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# Drivers, Barriers, and Enablers of Distributed Solar PV in Ghana: Evidence from Finance and Telecommunications Subsectors

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## Key Policy Recommendations

1. **Improve equipment standardisation and personnel certification** to boost market confidence and uptake.
2. **Expand access to credit** by supporting project preparation (e.g., feasibility studies, risk assessments) to develop a stronger pipeline of bankable solar PV projects.
3. **Advance research on rental-based solar models**, with academia and industry co-developing practical frameworks that align incentives for both landlords and tenants.
4. **Promote data-sharing partnerships with Higher Education Institutions (HEIs)** to enhance research, system performance monitoring, and techno-economic analysis.



*Figure 2: Solar PV installation at the Dabase site, operated by Helios Towers*



*Figure 1: Solar PV installation at Consolidated Bank Ghana Ltd. (CBG), South Legon Branch by Tradeworks Co. Ltd.*

5. **Accelerate net metering implementation** through the Ministry of Energy and Green Transition to incentivise distributed solar PV uptake.
6. **Facilitate access to global climate finance** by supporting financial institutions—through targeted policies and institutional coordination—to tap into international funding sources.
7. **Leverage telecom infrastructure nationwide** to pilot and scale complementary renewable energy technologies, such as wind and biofuel-based generation.

# Summary

Distributed solar PV adoption in Ghana's commercial sector remains uneven, constrained by high costs and regulatory gaps, yet it offers significant potential for cost savings, resilience, and sustainability. This research examines the dynamics, barriers, and enablers of distributed solar PV adoption in Ghana's commercial sector with a focus on the financial and telecommunications subsectors. The analysis

is based on a blend of document analysis and qualitative interviews with banks, regulators, and telecom operators. Results show that electricity cost reduction goals, regulatory requirements, and sustainability commitments drive adoption. Some banks and telecom operators have ambitious expansion plans, aiming to scale solar PV across branches, sites for Automated Teller Machines

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## 1. Introduction

Energy security has become an urgent global concern amid geopolitical tensions and the transition to affordable, low-carbon energy systems [1]. Although Ghana's strong solar resource base presents significant opportunities for distributed solar PV, conventional energy sources continue to dominate the national mix notwithstanding a 10% renewable energy target by 2030 [2, 3]. Non-hydro renewable electricity generation capacity stood at about 2.4% in 2023 [4].

Small and medium-sized enterprises, which form the backbone of Ghana's economy, depend heavily on reliable electricity [5]. However, grid instability and high tariffs undermine productivity and competitiveness,

forcing many businesses to rely on costly and polluting diesel generators [6, 7]. While financial, policy and technical barriers are well documented, less attention has been given to behavioural and institutional factors influencing renewable energy uptake, including perceptions of investment viability and trust in developers [5, 8].

This study examines the barriers and enablers of distributed solar PV adoption in Ghana's commercial sector, focusing on the telecommunications and finance subsectors. It aims to: (1) identify key barriers, enablers and opportunities that shape renewable energy deployment; (2) analyse investment decision-making that drives adoption; and (3) recommend policy and regulatory actions needed to scale up deployment.

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## 2. The Commercial Sector

Ghana's commercial sector is a key engine of economic growth, employment, and urbanisation, with micro, small, and medium enterprises forming its backbone. Within this sector, the finance subsector plays a pivotal role by mobilising capital, enabling transactions, and supporting investment [9, 10]. Meanwhile, the telecommunications

subsector underpins Ghana's digital transformation and depends on reliable electricity to maintain near-continuous network uptime. Many base stations continue to rely on diesel generators—raising operational costs and emissions—whereas hybrid solar photovoltaic (PV) systems present a lower-cost, cleaner alternative over their lifecycle [11, 12].

Despite its potential, renewable energy adoption remains constrained by high interest rates, short loan tenures, and limited access to long-term financing [3, 13]. Emerging financial instruments, including

concessional finance and blended public-private partnerships, are increasingly recognised as essential for de-risking investments and accelerating the deployment of solar PV systems at scale [14].

### 3. Methodology

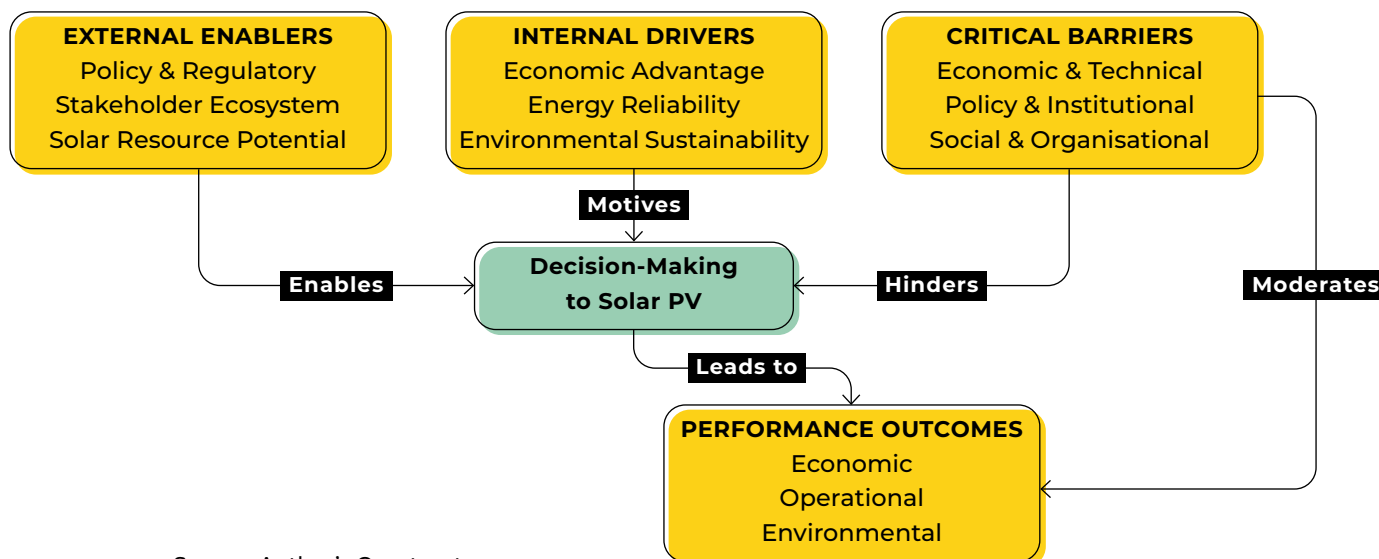
A qualitative design was adopted to examine opportunities and barriers in distributed solar PV adoption within Ghana’s telecommunications and finance subsectors. Purposive sampling guided participant selection, while site inspections enriched interview data. Analysis followed a deductive-inductive approach, supported by an evolving codebook and triangulation across interviews, observations, and policy documents, thereby enhancing credibility and ensuring findings were systematically validated.

This study applies an Integrated Solar PV Adoption Framework developed to explain how external enablers, internal drivers, and key barriers shape adoption in Ghana’s banking and telecommunications subsectors (see **Figure 3**). Favourable conditions, such as strong solar

potential, supportive policies like the Renewable Energy Act (Act 832), and green financing initiatives, create an enabling environment. At the firm level, adoption is driven by cost savings, the need for reliable power, and growing sustainability commitments.

The framework highlights that outcomes depend on the balance between these drivers and persistent barriers, including financing constraints, maintenance challenges, and weak net metering systems. When aligned, adoption delivers economic, operational, and environmental benefits. Overall, the model provides a practical tool for policymakers, investors, and industry leaders to identify leverage points and accelerate distributed solar PV uptake in Ghana’s commercial sector.

*Figure 3: A conceptual framework for scaling up DIST-PV in the commercial sector*



Source: Author’s Construct

**Table 1: Profile Of Institutional Participants And Interview Codes**

No.	Institution	Role Of Participants	Location	Institution Code
1.	Regulator	Banking Supervision Department	Accra	Institution A
2.	Development Bank	The Power Engineer and Energy Sector Specialist	Accra	Institution B
3.	Industry Association	Chief Executive Officer, Regulatory and Ethics Officer, Operations and Risk Officer, and Researcher	Accra	Institution C
4.	Commercial Bank	Head, Research and Business Support	Accra	Institution D
5.	Commercial Bank	Head Utilities Manager, Facilities Manager, Sustainable Financing Department.	Accra	Institution E
6.	Commercial Bank	Sustainable Finance Product Manager	Accra	Institution F
7.	Commercial Bank	Sustainability Desk Officer	Accra	Institution G
8.	Commercial Bank	Sustainability Desk Officers	Accra	Institution H
9.	Network Service Provider	Site Performance Analyst	Accra	Institution I
10.	Commercial Bank	Sustainability Desk Officers	Accra	Institution J

## 4. Results

Ghana’s energy policy frameworks, such as the Renewable Energy Act 2011 (Act 832), Energy Policy 2021, and Net Metering Scheme 2015, Renewable Energy Master Plan, and the National Energy Transition Framework establishes enabling structures to promote renewable energy adoption, although results reveal uneven institutional engagement. One head of research and business support (D) confirmed knowledge of national frameworks and fiscal incentives, **“Yes, we are aware of such government policies, including the green taxonomy, the nationally determined contributions, the national adaptation plans and some possible tax incentives”**; signaling recognition of climate commitments. Conversely, another utility manager (E) reported no awareness, highlighting weak communication channels. This inconsistency points to the need for targeted outreach and stronger coordination. Without widespread awareness and ensuring sustained commitment to actual implementation, even well-designed frameworks may fail to achieve practical adoption. Table 2 provides an overview

of the drivers, barriers, and adoption outcomes across the two subsectors, highlighting their similarities and differences.

### Drivers of Adoption

Results show that electricity cost reduction goals, regulatory requirements, and sustainability commitments drive adoption. Expansion plans are ambitious, with banks and telecom operators aiming to scale solar PV across branches, sites for Automated Teller Machines (ATMs), and cell sites.

Electricity cost reduction consistently emerged as a driver of solar PV adoption. As noted by the utilities manager (E), **“Yes, cost reduction was part of the motivation; it is part of the consideration.”** The head of research and business support (D) reinforced this by highlighting savings: **“The solar installation at the Tema Industrial area helped us to reduce our electricity cost from GHS15,000 to GHS5,000.”** Similarly, the sustainability desk officer (G) recalled **“Accra Tudu branch... the electricity cost was about 17,000 cedis a**

*month, and after the solar installation, the cost dropped from 17,000 to 4000 cedis.”*

Regulatory requirements also shaped institutional choices. The Bank of Ghana made it mandatory since the beginning of January 2026 for all banks to report on ESG (prior to this date reporting was optional and subject to data availability). The banking supervisor (A) emphasised governance obligations, stating, *“We are kind of encouraging banks to support this green agenda and to support green initiatives. They must integrate it into their policies and all that.”* This was also echoed by the chief executive officer (C), who observed, *“ESG is one of the regulatory requirements that the Bank of Ghana supervise. So, I would say there’s a regulatory push.”*

Sustainability commitments have reinforced adoption not only as an ethical responsibility but also as a reputational imperative. As one sustainability desk officer emphasised, *“If there’s anything we can do, taking small steps towards reducing that impact, I think, is the right thing to do.”* The officer further noted, *“It will be cost-efficient, and, for the sake of reducing our carbon footprints, sustainability is important.”*

These insights demonstrate how ethical responsibility, financial efficiency, and regulatory compliance converge to drive adoption. For institutions with international exposure, such commitments extend beyond internal obligations; they strengthen credibility with global stakeholders and align with international standards of sustainable practice.

### **Decision-Making approaches**

Institutional governance plays a decisive role in shaping solar PV adoption. As the utilities manager (E) explained, *“The decision came up during our strategy session for 2024 and is*

*captured in our strategy for 2025,”* illustrating how strategic planning embeds renewable energy into institutional priorities. Similarly, the sustainability desk officer (G) emphasised compliance and technical assurance, stating, *“The facilities department makes the recommendations ... the branch network head would then escalate [the concerns] ... In the approval process, the IT desk looks purely at solar activities.”*

These insights show that governance formats rooted in **strategic planning sessions and compliance-driven approval processes** are more amenable to adoption consideration. Strengthening these formats ensures that solar PV is systematically integrated into institutional decision-making.

Consultative approaches also emerged as critical. The sustainability desk officer (H) stressed the importance of inclusivity, explaining, *“Decision-making is a bottom-up approach and is eventually approved by the Executive Management/Board through a consultative initiative.”* This highlights how collective input strengthens governance processes. At the same time, executive authority remains central, as reiterated by the sustainability desk officer (J): *“The decision as to it getting done or not resides with management.”* These perspectives demonstrate that governance structures integrate financial, technical, and consultative considerations, ensuring decisions are both strategic and subject to accountability. These processes embed motivation into institutional frameworks, setting the stage for analysing adoption experiences and barriers.

### **Barriers to adoption**

Across Ghana’s commercial sector, solar PV adoption faces barriers that reflect both institutional and market realities. Evidence from interviews points to five recurring challenges:

equipment and workmanship quality, high upfront costs, vendor overpricing, financing constraints, and regulatory delays. Together, these barriers illustrate structural gaps that continue to limit renewable energy uptake.

Concerns over equipment and workmanship quality undermined early confidence. As the sustainability desk officer (G) recalled, ***“Initially, it was improper installations and therefore people were not interested... people’s perception was destroyed.”*** Poor workmanship not only damaged systems but also created negative perceptions that slowed uptake.

High upfront costs remain a critical deterrent, compounded by both local currency volatility and the pricing of PV systems in foreign currency (mostly in USD). As the banking supervision officer (A) explained, ***“The initial capital expenditure becomes a problem, looking at the currency and inflation risks, the cedi to<sup>1</sup> exchange rate also becomes a problem in acquiring these PV systems.”*** This highlights how exchange rate volatility and inflation risks discourage investment in technologies with long payback periods.

The nature of tenure – owner-occupier or rental – played a key role in the decision to invest in solar PV on a particular property. This concern was common among financial institutions. Banks were more likely to develop solar PV if they owned the properties and reluctant if they were renting the same. Banks, in essence, were not willing to spend on renewable energy provision on third-party properties when they were not sure of long-term tenure security and modalities for cost sharing/ transfer. Typically, a bank’s properties that are rented may include banking halls, office buildings, offsite ATM structures, and car parks among others. In essence, capital improvement in a rented property means capital improvement which

might result in rent increase. Some banks were not sure (1) whether landlords will accept these capital improvements in the first place, (2) who should pay for this solar installation – the tenant or landlord – and the implications for existing rent costs, (3) whether landlords will reduce rents or offer rent-free tenure in lieu of the capital investment (4) whether landlords will demand higher rents as a result of such capital improvements, (5) whether a landlord can seek to vacate the property so it can be rented for a higher price. All these are concerns that need to be addressed and clarified before adoption to avoid conflicts. However, this problem is uncommon among the telcos because majority of these properties are cell sites. Where telcos are using rental office spaces or car parks, the same issues as those faced by banks will become material.

Vendor overpricing compounds financial barriers. As the sustainable finance product manager (F) cautioned, ***“Over-blowing cost of projects, such as discrete over-pricing by vendors”*** could create barriers. This concern was reiterated by the site performance analyst (I), ***“It’s quite expensive... You need to talk to somebody, a technician somewhere, who will come with a huge estimate. You will realise that most of the things are overpriced.”***

Financing constraints further limit uptake. The banking supervision officer (A) explained, ***“Having a loan tenure for most of these commercial banks being 3 to 5 years, ... it weighs so much on the customer repaying it within 3 to 5 years.”*** Short repayment periods are misaligned with the financial realities of renewable energy investments.

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<sup>1</sup> Bank of Ghana’s interbank foreign exchange rate for the US dollar is approximately: USD 1 ≈ GH¢10.99 (buying) to GH¢11.00 (selling) on the Bank of Ghana interbank market as of February 13, 2026

## DRIVERS, BARRIERS, AND ENABLERS OF DISTRIBUTED SOLAR PV IN GHANA

Regulatory delays add institutional risk. As the chief executive officer (C) pointed out, *“We sometimes get frustrated at the pace of movement at EPA... the credit is waiting, credit is ready, and you are waiting for EPA.”* Timing mismatches between approvals

and financing windows undermine investor confidence. Collectively, these barriers highlight systemic weaknesses that slow adoption and erode trust, underscoring the need for reforms to strengthen Ghana’s renewable energy transition.

**Table 2: Sectoral Drivers, Barriers, and Outcomes in Solar PV Adoption**

No.	Dimensions	Banks	Telecoms	Comparative Insights
1.	Drivers	Cost reduction, regulatory push, access to green financing, reputation, and sustainability positioning.	ESG commitments, operational cost efficiency, carbon footprint reduction, and net metering potential.	Both subsectors recognise sustainability imperatives, but banks emphasise financial and regulatory drivers, while telecoms focus on operational efficiency and ESG compliance.
2.	Barriers	High upfront costs, financing constraints, regulatory delays, building ownership issues, and uncertainty of savings.	Space constraints, shading, environmental disruptions (dust, bird activity), roof negotiations, and high replacement costs.	Shared barriers include cost and financing, but banks face institutional and regulatory hurdles, while telecoms are faced with technical and environmental challenges.
3.	Adoption Outcomes	Demonstrated electricity cost savings, operational improvements, resilience through storage, and expansion plans underway.	Large-scale deployment across cell sites, operational savings, but persistent environmental and technical risks.	Uneven distribution is evident: banks report measurable financial benefits and structured expansion, while telecoms achieve scale, but face sustainability risks tied to the environment and infrastructure.

## 5. Discussion

Awareness of Ghana’s renewable energy policies shows progress alongside persistent gaps. Frameworks such as the Energy Policy 2021 and the Net Metering Scheme, 2015 provide enabling structures for adoption. Some actors show clear recognition of climate commitments and fiscal incentives, while others reveal limited awareness, underscoring weak communication channels. This inconsistency highlights the need for targeted outreach and stronger coordination as policy ambition may prove ineffective in the absence of widespread understanding.

Electricity cost reduction consistently emerged as a decisive driver of solar PV adoption. Institutions reported substantial savings, with monthly electricity costs dropping after solar

PV installations. These reductions illustrate how financial efficiency strengthens competitiveness and provides immediate incentives for adoption. In the case of banks, results indicated that tenure security remained a barrier for solar PV investment.

Regulatory requirements also shaped institutional choices. Governance obligations through board-level oversight, establishment of sub-committees, and integration of regulatory requirements into policy were emphasised as essential. Supervisory oversight of environmental, social, and governance standards reinforced adoption, transforming renewable energy from a voluntary initiative into a compliance imperative.

Sustainability commitments further reinforced adoption as an ethical responsibility. Institutions

framed renewable energy as both cost-efficient and essential for reducing carbon footprints, reflecting a broader alignment between operational decisions and climate goals.

Decision-making processes embedded these motivations into governance structures.

Strategic planning integrated renewable energy into institutional priorities, while compliance and technical assurance guided recommendations. Consultative approaches ensured inclusivity, yet executive authority remained decisive, balancing collective input with management control.

## 6. Conclusion

This research examined dynamics, barriers, and enablers of distributed solar PV adoption in Ghana's finance and telecommunications subsectors. Adoption is uneven but growing, with institutions reporting significant cost savings, operational efficiencies, and sustainability gains. Motivations include cost reduction goals, regulatory requirements, and sustainability commitments, while barriers of high upfront costs, vendor overpricing, regulatory delays, and technical challenges persist.

Findings highlight the need for coordinated action. Financial institutions, regulators, and government agencies must collaborate to expand awareness, improve access to concessional financing, and strengthen regulations. Overall, distributed solar PV offers a pathway to “cost efficiency, resilience, and sustainability.” Addressing systemic barriers and leveraging enablers will accelerate Ghana's energy transition and climate commitments.

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