CLIMATE FINANCING AND GROWTH OF RENEWABLE ENERGY IN KENYA

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ABSTRACT

Kenya's renewable energy sector has expanded rapidly over the past decade, with total installed electricity capacity rising from approximately 1,300 MW in 2010 to over 3,300 MW by 2024, and renewable sources accounting for nearly 85–90% of installed capacity. Geothermal capacity alone exceeds 950 MW, positioning Kenya as Africa's leading geothermal producer. Despite this growth, renewable energy expansion remains structurally uneven. While grid-connected geothermal and wind projects have scaled significantly, disparities persist in rural renewable access, decentralized off-grid penetration, and sustained infrastructure investment. This uneven growth raises concerns regarding the determinants of renewable energy expansion and the effectiveness of financial interventions intended to accelerate the energy transition. Over the same period, climate finance commitments to Kenya have increased substantially. However, the extent to which climate financing translates into measurable renewable energy growth outcomes remains empirically underexamined. Existing studies largely treat climate finance as a direct driver of renewable expansion, with limited attention to the internal capital formation processes and policy conditions that shape this relationship. This study examines the effect of climate financing on renewable energy growth in Kenya over a ten-year panel period. Climate financing is disaggregated into financing mechanisms, financing uptake rate, and financing volume. Renewable energy growth is measured using installed renewable capacity, household renewable energy access, and off-grid consumption rate. The study introduces renewable energy capital formation, operationalized through renewable infrastructure capital expenditure and grid expansion investment, as a mediating variable. Green policy instruments, comprising feed-in tariffs, tax incentives, and tradable green certificates, are modelled as moderating variables. Adopting a positivist philosophy and a quantitative longitudinal design, the study employs panel regression techniques, including fixed effects and random effects estimations, to test direct, mediating, and moderating relationships. By integrating capital formation and policy conditioning effects into the climate finance–renewable energy nexus, the study provides structured empirical evidence to inform climate finance deployment, infrastructure planning, and green policy design in Kenya.

INTRODUCTION

Background of the study

Climate change refers to the long-standing extreme changes in global temperatures, weather patterns, and environmental conditions across the globe. While these changes have always happened naturally, in recent decades, human activities have caused a strain on the natural balance, accelerating the process (World Bank, 2019). The effects of Climate change are felt in the rise of global warming, rising sea levels, frequent floods and droughts, all this causing a disruption to ecosystems and agriculture. As more countries transition towards low-carbon economies, climate financing becomes a sure pathway to realising sustainable development goals (International Monetary Fund [IMF], 2019). Like many other countries, Kenya is not immune to climate change. According to the Kenya National Bureau of Statistics (KNBS, 2020), extreme droughts, floods, irregular and unpredictable rainfall, and temperatures shifts have all been experienced. This sustained strain on the natural environment to support agriculture, which remains the country's economy's backbone, has as such weakened (Mwangi, 2020).

According to Green Climate Fund (2020), unlike traditional investments, unlocking the economic potential for investments in climate action, mitigation and adaptation is critical for Mother Nature's survival. Climate financing is one sure way to addressing climate change since investments needed to afford the transition to a low-carbon global economy are often capital-intensive (Kibet, 2024). Climate financing can come from different stream sources, ranging from public sectors to corporate private investors at the national or international spaces. Climate financing can be structured as concessional loans or grants, donations, climate-specific bonds, debt swaps, or even equities. This financing, usually targeted for climate action and environmental sustainability, helps to boost capacity for mitigation, adaptation, and resilience building (Almulhim et al., 2025). This increasing threat to global socio-economic development and environmental harmony has seen countries developing legal, regulatory and strategic frameworks to curb the run-away effects or reverse the damages. This has led to an expansion in the definition of climate finance. The importance of climate financing has grown so rapidly that some countries, such as the Maldives, consider all finance to be climate finance. This is because their economy and survival are dependent on climate resilience. As such, a pivoting away from traditional development budgets to climate-specific has increased, all this to support climate resilience and change adaptation (Li et al., 2022).

According to the United Nations Framework Convention on Climate Change (UNFCCC, 2020), renewable or green energy has the potential to mitigating climate change effects and guaranteeing economic resilience. The transition to renewable energy, however, faces numerous challenges, especially across developing economies like Kenya. Financial, infrastructural, and governance shortfalls makes climate financing and investments pivotal in driving this transition across the globe. Climate funding has also emerged as a determinant in supporting the adoption of renewable energy. More significant flows of

finance by global organizations, development institutions, and private investments have driven faster global clean energy projects (Kiremu et al., 2022).

For prosperity, the African economy, and most specifically and relevant to this study, Kenya's growth must be green. Green growth refers to the intentional approach of making economic decisions fully conscious of their effects on the environment and only committing to alternatives that leave minimal to no harm (Omala et al., 2024). Green energy sources such as Solar power, hydroelectric and wind energy are an alternate source of energy with a comparative advantage over fossil fuels. They are a model alternative to countries seeking green growth. Intentional proactive investment, implementation of global reforms, and proper planning are essential to realize this progress (Zhang et al., 2022). In a policy brief by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ, 2025, Kenya formulated a team of experts in collaborating with World Bank professionals and other climate-action think tanks to develop and create a roadmap for progressive institutionalization of incentives and outcomes of green initiatives in Kenya. Kenya has further drafted a national climate change resilience and adaptation framework for approval and implementation. Opportunities for climate financing are in surplus. Studies show well-curated African initiatives can transform and strengthen carbon offset markets, unlocking significant funding sources estimated at $50/ton. This would account for $15b in annual revenue and over 50 million jobs (Ministry of Environment and Forestry, Kenya, 2018).

This study explores the relationship of climate financing on the growth of renewable energy in Kenya. Emphasis is placed on the mediating roles of capital formation alongside the moderating factors of Regulatory framework. The study will seek to establish whether success of renewable energy growth depends on sustained financing, enabling technological innovation and capital formation alongside structural intervening variables like regulatory framework and capital formation. By addressing these interdependencies, Kenya can hopefully maximize climate finance's impact to achieve a resilient energy future. This research will contribute to the growing knowledge pool on far-reaching impacts of climate financing as it relates to the growth of renewable energy environmental sustainability. Recommendations arrived at will inform Policy implications towards climate finance disbursements, innovations, and requisite governance frameworks critical to spur Kenya's energy transformation agenda.

Climate Financing

Climate financing can be defined as the total financial flows, which are geared towards addressing the causes and effects of climate change (Wainaina, 2025). These financial flows are specifically geared towards addressing the causes and effects of climate change. These financial flows may come from both national and international sources, both public and private, and may be geared towards addressing issues such as greenhouse emissions, environmental sustainability, among others (Green Climate Fund, 2020; UNFCCC, 2020). Climate financing is, therefore, not like other financial flows, which are geared towards development, since it is specific, conditional, and geared towards environmental sustainability rather than financial returns.

Climate financing is a big catalyst in the renewable energy sector. In a sector characterized by high investment costs, long project periods, and technological risks, financing alternatives become a relief. Meattle et al. (2022) posits that Climate financing can take different forms such as grants, concessional loans, green bonds, and, or public-private partnerships. The success of climate financing therefore, depends on its availability as well as the mechanisms in which it is delivered and absorbed by the economy.

The functionality of climate financing lies not only in its availability but also in its structure, flow, and absorption in the recipient economies. In terms of climate financing, it is conceptualized in three dimensions: financing mechanisms, financing volume, and financing uptake rate. This reflects not only the availability of climate finance in Kenya's energy sector, but also its functionality in promoting growth in renewable energy development.

Growth of Renewable Energy

Renewable energy is a form of energy derived from natural self-replenishing sources. In Kenya, these sources include solar, wind, geothermal, hydro, and biomass. Renewable energy growth is a concept that goes beyond the expansion of renewable energy installed capacity. It also entails improvement in access to renewable energy and off-grid renewable energy, particularly in underserved areas (IRENA, 2021).

In Kenya, renewable energy growth is pushed by various factors. The key factor is the need to reduce fossil fuel reliance and improve energy security. It is also pushed by the need for Kenya to meet its climate change obligations under various global agreements and frameworks, particularly the Paris Agreement (World Bank, 2021). Despite the progress made by Kenya in developing grid-connected renewable energy sources like geothermal and wind energy, there is a challenge with off-grid renewable energy and sustainability, particularly in rural areas of Kenya (KNBS, 2020).

This study conceptualized renewable energy growth by developing three outcome indicators. The indicators developed for this study include growth in installed renewable energy capacity, increase in energy access, and off-grid energy consumption rate.

Renewable Energy Capital Formation

Renewable Energy Capital Formation refers to the accumulation of fixed capital assets within the renewable energy sector resulting from investment activities. It represents the process through which financial resources are transformed into physical infrastructure capable of generating and transmitting renewable energy. In this study, renewable energy capital formation is conceptualized as the transmission mechanism through which climate financing influences renewable energy growth.

Capital accumulation theory posits that sustained financial inflows contribute to productive asset formation, which in turn drives sectoral growth and long-term economic development

(Smith, 1776; Zhang, 2022). In the context of renewable energy, climate financing enhances the availability of funds required for infrastructure development, grid expansion, and asset acquisition. These investments increase installed generation capacity, strengthen transmission networks, and improve energy access outcomes.

Renewable energy capital formation is operationalized using renewable infrastructure capital expenditure and grid expansion investment. These measures reflect tangible capital deepening within the energy sector and provide a quantifiable basis for testing mediation effects in the climate finance–renewable energy growth relationship.

Green Policy Instruments

Green Policy Instruments refer to regulatory and fiscal mechanisms designed to incentivize renewable energy investment and improve project bankability. In Kenya, these instruments include feed-in tariffs, renewable energy tax incentives, and tradable green certificate regimes, among other supportive policy measures (GIZ, 2025; KIPPRA, 2021).
Unlike capital formation, which functions as a transmission mechanism, green policy instruments condition the effectiveness of climate financing. Institutional theory suggests that regulatory environments shape investment outcomes by influencing risk perception, return expectations, and investor confidence (Scott, 1995). Well-designed policy instruments can amplify the impact of financial inflows by reducing uncertainty, lowering capital costs, and improving revenue predictability.

In this study, green policy instruments are conceptualized as moderating variables that influence the strength of the relationship between climate financing and renewable energy growth. Their presence and intensity determine whether climate financing translates efficiently into infrastructure development and energy expansion.

Statement of the Problem

Despite Kenya's recognition as a regional leader in renewable energy, the growth of renewable energy has remained uneven, fragmented, and slower than national ambitions suggest (IRENA, 2021. While grid-connected renewable sources such as geothermal and wind have expanded, growth in installed capacity has not translated proportionately into broad-based energy access, particularly in rural and off-grid areas (KNBS, 2020). National electricity access remains characterized by persistent spatial and socio-economic disparities, with off-grid renewable solutions exhibiting inconsistent adoption and sustainability across counties (Hellqvist, 2021; Owino & Mwangi, 2021). Moreover, several renewable energy projects experience delays, underutilization, or post-implementation sustainability challenges, raising concerns about the effectiveness of current growth pathways (World Bank, 2021;). Renewable energy share accounts for between 85–90% of the Kenya's energy consumption. With a growth of more than two times in 14 years, the biggest jump was from 1,300 MW in 2023 to 3,300+ MW in 2024 total capacity (GIZ, 2025). These trends point to a fundamental problem: growth in renewable energy in Kenya has not been sufficient, inclusive, or resilient to guarantee long-term energy security and climate objectives, thereby necessitating closer empirical

examination of the factors shaping renewable energy outcomes. These inconsistencies raise concerns regarding the structural drivers of renewable energy growth within the country's evolving climate finance landscape (Lutta et al., 2025).

Although Kenya has attracted increasing volumes of climate financing from international climate funds, concessional loans, green bonds, and blended finance arrangements (World Bank, 2021; Mungai et al., 2022), the relationship between these financial inflows and measurable renewable energy growth outcomes remains insufficiently clarified. Evidence indicates that financing commitments do not always translate proportionately into infrastructure expansion or energy access improvements, partly due to capital absorption inefficiencies and infrastructural constraints (Climate Investment Funds, 2018; Hellqvist, 2021).

Existing empirical studies have largely examined climate finance in relation to emissions reduction or cross-country energy transition patterns (Acheampong et al., 2019; Li et al., 2022), with limited Kenya-specific investigations disaggregating climate financing into financing mechanisms, financing uptake rate, and financing volume. Furthermore, prior studies have predominantly focused on direct relationships between climate finance and renewable energy outcomes, without formally modelling renewable energy capital formation as a transmission mechanism or testing the conditional influence of green policy instruments such as feed-in tariffs, tax incentives, and tradable green certificates.

The absence of a structured moderated mediation analysis limits understanding of whether climate financing drives renewable energy growth directly, indirectly through capital formation, or conditionally depending on regulatory policy strength. Without empirical clarity on these structural relationships, policy formulation risks emphasizing financial mobilization without adequately addressing capital deployment dynamics and regulatory effectiveness (Meattle et al., 2022; World Bank, 2021). This study therefore seeks to investigate the relationship between climate financing and the growth of renewable energy in Kenya.

Objectives of the Study

This section presents the general and specific objectives that underpins this study.

General Objectives

The Research will seek to investigate the effect of climate financing on the growth of renewable energy in Kenya.

Specific Objectives of the Study

The Specific Objectives for the Research will be:

i. To determine the effect of climate financing mechanisms on the growth of renewable energy in Kenya.
ii. To determine the effect of climate financing uptake rate on the growth of renewable energy in Kenya.

iii. To determine the effect of climate financing volume on the growth of renewable energy in Kenya.
iv. To determine the mediating effect of renewable energy capital formation on the relationship between climate financing and renewable energy growth in Kenya.
v. To determine the moderating effect of green policy instruments on the relationship between climate financing and renewable energy growth in Kenya.

Research Hypotheses

Ho1: Climate financing mechanisms have no significant effect on renewable energy growth in Kenya.
Ho2: Climate financing uptake rate has no significant effect on renewable energy growth in Kenya.
Ho3: Climate financing volume has no significant effect on renewable energy growth in Kenya.
Ho4: Renewable energy capital formation does not significantly mediate the relationship between climate financing and renewable energy growth in Kenya.
Ho5: Green policy instruments does not significantly moderate the relationship between climate financing and renewable energy growth in Kenya.

Scope of the Study

The study looks at how renewable energy growth is affected by climate financing in Kenya. The study focuses on 10 years during which climate financing has been actively mobilized toward renewable energy development in the country. In better scoring the relationship between climate financing and the growth of renewable energy, the study considers the moderating effect of green policy instruments and the mediation effect of Renewable Energy Capital Formation in Kenya.

Significance of the Study

The study has significant contributions to policy, practice, and knowledge. From a policy perspective, the study offers valuable knowledge to inform the development of climate finance policies, renewable energy policies, and regulatory reforms that align with the energy transition and climate change commitments in Kenya. The study further informs financiers, development partners, and renewable energy developers on the best financing approaches, mechanisms, and conditions to effectively leverage capital inflows and produce energy outcomes. From an academic perspective, the study adds value to the existing literature by developing a unique model that empirically links climate finance, regulatory frameworks, and capital formation, filling the gaps in the existing literature on renewable energy in Africa and specific countries.

The study also adds value to the achievement of the sustainable development goals, particularly those related to access to clean energy, climate change, and resilient infrastructure, by shedding light on the best approaches to structuring financial flows to produce long-term development outcomes rather than short-term project outcomes.

Limitations of the Study

Despite its careful design, this study has several limitations, including the fact that the climate financing data may not entirely reflect the unrecorded flow of funds, hence the actual investment levels. Similarly, the green policy instruments and capital formation indicators may not entirely reflect the institutional dynamics, effectiveness, and challenges associated with policy implementation.

Organization of the Study

This independent study paper is divided into two chapters. Chapter one deals with the background, problem statement, objectives, research questions, hypotheses, scope, significance, and limitations of the study while Chapter Two is devoted to the literature review of the theoretical, conceptual, and empirical aspects of climate financing and renewable energy growth.

LITERATURE REVIEW

Introduction

In this chapter, we shall summarize relevant theories as presented in various prior study designs in as much as they help lay the theoretical foundation for our research. A strong theoretical foundation will be essential to conceptualize the relationship between climate financing and the growth of renewable energy in Kenya.

Theoretical Literature Review

Theoretical Literature review is the structured assessment of prior quantitative and qualitative research works, allowing for the identification of patterns, inconsistencies, and gaps. This process helps establish the validity of concepts, informs variable measurement, and grounds the choice of methodology (Post, et al., 2020). In summarizing the discussion of climate financing in advancing the growth of renewable energy in Kenya, Climate finance theory, development theory, Capital Accumulation, Resource based view, and Institutional theories provided a holistic approach to studying the nexus between climate financing instruments and green energy growth. These theories provide a firm base and vision to study the complex nexus between climate financing and Kenya's growth of green energy.

Climate finance theory

Based on the research effort and the agenda of policymaking in the United Nations Framework Convention on Climate Change (UNFCCC), Climate finance theory is anchored in the "principle of common but differentiated responsibilities". It postulates that targeted financial flows can enable countries to not only mitigate but also adapt to climate change by financing low-carbon, climate-resilient infrastructure. It strongly implies that developed countries, which are known to account for the most significant proportion of greenhouse gas emissions, ought, by all fairness, to extend financial support as compensation to the less-developing nations with considerably fewer GHG emissions in hopes of offsetting the environmental debt. Climate finance theory emphasizes bringing the

potential impact of climate change into the design of financial projects and products in anticipation of adapting the adaptation measures.

This theory will be key in understanding this topic as it provides an empirical background by explaining how the various climate financial mechanisms help to mobilize resources for climate-related projects. Besides setting a foundation for systematically analysing Kenya's climate finance landscape using quantitative analysis models to measure impact, it aligns with the United nation's development goals on climate action (SDG 13) and partnerships (SDG 17), (Otundo, 2024). Climate Finance Theory, therefore, offers the normative and structural logic for climate-aligned resource mobilization and justifies Kenya's increasing focus on green bonds, public-private partnerships, and concessional lending for solar, wind, and geothermal investments.

While assessing the impact of climate finance on the energy transition in developing Asia, Li et al. (2022). applied this theory to model their study, The authors found that strategic use of climate funds; especially concessional loans and blended finance, accelerated renewable energy deployment in countries with enabling institutions and clear policy frameworks. This supports the inclusion of financing mechanisms**,** uptake rates**,** and funding volume as sub-constructs of climate finance in this study.

Sustainable Development Theory

This theory was in essence proposed by the Brundtland Commission of World Commission on Environment and Development (WCED) in 1987, this theory suggests that economic growth needs to meet the needs of today without compromising the future generations' ability to meet theirs. The focus is on reaching the point of sustainability where environmental preservation and economic growth coexist. It forms the empirical basis on which we can examine the effects of climate funding mechanisms and how these contribute to long term economic growth.

Put in perspective, the growth in the supply of energy without exhausting natural resources; in conjunction with development methods, climate funding methods can finance green growth, renewable fuels, climate-resistant infrastructure, and inclusive growth, which are vital in countries that are in the developmental stage like Kenya (Ben Lazreg and Yousfi, (2025). Therefore, we can examine how climate finance can balance environmental conservation and economic growth concurrently and tackle climate threats. This theory largely resonates with the mediating role of capital formation. It supports the view that renewable energy should not only be installed but also maintained and scaled sustainably to protect the environment.

By weaving in the research around the sustainable Development Theory, Gyamfi et al. (2018), investigated the role of sustainable development strategies in expanding renewable energy access in East Africa. The study found that green energy financing improved livelihoods, reduced emissions, and contributed to regional equity in energy access. These

outcomes align with this study's dependent variable—growth of renewable installed capacity, increased energy access, and off-grid consumption.

Capital Accumulation Theory

Capital accumulation theory, originally developed by Smith in 1776, and improved in continuous succession by David Ricardo and Karl Marx in different perspectives, postulates that the consistent accumulation of natural, physical, and artificial capital resources is crucial for long-term economic development. For this study, investments sourced from the different climate funding institutions meant to be applied in the construction of climate-resistant infrastructure, renewable energy schemes, and environmental protection, in general, tend to build physical and natural capital. Capital accumulation theory will assist in analyzing how investments in climate finance support the construction of energy-related infrastructure and the likely spillover to other sectors of the economy.

Using panel data and GMM estimations, Zhang (2022) attempted to examine the complex role of green finance and renewable energy investment in driving economic performance among OECD countries. The research results determined a significantly positive relationship between green investment and economic output. This supports the theory angle that capital directed toward renewable energy yields long-term gains. The theory aligns with the variable of climate financing volume and mechanisms as instrumental in expanding installed renewable capacity and overall energy access.

Institutional Theory

Developed by Scott in 1995, Institutional theory centers on institutions' inherent role in determining economic outcomes. Governments, international institutions, and NGOs are critical actors, ranging from policy formulation and influence to applying necessary programs that further climate change. Financial flows of climate financing are viable if there are strong institutions in managing, allocating, and executing financing programs of acute precision. Implementation of climate change financing programs in Kenya and their success will be subject to the capacity of national and local institutions to coordinate their efforts in various sectors (Baimwera and Wangombe, 2017). This theory will be instrumental in giving a platform to assess how Kenya's government, private sector, and NGOs enable or facilitate the effects of climate finance in the energy and natural resources sectors. It will assist in analyzing the institutional architectures necessary for climate change financing to yield measurable effects on economic development.

Dube and Horvey (2023). found that institutional quality significantly influenced climate-related capital flows. With a research design that utilized panel data study across 23 African nations, the authors determined that higher regulatory quality and institutional stability attract more renewable energy investments. This conclusion is in tandem with the proposed role of regulatory frameworks to moderate the relationship between climate finance and energy outcomes.

Resource-Based View (RBV)

Developed by Barney in 1991, Resource-Based View theory postulates that the ability to achieve competitive advantage depends on an organizations' capacity to control and utilize valuable, rare, inimitable, and non-substitutable resources. In this research context, climate financing, renewable energy reserves, and innovative capabilities are strategic resources. This theory as such, correlates the importance of capital formation in translating climate finance into tangible renewable energy outcomes.

Climate financing can significantly boost energy efficiency and renewable energy capacity in emerging economies. Zhou and Li (2022), while applying this theory, found that firms which accessed green finance and built supporting internal capabilities outperformed those that didn't, particularly in terms of return on investment and long-term energy sustainability. The research showed that firms accessing climate finance demonstrated higher returns and long-term operational sustainability, reinforcing the notion that financial and technical capabilities are core assets. This theory informs both the capital formation mediator and the strategic role of climate financing mechanisms

Empirical Literature

Empirical literature review is the process of going through prior research work in the same or related research area to compare perspectives. It serves both diagnostic and constructive roles in properly mapping quality research. Empirical literature review emphasizes evidence-based insights drawn from real-world data (Starke et al., 2022). By drawing parallels to other studies, the researcher can identify underlying patterns, make comparison and contrasts with prior studies. This review process allows the researcher to correctly evaluate the current state of knowledge and to determine the extent to which, if at all, relationships among key variables have been adequately tested in similar or different contexts. An objective Empirical literature review will enable the researcher to unravel relevance, applicability, and generalizability of findings through the selection of appropriate tools for data collection, analysis, and interpretation. In general, it ensures that the proposed study adheres to acceptable scientific standards and practices while also allowing for methodological innovation (Lim et al., 2022).

Growth of renewable energy in Kenya

As climate change effects become more bare, the transition to renewable energy has continued to gain momentum across the globe. Nations have, in their own strides sought to reduce greenhouse gas emissions through enhanced energy security and sustainable development (Ayorinde et al., 2024). In efforts to manage climate change and its far-reaching consequences, renewable energy has been proposed as a solution. With Kenya having positioned itself as a leader in renewable energy technologies; primarily geothermal, hydro, and wind, its infrastructural capacity sees over 80% of its electricity generated from renewable sources (Otundo, 2024). This growth has been made possible by the utilisation of climate financing, a supportive regulatory environment that has seen policy adoption and public-private partnerships and institutional reforms. Despite the milestones, Kenya has faced difficulties to scale available off-grid solutions (Barngetuny, 2024). An appreciation

of Kenya's current renewable energy environment will be key not only to this research but also to informing future energy-related policies, and resilience strategies.

The International Renewable Energy Agency (IRENA) found that electricity capacity expansions that came from renewable energy sources was attributable to the declining green technology costs, an enabling policy environment, and increased availability of green finance instruments (IRENA, 2021). These findings support this study's independent variable, climate financing, as well as justifying the place of the implementation environment in facilitating renewable energy adoption and growth. In contrast, the IRENA report was largely descriptive and adopted a global focus, lacking an empirical depth and contextual specificity to Kenya. The study variables did not include outcome variables such as off-grid energy consumption**,** which are crucial to this study and the Kenyan renewable energy landscape.

In analyzing the potential of renewable energy in Sub-Saharan Africa, Amoah et al. (2022) used a scenario-based energy system model named MESSAGEix-Africa. The study affirms the importance of climate finance through the lens of energy access and institutional frameworks in renewable energy growth. The study is model-based and predictive, avoiding the use of empirical data that focuses on real-world trends and causality. The study lacks a detailed disaggregation of climate financing dimensions such as uptake rates and volume, which are integral to this research. It also does not consider capital formation as an intervening variable, as such, failing to illustrate how systemic adaptation influence renewable energy sustainability.

Microfinance and grant-based climate funding has had a positive significant effect on off-grid solar electrification in rural Kenya (Hellqvist, 2021). The study, with a similar geographic scope and focus, addressed climate financing mechanisms**,** energy access**,** and off-grid consumption**.** It also employs regulatory support at the county level**,** as a moderating variable. However, the authors did not explore the broader financing volume or uptake rate across the national landscape, nor did they integrate a structured mediating variable such as capital formation. This presents an opportunity to scale into a nationally representative, multi-dimensional analysis.

Off-grid energy consumption is a critical measure of renewable energy access. In a study seeking to understand the green energy sector in Kenya, Owino and Mwangi (2021) found that targeted climate financing led on average to a 35% increase in off-grid electricity consumption. These findings highlight the role of climate financing in expanding green energy access especially in areas beyond the national grid. The further pointed that the sustainability of these off-grid solutions was highly dependent on the regulatory environment. This aligns closely with the present study's conceptual framework, where off-grid consumption rate is a key sub-indicator of the growth of renewable energy and its relationship to climate financing.

Climate Financing and renewable energy

Kinuthia et al., (2025) examined the effect of climate finance inflows on renewable energy capacity development in 28 African countries over the period 2000–2020. The study found that increases in climate-related development finance significantly enhanced the installed capacity of renewable energy, particularly in countries with higher institutional quality. The findings align with the current study's interest in climate financing volume and mechanisms as key drivers of renewable energy growth. However, the study did not consider mediating or moderating factors such as capital formation or green policy instruments , presenting a gap that the current study addresses. Zhang et al. (2022) on the other hand explored the relationship between green finance and renewable energy technological innovation. The study revealed that green bonds and concessional credit positively influenced solar and wind energy innovation. The study supports the construct of climate financing and directly relates to technological innovation, a key indicator in capital formation. The study However has a contextual distinction from this study since it took a broader focus than analysing renewable energy access for off-grid consumption.

On a similar but separate study, Ayorinde et al. (2024) conducted a study on how climate-financed renewable energy projects contribute to economic development in Kenya. The study found that climate finance enhanced energy security and reduced fossil fuel dependency. While this study aligns directly with renewable energy growth, particularly in terms of installed capacity and economic impact, the analysis lacked disaggregation into climate financing mechanisms (e.g., green bonds vs grants), and did not assess off-grid energy access, a gap this study aims to fill.

Financing Mechanism and Renewable Energy

A study by Rasoulinezhad and Taghizadeh-Hesary (2022) found that green bond issuance significantly increased investments in solar and wind infrastructure. Set up in Asis, the study hints at the importance of regulatory frameworks in boosting the growth of renewable energy. A similar study assessing the impact of public-private partnerships (PPPs) as a financing mechanism for renewable energy projects in Ethiopia found that well-structured PPPs significantly enhanced renewable energy capacity development and improved rural energy access. Mundonde and Makoni (2025) noted that the absence of risk-sharing frameworks and weak institutional capacity often undermined project success. This result adds to the depth of financing mechanism by validating the impact of PPPs while also touching on institutional resilience, and capital formation.

A separate study by Ali (2023) to assess the effects of grant-based financing on the development of mini-grid solar projects in Kenya found that donor-backed grants significantly improved project feasibility and reduced installation timelines. The study emphasized that flexible grant conditions were key to sustaining off-grid energy solutions. This Kenya-specific study strengthens the local context and financing mechanism variable. It also ties directly into the off-grid consumption rate and increased energy access components of your dependent variable.

Financing volume and Renewable Energy

The volume of climate-related funds has over various studies been linked to observable increase solar and wind investments particularly when funds were directed toward infrastructural and technological upgrades. Climate financing volume is not just a funding measure but a critical driver of policy-backed energy transition (Acheampong, 2021). This resonates strongly with the current study's independent variable, climate financing volume, and its direct effect on the growth of renewable energy in Kenya. A separate study by Almulhim et al. (2025) sought to introduce a broader perspective on how energy investment is linked by the breadth of available climate finance in the long-term. Mapped across 60 countries, the study confirmed that indeed the volumes of financing positively impacted investment scales of renewable electricity generation. The study further pointed that, especially for middle-income countries, there were minimum level of financial support required to be realised before the said effects really manifest. This insight adds nuance to the present study by indicating that volume matters not only in totality but in sufficiency, a point of interest for exploring financing efficiency in Kenya's energy sector.

Another narrow-focused research on Kenya, sought to examine how internationally derived climate funds on an annual average impact renewable energy growth. The study concluded that financing volume was directly correlated to expansions in green energy sources such as geothermal and solar energy. Additionally, financing volume was associated with ancillary benefits such as employment creation and rural electrification. These findings are highly aligned with the present study, particularly as they validate the effect of climate finance volume on Kenya's installed renewable energy capacity, off-grid consumption, and energy access; the three key constructs under the dependent variable (Ayorinde, 2024).

Financing uptake rate and Renewable Energy

Financing uptake rate, referring to the rate at which climate financing opportunities are absorbed, has emerged as a key determinant of renewable energy expansion; especially in developing countries where access to green capital does not always translate into its effective utilization. Countries with high financing uptake rates experienced more pronounced growth in solar PV and wind installations (Chanyisa, 2021). Corporate bureaucracies in processing and disbursement of climate funds, the unconventional nature of the sector making project bankability a concern as well as lack of environmental readiness in some countries has continued to curtail the impact of available finance pool. These challenges impress on the importance of not only making available a pool of climate finance but also moderating institutional readiness to absorb and utilize the funds effectively (Yusuf et al., 2022). This applies as much for Kenya as is with other developing nations, which has shown strong access possibilities but moderate absorption capacity.

A study in the East African context investigating the determinants of climate finance uptake among renewable energy developers in Kenya and Uganda observed that projects with structured financial planning and government support recorded higher uptake rates and faster execution. This informed the conclusion that the rate of uptake was heavily influenced by existing regulatory environment, technical green-energy capacity, and access

to financial intermediaries (Baimwera and Wangombe, 2017). The findings speak clearly to this study, especially in how the uptake rate of climate financing influences the growth of renewable energy in Kenya. This is most evident in areas like off-grid consumption and access to energy in underserved communities.

The Climate Investment Funds (2018), while equally assessing Kenya's geothermal sector determined that although $250 million was approved for climate finance, only 60% was utilized in the first three years because of delays and limited capacity. The uptake rates however went up once project structures were improved, and teams were better trained leading to a 15% increase in installed geothermal capacity. This analysis supports the study perspective that effective financing is more than just paperwork. It requires prepared institutions and well-structured policies to support the process.

Climate Financing, Green Policy Instruments and Renewable Energy Growth

The effectiveness of climate financing in stimulating renewable energy growth depends not only on the volume and structure of financial inflows but also on the regulatory and fiscal environment within which such financing operates. Green policy instruments—including feed-in tariffs, renewable energy tax incentives, and tradable green certificate frameworks—play a critical role in shaping investment incentives, project bankability, and risk perception within the renewable energy sector (Kiremu et al, 2022).

Empirical evidence suggests that countries with structured renewable energy support mechanisms experience stronger returns from climate finance. Regulatory instruments such as feed-in tariffs and tax incentives reduce investment uncertainty, stabilize revenue expectations, and lower effective capital costs, thereby enhancing the capacity of climate finance to translate into infrastructure deployment (GIZ, 2025). In this context, green policy instruments do not generate renewable energy growth independently; rather, they condition the strength of the relationship between climate financing and renewable energy expansion. Kenya provides a relevant case in this regard. The Energy Act and the Renewable Energy Feed-in Tariff framework have been instrumental in improving investor confidence and mobilizing private sector participation in geothermal, wind, and solar projects (Mabea, 2020). These regulatory mechanisms have strengthened project viability and enhanced the impact of both domestic and international climate finance flows. However, existing studies largely examine regulatory reforms descriptively without formally testing whether such policy instruments moderate the relationship between climate finance inflows and measurable renewable energy growth outcomes.

KIPPRA (2021) further demonstrated that structured regulatory instruments—including the National Climate Change Action Plan and Public–Private Partnerships Act—improved renewable energy funding accessibility and project implementation efficiency. Policy clarity and streamlined approval processes were associated with increased private sector participation and higher investment returns in renewable energy projects. While these findings underscore the importance of regulatory support, they do not empirically evaluate

the conditional interaction between climate finance and policy instruments within a structured econometric framework.

Despite recognition of regulatory support mechanisms in the literature, limited empirical studies have quantitatively modelled green policy instruments as moderating variables influencing the effectiveness of climate financing. Most analyses treat regulation and finance as independent drivers rather than testing their interactive effects. This gap justifies the inclusion of green policy instruments as a moderating construct in the present study, where the impact of climate financing on renewable energy growth is expected to vary depending on the strength and structure of policy support mechanisms.

Climate Financing, RECF and Renewable Energy Growth

The effectiveness of climate financing in driving renewable energy growth depends not merely on the availability of funds, but on the extent to which such financing translates into tangible capital accumulation within the energy sector. Renewable energy capital formation represents the process through which financial inflows are transformed into physical infrastructure, including generation assets, grid expansion, and transmission upgrades.

Zhou and Kimathi (2022), in examining financing interventions and renewable energy project outcomes in East African countries, including Kenya, found that higher financing intensity was significantly associated with improved project completion rates and infrastructure durability. Their findings suggest that the magnitude and structure of financial inflows influence the scale and quality of renewable energy infrastructure deployed. This aligns with the capital formation perspective adopted in the present study, where climate finance is expected to increase renewable infrastructure capital expenditure and grid expansion investment, thereby driving measurable renewable energy growth.

Similarly, Nkoa et al. (2025) analysed the transmission mechanisms through which climate finance supports infrastructure development in Africa. The study reported that climate finance inflows contributed to higher levels of infrastructure investment and improved project delivery outcomes, particularly in countries with structured capital deployment strategies. While the study did not focus exclusively on renewable energy growth indicators, its findings reinforce the importance of capital accumulation as an intermediary mechanism linking climate finance to sectoral development outcomes.

Prince Nartey Menzo (2025) further observed that renewable energy projects supported by structured climate finance instruments demonstrated higher performance when investment was directed toward climate-resilient and technologically robust infrastructure. Projects incorporating durable technologies and long-term infrastructure planning exhibited stronger operational sustainability and scalability. Although framed within sustainability discourse, these findings underscore the role of infrastructure investment quality and capital deepening in determining renewable energy project success.

Despite these contributions, existing studies have not formally modelled renewable energy capital formation as a mediating variable between climate financing and renewable energy

growth. Most empirical analyses examine either financing inflows or project outcomes in isolation, without testing whether capital accumulation mechanisms transmit the effects of climate finance into measurable sector-wide growth indicators such as installed renewable capacity, energy access expansion, and off-grid consumption rates. This gap justifies the inclusion of renewable energy capital formation as a structured mediating construct in the present study.

Summary of Literature Review and Research Gaps

The reviewed literature has played a critical role in identifying the important role of climate finance in promoting growth in renewable energy in Kenya. Green funds, carbon credits, and investments by the private sector have led to Growth in Installed Renewable Energy Capacity, Increased Energy Access and off-grid consumption. Empirical literature indicates that climate change finance is poised to support economic growth in Kenya through investments in agriculture, energy, infrastructure, and capacity-building projects. Bureaucratic inefficiencies and risk perception constitute the hurdles to full realization of benefits in climate finance. Future studies need to investigate new models of financing and policy reform in maximizing climate finance utilization in Kenya's renewable energy market.

Despite the wide range of climate financing and geothermal studies, gaps are still unaddressed. To begin with, there is a limitation of empirical studies that have previously been conducted in the Kenyan perspective. Most of the Research comes from trends on a global level, and there is little empirical data available on climate financing directly affecting Kenya's renewable energy growth. Understandably, renewable energy itself is a new issue. Effectiveness of specific climate finance mechanisms is also a critical challenge. There is a recurring shortage of studies that compare the effects of green bonds, carbon markets, and concessional loans in Kenya. It is a critical flaw in the quest to understand better the operation of financing mechanisms on a nation's growth.

Other gaps include the lack of consideration of the effects of Private Sector Participation in Climate Financing. It resulted in a lukewarm explanation of how private investors and SMEs have positively contributed to sustainable energy financing. Technological Innovations and the Sustainability of Funded Projects in Climate Finance also reflected a persistent lack of explanation of how the various climate financing mechanisms can boost climate finance efficiency.

Table 2.1 Summary of Empirical Literature

Author(s)	Study objectives	Key findings / conclusions	Research gaps	How this study fills the existing study gaps
Acheampong, Adams & Boateng (2019)	Test globalization and renewable energy effects on emissions in SSA	RE associated with emissions mitigation (study-level results); globalization effects vary	finance not modelled; weak mechanism testing	Shift DV to RE growth and model climate finance and moderator/mediator
Ali (2023)	Donor funding effect on implementation of wind projects in Kenya	Donor funding influences implementation effectiveness	Project-level; narrow tech; not sector growth	Sector-level RE growth; decomposed climate finance
Almulhim et al. (2025)	RE and institutional quality effect on consumption-based CO_2	RE and institutions matter for emissions	finance absent; not Kenya-specific	Kenya RE growth DV; climate finance and green policy instruments paths
Amoah et al. (2025)	Climate finance–RE transition nexus in SSA	Evidence supports climate finance–transition linkage	Macro/SSA; weak Kenya specificity; limited mediator/moderator structure	Kenya empirical test; finance disaggregation; moderation/mediation
Baimwera & Wangombe (2017)	Determine uptake drivers of carbon	Uptake shaped by institutional/market constraints	Carbon finance only; not linked to RE growth indicators	Expand to climate finance mechanisms/volume/upt

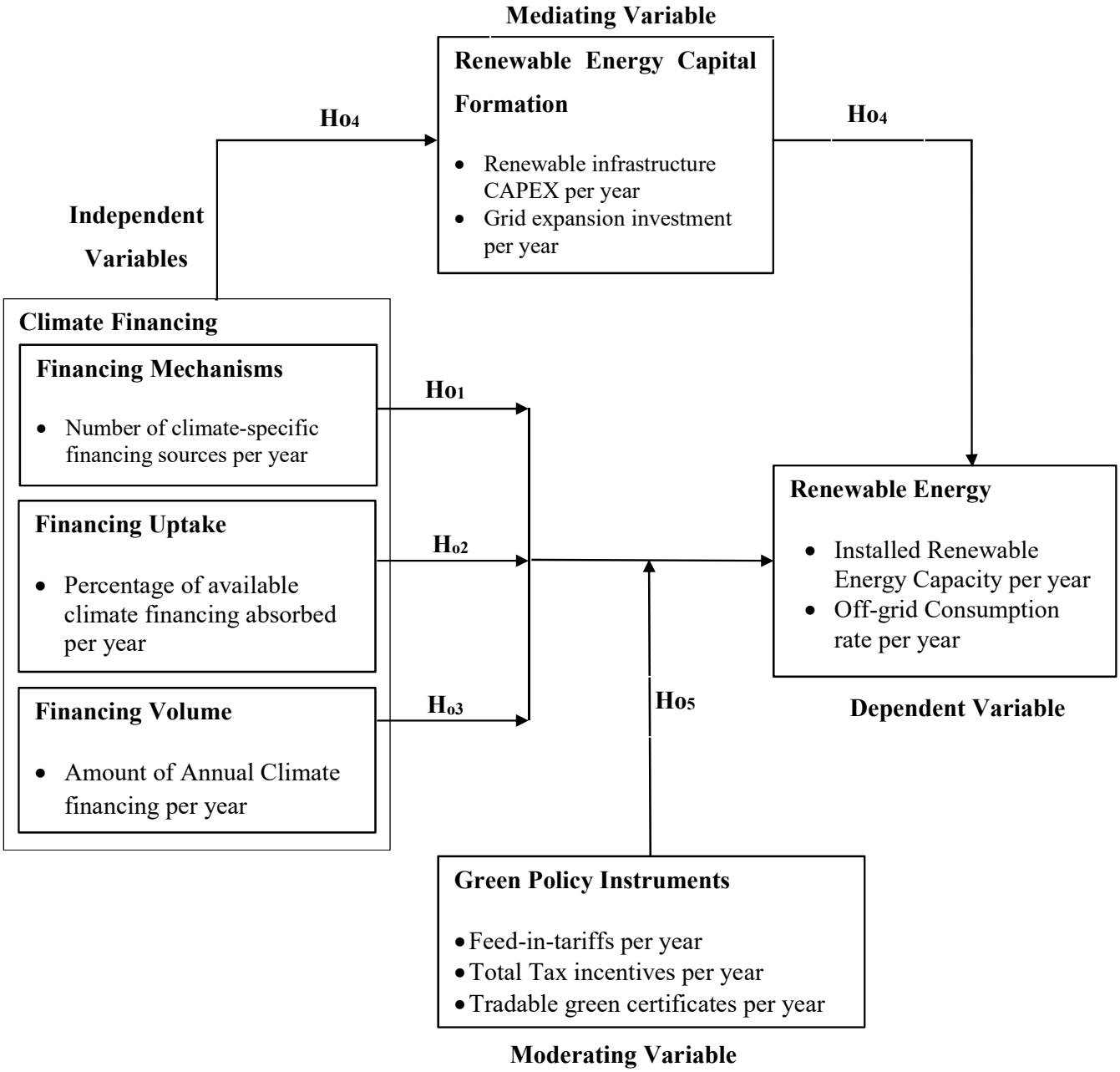
	finance in Kenya RE			ake and RE growth measures
Barngetuny (2024)	Net-zero financing challenges/opportunities in Kenya	Mostly descriptive conclusions about constraints/opportunities	Weak causal link to RE growth	Empirical pathway model with measurable RE growth
Ben Lazreg & Yousfi (2025)	RE, prices, climate policy uncertainty and emissions	Policy uncertainty affects RE/price/emissions dynamics	Context mismatch; emissions DV	Kenya RE growth; regulatory moderation
Chanyisa (2021)	Access to green energy financing in Kenya (case study)	Financing access constraints matter for project implementation	Case-study; limited generalizability; lacks mechanisms	Kenya-wide model with finance disaggregation and moderator/mediator
Dube & Horvey (2023)	Institutional quality and RE capital flows in Africa	Institutions positively affect RE capital flows	Focus on inflows, not RE growth outcomes	Link finance to RE growth outcomes in Kenya
Hellqvist (2021)	Off-grid solar enabling sustainable development (Kenya women)	Off-grid solar supports development outcomes	Micro focus; finance mechanisms not modelled	Not incorporated off-grid consumption as RE growth measure; finance as driver
Kinuthia et al. (2025)	RE consumption/emissions with	Institutional quality moderates energy–emissions dynamics	Emissions DV; finance absent	RE growth DV; climate finance and regulator/resilience

	institutional moderation			
Kiremu et al. (2022)	Climate finance readiness in Kenya (framework review)	Identifies readiness frameworks and gaps	Not causal testing; weak link to RE growth outcomes	Empirical test and regulatory moderation
Li et al. (2022)	Climate-related development finance & emissions/energy structure	Finance affects energy structure/emissions in developing countries	Emissions DV; limited Kenya-specific pathways	Kenya RE growth DV and finance disaggregation
Mabea (2020)	Electricity market coupling & RE investment in EAC	Investment/market structure insights	Regional; not climate finance mechanisms; not RE growth modelling	Kenya-specific finance growth model
Mundonde & Makoni (2025)	Determinants of RE PPP financing (emerging/developing economies)	Institutional quality and macro factors influence PPP financing (short/long run dynamics in their model)	PPP-only lens; outcomes not always growth measures	Limited climate financing scope
Mwangi et al. (2020) water towers	Assess vulnerability of Kenya's water	Uses exposure/sensitivity/ adaptive capacity framing; documents	Not RE-finance specific	Use as climate-risk justification underpinning urgency

	towers to climate change	vulnerability patterns		
Nkoa, Rutazihana & Kelly (2025)	Climate finance & infrastructure development in Africa and transmission mechanisms	Finds climate finance supports infrastructure; effects amplified through human capital/innovation (per article abstract)	Not RE-specific; cross-country	Apply mechanisms to RE; Kenya-specific model with resilience mediation
Otundo Richard (2024) crowdfunding	Crowdfunding as financing mechanism for RE in marginalized Kenya regions	Mixed-method evidence on perceptions/role of crowdfunding	Often limited scale; not linked to sector growth indicators	Integrate alternative mechanisms as part of finance mechanisms construct
Owino & Mwangi (2021) (as listed)	Off-grid solar home systems impact in Kenya	Evidence SHS increases lighting use/LED adoption and reduces kerosene	Micro welfare/energy-use focus, not finance mechanisms	Supports off-grid component of DV
Rasoulinezhad & Taghizadeh-Hesary (2022)	Green finance and energy efficiency/RE	Empirical link between green finance and energy efficiency/RE	Often cross-country; not Kenya-specific	Kenya focus and moderator/mediator model
Starke et al. (2022)	Systematic review: fairness perceptions	Synthesises empirical insights	Not RE/climate finance; but useful for	Use as ethics lens if modelling AI green

	in algorithmic decision-making	and dimensions of perceived algorithmic fairness	algorithmic green policy instruments ethics	policy instruments; not core empirical base

2.1 Conceptual Framework



Source: Researcher (2026)

REFERENCES

Acheampong, A. O., Adams, S., & Boateng, E. (2019). Do Globalization and Renewable Energy Contribute to Carbon Emissions Mitigation in Sub-Saharan Africa? Science of the Total Environment, 677, 436-446. https://doi.org/10.1016/j.scitotenv.2019.04.353

Ali, A. G. (2023). Effect of donor funding on effective implementation of wind power projects in Kenya. *Journal of Entrepreneurship & Project Management, 7*(15), 173–184. https://doi.org/10.53819/81018102t5300

Almulhim, A. A., Inuwa, N., Chaouachi, M., & Samour, A. (2025). Testing the impact of renewable energy and institutional quality on consumption-based CO_2 emissions: Fresh insights from MMQR approach. *Sustainability, 17*(2), 704. https://doi.org/10.3390/su17020704

Amoah, A., Amoah, B., Kwablah, E., & Asiama, R. K. (2025). Renewable energy transition and climate finance nexus in sub-Saharan Africa. *Global Environmental Change Advances, 4*, 100013. https://doi.org/10.1016/j.gecadv.2025.100013

Ayorinde, O. B., Etukudoh, E. A., Sikhakhane Nwokediegwu, Z. Q., Ibekwe, K. I., Umoh, A. A., & Hamdan, A. (2024). Renewable energy projects in Africa: A review of climate finance strategies. *International Journal of Science and Research Archive, 11*(1), 923–932. https://doi.org/10.30574/ijsra.2024.11.1.0170

Baimwera, B., & Wangombe, D. (2017). The determinants of the uptake of carbon finance by renewable energy producers in Kenya. *African Journal of Economic and Sustainable Development, 6*(2/3), 123–139.

Barngetuny, J. (2024). Financing the Transition to Net-Zero in Kenya: Challenges and Opportunities. *International Journal of Education and Management Studies*, *14*(4), 480-488.

Ben Lazreg, M., & Yousfi, M. (2025). Interplay between renewable energy consumption and prices, climate policy uncertainty, and CO_2 emissions: Insights for environmental sustainability. *Renewable Energy, 6*(6). https://doi.org/10.46557/001c.146299

Chanyisa, K. S. (2021). *Access to Green Energy Financing in Kenya: Case Study of Private Energy Projects* (Doctoral dissertation, University of Nairobi).

Climate Investment Funds. (2018). *Geothermal energy powering Kenya's future: Menengai geothermal field development facilitated by public-private partnership*. Climate Investment Funds. https://www.cif.org/sites/cif_enc/files/knowledge-documents/cif_case_study_kenya_revised.pd

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. (2025). *Public–private dialogue regulatory guide for energy efficiency in Kenya* [PDF]. GIZ. https://www.giz.de/en/downloads/giz2025-en-ke-pdp-regulatory-guide-energy-efficiencybf.pdf

Dube, A., & Horvey, S. S. (2023). Institutional quality and renewable energy capital flows in Africa. *Future Business Journal*, *9*(1), 55.

Green Climate Fund. (2020). Annual report 2020. Green Climate Fund. https://www.greenclimate.fund/documents

Gupta, A., & Gupta, N. (2022). *Research methodology*. SBPD publications.

Gyamfi, S., Derkyi, N. S., Asuamah, E. Y., & Aduako, I. J. (2018). Renewable energy and sustainable development. In *Sustainable Hydropower in West Africa* (pp. 75-94). Academic Press.

Hellqvist, L. (2021). Feasibility of off-grid solar energy enabling sustainable development of women in rural Kenya. *Journal of International Women's Studies, 22*(3), 51–59. https://vc.bridgew.edu/jiws/vol22/iss3/6

International Monetary Fund (IMF). (2019). World Economic Outlook: Growth and climate change. International Monetary Fund. https://www.imf.org/en/Publications/WEO

International Renewable Energy Agency. (2021). *Renewable capacity statistics 2021*. IRENA. https://www.irena.org/publications/2021/March/Renewable-Capacity-Statistics-2021

Kenya National Bureau of Statistics (KNBS). (2020). Economic survey 2020. Government of Kenya. https://www.knbs.or.ke

Khatri, K. K. (2020). Research paradigm: A philosophy of educational research. *International Journal of English Literature and Social Sciences*, *5*(5), 1435-1440.

Kibet, G. K. (2024). "ADOPTION OF GREEN ENERGY AND TESTING THE PRESENCE OF ENVIRONMENTAL KUZNETS CURVE IN KENYA (Doctoral dissertation, Kenyatta University).

Kinuthia, P. M., Kemboi, I. K., Onyango, J., & Adaramola, M. S. (2025). *Renewable energy consumption and carbon emissions in Sub-Saharan Africa: The moderating role of institutional quality*. International Journal of Research and Innovation in Social Science, 4257–4270. https://doi.org/10.47772/IJRISS.2025.905000324

KIPPRA. (2021). *Policy brief on renewable energy regulatory instruments and investment performance in Kenya*. Kenya Institute for Public Policy Research and Analysis.

Kiremu, M., Scrimgeour, F., Mutegi, J., & Mumo, R. (2022). Climate finance readiness: A review of institutional frameworks and policies in Kenya. Sustainable Environment, 8(1), 2022569.

Kiremu, M., Scrimgeour, F., Mutegi, J., & Mumo, R. (2022). Climate finance readiness: A review of institutional frameworks and policies in Kenya. *Sustainable Environment*, *8*(1), 2022569.

Li, N., Shi, B., Wu, L., Kang, R., & Gao, Q. (2022). Climate-related development finance, energy structure transformation and carbon emissions reduction: an analysis from the perspective of developing countries. *Frontiers in Environmental Science*, *9*, 778254.

Lim, W. M., Kumar, S., & Ali, F. (2022). Advancing knowledge through literature reviews: 'what', 'why', and 'how to contribute'. *The Service Industries Journal*, *42*(7-8), 481-513.

Lutta, A., Kehbila, A., Kisang, O., Osano, P., & Macharia, P. (2025). Climate finance landscape in arid and semi-arid counties of Kenya. Stockholm Environment Institute (SEI) Report.

Mabea, G. A. (2020). Electricity market coupling and investment in renewable energy: East Africa Community power markets. *International Journal of Sustainable Energy*, *39*(4), 321-334.

Meattle, C., Padmanabhi, R., Fernandes, P., Balm, A., Wakaba, E., Chiriac, D., & Tonkonogy, B. (2022). *Landscape of climate finance in Africa* (FSD Africa / Climate Policy Initiative report). FSD Africa. https://fsdafrica.org/wp-content/uploads/2025/05/1.-Landscape-of-Climate-Finance-in-Africa-l-Full-report.pdf

Ministry of Environment and Forestry. (2018). *National Climate Change Action Plan (Kenya) 2018–2022*. Government of Kenya.

Mundonde, J., & Makoni, P. L. (2025). Bridging the green infrastructure gap: Determinants of renewable energy PPP financing in emerging and developing economies. *Sustainability, 17*(20), 9072. https://doi.org/10.3390/su17209072

Mungai, E. M., Ndiritu, S. W., & Da Silva, I. (2022). Unlocking climate finance potential and policy barriers—A case of renewable energy and energy efficiency in Sub-Saharan Africa. *Resources, Environment and Sustainability*, *7*, 100043.

Mwangi, K. K., Musili, A. M., Otieno, V. A., & Endris, H. S. (2020). Vulnerability of Kenya's water towers to future climate change: An assessment to inform decision making in watershed management. *American Journal of Climate Change, 9*, 317–353. https://doi.org/10.4236/ajcc.2020.93020

Nkoa, B. E. O., Rutazihana, P. N., & Kelly, A. M. (2025). Climate finance and infrastructure development in Africa: Direct effects and transmission mechanisms. *Development and Sustainability in Economics and Finance, 8*, 100096. https://doi.org/10.1016/j.dsef.2025.100096

Omala, M. A., Kioko, E., & Gravesen, M. (2024). Effective climate finance coordination? Stakeholder perceptions, climate change policy implementation and the underlying political economy factors in Kenya. Climate Policy, 24(7), 863-877.

Otundo Richard, M. (2024). Exploring crowdfunding as a financial mechanism for sustainable renewable energy projects in marginalized regions of Kenya: a systematic review. *Exploring Crowdfunding as a Financial Mechanism for Sustainable Renewable Energy Projects in Marginalized Regions of Kenya: A Systematic Review*.

Otundo Richard, M. (2024). Promoting Sustainable Growth: The Role of Natural Resource Utilization, Green Investment, Digital Finance, Industrial Usage, Energy Efficiency, and Renewable Energy Consumption in Kenya, Rwanda and Uganda. *Green Investment, Digital Finance, Industrial Usage, Energy Efficiency, and Renewable Energy Consumption in Kenya, Rwanda and Uganda. (November 10, 2024)*.

Owino, J., & Mwangi, P. (2021). The impact of off-grid solar home systems in Kenya on energy consumption and expenditures. *ResearchGate*. https://www.researchgate.net/publication/351494444_The_impact_of_off-grid_solar_home_systems_in_Kenya_on_energy_consumption_and_expenditures

Post, C., Sarala, R., Gatrell, C., & Prescott, J. E. (2020). Advancing theory with review articles. *Journal of Management Studies*, *57*(2), 351-376.

Prince Nartey Menzo, B., Asuamah Yeboah, S., & Prempeh, K. B. (2025). *Innovative climate finance in Ghana: A systematic review of green bonds, blended finance, and climate funds* (MPRA Paper No. 124517). Munich Personal RePEc Archive. https://mpra.ub.uni-muenchen.de/124517/1/MPRA_paper_124517.pdf

Rasoulinezhad, E., & Taghizadeh-Hesary, F. (2022). Role of green finance in improving energy efficiency and renewable energy development. *Energy efficiency*, *15*(2), 14.

Starke, C., Baleis, J., Keller, B., & Marcinkowski, F. (2022). Fairness perceptions of algorithmic decision-making: A systematic review of the empirical literature. *Big Data & Society*, *9*(2), 20539517221115189.

Taherdoost, H. (2022). What are different research approaches? Comprehensive review of qualitative, quantitative, and mixed method research, their applications, types, and limitations. *Journal of Management Science & Engineering Research*, *5*(1), 53-63.

Tamminen, K. A., & Poucher, Z. A. (2020). Research philosophies. In *The Routledge international encyclopedia of sport and exercise psychology* (pp. 535-549). Routledge.

UNFCCC. (2020). Report on financing for climate action: Global trends and implications for Kenya. United Nations Framework Convention on Climate Change. https://unfccc.int

Wainaina, K. S., Aluoch, M. O., & Kimutai, C. (2025). Carbon Financing and Profitability of Renewable Energy Firms Registered Under the Energy and Petroleum Regulatory Authority, Kenya. International Academic Journal of Economics and Finance (IAJEF)| ISSN 2518-2366, 4(4), 490-509.

World Bank. (2019). World Development Report 2019: The changing nature of work. World Bank Group. https://www.worldbank.org

World Bank. (2021). Kenya climate financing report. World Bank Group. https://www.worldbank.org/en/country/kenya

Yusuf, T., Olanrewaju, F., & Adepoju, A. (2022). Financing uptake and renewable energy growth: Evidence from sub-Saharan Africa. *Energy Policy*, 162, 112789. https://doi.org/10.1016/j.enpol.2022.112789

Zhang, L., Saydaliev, H. B., & Ma, X. (2022). Does green finance investment and technological innovation improve renewable energy efficiency and sustainable development goals. *Renewable Energy*, *193*, 991-1000.

Zhang, Y. (2022). How economic performance of OECD economies influences through green finance and renewable energy investment resources? *Resources Policy, 79*(1), 102925. https://doi.org/10.1016/j.resourpol.2022.102925

Zhou, J., & Li, X. (2022). Role of green finance in improving energy efficiency and renewable energy development. Energy Efficiency, 15(3), 45–61.

Zhou, Y., & Kimathi, A. (2022). Linking capital formation to climate financing outcomes in East Africa's off-grid renewable sector. *East African Journal of Energy Policy*, 8(1), 78–91.