UNIVERSITY OF GOTHENBURG
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Sustainable Development Finance in Practice: An Analysis of Swedfund's Renewable Energy Investment Patterns Across African Markets

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Bachelor Thesis Authors
Lise Vanem
Rakel Jonasson
Wilma Blixt

Supervisor
Konstantina Katsela

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Abstract

This thesis examines the country-level characteristics associated with Swedfund's renewable energy investments across Africa between 2019 and 2023. Building on theories of imperfect capital markets, institutional quality, and development finance, the study analyses Swedfund's geographic investment allocation. The analysis further examines whether there are patterns within this geographic allocation and if these reflect development objectives, financial viability, or a balance between the two. Using panel regression analysis, the study investigates Swedfund's investments within the "Energy and Climate" sector, in relation to s*trength of minority investor protection, readiness, vulnerability, GDP per capita, renewable energy share, FDI inflows,* and *inflation*. The findings suggest that stronger institutional and governance conditions, particularly *strength of investor protection*, are positively associated with investment activity. This highlights the importance of governance quality and implementation capacity for investment feasibility. At the same time, Swedfund appears willing to operate in economically volatile and underserved markets characterised by lower *FDI inflows* and higher *inflation*. However, *vulnerability* and *GDP per capita* alone do not appear decisive in explaining geographic investment allocation. Overall, the results suggest that Swedfund balances development objectives with financial sustainability and operational feasibility. Given the importance of renewable energy for achieving the sustainable development goals and the 2030 Agenda, the study contributes to the growing literature on development finance institutions, renewable energy and geographic investment allocation in developing economies.

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List of Abbreviations

DFI *Development Finance Institution*s
FDI *Foreign direct investment*
GDP *Gross domestic product*
HDI *Human Development Index*
RES *Renewable Energy Share*
SDGs *Sustainable Development Goals*
SMI *Strength of Minority Investor Protection Index*

1. Introduction

This chapter introduces the broader context surrounding sustainable development finance, renewable energy investments, and the role of Development Finance Institutions in imperfect markets. It further presents the problem discussion, the research purpose and research questions, as well as the study's delimitations and contributions to existing literature.

1.1 Background

The 2030 Agenda, adopted by the United Nations (UN) in 2015, is a global framework comprising 17 sustainable development goals (SDGs), addressing challenges such as poverty, inequality, and environmental sustainability (United Nations, n.d.-a). In the same year, the Paris Agreement was adopted as an international treaty focused on combating climate change through limiting the rise in global temperatures (United Nations, n.d.-b). Climate change is increasingly undermining sustainable development and risks pushing 132 million people into extreme poverty (Swedfund, 2025). Thus, to reach the 17 SDGs there is still a substantial need for changes in global economic structures and investments in renewable energy. However, a substantial gap in the ability to finance the transition to renewable energy, particularly in developing countries, remains (Kapoor, 2019).

According to British International Investment (n.d.), no country in history has overcome poverty without private investment. Under ideal market conditions, capital would be efficiently allocated through supply and demand mechanisms, making public intervention unnecessary. However, such conditions rarely exist in high-risk or low-income markets, where information asymmetries, institutional weaknesses and perceived risk prevent investments (Kapoor, 2019). The lack of ideal market conditions reveals the pressing need for external financing through aid and foreign direct investments (FDIs). Yet, data on bilateral official development assistance from the Organisation for Economic Co-operation and Development (OECD, n.d.-a) showcase a 26,4% decrease in aid 2025. The tightening fiscal constraints in donor countries (United Nations, 2026) and market imperfections highlight an increasing need for development finance institutions (DFIs) to help address the growing financing gap.

With sustainability as a priority, DFIs adopt a business model that combines commercial and development objectives. By offering risk capital to development projects and investing in the global south, the investments are expected to generate financial returns while also contributing to development progress (Sundberg, 2023). European governments have supported a substantial expansion of DFIs, mainly to promote employment, economic growth, and private sector development (European Development Finance Institutions, n.d.).

In a study conducted by Khan and Su (2022), Sweden is identified as one of the most innovative countries with economic strength, while also being a leader within the renewable energy transition. Having achieved a leading position within the EU, Sweden's total energy consumption consists of over 60% renewables, prioritizing investments in green lithium batteries and fossil-free steel (Khan & Su, 2022).

Sweden's DFI, Swedfund, aims to reduce poverty, promote sustainable development, and mobilize further investments through its growing portfolio (Swedfund, n.d.-a). Grounded in the UN SDGs, Swedfund's energy and climate sector exclusively invests in renewable energy and climate-related projects that support the green transition (Swedfund, n.d.-b). Through retained earnings and state funding, Swedfund seeks to generate both development impact and financial sustainability in vulnerable yet promising markets. Central to this mission is the concept of additionality, where investments are intended to mobilize capital and provide support that private markets would otherwise be unwilling or unable to provide (Andersen et al., 2021; Swedfund, n.d.-a).

Many of the countries where Swedfund operates, experience a shortage of private sector capital. The limited access to international private capital further highlights the importance of DFIs in mobilizing investments in underserved markets to promote economic development (Swedfund, 2025). This imbalance is particularly visible in Africa, which in 2019 accounted for approximately 16 percent of the global population but received only 3 percent of global FDI inflows (British International Investment, n.d.)

Among the millions of people at risk of falling into extreme poverty, developing countries in Sub-Saharan Africa are most affected, despite their very low share of total global emissions (Swedfund, 2025). Given Africa's vulnerability to climate change, a large share of Swedfund's investments is directed toward the African continent. Approximately 46% of its total revenue during the fiscal year 2025, originates from this region according to Swedfund (2025). Recent climate data further emphasize the severity of Africa's vulnerability. In 2024, the average surface temperature across the continent was approximately 0.86°C above the 1991-2020 long term average, with North Africa experiencing the most pronounced increase at 1.28°C (World Meteorological Organization, 2025). Extreme heat events affected large parts of the continent throughout the year, disrupting agriculture, labour productivity and education. Furthermore, increased sea surface temperatures disrupt marine ecosystems and can intensify tropical storms (World Meteorological Organization, 2025). Meanwhile, it is projected that the continent's energy demand is going to triple by 2050, placing additional pressure on already fragile and insufficient systems. Addressing these challenges requires investments that both reduce emissions and strengthen long-term resilience (Swedfund, 2025).

The COVID-19 pandemic shifted development priorities toward healthcare systems, crisis management, and economic recovery, potentially influencing geographic investment allocation and sustainable financing during the period examined in this study (United Nations, 2020). The pandemic also intensified existing financing challenges by disrupting

global capital flows, increasing economic uncertainty, and reducing cross-border investment activity (Swedfund, 2020). African economies were particularly affected by the declining foreign investments, complicating the financing of long-term infrastructure and renewable energy projects (United Nations, 2020).

1.2 Problem discussion

While the need for increased investments in developing countries is widely recognized, the actual factors behind the allocation of these funds remains unclear. Existing research has mainly focused on the power of policy making. Polzin et al. (2019) emphasise that from an investor perspective, mobilizing private capital for renewable energy, depends on policy design that simultaneously addresses risk and expected returns. Yet, how investment decisions are made within DFIs at the operational level has received less attention, particularly how multiple criteria are balanced in the allocation of funds across regions.

A significant challenge in analysing DFI behaviour lies in the conceptual distinction between *developing countries* and *high-risk markets*. While developing countries are commonly defined through socio-economic indicators such as income levels and institutional development, no universally agreed definitions exist. Within international organizations, the development status is often self-declared, which results in substantial variation in economic conditions across countries classified within the same category (World Trade Organization, n.d.). In contrast, high-risk markets are characterized by barriers to capital, including political instability, macroeconomic volatility, currency fluctuations, and limited access to reliable information (Galizia & Lund, 2024). If investments are primarily directed toward relatively stable developing countries, DFIs may meet their development objectives but fail to address the most severe market failures.

Further, DFI investments involve cross-border transactions, which entails the use of several currencies, resulting in *currency risk* (Lumenalta, 2025). Macroeconomic instability tends to be present in African markets due to political volatilities, which can amplify currency fluctuations and reduce attractiveness to investors (Invest Africa, n.d.). A World Bank study examining 80 countries during the span of 25 years found a significant negative relationship between exchange rate volatility and FDI inflows. This is applicable to South Africa, where a survey in the study revealed fluctuations as a major concern for present investors (Hanusch et al., 2018). To reduce these risks and improve predictability in long-term financing of large-scale renewable energy projects (Horrocks et al., 2025), Swedfund primarily denominates investments in USD and EUR (Swedfund, 2025). Still, portfolio companies are often exposed to local currencies where they operate, affecting Swedfund's credit and equity risk exposure (Swedfund, 2025).

The lifespan of a project is partly dependent on the level of credit risk, which is often more prominent in riskier markets (Randall & Knowles, 2023). This raises questions about how DFIs balance financial viability and development impact, resulting in a *conflict of interest*. To balance development impact and financial viability, Swedfund adopts a portfolio approach

(Swedfund, n.d-a); meaning that their overall portfolio is intended to include investments with both higher and lower credit risk and development impact (Randall & Knowles, 2023). Through this, Swedfund may incentivize investments toward relatively safer markets to ensure their own institutional survival, since investors generally favor projects with lower uncertainty and higher likelihood of success (Catalogue of Bias Collaboration et al., 2017).

Tracy and Scott (2024) identify *greenwashing* as a major obstacle in achieving the UN SDGs, noting that a large portion of corporate engagement is superficial and focused on reputational gains rather than real impact. Sustainable investments often involve higher costs, longer time horizons, and greater uncertainty, which often conflict with financial return requirements (Ngomsik & Vermeesch, 2024). Major financial institutions issue "green investment" opportunities while still lending enormous sums to industries that contribute the most to global warming (Robinson, 2022). Although Swedfund measures and reports climate impacts within its portfolio companies (Swedfund, 2025), previous research highlights the difficulty of evaluating sustainability outcomes across the full investment lifecycle. This is due to limited information regarding conditions at the time investments were initiated (Spratt et al., 2018), exposing Swedfund to criticism of potential greenwashing.

Overall, the problem discussion highlights the risks faced by a relatively small DFI such as Swedfund (Spratt et al., 2018). From a corporate finance perspective, investment decisions are typically based on risk and return (Berk & DeMarzo, 2024), which may not fully align with the broader development objectives of DFIs and SDGs. Swedfund's limited size constrains its ability to diversify risk. At the same time, difficulties in measuring long-term impact and additionality complicate evaluations of its effectiveness (Spratt et al., 2018). Although Swedfund follows a general criteria-based investment process, investment decisions remain multidimensional and are assessed individually (Swedfund, 2025). Therefore, an examination of whether Swedfund operates in line with its mission becomes highly relevant.

1.3 Purpose

The purpose of the thesis is to examine the renewable energy investments of Swedfund across the African continent. By analysing country-level indicators of development needs, financial constraints, and investment risk, this study seeks to assess whether Swedfund's renewable energy investments are directed towards countries consistent with theoretical expectations from corporate finance and development finance literature, as well as with Swedfund's stated mission.

> RQ: Which country-level characteristics are associated with Swedfund's number of renewable energy investments across African countries, and to what extent do they align with the theoretical role of DFIs?

Supported by the sub questions:

i. Are countries with greater development needs more likely to receive Swedfund's investments?

ii. Are countries with stronger financial, institutional, or lower-risk conditions more likely to receive Swedfund's investments?

These questions are examined through two hypotheses that distinguish between investment driven by institutional quality and a trade-off between development need and investment feasibility.

1.4 Delimitations

The study acknowledges several delimitations related to the geographical scope, time frame, data selection and analytical focus of the research.

The thesis focuses on Swedfund's investments rather than project-level initiatives. Although Swedfund also engages in project development through feasibility studies, investments constitute its primary financial tool for promoting sustainable development (Swedfund, n.d.-a). Consequently, the study is limited to analysing geographic patterns within Swedfund's sustainability-oriented *investment portfolio*.

Furthermore, the study adopts a panel-data approach focusing on Swedfund's active investments entered during 2019–2023, excluding historical investments and potential variations in investment strategy over time. Hence, the analysis does not account for demographic, institutional, or economic changes that occur during the lifespan of Swedfund's investments and how impact accumulates.

Swedfund invests across several sectors, including financial inclusion and food systems. However, this thesis is limited to investments within the energy and climate sector, excluding other sectors from the analysis. This delimitation is made in order to focus specifically on investments that are explicitly sustainability-oriented through their connection to SDG 13; Climate Action, as outlined in Swedfund's investment framework (Swedfund, n.d.-b). Like Swedfund's other sectors, the energy and climate sector cover the SDGs of No Poverty, Reduced Inequalities, and Gender Equality while *also* including goal 13 (Swedfund, n.d.-b).

The geographical scope of the study is limited to African countries. The focus on Africa is motivated by the continent's high exposure to climate vulnerability (World Meteorological Organization, 2024), large financing gaps and increasing need for sustainable energy investments (Swedfund, 2025). As a result, the analysis excludes other regions where Swedfund is also active, namely Ukraine, Latin America and Asia.

Lastly, since the focus is on pattern-identification, the study does not directly measure financial, value or development additionality, nor does it establish causal relationships.

1.5 Contributions

While much of the existing literature on DFIs discusses the role of financial instruments, policy making, and impacts of DFIs, this is often done through comparing financial performance (Léon, 2025; Polzin et al., 2019). However, DFIs are not only profit oriented investors (Sundberg, 2023), adding a layer of complexity. Léon (2025) suggests that the literature on DFI performance is generally limited and typically focuses on their ability to mobilize private capital. Therefore, less attention has been given to the investment decisions and risk preference of individual DFIs. Additionally, further analysis is encouraged to focus on low-income countries, moving away from the current focus on emerging markets in Eastern- and Central Europe, Turkey, China and Brazil.

This gap is particularly evident within the renewable energy financing literature. Previous studies have mainly focused on financing barriers, investment mobilization, and project-level outcomes in developing countries (Probst et al., 2021). More recent research, however, increasingly emphasizes the broader importance of green finance in supporting renewable energy development. Muhmad et al. (2024) demonstrate a growing global academic interest in green finance and confirm its positive relationship with renewable energy expansion.

In response to this gap and growing interest, the study contributes to the literature by examining how Swedfund, as a single, state-owned DFI, allocates renewable energy investments across African countries with varying institutional and economic conditions.

The analysis applies perspectives from corporate finance theory to the context of development finance and imperfect capital markets. Since corporate finance literature has traditionally focused on firms in the US and other developed economies (Ayyagari et al., 2013), the study contributes by extending the perspectives on investment behaviour in developing markets.

1.6 Thesis Structure

The thesis is structured as follows: Chapter 2 establishes the theoretical framework and develops the hypotheses. This guides the empirical analysis by linking corporate finance theory, institutional conditions, and development finance perspectives. Chapter 3 explains the research design, data selection, variables, and econometric methodology used to examine the relationship between country-level characteristics and Swedfund's geographic investment patterns. Chapter 4 presents the empirical findings of the analysis, while Chapter 5 analyses these findings in relation to the theoretical framework and previous literature. Finally, Chapter 6 discusses and highlights the broader implications of the results for DFIs, sustainable finance, and geographic investment allocation in developing markets, before concluding the study.

2. Theoretical Framework

In this chapter, key concepts and perspectives from corporate finance and development finance literature are presented in order to establish the theoretical foundation of the study. Particular attention is given to market imperfections, institutional conditions and sustainability considerations influencing development finance investment decisions.

2.1 Perfect Capital Markets

Understanding firm financing behaviour begins with the concept of perfect capital markets and extends to more realistic environment characteristics by market imperfections (Berk & DeMarzo, 2024).

Modigliani and Miller (1958) established the foundation of modern corporate finance theory by arguing that, under perfect capital markets the capital structure of a firm does not affect its overall value. Under these assumptions, the total value of a firm is determined solely by cash flows generated by its assets and not by how these assets are financed (Berk & DeMarzo, 2024).

$$(1)\ V_L = V_U$$

In this setting, increased leverage, represented by a higher debt-to-equity ratio (D/E), raises the return on equity (r_E) relative to the return of an unlevered firm (r_U). This is due to the higher financial risk that shareholders have to bear. As firms rely more on debt financing, carrying a cost of debt (r_D), equity holders require a higher expected return to compensate for the increased probability of default. Despite the increase in the cost of equity, the firm's overall weighted average cost of capital remains unchanged under the Modigliani-Miller assumptions (Berk & DeMarzo, 2024).

$$(2)\ r_E = r_u + (D/E)(r_u - r_D)$$

However, these conditions rarely hold in reality. When imperfections are introduced, capital structure decisions become useful in addressing financial frictions (Berk & DeMarzo, 2024). The shift from the idealized Modigliani and Miller world to one with imperfections provides the theoretical basis for understanding financing constraints in developing economies.

2.2 Imperfect capital markets

2.2.1 Information asymmetry

The real world imperfections are particularly pronounced in developing countries, where institutional quality is often weaker, leading to greater financial risk. A critical element of corporate governance in any country is the quality of information and its availability to both regulators and investors (Ayyagari et al., 2013).

"The Market for Lemons", conducted by Akerlof¨s (1970), described as "the most important study in the literature on economics of information", explores the mechanisms of *information asymmetry* (The Nobel Prize, 2001). Information asymmetry is a central market imperfection where one party in a transaction possesses more information than the other. This can occur ex ante, before a contract is signed, resulting in *adverse selection* (Akerlof, 1970). Akerlof (1970) further explains how adverse selection makes it difficult for investors to distinguish between good and bad investment opportunities, causing high-quality investments to be driven out of the market. As a result, overall investment decreases, particularly in developing countries where weak institutions and limited transparency inflate informational asymmetries.

Investors who possess less information demand higher returns to compensate for risk (Merton, 1987; Barry & Brown, 1985). Consequently, many DFIs position themselves somewhere between *profitable projects* that the private sector would be able to finance, and *higher-risk projects* that struggle to attract funding. Since DFIs have more information about the local conditions, they end up experiencing less actual risks than those initially perceived by private investors. To mitigate risk and share information further, different DFIs benefit from collaborative mechanisms and joint operations within the same countries (Kapoor, 2019). *The peer emulation theory* links collaboration strategies to sustainable finance. It suggests that economic agents act similarly as other peers in adopting sustainable measures such as social, economic, and political ideals. In the pursuit of sustainable finance goals, the behaviour of agents easily influencing each other reflects a lack of a uniform standard. Common approaches facilitate quicker, easier, and more cost-effective adoption while also promoting improvements of the existing policies, making them appealing for others (Peterson, 2023). To exemplify, ARISE, a joint equity funded venture between Norfund (Norway's DFI), FMO (the Dutch development bank) and Rabobank, benefits from shared cross-border learning and portfolio diversification in African financial institutions (Kapoor, 2019). Literature therefore suggests that major DFIs could easily take on more risk and focus on the places where it would make the most difference (Forster & Charnoz, 2023)

Given the role of DFIs, it becomes relevant to analyse whether Swedfund primarily operates in countries where *FDI inflows* are generally more dominant, reflecting a mechanism of the peer emulation theory. FDI inflows include equity capital, reinvested earnings, and other assets associated with cross-border investments, and are commonly used as an indicator of a country's attractiveness to international investors (OECD, n.d.-b). Bato and Duhan (2025) studied the impact of various economic factors on poverty in African countries using variables such as FDI inflow. Therefore, the inclusion of this variable in the study becomes relevant for examining whether Swedfund's investment behaviour is associated with mechanisms related to information asymmetry in international markets.

Information asymmetry can also occur ex post, resulting in *moral hazard* (Mohn, 2025). Moral hazard is the idea that individuals will change their behaviour if they are not fully responsible for the consequences. This is evident in credit markets, as borrowers often possess more information than the lenders. After lending is granted, both parties share the

risk burden through the contract. This may lead to borrowers taking on excessive risk, since the upside becomes substantial, while the downside is limited (Berk & DeMarzo, 2024). Stiglitz and Weiss (1981) explain how this results in lenders choosing to ration credit in higher risk markets. Ayyagari et al. (2013) emphasize that access to financing in developing countries often depends on firm size, with small and medium-sized enterprises facing significantly greater financial constraints than larger firms. This despite the fact that small firms are major contributors to employment within these countries. This highlights the importance of DFIs as providers of external financing, especially for the smaller firms. In mitigating the financing gap and making information more accessible, Swedfund aims to act as a catalyst, creating new commercial markets and leverage additional investors (Bery et al., 2025; British International Investment, n.d.; Swedfund, n.d.-a).

The *positive signaling theory* explains the importance of information disclosure in reducing information asymmetry between firms and investors. Economic agents are incentivized to communicate their commitment to sustainable finance goals in order to signal credibility and attract external support. However, this disclosure does not necessarily translate into concrete actions. Furthermore, excessively sharing favorable sustainability information may serve as a strategy for firms to redirect attention from negative aspects of their operations (Peterson, 2023). In the research paper *DFIs: New directions for the future,* Forster and Charnoz (2023) discuss the problem of inflexible measurements of impact assessments. When DFIs claim that their project or investment is green or contributes to the SDGs, it is difficult to find the right partners, potentially limiting the possibilities for DFIs to attract new markets and investors. If the sustainability criteria are too strict, partners will not be able to qualify, and if the conditions are too broad, it might result in *greenwashing*.

2.2.2 Institutional Theory

Firm *ownership structure* in the least developed countries mostly consists of wealthy families or the state, whereas in more developed countries they are often widely held (Ayyagari et al., 2013). Corporate finance theory commonly describes a firm as a *nexus of contracts* between all actors, including creditors and investors. Therefore the degree of which the contractual agreement can be enforced is essential for the existence of the firm (LawTeacher, 2018). Empirical evidence shows that countries with stronger legal enforcement, higher quality of accounting standards and better *protection of investor rights,* tend to exhibit more developed financial systems and improved enforcement of contracts (La porta et al., 1998). Hence, the reason behind the different ownership structures can be found in the lack of policies and institutions that protect shareholders property rights, allowing the expropriation of *minority shareholders* (Ayyagari et al., 2013).

Johnson et al. (2002) argue that the quality of institutions is shaped by colonial roots, where some legal systems were originally designed to solely extract resources rather than protect property rights. As a result, countries with similar legal origins may exhibit substantial differences in actual institutional effectiveness. Correspondingly, Avom et al. (2024) examine how historical colonial conditions have shaped the development of financial markets in

African countries. In countries with high settler mortality, institutions are associated with weaker financial market development, as colonial powers established extractive systems characterised by wealth extraction, land appropriation, and weak protection of property rights. In countries with higher settler presence, institutions tend to support stronger financial market growth, reflecting a framework that provides greater protection of investors. Countries in West, South, and partly East Africa generally exhibit stronger performance in governance indicators such as rule of law and government effectiveness. These are closely linked to investor protection. In contrast, fewer countries in North and Central Africa demonstrate strong institutional performance, although exceptions such as Tunisia and Morocco can be observed (Avom et al., 2024). Taken together, these findings suggest that institutional quality alone is insufficient to explain financial development. Its impact should be discussed within a broader historical context.

Moreover, strong institutions, governance, and support systems, captured through a country's *readiness*, is necessary to translate investments into actual development outcomes (Amegavi, et al., 2021). In countries with weak institutions and insecure property rights investors' willingness to engage in economic activity may be reduced (Ayyagari et al., 2013). Therefore, financial institutions become increasingly important for supporting firm growth and economic development in such environments (Johnson et al., 2002).

2.3 Mechanisms: Investment risks and Financial conditions

Financial crises are a recurring feature of developing economies and tend to be particularly severe due to the structural weaknesses in financial systems. Aside from adverse selection and moral hazard, macroeconomic shocks such as *currency devaluation* and *inflation* can further weaken the financial systems (Mishkin, 1996).

Currency devaluation refers to a decrease in the value of a country’s currency relative to others, meaning that it can buy less foreign currency than before (Cooper, 1971). Over the years 1976-2001, developing country currencies lost on average 72% of their value relative to the U.S dollar (Gray & Irwin, 2003). Inflation refers to a general increase in the prices of goods and services within a country over time, which reduces purchasing power (World Bank, n.d.-a). The two conceptual risks are interconnected as a devalued currency often makes imports more expensive, which can contribute to inflation. Likewise, high inflation can weaken confidence in a currency and lead to depreciation or devaluation (World Bank, 2018). De Saituma Cagiza and Cagiza (2025) incorporate inflation as a variable that reflects conditions shaping the investment climate. From a perspective on macroeconomic stability, high inflation is commonly associated with uncertainty and rising costs that may discourage FDI inflows, while moderate inflation is often linked to stronger economic growth.

2.4 Instrument choice: Pecking Order Theory

In countries with weak legal institutions, financial systems are often underdeveloped (Beck et al., 2008). In imperfect capital markets firms cannot always choose between funding due to limited access to borrowing (Stiglitz & Weiss, 1981).

According to the *pecking order theory* by Myers and Majluf (1984), managers follow a hierarchy when considering sources of financing. The theory is closely intertwined with the concept of asymmetric information, and is perceived as a core decider of a firm's financing. In practice, financial managers prefer to rely on internal funds rather than debt and equity, where debt is preferred over equity since it offers lower information costs.

In this context, evaluating Swedfund's choice of funding when entering an investment can reveal valuable insights into the presence of information asymmetry and financial conditions for local firms trying to operate in the country. Swedfund mainly uses equity and debt in their investments (Swedfund, n.d.-c). According to Swedfund (2025) the choice of investment instrument depends on the financing requirement of each company and a strive to achieve a good balance within their portfolio.

2.5 Mechanism: Development need

DFIs state that they are willing to take on greater commercial risks in order to support businesses or sectors that can have positive development impact (British International Investment, n.d.). Yet, DFIs have been criticized for their limited track record in poorer and more vulnerable countries, despite these environments often facing the greatest development needs. DFIs commonly respond that a substantial share of the world's poor live in middle-income countries characterized by significant socioeconomic and geographical inequalities. Nevertheless, they should aim to do more in the world's most difficult environments (Forster & Charnoz, 2023).

Research on DFI frequently applies *gross domestic product (GDP) per capita* as an indicator of material wealth and economic activity within a country (Bato & Duhan, 2025; OECD, n.d.-c). GDP captures the value of goods and services produced within an economy, but does not directly reflect broader social dimensions (OECD, n.d.-c). The study on economic factor's impact on poverty in African countries, by Bato and Duhan (2025), revealed a significant connection between GDP per capita and the working population living in poverty. This underlines the relevance of GDP as a deciding factor for targeting developing markets. It is also used by businesses and investors to assess the economic climate and make investment decisions (World Bank, n.d.-b). As a complement to this widely used measurement, the *human development index (HDI)* measures similar aspects but incorporates indicators such as life expectancy, education, and income per capita, capturing human development and living standards from another perspective (Lashmar, 2018).

2.6 Mechanism: Sustainability need

Swedfund and other DFIs emphasize tackling climate change as a key objective. This is done by supporting countries in their transition towards a net-zero economy while simultaneously promoting greater economic resilience (British International Investment, n.d.; Swedfund, n.d.-a). Achieving this requires substantial structural changes within economies (Kapoor, 2019). *System disruption theory* within sustainable finance argues that sustainability goals

may challenge traditional economic and financial structures. This particularly affects businesses that rely on conventional forms of financing. As a result, investment decisions are often based on perceived benefits relative to costs, as well as the potential effects on income, livelihood, and business operations. The theory further acknowledges that a sustainable transition is complex and requires sufficient transparency regarding how new implementations may affect existing structures (Peterson, 2023).

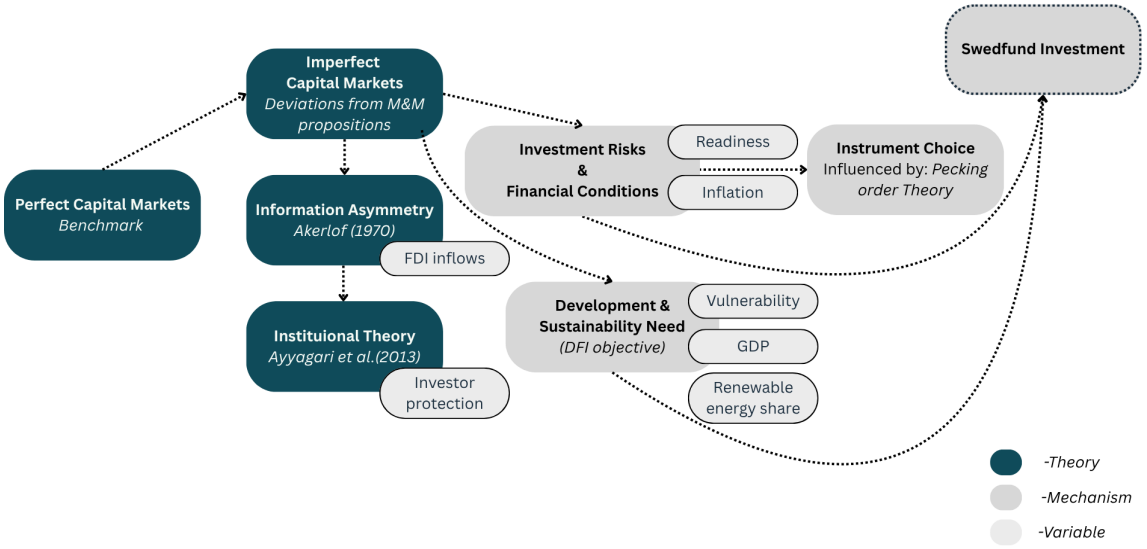
Reflecting the transition away from conventional energy structures, *renewable energy share* (RES) becomes a relevant indicator of progress within the sustainability transition. It reflects the extent to which countries rely on sustainable energy sources within their electricity systems. Higher RES may indicate greater progress towards a green transition and stronger sustainability performance (Energy Sector Management Assistance Program, 2025). Accordingly, renewable energy indicators are commonly used in sustainable finance research as measures of environmental transition and sustainability commitment (Peterson, 2023).

Climate *vulnerability* further reflects countries' exposure and adaptive capacity in relation to climate-related risks across sectors such as infrastructure, water, food, and ecosystem services (Notre Dame Global Adaptation Initiative, n.d.). Lower vulnerability levels may indicate stronger resilience and institutional preparedness. Amegavi et al. (2021) further argue that countries with stronger governance capacity and higher readiness are generally less vulnerable to climate-related shocks.

2.7 Analytical Framework

The conceptual framework (Figure 1) guiding the analysis builds on the assumption of imperfect capital markets, where information asymmetries and institutional factors lead to poor financial conditions and investment risk mechanisms. These theories influence both the feasibility of investments and the choice of financial instruments. In addition, DFIs investment decisions should reflect not only financial considerations but also development and sustainability needs. The model therefore captures both market-based constraints and development objectives in explaining the allocation of Swedfund's investments.

FIGURE 1: Conceptual framework of determinants influencing Swedfund investment decisions



Note: The figure is developed and created by the authors.

Against this theoretical framework, Swedfund's investment decisions can be understood through the interaction between theories, mechanisms, and observable country-level variables. The theoretical perspectives on imperfect capital markets, namely information asymmetry and institutional theory, explain why geographic investment allocation may depend on both investment risk, financial conditions, development and sustainability needs. These mechanisms are reflected through variables such as *FDI inflows* and *inflation*, capturing market conditions and investment attractiveness. *Investor protection* and *readiness,* reflects institutional quality and implementation capacity. In addition, *vulnerability*, *GDP per capita*, and *RES* capture broader development and sustainability needs associated with the green transition. Together, these dimensions provide a framework for analysing whether Swedfund's investments primarily reflect development objectives, market-based investment logic, or a combination.

2.8 Hypotheses

Based on the theoretical framework outlined above, the following hypotheses are formulated to guide the empirical analysis. These hypotheses reflect the expected relationship between country-level characteristics and Swedfund's investment allocation, particularly in relation to development needs, financial constraints, and risk conditions. Although DFIs are expected to operate in underserved and high-risk markets, investment decisions may still depend on institutional quality and financial viability in order to ensure long-term sustainability and implementation feasibility. The hypotheses are:

H1: Swedfund is more likely to invest in countries with stronger minority shareholder protection.

H2: Swedfund's geographic investment patterns reflect a trade-off between financial viability and development needs.

3. Data and Method

This chapter presents the research design, data collection process, variables, and econometric methods applied in the study. The method is developed to examine the relationship between country-level characteristics and Swedfund's renewable energy investments across African countries.

3.1 Research design

This study applies a quantitative approach to identify relationships between country-level characteristics and Swedfund's investment number in renewable energy across the African continent. Similarly to previous studies (Meng & Xu, 2025), the thesis applies a linear panel regression to identify relationships between macroeconomic and institutional variables. This approach makes it possible to analyse variation between countries over time, while simultaneously increasing the number of observations available for the analysis. This enhances both quality and quantity of data (Wei & Bandara, 2009). The data is sourced from archival material of 54 African countries over a five-year period, resulting in 270 country-year observations.

The secondary data is collected independently of the research process, and is merely observational, meaning that no variables are manipulated (Bell et al., 2019). The data is collected from Swedfund, the World Bank, World Population Review, Notre Dame Global Adaptation Initiative, and Ember. By combining several internationally established datasets, the study aims to improve both reliability and comparability across countries and years (Bell et. al., 2019).

3.2 Model specification

To estimate the relationship between the independent variables and Swedfund's number of investments, the study applies ordinary least squares (OLS) panel regression. It is considered an appropriate fit as the study seeks to estimate linear relationships between a dependent variable and several independent ones simultaneously (Majka, 2024). While count-data models such as Poisson regression could also be applied, the study is exploratory in nature and seeks to identify associations between country-level characteristics and investment occurrence rather than to predict count outcomes. OLS coefficients are straightforward to interpret and compare across model specifications. The empirical specification is presented below:

$$Investments_{it} = \alpha + \beta_1 SMI_{D,it} + \beta_2 Readiness_{it} + \beta_3 Vulnerability_{it} + \beta_4 LnGDP_{it} + \beta_5 RES_{it} + \\ + \beta_6 FDIinflow_{it} + \beta_7 Inflation_{it} + \gamma_t + \varepsilon_{it}$$

Where $Investments_{it}$ represents the number of Swedfund investments in country *i* during year *t.* The independent variables capture institutional conditions, financial viability, and development needs through measures of *strength of minority investor protection (SMI_D),*

readiness, vulnerability, natural logarithm of GDP per capita (LnGDP), renewable energy share (RES), FDI inflows, and *inflation.*

In the model specification, α, represents country-specific random effects. A random-effects specification is considered appropriate because the study seeks to explain differences in geographic investment allocation across countries, rather than changes within countries over time.

Further, year fixed effects (γ_t) are included to control for common time-specific shocks affecting all countries simultaneously (Bell et al., 2019). The error term is represented by ε_{it}.

Before the multivariate analysis, a bivariate one is conducted to provide an initial exploratory comparison between countries with and without Swedfund investments. This involves examining mean differences across the variables and applying independent sample t-tests to assess statistical significance (Bell et al., 2019).

3.3 Variables and measurements

The study uses indirect proxies, which need to effectively reflect geographic investment patterns that are consistent with theory and Swedfund's investment assessment. This helps establish face validity; the extent to which the selected indicators appear to measure the intended concepts based on theoretical reasoning (Bell et. al, 2019). According to Swedfund's 2025 annual report, broadly stated, their investment decisions involve estimates of financial viability, institutional conditions and sustainability-related factors (Swedfund, 2025). Convergent validity is supported through the use of multiple indicators capturing related aspects of the same underlying ideas, in this case, providing complementary perspectives on the investment environment. If these indicators display consistent relationships with the dependent variable, this strengthens the validity of the analysis in capturing broader structural geographic patterns underlying investment decisions (Bell et. al, 2019).

3.3.1 Variable guide

Table 1 presents an overview of the variables included in the empirical analysis, their operationalization, and sources of data. The variables are divided into dependent and independent variables, whereas the independent ones are either variables of interest or control variables.

TABLE 1: Variable Guide

Dependent variable	Type of variable	Source
Investments	Discrete (number of investments)	Swedfund
Independent variables		
Variables of interest		
SMI_D	Dummy (1 = above mean, 0 = below mean)	World Bank
Readiness	Continuous (index 0-1)	Notre Dame Global Adaptation Initiative
Vulnerability	Continuous (index 0-1)	Notre Dame Global Adaptation Initiative
Control variables		
LnGDP	Continuous (current US$, logtransformed)	World Bank
RES	Continuous (0-100%)	World Bank
FDI inflows	Continuous (current US$, scaled by mean)	World Bank
Inflation	Continuous (%)	World Bank

3.3.2 Dependent variable

The dependent variable, *investments*, consists of Swedfund's active investments within the energy and climate sector, entered between 2019–2023, retrieved from the official Swedfund investment database (Swedfund n.d.-c). It captures the number of investments Swedfund made in a given country, making it suitable for examining geographic patterns of investment targeting.

3.3.3 Independent variables

The variables of interest are selected to capture institutional conditions and development-related factors central to Swedfund's investment framework. The control variables are included to account for broader economic and structural conditions that may influence geographic investment allocation.

3.3.3.1 Variables of interest

SMI_D, sourced from the World Bank (n.d.-c), measures the extent to which legal frameworks protect minority shareholders from expropriation. The variable itself incorporates factors such as transparency requirements, director accountability, and shareholder rights (World Bank, n.d.-c). In this study, it serves as a proxy for institutional quality and legal reliability, capturing the extent to which investors can operate in a predictable and secure environment. The SMI_D variable was only available for 2019. To enable its inclusion in the panel dataset, the variable was operationalized as a dummy variable, where countries with values above the sample mean were assigned a value of 1 and countries below the sample mean were assigned a value of 0. Those above the sample mean (1), exhibit stronger

protection of minority investors.

Readiness is obtained from the Notre Dame Global Adaptation Initiative (n.d) and captures a country's governance, social and economic preparedness to absorb investments and implement projects successfully (Notre Dame Global Adaptation Initiative, n.d). Countries with higher readiness (closer to 1) are generally considered better equipped to sustain long-term investments and reduce implementation risks (Amegavi et al., 2021). In this study, readiness is used to capture the capacity to operationalize investments, particularly within the context of climate and energy-related projects. The variable further helps explain whether Swedfund prioritizes environments where investments are more likely to generate tangible results, demonstrating financial viability.

Vulnerability is also sourced from the Notre Dame Global Adaptation Initiative (n.d.) and measures a country's exposure and sensitivity to climate-related risks, including infrastructure and institutional vulnerability (Notre Dame Global Adaptation Initiative, n.d.). In this study, higher vulnerability (closer to 1) indicates greater need for climate adaptation through investments in resilient renewable energy infrastructure, contributing to the sustainability transition.

3.3.3.2 Control variables

Economic development is measured using the World Bank's "*GDP per capita (Current US$)*" indicator (World Bank, n.d.-d). The variable represents the total value of goods and services produced within a country, divided by its population (World bank, n.d.-d). It serves as a proxy for average income and economic development, helping assess whether Swedfund operates in poorer or more economically advanced countries. GDP per capita is widely used in development economics as an indicator of living standards and overall economic capacity, reflecting development needs (Avom et. al, 2024; Bato & Duhan, 2025; Lashmar, 2018). To reduce skewness and account for large differences across countries, the variable is log-transformed.

RES displays the share of electricity generation derived from renewable energy sources within the observed countries. The data is retrieved from Ember (n.d.-a), "a global energy think tank that accelerates the clean energy transition with data and policy" (Ember, n.d.-b). In this study, the variable captures differences in countries' energy transitions and development in renewable energy systems, reflecting the sustainability transition. The variable is measured on a scale 0-100%, where 100% represents that all energy use was derived from renewable energy sources.

FDI inflows are retrieved from the World Bank (n.d.-e) and expressed in terms of balance of payments (BoP) in current US$. The measure includes equity capital, reinvested earnings, and other capital associated with cross-border investments (World Bank, n.d.-e). It is therefore used as a proxy for investment attractiveness and access to international capital, further connected to financial viability. To account for large variation across countries and

years while preserving negative observations in the dataset, FDI inflows are mean-adjusted. This reduces the influence of extreme values and enables a more balanced comparison across observations.

Inflation is sourced from the World Bank, expressed in percentages, and measured using the consumer price index (CPI) (World Bank, n.d.-a). In this study, it points to macroeconomic stability and the financial state of different economies in Africa, indicating Swedfund's willingness to take on financial risk.

3.4 Descriptive statistics

The descriptive statistics in Table 2 summarize the variables included in the analysis. It includes the number of observations (N), minimum, mean, maximum and standard deviation values for each variable.

TABLE 2: Descriptive statistics of variables

Variables	N	Min	Mean	Max	SD
Investments	270	0	0.2259259	3	0.5145414
SMI_D	270	0	0.462963	1	0.4995523
Readiness	265	0.1320047	0.3136329	0.5646343	0.0736887
Vulnerability	265	0.3584625	0.5077355	0.64958242	0.0704463
LnGDP	270	5.456648	7.404165	9.859615	0.9312194
RES	270	0	0.4059781	1	0.3560916
FDIinflow	270	-4.338318	0.6285717	26.73122	1.954477
Inflation	270	-0.164	0.1625818	6.6736	0.6058117

The dependent variable, *investments*, has a low mean value (0.23), indicating that most country-year observations received few or no Swedfund investments although some received up to three per year. The dummy variable *SMI_D* has a mean of 0.46, showing that the sample is relatively evenly distributed between countries with weaker and stronger minority investor protection. *Readiness* and *vulnerability* show moderate variation across the sample, suggesting differences in countries' climate preparedness and exposure to climate risks. *LnGDP* shows variation in economic development and market size across countries. The relatively moderate standard deviation suggests that the log transformation successfully reduces skewness and limits the influence of extreme observations. *RES* displays substantial variation, ranging from countries with no renewable energy generation to countries where renewable energy accounts for nearly all electricity production. Finally, *FDI inflow* and *inflation* exhibit the greatest dispersion among the variables, reflecting substantial differences in macroeconomic conditions, investment attractiveness, and financial stability across countries and years.

3.5 Regression diagnostics and statistical considerations

The study relies on p-values to assess the statistical significance of each coefficient in the OLS analysis. The p-values test the null hypothesis that a coefficient is equal to zero, meaning that the independent variable has no effect on the dependent variable. Statistical significance is evaluated at the 1%, 5%, and 10% levels, indicating the probability that the observed relationship occurred by chance (Majka, 2024).

The study acknowledges the risk of both Type I and Type II errors. A Type I error occurs when a statistically significant relationship is identified despite no true relationship existing, whereas a Type II error refers to failing to detect a relationship that actually exists. Given the relatively small sample size of 54 countries observed over a five-year period, the risk of Type II errors is particularly relevant, as limited statistical power may reduce the ability to identify weaker relationships between variables. Therefore, findings approaching conventional significance levels are interpreted with caution (Bell et al., 2019).

The validity of OLS estimates relies on a set of underlying assumptions. First, the relationship between the dependent variable and independent variables is assumed to be linear. However, real-world relationships may contain non-linear patterns that are not fully captured by a linear model (Majka, 2024).

Second, the error terms are assumed to be independent. Since the dataset contains repeated observations of the same countries over time, clustered standard errors at the country level are applied to account for potential autocorrelation and heteroskedasticity (Abadie et al., 2022; Majka, 2024). To assess potential multicollinearity among the independent variables a correlation matrix is examined (Table 3 in appendix). The strongest correlation is observed between *lnGDP* and *vulnerability* (-0.7822), indicating a strong negative relationship between economic development and climate vulnerability. Although the coefficient approaches the commonly used threshold of ±0.8 for potential multicollinearity concerns (Shrestha, 2020), it remains below the critical level and is therefore considered acceptable for the regression analysis. In addition, *readiness* is moderately positively correlated with *lnGDP* (0.5379), while *readiness* and *vulnerability* (-0.4865) exhibit a moderate negative relationship. The remaining variables display relatively weak correlations with one another and with the dependent variable. In particular, *inflation* shows consistently low correlations across the matrix.

Lastly, OLS assumes normally distributed error terms. The normality of the residuals is assessed using the Shapiro-Wilk test (Majka, 2024) (Table 4 appendix). The results indicate that the residuals do not significantly deviate from normality ($W = 0.991$, $p = 0.125$). The regression results can be considered reliable even in the presence of minor deviations from normality (Ghasemi & Zahediasl, 2012).

Model fit is assessed using the chi-squared statistic. A statistically significant result indicates that the independent variables jointly contribute to explaining variation in the dependent

variable, suggesting that the model provides a meaningful fit to the data. Unlike some other statistics, the magnitude of the chi-squared value itself is not directly interpretable, as it depends on the number of independent variables and sample size. Therefore, emphasis is placed on the associated p-value when assessing model fit (McHugh, 2013).

3.6 Limitations

Quantitative research is subject to several critiques within social science methodology, often for treating social phenomena as objective and measurable in ways similar to natural sciences. Complex social and institutional realities may become oversimplified when translated into numerical indicators and statistical relationships (Bell et al., 2019). Building on the broader methodological considerations, the following section outlines the specific limitations of the empirical analysis.

3.6.1 Model and causality limitations

The regression model identifies statistical relationships but does not establish causality. This means that the results need to be interpreted as associations rather than evidence for factors directly determining Swedfund's investment decisions. This study relies on proxy variables to enable a cross-country comparison of complex concepts, making it subject to endogeneity and omitted variable bias (Ayyagari et al., 2013).

3.6.2 Endogeneity and omitted variables

Endogeneity arises when one or more independent variables are correlated with the error term, due to omitted variables or reverse causality (Bell et. al., 2019). Omitted variable bias may occur if the model does not fully capture all factors influencing Swedfund's investment decisions, such as political considerations, strategic priorities, or project-specific conditions. In addition, Swedfund's investment decisions may both influence, and be influenced by, country-level characteristics, creating potential reverse causality. For example, while higher readiness or lower vulnerability may attract investments, Swedfund's presence may simultaneously contribute to improvements in these indicators over time. This creates a potential two-way relationship that cannot be fully captured within the regression framework.

Although the inclusion of control variables and the panel data structure help mitigate some of these concerns, endogeneity cannot be entirely eliminated. As a result, the estimated relationships should be interpreted as associations rather than causal effects (Stathelp, n.d.)

A further limitation concerns the use of *FDI inflows* as a control variable, as the measure includes Swedfund's own investments. This creates a degree of overlap as the dependent variable may partly be reflected in the variable. However, given that Swedfund's investment volumes are relatively small compared to total FDI inflows, the study considers this issue limited and therefore does not adjust for it within the scope of the analysis.

3.6.3 Missing Data

The *SMI_D* variable was only available for 2019. The use of the 2019 value for all years is supported by the literature suggesting that investor protection is largely determined by underlying legal institutions and legal origins, which tend to change slowly over time. La Porta et al. (1998) argue that investor protection is rooted in national legal traditions, making it a relatively stable institutional characteristic. A limitation of this approach is that countries with values close to the sample mean may be classified differently despite having very similar levels of minority investor protection. As a result, some information is lost when converting a continuous measure into a dummy variable.

Observations of *readiness* and *vulnerability* for South Sudan are absent in the data set across the five year period. Hence the country is excluded from the regression. Missing data could potentially cause biases where countries with weaker institutions or limited data availability may be systematically underrepresented. However, since only one country is excluded from the sample, the potential impact on the overall results is considered small.

Other variables initially considered relevant were excluded due to missing observations during the selected time period. Variables such as tax rates, interest rates, and accounting standards, which may be relevant for analysing information asymmetry, suffered from insufficient data coverage.

Swedfund does not publicly disclose the distribution of investment amounts in monetary terms across individual countries within multi-country projects. Therefore, the dependent variable captures the number of Swedfund investments in each country rather than the scale or financial magnitude of those investments. As a result, the analysis cannot differentiate between countries receiving relatively small investments and those receiving larger capital commitments. Consequently, the dependent variable reflects Swedfunds investment quantity and presence, rather than how much capital is allocated to each country.

3.7 AI usage

The artificial intelligence (AI) tool ChatGPT, is used for linguistic refinement, including assistance with synonyms, word choice and sentence structure. It is applied to support the interpretation and understanding of terminology and concepts found in the literature.

Furthermore, it is used throughout the research contributing to the development of the report’s structure by providing critical suggestions for improvement, which are carefully reviewed and evaluated by the authors. AI is also used to identify and reduce repetition and overlaps in order to create a more coherent and consistent text. Since certain aspects of the subject may appear self-evident to the authors due to familiarity with the topic, AI is additionally used to identify sections where further clarification or elaboration is needed to improve readability and strengthen the overall reasoning.

However, the use of AI requires active engagement and critical assessment by the authors. All suggestions and outputs are therefore reviewed, revised, and further developed by the authors to ensure academic integrity and maintain the quality of the work.

4. Results

The empirical results from the bivariate- and multivariate analyses are presented in this chapter. The findings provide an overview of Swedfund's geographic investment patterns in African countries .

4.1 Bivariate Analysis: Swedfund Vs. Non-Swedfund Countries

The bivariate analysis provides an initial descriptive comparison between group means for countries with and without Swedfund investments (Table 5). By comparing the differences across the variables, the analysis offers insights into whether institutional, financial, and sustainability-related characteristics differ systematically between the two groups. *Swedfund invested* is defined as countries with at least one registered investment while *Swedfund not invested* refers to countries without recorded investments during the time span 2019–2023. However, since the analysis does not control for interactions between variables or other underlying factors, the results should be interpreted as descriptive rather than causal.

TABLE 5: Descriptive Comparison of Countries With and Without Swedfund Investments

Variable	Swedfund invested (1)	Swedfund not invested (0)	Difference
SMI_D	0.754717	0.3917051	0.3630119***
Readiness	0.3068103	0.3152985	-0.0084882
Vulnerability	0.4951529	0.5108073	-0.01565543
LnGDP	7.468412	7.388473	0.0799384
RES	0.5588642	0.3686373	0.1902268***
FDI inflow	0.8233211	0.5810062	0.242315
Inflation	0.338468	0.1196234	0.2188446**

Note: The Difference column reports the mean difference between the two groups (Swedfund invested – Swedfund not invested). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

To provide an initial understanding of the distribution of investments within the sample, the observations are divided into two groups; those with, and those without Swedfund investments. The results indicate that countries with Swedfund investments exhibit significantly higher levels of investor protection (SMI_D) compared to countries without investments, with the difference being statistically significant at the 1% level. In contrast, readiness and vulnerability show only minor and statistically insignificant differences between the two groups.

Among the control variables, RES and inflation exhibit statistically significant differences, 0.19 and 0.219, between investment and non-investment, at 1% and 5% respectively. In

contrast, GDP per capita and FDI inflows do not show statistically significant differences between the groups.

4.2 Multivariate analysis: Regression Results

This section presents the results from the multivariate regression analysis, allowing for a more systematic examination of the relationship between country-level characteristics and the number of investments while controlling for other factors. Table 6 reports the results from the panel regressions with *investments* as the dependent variable. Column 1 presents the baseline specification including the variables of interest, reflecting institutional and climate-related factors. Column 2 extends the model by including development and energy-related control variables, while Column 3 presents the full specification including year fixed effects. Standard errors are clustered at the country (ID) level and reported in parentheses.

TABLE 6: Linear Panel Regression Results

	(1)	(2)	(3)
Variable	**Investments**	**Investments**	**Investments**
SMI_D	0.346*** (0.095)	0.368*** (0.101)	0.392*** (0.108)
Readiness	-1.466*** (0.509)	-1.128* (0.660)	-1.116* (0.666)
Vulnerability	-1.197* (0.680)	-0.912 (0.757)	-1.046 (0.776)
LnGDP		0.047 (0.053)	0.030 (0.051)
RES		0.299** (0.136)	0.282** (0.136)
FDI inflow		-0.022*** (0.007)	-0.022*** (0.006)
Inflation		0.063*** (0.020)	0.055*** (0.019)
Year 2019 (Base year)			0.000 (.)
Year 2020			0.107* (0.064)
Year 2021			-0.012 (0.062)
Year 2022			0.201** (0.082)
Year 2023			0.163** (0.077)
Constant	1.131** (0.465)	-0.402 (0.743)	0.512 (0.754)
Observations	265	265	265
Wald Chi-square	14.303	89.443	169.768
Prob > Chi-square	0.003	0.000	0.000

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

In column 1 all the variables show a statistically significant impact on the *number of investments*, *SMI_D* and *readiness* at 1% level and *vulnerability* at 10%. This implies that an increase of 1 unit in *SMI_D*, increases *number of investments* by $\beta_1 = 0.346$, holding other variables constant. Moreover, *readiness* and *vulnerability* both have a negative relationship with *number of investments*, indicating that for a 1 unit increase in these variables, the *number of investments* decrease by $\beta_2 = -1.466$ and $\beta_3 = -1.197$ respectively, all else equal.

Column 2 extends the model by including control variables. The coefficient for *SMI_D* remains positive with a value of $\beta_1 = 0.368$ and highly significant at 1%. *Readiness* has a negative relationship at $\beta_2 = -1.128$, statistically significant at 10% while *vulnerability* loses statistical significance.

Further, among the control variables, *RES* has a positive ($\beta_5 = 0.299$) and statistically significant effect on *number of investments* ($\rho < 0.05$), whereas *FDI inflows* exhibit a negative ($\beta_6 = -0.022$) and a highly significant relationship ($\rho < 0.05$). *Inflation* is also positively associated with *number of investments* ($\beta_7 = 0.063$) and statistically significant at 1% level while *lnGDP* does not show a statistically insignificant result.

The results in column 3 remain broadly consistent with those reported in column 2, as both the significant and insignificant variables retain their significance levels and directions of effect even after the inclusion of time effects.

Using *2019* as the base year, the coefficients for *2020* ($\gamma_{2020} = 0.107$), *2022* ($\gamma_{2022} = 0.201$) *2023* ($\gamma_{2023} = 0.163$) are positive and statistically significant at 10%, 5% and 5% levels respectively. To exemplify, for γ_{2020}, the *number of investments* are 0.107 higher than for γ_{2019}, holding all other variables equal. The coefficient for *2021* is not statistically significant.

The Wald chi-square statistics of 14.303, 89.443, and 169.768 increase across the models, partly due to the inclusion of additional explanatory variables. Together with p-values (Prob > chi²) below 0.01, this indicates that each model is statistically significant overall.

4.3 Robustness check

To assess whether the results are sensitive to the choice of development indicator, a robustness check is conducted where *HDI* replaces *lnGDP per capita* in the regression model. Table 7 presents the results from the robustness specification. Standard errors are clustered at the country level and reported in parentheses.

TABLE 7: Robustness Check- Replacing Ln GDP per Capita with HDI

Variable	Investments (Robustness Model)
SMI_D	0.392*** (0.108)
Readiness	-1.427* (0.742)
Vulnerability	-0.479 (0.942)
HDI	0.829 (0.073)
RES	0.302** (0.134)
FDI inflow	-0.022** (0.007)
Inflation	0.046** (0.023)
Year 2019 (Base year)	0.000 (.)
Year 2020	0.112** (0.066)
Year 2021	-0.005 (0.064)
Year 2022	0.213** (0.084)
Year 2023	0.158** (0.077)
Constant	0.047 (0.879)
Observations	262
Wald Chi-square	150.858
Prob > Chi-square	0.000

Note: *** p < 0.01, ** p < 0.05, * p < 0.10.

Overall, the main findings remain largely consistent with the baseline specification. *SMI_D* ($\beta_1 = 0.392$) continues to display a positive and statistically significant relationship with the *number of investments* at the 1% level. Similarly, *Readiness* ($\beta_2 = -1.427$) remains

negatively associated with the dependent variable and retains statistical significance at the 10% level. *Vulnerability* remains statistically insignificant.

The alternative development measure, *HDI*, does not exhibit a statistically significant effect. Among the control variables, *RES* remains positive ($\beta_5 = 0.302$) and statistically significant ($\rho < 0.05$). *FDI inflows* ($\beta_6 = -0.022$) and *inflation* ($\beta_7 = 0.046$) both drop to a statistical significance level of 5% in this specification.

Furthermore, the model reports a lower Wald Chi-square value of 150.859 compared to the baseline specification of 169.768 (Prob > chi² 0.00) .

5. Empirical Analysis

This chapter analyses the empirical findings in relation to the theoretical framework. The analysis focuses on how institutional conditions, financial constraints, sustainability and development needs may explain Swedfund's geographic investment allocation.

5.1 Bivariate Analysis

The bivariate analysis reveals clear differences between countries with and without Swedfund investments across several variables. Countries receiving investments exhibit substantially higher levels of investor protection (*SMI_D*), representing the largest and one of the most statistically robust differences among the variables. This indicates that investor protection emerges as a key factor in Swedfund's geographic investments pattern. The lack of significance in the mean differences of *readiness, vulnerability*, *lnGDP,* and *FDI inflows*, suggests that there are no large contrasts between investment and non-investment countries when the variables are considered in isolation. On the other hand, the result for *RES* implies that countries with Swedfund investments tend to have more developed renewable energy sectors. Similarly, *inflation* exhibits a statistically significant difference, suggesting systematic differences in the financial environments conditions across the two groups.

5.2 Multivariate analysis

SMI_D, one of the study's main variables of interest, has a positive correlation with the number of *investments* across the regressions at 1% significance. These results strongly support hypothesis 1: *Swedfund is more likely to invest in countries with stronger minority shareholder protection,* suggesting that Swedfund prefers more developed financial systems as these tend to exhibit better protection of investor rights (La Porta et al., 1998). As expected, Swedfund as an investor seems to be more willing to engage in economic activity when firms, as nexuses of contracts, have a higher degree of contract enforcement (Ayyagari et al., 2013; LawTeacher, 2018).

The regression results reveal a negative and weakly statistically significant relationship between *readiness* and the number of *investments* when all the variables are included, indicating that Swedfund tends to invest more frequently in countries with lower levels of readiness. This contrasts with institutional theory, which proposes that countries with stronger institutional readiness reduce uncertainty and are better equipped to implement projects effectively, attracting investments (Amegavi et al., 2021). However, the connection should be interpreted with caution, as it is only weakly statistically significant.

FDI inflows display a negative and highly statistically significant relationship with the number of *Investments*, suggesting that Swedfund tends to allocate more investments to countries receiving lower levels of FDI. This may indicate a consistent geographic investment pattern where Swedfund operates in markets that attract less private international

capital. This result does not provide evidence of the collaboration mechanisms described in the peer emulation theory, where investors are expected to cluster in markets already attracting international capital, as the presence of other investors can signal market credibility. Instead, the findings are more consistent with Swedfund's role as a DFI, where investments may be directed towards markets that lack such signals and have greater financing gaps.

Inflation reflects a positive and statistically strong, significant association. In literature, moderate inflation fosters economic growth while high inflation may discourage foreign investments due to uncertainty and rising costs (De Saituma Cagiza & Cagiza, 2025). The results therefore suggest a broad and complex relationship, as inflation differs substantially across countries and may capture several underlying economic conditions simultaneously. Therefore, interpreting the findings with caution becomes important.

Vulnerability, as a variable of interest, shows a weakly significant result in the model with *SMI_D* and *readiness* (column 1), while it becomes insignificant when adding control variables. This suggests that the initial effect may be driven by omitted variables, indicating that vulnerability does not independently explain the presence of Swedfund investments. Moreover, it is likely correlated with other country characteristics such as institutional quality, economic development, or governance indicators. The findings therefore suggest that vulnerability alone is insufficient in explaining Swedfund's geographic investment allocation.

RES displays a positive and statistically significant connection, implying that Swedfund has more investments in countries that have already progressed in the renewable energy transition. One possible interpretation is that markets with more established renewable energy sectors provide more favorable conditions for green implementations. From the perspective of *positive signaling theory,* renewable energy investments may also function as signals of sustainability commitment and credibility (Peterson, 2023). Consequently, countries with clearer sustainability profiles may become more attractive investment environments, as sustainability outcomes are easier to operationalize, evaluate, and communicate to external stakeholders.

The regression further shows that *lnGDP* has a positive but statistically insignificant relationship with *investments*. Although GDP per capita is commonly used as an indicator of economic development, the insignificant coefficient illustrates that broader economic development alone does not appear to determine Swedfund's geographic investment patterns within the sample.

The inclusion of years as fixed effects indicates that geographic investment patterns differed across the period 2019–2023. The years 2020, 2022, and 2023 display higher numbers of investments compared to 2019, with statistical significance. The results suggest that broader time-specific factors influenced Swedfund's geographic investment allocation during these years.

The robustness model shows that *HDI* also exhibits a statistically insignificant relationship with the number of *investments*. Neither *lnGDP* nor *HDI* independently explains Swedfund's geographic investment allocation once broader conditions are considered. The generally small change among the significance level and coefficients, implies that the main findings are not sensitive to the specific choice of development indicator and that the core result is robust. At the same time, *HDI* resulted in weaker significance levels for *readiness* and *vulnerability*, indicating some overlap between *HDI* and broader institutional and development-related conditions captured by these variables.

Taken together, the Wald Chi-square statistics indicate that all model specifications are jointly significant. The null hypothesis: "all coefficients are equal to zero" is rejected at the 1% level across all columns. Since the regression gradually adds more variables the Wald Chi-square increases substantially from 14.303 in the baseline model to 89.443 and 169.768 in Columns 2 and 3, respectively. The Wald chi-square statistic decreases from 169.798 in the baseline GDP model to 150.858 in the HDI specification. This difference is likely driven by the reduced number of observations caused by missing HDI data, while the model remains statistically significant overall.

The empirical findings suggest that Swedfund's geographic investment pattern reflects a balance between development objectives and financial viability, supporting Hypothesis 2. While Swedfund appears willing to operate in underserved markets with lower implementation capacity characterized by financing gaps, investments remain concentrated in countries with stronger institutional conditions.

6. Discussion

Broader implications of the empirical findings are discussed in this chapter in relation to the theoretical framework and the role of DFIs in sustainable development finance. Particular attention is given to how Swedfund balances development objectives with financial viability, institutional feasibility, and investment risk.

The findings suggest that institutional quality plays a central role in shaping Swedfund's investment decisions. This is consistent with Akerlof's (1970) theory of information asymmetry, which argues that investors face more prominent difficulties distinguishing between good and bad investment opportunities in environments with weak institutions, increasing the risk of adverse selection. Moreover, previous studies state that governance structures, legal predictability, and investment conditions play an important role in attracting sustainable investments in developing markets (Polzin et al., 2019; Probst et al., 2021).

Institutional quality varies significantly across Africa, suggesting that geographic investment allocation is influenced not only by regional trends but also by country-specific institutional strengths, consistent with Johnson et al. (2002). Previous literature argues that these differences must be understood within a broader historical context shaped by colonial roots, which continue to influence institutional effectiveness, financial market development, and investor protection (Avom et al., 2024; Johnson et al., 2002). As shown in appendix Table 8, Swedfund's investments are concentrated in countries such as Kenya, South Africa, and Nigeria, while institutionally weaker or more fragile countries receive few or no investments. This aligns with Avom et al. (2024), who find that stronger governance structures, particularly in parts of West, East, and Southern Africa, are associated with better investor protection and more developed financial markets. Tunisia and Morocco are identified as relative exceptions in North Africa, which is also reflected in Swedfund's investments in both countries. In contrast, countries characterised by weaker institutional frameworks, often linked to extractive colonial legacies, tend to exhibit lower financial development and reduced investment attractiveness. This reveals the importance of institutional quality that reduces information asymmetry to make investment risks easier to assess. Together, this suggests that Swedfund's geographic investment patterns reflect broader and historically rooted differences in institutional quality that continue to shape investment feasibility across African countries.

Moreover, African countries with lower readiness may face challenges in effectively absorbing and utilizing investments, therefore countries with higher readiness should theoretically be more attractive. Hence, the weakly negative statistically significant findings between *readiness* and *investments* can be a result of their broader development mandate as a DFI. Likewise, the geographic pattern indicates that Swedfund allocates more investments to countries receiving lower levels of FDI inflows, and to those with higher inflation. These results support Swedfund's mandate in providing capital and acting as a catalyst for creating

new capital markets (Bery et al., 2025; British International Investment, n.d.; Swedfund, n.d.-a). At the same time, as lower FDI inflows are often associated with greater information asymmetries, this may suggest Swedfund is willing to operate in economically volatile contexts where private capital remains limited.

Building on the discussion of the development mandate, Swedfund is expected to operate in more fragile and high-need environments. The findings suggest that *vulnerability* and *lnGDP* alone is not a decisive factor in explaining Swedfund's geographic investment patterns, but remains a relevant topic. The absence of a strong direct relationship does not necessarily imply that vulnerability and economic size are unimportant. Rather, it aligns with previous literature emphasizing that investments in developing countries require supportive investment environments (Probst et al., 2021), strengthening both hypotheses. The result supports previous beliefs that DFIs face difficulties operating in the most vulnerable environments (Forster & Charnoz, 2023).

RES shows that Swedfund tends to invest more frequently in countries where renewable energy systems are already relatively developed. These findings align with the *system disruption theory* on sustainability transitions which emphasizes the difficulties in changing existing structures (Peterson, 2023). Consequently, green transition is easier in systems with more established renewable energy sectors as they involve lower transition costs and fewer barriers. This might explain what makes already functioning systems more attractive environments for Swedfund's renewable energy portfolio. Additionally, the results illustrate a broader dilemma between actual sustainable outcomes and greenwashing. Forster and Charnoz (2023) suggests that investments concentrated in countries with clearer sustainability profiles and stronger institutional environments may be easier to evaluate, operationalize, and present as measurable sustainability outcomes.

The observed effects for the geographic investment patterns during the time period 2019–2023 may be a result of changed strategies, due to the COVID-19 pandemic. In Swedfund's annual report from 2020, they state that as a result of the pandemic, Africa faces its first recession in 25 years. This was due to decreased demand, disrupted supply chains and the sharp increase in exchange rates that make imports more expensive. All increasing the need for aid and investments. Yet, foreign investments were reduced or delayed as a result of the pandemic. Swedfund emphasises that following the fiscal year of 2020, interest in impact investments among private investors continued to increase (Swedfund, 2020). Together, these developments and the broader effects of the pandemic may help explain the increase in Swedfund's energy and climate investments in Africa during the examined period.

Countries with weak legal institutions and limited transparency may have lower firm growth, increased difficulties in attracting investments and accessing funding (Beck et al., 2008). As a result, firms may be unable to follow the financing hierarchy described by the *pecking order theory* (Myers & Majluf, 1984). The descriptive overview of Swedfund's investment instruments (Table 9 in appendix) provides additional insight into how financing constraints may influence investment structures. Here, Swedfund frequently provides equity financing

despite debt being theoretically preferred (Myers & Majluf, 1984), indicating that debt is not always accessible or viable in financially underdeveloped markets. Therefore, firms may rely on equity financing, due to constraints within local financial systems, rather than out of preference.

Meanwhile, the use of equity further reflects the development mandate of Swedfund, as active ownership allows for greater influence over governance structures, sustainability practices, and long-term development outcomes (Swedfund, 2025). Equity financing may also mitigate information asymmetry like moral hazard problems that may arise if financing is provided only through debt. This is because lending reinforces the importance of contractual agreements that are enabled by institutional quality. Overall, this illustrates how the discussed theories overlap through mechanisms associated with imperfect capital markets and are reflected in Swedfund's observed geographic investment patterns.

7. Conclusion

This chapter concludes the study through a summary of the main findings and their implications for development finance institutions and future research.

The purpose of the study was to examine which country-level characteristics that are associated with Swedfund's renewable energy investments across African countries, and to what extent these geographic investment patterns align with the theoretical role of DFIs. Through a quantitative panel regression, the study analysed institutional, financial and sustainability determinants in geographic investment allocation.

The results show that stronger minority investor protection is consistently associated with higher occurrences of Swedfund investments, highlighting the importance of institutional quality in shaping investment distributions. At the same time, the negative relationship between *readiness* and *investments* suggests that Swedfund does not solely prioritize environments where they are more likely to generate tangible results. Similarly, the negative association with *FDI inflows* indicates that Swedfund may tend to invest in markets with more limited access to private capital. The positive relationship between *inflation* and *investments* further implies a presence in economically volatile environments characterized by financial instability and underdeveloped economic systems.

Taken together, these findings strengthen the argument that Swedfund operates in line with the theoretical role of DFIs by addressing financing gaps and market imperfections in underserved markets. Meanwhile *vulnerability* and broader development indicators; *GDP per capita* and *HDI* do not independently explain geographic investment allocation. Instead, the concentration of *investments* in countries with more developed renewable energy sectors implies that long-term project viability plays an important role. The results may therefore reveal a key trade-off between maximizing development needs and ensuring financial and operational viability.

The findings suggest that Swedfund's investments are associated more strongly with institutional quality, financial viability, and sector specific infrastructure, than with indicators of development need alone. The study contributes to existing literature on development finance by illustrating how DFI investment behavior reflects development mandates and corporate finance investment logic.

The results may have broader implications beyond the case of Swedfund. Improving institutional quality and implementation capacity may be key to attracting development finance investments, particularly in the renewable energy sector. At the same time, ensuring that the most vulnerable countries are not excluded from investment due to weaker institutional conditions remains a challenge.

However, several limitations should be acknowledged when interpreting the findings of this study. The analysis is based on a relatively small sample, consisting of the countries in Africa, observed over a five-year period, which may limit the generalization of the results. In addition, the study focuses on the number of Swedfund investments rather than the monetary size, structure, or long-term impact of the investments. Therefore, the findings should be understood as evidence of geographic investment patterns rather than monetary allocation of capital. Furthermore, the study relies on country-level indicators as proxies for institutional quality, sustainability conditions, and financial risk. As a result, the analysis does not fully capture project-level investment decisions or differences in investment scale across countries. Notably, the study identifies statistical associations rather than causal relationships.

Future research could build on this study by incorporating project-level data, including investment size and long-term outcomes, as well as extending the analysis across longer time periods and multiple DFIs. Such approaches would provide a more detailed understanding of how DFIs balance financial viability with development needs in practice. Emphasizing the importance of DFIs in implementing and funding the 2030 Agenda, future research is encouraged. Although this study focuses only on Swedfund, the findings may also raise an important question about the first-mover role in less developed energy markets. If DFIs are less likely to make the initial investments for green energy in countries without already established renewable energy sectors, further research could examine which actors are expected to take that role, and how DFIs can contribute in early-stage renewable energy developments. This highlights the broader challenge of financing sustainable transitions in the world’s most underserved and high-risk markets.

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Appendix

Table 3 Presents the correlation matrix for the explanatory variables included in the regression analysis. The matrix provides an overview of the pairwise relationship between the variables included in the model.

TABLE 3: Pairwise Pearson's Correlation coefficient matrix

	Investments	SMI_D	Readiness	Vulnerability	LnGDP	RES	FDI inflow	Inflation
Investments	1							
SMI_D	0.2899*	1						
Readiness	-0.0365	0.3427*	1					
Vulnerability	-0.1129	-0.1580*	-0.4865*	1				
LnGDP	0.0675	0.1511*	0.5379*	-0.7822*	1			
RES	0.1709*	-0.1307*	-0.3220*	0.1497*	-0.2961*	1		
FDI inflow	0.0886	0.1977*	0.0930	-0.2223*	0.1370*	-0.0843	1	
Inflation	0.1082	0.0570	-0.1726*	0.0641	-0.0327	0.1059	-0.0233	1

Note: * represents significance at the 5% level.

Table 4 presents the results of the Shapiro-Wilk test for normality of the regression residuals.

TABLE 4: Shapiro-Wilk Test

	N	W-statistic	z-value	p-value
Residuals	262	0.99134	1.15	0.12505

Table 8 Presents the geographical distribution of active Swedfund investments across African countries during the study period 2019-2023. The total number of investments during the 5

year span constitutes an overall view of the dependent variable. Countries with zero investments indicate no recorded Swedfund presence during the sample period.

TABLE 8: Distribution of Swedfund's active investments across African countries (entered 2019-2023)

Country	Investments
Algeria	0
Angola	1
Benin	0
Botswana	0
Burkina Faso	1
Burundi	0
Cameroon	1
Cape Verde	0
Central African Republic	1
Chad	0
Comoros	0
Congo Democratic Republic	1
Congo Republic	1
Djibouti	0
Egypt	0
Equatorial Guinea	0
Eritrea	0
Eswatini (Swaziland)	0
Ethiopia	2
Gabon	2
Gambia	0
Ghana	2
Guinea	1
Guinea Bissau	0
Ivory Coast	2
Kenya	8
Lesotho	0

Liberia	0
Libya	0
Madagascar	1
Malawi	3
Mali	0
Mauritania	0
Mauritius	0
Morocco	2
Mozambique	0
Namibia	1
Niger	0
Nigeria	6
Rwanda	2
Senegal	3
Seychelles	0
Sierra Leone	1
Somalia	0
South Africa	7
South Sudan	1
Sudan	0
Sao Tome and Principe	0
Tanzania	1
Togo	0
Tunisia	1
Uganda	3
Zambia	3
Zimbabwe	3

Table 9 presents the Swedfund's investments in renewable energy projects, including the year of investment and the financial instrument used including equity or debt. The data illustrates the composition of investments over time. The data illustrate the composition of investments

over time and the predominance of equity financing within the sample, used to support theories of credit rationing and developing mandate (Swedfund. (n.d.-c).

TABLE 9: Investment specification

Investment	**Year**	**Instrument**
Husk Power Systems. Inc	2023	Equity
E3 Low Carbon Economy Fund 1	2023	Equity
Sunfunder (Gigation Empowerment Fund)	2023	Debt
Evolution III	2023	Equity
African Infrastructure Investment Fund 4	2022	Equity
Climate Investors Two	2022	Equity
Serengeti Energy	2022	Equity
African Renewable Energy Fund II	2021	Equity
Sunfunder (Solar Energy Transformation)	2020	Debt
Metier Sustainable Capital Fund II	2019	Equity