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Financing the Renewable Energy Transition in Sub-Saharan Africa: A Systematic Review of Investment Instruments, Market Models and Institutional Constraints

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Systematic Review

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Abstract

Sub-Saharan Africa possesses substantial renewable energy resources yet attracts a disproportionately small share of global clean-energy investment, leaving persistent financing gaps that constrain energy access and transition objectives. This systematic review examines financing instruments, renewable energy market models, investment outcomes and institutional conditions across Sub-Saharan Africa. A PRISMA-guided search identified 198 records; after removal of 88 outdated or duplicate records, 110 were screened, 66 excluded, 44 full texts assessed and one further document excluded, leaving 43 studies for synthesis. Evidence was extracted using a structured review matrix and synthesized through thematic analysis supported by NVivo, alongside descriptive examination of financing instruments and technologies. Public and concessional capital including government grants, concessional loans and development-partner finance emerged as the most prominent financing mechanisms. State-led and donor-supported models enabled project initiation but did not consistently create competitive, self-sustaining markets or mobilize durable private investment. High cost of capital, currency exposure, off-taker risk, policy inconsistency, weak utility creditworthiness and limited institutional capacity constrained bankability. Decentralized systems, particularly mini-grids and off-grid solar, were important for access but faced tailored financing and regulatory barriers. The review concludes that financing instruments are necessary but insufficient: investment effectiveness depends on institutional credibility, coherent policy implementation, domestic financial-market development and system-level reform.

Highlights

• Public and concessional capital remains central to deployment.

• Institutional credibility mediates financing effectiveness.

• Currency and off-taker risks raise financing costs.

• Decentralized systems need tailored finance and regulation.

1. Introduction

The transition towards renewable and low-carbon energy systems is a central development challenge for Sub-Saharan Africa (SSA). The region has significant solar, wind, hydropower and geothermal resources, while electricity access, reliability and affordability remain uneven. Renewable energy (RE) investment is therefore linked not only to climate mitigation but also to energy security, economic development and the achievement of Sustainable Development Goal 7. Despite resource potential and policy commitments, the scale and pace of investment remain inadequate in many countries, revealing a persistent gap between energy ambitions and capital mobilization (Bishoge, Kombe & Mvile, 2020; Ebhota & Tabakov, 2022; Müller et al., 2021; Cai, Lemaire & Medici, 2024).

The review identified high upfront capital requirements, long payback periods, limited domestic finance, perceived country and project risks, and institutional weaknesses as recurring explanations for this mismatch (Owusu-Manu et al., 2021; Hoka, 2021; Pueyo, 2018; Michael Olabisi et al., 2022). These constraints interact rather than operate independently. Currency instability can affect project revenues and debt service, while weak utility finances can undermine power purchase agreement (PPA) credibility and inconsistent regulation can increase transaction costs and uncertainty (Hoka, 2021; Pueyo, 2018; Diallo & Ouoba, 2023). The result is an investment environment in which financing may be available in principle but difficult to mobilize on sustainable terms (Owusu-Manu et al., 2021; Michael Olabisi et al., 2022).

A range of instruments have been promoted to address these constraints, including grants, concessional loans, guarantees, blended finance, climate finance, public–private partnerships (PPPs), green bonds, project finance and results-based mechanisms (Soumonni & Ojah, 2021; Sankoh et al., 2021; Krause et al., 2024; Argueta et al., 2023). The review also considers the market arrangements through which renewable energy is developed: state-led and donor-supported projects, independent power producer (IPP) arrangements, competitive procurement and decentralised models such as mini-grids and off-grid solar (Kruger & Eberhard, 2018; Pueyo, 2018; Ikejemba et al., 2017). Instruments and models are not interchangeable; their performance depends on project characteristics, market maturity and institutional conditions (Soumonni & Ojah, 2021; Krause et al., 2024).

The analytical problem is therefore not simply which financing instruments are available, but under what institutional and market conditions are they likely to mobilize investment and support a transition. Prior research often examines financing barriers, policies, institutions or country cases separately (Müller et al., 2021; Kruger & Eberhard, 2018; Asongu & Odhiambo, 2021). This review brings these dimensions together and considers the conditions under which finance contributes to deployment, private capital mobilization and market development.

This article synthesized evidence on renewable energy markets and investment strategies in SSA. It addressed three questions: (1) which financing instruments and market models are reported in the literature; (2) what constraints and enabling conditions shape financing effectiveness and project bankability; and (3) what implications follow for policymakers, development partners and investors seeking a durable energy transition.

2. Conceptual framing

2.1 Energy transition theory

Energy transition theory provides a way to understand changes in energy systems as processes involving technologies, markets, institutions and wider socio-economic conditions. Renewable energy deployment is not solely a substitution of one technology for another; it involves changes in infrastructure, investment patterns, governance and the relationships between incumbent and emerging energy systems. In SSA, transition pathways are particularly context-dependent and may combine state-led provision, donor-supported programmes and market-based investment rather than follow a linear sequence towards liberalised markets (Müller et al., 2021; Han, 2023; Noah & Oladipo, 2025).

2.2 Investment and finance theory

An investment and finance perspective directs attention to expected returns, risk allocation, capital structure and the cost of capital. Renewable energy projects can involve high initial capital expenditure, long asset lives and revenue streams exposed to tariff, currency, counterparty and policy risks (Owusu-Manu et al., 2021; Pueyo, 2018; Hoka, 2021). Finance mechanisms can lower the cost or redistribute risks, but their effectiveness depends on whether risks are reduced, transparently allocated or merely transferred to public institutions (Soumonni & Ojah, 2021; Diallo & Ouoba, 2023). Project bankability is consequently shaped by both financial design and the wider operating environment (Owusu-Manu et al., 2021; Pueyo, 2018; Hoka, 2021).

2.3 Institutional theory

Institutional theory highlights the influence of formal rules, regulatory organisations, governance arrangements and implementation capacity on market behaviour. Policy adoption does not automatically translate into implementation: regulatory inconsistency, weak enforcement, limited administrative capacity and utility financial distress can create a gap between formal commitments and operational practice (Ikejemba et al., 2017; Kruger & Eberhard, 2018; Moyo & Oree, 2024; Gyimah & Gyimah, 2024). These conditions affect investor confidence, contractual credibility and the transaction costs of renewable energy development (Owusu-Manu et al., 2021; Kruger & Eberhard, 2018).

2.4 Integrated analytical framework

Taken together, these perspectives support an integrated analytical proposition: financing instruments influence renewable energy deployment through market arrangements, but their effects are conditioned by regulatory credibility, institutional capacity and the financial health of sector actors (Soumonni & Ojah, 2021; Müller et al., 2021; Asongu & Odhiambo, 2021). The framework connects energy-transition pathways, investment and risk mechanisms, and institutional conditions to outcomes including cost of capital, project bankability, private investment, deployment and electricity access. The relationships among these theoretical perspectives and the expected renewable energy market outcomes are illustrated in Fig. 1.

3. Methods

3.1 Review design and evidence sources

The study adopted a systematic literature review (SLR) design to synthesise, critically analyse and interpret evidence on renewable energy markets and financing strategies in SSA. The review used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to organise identification, screening and selection. The unit of analysis was an individual study or documentary source included in the review matrix. The review combined peer-reviewed academic literature with institutional and policy material, recognising that renewable energy finance is also documented by development finance institutions and multilateral agencies.

Academic databases searched were Scopus, Web of Science, ScienceDirect, SpringerLink and Google Scholar. Institutional and policy sources included the International Energy Agency (IEA), International Renewable Energy Agency (IRENA), World Bank, African Development Bank (AfDB), BloombergNEF, International Institute for Sustainable Development (IISD) and OECD, alongside reports from development finance institutions, multilateral agencies and reputable think tanks.

3.2 Search strategy and selection

A structured keyword search used Boolean combinations to capture variations in terminology. Search strings included: ‘renewable energy’ AND ‘Sub-Saharan Africa’; ‘clean energy finance’ OR ‘climate finance’ AND ‘Africa’; ‘blended finance’ OR ‘green bonds’ OR ‘public–private partnerships’ AND ‘renewable energy’; and ‘energy transition’ AND ‘investment risk’ AND ‘SSA’. Terms were applied to titles, abstracts and keywords. Reference lists of selected articles were also snowballed to identify additional studies.

Selection involved title screening to remove clearly irrelevant records, abstract screening for alignment with the review objectives, and full-text assessment for methodological quality and substantive relevance. The reported flow was 198 records identified; 88 removed as outdated or duplicates; 110 records screened; 66 excluded at screening; 44 full texts assessed; one excluded at full-text stage; and 43 studies retained for synthesis. The flow is presented in Fig. 2.

Figure 2: PRISMA flow diagram

Documents excluded

n = 88 (Outdated & Duplications)

Documents identified

N = 198

Identification

Documents screened N = 110

Documents excluded n = 66

(Inadequate information)

Screening

Documents sought for retrieval & assessed for eligibility

N = 44

Documents excluded n = 1

Documents included for in depth analysis

N = 43

Included

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3.3 Inclusion and exclusion criteria

Included sources focused on renewable or low-carbon energy in SSA; examined financing instruments, investment strategies, market mechanisms or policy frameworks; and comprised peer-reviewed journal articles, institutional reports or high-quality working papers. Sources focused exclusively on fossil-fuel investment, situated outside SSA, or consisting of opinion pieces without analytical or empirical grounding were excluded. Duplicate studies and earlier versions of updated reports were also excluded

3.4 Data extraction and synthesis

A standardised review matrix was used to extract study title, authorship, year, journal or source, DOI, abstract, geographical coverage, objectives, research questions, methods, relevant policies, primary outcomes, findings, discussion, limitations, research gaps and future research recommendations. The matrix also captured renewable energy technologies, financing instruments, market models, perceived effectiveness in attracting investment or reducing risk, and lessons and recommendations for policymakers, investors and development partners

Analysis combined qualitative thematic synthesis with descriptive examination of patterns in the review matrix. NVivo-supported thematic analysis organised evidence into eight categories: (i) financing instruments; (ii) market models for renewable energy deployment; (iii) investment outcomes and effectiveness; (iv) cost of capital and investment risk; (v) institutional and policy environment; (vi) concessional finance; (vii) decentralised energy systems and energy access; and (viii) enabling and constraining factors shaping market development. Matrix coding and descriptive frequencies were used to examine the prominence of themes and technologies across the evidence base. The synthesis emphasised convergence and recurring patterns rather than treating individual studies as independent estimates suitable for statistical pooling

3.5 Ethical considerations and limitations

As a desk-based review relying on secondary sources, the study did not recruit human participants or collect identifiable personal data and therefore did not require human-subject ethical approval. Ethical practice was maintained through attribution, avoidance of plagiarism and faithful representation of source findings. Methodological limitations include dependence on published and documented evidence, which may omit emerging or undocumented projects and may overrepresent initiatives with available reporting. Heterogeneity in countries, technologies, designs and outcome measures also limits direct comparison and causal inference

4. Results

4.1 Characteristics and scope of the evidence

The final evidence set comprised 43 studies and sources as reported in the review flow. The evidence covered renewable energy finance, policy and market development across SSA, with country-level cases and regional or multi-country analyses. The reviewed studies differed in geographical coverage, research design, technology focus and outcome measures. This heterogeneity precluded statistical pooling and supported a thematic narrative synthesis. The matrix included work on financing barriers and institutional settings, market instruments and auctions, decentralised systems, renewable energy deployment and macroeconomic or policy conditions The evidence base included studies of financing challenges and market formation, renewable energy deployment and macroeconomic determinants and policy, governance, energy justice and technology pathways. The review matrix and thematic coding show that financing, institutions and risk were interrelated rather than separate strands. Public and concessional

finance, institutional constraints and cost of capital were prominent coding areas; private investment participation and decentralised market models were represented but less dominant. Table 1 summarises the qualitative coding categories and their relative prominence as recorded in the review.

Table 1
Overview of Coding Output (Qualitative thematic frequency table)

Theme	Description	Number of Sources Coded
Public & Concessional Finance	Grants, concessional loans, DFIs	High
Private Investment Participation	IPPs, private equity, commercial banks	Moderate
Institutional Constraints	Policy instability, weak utilities	High
Cost of Capital & Risk	Currency risk, off-taker risk	High
Decentralized Market Models	Mini-grids, off-grid solar	Moderate

4.2 Dominant financing instruments

Public and concessional finance emerged as the most prominent sources of capital. Government funding, grants, concessional loans and development-partner finance were repeatedly identified as mechanisms supporting renewable energy deployment, particularly in utility-scale projects and early-stage markets where perceived investment risk remains high (Owusu-Manu et al., 2021; Hoka, 2021; Michael Olabisi et al., 2022; Soumonni & Ojah, 2021; Sankoh et al., 2021). Figure 3 presents the frequency of financing instruments identified in the review matrix. It shows loans, grants and concessional loans among the most frequently referenced mechanisms, followed by guaranteed or credit-enhancement arrangements and blended finance.

In contrast, private equity, green bonds, commercial project-finance structures and other market-based mechanisms appeared less frequently in the reviewed literature (Krause et al., 2024; Argueta et al., 2023; Han, 2023; Cai et al., 2024). Auctions, results-based financing and securitisation were marginally represented. This pattern indicates that public and concessional capital remains central to the documented financing landscape, while private and innovative mechanisms are less consistently represented or remain context-specific. Frequency of mention should not be interpreted as a direct measure of capital volume or instrument performance.

4.3 Market models and renewable energy technologies

The reviewed literature identifies state-led and donor-driven market models as prominent frameworks supporting RE deployment in SSA. Public procurement, donor-funded projects and government-backed PPAs have supported project implementation and initial roll-out (Ikejemba et al., 2017; Owusu-Manu et al., 2021; Sankoh et al., 2021). However, evidence in the matrix indicates that these arrangements have not consistently translated into competitive or self-sustaining markets. Continued dependence on concessional and public finance, limited competition and weak mobilisation of private capital suggest that these models often compensate for risk rather than catalyse durable market formation (Pueyo, 2018; Kruger & Eberhard, 2018; Owusu-Manu et al., 2021).

Competitive procurement, IPP arrangements and private-sector-led investment were reported less frequently and were more evident in settings with relatively stronger regulatory and institutional frameworks (Kruger & Eberhard, 2018; Pueyo, 2018). Where these mechanisms operate, clearer policy signals and more credible regulatory environments are important enabling conditions (Kruger & Eberhard, 2018; Diallo & Ouoba, 2023). The review also identifies decentralized renewable energy systems particularly mini-grids and off-grid solar as relevant for expanding energy access in rural and underserved areas, although these models often face regulatory ambiguity and financing constraints (Ikejemba et al., 2017; Owusu-Manu et al., 2021; Bishoge et al., 2020; Ebhota & Tabakov, 2022).

Figure 4 summarises renewable energy sources mentioned in the reviewed papers. Solar PV, wind, hydro/mini-hydro and biomass are most frequently represented; geothermal, tidal/wave and storage/batteries appear less often. This distribution describes the technologies represented in the literature reviewed and should not be read as a measure of installed capacity or resource potential.

4.4 Effectiveness of financing instruments

The evidence presents a mixed assessment of financing effectiveness. Public and donor-backed instruments can reduce upfront capital requirements and enable project deployment, particularly in high-risk environments (Owusu-Manu et al., 2021; Soumonni & Ojah, 2021). Nevertheless, the review reports limited success in attracting sustained private investment or reducing long-term financing costs where underlying market conditions remain weak (Pueyo, 2018; Michael Olabisi et al., 2022; Diallo & Ouoba, 2023). Availability of finance is therefore distinct from the ability to crowd in private capital or sustain projects over their lifecycle.

High cost of capital emerged as a recurrent constraint. Currency risk, macroeconomic instability, regulatory uncertainty and off-taker risk particularly where state-owned utilities have weak financial performance were associated with higher financing costs and reduced project bankability (Hoka, 2021; Pueyo, 2018; Olanrele & Fuinhas, 2022; Ebhota & Tabakov, 2022). Concessional finance may compensate for these risks at project level, but does not necessarily resolve the structural conditions generating them (Soumonni & Ojah, 2021; Pueyo, 2018).

4.5 Institutional and policy constraints

Institutional weaknesses were identified as structural factors shaping whether financing instruments translate into investable projects. Policy inconsistency, fragmented implementation, limited regulatory capacity and weak enforcement were linked to investor uncertainty and weakened project pipelines (Ikejemba et al., 2017; Kruger & Eberhard, 2018; Moyo & Oree, 2024). Differences in renewable energy outcomes were associated not only with resource potential but also with regulatory quality, policy credibility and consistency of market rules (Asongu & Odhiambo, 2021; Gyimah & Gyimah, 2024).

A recurring bottleneck was the performance of state-owned utilities, particularly revenue sufficiency, governance and contractual reliability. Weak utility balance sheets, delayed payments and perceived off-taker risk undermine PPAs and discourage private participation even where policy targets are ambitious (Owusu-Manu et al., 2021; Diallo & Ouoba, 2023). This can reinforce dependence on concessional finance and guarantees. Conversely, transparent procurement, coherent regulation and enforceable contracts were associated with more favourable conditions for auctions and IPP models (Kruger & Eberhard, 2018; Ikejemba et al., 2017).

4.6 Summary of findings

Four patterns converge across the evidence: (i) renewable energy deployment remains substantially dependent on public and concessional capital; (ii) state-led and donor-supported arrangements are prominent in project implementation; (iii) cost of capital, currency exposure, off-taker risk and institutional constraints limit sustained private investment; and (iv) decentralised systems can contribute to energy access but require financing and regulatory arrangements suited to their characteristics.

5. Discussion

5.1 Financing is necessary but not sufficient for market transformation

The findings suggest that the central financing challenge in SSA is not simply the absence of instruments. Public, concessional and market-based mechanisms are available, yet renewable energy markets remain dependent on public and development-partner capital (Pueyo, 2018; Michael Olabisi et al., 2022; Soumonni & Ojah, 2021). Grants and concessional loans can reduce the immediate financing burden and support projects facing high perceived risk (Owusu-Manu et al., 2021; Hoka, 2021). However, project-level risk compensation does not automatically resolve weak institutions, uncertain revenue arrangements, limited domestic capital or the conditions that make projects difficult to finance commercially (Pueyo, 2018; Diallo & Ouoba, 2023).

The prominence of state-led and donor-supported models reflects their role in initiating projects where markets are nascent or risks are high. The review nevertheless indicates that project initiation and market transformation are distinct outcomes. A project can be delivered with concessional support without generating competition, local financing capacity or a pipeline of commercially sustainable investments. Thus, financing effectiveness should be assessed not only by deployment but also by whether mechanisms improve risk allocation, institutional capability and longer-term market development

5.2 Institutional credibility mediates financing effectiveness

The review's central analytical implication is that institutional conditions mediate the relationship between financing instruments and investment outcomes. Formal policy adoption is not equivalent to implementation. Where rules are inconsistently enforced, tariff-setting is unpredictable or contracts are not credible, investors may demand higher returns, delay decisions or avoid the market (Kruger & Eberhard, 2018; Asongu & Odhiambo, 2021; Moyo & Oree, 2024). Institutional credibility therefore affects both the cost and availability of capital (Müller et al., 2021; Diallo & Ouoba, 2023).

This interpretation is consistent with the integrated institutional framing: a gap between policy design and operational practice weakens the effect of otherwise attractive instruments. Regulatory capacity, transparent procurement, contract enforcement and credible dispute resolution are not peripheral administrative considerations; they are components of the investment environment. The evidence also highlights utility creditworthiness as a critical link between public policy and private participation, because a PPA is only as bankable as the revenue and payment arrangements underpinning it

5.3 Cost of capital, currency exposure and off-taker risk

High cost of capital reflects the combined effect of country-level macroeconomic conditions, exchange-rate exposure, project performance, revenue uncertainty and counterparty creditworthiness (Hoka, 2021; Pueyo, 2018; Olanrele & Fuinhas, 2022; Adedoyin et al., 2021). Currency mismatch is particularly consequential where revenues are denominated in local currency but debt or equipment costs are foreign-currency based (Pueyo, 2018; Hoka, 2021). Off-taker risk compounds the problem when utilities face financial distress or delayed payments (Owusu-Manu et al., 2021; Diallo & Ouoba, 2023). These risks influence financing terms and can make projects unviable even when renewable resources and technology costs are favourable.

Guarantees, liquidity facilities and concessional tranches may allocate or absorb some risks. Their design should specify risk ownership, transparent eligibility and the conditions under which public support is justified. If risk-sharing substitutes for reforms in utility finances, regulation or contract enforcement, it may perpetuate reliance on concessional capital rather than improve market fundamentals. The matrix also points to underdeveloped domestic financial markets and limited long-term local-currency finance as constraints on local institutional-investor participation

5.4 Decentralised systems as core transition pathways

Mini-grids and off-grid solar are important options for reaching rural and underserved populations and should not be assessed only against utility-scale generation. Their contribution includes access in areas where grid extension may be slow or uneconomic (Bishoge et al., 2020; Ebhota & Tabakov, 2022; Eze et al., 2024). Their financing needs, however, differ in scale, revenue model, customer base and operating risk. Tailored instruments and regulation are therefore needed to support viable decentralised systems (Ikejemba et al., 2017; Owusu-Manu et al., 2021).

Where national strategies treat decentralised systems as peripheral, developers can face uncertain licensing, tariff rules, grid-arrival provisions and access to long-term finance. The review suggests that decentralised renewable energy is often recognised for access benefits but remains marginal in policy and financing architecture. Integrating these systems into national transition plans would require predictable regulation, appropriate tariffs, consumer and community engagement, and financing that accounts for their specific cash-flow and affordability conditions

5.5 A systemic approach to the energy transition

The combined theoretical framework suggests that renewable energy finance should be understood as part of wider market formation. Energy transition theory draws attention to the coexistence of state-led, donor-supported and market-based pathways (Müller et al., 2021; Han, 2023); investment and finance theory clarifies how risk, returns and capital structures shape project decisions (Soumonni & Ojah, 2021; Krause et al., 2024); and institutional theory explains why governance and implementation conditions affect the performance of these mechanisms (Müller et al., 2021; Asongu & Odhiambo, 2021). The evidence indicates that isolated project transactions are unlikely to deliver systemic change if institutions and sector infrastructure remain weak.

System-level interventions include strengthening utility financial performance, improving transmission and distribution infrastructure, integrating renewable energy planning into broader economic and industrial strategies, and deepening domestic financial markets. These actions can address underlying market failures and help move financing from episodic project support towards sustained investment. This is not an argument to withdraw concessional finance prematurely, but to deploy it strategically alongside institutional and market reforms

5.6 Policy and investment implications

The synthesis supports five interrelated priorities. First, governments should strengthen regulatory predictability, contract enforcement and transparent procurement through capable regulators, credible tariff-setting processes and accessible dispute resolution (Kruger & Eberhard, 2018; Diallo & Ouoba, 2023). Second, public and development-partner finance should move beyond isolated projects towards system-level interventions that improve utility creditworthiness and infrastructure (Owusu-Manu et al., 2021; Michael Olabisi et al., 2022). Third, blended finance should complement rather than substitute for institutional reform, with guarantees and concessional tranches linked to transparent risk allocation and policy milestones (Soumonni & Ojah, 2021; Argueta et al., 2023). Fourth, domestic financial markets should be developed through local-currency instruments, standardised project disclosure and enabling regulation for pension funds and insurers (Krause et al., 2024; Cai et al., 2024). Fifth, decentralised systems should be integrated into national energy strategies with tailored finance and regulation (Bishoge et al., 2020; Eze et al., 2024).

6. Limitations and future research

This review is limited by reliance on secondary sources and the heterogeneity of included evidence. It did not collect primary data, conduct project-level financial modelling or estimate causal effects of individual instruments. The search and screening counts are reported from the original review; database-specific search dates and exact search strings, publication-year limits and formal quality-appraisal procedures were not fully documented in the source materials available for this manuscript. The coding table reports qualitative categories rather than numerical NVivo counts; accordingly, High/Moderate/Low classifications are retained without conversion to percentages or frequencies

Future research should include longitudinal studies of financing instruments and policy reforms; comparative analyses of institutional quality and investment outcomes across countries; empirical work on pension funds, insurance companies and local-currency finance; and project-level studies of risk allocation, utility payment performance and bankability. Further research on decentralised systems should examine their role as transformative rather than transitional components of energy systems, including social, economic and governance impacts (Oluoch et al., 2019; Ayorinde et al., 2024; Eze et al., 2024; Oyegbile et al., 2024).

7. Conclusion

This systematic review examined how financing instruments, market models and institutional conditions shape renewable energy investment in SSA. The synthesis indicates that public and concessional finance remains central to deployment, while state-led and donor-supported arrangements continue to dominate the documented market landscape (Soumonni & Ojah, 2021; Sankoh et al., 2021; Michael Olabisi et al., 2022). These approaches have enabled project initiation but have not consistently generated competitive, self-sustaining markets or durable private investment (Pueyo, 2018; Kruger & Eberhard, 2018). High cost of capital, currency mismatch, off-taker risk, weak utility finances, policy inconsistency and institutional capacity constraints remain interlocking barriers (Hoka, 2021; Owusu-Manu et al., 2021; Diallo & Ouoba, 2023; Müller et al., 2021).

The central conclusion is that financing instruments alone cannot deliver a durable energy transition. Their effectiveness depends on the credibility of institutions through which projects are planned, procured, regulated and paid for. A transition-oriented financing strategy should combine appropriately

designed concessional and risk-sharing instruments with regulatory stability, utility reform, domestic financial-market development and recognition of decentralised energy systems as core pathways. The evidence therefore frames renewable energy finance in SSA as a systemic institutional and market-development challenge, not merely a technical problem of financial engineering

Declarations

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Author contributions:

The author conceptualized the study, developed the review methodology, conducted the literature search and screening, extracted and analyzed the data, interpreted the findings, and prepared and approved the manuscript.

Data availability:

The review matrix used in this study is available and has been shared as a supplementary file

Ethics approval: Not applicable; this review used published and documentary sources and did not involve human participants.

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Figures



Figure 1

Integrated conceptual framework linking energy transition, investment and finance, and institutional theory to renewable energy market outcomes

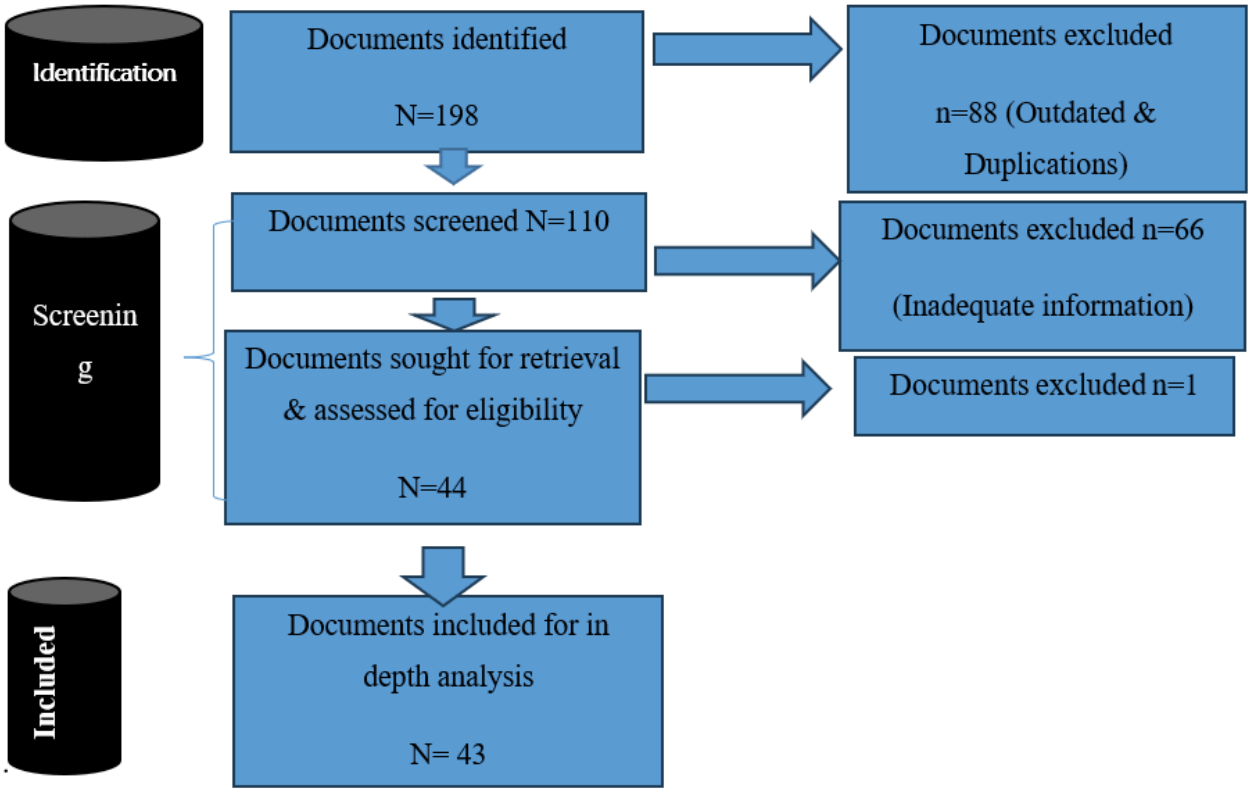


Figure 2

PRISMA flow diagram

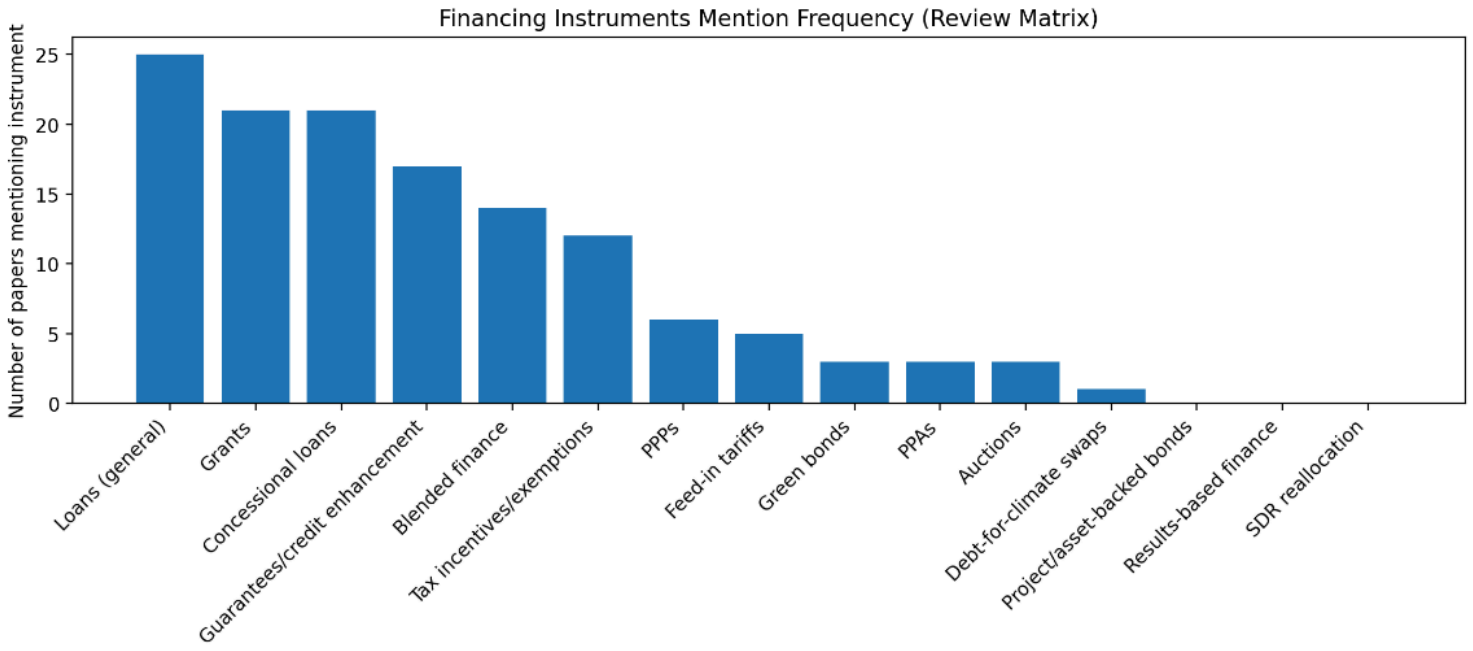


Figure 3

Frequency of renewable energy financing instruments referenced in the systematic review matrix

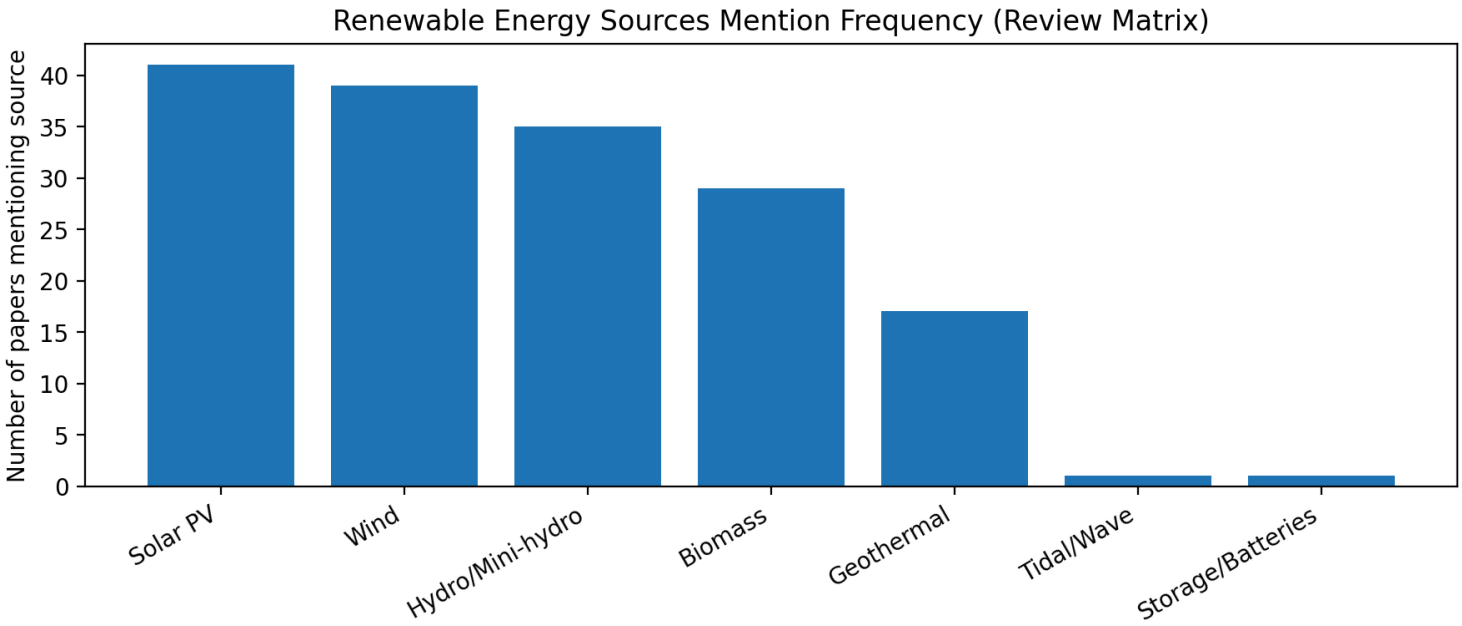


Figure 4

Renewable energy sources mentioned in the reviewed papers. Source: Author's synthesis based on reviewed studies