



TECHNICAL NOTE NO. RTB-001-SB

SMALL ENTERPRISES AND CLIMATE NEGOTIATIONS

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"Macaozinho" - AI Chatbot

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UNDP is the United Nations' lead organisation in the fight to end the injustice of poverty, inequality, and climate change. Working with a broad network of experts and partners in 170 countries, it supports nations in developing integrated, lasting solutions for people and the planet.

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The *Route to Belém* platform is an initiative under the UNDP programme "Support to COP30" (BRA/24/007), which combines technical expertise with new technologies and digital environments to help make COP30 in Belém, Brazil, the turning point needed to address global climate change. This will be achieved through two strategies. The first draws on scientific studies to strengthen discussions among COP negotiators. The second uses digital tools, such as a smart scheduling application, metaverse platforms, and a virtual assistant (chatbot), to engage society, the private sector, and academia in the debates, enabling participation from both those in Belém and in other locations.

The views expressed in this publication are those of the authors and do not necessarily reflect the views of the United Nations, including UNDP, or its Member States.

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ABSTRACT

The technical note examines the relevance of climate change for micro, small, and medium-sized enterprises (MSMEs), highlighting how climate risks, mitigation, adaptation, and resilience can pose both challenges and opportunities for this sector. It underscores the urgency of action, as MSMEs are disproportionately affected by extreme weather events, with estimated global losses ranging from USD 160 to USD 220 billion annually. This call to action also stresses the importance of greater engagement in the preparation and conduct of international climate negotiations, to advance a stronger legal, regulatory, institutional, and policy framework, as well as access to instruments and resources that can enhance the business environment for MSMEs in the context of the climate crisis and emerging challenges.

Keywords: Climate change, Small Businesses, Mitigation, Adaptation.

JEL Classification: Q54, L26, O29.

“What is the use of a house if you haven’t got a tolerable planet to put it on?”

Henry David Thoreau, North American writer

1. INTRODUCTION

What is climate change? Climate change refers to significant and long-term alterations in the Earth’s climate patterns, particularly those driven by human activities since the Industrial Revolution. These changes include rising global temperatures (global warming), shifts in rainfall patterns, melting glaciers, rising sea levels, and increasingly frequent and intense extreme weather events. Climate change is one of the greatest challenges facing humanity in the 21st century, requiring global cooperation to mitigate its impacts and adapt to new realities.

This challenge has been at the centre of international climate negotiations, which are multilateral efforts to address climate change by establishing targets, rules, and mechanisms for cooperation among countries. The main outcomes of these discussions include global agreements, financing mechanisms, and emission reduction commitments. Further details on climate change and climate negotiations are presented in Appendix 1.

When we hear, often inadvertently, about international climate negotiations and their many meetings over the years in different parts of the world, and then think about small businesses, the initial reaction is to see them as two distinct and separate worlds: on one side, small businesses, and on the other, governments with their policies and programmes.

However, the reality could not be further from this perception. Not only will individuals be directly affected by climate-related events resulting from rising global temperatures, but micro, small, and medium-sized enterprises (MSMEs) will also be on the front line, bearing their impacts.

Structural vulnerabilities mean that MSMEs are disproportionately affected by extreme weather events compared to large enterprises. This is due to a range of factors that are directly linked to their specific conditions as small businesses, as illustrated in the table below—without claiming to exhaust all factors involved:

Table 1. Structural vulnerabilities MSMEs

Factor	Impacts on MPMEs	Evidence
Limited resources	Dificuldade em investir em infraestrutura resiliente (e.g. barreiras antienchentes)	MSMEs experience losses three times higher relative to their revenues (Hallegatte et al., 2016)
Location	Concentration in high-risk areas (flood-prone urban centres, coastal zones)	70% of MSMEs in tropical cities are located in vulnerable zones (Rosenzweig et al., 2018)
Supply chain fragility	Disruptions to roads or local supply from suppliers—often MSMEs themselves—also affected during extreme events	Floods block access to raw materials for small businesses (Surminski et al., 2016)
Local customer	Tourism, commerce, and services—sectors with a large number of MSMEs—are immediately affected by disasters	Hurricane season reduces tourism in the Caribbean by 40% (Scott et al., 2016)
Recovery capacity	MSMEs take longer to recover from disasters, or sometimes fail to recover altogether	While most large enterprises recover within 2 to 4 weeks, MSMEs take between 5 and 12 months (Hallegatte et al., 2016). Sixty per cent of SMEs close permanently after severe events (MDB, 2016).

Source: Author's elaboration.

Bringing this context closer to the reality of Latin America and the Caribbean to illustrate the critical impacts of climate change on MSMEs, two recent extreme climate events can be highlighted. The first occurred in the Caribbean, on the island of Puerto Rico, in 2017, with the impact of Hurricane Maria. Forty per cent of small businesses never reopened, compared to 5 per cent of large enterprises (ECLAC, 2018). In Brazil, during the 2022 floods in Petrópolis, in the State of Rio de Janeiro, 89 per cent of microenterprises suffered losses exceeding BRL 50,000, exacerbated by the fact that almost all lacked insurance or emergency reserve funds (FIRJAN, 2022).

Therefore, it is entirely reasonable that organizations representing and supporting small businesses seek an active role in climate dialogues and negotiations. They should also take a proactive approach to anticipate opportunities, risks, solutions, and adequate resources, enabling small businesses to position themselves effectively in the face of the climate crisis, which is already a present reality.

The following sections review how the issues of climate mitigation, adaptation, and risk are concretely related to the reality of micro, small, and medium-sized enterprises, with a particular focus on the Brazilian context and local conditions.

2. CLIMATE MITIGATION AND MICRO, SMALL, AND MEDIUM-SIZED ENTERPRISES

Climate mitigation refers to the reduction or prevention of greenhouse gas (GHG) emissions to avoid or minimise climate change, which drives global warming and alters climate patterns. It involves processes that reduce or remove GHGs from the atmosphere, such as carbon dioxide, methane, and nitrous oxide, to limit global warming and its impacts.

Climate mitigation is a strategic issue for MSMEs, as it offers direct benefits in terms of competitiveness, resilience, and access to new markets. The table below highlights the main areas where significant opportunities exist for MSMEs, based on technical evidence:

Table 2. Opportunity areas for MSMEs

Areas	Opportunities for MSMEs and supporting evidence
Cost reduction and increased resource-use efficiency	Energy efficiency: The adoption of energy-efficient technologies (e.g., optimized electric motors, LED lighting) can reduce operational costs by 20–25% (Napp et al., 2014) Circular economy: Reusing materials and reducing waste lowers costs for inputs and environmental disposal (Lewandowski, 2016)
Access to markets and financing	Accessing a global market: A growing proportion of domestic and international buyers and consumers (especially in the European Union) are demanding low-carbon products. Small businesses that align with these expectations can expand their access to value chains (Plantinga and Scholtens 2016) ‘Green’ lines: Banks and funds (e.g., GCF) prioritise loans for small businesses with mitigation projects (solar energy, agroforestry, etc.) that offer reduced costs (MDB 2016)
Innovation and new markets	Bioeconomy: MSMEs can take a leading role in sectors such as biomaterials (e.g. natural fibres replacing plastics) and ecological restoration (Linder and Williander 2017) Payments for Environmental Services (PES) and carbon credits (e.g., via REDD+3) generate additional revenue for rural properties (Stevens and others 2014) Technologies associated with low-carbon agriculture: Supply of technologies and new related services (e.g. direct planting solutions, farmer-managed natural regeneration—FMNR)⁴ that enhance productivity and reduce losses during droughts or extreme rainfall (Reij and Winterbottom 2015).

Source: Author's elaboration.

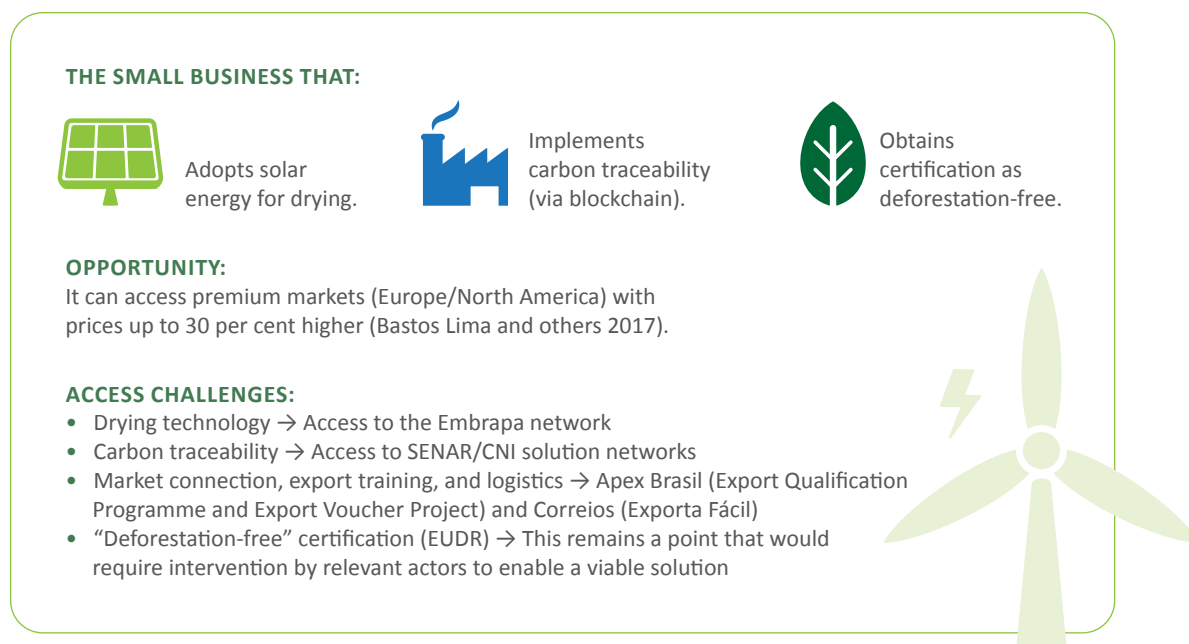
3. REDD+ (Reducing Emissions from Deforestation and Forest Degradation, plus forest-related activities) is a mechanism developed under the United Nations Framework Convention on Climate Change (UNFCCC) to incentivize developing countries to reduce greenhouse gas emissions from deforestation and forest degradation.

4. *Farm Managed Natural Regeneration*, em português Regeneração Natural Gerenciada pelo Agricultor constitui-se em uma prática para restaurar terras envolvendo o manejo sistemático de árvores e arbustos a partir de tocos, sistemas de raízes ou sementes, com o objetivo de aumentar a produção de alimentos e a melhorar a qualidade de vida de agricultores em países em desenvolvimento, para mais informações ver: <https://www.fao.org/family-farming/detail/en/c/1612894/>.

However, for MSMEs to fully seize the opportunities offered by climate mitigation, several critical challenges require political action and inter-institutional coordination. This is necessary to enable small businesses to capitalise on these opportunities and overcome the initial investment and cost barriers associated with new technologies and innovation. It requires the establishment and implementation of new institutional and cooperative arrangements to support the deployment of technological improvements, allowing MSMEs to navigate the learning curves of these new technologies and thereby mitigate the risks of pioneering and technological evolution inherent in any similar process..

In this regard, several solution alternatives can be considered and implemented, such as: (i) subsidy mechanisms and non-reimbursable funds to enable necessary investments during the highest-risk phases, whether related to technology or the enterprise (“valley of death”); (ii) research and development partnership networks to align academic, strategic, productive, and climate interests; and (iii) capacity-building programmes in sustainable management delivered by reference institutions in the sector—for example, in Brazil, entities such as SEBRAE, SENAI, and SENAR, to name a few (Burnham and Ma 2017).

Box 1. Example of a small cocoa agro-industry in Pará



Source: Author's elaboration.

In this way, climate mitigation for micro, small, and medium-sized enterprises is not merely an act of complying with rules; it becomes a concrete opportunity to build a competitive advantage. It allows the business to differentiate itself from competitors that continue to operate as they always have—or, in the language of climate change, ‘business as usual’.

MSMEs that identify and seize these opportunities early will benefit from: (i) higher profitability (through efficiency, differentiation, and/or market segmentation); (ii) long-term sustainability (through resilience); and (iii) visibility in local, regional, and global markets (through innovation).

3. CLIMATE ADAPTATION AND MICRO, SMALL, AND MEDIUM-SIZED ENTERPRISES

Climate adaptation is not only relevant for the opportunities it offers small enterprises; it is, above all, a matter of survival. Micro, small and medium-sized enterprises (MSMEs) are, and will continue to be, among the most affected by climate change, as highlighted in the introduction to this note.

The first subsection below explores the extent to which small enterprises are impacted by extreme weather events, examining their exposure to climate risks and how these risks translate into economic and operational challenges for MSMEs. The second subsection discusses how enterprises can plan to address these increasingly frequent, unpredictable and intense extreme events, and how to manage the associated climate risks.

3.1 MSME losses resulting from extreme events

Indeed, given that small businesses have the widest territorial presence, operate at the largest volume, and employ the greatest number of people in economies, it is not surprising that where extreme weather events occur, MSMEs are disproportionately affected compared with large enterprises.

Estimating annual global losses for MSMEs due to extreme weather events is a complex measurement challenge. However, studies cited by the IPCC and specialized reports, such as those from the Multilateral Development Bank Group, highlight the following evidence:

1. Direct Losses (infrastructure, inventory, equipment)

- Of the total estimated losses of USD 150–200 billion per year (global average 2010–2025), MSMEs accounted for approximately 60 per cent of this amount, that is, between USD 90–120 billion per year (Hallegatte and others 2016; MDB 2016).
- This occurs because MSMEs are concentrated in vulnerable areas (e.g., coastal zones, urban heat islands, slopes, informal settlements, etc.).

2. Indirect Losses (operational disruption, loss of customers, supply chain interruptions)

- MSMEs lose between USD 70 and 100 billion per year, particularly in sectors such as agriculture, tourism, and local commerce (Surminski and others 2016).
- Illustrating this phenomenon, hurricanes in the Caribbean cause estimated losses of USD 2.3 billion per year in small tourism businesses alone (Scott and others 2016).

These losses also exhibit a disproportionate regional impact, reflecting areas with significant population concentrations, as summarized in the table below.

Table 3. Disproportionate impact by region

Region	Annual MSME losses (USD)	Main threats
Southeast Asia	42–58 billion	Floods and typhoons
Latin America	18–25 billion	Droughts and landslides
Sub-Saharan Africa	15–20 billion	Water scarcity and extreme heat

Fontes: MDB, 2016; UCCRN, 2018.

Although the impact is significant, there is strong evidence that the figures associated with MSMEs are underestimated, given the difficulty of collecting reliable data for this segment. First, informality is a major factor: according to OECD data, 70 per cent of microenterprises in emerging economies do not keep records of losses incurred (OECD 2021). Second, these enterprises make little use of insurance in their operations; it is estimated that only 5 to 10 per cent of SMEs in the Global South are covered for climate-related events (Surminski 2016). Finally, aggregate data remain scarce due to sectoral diversity and underreporting. Ongoing studies in preparation for COP30 (Belém 2025) are seeking more accurate metrics through the use of satellite technology and artificial intelligence.

In Brazil specifically, floods and droughts cause losses of between BRL 16 and 22 billion per year for small businesses, particularly in agriculture in the Northeast and in commerce and services in the Southeast (FIRJAN 2022; MDB 2016).

In sum, for MSMEs, taking climate adaptation measures and building resilience is essential to reducing their total global losses, estimated at between USD 160 and 220 billion annually (direct and indirect combined). This becomes even more relevant in light of evidence suggesting that this figure could increase by 40 per cent by 2030 if no adequate and large-scale investment is made in climate adaptation for MSMEs (IPCC AR6).

3.2 Climate adaptation and the resilience of MSMEs to extreme events

As can be inferred from the previous topic, climate adaptation is a crucial factor for the survival and competitiveness of MSMEs in a future increasingly affected by climate change. This is particularly true in sectors such as agriculture, tourism, and local commerce, and in vulnerable regions that suffer critical direct impacts from extreme events, which translate into concrete losses for MSMEs. On the one hand, droughts, floods, or excessive heat expose MSMEs to potential losses of up to 20 per cent of their annual revenue if they are not adapted (Hallegatte et al. 2016). On the other hand, the adoption of adaptation measures that enhance resilience can substantially reduce such losses. For example, a small coastal hotel that invests in drainage systems and barriers against storm surges significantly lowers its risk of damage during extreme weather events (Camps-Calvet et al. 2016).

There is no single formula for MSMEs to implement adaptation measures, as the risks they face and the solutions to be pursued depend both on their location and on the sector in which they operate.

The first challenge is to identify the climate risks to which MSMEs are exposed. Climate risks refer to the potential negative impacts on human and natural systems resulting from climate change. These risks can be categorised as follows:

- **Physical climate risks:** These refer to the direct and indirect impacts caused by extreme weather events or long-term climate change on natural systems, infrastructure, economies, and communities. They are divided into two main categories: (i) **acute risks (Extreme Events)**, which are short-term, intense, and highly destructive climate events; and (ii) **chronic risks (Long-Term Changes)**, which are gradual transformations in the climate that persistently affect ecosystems, economies, and societies.
- **Transition climate risks:** These are the economic, social, and political impacts arising from efforts to mitigate climate change during the transition to a low-carbon economy. They emerge from policies, technologies, and market shifts aimed at reducing greenhouse gas emissions but may also produce negative side effects.

The main risks that should be considered are presented in greater detail in Table 4.

Table 4. Types of climate risk

Type of risk	Classification	Details
1. Extreme climate events	Physical climate risk: high impact and short-term	Severe storms, cyclones and hurricanes; heatwaves and extreme cold; prolonged droughts; floods and inundations; and landslides
2. Gradual climate change	Gradual, chronic physical climate risk with long-term impacts	Increase in average temperature; changes in precipitation patterns (heavier rainfall or longer dry periods); sea level rise; and ocean acidification
3. Availability and quality of natural resources	Physical climate risk, gradual and chronic long-term impacts	Water scarcity (reduced availability and quality); impacts on agricultural production and food security; ecosystem degradation and biodiversity loss; reduced forestry and fishery productivity
4. People's health and security	Transition climate risk	Increased heat- and air-quality-related illnesses; higher incidence of vector-borne diseases (e.g., dengue, malaria); and impacts on the mental health and well-being of employees and communities
5. Market	Transition climate risk	Changes in consumer and investor preferences, reducing demand for high-emission products or services
6. Economic and financial	Transition climate risk	Damage to physical infrastructure and company assets; disruptions in supply chains and logistics; increased operational costs (energy, water, insurance); loss of productivity and revenue due to operational interruptions; difficulties accessing insurance and risk-sharing mechanisms
7. Technological	Transition climate risk	Accelerated replacement of traditional technologies with clean alternatives, rendering assets or processes obsolete ("stranded assets")
8. Regulatory and legal	Transition climate risk	Changes in public policies and environmental regulations; increasing requirements for transparency and disclosure of climate-related risks; potential litigation related to climate liability
9. Reputational and social	Transition climate risk	Rising expectations from consumers, investors, and society regarding climate responsibility; negative impacts on company image and reputation if adequate adaptation and mitigation actions are not taken

Source: Author's elaboration.

When considering these risks and adopting a proactive, integrated approach, a company will be better prepared to face the challenges of climate change, ensuring greater long-term resilience and sustainability.

However, given the rapidly changing future scenario, continuous monitoring and periodic review of adaptation strategies are crucial, taking into account new scientific information and evolving climatic conditions.

Appendix 2 provides a concrete example for an MSME of how to assess climate-related risks and develop a climate resilience action plan.

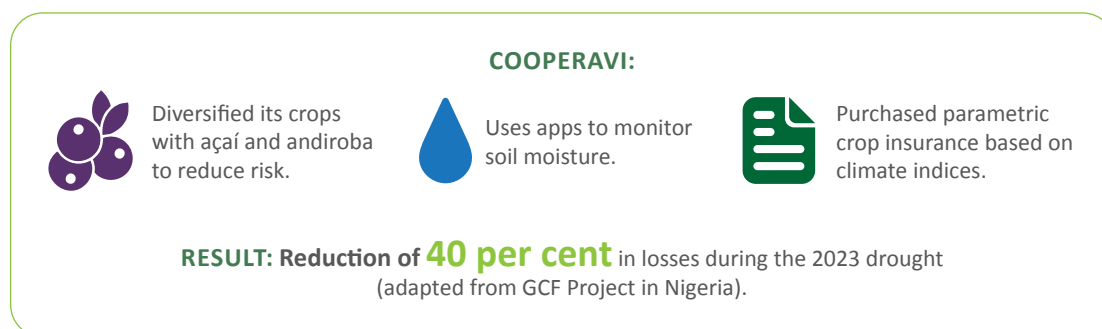
In this context, certain solutions are particularly important to ensure the operational continuity of MSMEs. In family farming, techniques such as drought-tolerant crops (e.g., BRS maize) and agroforestry systems help maintain productivity even under changing climatic conditions (Thornton and Comberti 2017). For industrial enterprises, technologies such as water reservoirs, solar energy, and battery energy storage systems (BESS) ensure operations can continue during droughts or power outages (Canales et al. 2015).

Another important factor for MSME adaptation and resilience is access to markets and financing. In this regard, these aspects can create opportunities for differentiation, as businesses become more reliable suppliers in the face of climate change impacts. Some examples include:

- **‘Resilient’ certifications:** Global buyers prioritize suppliers with adaptation plans (e.g., “climate-smart” coffee Burney and Naylor 2012).
- **Special credit lines:** Banks offer lower interest rates to SMEs with adaptation projects (e.g., artesian wells, flood protection infrastructure).
- **Use of information to segment the market:** For example, tourism SMEs systematically use information to develop “climate-smart” itineraries, such as trails during the dry season (Scott et al. 2016).
- **Development of new technologies:** For example, startups in the Cerrado manufacture and sell sensors for agricultural water monitoring.
- **Cooperativism:** Has the potential to create scale, spread risks, and share costly infrastructure (e.g., elevated flood-resistant storage) among MSMEs.
- **Parametric insurance for climate losses:** MSMEs, cooperatives, and business associations that offer or use parametric insurance can position themselves as promoters of sustainability, attracting customers concerned about climate change. This can be illustrated, for example, by fishing cooperatives that adopt such insurance, enhancing their creditworthiness by reducing risks for banks and investors. Additionally, because parametric insurance is based on indices (e.g., rainfall), it can be easy to use and allow rapid payouts for MSMEs. On one hand, this reduces transaction costs for insurers; on the other, it requires large portfolios to diversify both client and regional risks.

- **Public policies:** Public policies can, through scale, scope, and lower capital costs, create solutions that reduce economic, social, and environmental costs for micro, small, and medium-sized enterprises (MSMEs). Examples include adaptation funds that provide low-interest support for investments in adaptation and resilience, as well as reconstruction support for MSMEs. Other initiatives may focus on technical assistance, access to information, access to technology, and partnerships.

Box 2. Example of a cocoa cooperative in Pará



Source: Author's elaboration.

In summary, climate adaptation and resilience for SMEs translate into: (i) protection against catastrophic losses, as they are among the most affected and vulnerable groups; (ii) an opportunity to become more competitive in demanding markets that are constantly evolving due to climate impacts; and (iii) innovation for new business models. At the same time, this highlights a significant gap in public policies and instruments to address these challenges, while also representing opportunities and enhanced competitiveness for the economy in general, as effective positioning in the face of the climate crisis becomes a key differentiator.

4. INTERNATIONAL NEGOTIATIONS AND LINKAGE OPPORTUNITIES FOR MICRO, SMALL, AND MEDIUM-SIZED ENTERPRISES

International climate negotiations, such as those conducted under the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement, create multiple opportunities for productive linkages for MSMEs. The following section identifies ten dimensions in which these opportunities can be observed.

4.1 Access to new markets and sustainable value chains

Climate negotiations are driving demand for sustainable products and services, creating opportunities for Brazilian MSMEs to participate in green value chains, such as sustainable agriculture, the bioeconomy, renewable energy, energy efficiency and the circular economy. In this context, MSMEs can serve as suppliers of sustainable inputs, clean technologies and specialised services to larger companies seeking to meet climate and environmental targets.

In the Brazilian context, six main avenues stand out through which MSMEs can benefit:

a. Sustainable agriculture and agroecology

Brazilian MSMEs can supply sustainable inputs such as biofertilisers, organic seeds, natural crop protection products, and technologies for sustainable soil and water management. They can also engage in the production and marketing of organic, agroforestry and certified food products, responding to the growing demand for healthy and sustainable food both domestically and internationally.

Participation in sustainable value chains can create opportunities for differentiated exports, particularly to demanding markets such as Europe, the United States and Japan, where certified products with environmental and social traceability are highly valued. However, this option is contingent upon four key factors:

- (i) Availability of logistical connections at costs compatible with the type of product and export option;
- (ii) Evaluating whether moving one step further along the value chain could extend the product's shelf life (e.g. from fresh organic pirarucu to dried, smoked or salted pirarucu);
- (iii) For small-scale exports, ensuring that the product has sufficient margins per kilogram to offset relatively high logistics costs; and
- (iv) For exports with tighter margins, pursuing strategies for production consolidation (e.g. exporter cooperatives, specialised logistics companies).⁵

b. Bioeconomy and biodiversity products

Climate negotiations have fostered the economic valorisation of biodiversity and natural resources, particularly in the Amazon and other Brazilian biomes. Estimates suggest that by 2050, the bioeconomy could represent a market of USD 30 trillion (BCG 2022). Brazilian MSMEs can play a central role in the production and commercialisation of bioeconomy products, including natural cosmetics, phytotherapeutics, functional foods, essential oils, natural fibres, and other goods derived from the country's biodiversity.

These enterprises can benefit from sustainable value chains with environmental and social certifications, adding value to their products and gaining access to international markets that prioritise sustainability and environmental conservation.

5. Example: *FríoAéreo in Peru* — A company created by small-scale asparagus producers to enable the export of fresh asparagus to the United States market (see: <https://www.frioaereo.com.pe>).

c. Renewable energy and energy efficiency

Climate negotiations have accelerated the global energy transition, creating opportunities for Brazilian MSMEs to engage in value chains related to solar, wind, biomass, biogas, and energy efficiency.

MSMEs can supply equipment and components, provide installation and maintenance services, offer technical consultancy, and develop innovative solutions for distributed generation, energy efficiency in buildings, and sustainable industrial processes.

Participation in these value chains can create business opportunities with large national and international companies seeking to meet climate targets and reduce greenhouse gas emissions.

d. Circular economy and sustainable waste management

Climate negotiations have emphasised the importance of the circular economy and sustainable waste management as key strategies to reduce emissions and environmental impacts.

Small Brazilian companies can act in value chains related to recycling, waste reuse, reverse logistics, composting, the production of sustainable packaging, and the development of new biodegradable materials.

These companies can provide innovative solutions to large corporations seeking to meet environmental and regulatory targets, while also responding to growing consumer demand for sustainable, lower-impact products.

e. Sustainable tourism and ecotourism

Climate negotiations have promoted sustainable tourism as a key strategy for local economic development and environmental conservation. Brazilian MSMEs can engage in value chains related to ecotourism, community-based tourism, sustainable rural tourism, and responsible adventure tourism.

These companies can offer specialized services such as sustainable accommodation, organic and locally sourced food, trained tour guides, sustainable transport, and authentic cultural experiences, meeting the growing demand for responsible and sustainable tourism.

f. Certified products and environmental labels

With climate negotiations, new, more stringent environmental standards and international certifications have emerged, such as carbon neutrality, sustainable agriculture, fair trade, FSC

(Forest Stewardship Council), Rainforest Alliance, and others. Brazilian MSMEs can obtain these certifications and environmental labels, adding value to their products and services and expanding opportunities for export and participation in international value chains.

Certified products enjoy higher acceptance in demanding international markets, enabling Brazilian MSMEs to access differentiated, higher-value market niches.

So, how can these opportunities be leveraged in practice? For Brazilian small businesses to effectively seize them, it is important to consider several strategic actions:

1. Invest in technical and managerial training to meet the standards required by sustainable markets.
2. Seek strategic partnerships with large companies, cooperatives, sectoral associations, and research and development institutions.
3. Participate in national and international sustainable business platforms, specialized trade fairs, and green business matchmaking events.
4. Access available credit lines and climate financing for sustainable small businesses.
5. Pursue internationally recognized environmental and social certifications to add value to the products and services offered.

Therefore, international climate negotiations can create a favorable environment for Brazilian MSMEs to integrate into sustainable value chains, access new markets, and expand business opportunities, contributing to the country's sustainable economic development.

4.2 Financial incentives and access to climate finance

The expansion of climate finance for developing countries has been a permanent item on the Brazilian negotiators' agenda in international negotiations. The objective is to increase the availability of financial resources—ensuring adequate volume, cost and timeframes—so that enterprises, particularly those operating in strategic sectors, can implement their mitigation and adaptation projects in response to climate change.

MSMEs can access special credit lines, establish mechanisms to tap into international climate funds, draw on resources from national and regional development banks, and engage in public–private partnerships for sustainable projects.

The outcomes of international climate negotiations have strongly emphasized the need to expand climate finance for developing countries, such as Brazil. This creates significant opportunities for Brazilian small businesses to access targeted financial resources that can boost their participation in sustainable value chains and strengthen their competitiveness.

Some of these opportunities are outlined below:

a. Access to international climate funds

Brazilian MSMEs can access financial resources provided by international climate funds, such as the Green Climate Fund (GCF), the Global Environment Facility (GEF), the Adaptation Fund, among others. However, to secure sufficient volume at reasonable transactional costs, it is necessary to establish instruments and mechanisms with local partners—such as development banks, local financial institutions, or non-governmental organizations—to access these funds and obtain resources at scale, as these mechanisms are not designed to operate at the retail level.

These funds provide resources for climate change mitigation and adaptation projects, particularly in strategic sectors such as sustainable agriculture, renewable energy, energy efficiency, the bioeconomy, water management, and environmental conservation.

b. Special credit lines and green finance

Climate negotiations have encouraged national and international financial institutions to create special credit lines and green financing with favorable terms—such as lower interest rates, longer repayment periods, and extended grace periods—for sustainable projects.

Brazilian MSMEs can access these special credit lines offered by public banks (such as BNDES, Banco do Brasil, Caixa Econômica Federal, and regional banks), private banks, and credit cooperatives. Examples include specific lines for photovoltaic solar energy, energy efficiency, sustainable agriculture, the bioeconomy, the circular economy, and sustainable waste management.

c. Fiscal and tax incentives

Fiscal and tax incentives to promote sustainable investments and reduce greenhouse gas emissions have been encouraged in international negotiations, aiming for adoption by national and local governments.

Brazilian MSMEs can directly benefit from these incentives, such as tax reductions or exemptions (ICMS, ISS, IPI, import duties) for the acquisition of sustainable equipment, clean technologies, and sustainable inputs. These incentives can significantly lower operational and investment costs for small businesses, enhancing their competitiveness and economic viability.

d. Economic subsidy programmes and non-reimbursable funding

Countries engaged in climate negotiations have also promoted the creation of economic subsidy programmes and non-reimbursable resources (grants) to support innovative and sustainable projects.

Brazilian MSMEs can access these resources through specific calls for proposals issued by public institutions—such as Finep, Embrapii, Sebrae, and state development agencies—as well as by international organisations.

These resources can finance projects in technological innovation, the development of new sustainable products, technical and managerial capacity-building, environmental certifications, and economic and environmental feasibility studies.

e. Participation in carbon markets and payments for environmental services

One of the mechanisms that has emerged from climate negotiations is the carbon market. At present, the focus lies on voluntary and regulated carbon markets, which create opportunities for Brazilian MSMEs to develop emission offset projects and generate carbon credits.

Through such mechanisms, MSMEs can access additional resources by selling carbon credits generated from reforestation, regenerative agriculture, restoration of degraded areas, renewable energy, and energy efficiency projects.

In addition, MSMEs can access financial resources through payment for environmental services (PES) programmes, particularly in areas such as forest conservation, water resource protection, and biodiversity. Although still relatively new, these programmes are becoming increasingly viable as companies, state governments, and the federal government establish regulations and standards for PES initiatives.

f. Public–private partnerships and national climate investment platforms

The creation of national and international climate investment platforms has emerged as a key solution to mobilise the necessary investments, such as the Brazilian Platform for Climate and Ecological Transformation, the Just Energy Transition Partnerships (JETPs), and other similar initiatives.

MSMEs can participate in these platforms, accessing financial resources mobilised through public–private partnerships (e.g., matching funds, blended finance), sustainable investment funds, and innovative climate finance and investment mechanisms.

These platforms can facilitate MSMEs' access to national and international investors interested in sustainable projects aligned with global climate goals.

g. How to expand access?

For Brazilian MSMEs to effectively access these financial resources and climate incentives, it is important to consider several strategic actions:

- **Access to updated information** on credit lines, climate funds, and incentive programmes available in Brazil and abroad.
- **Targeted capacity-building and training** on developing sustainable projects and submitting proposals to climate funds and financing calls.
- **Strategic partnerships with financial institutions**, development banks, credit cooperatives, universities, and non-governmental organisations to access financial resources and specialised technical assistance.
- **Develop robust sustainable projects**, with clear environmental, social, and economic impact indicators, enhancing the likelihood of approval and funding.
- **National and international climate investment platforms**, specialized fairs and sustainable business roundtables to increase visibility and attract interested investors.

4.3 Strengthening technological innovation and technology transfer

Frequently, climate negotiations emphasise the importance of technological innovation and the transfer of clean and sustainable technologies to developing countries, such as Brazil. Brazilian MSMEs can benefit from this process by gaining greater access to innovative and sustainable technologies, facilitating their integration into green value chains and potentially enhancing their competitiveness and final added value.

a. Facilitated access to international sustainable technologies

Climate negotiations have driven international technology transfer mechanisms, such as the UNFCCC Technology Mechanism (Climate Technology Centre and Network—CTCN), which facilitates access for developing countries to sustainable technologies. Brazilian MSMEs can access innovative and sustainable technologies through these international mechanisms, particularly in strategic areas such as renewable energy (solar, wind, biomass), energy efficiency, sustainable agriculture, the bioeconomy, water management, the circular economy, and waste management.

Facilitated access to international technologies enables Brazilian small businesses to improve their production processes, reduce operational costs, increase efficiency and competitiveness, and meet national and international environmental and regulatory requirements.

b. Participation in technical-technological training programmes and technical and managerial assistance

Another key point emphasised is the importance of technological capacity-building and specialised technical assistance for developing countries, which is particularly relevant for MSMEs.

Brazilian MSMEs can apply for and participate in specific programmes offering technological capacity-building, technical training, specialised consulting, and technical assistance provided by national and international institutions. In Brazil, as well as through South–South cooperation, entities such as Sebrae, Senai, Embrapa, and certain universities and research centres act both as recipients and providers of international cooperation initiatives that strengthen technical-technological and managerial capacity-building.

This enables MSMEs to enhance their technical and managerial capabilities, adopt innovative and sustainable technologies, and increase their competitiveness in sustainable markets.

c. Financial incentives for sustainable technological innovation

The promotion of specific financial incentives for sustainable technological innovation is also a key topic in international negotiations, including special credit lines, economic subsidies, non-repayable grants, and sustainable innovation investment funds..

These financial resources can be accessed to develop innovative projects, acquire sustainable technologies, conduct technological testing and validation, obtain environmental certifications, and implement sustainable technological solutions in production processes.

Examples include programmes such as Finep Inovacred, Embrapii, targeted calls for sustainable innovation, international climate funds, and green credit lines offered by public and private banks.

National programmes of this nature—or new ones to be established—can, in turn, enable access to donor resources, climate funds, and international development banks through international financing projects, which often face challenges in reaching MSMEs directly at the required scale.

d. Strategic partnerships for technology transfer

Climate negotiations have strongly encouraged the creation of strategic partnerships among companies, universities, research centres, financial institutions, and governments to facilitate the transfer of sustainable technology.

Brazilian MSMEs can establish strategic partnerships with international companies holding sustainable technologies, national and international universities and research centres, and financial institutions specialising in technological innovation.

Such partnerships can enable access to innovative technologies, support effective technology transfer, adapt technologies to the local context, and strengthen their technological and competitive capacities.

e. Participation in international networks for sustainable technological innovation

International networks for sustainable technological innovation have been promoted as a result of international negotiations, such as the Climate Technology Centre and Network (CTCN), the Renewable Energy and Energy Efficiency Partnership (REEEP), and the Carbon Sequestration Leadership Forum (CSLF).

Participation in these international networks can create opportunities for Brazilian MSMEs by providing access to up-to-date information on sustainable technologies, technology transfer opportunities, specialised technical training, climate finance, and strategic partnerships.

Engagement in these networks has the potential to enhance the visibility of Brazilian small businesses, facilitate access to innovative and sustainable technologies, and strengthen their integration into international value chains.

f. Development of endogenous technologies and local technological adaptation

Technical and technological solutions to climate challenges may not always be available in the international context. For this reason, climate negotiations have also generated local outcomes, as national challenges often require the development of endogenous (local) technologies and the technological adaptation needed to meet the specific realities of developing countries.

The development of innovative technologies adapted to the Brazilian context—particularly in areas such as sustainable agriculture, the Amazon bioeconomy, decentralised renewable energy, local water management, and technological solutions for vulnerable communities—clearly represents opportunities for MSMEs, which are more closely connected to local realities and climate challenges.

The development of endogenous technologies strengthens not only the technological autonomy of Brazilian MSMEs but also that of the country as a whole. It further creates local and regional business opportunities, thereby contributing to Brazil's sustainable economic development.

g. How these opportunities can be seized in practice

Some strategic actions need to be prioritised to enable Brazilian MSMEs to effectively seize the opportunities related to technological innovation and technology transfer:

- **Seek up-to-date information** on international technology transfer mechanisms, technological capacity-building programmes, and available financial incentives, and establish national mechanisms to capture, disseminate, and internationalise capacities and competencies.
- **Actively participate in technological capacity-building programmes**, technical training, and specialised technical assistance offered by national and international institutions.
- **Establish strategic partnerships** with international companies, universities, research centres, and financial institutions specialising in sustainable technological innovation.
- **Develop robust innovative projects** with clear environmental, social, and economic impact indicators, thereby increasing the likelihood of approval and funding, while identifying relevant instruments to enhance efficiency and effectiveness in the preparation of strategic projects.
- **Participate in international networks on sustainable technological innovation**, national and international sustainable business platforms, specialised fairs, and green business roundtables.

4.4 Strengthened local and regional value chains

Climate negotiations highlight the importance of strengthening local and regional value chains, particularly those linked to family farming, agroecology, the Amazon bioeconomy, and the solidarity economy. This creates significant opportunities for MSMEs to integrate into sustainable value chains, generating local employment, promoting social inclusion, reducing environmental impacts, and enhancing the economic resilience of communities.

The related opportunities are outlined below and are closely linked to the previous topics, which emphasised financing, innovation, and technical-technological capacity-building. To avoid redundancy, they are presented here in a concise form, as follows:

1. Incentives for sustainable local and regional value chains.
2. Support for technological innovation adapted to local realities.
3. Strengthening local and regional cooperation networks around market needs.
4. Specialised technical training for sustainable value chains.
5. Participation in national and international platforms to strengthen local and regional value chains.

In summary, international climate negotiations provide, through both international and national channels, a favourable environment for Brazilian MSMEs to strengthen their sustainable local and regional value chains, accessing targeted financial incentives, specialised technical capacity-building, technologies adapted to the local context, local and regional productive cooperation networks, differentiated sustainable markets, and strategic national and international platforms.

4.5 Participation in climate adaptation projects

MSMEs can directly benefit from climate adaptation projects arising from international agreements and negotiations, particularly in sectors such as agriculture, water management, resilient infrastructure, and sustainable tourism. These projects can create demand for specialised services, adaptive technologies, and innovative solutions provided by local small businesses.

The increasing challenges posed by extreme climate events, such as droughts, floods, storms, and rising sea levels, create concrete opportunities for Brazilian MSMEs to actively participate in climate adaptation projects. Such participation can strengthen their resilience, reduce vulnerabilities, and generate economic, social, and environmental benefits.

A significant part of building MSME resilience in the face of high climate vulnerability will be addressed by the MSMEs themselves, owing to their local reach and deep understanding of local problems and markets. Some of these opportunities are outlined below.

a. Access to targeted financing for climate adaptation projects

Brazilian MSMEs can access these financial resources to implement concrete climate adaptation projects in strategic sectors such as sustainable agriculture, water management, resilient infrastructure, sustainable forest management, sustainable tourism, integrated climate risk management, and the restoration of degraded areas. Projects led by national institutions and submitted to international funds, such as the GCF and the Adaptation Fund, as well as special credit lines offered by international development banks, can increase the available funding and provide targeted guidance through national funds and special credit lines offered by domestic development banks.

b. Participation in pilot and demonstration climate adaptation projects

The implementation of pilot and demonstration climate adaptation projects in developing countries, aimed at testing and disseminating innovative and effective solutions, is a recurring topic in international climate negotiations, serving as a means to scale up replicable solutions. In this context, Brazilian MSMEs can actively participate in pilot and demonstration projects, implementing practical and innovative climate adaptation solutions adapted to the local context. Examples include pilot projects on climate-resilient agriculture, adaptive agroforestry systems, water capture and storage technologies, flood- and drought-resilient infrastructure, and the restoration of degraded ecosystems, among others.

c. Adaptive technology transfer for climate adaptation

Climate negotiations have emphasised the importance of adaptive technology transfer to support climate adaptation projects in developing countries. Brazilian small businesses can access adaptive technologies specifically designed for climate adaptation, such as early warning systems, water capture and storage technologies, adaptive agroforestry systems, low-cost technologies for local water management, resilient infrastructure, and nature-based solutions. Adaptive technology transfer enables Brazilian small businesses to implement concrete climate adaptation projects, strengthening their resilience and reducing climate-related vulnerabilities.

d. Specialised technical capacity-building in climate adaptation

As noted in the previous sections, specialised technical and managerial capacity-building is highly relevant, as it enables Brazilian MSMEs to enhance their technical and managerial capabilities to implement concrete climate adaptation projects.

e. Participation in local, regional, and international climate adaptation networks

These networks enable Brazilian MSMEs to access up-to-date information on financing opportunities, technology transfer, specialised technical capacity-building, and the implementation of concrete climate adaptation projects. Additionally, they enhance scale and accelerate the learning curve through peer-to-peer learning, specialised advisory support, and access to scientifically backed knowledge, both technological and market-oriented.

f. Integration into national and local climate adaptation plans

Climate negotiations provide an important impetus for the creation and implementation of specific national and local climate adaptation plans, such as National Adaptation Plans (NAPs) and municipal climate adaptation plans.

Brazilian MSMEs can actively participate in these national and local plans by implementing concrete projects aligned with the strategic priorities set by national and local governments. This integration enables Brazilian MSMEs to access targeted financial resources, specialised technical capacity-building, and institutional support for the implementation of concrete climate adaptation projects.

g. Practical approaches to seizing these opportunities

For Brazilian MSMEs to effectively seize these opportunities to participate in climate adaptation projects, it is important to consider several strategic actions:

- **Seek up-to-date information on targeted climate funds**, special credit lines and available international and national programmes for climate adaptation projects.
- **Actively participate in local, regional, and international networks** dedicated to climate adaptation, establishing strategic partnerships with other companies, cooperatives, producer associations, local financial institutions, universities, and local governments.
- **Develop robust climate adaptation projects** with clear environmental, social, and economic impact indicators, thereby increasing the likelihood of approval and funding.
- **Continuously invest in specialised technical capacity-building and adaptive technology transfer** to implement practical and innovative climate adaptation solutions.
- **Integrate into national and local climate adaptation plans**, aligning projects with the strategic priorities set by national and local governments..

In summary, international climate negotiations create a favourable environment for active participation in concrete climate adaptation projects, strengthening resilience, reducing vulnerabilities, and generating economic, social, and environmental benefits for both communities and MSMEs.

4.6 Access to environmental certifications and labels

The most stringent environmental standards and international certifications—such as carbon neutrality, sustainable agriculture, and fair trade certifications—are a recurring focus of international negotiations, particularly when linked to the financial mechanisms supporting climate initiatives.

Some of these certifications can be highly relevant for Brazilian MSMEs, adding value to their products and services and expanding opportunities for export and integration into international value chains. Furthermore, these certifications and labels serve as strategic

tools, enabling companies to demonstrate their commitment to sustainability, enhance their institutional reputation, and increase competitiveness. The following section outlines some of these opportunities in greater detail.

a. International certifications related to climate and sustainability

Brazilian MSMEs can access international certifications, which should be carefully evaluated to determine how they can positively enhance market potential and competitiveness—both in the short and long term—since certifications involve investments for implementation and operational costs for maintenance. Some examples of these certifications are outlined below:

- **Carbon Neutral Certification**, which recognises companies that measure, reduce, and offset their greenhouse gas emissions.
- **ISO 14001 Certification (Environmental Management System)**, which attests to the implementation of sustainable environmental practices and efficient management of natural resources.
- **FSC Certification (Forest Stewardship Council)**, which recognises sustainable practices in forest management and responsible use of forest products.
- **Fair Trade Certification**, which recognises sustainable and socially responsible practices within value chains.
- **Rainforest Alliance Certification**, which recognises sustainable practices in agriculture, tourism, and forest management.

b. National and international environmental labels

The creation and strengthening of national and international environmental labels is also an important outcome of international negotiations, aimed at recognising specific sustainable practices across different productive sectors.

But what is the difference between a label and a certification? A label is a visual representation that informs consumers that a product or service meets certain criteria (quality, safety, sustainability, etc.). Labels can be created by companies, associations, or governmental bodies and may vary in rigor. In contrast, a certification involves a formal process conducted by an independent and accredited body, which assesses whether a product, service, system, or process complies with specific standards and requirements. Additionally, certification may involve audits, tests, and analyses to verify compliance, and both products and processes can be certified.

Some examples of environmental labels accessible to Brazilian MSMEs include:

- **Organic Label**, which recognises sustainable practices in organic agriculture.
- **Procel Energy Efficiency Label**, which recognises products and processes with high energy efficiency.
- **LEED Label (Leadership in Energy and Environmental Design)**, which recognises sustainable and efficient buildings.
- **ABNT Environmental Label**, which recognises sustainable practices across various productive sectors, and the **Green Seal (Selo Verde)**, or **Ecological Label**, which certifies the environmental performance of products and services by meeting sustainability standards throughout their life cycle, from raw material extraction to disposal.

c. Access to new domestic and international markets

The value of environmental certifications and labels in domestic and international markets has created opportunities. For Brazilian MSMEs, obtaining recognised environmental certifications and labels translates into access to specific markets and value chains that prioritise sustainable practices—such as domestic and international organic product markets, carbon markets, FSC-certified product markets, and fair trade markets, as widely documented in the literature. Furthermore, these certifications and labels help strengthen institutional reputation with consumers, investors, and business partners.

d. Practical approaches to seizing these opportunities

For Brazilian MSMEs to effectively seize these opportunities to access environmental certifications and labels, it is important to consider several strategic actions:

- Seek up-to-date information on nationally and internationally recognised certifications and labels, identifying those most appropriate for their productive sector and business profile.
 - Actively participate in specialised technical capacity-building programmes for implementing the sustainable practices required by certifications and labels.
 - Develop targeted commercial strategies to access differentiated markets that value certifications and labels.
 - Actively engage in networks and platforms dedicated to certifications and labels, establishing strategic partnerships with other companies, financial institutions, universities, and civil society organisations.
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4.7 Participation in carbon offset and carbon market initiatives

With the advancement of climate negotiations, both voluntary and regulated carbon markets are expected to grow, creating opportunities for MSMEs to participate in these markets by developing emission offset projects, reforestation, regenerative agriculture, and environmental conservation initiatives. Such participation can generate additional revenue, strengthen financial sustainability and investment capacity, access new markets, enhance institutional reputation, and directly contribute to climate change mitigation.

A natural challenge lies in operational costs and the learning curve required to operate in this market. Collective strategies may therefore be more appropriate initially, working with a credit-consolidating entity—such as cooperatives, banks, or other institutions—that can offer volume and predictability to the buyer market. Some of the resulting opportunities are outlined below:

a. Participation in the voluntary carbon market

The voluntary carbon market (VCM) allows companies to develop specific projects to reduce or remove greenhouse gas (GHG) emissions, generating carbon credits that can be sold to companies or individuals seeking to voluntarily offset their emissions. MSMEs can develop projects within the voluntary carbon market, such as: (i) reforestation and forest restoration; (ii) sustainable and agroforestry agriculture; (iii) energy efficiency and renewable energy; (iv) and sustainable solid waste management and biogas.

b. Participation in regulated carbon markets

International climate negotiations have advanced the regulation of carbon markets under Article 6 of the Paris Agreement and the CORSIA scheme (Carbon Offsetting and Reduction Scheme for International Aviation). To participate in these regulated markets, MSMEs must follow rigorous methodologies, conduct independent monitoring and verification, and ensure the environmental integrity of the credits generated.

c. Development of REDD+ projects

The development of REDD+ projects (Reducing Emissions from Deforestation and Forest Degradation) is a recurring and actively promoted topic in international negotiations. These projects aim to reduce emissions from deforestation and forest degradation, while also promoting conservation, sustainable forest management, and the enhancement of forest carbon stocks.

REDD+ projects—particularly jurisdictional or national models, which are increasingly valued by international buyers due to their high environmental integrity—can represent business opportunities for Brazilian MSMEs.

Supply chains for “forest-based production” are consistently highlighted as opportunities for MSMEs in locations suitable for forest development, growth, and management.

Additionally, these projects generate carbon credits that can be sold in voluntary and regulated markets, producing additional revenue and delivering social and environmental benefits to local communities.

d. Ensuring the environmental integrity of carbon credits

Ensuring the environmental integrity of generated carbon credits—by following internationally recognised methodologies, conducting independent monitoring and verification, and using robust systems for credit registration and tracking—is a recurring focus in projects of this nature. Guaranteeing environmental integrity significantly increases the value and market acceptance of carbon credits generated by Brazilian MSMEs.

4.8 Greater prominence and visibility of MSMEs

The importance of including small businesses, local communities, and vulnerable groups in national and international climate strategies has been promoted in international negotiations to enhance their prominence and visibility.

International climate negotiations increasingly recognise the strategic importance of MSMEs in the transition to a sustainable and climate-resilient economy. This creates concrete opportunities for Brazilian small businesses to assume a more prominent role, gain visibility, and be recognised as key actors in the implementation of innovative and sustainable climate solutions. Some of these opportunities are outlined below.

a. International recognition of the role of MSMEs

Brazilian MSMEs can gain international recognition by demonstrating innovative and sustainable practices, particularly in strategic sectors such as sustainable agriculture, renewable energy, circular economy, energy efficiency, sustainable waste management, and biodiversity conservation. This international recognition strengthens the institutional reputation of Brazilian small businesses, expanding their commercial opportunities and strategic partnerships.

b. Active participation in international climate and sustainability events

Dedicated spaces for the active participation of small businesses in international events—such as the Conference of the Parties (COP), business forums, international trade fairs, and sectoral meetings—have been encouraged.

Brazilian MSMEs and their advocacy organisations can actively engage in these international events by presenting innovative solutions, sharing practical experiences, and establishing strategic partnerships with companies, investors, governments, and international organisations.

c. Inclusion of MSMEs in national and international public policies

Climate negotiations have strongly encouraged the inclusion of small businesses in national and international public policies related to climate and sustainability.

Brazilian MSMEs and their advocacy organisations can actively participate in public consultations, sectoral dialogues, and policy-making processes on climate policies, ensuring that their specific needs are considered and integrated into public policy. This inclusion strengthens the role of Brazilian small businesses, enabling them to directly influence the public policies that affect their businesses and productive sectors.

d. Access to international Sustainability platforms and networks

The creation and strengthening of international platforms and networks specifically for sustainable small businesses represents another significant opportunity, enabling access to up-to-date information, the sharing of practical experiences, the establishment of strategic partnerships, and enhanced global visibility.

Examples include international networks such as the SME Climate Hub, sustainable business platforms, climate innovation networks, and global circular economy initiatives.

e. Strategic communication and promotion of MSMEs' climate actions

Brazilian MSMEs can access specialised technical support to develop effective communication and promotion strategies for their sustainable actions, including sustainability reporting, green marketing campaigns, social media presence, and participation in national and international events. Such strategic communication has the potential to significantly enhance the visibility of Brazilian small businesses among consumers, investors, business partners, and governments.

f. Awards and recognitions for sustainable MSMEs

National and international awards and recognitions provide visibility, strengthen reputation, and expand commercial opportunities. Examples include national and international awards for sustainability, climate innovation, circular economy, and socio-environmental responsibility.

5. CONCLUSION

As discussed in this article, climate change and climate mitigation and adaptation actions are not merely environmental issues, but strategies for the survival and potential growth of MSMEs, which will shape the contexts in which they operate over the coming decades.

Companies that act proactively will gain competitive advantages, while those that neglect these issues will face increasing financial and operational risks, representing real and tangible threats to their survival and to the families that depend on them for their livelihoods.

MSMEs, together with low-income households, are the most vulnerable links in the economy when confronted with climate events, but they can reduce the risks they face by adopting measures that:

- **Prevention:** Planning, clarity, and simplicity to enhance resilience (e.g., strategic stockpiling, solar energy), translating into increased sales and/or reduced costs and losses.
- **Collective action:** Networks not only for mutual support among local businesses, but also to undertake the necessary initiatives that enable them to participate more actively in mitigation and adaptation effort.
- **Advocacy:** Advocacy for inclusive adaptation policies (e.g., funds with greater focus on MSMEs or changes to banking regulations that disadvantage MSMEs under COP30), as well as for improving the quality of information and financing sources available to MSMEs and their representative and technical assistance organisations.

With regard to the productive linkages of MSMEs, international climate negotiations create a favourable environment for Brazilian MSMEs to integrate into sustainable value chains, access new markets, secure climate finance, strengthen their technical and managerial capacities, and actively contribute to the country's sustainable development.

There is no single formula that applies to all businesses, situations, or regions of the world; however, being attentive to these measures represents a highly relevant horizon for the development of knowledge, actions, and policies at all levels. The future in a changing climate has already begun, with climate-related events affecting homes and businesses every day in different parts of the world. Past experience provides a basis for learning, but it offers no guarantees of applicability in the future.

REFERENCES

Bastos Lima, M. G., G. Kissinger, I. J. Visseren-Hamakers, J. Braña-Varela, and A. Gupta. 2017. "The Sustainable Development Goals and REDD+: Assessing Institutional Interactions and the Pursuit of Synergies." *International Environmental Agreements: Politics, Law and Economics* 17: 589–606. <https://doi.org/10.1007/s10784-017-9366-9>.

BCG Henderson Institute. 2022. *Synthetic Biology is About to Disrupt Your Industry*. <https://mkt-bcg-com-public-pdfs.s3.amazonaws.com/prod/synthetic-biology-is-about-to-disrupt-your-industry.pdf>.

Burney, J. A., and R. L. Naylor. 2012. "Smallholder Irrigation as a Poverty Alleviation Tool in Sub-Saharan Africa." *World Development* 40 (1): 110–23. <https://doi.org/10.1016/j.worlddev.2011.05.007>.

Burnham, M., and Z. Ma. 2018. "Multi-Scalar Pathways to Smallholder Adaptation." *World Development* 108: 249–62. <https://doi.org/10.1016/j.worlddev.2017.08.005>.

Camps-Calvet, M., J. Langemeyer, L. Calvet-Mir, and E. Gómez-Baggethun. 2016. "Ecosystem Services Provided by Urban Gardens in Barcelona, Spain: Insights for Policy and Planning." *Environmental Science & Policy* 62: 14–23. <https://doi.org/10.1016/j.envsci.2016.01.007>.

Canales, F., A. Beluco, and C. Mendes. 2015. "A Comparative Study of a Wind Hydro Hybrid System with Water Storage Capacity: Conventional Reservoir or Pumped Storage Plant?" *Journal of Energy Storage* 4: 96–105. <https://doi.org/10.1016/j.est.2015.09.007>.

CEPAL/ECLAC. 2018. *Assessment of the Effects and Impacts of Hurricane Maria in Puerto Rico*. Santiago, Chile: ECLAC/CEPAL.

Federação das Indústrias do Estado do Rio de Janeiro (FIRJAN). 2022. *Impactos Econômicos das Chuvas em Petrópolis*. Rio de Janeiro: FIRJAN.

Hallegatte, S., A. Vogt-Schilb, M. Bangalore, and J. Rozenberg. 2016. *Unbreakable: Building the Resilience of the Poor in the Face of Natural Disasters*. Washington, D.C.: World Bank Group. <http://documents.worldbank.org/curated/en/512241480487839624>.

IPCC. AR6. *Sexto Relatório de Avaliação*. <https://www.ipcc.ch/report/ar6/syr/>.

Lewandowski, M. 2016. "Designing the Business Models for Circular Economy—Towards the Conceptual Framework." *Sustainability* 8 (1): 43. <https://doi.org/10.3390/su8010043>.

Linder, M., and M. Williander. 2017. "Circular Business Model Innovation: Inherent Uncertainties." *Business Strategy and the Environment* 26 (2): 182–96. <https://doi.org/10.1002/bse.1906>.

Multilateral Development Banks (Bank, European Bank for Reconstruction and Development, European Investment Bank, African Development Bank, and Asian Development Bank). 2016. *Joint Report on Multilateral Development Banks' Climate Finance*. <https://publications.iadb.org/en/2016-joint-report-multilateral-development-banks-climate-finance>.

Napp, T., A. Gambhir, T. Hills, N. Florin, and P. Fennell. 2014. "A Review of the Technologies, Economics and Policy Instruments for Decarbonising Energy-Intensive Manufacturing Industries." *Renewable and Sustainable Energy Reviews* 30: 616–40. <https://doi.org/10.1016/j.rser.2013.10.036>.

OECD. 2021. *Managing Climate Risks, Facing Up to Losses and Damages*. Paris: OECD Publishing. <https://doi.org/10.1787/55ea1cc9-en>.

Organizações das Nações Unidas. 2015. *O Acordo de Paris*. <https://www.un.org/en/climatechange/paris-agreement>.

Plantinga, A., and B. Scholtens. 2016. "The Financial Impact of Divestment from Fossil Fuels." <https://doi.org/10.1080/14693062.2020.1806020>.

Reij, C., and R. Winterbottom. 2015. *Scaling Up Regreening: Six Steps to Success*. https://www.wri.org/webform/download_publication?source_entity_type=node&source_entity_id=42899.

Rosenzweig, C., W. Solecki, P. Romero-Lankao, S. Mehrotra, S. Dhakal, and S. Ali Ibrahim, eds. 2018. *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network*. Cambridge: Cambridge University Press. <https://uccrn.ei.columbia.edu/arc3.2>.

Scott, D., M. Hall, and S. Gössling. 2019. "Global Tourism Vulnerability to Climate Change." *Annals of Tourism Research* 77: 49–61. <https://doi.org/10.1016/j.annals.2019.05.007>.

Stevens, C., R. Winterbottom, J. Springer, and K. Reyntar. 2014. *Securing Rights, Combating Climate Change*. https://www.wri.org/webform/download_publication?source_entity_type=node&source_entity_id=41976.

Surminski, S., L. M. Bower, and J. Linnerooth-Bayer. 2016. "How Insurance Can Support Climate Resilience." *Nature Climate Change* 6 (4): 333–34. https://www.researchgate.net/publication/299399248_How_insurance_can_support_climate_resilience.

Thornton, T. F., and C. Combetti. 2017. "Synergies and Trade-Offs Between Adaptation, Mitigation and Development." *Climatic Change* 140: 5–18. <https://doi.org/10.1007/s10584-013-0884-3>.

United Nations Environment Programme (UNEP). 2023. *Emissions Gap Report 2023: Broken Record – Temperatures Hit New Highs, Yet World Fails to Cut Emissions (Again)*. Nairobi: UNEP. <https://www.unep.org/resources/emissions-gap-report-2023>.

Vogel, E., and R. Meyer. 2018. "Chapter 3 – Climate Change, Climate Extremes, and Global Food Production—Adaptation in the Agricultural Sector." In *Resilience*, edited by Zinta Zommers and Keith Alverson, 31–49. Elsevier. <https://www.sciencedirect.com/science/article/pii/B9780128118917000037>.

APPENDICES

Appendix 1. Climate change and international negotiations

A. Climate change

Climate change refers to significant and long-lasting alterations in the Earth's climate patterns, particularly those driven by human activities since the Industrial Revolution. These changes include rising global temperatures (global warming), shifts in precipitation patterns, glacier melt, sea-level rise, and more frequent and intense extreme weather events.

It represents one of humanity's greatest challenges in the twenty-first century, requiring global cooperation to mitigate its effects and adapt to new realities. Among its main causes are:

1. Greenhouse gas (GHG) emissions:
 - The burning of fossil fuels (coal, oil, and gas) releases carbon dioxide (CO₂), methane (CH₄), and other heat-trapping gases into the atmosphere.
 - Deforestation also contributes, as trees absorb CO₂, and their removal reduces this capacity. Additionally, forest fires release more GHGs into the atmosphere.
2. Industrial and agricultural activities:
 - Livestock farming emits methane (from cattle) and nitrous oxide (from fertilizers).
 - Industrial processes release pollutants and gases that intensify the greenhouse effect.
3. Urbanisation and excessive consumption:
 - Growing demand for energy, transportation, and material goods increases emissions.

The impacts of human interference in the climate are manifested through greater heat retention in the atmosphere, leading to higher temperatures and more intense and prolonged heatwaves. These, in turn, contribute to the increasing frequency, unpredictability and severity of extreme events such as hurricanes, droughts, floods and wildfires.

Other consequences include the melting of glaciers and polar ice caps and the resulting rise in sea levels, which threatens coastal cities. Biodiversity on land and in the oceans is also at

risk, with species facing possible extinction due to habitat loss and degradation. Human health is affected as well, with mosquito-borne diseases such as dengue likely to expand into new areas.

Addressing these challenges requires urgent action to transform humanity's relationship with nature and the climate. A comprehensive set of initiatives is needed to reduce greenhouse gas emissions in the atmosphere, including:

- **Reducing emissions:** Adopt renewable energy sources (solar, wind), promote electric vehicles and enhance energy efficiency.
- **Environmental conservation:** Protect forests and promote sustainable agriculture.
- **Individual actions:** Encourage responsible consumption, reduce waste and support sustainable initiatives.
- **Policies and global agreements:** International frameworks such as the Paris Agreement (UN, 2015) aim to limit global warming to 1.5–2°C above pre-industrial levels.

B. International climate negotiations and climate change

International climate negotiations are multilateral efforts to address the challenges posed by climate change, setting targets, rules and mechanisms for cooperation among countries. The main outcomes of these discussions include global agreements, financing mechanisms and emission reduction commitments.

Key frameworks in the climate negotiations include:

1. **United Nations Framework Convention on Climate Change (UNFCCC, 1992):** This convention aims to stabilize greenhouse gas (GHG) concentrations in the atmosphere. It established the Conferences of the Parties (COPs), where countries meet annually to negotiate climate actions.
 2. **Kyoto Protocol (1997, in force 2005):** The first treaty to set binding emission reduction targets for developed countries. It introduced the Carbon Market instruments and the Clean Development Mechanism (CDM). However, its impact was limited, as major emitters such as the United States did not ratify it, and China and India did not commit to binding targets.
 3. **Paris Agreement (2015, COP21):** Seeks to limit global warming to “well below 2°C,” preferably 1.5°C, above pre-industrial levels.
 4. **Voluntary commitments (Nationally Determined Contributions – NDCs):** Each country presents its emission reduction targets, updated every five years.
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5. **Climate finance:** Developed countries should contribute USD 100 billion per year to support developing nations. This target is currently under review, with expectations that it will be increased during COP30 in Belém.
6. **Transparency:** Global stocktake and review system.
7. **Glasgow Climate Pact (COP26, 2021):** Implemented to encourage the “phasedown” of coal and the reduction of fossil fuel subsidies.
8. **Rules for the global carbon market (Article 6 of the Paris Agreement):** Includes commitments such as elimination of methane (Global Methane Pledge) and the goal to end deforestation by 2030.
9. **Sharm el-Sheikh Agreement (COP27, 2022):** Focused on loss and damage, including the proposal to establish a fund for vulnerable countries affected by climate-related disasters. However, it achieved limited progress on emission reductions.
10. **COP28 (Dubai, 2023):** Provided the opportunity for the first global agreement on the energy transition, including references to reducing fossil fuel consumption, tripling renewable energy generation, and doubling energy savings from efficiency measures by 2030.

Although some progress has been made in international climate negotiations—for example: (i) nearly all countries now have climate targets (NDCs); (ii) renewable energy is expanding rapidly; and (iii) climate finance is increasing, though still below promised levels and what is required—these advances remain insufficient.

Studies indicate that global warming is likely to reach approximately 2.5–2.9°C (UNEP, 2023). This situation is exacerbated by the slow decay rate of greenhouse gases (GHGs) in the atmosphere, which means that their concentrations could remain extremely high for centuries if reliant solely on natural processes. Moreover, the consequences for forests and oceans in a significantly warmer world are not fully understood, and therefore their capacity to absorb these GHGs remains uncertain.

In addition: (i) developed countries have not fully delivered on the promise to mobilize USD 100 billion per year in climate finance; and (ii) resistance persists among nations dependent on oil and gas. The next steps are already underway at COP29 in Baku (2024) and COP30 in Belém (2025), which aim to: (i) define a new climate finance goal for the post-2025 period; (ii) increase ambition in Nationally Determined Contributions (NDCs) to limit temperature rise to 1.5°C; and (iii) implement the loss and damage fund.

While climate negotiations have made progress in establishing global frameworks, implementation remains slow. Pressure for faster and more equitable action continues, particularly to protect the most vulnerable countries. The coming years point to an international environment of increasingly complex diplomatic and negotiation dynamics, making the present moment a crossroads with equally unpredictable futures for climate negotiations.

Appendix 2. Example of a climate risk assessment and climate resilience plan for a small business in downtown Porto Alegre (RS, Brazil)

A. Climate risk assessment

For a small commercial business in the downtown district of Porto Alegre, in the state of Rio Grande do Sul (RS), Southern Brazil, climate risk is high, particularly from flooding and extreme heat.

Using IPCC data, urban studies, and vulnerability profiles for RS, the assessment identifies the following as the main climate risks for small businesses:

Climate event	Probability (2030)	Direct impact
Flooding (30% increase in rainfall intensity between 2025 and 2030)	85% (high)	Loss of inventory, damage to equipment, and an average 15-day business interruption
Heatwaves (+15 days per year above 35°C)	70% (medium-high)	30% reduction in customer flow and 40% increase in cooling costs
Severe storms	60% (average)	Blackouts (up to 48 hours), storefront damage

Sources: Rosenzweig et al. (2018) and Vogel et al. (2018), plus data from EPAGRI, FEPAGRO, INMET, MCTI, Porto Alegre City Hall, and the Metroclima Warning System.

In this context, based on available studies on losses incurred by MSMEs in Porto Alegre following the 2023 floods, annual losses are estimated to fall most likely between BRL 18,000 and 43,000. This corresponds to approximately 2 per cent to 5 per cent of the average annual revenue of a small business in the region, taking into account the following factors:

- **Location:** Downtown historic area (low-lying, near Lake Guaíba) risk of flooding in events exceeding 100 mm/24 hours.
- **Sector:** Retail (dependente on customer foot traffic)
- **Infrastructure:** Older buildings (inadequate draining)
- **Calculation basis:** Estimated loss = (flood risk × inventory value) + (sales reduction due to heat) + (additional operational costs)

B. Simplified climate resilience plan

Sector: Retail

Location: Downtown Porto Alegre, RS, Brazil

Main hazards: Flooding (85 per cent probability), extreme heat (70 per cent probability), blackouts (60 per cent probability)

1. Flood protection (highest priority)

Action	Timeline	Cost	Effectiveness
Install removable barriers (e.g., FloodGate)	15 days	BRL 2,500	Blocks water up to 80cm
Elevate inventory (shelves at least 80cm high)	7 days	BRL 1,200	Reduces losses by 90%
Purchase parametric insurance (triggered by 100mm/24h rainfall alert)	30 days	BRL 800/year	Covers BRL 20,000 in damages

2. Adaptation to extreme heat

Action	Timeline	Cost	Benefit
Apply UV film to storefront windows	10 days	BRL 800	Reduces indoor temperature by 5°C
Installation of HVLS ceiling fans	20 days	BRL 1,500	Improves thermal comfort
Implement extended hours (6 pm – 10 pm)	Immediate	–	Serving customers during cooler hours

3. Blackout preparedness

Action	Deadline	Cost	Autonomy
Purchase of biodiesel portable generator	30 days	BRL 3,000	48h continuous operation
Battery-powered LED lighting system	15 days	BRL 400	8h of backup power

4. Timeline and budget

Step	Total investment	Expected return (per year)
Short term (0-30 days)	BRL 4,700	40% reduction in flood-related losses
Medium term (31-90 days)	BRL 2,300	25% savings in energy costs
TOTAL	BRL 7,000	

* Payback period assessment: 18 months

5. Monitoring and evaluation

A. Key indicators:

- Number of climate-related interruptions per quarter
- Cost of damage/inventory replacement

B. Free tools:

- *Alerta Enchentes* POA (<https://prefeitura.poa.br/defesa-civil/avisos-e-alertas>)
- *Adapta Brasil* Platform (<https://sistema.adaptabrasil.mcti.gov.br/>)
- Center for Climate and Energy Solutions (<https://www.c2es.org/category/climate-solutions/>)

C. Quarterly review:

Simulate scenarios (e.g., “What if the Guaíba rises by 2 metres? What would be the consequences for my business?”)

6. Local financial resources

A. Subsidies:

- **Adapta Centro Histórico Programme** (50% for flood protection works)
- **Sala do Empreendedor Porto Alegre:** CRESCER RS line (interest-free financing for climate adaptation)

B. Exemptions:

IPTU Sustentável (10 per cent property tax discount for Properties with Diamond-level certification)⁶

6. According to Municipal Decree No. 21.789, 19/12/2022 <<http://leismunicipa.is/08mwb>>.



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