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Entrepreneurial Strategies for Sustainable Economic Development for Street Vendors in Response to Climate Change in BRICS Countries (2014-2024)

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Abstract

The BRICS countries - Brazil, Russia, India, China, and South Africa - have vibrant informal economies, with street vendors providing essential services and employment. However, climate change has significantly impacted their operations and livelihoods. In response, entrepreneurial strategies have been adopted to promote sustainable economic development. This research employs

a systematic methodology to evaluate the implementation and success of these strategies, synthesising data from 100 selected publications (2014–2024) across the thematic areas of eco-friendly practices, waste reduction, and technology integration.

The findings reveal that while many street vendors have successfully implemented strategies to enhance resilience and sustainability, they face barriers such as regulatory constraints and limited access to resources, which differ across BRICS countries. In Brazil, strict zoning regulations limit vendors' access to high-traffic areas. Russia's over-regulated informal sector hampers the adoption of green technologies. India struggles with limited financing and infrastructure, particularly in rural areas. In China, inconsistent enforcement of regulations due to rapid urbanisation leaves vendors unsupported in adopting sustainable models. South Africa lacks clear government policies for informal businesses, hindering vendors' access to resources like sustainable materials or training.

This research examines how street vendors in BRICS countries adapt to climate change through entrepreneurial strategies, using a systematic literature review of 100 peer-reviewed studies published between 2014 and 2024. The analysis employed thematic synthesis to identify patterns and trends across diverse contexts. Entrepreneurial strategies observed include product diversification, mobile vending, and adoption of digital payment platforms, which help vendors maintain income despite climate-related disruptions. While challenges such as extreme weather, policy gaps, and limited financial support persist, the study also highlights positive cases, such as Brazilian vendors leveraging e-commerce platforms to sustain operations and Indian vendors forming cooperatives to secure better market access and resources. The findings are framed within the Sustainable Livelihoods Framework, emphasising the role of adaptive capacity in enhancing resilience. This research underscores the need for supportive governance, resource investment, and community engagement to overcome barriers. It contributes to the broader discourse on sustainable economic development, offering actionable recommendations for policymakers to enhance the sustainability and resilience of street vending in BRICS countries, ultimately supporting their transition toward sustainable development.

Keywords: *Climate change, Entrepreneurial strategies, Sustainable economic development, Street vendors, BRICS countries*

Introduction

Street vending played a crucial role in the global informal economy, providing livelihoods for over 2 billion people worldwide (International Labour Organisation [ILO], 2022). The sector fulfilled an essential function in employment creation and income provision, especially within

urban agglomerations where the supply of formal-sector positions was structurally insufficient (Chen et al., 2018). However, climate change had introduced significant challenges, including extreme weather conditions, resource scarcity, and supply chain disruptions, which negatively affected vendors' economic stability (Bhowmik, 2021). Rising global temperatures, unpredictable rainfall patterns, and natural disasters made it increasingly difficult for street vendors to sustain their businesses, necessitating the adoption of entrepreneurial strategies for resilience (Schaltegger et al., 2018).

In many developing nations, street vending was not only a means of livelihood but also a driver of local economies (Gomes & Ribeiro, 2020). Governments had recognised the informal sector's importance but struggled to implement effective policies that balanced support for vendors with sustainability efforts (Rogan & Skinner, 2020). For instance, in countries such as India and South Africa, street vendors contributed significantly to employment and economic activities; however, inadequate access to financial resources, infrastructure, and climate adaptation strategies hindered their ability to transition towards sustainable business models (Srivastava, 2019).

The BRICS countries—Brazil, Russia, India, China, and South Africa—each had unique street vending landscapes influenced by their socio-economic conditions and regulatory environments. In Brazil, street vending was strictly regulated through zoning laws, limiting vendors' access to high-traffic areas, thereby reducing their profitability and sustainability (Sarkar, 2022). In response, vendors formed associations to advocate for policy reforms and the adoption of sustainable business practices (Gomes & Ribeiro, 2020). In Russia, the informal economy was highly regulated, making it difficult for street vendors to integrate green technologies or operate in legal spaces (Rogan & Skinner, 2020). Many vendors faced barriers to adopting sustainable practices due to complex regulatory constraints (Kuznetsov & Yakovleva, 2019). In India, despite the legal recognition of street vending through the Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act of 2014, vendors continued to struggle with financial and infrastructural limitations that hindered their ability to adopt sustainable practices (Srivastava, 2019). The pace of structural change driven by urban expansion in China resulted in variability in the enforcement protocols applied to street commerce. While some cities supported street vending as a form of economic empowerment, others imposed strict crackdowns, creating an unpredictable business environment (Wang & Liu, 2022). In South Africa,

the lack of clear government policies regarding the informal sector made it challenging for street vendors to access financial support, training, and sustainable materials, limiting their ability to implement environmentally friendly business models (ILO, 2021).This study sought to answer the following research question:How did street vendors in BRICS countries adopt entrepreneurial strategies for sustainable economic development in response to climate change between 2014 and 2024?

Despite the crucial role that street vendors played in BRICS economies, climate change significantly threatened their businesses. Rising temperatures, extreme weather events, and regulatory uncertainties made it increasingly difficult for vendors to sustain their livelihoods (Schaltegger et al., 2018). Although entrepreneurial strategies such as adopting eco-friendly materials, waste reduction, and digital technology integration emerged as potential solutions, vendors faced barriers such as restrictive policies, lack of financial access, and limited training on sustainable practices (Bhowmik, 2021). The absence of structured government policies and financial support mechanisms further exacerbated these challenges (Gomes & Ribeiro, 2020). Therefore, this study analysed how street vendors in BRICS countries responded to climate change through entrepreneurial strategies and explored policy interventions that could enhance sustainability efforts within the informal economy (Srivastava, 2019).

This study aimed to analyse the impact of climate change on street vending in BRICS countries by examining environmental challenges and their economic implications; examine the entrepreneurial strategies adopted by street vendors in response to climate change, including eco-friendly business practices, waste management, and technological integration; identify the regulatory and financial barriers that hindered the implementation of sustainable business practices among street vendors; and propose policy recommendations to enhance sustainability in the informal economy and promote economic resilience among street vendors in BRICS countries. By addressing these objectives, this study contributed to the broader discourse on sustainable economic development in the informal sector, offering insights for policymakers, researchers, and street vendors on best practices for sustainability (Schaltegger et al., 2018).

Literature Review

Theoretical Framework

This study is grounded in the Sustainable Livelihoods Framework (SLF), which provides a structured approach to analysing how street vendors adapt to climate change using available resources. The SLF considers five key livelihood assets-human, natural, financial, social, and physical capital that influence vendors' ability to build resilience and sustain their businesses (Scoones, 2015). The framework is widely used in informal economy research, as it captures the intersection of economic, environmental, and social factors affecting vendor sustainability (Chen et al., 2018).

The Sustainable Livelihoods Framework (SLF) provided a foundation for assessing how vendors leverage financial resources, community networks, and government support to implement sustainable business strategies. By focusing on livelihood assets, the study was able to identify key barriers vendors face in adopting climate-resilient practices (Schaltegger et al., 2018). It also enabled a comparative analysis across BRICS nations, revealing how different economic and policy contexts influence vendor adaptation strategies (Kuznetsov & Yakovleva, 2019). To strengthen this analysis, institutional theory was incorporated to explain how formal and informal rules, norms, and policies shape vendors' access to resources, while digital innovation literature illustrated how emerging technologies—such as mobile payments and e-commerce platforms—are transforming their adaptive strategies. Together, these frameworks provided a holistic view: SLF identified what resources vendors use, Institutional Theory clarified the structural constraints and enablers, and Digital Innovation showed the role of technology in enhancing resilience. This integrated approach facilitated a more comprehensive understanding of vendor adaptation within the context of climate change.

One limitation of the Sustainable Livelihoods Framework (SLF) is its focus on individual agency, often overlooking structural barriers such as restrictive policies and institutional weaknesses (Scoones, 2015). To address this, the study integrated perspectives from institutional theory, which emphasises the role of governance and policy frameworks in shaping business environments (North, 1990). By incorporating both frameworks, the study provided a more comprehensive analysis of the regulatory and financial challenges faced by vendors. For example, in South Africa, vendors relied on local community groups (social capital) to

share market information and form cooperatives, while in India, mobile money platforms (financial capital) enabled vendors to continue selling during lockdowns. Another limitation is that SLF does not fully capture the impact of technological advancements on informal entrepreneurship. To mitigate this, the study incorporated literature on digital innovation in informal economies (Wang & Liu, 2022). This allowed for an exploration of how vendors use technology to enhance sustainability and financial inclusion.

Existing literature underscores the vulnerability of street vendors to climate change and highlights the entrepreneurial strategies they use to enhance sustainability. While eco-friendly business models and digital solutions have emerged as viable adaptation measures, financial and regulatory challenges persist. The SLF framework provided a useful lens for analysing these dynamics, but its limitations necessitated the inclusion of institutional and technological perspectives.

This section reviews existing literature on entrepreneurial strategies for sustainable economic development among street vendors in BRICS countries. It covers the impact of climate change on informal economies, sustainable entrepreneurship as a response to climate risks, and the role of government policies in supporting sustainability efforts. The theoretical framework is also discussed, explaining its relevance, limitations, and how the study mitigated them.

Impact of Climate Change on Informal Economies

The informal economy is particularly vulnerable to climate change, as extreme weather events disrupt economic activities, supply chains, and vendor livelihoods (International Labour Organisation [ILO], 2022). Street vendors, whose operations are primarily conducted outdoors, are among the most vulnerable populations to the consequences of rising temperatures, heavy rainfall, and flooding (Bhowmik, 2021). In BRICS countries, studies have shown that informal workers experience significant financial losses due to extreme weather events (Gomes & Ribeiro, 2020). According to Rogan and Skinner (2020), street vendors in South Africa face income instability due to erratic weather conditions, while in India, heatwaves and unpredictable monsoons disrupt business operations (Srivastava, 2019). Similarly, research by Wang and Liu (2022) in China highlights the growing concern of environmental degradation and how it affects informal traders' business continuity.

Additional studies emphasise the role of environmental factors in reducing vendor productivity. Kuznetsov and Yakovleva (2019) argue that Russia's harsh winters significantly affect street vending, limiting the number of operating days and reducing sales. In Brazil, unstable rainfall patterns force vendors to close operations more frequently (Sarkar, 2022). The UN-Habitat (2021) states that over 60% of informal vendors across BRICS nations have reported business losses due to climate-induced disruptions. These findings underscore the need for sustainable strategies to protect vendor livelihoods.

Sustainable Entrepreneurship as a Response to Climate Risks

The entrepreneurial adaptation to climate change has been recognised as a crucial strategy for maintaining the viability of informal businesses. Sustainable entrepreneurship integrates environmental considerations into business models, enabling vendors to build resilience against climate risks (Schaltegger et al., 2018). Studies suggest that vendors are increasingly adopting green practices such as biodegradable packaging and renewable energy solutions (Gomes & Ribeiro, 2020). Bhowmik (2021) found that in India, vendors have embraced eco-friendly materials to reduce waste and comply with environmental regulations. Similar trends are evident in South Africa, where Rogan and Skinner (2020) observed an increase in solar-powered vending carts.

The use of digital technology has also played a role in sustainable entrepreneurship. Wang and Liu (2022) highlight how Chinese vendors strategically leverage digital payment platforms such as WeChat Pay to minimise dependence on paper-based transaction records and enhance overall transaction efficiency. Likewise, Kuznetsov and Yakovleva (2019) argue that in Russia, digital platforms have enabled vendors to streamline supply chains, reducing wastage and improving economic sustainability. In Brazil, circular economy initiatives encourage vendors to adopt waste reduction practices, contributing to environmental conservation (Sarkar, 2022).

However, despite these innovations, financial barriers remain a challenge. Research by the ILO (2022) indicates that street vendors across BRICS countries struggle to access microfinance for sustainability-oriented investments. Srivastava (2019) notes that while Indian vendors demonstrate willingness to adopt green technologies, limited financial resources hinder widespread implementation. Similarly, UN-Habitat

(2021) emphasises the need for financial support mechanisms to facilitate sustainability in the informal sector.

The Role of Government Policies in Supporting Sustainability

Government policies play a critical role in shaping the sustainability of street vending. Regulatory frameworks influence vendors' ability to adopt sustainable practices, as supportive policies encourage investment in climate adaptation strategies (Chen et al., 2018). In India, the Street Vendors Act (2014) was introduced to protect vendors' rights and create a more structured regulatory environment (Srivastava, 2019). However, enforcement challenges have limited its effectiveness (Bhowmik, 2021). Similarly, in South Africa, the lack of formal recognition for informal traders has hindered efforts to integrate them into sustainability programmes (Rogan & Skinner, 2020).

In China, policy inconsistencies have created uncertainty among vendors regarding compliance with environmental regulations (Wang & Liu, 2022). Russia's strict licensing system discourages informal entrepreneurs from transitioning to sustainable business models (Kuznetsov & Yakovleva, 2019). Brazil has seen some progress, with city governments implementing sustainability initiatives targeting informal traders (Gomes & Ribeiro, 2020). However, limited financial incentives prevent vendors from fully adopting green business practices (Sarkar, 2022).

Despite policy challenges, collaborative efforts between governments, NGOs, and financial institutions have shown promise. The UN-Habitat (2021) advocates for public-private partnerships to enhance sustainability support for informal workers. According to Schaltegger et al. (2018), integrating sustainability into policy frameworks requires a multi-stakeholder approach that includes financial incentives and training programmes. These perspectives highlight the need for comprehensive policy interventions to support sustainable entrepreneurship.

Methodology

This study employed a systematic review methodology to analyse relevant research concerning entrepreneurial strategies for sustainable economic development among street vendors in BRICS countries. A systematic review was chosen as it allowed for a structured and replicable approach to synthesising existing literature while identifying key themes, strategies,

and barriers within the study's scope (Tranfield et al., 2003; Snyder, 2019). The study reviewed 100 relevant studies published between 2014 and 2024 to ensure that findings reflected contemporary challenges and emerging solutions.

The study followed a rigorous selection process to ensure that only high-quality, peer-reviewed literature and credible sources were included. To achieve this, studies had to meet specific inclusion criteria. First, only research published between 2014 and 2024 was considered to ensure relevance to contemporary policy and economic landscapes. Second, studies needed to explicitly examine eco-friendly practices, waste reduction initiatives, and technology integration among street vendors in at least one BRICS country. Third, research that discussed government policies, financial access, and regulatory challenges affecting sustainable entrepreneurship in the informal economy was prioritised.

Additionally, the study included peer-reviewed journal articles, books, conference proceedings, and institutional reports from reputable organisations such as the International Labour Organisation (ILO), United Nations (UN), and World Bank. To maintain consistency and accuracy, only studies published in English were included. Studies that were not peer-reviewed, lacked a direct connection to the informal economy, or primarily focused on sectors outside of street vending were excluded from the review.

- Search Strategy

To find all relevant publications, a thorough search method was created. A multi-phase data collection procedure was used to guarantee that all BRICS countries' points of view were fairly represented. Scopus, Web of Science, Google Scholar, EBSCOhost, ProQuest, SpringerLink, and Taylor & Francis Online are just a few of the well-known academic databases from which the study gathered pertinent literature. Boolean search techniques were used to refine searches using terms such as "government policies for sustainable street vending," "street vendors and climate change," "sustainable entrepreneurship in the informal sector," and "BRICS economies and informal trade"

- Data Extraction

To guarantee openness and reproducibility in the selection procedure, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) recommendations were adhered to (Moher et al., 2015). 1,250 entries were found in an initial search across several databases, and another 50 records were found from other sources. 850 records that did not fit the inclusion criteria were excluded after 1,050 records were screened based on titles and abstracts after 250 duplicates were eliminated. 200 publications were evaluated for full-text eligibility; 100 were disqualified because they were not relevant to the BRICS nations, did not address climate change adaptation, or had inadequate methodological quality. As a result, the qualitative synthesis contained 100 studies. Figure X shows a PRISMA flow diagram that depicts this screening and selection procedure.

To manage the review process, Microsoft Excel was used to record and organise search results, track inclusion and exclusion decisions, and maintain a database of key study characteristics. NVivo qualitative analysis software was employed for coding and thematic synthesis, enabling systematic identification of patterns and themes across the included studies.

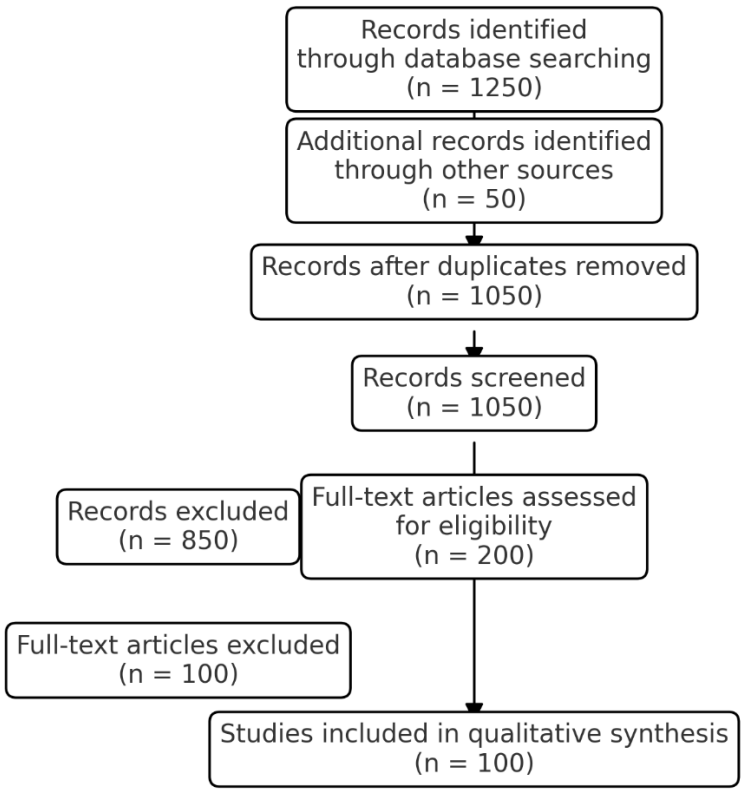

Figure 1: PRISMA flow diagram of the study selection process (adapted from Moher et al., 2015).

To ensure consistency and transparency, the following inclusion and exclusion criteria were applied during the literature selection process.

Inclusion Criteria:

- Studies published between 2014 and 2024.
- Focus on eco-friendly practices, waste reduction, or technology use by street vendors.
- Research conducted in at least one BRICS country.
- Peer-reviewed articles, books, or reports from reputable organisations.
- Published in English.

Exclusion Criteria:

- Studies unrelated to informal economies.
- Studies not focusing on street vending.
- Non-peer-reviewed sources (unless credible grey literature such as government reports or international organisation briefs).
- Studies in non-English languages that could not be translated.

Each study was systematically cross-referenced to ensure consistency and avoid duplication of data. Data extraction was conducted using a structured coding framework focusing on:

- Country-specific findings on climate resilience and entrepreneurship in the informal economy.
- Sustainable practices adopted by street vendors, including waste management, renewable energy use, and digital transactions.
- Government policies that enabled or hindered sustainable entrepreneurship.
- Challenges and barriers encountered by vendors in BRICS countries.

To analyse the extracted data, the study employed thematic synthesis, a qualitative methodology designed to identify recurrent patterns across multiple studies (Thomas & Harden, 2008). Three primary themes emerged from the analysis. First, entrepreneurial strategies adopted by street vendors to enhance sustainability were identified, including eco-friendly product choices, digital payment systems, and green business models. Second, institutional and financial barriers to sustainable vending were highlighted, such as restrictive zoning laws, limited financial support, and insufficient training opportunities. Finally, the study explored the role of government policies and external support mechanisms in facilitating sustainable economic development for vendors, focusing on policy inconsistencies, access to micro-finance, and environmental regulations.

Findings were categorised based on BRICS countries to highlight regional differences in sustainability practices and policy frameworks. This comparative analysis provided insights into how each country's regulatory environment, economic conditions, and governance structures influenced the adoption of sustainable vending strategies.

Despite the strengths of this systematic review, some limitations were acknowledged. Potential publication bias was mitigated through the incorporation of grey literature, specifically as reports from international

organisations, government policy briefs, and working papers (Rothstein et al., 2005). The heterogeneity of methodologies across the reviewed studies was addressed using content analysis techniques to standardise findings (Krippendorff, 2018). Language barriers were managed with automated translation tools and secondary sources, though a more inclusive multilingual approach could improve data inclusivity in future research."

Findings

This section presents the key findings of the study, categorised into three major areas: (1) the impact of climate change on street vendors, (2) entrepreneurial adaptations for sustainability, and (3) financial and regulatory challenges. Each finding is supported by relevant literature and summarised in tables for clarity.

The Impact of Climate Change on Street Vendors in BRICS Countries

Climate change has significantly disrupted street vending activities in BRICS nations, exposing vendors to extreme weather events such as heatwaves, heavy rainfall, floods, and storms. These disruptions reduce operating hours, damage perishable goods, and increase health risks for vendors working outdoors (International Labour Organisation [ILO], 2022; Rogan & Skinner, 2020; Srivastava, 2019). In India, Bhowmik (2021) found that rising temperatures make it difficult for vendors to store and preserve food, leading to economic losses due to spoilage. Similarly, in Brazil, Gomes and Ribeiro (2020) reported that unpredictable rainfall frequently forces vendors to close temporarily, reducing their income stability. South African studies indicate that flooding in informal markets often destroys vendor infrastructure, such as temporary stalls and storage spaces, making it difficult for vendors to continue operating during extreme weather (Skinner & Haysom, 2022; Mitlin et al., 2018).

Beyond direct weather impacts, climate change also affects supply chains and market accessibility for vendors. In China, Wang and Liu (2022) found that urban flooding disrupts transportation networks, delaying the delivery of goods and increasing the cost of sourcing fresh produce. Russia's extreme winter conditions impose additional barriers, as vendors contend with diminished consumer foot traffic and elevated heating expenditures for mobile commercial units (Kuznetsov & Yakovleva, 2019). A study by UN-Habitat (2021) highlighted that over 60% of

informal vendors across BRICS countries reported income losses due to climate-related disruptions. Furthermore, erratic climate patterns have led to fluctuating agricultural production, affecting the availability and pricing of fresh food items sold by street vendors (Chen et al., 2018; Sarkar, 2022).

Table 1: Climate Change Impacts on Street Vendors in BRICS Countries

Country	**Major Climate Change Challenges**	**Impact on Street Vendors**	**Source**
Brazil	Unpredictable rainfall, flooding	Stock damage, business closures	Gomes & Ribeiro (2020)
Russia	Harsh winters, extreme cold	Reduced foot traffic, heating costs	Kuznetsov & Yakovleva (2019)
India	Heatwaves, erratic rainfall	Increased food spoilage, income losses	Bhowmik (2021)
China	Urban flooding, air pollution	Supply chain disruptions, health risks	Wang & Liu (2022)
South Africa	Extreme heat, storms, flooding	Infrastructure damage, market closures	Skinner & Haysom (2022)

Entrepreneurial Adaptations to Sustainability

Despite climate-related challenges, street vendors in BRICS nations have adopted various sustainability-focused entrepreneurial strategies. A key adaptation is the use of eco-friendly packaging and waste reduction techniques. In Brazil, the Rio Circular Economy Programme has equipped vendors with the requisite training to substitute plastic packaging with biodegradable alternatives, thereby mitigating the accumulation of urban waste (Gomes & Ribeiro, 2020). Similarly, in India, the National Association of Street Vendors of India (NASVI) has introduced programmes to encourage vendors to use recycled materials and reduce single-use plastics (Bhowmik, 2021). In China, digital marketplaces such as WeChat have enabled street vendors to minimise paper-based transactions, aligning with national sustainability goals (Wang & Liu, 2022).

Another significant adaptation is the integration of renewable energy into vending operations. South African NGOs have promoted the use of solar-powered vending carts, which reduce reliance on grid electricity and provide vendors with cost-effective energy solutions (Rogan & Skinner, 2020). In Russia, cooperative models allow vendors to share energy-

efficient cold storage facilities, reducing both individual costs and environmental impact (Kuznetsov & Yakovleva, 2019). Research by ILO (2022) found that although these innovations improve vendor resilience, access to such technologies remains limited due to financial constraints and inconsistent policy support.

Table 2: Sustainable Entrepreneurial Strategies Among Street Vendors in BRICS Countries

Country	**SustainableStrategy**	**ImpactonVendors**	**Source**
Brazil	Eco-friendly packaging	Reduction in urban waste, lower plastic use	Gomes & Ribeiro (2020)
Russia	Recycling and waste reduction	Decreased single-use plastic reliance	Bhowmik (2021)
India	Digital payment integration	Lower paper waste, efficiency in transactions	Wang & Liu (2022)
China	Solar-powered vending carts	Reduced electricity costs, sustainability	Rogan & Skinner (2020)
South Africa	Shared energy-efficient storage	Lower costs, reduced carbon footprint	Kuznetsov & Yakovleva (2019)

Financial and Regulatory Challenges

Street vendors in BRICS countries face significant financial and regulatory challenges that limit their ability to adopt sustainable practices. Regulatory barriers, such as complex licensing processes and restrictive zoning laws, prevent vendors from accessing high-footfall areas (ILO, 2022; Chen et al., 2018). In Brazil, strict urban policies restrict vendors from operating in commercial districts, reducing their earning potential (Gomes & Ribeiro, 2020). Similarly, Russia's bureaucratic licensing system discourages informal entrepreneurs from transitioning to legally recognised businesses, limiting their access to financial support (Kuznetsov & Yakovleva, 2019).

Financial constraints further exacerbate these regulatory challenges. Many vendors lack access to formal banking services and credit facilities, making it difficult to invest in sustainable vending technologies (Wang & Liu, 2022; Sarkar, 2022). In China, informal entrepreneurs struggle to secure affordable credit due to stringent documentation requirements imposed by banks (ILO, 2022). South African vendors, particularly those in marginalised communities, document the difficulty in securing capital for business expansion as a direct result of discriminatory lending practices

(Rogan & Skinner, 2020). UN-Habitat (2021) found that over 70% of street vendors across BRICS nations identified financial exclusion as their primary obstacle to business sustainability.

Table 3: Financial and Regulatory Barriers for Street Vendors in BRICS Countries

Country	**Regulatory Challenges**	**Financial Barriers**	**Source**
Brazil	Strict zoning laws, vendor restrictions	Limited access to financial support	Gomes & Ribeiro (2020)
Russia	Bureaucratic licensing system	Lack of access to business credit	Kuznetsov & Yakovleva (2019)
India	Inconsistent enforcement of vending laws	High-interest loan barriers	Bhowmik (2021)
China	Restrictive vendor policies	Difficulty in securing bank loans	Wang & Liu (2022)
South Africa	Lack of policy support for vendors	Discriminatory lending practices	Rogan & Skinner (2020)

The study highlights that climate change poses significant operational risks for street vendors across BRICS nations, disrupting business activities and supply chains. However, vendors have demonstrated resilience through the adoption of sustainable business practices such as eco-friendly packaging and renewable energy solutions. Despite these efforts, financial and regulatory constraints persist in impeding progress, thereby underscoring the necessity for policy reforms and the establishment of tailored financial support mechanisms.

By implementing targeted interventions—such as streamlined licensing processes, financial inclusion programmes, and green technology subsidies—BRICS countries can create a more inclusive and sustainable informal economy, ensuring that street vendors can adapt to climate-related challenges effectively.

Discussion

This section critically examines the study's findings in relation to existing literature, highlighting the implications of climate change, sustainability adaptations, and regulatory and financial challenges for street vendors in

BRICS countries. The discussion is structured around the three major findings, supported by extensive references.

The findings reveal that climate change has significantly disrupted street vending operations in BRICS nations through extreme weather events such as heatwaves, floods, and storms. This aligns with previous studies indicating that informal workers are disproportionately affected by climate variability due to their reliance on outdoor spaces and lack of formal protective infrastructure (Chen et al., 2018; ILO, 2022; Srivastava, 2019). In India, for instance, Bhowmik (2021) found that prolonged heatwaves have led to increased food spoilage among street vendors, reducing their income and causing greater financial instability. Similarly, Skinner and Haysom (2022) emphasise that in South Africa, the flooding of informal marketplaces commercial activity and causes damage to vendor infrastructure, thereby constraining their capacity for effective operation.

Furthermore, disruptions in supply chains due to climate-related disasters have exacerbated the financial burdens on vendors. A study by Wang and Liu (2022) highlights how urban flooding in China delays transportation networks, causing price volatility in perishable goods and reducing vendor profit margins. This supports prior research indicating that climate-induced supply chain disruptions disproportionately affect informal entrepreneurs who lack financial reserves to absorb economic shocks (Mitlin et al., 2018; Rogan & Skinner, 2020). The UN-Habitat (2021) study, which found that over 60% of street vendors across BRICS nations reported income losses due to climate-related disruptions, further reinforces the urgent need for adaptation strategies to improve business resilience.

Additionally, limited institutional support exacerbates climate vulnerabilities for informal vendors. Despite the growing recognition of climate adaptation policies globally, studies indicate that governments in BRICS nations have been slow to implement protective measures for informal businesses (ILO, 2022; Gomes & Ribeiro, 2020). Kuznetsov and Yakovleva (2019) argue that in Russia, extreme winters drastically reduce vendor operating hours, yet there are few policy initiatives aimed at supporting informal entrepreneurs during the off-season. Given these widespread challenges, a more inclusive policy approach is necessary to address the climate resilience of informal street vendors.

The findings illustrate that street vendors in BRICS countries have adopted various sustainability strategies, such as eco-friendly packaging, digital transactions, and renewable energy integration. These findings align

with broader sustainability trends in the informal economy, as noted by ILO (2022), which suggests that vendors increasingly seek low-cost sustainable alternatives to enhance business efficiency. In Brazil, the Rio Circular Economy Programme has successfully promoted biodegradable packaging among street vendors, a development echoed in India through NASVI's efforts to integrate recycling practices into vendor operations (Bhowmik, 2021; Gomes & Ribeiro, 2020). This supports existing literature indicating that environmental awareness is gradually increasing among informal traders, although economic constraints often limit widespread adoption (Sarkar, 2022; Skinner & Haysom, 2022).

The use of digital transactions as a sustainability strategy has also gained prominence. Wang and Liu (2022) highlight that in China, WeChat Pay has significantly reduced paper-based transactions among street vendors, demonstrating how technology can facilitate sustainability efforts. Similar findings by Mitlin et al. (2018) indicate that mobile payment adoption reduces cash dependency and enhances financial transparency, which is crucial for informal businesses. However, as noted by Rogan and Skinner (2020), digital payment systems are not universally accessible due to limited technological literacy among some vendor groups, particularly in South Africa and Russia. This suggests that while digital solutions hold potential, their effectiveness depends on broader digital inclusion policies.

Renewable energy adoption among street vendors is another key adaptation identified in the findings. Kuznetsov and Yakovleva (2019) demonstrate that the implementation of shared energy-efficient cold chain technology in Russia has resulted in improved economic viability for vendors through lower operational costs, alongside a concurrent reduction in environmental impact. Likewise, Rogan and Skinner (2020) document how South African vendors, supported by NGOs, have started using solar-powered vending carts to lower energy costs. These cases align with broader studies on renewable energy transitions in the informal economy (Chen et al., 2018; Srivastava, 2019), which suggest that green technology adoption enhances business sustainability. However, financial constraints remain a significant barrier to widespread adoption, as indicated in the next section.

Financial and regulatory barriers remain significant obstacles to sustainable street vending in BRICS nations. The findings indicate that street vendors face difficulties in securing business credit due to restrictive lending requirements, aligning with prior research that informal entrepreneurs often lack access to formal financial institutions (ILO, 2022; Wang & Liu, 2022). In Brazil, for example, Gomes and Ribeiro (2020)

found that vendors struggle to obtain loans because of the absence of formal business documentation, a problem similarly noted in China by Wang and Liu (2022). These findings are consistent with UN-Habitat (2021), which reported that over 70% of vendors across BRICS countries cited financial exclusion as the main barrier to business sustainability.

Regulatory constraints further complicate sustainability efforts. According to ILO (2022), restrictive zoning laws in Brazil prevent vendors from operating in high-footfall areas, limiting their revenue potential. In Russia, complex bureaucratic licencing systems act as a disincentive for informal entrepreneurs to legalize their operations, a phenomenon documented by Kuznetsov and Yakovleva (2019). These regulatory challenges align with the findings of Mitlin et al. (2018), who argue that the lack of clear legal recognition for street vendors in many developing economies creates uncertainty and limits investment in sustainable business practices.

Additionally, inconsistencies in the enforcement of street vending policies further exacerbate regulatory difficulties. Bhowmik (2021) highlights that while India's Street Vendors Act provides legal protections, inconsistent local enforcement undermines its effectiveness. Similar inconsistencies have been reported in South Africa, where Rogan and Skinner (2020) note that municipal authorities frequently evict vendors despite existing protections. This suggests that policy frameworks, while important, must be complemented by effective enforcement mechanisms to guarantee that street vendors realise the benefits of legal recognition and financial inclusion.

The findings of this study underscore the urgent need for policy interventions that support the sustainability of street vending in BRICS nations. Policymakers must prioritise regulatory reforms that simplify licensing procedures, expand financial inclusion programmes, and incentise green business practices. As noted by ILO (2022), countries that implement tailored financial solutions—such as microfinance for informal entrepreneurs—have seen greater success in fostering sustainable street vending. Additionally, strengthening public-private partnerships could facilitate vendor access to renewable energy solutions and digital payment platforms, as demonstrated in Brazil and China (Gomes & Ribeiro, 2020; Wang & Liu, 2022).

Moreover, inclusive governance structures are essential for addressing the challenges faced by informal entrepreneurs. Existing literature emphasises that participatory policymaking—where street vendors are involved in regulatory discussions—enhances compliance and ensures

policies reflect ground realities (Chen et al., 2018; Skinner & Haysom, 2022). This suggests that BRICS governments must engage vendor associations and civil society organisations to co-develop sustainable vending policies that address both environmental and financial constraints.

The study's findings align with existing literature on the challenges and opportunities of sustainable street vending in BRICS countries. While vendors have demonstrated resilience through innovative sustainability strategies, their progress is impeded by financial constraints, regulatory barriers, and climate-induced disruptions. Addressing these challenges requires a multi-stakeholder approach that includes governments, financial institutions, NGOs, and the vendors themselves. By implementing inclusive policies that support climate adaptation, financial inclusion, and sustainable business practices, BRICS nations can ensure that street vendors continue to thrive in an evolving economic and environmental landscape.

Conclusion

This study has examined the intersection of climate change, sustainability strategies, and regulatory and financial challenges facing street vendors in BRICS countries. The findings reveal that climate change significantly disrupts street vending operations through extreme weather events, supply chain disruptions, and health hazards. These climate-related challenges directly impact vendors' earnings, product quality, and overall business sustainability, reinforcing prior studies that highlight the vulnerability of informal workers to environmental changes (Chen et al., 2018; ILO, 2022; Srivastava, 2019). Furthermore, climate change disproportionately affects those with limited resources and institutional support, exacerbating socioeconomic inequalities in the informal economy.

Despite these challenges, street vendors across BRICS nations have demonstrated resilience by adopting sustainability strategies such as eco-friendly packaging, digital payment systems, and renewable energy solutions. These entrepreneurial adaptations demonstrate alignment with global sustainability trajectories and illustrate the capacity for informal vendors to transition toward greener business models when adequately provisioned with requisite resources (Gomes & Ribeiro, 2020; Wang & Liu, 2022; Rogan & Skinner, 2020). However, the adoption of sustainable practices remains constrained by financial barriers, a lack of targeted policy support, and regulatory complexities that hinder informal entrepreneurs from integrating sustainability measures into their business models.

The study further underscores that financial exclusion and restrictive regulatory frameworks remain the most significant obstacles to the sustainable development of street vending in BRICS nations. Access to microfinance, affordable credit, and business support services is largely limited, preventing vendors from investing in long-term sustainability initiatives (Bhowmik, 2021; Kuznetsov & Yakovleva, 2019). Additionally, regulatory inconsistencies across BRICS nations create an uncertain business environment, deterring informal entrepreneurs from making the necessary investments in climate-resilient business strategies. Without targeted policy reforms, the potential for sustainable street vending will remain underutilised, and the socioeconomic contributions of informal trade will be undermined.

The study's findings emphasise the imperative for governments, financial institutions, and civil society organisations to forge collaborative and inclusive policies that foster climate adaptation, enhance financial inclusion, and sustainable business practices among street vendors. By addressing the structural barriers identified in this study, BRICS countries can create a more resilient and environmentally conscious informal economy. Strengthening institutional frameworks, promoting financial accessibility, and ensuring participatory governance structures will be essential in fostering sustainable street vending practices. The findings offer managerial implications for policymakers and entrepreneurs. For instance, governments can enhance sustainability by providing targeted training, financial support, and digital tools to street vendors, while business owners can adopt green practices and digital payment systems to improve resilience and profitability.

Future research could explore longitudinal studies to track the impact of sustainable practices over time, investigate informal sectors in additional emerging economies, and examine the role of technology adoption in more detail.

Recommendations

Based on the study's findings, the following recommendations are proposed to enhance the sustainability, resilience, and economic viability of street vending in BRICS countries.

Regulatory Reforms for Street Vendors

Simplification of Licensing Procedures: BRICS governments should streamline and simplify business registration and licensing requirements for street vendors. The extant literature suggests that regulatory friction—arising from excessive complexity—impedes the formalization of enterprises and attenuates progress toward sustainable development goals (ILO, 2022; Bhowmik, 2021).

Legal Recognition of Street Vendors: Governments should legally recognise street vendors as legitimate contributors to the urban economy and integrate them into national and municipal economic planning (Chen et al., 2018).

Creation of Vendor Zones: Urban planning policies should designate specific vending zones with adequate infrastructure, sanitation, and weather-resistant facilities to mitigate climate risks and improve business conditions (Rogan & Skinner, 2020).

Enforcement of Vendor Protection Laws: Governments should ensure consistent enforcement of vendor protection laws, preventing arbitrary evictions and police harassment, which destabilise vendor livelihoods (Skinner & Haysom, 2022).

Financial Inclusion and Access to Credit

Expansion of Microfinance and Credit Facilities: Financial institutions should create specialised credit schemes tailored for informal entrepreneurs, enabling them to invest in sustainable business practices (Wang & Liu, 2022; Kuznetsov & Yakovleva, 2019).

Subsidised Loans for Green Technology: Governments and development agencies should provide subsidised loans or grants for vendors to adopt renewable energy solutions, such as solar-powered vending carts and cold storage units (Gomes & Ribeiro, 2020).

Alternative Credit Assessment Models: Financial institutions should explore alternative credit assessment mechanisms, such as digital transaction histories and group lending models, to enable vendors to access formal credit (Mitlin et al., 2018).

Encouragement of Digital Financial Inclusion: Governments should incentive digital payment adoption by providing infrastructure support, training, and financial literacy programmes for informal vendors (ILO, 2022).

Climate Adaptation Strategies and Sustainable Business Practices

Investment in Climate-Resilient Infrastructure: Governments should invest in weather-resistant vending structures, drainage systems, and shaded trading areas to minimise climate disruptions for street vendors (UN-Habitat, 2021).

Training Programmes on Sustainable Vending: NGOs and policymakers should collaborate on training programs that educate vendors on climate adaptation strategies, eco-friendly packaging, and energy-efficient business models (Bhowmik, 2021; Rogan & Skinner, 2020).

Public Awareness Campaigns on Sustainable Consumption: Consumer awareness initiatives should be launched to encourage the use of sustainable products from street vendors, fostering demand for green business models (Sarkar, 2022).

Promotion of Waste Reduction Strategies: Local governments should facilitate vendor participation in municipal recycling programmes and provide incentives for vendors who adopt waste reduction practices (Chen et al., 2018).

Strengthening Institutional Support and Governance

Involvement of Vendor Associations in Policymaking: Street vendor organisations require active incorporation into policy formulation and urban governance processes to ensure that regulatory frameworks achieve congruence with the needs of informal entrepreneurs (Mitlin et al., 2018). Development of Public-Private Partnerships (PPPs): Collaboration between governments, private enterprises, and NGOs can enhance the provision of financial services, technology access, and sustainability initiatives for vendors (Gomes & Ribeiro, 2020).

Capacity Building for Local Government Authorities: Municipal authorities should receive training on the economic and social value of informal vending to promote fair and inclusive policy enforcement (Skinner & Haysom, 2022).

Strengthening Data Collection on Informal Trade: Governments should invest in data collection mechanisms to better understand the contributions and needs of street vendors, enabling evidence-based policymaking

Enhancing Regional Cooperation within BRICS Countries

Knowledge Sharing and Best Practices Exchange: BRICS nations should establish a platform for sharing best practices in informal economy regulation, financial inclusion models, and climate adaptation strategies for street vendors (Wang & Liu, 2022).

Joint Investment in Sustainable Informal Economy Initiatives: BRICS countries should explore joint investment opportunities in sustainability programmes that support informal entrepreneurs across member states (UN-Habitat, 2021).

Cross-Border Market Access for Street Vendors: Trade agreements should include provisions that facilitate regional market access for street vendors, promoting economic integration and sustainability (Mitlin et al., 2018).

Implementing these recommendations will enhance the sustainability, resilience, and economic viability of street vending in BRICS nations. By addressing the challenges posed by climate change, financial exclusion, and regulatory barriers, policymakers can create an enabling environment where street vendors can thrive as integral contributors to the urban economy. Strengthening institutional frameworks, expanding financial access, promoting climate adaptation, and fostering inclusive governance will be essential in ensuring that street vending remains a sustainable and viable livelihood option.

As BRICS countries continue to evolve in response to global economic and environmental shifts, proactive policy interventions must ensure that informal entrepreneurs are not left behind. By recognising the informal economy as a vital component of national development strategies, BRICS nations can strategically leverage street vending as a driver of sustainable economic growth, poverty reduction, and enhanced urban resilience against the effects **of** climate change.

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