp-content/uploads/2023/10/Verra_SDVIStaFactSheet_Letter_webready.pdf

⁷⁷ Social Development Direct. (2022). Integrating a Gender Lens in Voluntary Carbon Markets Volume I. Executive Summary. Accessible at: <https://www.sddirect.org.uk/resource/integrating-gender-lens-voluntary-carbon-markets>.

⁷⁸ Ecosystem Marketplace (EM) is a Forest Trends initiative. It is a Non-profit organization focused on transparency related to ecosystem services and payment plans. Further information on their website: <https://www.ecosystemmarketplace.com>.

⁷⁹ Ecosystem Marketplace (2022). *The Art of Integrity: State of the Voluntary Carbon Marketplace*. Accessible at: <https://www.ecosystemmarketplace.com/articles/the-art-of-integrity-state-of-the-voluntary-carbon-markets-q3-2022/>.

⁸⁰ Outcomes X is a marketplace platform for social outcomes. It seeks to guarantee social outcomes to empower social innovators (e.g. social enterprises). Further information on their site: <https://www.outcomesx.com>.

⁸¹ Impact genome is an organization that created an evidence-based impact standard, to permit users the classification of social outcomes by their core components, context and beneficiaries. Further information on their website: <https://www.impactgenome.org>.

⁸² Gold Standard (2021). *CERTIFIED SDG IMPACTS for results based finance*. Accessible at: <https://www.goldstandard.org/impact-quantification/certified-sdg-impacts>.

⁸³ Demonstrating Sustainable Development Benefits with Verra's SD Vista Program. Accessible at: https://verra.org/wp-content/uploads/2023/10/Verra_SDVIStaFactSheet_Letter_webready.pdf

certificates through one platform only. However, as these social impact registries gain momentum and the market for these impacts grows, it is worth exploring additional places where these could be monetized.

4.2.4 Results-based financing schemes

A third mechanism to monetize impacts are traditional results-based financing approaches, where financial awards are tied to pre-agreed and verifiable results. These are common in the development sector, with more than \$25 billion in development spending tied to results over the past decade.⁸⁴

Case Study 3

Energy Access RBF programs

What: Sistema.bio has accessed RBF funding for SDG 7. These schemes pay once the funder has verified energy access in the households during the project. This means that the company gets paid only after implementing the biodigester.

Who: RVO through its SDG 7 RBF Facility¹ and AECF REACT RBF.

Impact on Sistema.bio operations: The funding allows Sistema.bio to invest in harder-to-reach regions, typically where the poorest customers are found.

Price per impact: between \$40 and \$250 per connection

Challenges: Given that the capital is received after implementation, it is harder to pass on these benefits directly as a price reduction of the technology.

4.2.5 Summary

The Clean Cooking Alliance did a landscape review of RBF mechanisms in the clean cooking sector. The Figure below shows a summary of RBF mechanisms enabling different SDGs, including SDG 7, SDG 3, SDG 5 and SDG 13; the Y axis shows the amount of financing mobilized while the X axis shows the period of time covered by a specific impact-linked financed project. The figure shows that SDG 3 and 5 impacts (as represented by blue and green bars) are the least monetized in this sector, with Sistema.bio's Clean Impact Bond being one of the two examples of doing this (the other one being managed by C-Quest Capital).

⁸⁴ GPRBA (2018), Annual Report (2018). Washington D.C.: The Global Partnership on Outputs-Based Aid-The World Bank. Accessible at: https://www.gprba.org/sites/gprba/files/publication/downloads/2018-10/GPOBA_AnnualReport_2018.pdf.

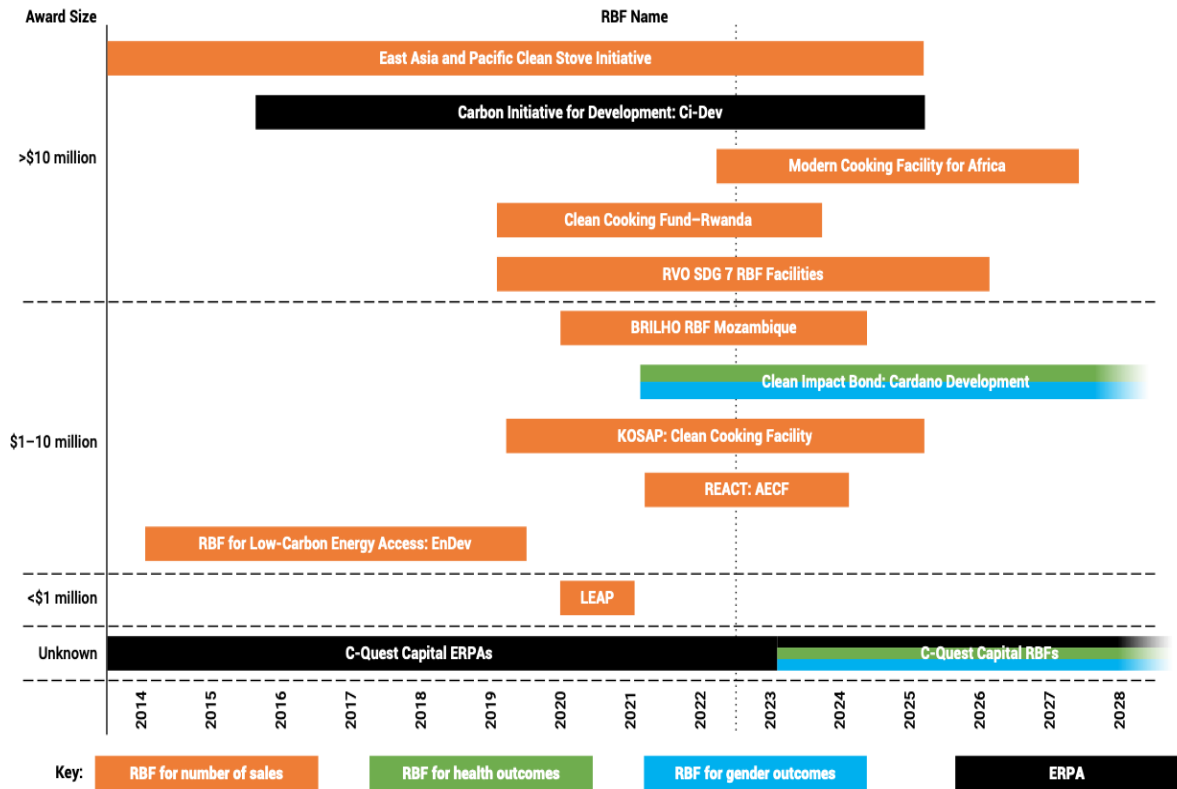


Figure 3 Landscape of clean cooking RBFs, source: <https://cleancooking.org/wp-content/uploads/2022/10/CCA-Clean-Cooking-RBFs-Report-2022.pdf>

Sistema.bio did a similar analysis of its own RBF programs as depicted by the figure below, following the same structure as the Clean Cooking Alliance graph above, showing the different type of projects it has been able to implement through impact-linked financing mechanisms, including its timelines, amount of financing mobilized and type of SDGs involved.

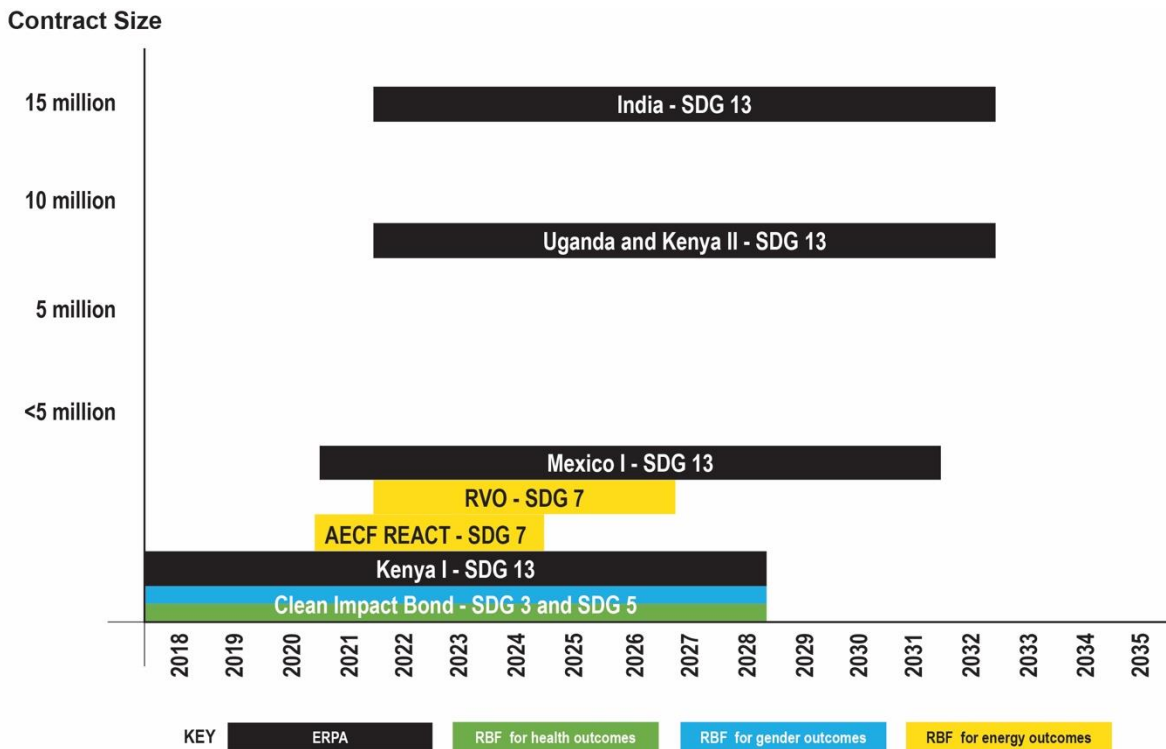


Figure 4 Sistema.bio's active contracts monetizing SDGs as RBFs

4.3 Contract structures for impact monetization

Within the entire clean cooking sector, Sistema.bio has explored with the same variety of different mechanisms to mobilize impact financing, establishing the experience across different geographies, project types and sizes.

In addition to the mechanisms available to monetize impacts, Sistema.bio has engaged in different types of contract structures within these mechanisms. These structures will dictate how and when the monetization will happen, and they have pros and cons depending on what a company wants to capitalize on:

Table 3: Summary of Contract Structures Analysed for Impact Monetization

Contract structure	Pros	Cons	Sistema.bio experience
<p>Brokerage agreement: a contract where one party agrees to act as a sales agent of another. In the context of carbon credits, for example, there is typically a broker or intermediary that will sell the credits issued by a project developer. These contracts typically involve some type of sales commission or fee, and may include a floor price, a term, a right of first refusal, etc. Payment is made upon sale of asset – in this context upon the sale of certified impacts such as carbon credits.</p>	<ul style="list-style-type: none"> If price of the impact increases in the future, the project developer may be able to reap the benefits of the price increase. 	<ul style="list-style-type: none"> If price of the asset decreases in the future, the project developer may lose significant revenue for not having fixed a price earlier on. No clarity on amount of potential revenue the enterprise can receive upon sale given the volatility of the price. 	<p>This structure was used for Sistema.bio’s first carbon credit (SDG 13) project in 2018. At point, the voluntary carbon market was slowly starting to gain momentum; the structure allowed the company to co-develop a project with an established broker who would be the exclusive seller of the credits generated, with low risk for the company and the prospect of benefitting from higher pricing in the future but with the caveat of not being able to directly pass on the carbon revenue in the form of price reduction to the farmer due to uncertainty in potential future income from credit sales and only receiving payment once credits are generated (2 years after installation of the technology).</p>
<p>Long-term offtake agreement: An offtake agreement is an arrangement between a project developer and a buyer to purchase or sell impacts (in this context). They typically include a floor or fixed price</p>	<ul style="list-style-type: none"> Securing price for impact in the long-term, providing clarity for future revenues. In the first scenario where a buyer prepays for a percentage of expected future 	<ul style="list-style-type: none"> If the price of the impact increases over time and the offtake agreement fixes a price, there can be significant lost revenue. In the second scenario where a buyer does not prepay for a 	<p>This structure is used by Sistema.bio in many of its active carbon credit (SDG 13) projects. The nature of a long-term offtake agreement means a price for the impact is fixed at the moment of signing., this structure is useful for Sistema.bio because it gives the company visibility around the revenue it will generate for the installation of biodigesters in</p>

<p>for the impact in the long-term.</p> <p>These offtake agreements can broadly take two paths:</p> <p>1) Buyer prepays for a percentage of the expected future impacts</p> <p>2) Buyer only commits to paying for future impacts</p>	<p>impacts, the enterprise can use that capital to implement a project without looking for outside working capital</p>	<p>percentage of expected future impacts (just commits to paying for them), the enterprise has to look for working capital to implement the project, typically at high interest rates.</p>	<p>a certain location. This visibility allows the company to directly reduce the price of the technology based on future revenue. The price volatility of the voluntary carbon market in these past years means this structure decreases the risk of a market crash (price going down) but also means the company may forego potential revenue if the price were to increase substantially.</p>
<p>Traditional results-based financing grant agreement: this is a more traditional contract structure which is typically a grant agreement between a project developer and a funder, which sets a fixed price per verified result, over a limited time period.</p>	<ul style="list-style-type: none"> • Fixed price for SDG impact provides clarity for future revenues 	<ul style="list-style-type: none"> • Enterprise has to look for working capital to implement the project as payments are done upon results verification 	<p>This structure has been more common for other SDGs for which there is no developed market such as the carbon market (SDG 13), such as SDG 7. Sistema.bio has leveraged this type of contracts based on the funding cycles of large organizations who have clear impact objectives such as clean cooking access or access to clean, renewable energy. These contract structures allow Sistema.bio to invest more resources to target harder to reach farmers, farmers under the poverty line, etc.</p>

4.4 Challenges

Over the past four years, Sistema.bio has been able to participate in several impact-based financing mechanism structures geared towards SDG 3, 5, 7 and 13. We analyzed the different contract structures, and consolidated interviewees insights and ideas to summarize the main challenges and obstacles of successful impact quantification and monetization.

4.4.1 Outcome buyers – who will pay for the impacts?

The market for SDG 13 impacts, specifically emissions reductions or removals in the form of carbon credits, has matured since its start in early 2000s and there are clear players within the market, including developers, auditors, standards, brokers, and importantly buyers, among others. This is not the case for any other SDG outcome, such as SDG 3, 5, and 7. Social enterprises might hesitate to invest into robust monitoring frameworks that require time and labour resources if there is not a clear structure established beforehand for the purchase a given outcome.

As an interviewee put it, “there is a general perception that an outcomes market won’t be as lucrative as carbon”. Another source stated that the market is not close to a point where many organisations are willing to buy a social value credit yet. Similarly, another source made the chicken and egg metaphor: what comes first? Outcome buyers want to see a model work before they pay, and project developers want to see the price of outcomes before they invest in quantifying their impacts. There is a general perception that this only works in carefully structured pilots where the chicken and egg issue is resolved a priori but supported by technical assistance and grant funding from the

stakeholders involved in the project, who are typically investing money to prove a concept but that would not be there if the market was more mature.

To use another common metaphor for early market development, the pump of established deals and market prices must be “primed” before a marketplace and significant outcome deals of this type will begin to flow. There is a significant role of traditional development funding actors and donors that have spoken about these impacts, but who could now support early outcome generating projects in the form of low-risk outcome bonds to attract more capital and project developers to this space.

4.4.2 Transaction costs for measuring and monetizing impact

Social enterprises must have robust internal resources required to build and maintain a rigorous, well-designed monitoring and evaluation framework that allows for regular impact measurement. There was a general view among participants in interview rounds that impact quantification and its successful monetization processes often have extremely high transaction costs. Many of the methodologies required to generate certified impacts are expensive to implement and monitor. The best example is monetizing SDG 13 impacts in the form of carbon credits, which comes with high administrative costs and a steep learning curve, which often requires social enterprises to hire a consultant at an additional cost. Registries also charge fees that can be high. Social enterprises may invest in these transaction costs early on if they are confident that the impacts will generate revenue in the future. This typically is secured through an offtake agreement or similar contracts with buyers. However, obtaining these offtake agreements is not straightforward; it is more common or feasible in the carbon market but the market for other impacts in SDG 3 or 5 is not as advanced and thus finding buyers for future revenues is harder. In these cases, a social enterprise may think twice before taking on the transaction costs required to secure certified impacts.

A common perspective brought up by interviewees and by the Lessons Learned section from the Clean Impact Bond report⁸⁵ is that these structures take a long time to structure (this particular bond took two and a half years, considering that COVID played a role in this timing), and many stakeholders are involved (over eight parties were involved in the Clean Impact Bond).

Sistema.bio worked with several technical partners in the Clean Impact Bond to implement both the Gold Standard’s ADALYs methodology and its own gender impact methodology. Both were very robust and technically sound, and in the case of the ADALYs methodology, the only one available if we want to generate Improved Health Outcomes through Gold Standard. However, implementing these was costly and time and resource consuming, and if outcome buyers have not been identified yet, which will often be the case given the nascency of the market, it may not be worth undergoing such costs.

An important point to consider when evaluating impact bonds is building on previous experiences. The Clean Impact Bond lays out several learnings that can enable similar projects to build on, and this should not be taken as granted.

4.4.3 What to measure, how to measure it, and where to report it?

A common thread among the interviews and Sistema.bio’s internal review of impact monetization is that, while there has been significant progress around methodological approaches to measure SDG impacts – such as standardized methodologies in Gold Standard – uncertainty remains for other SDGs that have less trajectory in being commercialized, such as SDGs 3 and 5. This in turn creates less certainty about the possibilities to monetize certain impacts and thus removes incentives to invest in robust monitoring systems within the enterprise if there is no clear pathway. Projects and work like those described above help reduce this uncertainty. There is a “chicken and egg” effect here too as financing partners may be looking for proven data points while projects are waiting for funding to show data.

4.4.4 Uncertainty around pricing

A common thread among interviewees, and also within Sistema.bio, is the uncertainty around pricing for SDGs. Even SDG 13 carbon credit pricing is volatile and subject to changes depending on supply,

⁸⁵ IFC. (2023). *Clean Impact Bond: Mobilizing Finance for Clean Cooking*. Accessible at: <https://www.ifc.org/en/insights-reports/2023/clean-impact-bond-mobilizing-finance-for-clean-cooking>.

demand, public perception (news articles), regulations, etc. This is a sign of a less mature and fractured marketplace, where basic rules for pricing, like the cost to produce an outcome and the overall size and price elasticity of the demand, are still missing. For social enterprises, this uncertainty means having to juggle between maximizing potential future revenues and securing fixed pricing over the long term to have greater visibility around how much of this revenue can be passed on to the end user.

4.4.5 Finding innovative financing mechanisms for impact monetization

Impact-based financing mechanisms are meant to drive funding to catalytic enterprises that can prove they are generating measurable, quantifiable impacts. The nature of this type of work often means working in low-income, rural markets where structural challenges inherently exist and there may be a long payback period for the project. As a project seeks impact it might increase the traditional risks for an enterprise. So, while investors are driven by creating impacts, they are still motivated by traditional finance key performance indicators (KPIs) and are looking for risk adjusted financial return. Even in the impact space, high ESG scores and high impact may help enterprises in developing impact markets gain access to finance but will not likely be able to reduce the perception of risk and greatly improve financing conditions. Consequently, monetizing SDGs has some similarities with traditional commodity finance, where project developers must look for every opportunity to remove or limit perceived and real risks of the project. It is also important for project proponents to properly model the impact of financing on financial returns. With risk-adjusted interest rates and long-term project periods, interest alone can significantly increase the cost of generating impacts.

In parallel to finding truly innovative financial institutions willing to fund SDG impacts, a social enterprise needs to have dedicated internal time and resources within its executive team to pitch, source and negotiate with financial institutions willing to engage in innovative impact-linked financing mechanisms.

5 Lessons and recommendations

Since 2020, Sistema.bio has significantly increased the number of projects that monetize SDG impacts, generating revenue that allows it to reach more farmers. This experience has allowed the company to explore different mechanisms, contract types, and methodologies. From this experience, some overall lessons for the company and recommendations for other organizations trying to work in the same space have emerged.

Innovative financing mechanisms take time

The nature of impact financing is that it requires time for impacts to happen, even after the intervention is up and running. Impacts accumulate over time, and even after impacts are generated and reported, issuing the final outcome and generating revenue can require additional steps. Sistema.bio learned in many of the projects listed in this report that even where pre-financing mechanisms are considered, they can take a lot of time and costs before they are fully implemented and generating revenue for the company. It is not recommended that a company with ongoing operations count on these initial revenue streams to fund its operations. The complexity of these structures can create delays, and therefore having patient capital alongside in the process to ensure that cashflow concerns do not impact the quality of the overall project structure. Once projects are up and running and payment rhythm has been established, then organizations can more closely link outcome payments with operations, but it will continue to have an element of risk as impact and operational timelines can vary.

Take the extra time to align stakeholders before starting projects

In order to manage an effective RBF project, it is necessary to have multiple partners involved, generally at a minimum investors and impact off-takers. It is necessary to clearly define roles, responsibilities and cost sharing and to ensure this extends out to appropriately long-term vision of the project. For example, many carbon credit projects require a five-year re-certification process that can be nearly as costly as the initial registration. Who will cover those costs? There are also many

coordination and management steps, and third-party validation, verification and registration costs that must be clearly assigned to each party. This is critically related to ownership of the impacts, but may also require consideration of ownership of intellectual property that might be generated in the project, and other assets and cash flows related to the project. In addition, parties must be aligned on what materials can be shared in public domain (e.g., do project sponsors want some credit? No credit? All the credit?), and what will remain confidential.

RBF is based on trust and impact and requires high internal integrity

RBF is based on the very best efforts to create, measure and report impacts that are additional, measurable, transparent, conservative and never double counted. Project developers must be their own harshest critic and strive to ensure that there is no doubt of the level of impact being created. One of the most important elements of this is additionality, ensuring that impacts are not just “tacked on” to business as usual. Even if those businesses don’t create impact, the additional funding should create impact that was not present without the funding at the same scope and scale. Double counting is something that can also be a significant risk. With many partners involved, language, reporting and impact ownership needs to be very specific to ensure that multiple groups are not claiming the same impact in a way that might inflate the overall impact. For example, if you will assign an SDG co-benefit to a carbon credit program, those SDG benefits cannot be attributed to any other outcome buyer other than those that own the carbon credit without very specific contracts that detail such points. Project developers need to ensure that their own teams and partners clearly understand the core principles and trust required for RBF funding to flow to projects that can create impact and ensure that they champion these principles within the organizations and with their partners. On the contrary, companies and partnerships could face significant legal, financing and public relations risks and also risk undermining the overall development of RBF as a legitimate mechanism for development. There is a lot of work happening here, and the Core Carbon Principles⁸⁶ is a good place to start.

Make impact a clear part of your core business

Project developers and companies that want to drive impact should do their best to not have the impact of their work as a “plus” or an “add on” that does not clearly align with the core business of the organization. This is important because successful RBF projects require clear, long-term coordination with all elements of the company and decisions made at the business level can change how impacts are measured or reported. Go all in for impact, and there are likely business advantages as well that accelerate and improve that quality of the company.

Specific lessons for choosing an impact funding approach for each SDG

SDG 3 may have one of the highest research, methodological and reporting burdens of all the SDGs given the nature of tracking health outcomes. Thus, the following approaches are recommended:

1. If the project has identified an outcome buyer for SDG 3 impacts, implement Gold Standard aDALY methodology.
2. If the project has carbon projects active or in its pipeline, include SDG 3 as a co-benefit or label in the certifying standard using available tools in the standards, such as the SDG Impact Tool from Gold Standard for the Global Goals to define indicators, or implement W+ standard methodology to monitor self-reported health improvements.
3. If the project is not generating carbon credits, explore impact platforms such as Outcomes X to review the feasibility of selling health outcomes through there.

SDG 5 requires field level data, but is based largely on more simple surveys and observation and largely is driven by perceptions of the beneficiaries. Thus, similar to the recommendations on SDG 3, given that SDG 5 outcome market is not developed, the following approaches are recommended:

1. If the project has identified an outcome buyer for SDG 5 impacts, identify a methodology that aligns with requirements of outcome buyer or consider making modifications that suit the desired outcomes.

⁸⁶ ICVCM (2021). The Core Carbon Principles. Accessible at: <https://icvcm.org/the-core-carbon-principles/>.

2. If the project has carbon projects active or in its pipeline, include SDG 5 as a co-benefit in the certifying standard, by implementing W+ standard methodology to monitor self-reported gender equality improvements. The Verified Carbon Standard from VERRA allows projects to gain a W+ label.⁸⁷
3. If the project is not generating carbon credits, explore platforms such as W+ or Outcomes X to review the feasibility of selling gender outcomes through these.

SDG 7 may be one of the better funded SDGs for energy practitioners. There are established RBF programs with well-developed rules and regulations, which require that a given technology or approach demonstrate affordable, reliable and clean energy services. Once you are able to confirm these characteristics, detailed tracking of the amount of people using a given technology is the common impact that is measured. Therefore:

1. Identify programs that have been published with RBF indicators and follow these indicators closely to ensure technology and monitoring methodology align.
2. If the project has carbon projects active or in its pipeline, include SDG 7 as a co-benefit in the certifying standard, projects must ensure they are tracking the amount of people that are using a given technology or service.

For **SDG 13**, there are a number of independent registries where carbon reduction projects can be included to generate carbon credits for sale. Some concrete steps for choosing include:

1. Confirm whether the project has a carbon credit buyer that is able to “pre-purchase” carbon credits or will buy them vintage, or as issued.
2. If they are vintage sales, a project must secure financing that will cover the implementation, registration, validation and verification steps required for each methodology. It is possible that project will not generate cash for 3-4 years after starting implementation, so proper alignment with the financing is required.
3. The registration should consider whether a project is aiming for voluntary carbon credits or compliance carbon credits, which will change the type and source of registration and monitoring requirements.

6 Conclusion

This work has shown that it is still early days in RBF, but early examples and case studies show that impact bonds and impact markets (like the voluntary carbon market) can drive significant investment to SDG-aligned development. Done properly, this can help re-orient market-based economies, asset financing, legal and tax frameworks, and global cooperation to solving the world’s most important problems. Creative, dedicated social enterprises and organizations can accelerate their work by collaborating around tough problems and ensuring they create impact for people and the planet.

More successful project structures and clearly defined economic and impact returns for the RBF space are needed. This primarily requires more impact buyers. Buyers should include the broadest possible coalition of governments, businesses and organizations that should be incentivized by laws, agreements, and the desire for positive impact. Because achieving the SDGs in most cases creates significant positive externalities, and reduces inefficiency and costs in the global economy, reorienting some portion of the global market and asset trading to RBF would create significant global upside.

With all the above experience, Sistema.bio will continue to develop innovative impact and RBF structures that seek to leverage the broadest possible coalition of funders, farmers and partners to achieve their mission. In the short term, the clearest pathway for scalable RBF structures is a mixture of compliance and voluntary carbon markets for creating carbon credits that include significant, measurable co-benefits to attract a range of potential carbon buyers. The organization will continue to seek opportunities to focus project around all four SDGs and others not discussed here in detail.

⁸⁷ WPlus (2021). VCS & W+ PROJECT DEVELOPMENT PROCESS. Accessible at: https://www.wplus.org/wp-content/uploads/2020/10/VCS-and-W-Guidance-Document_v1.0.pdf