Analysis of the Gender Dimension in the Green Innovation and Entrepreneurship in Africa

Youth & Women GREENOVATIONS

Imprint

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Executive Summary

African women entrepreneurs constitute 58% of the continent's self-employed population, yet they continue to earn lower profits than men (34% less on average). Within the green sector, a critical sector for sustainable development, women play various key roles across the green ecosystem beyond that of an entrepreneur. While they are important community makers and customers, yet they remain under-represented as entrepreneurs across the many highly specialised and tech-enabled green sectors of renewable energy, water management, waste management, blue economy and smart agriculture.

Furthermore, despite foundational similarities in the business journey of entrepreneurs in the green sectors and in the overall entrepreneurial journey, the green entrepreneurship journey presents distinct challenges and opportunities. These challenges pertain to; motivation to start a business, technical know-how, perceptions and acceptance, market access and marketing, and access to finance. Women entrepreneurs are often excluded from requisite mechanisms and support structures owing to generalized barriers faced by women entrepreneurs and secondly to barriers unique to their start-up and the scale-up phase specific to the green sector.

Women entrepreneurs in the green innovations sector face numerous challenges including:

- **Access to the marke**t is often driven by gender biases and stereotypes, difficulty in achieving product-market fit, limited market information, and discrimination in supply chains and procurement processes.
- **Access to finance** with challenges in securing adequate funding for their ventures, limited access to capital across the various stages of venture development, discriminatory lending practices and higher perception of risk by investors.
- **Accessing supportive networks** with limited opportunities for business networking and mentorship.
- **Cultural norms and societal expectations** hinder their decision-making authority and affect their credibility in a male-dominated sector, often resulting in a significant negative impact on their mindset and confidence.
- **Policy and regulatory challenges** with the absence of gender-responsive policies and regulations; and **limited access to quality education and skills** that constrain the ability to participate in let alone innovate and adapt to market demands.

The existing support mechanisms promoting and nurturing women's green innovation and entrepreneurship activities in Africa are principally in six key areas:

- **Capacity building and training:** designed for women entrepreneurs to successfully navigate their journey in the green sectors;
- **Networking and collaboration:** whilst not gender-specific, provide opportunities to facilitate knowledge exchange and meet key players in the ecosystem such as investors;
- **Access to finance:** to start and scale women's green businesses;

- **Access to market:** including opportunities for network expansion, market linkages and potential market exploration;
- **Policy support:** with an increase in governments and international organizations acknowledgement of the importance of women's involvement in the green economy.
- **Research and development:** with growing evidence that promoting women's participation in research and development can improve the outcomes for women in the sector.

Addressing these challenges requires firstly adopting a comprehensive outlook based on the impact and significance of women across the green sector not only as entrepreneurs but also as ecosystem actors, consumers and community members who are set to increase steeply over the coming years. Secondly, a multifaceted approach involving various stakeholders, including governments, businesses, investors, and support organizations focused on the six key aspects of capacity building and training, networking and collaboration, access to finance, access to market, policy support, and research and development for the three business stages as follows:

Business formation: increased pre-seed financing to support the formation and validation stages of women-led startups; and establishing mentorship and networking programs that connect experienced women entrepreneurs with inspiring ones to provide guidance, support, and networking' opportunities;

Business validation: increased funding for the business validation stage through innovative financing mechanisms better suited to the context and cultures of women in the sector. Efforts should be made to disseminate information on green innovations, funding opportunities, and training programs through diverse channels including government, ESOs and private entities;

Business Growth: the creation of sector and women-specific funding for the business growth stages, providing specialised training in key business areas such as digital marketing and sales that target women entrepreneurs in the sector; and creating gender-Inclusive market access programs including opportunities for incentivised public and private partnerships.

Introduction

As African nations navigate environmental changes and challenges, there is a growing need for more innovation and visionary leaders to address the increasingly critical situation. However, the innovation and entrepreneurship space across the continent is restrictive, especially for women. This report explores how we might empower and include more women in green innovation sectors to create a sustainable impact on multiple fronts.

2.1 Purpose of the report

This report aims to inform about the status and challenges of women's inclusion in the green innovation ecosystems and to explore opportunities and recommendations on how we might increase their inclusion through support at various levels of the ecosystems in which we work. Through this, we hope to contribute to the inclusion of women in the green innovation and entrepreneurship sectors across Africa. When women entrepreneurs are included in the green innovations ecosystem, several positive outcomes and potential developments can emerge. Beyond addressing inclusion, the report provides recommendations on some of the various strategies to enhance women's participation and impact in the green innovations ecosystem.

The report targets key stakeholders in the Quintuple Helix Framework (see framework introduction below) as readers and implementers - namely the policymakers, technology hubs, development and education partners. The report will furthermore inform our own program design within the Greenovations project, and the design of other, similar programs across the continent, leading to greater opportunities and support for women entrepreneurs in the green sector.

2.2 Problem Statement and Specific Objectives

Problem Statement:
Despite the increasing emphasis on sustainability and green innovation, women entrepreneurs in the green innovation sector encounter unique challenges that hinder their participation and success. This study aims to identify and analyse the key obstacles faced by women entrepreneurs in the sector, including gender bias, limited access to funding and resources, under-representation and lack of supportive networks among others. By understanding these challenges, the report intends to propose strategies and recommendations to promote gender equality and empower women entrepreneurs in driving sustainable, environmentally friendly and inclusive green innovation.

Objectives:
In an effort to investigate the gender dimension in green innovation and entrepreneurship on the African continent, and to make recommendations for an increasing and effective promotion of gender roles within the ecosystem, we have set the following specific objectives for the report:

- Analyse women-led businesses and their current situation
- Identify existing challenges and understand their capacity building needs
- Collect existing support and incubation practices from business ideation to maturity
- Develop integrated strategies to support women-led businesses to start and grow, and explore collaboration opportunities for and with them
- Recommend ways to strengthen female entrepreneurship and innovation across the green ecosystem.

2.3 Methodology

This report is co-created by a team of gender and green sector specialists. It is shaped by practitioners' insights gained through extensive work and research experience in the African green ecosystem, as well as up-to-date data on the green sectors and women's inclusion. Within the co-creation process, individual chapters were drafted by teams of specialists, and consecutively shared internally and externally for validation and input. An iterative approach with several rounds of research, writing and validation made it possible to create a coherent report considering various perspectives, experiences and expert knowledge sets.

To conduct a comprehensive analysis of the barriers faced by women entrepreneurs in Africa in the green innovation sector, a mixed-methods approach was employed. Both quantitative and qualitative research methods were used to gather relevant data and insights. The literature review included a thorough consideration of sources such as academic journals, research papers, industry reports, policy documents, and case studies. The data collected provided context, statistical information, and trends related to the role of women entrepreneurs in the green innovation sector.

For some chapters, insights from the literature review informed additional data collection methods, which included surveys targeting women entrepreneurs in the green innovation sector, as well as interviews with key stakeholders such as women entrepreneurs, policymakers, and industry experts. Surveys and interviews provided qualitative insights into the specific barriers and challenges faced by women entrepreneurs, as well as potential solutions. The data were analysed using appropriate qualitative and quantitative analysis techniques. For the survey data, the statistical analysis helped identify patterns, trends, and correlations. Thematic analysis was used for qualitative data from interviews to identify key themes and patterns.

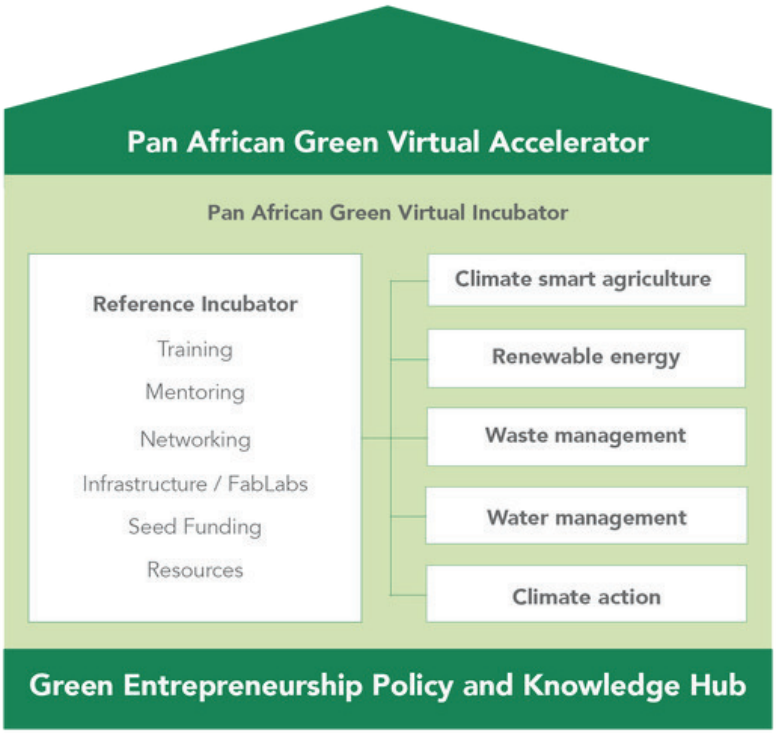
Based on the data from literature research, surveys and interviews, we identified key insights and patterns, opportunities, and actionable recommendations for a variety of ecosystem actors.

Within the report, we considered the following conceptual frameworks for argumentation and overall structure:

- **The Green Inclusive Innovation and Entrepreneurship Framework for Africa:**

The Green Inclusive Innovation and Entrepreneurship Framework for Africa (GIIEFA) consists of incremental components or steps for the setup of the ecosystem to support youth and women as green entrepreneurs in Africa.

The framework was developed by the Greenovations project team and builds on the result of the analysis, assessment and classification of green African start-ups, innovations and promising market segments, which resulted in five green sectors we are looking at throughout the Greenovation project and this report. These sectors are renewable energy, water management, smart agriculture, climate actions and waste management.



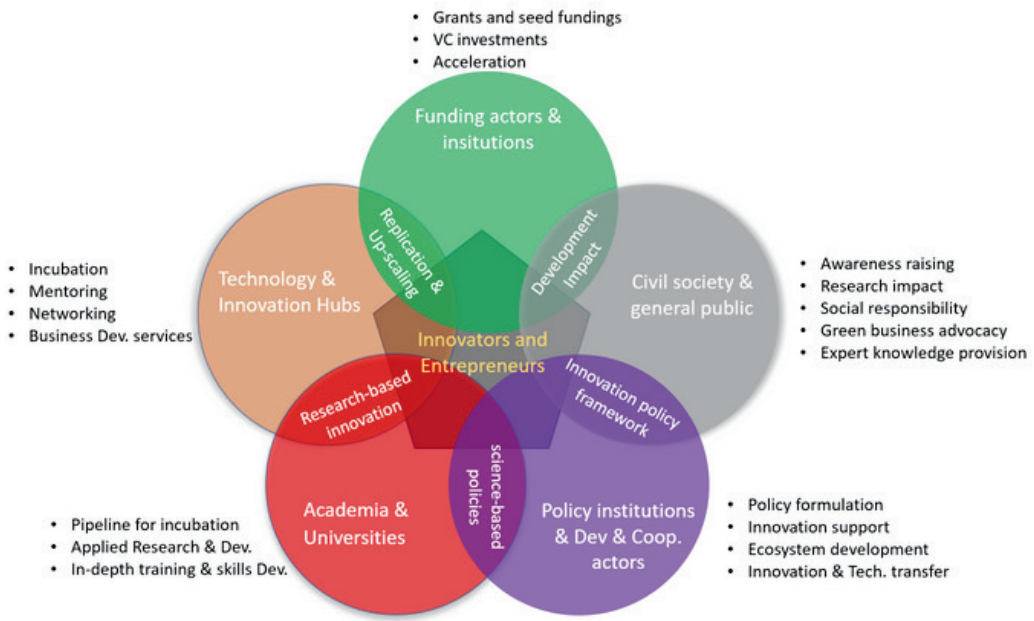
Proposed Green Inclusive Innovation and Entrepreneurship Framework for Africa (GIIEFA)

- **The Quintuple helix Framework**

The innovation helix framework generally describes interactions between stakeholder groups within a knowledge economy. Each sector is represented by a circle (helix), with overlapping showing interactions between sectors. Building on previous versions of the innovation helix framework, the Greenovations project and this report apply a Quintuple Helix Perspective. We will continuously analyse the impact and role of all Quintuple Helix actors on women entrepreneurs and innovators - who are placed at the very centre of the model. As such, the model helps us to include, next to the perspective of the women entrepreneurs themselves, the perspective of various important ecosystem actors, and the complex interactions between them.
The Quintuple Helix model includes the following ecosystem actors:

- Technology and Innovation Hubs
- Funding Actors and Institutions
- Academia and Universities
- Policy Institutions, Development and Cooperation actors
- Civil society and the general public.

Currently in discussion is the addition of a 6th dimension of the helix: Civil society actors, including media, NGOs, community groups and sector/businesses associations, as well as the general public, including women and youth. These actors play a major role in female entrepreneurship as customers, community members, supporters or critics, and influencers. Wherever applicable, we will consider the role and impact of this 6th ecosystem actor.



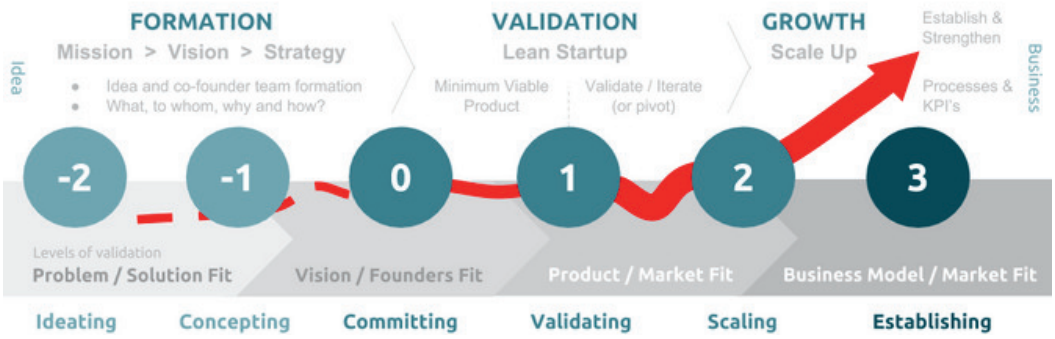
Quintuple helix of innovation and entrepreneurship

In each chapter, we will look at the respective relevant actors (public and private) involved, the resources combined, and the activities performed, as well as the outcome of the processes, that is, the perceived value those actors contribute to the support and growth of female-led businesses in the green sectors.

- **The startup development process**

The Startup Development Phases are a standard, open-source framework created by Startup Commons. The framework describes the journey of innovative entrepreneurs from idea to product, to growth. While the framework is not specifically designed for the green sectors, or for the context of African female entrepreneurs, its principles and general structure apply.

In this report, we are building on this framework in our chapter structure: We understand the journey of an entrepreneur as divided in three major phases of Business Formation, Business Validation and Business Growth. In discussing the situation, challenges, needs and existing practices to support female green entrepreneurs, we will explore all of these gender aspects along those three stages. The journey of a female entrepreneur along the startup development phases is outlined and reflected on in detail in Chapter 3.2. It is also important to note that these stages can vary depending on the nature of the startup, industry, and individual circumstances. Additionally, not all startups follow the exact same trajectory, and some may skip or combine certain stages based on their unique needs and opportunities.



Start-up Development Phases by startupcommons.org

2.4 Definition of working concepts

Green sectors:
When referring to the 'green sectors' within the Greenovations project and throughout this report, we mean the five sectors of renewable energy, water management, smart agriculture, waste management, climate action and blue tech/economy. Each of these sectors can be subdivided into a number of market segments, specified in **Chapter 3.1**.

Green entrepreneurship:
Schumpeter et al. (Schumpeter, 1934) define an entrepreneur as a change agent. We understand *green* entrepreneurs as individuals who create a business venture to address an environmental issue. Green entrepreneurs produce environmentally friendly products or services or promote environmentally sustainable practices while generating an income for their businesses. In this report, we will focus on green entrepreneurs in the green sectors defined above.

Green Innovation Ecosystems:
Green innovation ecosystems refer to interconnected networks of organisations, institutions, and individuals that collaborate and work together to drive and support the development and adoption of environmentally sustainable technologies, practices, and solutions. These ecosystems bring together stakeholders from various sectors, including businesses, research institutions, government agencies, non-profit organisations, and investors, to foster innovation and address environmental challenges. See also Green Innovation Ecosystems: An Exploratory Study of the Involved Actors | SpringerLink.

Gender inclusion:
Gender Inclusion commonly refers to a fair representation of men and women, and that both are equally encouraged to participate (Worldbank, 2021). In this report, we refer to gender inclusion to mean particularly the inclusion of women in having equal rights and access to resources, opportunities, and support.

Entrepreneur and Startup:
An *entrepreneur*, generally speaking, is an individual who creates a new business (alone or together with other co-founders), bearing most of the risk and enjoying most of the rewards (Investopedia, 2023). In Chapter 3.2, we will explain the difference between necessity and opportunity entrepreneurs in the African context. Startup (co-)founders fall into the category of opportunity entrepreneurs.

Startups are young companies founded to develop a unique product or service and bring it to market and scale. Start-ups are rooted in innovation and often aim to create high-tech, disruptive new services or products. What differentiates startups from other small companies is the focus on an actual problem or opportunity, a high degree of flexibility and ability to change, and the ambition to scale a product, service, and a whole business, massively (Forbes, 2023).

Incubation and Acceleration:
An incubator and an accelerator are both programs designed to support and nurture startups at their early stages. Whilst the terms "incubator" and "accelerator" are often used interchangeably, the specific offerings of programs can vary widely. The key distinction lies in the stage of startups they target, the duration and structure of the programs and the objectives they aim to achieve including funding.

- ***Stage and Focus:***

Incubator: An incubator typically focuses on the formation phase when the startups are ideating, concepting and committing. Their aim is to provide a supportive environment for the startups' development through these critical phases and help startups refine their business model, develop prototypes, and conduct market research. Incubators thus offer a range of resources, such as office space, mentorship, networking opportunities, and sometimes, access to funding. The primary goal of an incubator is to help startups get to a phase where they commit to

their ideas with some early validation, have a minimal viable product or service, and establish a solid foundation.

Accelerator: Accelerators, on the other hand, are geared towards startups that have already developed a product or service, have validated it and gained some traction, and are ready to scale. They therefore focus on the validation through to the scaling phases. Startups in accelerator programs often receive assistance in areas such as market expansion, customer acquisition, product refinement, and fundraising.

They provide access to mentorship, expertise, industry connections and investors and sometimes offer funding themselves to help startups rapidly expand their operations and reach.

- ***Structure and duration:***

Incubators: Incubators usually provide a longer-term support system for startups. They may have a flexible timeline and can accommodate startups for several months or even years. The duration can vary based on the needs of the startup and the terms of the incubator program.

Accelerator: Accelerator programs are typically more intense and time-limited than incubators, aiming to accelerate the growth and success of startups within a defined period. They thus follow a fixed-term model, often running for a few months, typically from three to six months. During this time, startups go through an intensive program that includes mentorship, workshops, pitch sessions, and sometimes a culminating demo day. The focus is on accelerating the growth and achieving significant milestones within the defined time frame.

- **Funding:**

Incubator: Incubators may provide startups with access to funding sources, but they typically focus more on creating an environment conducive to startup growth rather than directly investing in the companies. Startups in an incubator often have to secure their own funding through other means, such as grants, angel investors, or venture capital.

Accelerator: Accelerators may offer startups some funding in exchange for equity, although the amount and terms can vary. The focus of an accelerator is to help startups rapidly scale, and the funding provided can be used to fuel that growth. Additionally, accelerators often provide opportunities for startups to pitch to investors and make valuable connections in the investment community.

Entrepreneurial curriculum:
An entrepreneurial curriculum refers to a set of courses, programs and activities designed to foster and develop entrepreneurial skills, mindsets, and knowledge among individuals.
It can be in both academic and industry contexts, each with its own specific focus and objectives.

Both academic and industry-related entrepreneurial curricula play important roles in promoting entrepreneurship and innovation. They provide individuals with tools, knowledge and support to navigate the challenges and run a business successfully whether in the academic or real world. See also Academic Entrepreneur, Academic Entrepreneurship | SpringerLink

2.5 Report structure and chapters' overview

In line with the purpose and objectives listed above, this report consists of two introductory and five main content chapters:

Chapter 1: Executive Summary provides an overview of the report, its context and key insights.

Chapter 2: Introduction presents the report's purpose and objectives, as well as the methodology used and key concepts defined.

Chapter 3: Role and Significance of women entrepreneurs in the green sectors in Africa describes the current entrepreneurship landscape across the green sectors and their market segments, with specific reference to the role of women within. The chapter then continues to describe female entrepreneurship in Africa along the startup development phases and outlines the particular conditions women entrepreneurs might face in the green sectors. Finally, the chapter looks at the future importance and potential impact of women on the green sectors - as entrepreneurs, ecosystem actors, and community members.

Chapter 4: Challenges and support needs of women entrepreneurs in the green sectors in Africa highlight the barriers and obstacles that hinder the progress and success of women entrepreneurs in the realm of green innovations in Africa. It details the reasons and specifics behind each barrier and lists recommendations to help women entrepreneurs overcome them, deriving specific support needs related to each barrier.

Chapter 5: Existing Mechanisms and Practices to support women entrepreneurs in the green sectors in Africa explains what is currently being done, and what has been tried in the past in order to support women entrepreneurs in the green sectors. The chapter outlines different types of mechanisms and practices by the ecosystem actors in the Quintuple Helix, and lists examples of existing initiatives and projects.

Chapter 6: Opportunities and Synergies look at the challenges and support needs identified in Chapter 4, as well as the existing mechanisms listed in Chapter 5, and derives opportunities and synergies within the ecosystem.

Chapter 7: Conclusion and Recommendations summarises the key findings and insights gathered throughout the report. The chapter furthermore provides recommendations for a variety of ecosystem actors on how to improve the inclusion and support of women entrepreneurs in the green sectors, and on specific actions to be taken.

Role and significance of women entrepreneurs in the green sectors in Africa

This chapter aims to provide an overview of female entrepreneurship in the green sectors across Africa. Before discussing specific challenges, support mechanisms and opportunities for women entrepreneurs in the green sectors, it is important to understand female entrepreneurship, as well as green entrepreneurship in Africa. Within this chapter, we will try to answer the following guiding questions: What is the current status of the green sectors, and what roles do women typically play within them? What types of businesses do African women entrepreneurs typically run, and how are they affected by the conditions in and characteristics of the green sectors? And: What contribution and impact could women create in the green sectors in Africa in the future?

3.1 Overview of the current entrepreneurship landscape across the African Green Sectors, and the role and engagement of women within them

We will first provide an overview of the selected green sub-sectors in Africa, including general information on size, trends and emerging market segments. Once a contextual understanding has been established, we will then explore the current role and engagement of women in these sub-sectors. We will also provide a few examples of women entrepreneurs to highlight their contributions and shed light on female entrepreneurship in the space.

Renewable Energy

The renewable energy sector in Africa is a rapidly growing one, with notable increases in private sector initiatives, targeted investment, media attention and government prioritisation over the past years. With the average electrification rate across Africa at 55.94% (2020, World Bank), 600 million people lack access to electricity (IEA's Africa Energy Outlook). With only 9% of all energy generated in Africa in 2020 coming from renewable sources (Statista), the renewable energy sector has a unique opportunity for growth. In parallel, many African governments struggle to deliver on their promises to connect all (or a major part) of their population to the national grid. innovative, smaller-scale technology such as mini-grids, home solutions and community-based systems often run privately or in public-private partnerships, and relying on locally available renewable resources (mainly solar energy) - are coming into focus as an important piece of the electrification puzzle. Examples for high-growth companies that offer these technologies are Zola Electric, Bboxx and Engie Energy Access.

The average annual investments in renewable energy grew from less than USD 0.5 billion between 2000 and 2009 to USD 5 billion between 2010 and 2020 (IRENA's Renewable Energy Market Analysis: Africa and its Regions). The African renewable energy market is expected to grow by more than 8% between 2022 to 2027 (Mordor Intelligence, Africa Renewable Energy Market Size).

Noteworthy market segments within this sector include (GET.invest's Renewable Energy Market Segments in Sub-Saharan Africa: Outlook & Challenges)

- Independent Power Producers
- Mini-grids
- Commercial and Industrial
- Solar Home Systems (SHS)/Off-Grid Solar
- Clean Cooking

Gender inclusion continues to be the focus of a number of development efforts within the sector. There is a persistent gender gap in employment within the sector driven by unequal access to education and technical skills training, fewer job promotion opportunities, unequal pay and other inadequate and unfair company policies (IEA Africa Energy Outlook 2019).
When considering senior management, there is also a gender gap. In sub-Saharan Africa, women make up 27% of board members and 24% of senior managers of renewable companies (IFC Women's Participation in the Renewable Energy Workforce in Sub-Saharan Africa). While indicating a serious gender gap in leadership, this is relatively higher than the 6% of African companies (McKinsey Global Institute's The power of parity: Advancing women's equality in Africa) hat are led by women CEOs. In line with the low representation of women in renewable energy specialist and leadership roles, the number of female renewable energy entrepreneurs is still very low. But there is reason to hope for significant growth: The IEA's Sustainable Africa Scenario estimates that 4 million additional energy-related jobs will be needed across the continent by 2030 — offering entry into the formal economy and increased entrepreneurial opportunities for women (IEA's Africa Energy Outlook). Noteworthy women venture entrepreneurs in the renewable energy space include the entrepreneurs on GOGLA's list of Women Leaders in the Off-Grid Solar Energy Industry. An inspiring example for a women-led and women-focused organisation in renewable energy is Solar Sister.

Water Management

The African water management sector is vastly diverse, ranging from small-scale water purification and pumping businesses to large multinational companies and governments implementing water infrastructure development projects.

Between 2000 and 2020, Africa's population grew from 800 million to 1.3 billion. 411 million people lack basic drinking water services, 779 million lack basic sanitation services (including 208 million who still practise open defecation), and 839 million lack basic hygiene services. There are significant disparities within countries, between urban and rural, between sub-national regions, and between the richest and poorest parts of the population (JMP's Progress on Drinking Water, Sanitation and Hygiene in Africa 2000-2020). This indicates the vast size of and nuanced demand and needs within the sector.

Calculating the number of companies operating in the sector can be difficult, with the presence of both informal and formal operations. As a public utility, though, governments dominate the space, with private sector participation remaining relatively low. Recognizing the tremendous unmet demand in the WASH space, and the ability of private sector actors to help address them, governments are increasingly implementing policies to attract more investment and involvement of the private sector, especially in sustainable water management practices.

Noteworthy market segments in this sector include:

- Water treatment
- Water monitoring/storage
- Water access (Solar desalination)
- Water technical consulting/repair
- Irrigation water
- Rural & urban water management
- Sanitation
- Wastewater

Women's participation in water supply and WASH businesses is relatively low. A recent study led by The World Bank's Water Global Practice (Women in Water Utilities, Breaking Barriers) highlights that in the water sector, less than one in five workers are women. When considering the particular underrepresentation of women in decision-making, management and technical roles, reasons could include the relatively lower rates of education in engineering and geology, lack of company and government policies to include women at all levels, cultural factors, social perceptions and the lack of gender parity policies.
An example of one of the few women-led companies in the water management space is Water Access Rwanda.

Smart agriculture

The agricultural sector in Africa is estimated to grow to $1 trillion by 2030 (AfDB). As a relatively nascent and growing sub-sector, it is difficult to estimate the current size of the smart agriculture market. However, the forecasted growth in the agricultural space is expected to be driven by innovative technologies and practices, including smart agriculture.

There has been a recent rise in the number of smart agriculture startups, working to improve efficiencies, boost productivity and reduce waste across the agriculture sector by leveraging technologies. There is also a growing interest in strengthening smart agribusinesses – which can be seen in the increasing number of entrepreneurship support programs and investment funds specifically targeting agri-tech and smart agriculture startups across the continent (Worldbank: Growing Africa).

Emerging technological and startup advances observed in the following segments:

- Digital data-driven agriculture
- Precision farming - (e.g. GIS)
- AI-driven platforms; e.g. UjuziKilimo, Tulaa, AGIN, ProjectFARM and Apollo Agriculture
- Drones: Increasingly used to monitor crops, map soil, spray, plant seeds, etc.

While women produce an estimated 60 to 80 per cent of agricultural production in developing countries (Local Development Research Institute), and form the majority of the agricultural workforce, their role is primarily limited to the provision of labour. As development organisations work towards transforming subsistence to commercial farming, the role of women as owners, leaders and entrepreneurs is often limited by access to land rights, productive resources, extension and market information, capital and family and cultural norms. Faced with structural, systemic and societal barriers, women agri-entrepreneurs often remain informal, tend to underperform and have a high risk of failure. Smart agriculture has, however, the potential to strengthen the role of and opportunity for women at all levels of the value chain, by addressing challenges women have been facing in this sector, such as access to relevant and timeline information, inputs, etc.

In the agri-foodtech sector, an increasing amount of venture capital is being invested but is not reaching women entrepreneurs (AgriFunder, 2022). In 2018, only 3% of funding dollars and 7% of deals went to female-only founded startups in the Agri-FoodTech industry, an increase of only 2% and 4% since 2013 (mwoma.org). So far until 2020, only 3% of financial investments have been allocated to female-led startups in Africa (Briter Bridges). When considering more advanced technologies like AI and machine learning in smart agriculture, while there are noteworthy female developers like Nazirini Siraji from Mbale Uganda who created the "Farmers Companion App", most AI projects and companies originating in countries across Africa are male-dominated [The Artificial Intelligence Labour Gender Gap in Africa. Centre for Intellectual Property and Information Technology Strathmore University (2021)]. This results in significant gender disparities with implications for emerging AI-based agriculture technologies and companies.

Waste management

An industry report by Mordor Intelligence estimates that the size of the waste management market in Africa is USD 6.85 billion and anticipates its growth at 5.54% per year for the next five years. Waste collection in most African countries is inadequate, with the average collection rate at 55%. It is worth noting that 90% of all waste generated in Africa goes to uncontrolled dumpsites. Furthermore, 13% of waste on the continent is plastic, while 57% of it is organic. An estimated 70 to 80% of all waste generated in Africa is recyclable. However, only 4% is currently recycled, presenting a huge potential for innovators of collection and recycling solutions (UNEP's Africa Waste Management Outlook, 2018).

There has been a recent rise in the number of smart agriculture startups, working to improve efficiencies, boost productivity and reduce waste across the agriculture sector by leveraging technologies. There is also a growing interest in strengthening smart agribusinesses – which can be seen in the increasing number of entrepreneurship support programs and investment funds specifically targeting agri-tech and smart agriculture startups across the continent (Worldbank: Growing Africa).

As within other green sectors, women are actively involved in the sector, however mainly in low-level jobs such as in waste collection, separation and sorting. A study on informal e-waste refurbishment in Nigeria, for example, showed that male workers dominated the workforce, while there were hardly any women in refurbishing and repair (Osibanjo, Gender and e-waste management in Africa).

Women currently have very limited access to higher-income and decision-making roles, and are being excluded when waste-management activities are formalised, missing out on protection and benefits (UNEP, Why gender dynamics matter in waste management).

Recognizing the importance of private enterprise to open opportunities for women and protect the climate, a number of efforts to engage women to turn waste into useful products exist. However, these too are relatively lower down the value chain. Entrepreneurship support organisations with programs focusing on the circular economy are also growing in number, and starting to target women entrepreneurs for their programs.

Noteworthy market segments within which innovations are taking root include:

- Waste to energy
- Plastic waste (Magdalene Ontoba, Magvision, Ghana; Bilikiss Adebiyi-Abiola, co-founder of WeCyclers (Nigeria)
- Municipal waste
- Food waste reduction
- Recycling (Kudakwashe Dhliwayo, Vital Recycling Zimbabwe; Lorna Rutto, EcoPost, Kenya; Chinenye Okoro Onu, co-founder Mosaic Inspiration Project (Ghana))
- Chemical waste
- E-waste

Climate action

Africa faces increasingly pressing climate-related issues and crises, including droughts, floods, desertification, storms, etc. Climate action is receiving growing attention as a rapidly evolving sector with the ability to address these challenges. Technology plays an important role in enabling countries to become more sustainable and resilient to climate change.

It is difficult to speak to the status of gender inclusivity in all of the above industries across Africa. It should be first noted that when considering the impact of climate change, women are disproportionately vulnerable (Awiti, 2022). For example, they represented more than 75 per cent of those displaced due to rains and flooding in 18 African countries in 2007 (UNICEF (2008) Our Climate, Our Children, Our Responsibility).

Women have been traditionally absent from the already limited climate-informed policy and decision-making in Africa (Lambrou and Piana, 2006). The current "trend to frame climate change as a problem that needs technical and scientific solutions," makes it even more difficult to involve women as key solution holders and limits their adoption of climate technologies.

Climate-focused women-led companies, as in other green sub-sectors, find it challenging to access the much-needed capital to launch and grow their business.

Noteworthy market segments within which innovations are taking root include:

- Climate Information Services
- Climate Risk Analytics and Risk Management
- Climate Finance, ESG investing and Fintech
- Climate Risk Management and Intelligence
- Carbon Farming
- Battery/EV, ridesharing, electric micro-mobility
- Carbon credits/markets
- Circular economy (Yaye Souadou, co-founder and President of E-cover (Senegal);

Blue economy

The lack of consensus on standardized categorization in within the 'blue economy' highlights how complex it is to define and classify various sub-sectors, industries and activities within the sector. Despite this challenge of categorization, the blue economy in Africa is particularly under-explored and invested in, but with tremendous potential for economic growth, improved livelihoods and environmental sustainability.

The continent's vast coastline and freshwater resources provide ample opportunities for the farming of fish at various scales of operation. With the market for aquaculture and small-scale fisheries expanding, countries like Nigeria, Egypt, Ghana, Uganda and South Africa have witnessed a significant growth in production.

A number of efforts are underway to encourage sustainable fishing practices, to strengthen positive policies and enable favourable market links. While the African contribution to world aquaculture production is relatively low at only around 2.7% (FAO Aquaculture Newsletter. 61:II–III), the region recorded a twenty-fold production increase from 1995 to 2018 (FAO The State of World Fisheries and Aquaculture 2016).

Tangentially, non-farming activities are also attracting growing interest blue economy space. Innovations to harness energy from currents and offshore wind are growing, with potential seen in countries like Mozambique, South Africa, Somalia, Madagascar and Morocco exhibiting particularly good resources (Elsner et al).

However, these require substantial investment and specialized technical expertise, posing significant barriers for entrepreneurs. On the other hand, certain Innovations within reach of entrepreneurs are also gaining traction. For instance, the farming of seaweed as fertilizer, sustainable coastal tourism, and blue carbon initiatives (eg. mangroves) are promising.

The practical engagement of women in the blue economy space carries across industries and countries. In general, women play a crucial role in smaller-scale activities like fishing, farming, waste management, etc., however, their participation in positions of leadership and decision-making is relatively limited. In the emerging blue tech space, women's representation is also relatively low — for similar reasons mentioned in previous sub-sectors.

The African aquaculture sector employs about 6.2 million people, a large number of whom are women engaged in large-scale commercial farms and predominantly involved in downstream postharvest and marketing operations of the aquaculture value chain (Satia 2016. An overview of the large marine ecosystem programs at work in Africa today. Environ Dev. 17:11–19.). The private sector has been a driving force in the development of this sub-sector, and often faces challenges like inadequate availability of capital, quantities and qualities of seed and feeds, resource competition, management and overall governance in the sector (Satia BP. 2016. An overview of the large marine ecosystem programs at work in Africa today. Environ Dev. 17:11–19).

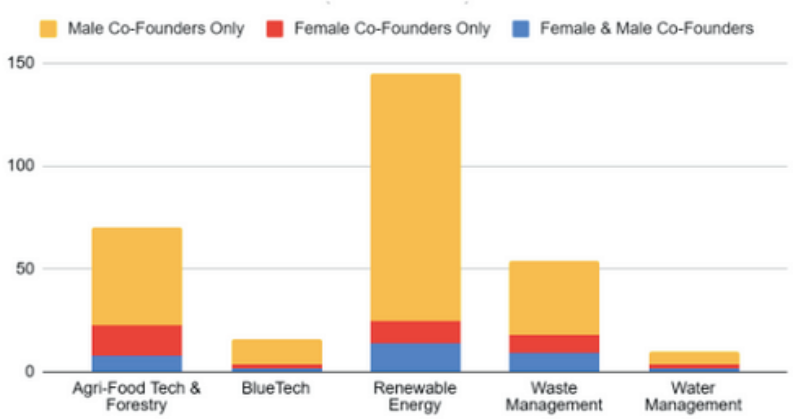
3.2 Understanding female entrepreneurship in the green sectors

In order to understand the role and potential of female green entrepreneurship, it is important to understand the experiences, preferences and possibilities of women entrepreneurs — in general, and in particular within the selected green sectors. This chapter outlines the typical entrepreneurial journeys of female founders in Africa, differentiating between so-called "necessity entrepreneurs" and "opportunity entrepreneurs". The entrepreneurial journeys will provide first insights into the challenges and support needs of women entrepreneurs, and explain the resulting types, sizes and scales of women-led startups. We will furthermore discuss conditions and particularities within the selected green sectors that affect the entrepreneurial journey of many green startup founders in Africa.

The entrepreneurial pursuit: Journey, size and Scale of Startups

Literature on entrepreneurship, in Africa and worldwide, distinguish between necessity and opportunity entrepreneurs (Reynolds et al., 2005). Even though Rosa et al. (2009) point out that the motivation of entrepreneurs is often complex and includes a variety of aspects, we will still use the theoretical framework of necessity versus opportunity entrepreneurs to explain the impact of socio-economic status, education and cultural background on the journey of female entrepreneurs in Africa. A comprehensive analysis of the startup landscape in the green sector reveals that although women are active in the green sectors, their representation in the startup ecosystem is still very low.

Indeed, data from Briter Bridges database collected, show that startups with women as co-founders or founders who have raised funds during the period from 2015 to 2023 only represent one third of the male founded start-ups in the sector. The figure below depicts the details of the female founded and co-founded representation in the startups ecosystem on the continent.



African funded green startups - Gender distribution (2018 - 2023)

Besides, across the five green sectors, when looking at the number of deals completed by startups on the continent, the top categories for female co-founded green investments by the number of deals are waste management (40%), smart agriculture and forestry (27%), water management (31%), renewable energy (17%), and blue tech (6%).

1 Greenovations report - The green innovation ecosystem in Africa

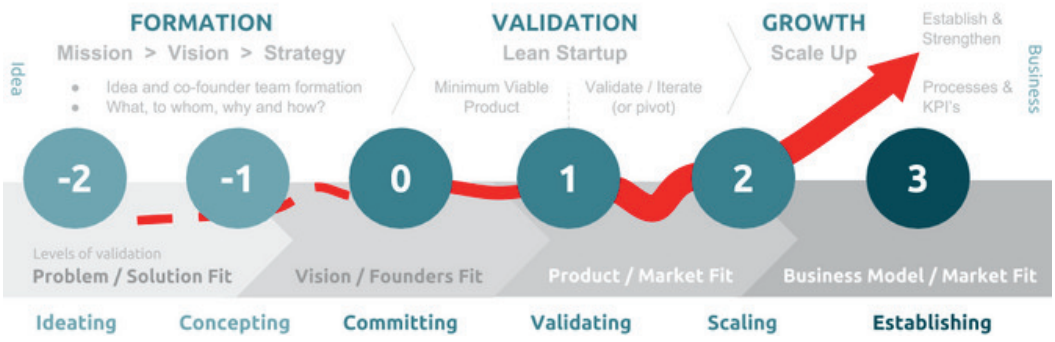
Opportunity entrepreneurs

Characteristic for opportunity entrepreneurs is their conceptual approach and thinking in the first start-up phase:

During **business formation**, they identify a problem, an opportunity or market gap. Based on this problem or opportunity, several possible business solutions are considered and the mission and vision of the business is formulated. The initial strategy of the business emerges from this mission and vision statement. At this stage, the opportunity entrepreneur typically also forms a co-founding core team.

During **business validation**, opportunity entrepreneurs create a first prototype of their product or service often called the "minimum viable product" and test it in their market. Based on initial findings, they change or improve the product. In this phase, the entrepreneurial vision and the business solution might be changed several times. It is important to mention that this phase requires a relatively high level of skills, and the know-how and willingness to take calculated risks. While opportunity entrepreneurs might require some level of guidance through training and mentoring, they are quick to take up new ideas and skills.

During **business growth**, opportunity entrepreneurs seek to establish their businesses formally and strengthen systems and structures. In order to scale, the business model might be refined or changed. In this phase, access to funding and formal financial services in general is crucial. In this phase, many opportunity entrepreneurs might require support including business planning and financial modelling, as well as access to capital and networks.



Start-up Development Phases by startupcommons.org

> it is important to note that in Africa, only one in ten growth-oriented opportunity entrepreneurs are female (GEM Women's Entrepreneurship Report 20222). Reasons might include the relatively high risks of opportunity-driven businesses, as well as capital intensiveness and networks needed to create and grow start-ups. In addition, many aspiring female opportunity entrepreneurs struggle with external - and sometimes their own - perception that entrepreneurship and start-ups are and should be a male domain

The women who start opportunity-driven business are often highly educated, have graduated from university or another higher education institution. Most female opportunity entrepreneurs are highly resourced. They come from middle or upper class economic backgrounds and can count on the support of their family and community. They are well networked, and familiar with formal economical and financial structures, institutions and processes. Many of them are technically and digitally savvy; and exposed to entrepreneurial and innovative influence online and offline. Typically, they are passionate about their business, the sector they engage in, and the problem they try to solve.

Necessity entrepreneurs

The journey and business types of necessity entrepreneurs take a different shape. Many necessity entrepreneurs run several types of small-scale businesses or combine entrepreneurship with paid jobs and farming activities. Weber et al. (2022) distinguish between four types of necessity entrepreneurs: Farmer entrepreneurs, who run their farms both for subsistence and business, and earn a major part of their income through farming. Subsistors, who sell only little of their own farm produce, and also engage only occasionally in entrepreneurial activity in order to make ends meet. Wage supplementors, whose main income source is through employment, and who complement this through additional entrepreneurial activity and farming. And market innovators, who are engaged in non-farming entrepreneurship, may employ others and generate most of their income through it.

All of these types of necessity entrepreneurs have in common that they are not driven by solving a problem or filling a market gap. They rather look for tested models to generate (additional) income to feed their families. During business formation, they therefore often decide for businesses that they have seen being run successfully in their immediate surroundings. The problem-solution fit they go for has been tried and tested by others, requires only little capital and poses little risk. Lower education levels and lack of entrepreneurial skills make it challenging for necessity entrepreneurs to start more advanced, tech-enabled businesses.

In the business validation phase, necessity entrepreneurs' main concern is the stability of the business. They consider whether they are able to run the business longer term, if they reach enough customers, have enough funds, and the required skills to "make it work". If the business does not yield the expected results, necessity entrepreneurs tend to give up the business idea entirely, and often lack the necessary skills and resources to adjust and test different approaches. In order to succeed in this phase, necessity entrepreneurs might benefit from basic entrepreneurship skills building, such as financial literacy, bookkeeping and basic marketing.

Significant business growth rarely happens in the case of necessity entrepreneurship. The businesses remain relatively small, risk-averse and low-tech. Necessity entrepreneurs lack experiences, skills and resources to grow their businesses, and often do not have any access to finance, networks and opportunities in general. Helping them access these services might enable moderate growth of businesses; this growth will however in most cases remain limited, among others due to risk-averseness and limited management skills.

While women in Sub-Sahara Africa are equally represented among entrepreneurs as men, there are major differences when it comes to business size and growth orientation (Campos et al, White paper on gender and enterprise development). African women are more likely than men to be necessity entrepreneurs owing to fewer formal education, employment and funding opportunities (IFC, 2023).

Many women fall under the category of subsistors, only engaging in entrepreneurship occasionally and complementary to subsistence farming. There are however also many female farmer entrepreneurs and market innovators who earn the main household income through entrepreneurial activity. The main reason for most women entrepreneurs to remain in the necessity spectrum are the barriers they face, such as: lack of time, lack of resources and education, limited access to networks and opportunities, lack of acceptance etc. In addition, the Covid-19 pandemic caused many female entrepreneurs to deviate from more risky, innovative business models to proven, low-risk necessity businesses.

An example for this is ***Gertrude Kashoka, Founder of Mangisa Solar***, a company involved in solar installation and distribution based in Sivaonga District in Zambia.

She explained that

> it became necessary for me to do what I had to do for my business to survive. Having an education background in teaching, I began to offer private tuition to children of exam classes that had been affected during the pandemic and since then, my solar business has been put on hold

The specific challenges and barriers and resulting support needs of female entrepreneurs will be discussed in detail later in this report. The disparity between a large number of female necessity numbers versus a relatively small number of female opportunity entrepreneurs is also present in the selected green sectors of renewable energy, water management, waste management, smart agriculture and climate action in Africa. There is a large number of female entrepreneurs engaging in small-scale, low-tech businesses within these sectors, such as solar lamp manufacturing, water filter and clean water sales, cookstove distribution, and waste recycling. Their motivations and business journeys tend to be aligned to the overall case - they need to generate income, and "make ends meet", and green technologies and product options like solar lamps or water filters are available to them in their context.

Female opportunity entrepreneurs in green sectors, in contrast, are very few. There is only a small number of tech-enabled start-ups that are (co-)founded and run by women. Their motivations might include ecological and sustainability considerations along with scaling their business model to success, as further outlined in chapter 3.2.2 and in chapter 4. In this report, the term "women entrepreneurs" includes both female opportunity entrepreneurs, as well as more necessity-driven green innovators in the informal sector.

The green factor: Aspects that affect the journey of female entrepreneurs in the green sectors

So far, we have discussed the start-up journey of an archetypical African opportunity entrepreneur, and the profile of women who follow this journey. When now adding the lens of green sector entrepreneurship, one can state that the described journey of these female opportunity entrepreneurs remains valid overall: Just as other opportunity entrepreneurs, green entrepreneurs usually start with identifying a business opportunity to address a market and environmental need. As they test the business opportunity, they learn about the market, define aspects of their service or product, and consider how they will produce and sell them. As the green businesses grow, they face similar challenges in accessing the market and resources, such as skilled labour and capital.

There are however a couple of nuances and particularities that characterise entrepreneurial engagement in those green sectors specifically, and might shape the journey of female green entrepreneurs in Africa:

- The motivation to start and grow a business might not only be driven by filling a market gap or "making it" as an entrepreneur, but also include a passion for sustainability and environmental topics.
- There might be a need for specific technical skills and knowledge that are essential to develop and sell green products and services, which could be a major barrier for women who are still underrepresented in STEM fields.
- In some of the green sectors, women entrepreneurs might struggle with perceptions and acceptance - both of new technologies and approaches, as well as of themselves as entrepreneurs. This can negatively affect market access and access to finance; both of which are major challenges for green entrepreneurs anyways.
- As most market segments of the green sectors are relatively young and emerging, there is also a high risk of failure. With limited market knowledge, changing

, changing ecosystem conditions, and lack of comparable products and business models, the right incentives and support structures become very important.

- As most businesses in the innovation space, green sector businesses require high commitment and massive time investment; a challenge especially for women who juggle work, household and family responsibilities.
- Business models and products in green sectors such as renewable energy, water and waste often substitute or compete with public infrastructure and have to grow rapidly and operate at scale in order to be successful.

Furthermore, as entrepreneurs create foundational infrastructure for countries, they are subject to major influence of governments that regulate them. While this can increase profitability and stability in some cases, changing political conditions might also increase risk, and make it difficult for green businesses to grow and succeed. This is especially true for women entrepreneurs in the green sectors, who anyways face barriers to access commercial and equity financing, technological know-how, and networks of support.

While any of these aspects might or might not affect female entrepreneurs in the selected green sectors, it is important to keep in mind that this specific group of entrepreneurs carries a double burden: Green women entrepreneurs face barriers related to their gender, as well as particular challenges related to operating a business in the green sectors. These specific challenges and barriers, as well as their consequences, are outlined and explained in detail in chapter 4 of this report.

3.3 Importance and potential impact of women in green sectors across Africa

At present, women are still a minority among founders of innovative and growth-oriented green businesses. In Kenya, for example, only 21% of green businesses identified have women on their founding teams (Ande Building the Green Economy, 2023). As the green sectors advance and grow, and as economic, political and educational conditions for women improve, the potential for women entrepreneurs to increase their impact is immense. This chapter gives an outlook on a promising future: It describes the potential impact women could have, and why continued gender inclusion matters greatly for the development of the green sectors.

3.3.1 Women entrepreneurs as drivers of growth in the green sectors

So far, women are disproportionately concentrated in the lower spheres of decision-making hierarchy of companies. Women entrepreneurs access less investment and support than their male counterparts and therefore often give up, or remain in the necessity spectrum of entrepreneurship. During the Covid-19 pandemic, many women entrepreneurs in the green sectors shifted their efforts into other, non-green sectors where it was easier to survive.

However, a number of factors indicate that the number and significance of female entrepreneurs in the green sectors will improve significantly over the next few years: Africa's middle class is growing, and so is the number of well-resourced middle class women who might possess the skills, resources and risk propensity to venture into green entrepreneurship. The number of female university graduates is on the rise, and efforts are undertaken to close the gender gap in STEM fields (Worldbank: The Equality Equation, 2020). Governments, NGOs and donor organisations create an increasing number of regional and national programs, networks and resources to support female entrepreneurs in the green sectors specifically (Ande Green Entrepreneurship in Kenya Snapshot, 2023).

A great collection of examples can be found in the Network and Resource Directory by Power Africa (USAid, 2022). In parallel, funders and investors are encouraged to pay more attention to female entrepreneurs, and start creating investment vehicles for the green sectors in particular, for example UNDP's Women's Green Business Initiative, targeting emerging climate funds. All this raises hopes that many more women will find it attractive and feasible to found innovative green businesses in the future.

The developments of the past years give more reason to hope: In emerging markets, an estimate of 30 to 37% of SMEs are women-owned, and women-led businesses are the fastest-growing market segment (IFC, 2023). In the green sectors, the number of women entrepreneurs is growing in particular in the fields of climate adaptation in agriculture and renewable energy, with a smaller number of female entrepreneurs in recycling (AWCE, Strengthening Ecosystems for WomenClimate Entrepreneurs in Sub-Saharan Africa, 2021). Women entrepreneurs can be strong agents of change, benefitting from and contributing to commercial advancement in the green sectors. They make up half of Africa's population; their engagement as entrepreneurs is an important factor for economic growth and development of the green sectors.

3.3.2 Influence of female actors on the green sectors across the Quintuple Helix

Successful female entrepreneurs are not the only group that matters for the growth and development of the green sectors. The Quintuple Helix illustrates the variety of actors and their contributions to the green entrepreneurship ecosystem. Women do already play an active role on all levels of this ecosystem, with a lot of potential for greater impact in the coming years.

Women in Tech Hubs

- Women in tech hubs can play a significant role in the inclusion of more women in the green sectors. Multiple inclusion efforts stress the importance of women enablers as mentors, managers, trainers, coaches, etc. in strengthening women entrepreneurs. This is not only reflected in the quantity of female influencers but the quality of female leadership as role models in tech hubs which also significantly attracts participation by female techpreneurs. An example for this is Dorcas Owino, who leads ***LakeHub Kisumu***, and empowers many potential female entrepreneurs through her public engagement on gender inclusion.

- Especially in contexts where women see entrepreneurship as a male dominated space, women enablers at tech hubs can form the first line of influence and act as role models, encouraging women to participate in programs that, over time, support them as entrepreneurs.

Women as Funders

- There is a well-acknowledged need for more funds to invest in female founders. This is also evident in a number of women-led green funds that target women entrepreneurs. Examples include the Enygma Ventures Fund (2023) that focuses on investing in women entrepreneurs in Southern and East Africa at the validation to scaling phase, and AlitheaIDF (2023) that has a pan African focus on women entrepreneurs at the scaling and growth phases.

- Women in decision-making positions at funding organisations bring to the table their unique experiences and perspectives, potentially shared by women entrepreneurs. As they have a better understanding of the needs and challenges of women entrepreneurs, they can inform investment approaches and decisions, and create a more nuanced gender equitable funding landscape.

Women in Development Cooperation

- As relatively more resourced organisations, international development cooperation efforts could have immense influence on the sectors and markets in which they work. Women within these organisations could advocate for gender inclusivity efforts, and for resources to be invested in such efforts.

- Women working in the 'green' departments in development cooperation could also contribute as mentors. They often have technical and/or managerial expertise that might be of immense value to young female entrepreneurs.

- Women in Government and Policy Institutions

- Considering that women policy-makers might be more likely to have faced similar issues as female entrepreneurs, they are better positioned to represent and advocate for their needs in policy-making, as compared to their male counterparts.

- Women in government could serve as champions and role models
  - within the government system, not only prioritising social and environmental issues, but also for the inclusiveness of policies and programs that enable increased participation of women.
  - within the ecosystem, inspiring the next generation of female leaders in the green sector.

Women in Academia and Universities

- More targeted promotion of STEM and technical education to women will hopefully lead to more women in academia in those fields. They are needed for young women to see that these are sectors for women. Female researchers, post-docs and professors could act as mentors and guides for young women in the sector, and encourage them to work on innovations and start-ups.

- Female STEM researchers and university personnel can better relate to the challenges that young female students, researchers and entrepreneurs face and can speak to those challenges directly.

Women in Civil Society

- Women as customers, household decision makers and community influencers can play a major role in pushing green innovations and in fostering sustainability on a grassroots level.
- Women, due to their cultural and societal role, often tend to prioritize sustainable, healthy and responsible solutions. Their voice in civil society organizations, activist movements and community organizations can therefore make a difference for the green sectors overall.

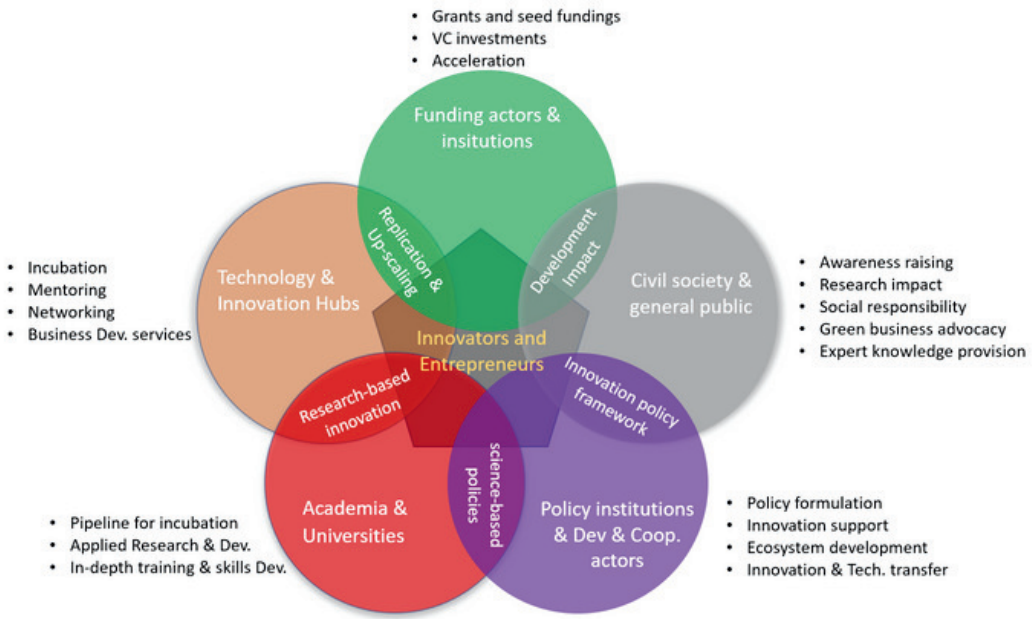


Figure 2: Quintuple helix of innovation and entrepreneurship

3.3.3 Cultural and societal impact of women on the development of the green sectors

African women as drivers of green change matter—as entrepreneurs, ecosystem actors, consumers and community members. Several cultural and societal factors determine the impact and significance of women on the development of the green sectors and sustainable development in Africa overall.

First, due to their sense of responsibility and long-term thinking, as well as their position as primary beneficiaries of green solutions (as well as being the ones to suffer the lack thereof) (Ande Building the Green Economy, 2023), women play a crucial role as catalysts for innovative climate solutions (AWCF, Towards a Gender-Transformative Climate Finance Roadmap, 2022).

Secondly, women are often well-networked and deeply embedded in their communities. They take active roles in local decision making, and organise themselves in groups and cooperatives. Their words and opinions matter; as such they can play a major role in promoting the adoption of innovative green technologies and solutions at a grassroots level. For example, women as the main users of electricity understand consumer needs best, and leverage their extensive local networks to build trust around renewable energy, and drive sales (ENERGIA, 2019, p. 27)

Furthermore, women are often custodians of indigenous knowledge in the green local economy, especially related to agriculture and food production (Lukhele-Olorunju et al., 2018, and Seleti et al, 2017). As such, they might play an important role in policy formulation, commercialization and IP related frameworks around indigenous green knowledge (Rallying Cry, 2022). A vivid example is Betty Nyirongo, a 72 year old women entrepreneur in Zambia who is preserving and replanting wild fruit trees, and who is now educating the young generation on traditional preservation methods through indigenous knowledge. She has influenced public action around commercialization of indigenous knowledge in Zambia and is currently working with universities to develop local indigenous knowledge frameworks.

Lastly, in many African societies, even those perceived as patriarchal, women tend to be the "hidden" decision makers on household level. They control 80% of household spendings (ENERGIA, 2018, p. 28) , and could as such massively influence the adoption of renewable energy, water and waste solutions. They also have a huge impact on the perceptions, attitudes and priorities of their children, who are the customers, decision makers and entrepreneurs of tomorrow.

3.4 Key Insights

Summing up, we would like to point out the following key conclusions and insights drawn from Chapter 3 on "Overview of women engagement in the current entrepreneurship landscape across the African Green Sectors":

01	Each of the selected green sectors of renewable energy, water management, waste management, climate action, blue economy/tech and smart agriculture has many highly-specialised and tech-enabled market segments that are currently small, but growing at high speed. Women are still under-represented as entrepreneurs and actors in all of these sectors.
02	In the African entrepreneurship ecosystem, one might differentiate between so-called "necessity entrepreneurs" who have very limited resources, and often found small-scale, low-risk and low-tech copycat businesses, and so-called "opportunity entrepreneurs" who are often well educated and resourced, and willing and able to start and grow innovative, tech-supported, scalable businesses. While many women entrepreneurs are somewhere on the spectrum between those two extremes, the majority of female entrepreneurs in Africa hesitate to take major risks, and struggle to grow.
03	Even though the journey of entrepreneurs in the green sectors is similar to the overall entrepreneurial journey, there are particular challenges and opportunities that might come with founding a business in one of the green sectors. Those relate to motivation to start a business, technical know-how, perceptions and acceptance, market access and marketing, and access to finance. In addition, many businesses within the renewable energy, water and waste management sectors are required to scale rapidly, and are dependent on governments and changing political situations.
04	The potential to include women at all levels of the green ecosystem cannot be underestimated - there are clear signs that their impact and significance not only as entrepreneurs, but also as ecosystem actors, consumers and community members will increase steeply over the coming years.

Challenges of women entrepreneurs in the green sectors in Africa

Women entrepreneurs in the green sector in Africa face various challenges, including limited access to education and information, markets, networks, funding, and cultural and mindset barriers. These challenges hinder their growth and success, but with the right support, they can overcome these barriers and contribute significantly to the Green Innovation sector.

This section highlights;

- the challenges faced by women entrepreneurs in the green sector and their support needs.
- women entrepreneurs operating in the green sector, which encompasses various sub sectors such as renewable energy, water management, smart agriculture and climate action.
- the challenges faced by women entrepreneurs across different stages of their entrepreneurial journey, including ideation, venture creation, growth, and accessing funding as evidenced in Chapter 3.
- lessons and experiences shared during data collection which included case studies and stories of entrepreneurs and key stakeholders in the green innovation sector.

4.1 Overview on barriers faced by women entrepreneurs in the Green Innovation sector in Africa

The green sector is a critical sector for sustainable development, and women entrepreneurs play a vital role in driving its growth. However, women entrepreneurs in the green sector in Africa face significant challenges that hinder their success. First, they are hindered by barriers faced by women entrepreneurs generally, and secondly by barriers that are unique to their start up and scale up phase specific to the green sector. These include [1]; limited access to education and information, markets, networks and opportunities, funding, cultural and mindset barriers and policy and systemic barriers. Barriers exist at various formation stages of women entrepreneurs. As alluded to in previous chapters, there are 3 main stages of entrepreneurship formation including; ideation, validation and growth.

This chapter surfaces key aspects on the social, economic, cultural and systemic barriers that may exist at these stages of starting and growing a business in the green economy. To address some of these challenges, women entrepreneurs in the green sector require access to training and education programs to enhance their knowledge and skills. They also need access to information on sustainable practices, technology, and management. Building strong networks and access markets and business opportunities is also critical, which could include mentoring, networking events, and access to international markets.[2]

Further, Women entrepreneurs in the green sector require access to funding, including venture capital, angel investment, and loans from financial institutions. This requires financial institutions and investors to develop gender-responsive financial products and services that cater to the needs of women entrepreneurs.

Cultural and Mindset Barriers have also proven to be a major setback to advancing gender equality in the green innovation sector. Women entrepreneurs in the green sector require support to overcome cultural and mindset barriers. This includes advocacy and awareness campaigns to challenge gender stereotypes and promote the participation of women in entrepreneurship. Additionally, mentoring and coaching programs can help women entrepreneurs build confidence and develop a growth mindset.

4.2 Barriers across business stages

Chapter 2 identifies the journey of an entrepreneur as divided in three major phases of Business Formation, Business Validation and Business Growth. In discussing challenges, we further explore all of these gender aspects along those three stages.

2.4.1 Business formation and validation phase

Findings from focus group discussions and key informant interviews during our research reveal three common challenges faced in the startup or early stage of women led businesses in the green sector. These are categorized in three main areas including MVP positioning and prototyping, limited market information, lack of pre-seed capital and limited industry skills. For example, Participants agreed to having challenges in establishing their MVP despite having a strong value proposition. They reported that it took much longer to ideate, attain MVP and to start generating revenue. A respondent that runs a water safety and testing startup had this to say:

2 UNCTAD (United Nations Conference on Trade and Development). (2021). Women's Entrepreneurship for Sustainable and Inclusive Industrial Development. Retrieved from https://unctad.org/system/files/official-document/ditctc2018d2_en.pdf

> I wasn't confident about my product going to market and even though I was clear about its value proposition, it took time for me to establish a viable revenue model. I had very little knowledge about similar products in the market and how to run this as a business.

With regards to limited industry skills, participants reported challenges in identifying startup teams with required knowledge and skills in their industry, particularly in water management, waste management and climate action. It took longer to grow their teams and they usually experienced high turnover as most skilled labor would rather work full time in a larger more stable green industry business.

A key informant from the financial sector also highlighted that the probability of an early stage green innovation startup to exist beyond 3 years is high and comes with a huge financial investment risk.

> I wasn't confident about my product going to market and even though I was clear about its value proposition, it took time for me to establish a viable revenue model. I had very little knowledge about similar products in the market and how to run this as a business.

Business growth stage

There are a number of things to consider when it comes to analyzing growth barriers faced by women led businesses in the green sector. Growth metrics and indicators are often rated differently for women led businesses in comparison to male led and this could have potential negative impact on how female founders raise growth capital, attain market share and sustain growth and green innovation.

For example, growth accelerator programs that are focused on promoting female entrepreneurship may be less robust on eligibility criteria, have less stringent assessment tools and may offer more flexibility during training and coaching. However, when it comes to raising capital, different measurement frameworks are used. This misalignment may disadvantage the business when it comes to successful capital raise. This poses a question on some of the theories and practices on growth and gender integrated design.

In green innovations, the experience may be even more intense for women, given the early stage emergence status of the sector. For example, a women led business in Malawi that cultivates black soldier flies participated in a total of 7 accelerator programs, minimum 4 months each but failed to raise any growth capital. Asked why this was the case, she attributed her failed attempts to unclear goals and inconsistency in growth accelerator programs (take note that this point is based purely on the informant's opinion and not derived from specific evidence).

We concluded that despite a number of entrepreneurship support programs and facilities available to support women led growth stage businesses , developing steady pipelines remains a huge challenge and this is even more evident for women led businesses in the green sector. The struggle to attain exponential growth, attract appropriate capital and gain access to credible mentoring and coaching support. Further, most programs are designed to support capital raise but few are looking at post funding support. A financial sector key informant identified two major funding challenges experienced by capital providers looking to fund green women businesses i.e poor pipeline and lack of scalability

In climate action, including biodiversity conservation, the few growth stage businesses operating in the sector and mainly social enterprises with unclear market solutions depend largely on grant funding. A study by Mckenzie, 2017 shows that social enterprise models are usually challenged in between achieving profitability while sustaining impact. Most growth accelerator models in green innovations are not designed to address this challenge.

> I feel there is a ceiling when it comes to funding women green businesses. They fund us according to what is already determined by the donor and not what our businesses need for growth. Usually, this funding is very small and can't even cover our milestones'

Niza Simwanza, Gasbees Energy, Zambia.

Although this challenge identified by Niza is common across all sectors, the green innovations sector records higher numbers of green business proposals that are funded less than 20% of what the businesses apply for.[3]

4.3 Thematic barriers

4.3.1 Access to education

Women entrepreneurs in the green innovations sector in Africa. However, there are several barriers that women face in this regard including the following:

a) Limited Educational Opportunities: In many parts of Africa, women have limited access to quality education, particularly at higher levels. According to the International Finance Corporation (IFC), over 70% of women-owned businesses in Africa are in low-skilled sectors. This also includes lack of financial education which is strongly linked to an ability to run a business effectively. This hampers their ability to acquire the necessary knowledge and skills related to green innovations. Gender biases and stereotypes often discourage girls from pursuing science, technology, engineering, and mathematics (STEM) fields, which are vital for green entrepreneurship.

3 Biodiversity Finance Study, 2021
4 International Finance Corporation (IFC)

Usually, the key driver is not that they are already skilled and or experienced in the sector, but the desire to fulfill a potential market need. This further compromises their odds of success given that they most likely will not have the skills, education, experience, knowledge and exposure required to venture in the sector.

Women in smart agriculture for example reported that new developments and innovation in Agritech, motivated them to start even though they did not have a background in STEM fields. However, they also identified that lack of education and experience limited their growth potential.

b) Information and Knowledge Gap: Women entrepreneurs in the green innovations sector often face challenges in accessing relevant information and knowledge. This can be due to limited availability of resources, lack of awareness about green technologies and practices, and insufficient dissemination of information about funding opportunities, training programs, and market trends. Only 37% of women in sub-Saharan Africa have access to the internet, further exacerbating the digital divide and hindering their access to online resources and market opportunities. Limited internet connectivity and digital literacy further exacerbate the information gap. Further analysis on information gap shows that a lot of information, training and content on the green sector including support mechanisms for women entrepreneurs are found online and on digital platforms which most women entrepreneurs don't have access to or simply lack digital skills to maximize learning.

> I enrolled in a biogas online training program but didn't complete due to limited internet access in Mwinilunga and most of the tools they were using for training were new to me

Undisclosed informant

WEAC, a women's entrepreneurship support center in Zambia confirms that online training programs that do not incorporate in-person interactions will most likely have a higher attrition rate and or poor attendance_Kapoche Mwale Impact and Evaluation Lead, WEAC May 2023.[3]

c) Cultural and Societal Norms: Cultural and societal norms can pose significant barriers along the entrepreneurial journey and on women's access to education, information and resources. Traditional gender roles and expectations may prioritize women's domestic responsibilities over their educational pursuits, limiting their opportunities for learning and skill development. Social and societal norms could also limit women's ambitions and ability to pursue growth. A question posed during our interviews on how far women entrepreneurs thought they could go in their businesses yielded interesting results;

> I think my business will significantly grow in the next 5 years or so but I am not sure if have the right skills and capabilities to take it to that level

Most women entrepreneurs have the desire to succeed but face limiting beliefs about their own capabilities usually because of cultural and societal norms that view women as unequal and less able. This is even more[3] evident in STEM fields. Additionally, social norms that discourage women from engaging in entrepreneurial activities can further hinder their access to education and information.

d) Financial Constraints: Limited financial resources can impede women's access to entrepreneurial education, tools and information. Women entrepreneurs may struggle to afford quality education, vocational training programs, business development services, or participation in workshops and conferences or indeed incubation and acceleration programs.

Despite significant increase in sponsorship programs targeting women entrepreneurs and their increased participation in capacity building programs, places are usually limited and mostly offered in main cities. Lack of access to credit and financial services further exacerbates these challenges, making it difficult for women to invest in their own education and training.

e) Lack of Mentorship and Networking Opportunities: Women entrepreneurs in the green innovations sector often face a lack of mentorship and networking opportunities, which are essential for knowledge sharing, skill development, and accessing information.

Male-dominated networks and professional associations may exclude or marginalize women, limiting their access to valuable contacts, partnerships, and learning opportunities. Finding mentors, especially females in green innovations is even more challenging than it is in other sectors. Most innovation hubs struggle to start and grow green innovation communities as this is a sector that would not usually form part of the core entrepreneurship support programs. If they do exist, they are usually dominated by men. Because of inadequate steady green innovation pipeline, the ratio of mentor/mentee in this sector is usually below average.

4.3.2 Access to markets, networks and opportunities

Access to markets, networks, and opportunities is a critical factor for the success of women entrepreneurs in the green innovation sector in Africa. However, several barriers impede their ability to access these essential resources.

a) Limited Market Access: Women entrepreneurs often face challenges in accessing markets for their green innovation products and services. They may encounter biases and discrimination when trying to enter established supply chains or secure contracts with larger companies. ack of information about market demand, pricing mechanisms, and distribution channels further restricts their ability to reach potential customers.

b) Market knowledge, access and marketing: Considering the relatively lower awareness for ecological topics, and resulting lower demand for green products and services, green entrepreneurs might find it difficult to access markets. They might need to invest time and resources in educating potential customers, so the added value of green products is understood and valued (Ande Building the Green Economy, 2023). Competitive products of lower quality destroy the reputation of a new technology or innovation,and make education about and promotion of green products and services difficult. It might furthermore be challenging to determine adequate price points for new products and services that are not yet known to the target group.

Further, Deep-rooted gender biases and stereotypes can hinder women's access to markets and networking opportunities. Traditional gender roles often confine women to specific sectors or roles, limiting their visibility and credibility in the business world. Stereotypes that associate women with softer skills rather than technical expertise can undermine their chances of accessing markets and networks in the green innovation sector. Women entrepreneurs face challenges in building networks and connections in the green innovation sector. Male-dominated professional networks and industry events may exclude or marginalize women, limiting their access to valuable contacts, partnerships, and business opportunities. This lack of networking opportunities can constrain their ability to access markets and gain visibility.

They may also face difficulties in accessing crucial information and resources related to market trends, emerging opportunities, and business support services. Limited internet connectivity, inadequate access to business development programs, and a lack of tailored information can inhibit their ability to seize market opportunities and make informed business decisions. [3]

Access to financial resources and investment opportunities is often limited for women entrepreneurs in the green innovation sector looking to grow their markets. Gender biases in financing institutions and investment networks can result in less favorable terms or limited access to capital. Lack of collateral, risk aversion by investors, and limited awareness of funding options can further impede their ability to scale their businesses and access new markets.[5]

Women are also often underrepresented in decision-making spaces related to green innovation and entrepreneurship. This lack of representation diminishes their influence in shaping policies, accessing support programs, and participating in market-oriented initiatives.
It also hampers their ability to advocate for their interests and address systemic barriers that hinder market access.

4.3.3 Access to funding

Access to funding is a critical challenge faced by women entrepreneurs in the green innovations sector. According to a report by the African Development Bank, women entrepreneurs in Africa face a $42 billion financing gap. Only 3% of venture capital investments in Africa go to women-led startups. The green ecosystem revealed a predominantly male dominated funding landscape of green start-ups and ventures. Indeed, male founded stat-ups capture a significant 89% of the $3 Billion funding volume raised during the 2015 – 2023 period. Mixed co-founded start-ups recorded 10%, and All female co-founders were able to raise only 1% of the funding volume. This asymmetrical funding distribution reflects the status in the broader startup ecosystem.

5 The Gendered Barriers to Entrepreneurship and Access to Green Finance for Women in Nigeria. Journal of Economics and Sustainable Development, 10(9), 109-120.

Indeed, across all digital and technology-driven sectors during the same period, the distribution follows the same patterns with only 4% capital injection into Africa raised by all-female startups/venture , the co-founded accounting for only 10% of the total number of deals.[6]

Lack of collateral, limited financial literacy, and discriminatory lending practices make it challenging for women entrepreneurs to secure funding for their green innovation ventures.

Despite progress in promoting gender equality, women still encounter several barriers when it comes to securing financial resources for their ventures and these may include the following:[7]

a) Limited Investor Networks: Women entrepreneurs often face difficulties in accessing established investor networks that predominantly consist of male investors. These networks tend to be more comfortable investing in businesses led by men or may have unconscious biases that favour male entrepreneurs. Consequently, women find it harder to connect with potential investors who understand and appreciate the value of green innovations. “I used to get nervous whenever I had an opportunity to speak to investors. I think it gets better with exposure and the more you experience them, the better your pitch becomes "_ Lillian Muchindu, Founder/CEO Kafue technogrid.

b) Lack of knowledge on funding: Women entrepreneurs also tend to have less access to networks and programs where they can access business and financial education with most women focused associations on the continent being focused on social and community development initiatives rather than business. As such there are more disproportional gaps in their knowledge when it comes to funding types that are available to them, which type to match with their different financing needs as well as overall knowledge on sources of finance.

c) Gender Stereotypes and Bias: *Gender* stereotypes and biases can influence investors' perception of women entrepreneurs and their ventures. Women may be viewed as having limited business acumen or as being less capable of running high-growth, innovative companies. These biases can result in a lack of trust and skepticism from investors, making it more challenging for women entrepreneurs to secure funding for their green innovations.

d) Lack of Representation: The underrepresentation of women in decision-making roles within financial institutions and venture capital firms can contribute to the barriers women face in accessing funding. When decision-makers lack diversity, they may overlook or undervalue the potential of women-led green innovation ventures, further exacerbating the funding gap.

e) Risk Aversion and Investor Perceptions: Investors, especially traditional ones, may have a higher aversion to risk, which can affect their willingness to invest in early-stage green innovation ventures led by women. These ventures are often perceived as riskier due to the combination of innovative technologies, sustainability objectives, and gender-related biases. As a result, women entrepreneurs may struggle to convince investors of the viability and potential returns of their green innovation projects.

f) Access to finance: As with many entrepreneurs on the continent, access to finance remains a challenge for green entrepreneurs too. However, businesses in green sectors might be considered riskier to invest in, depending on the type of business and the sub-sectors it works in (Linnanen, 2002). Furthermore, traditional financial institutions are often not experienced in investing in innovative green businesses, creating additional challenges especially for women, who tend to struggle anyways with credibility as successful green entrepreneurs, and access to capital due to lack of collateral (women are not allowed to own land in many African societies, for example).

6 Working Greenovations report - The Green innovation ecosystem in Africa
7 https://www.afdb.org/fileadmin/uploads/afdb/Documents/Generic-Documents/We-Fi_Resource_Guide_-_FINAL.pdf

There are however first developments: A number of development financial institutions have introduced investment vehicles targeting green initiatives, and specifically women within, as seen in chapter 5.[8]

g) Limited Collateral and Assets: Some funding sources, such as bank loans, require collateral or assets as security. Women entrepreneurs, particularly those starting out, may have limited personal assets or may face challenges in accessing property rights, making it harder for them to meet the collateral requirements. This limitation restricts their ability to secure traditional forms of funding and forces them to explore alternative financing options.

h) Mismatch of funding to needs: There is often a mismatch between the funding that is available to women entrepreneurs in the green economy to their needs. For example, there is generally less funding available at the earlier stages of business development as there is less interest from commercial funders in funding smaller amounts. Additionally, not all types of funding may be suited to certain phases of business growth as well as the existing business models in the sector.

Equity investors for example would prefer to invest in businesses that have exponential growth capability whilst certain businesses in the sector may have a more linear growth capacity. [3]

i) Access to Networks and Mentors: Networking plays a crucial role in accessing funding opportunities. Women entrepreneurs, especially those new to the industry, may face challenges in establishing connections with influential individuals, mentors, and industry experts who can provide guidance and introduce them to potential investors. The lack of access to these networks can hinder their ability to secure funding for their green innovation ventures.

j) Confidence and Pitching Skills: Research indicates that women entrepreneurs may exhibit lower levels of confidence in pitching their ideas to investors, which can negatively impact their chances of securing funding. Additionally, venture capitalists often favour entrepreneurs who possess persuasive pitching skills, and the gender gap in this area can further disadvantage women entrepreneurs seeking funding for their green innovations

4.3.4 Cultural Barriers

Cultural barriers pose significant challenges for women entrepreneurs in the green innovations sector. These barriers are deeply rooted in societal norms, beliefs, and expectations, and they can have a profound impact on women's ability to start and grow their ventures.

Here is a detailed analysis of cultural barriers specific to women entrepreneurs in the green innovations sector:

8 https://www.jstor.org/stable/greemanainte.38.71

a) Gender Role Expectations: Cultural norms often dictate specific gender roles and responsibilities, which can limit women's opportunities to pursue entrepreneurship and, in some cases hinder altogether, their participation in the green innovations sector. Traditional expectations of women as caretakers and homemakers may discourage them from entering male-dominated fields such as technology, engineering, or renewable energy. This cultural bias can result in limited support and encouragement for women to explore entrepreneurial opportunities in the green sector.

b) Lack of Role Models: Women's contributions to green entrepreneurship are often overlooked or underrepresented. The absence of visible and successful women entrepreneurs in the green innovations sector can create a lack of role models for aspiring women entrepreneurs. Role models play a crucial role in inspiring and motivating individuals to pursue entrepreneurial ventures. The scarcity of female role models in the green sector can perpetuate the belief that entrepreneurship in this domain is not suitable or attainable for women, further deterring them from entering the field.

c) Social Stigma and Perception: Cultural barriers can subject women entrepreneurs in the green innovations sector to social stigma and negative perceptions. In some societies, entrepreneurship is still primarily seen as a male pursuit, and women who challenge this norm may face criticism, social pressure, or ostracization. Such stigmatization can be a significant deterrent for women to engage in entrepreneurial activities in the green sector. In some of the green sectors, women entrepreneurs might struggle with perceptions and acceptance - both of new technologies and approaches, as well as of themselves as entrepreneurs. In some cultural contexts, women might be disrespected if working with waste and sanitation for example. Similarly, smart agriculture entrepreneurs struggle with assumptions around agriculture being “dirty” and “for poor and unskilled people”. Overcoming those perceptions and gaining acceptance not only of potential customers, but the community around might cost a lot of time and energy, and prevent many women entrepreneurs from pursuing green businesses at all.[3]

d) Access to Networks and Resources: Cultural barriers can limit women's access to networks and resources that are crucial for entrepreneurial success. Networking plays a vital role in business development, accessing funding, and gaining industry insights. However, cultural norms may discourage women from participating in networking events or accessing male-dominated business networks, limiting their access to mentors, investors, and other valuable resources.

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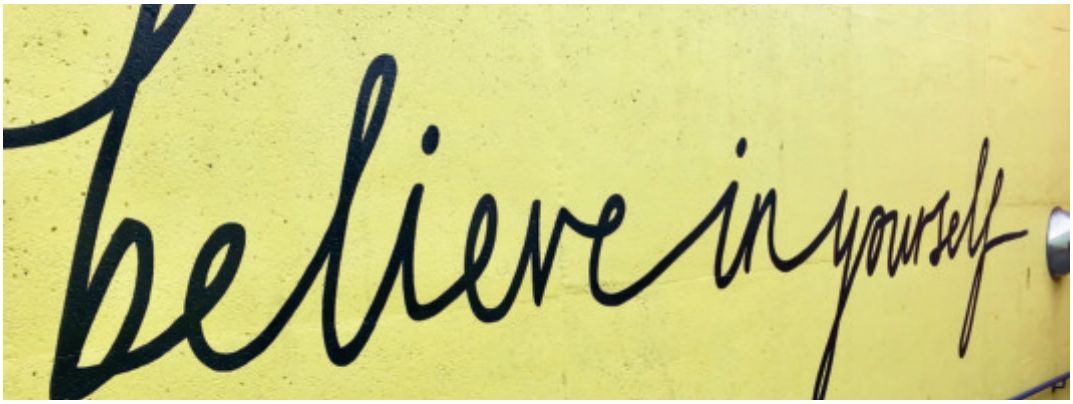
e) Limited Access to Education and Training: Cultural barriers can contribute to disparities in educational opportunities for women in certain societies. Unequal access to quality education and training programs can hinder women's ability to acquire the necessary knowledge and skills in the green innovations sector. This lack of education and training can create a significant disadvantage for women entrepreneurs, making it harder for them to navigate the complexities of running a successful green venture.

f) Family and Domestic Responsibilities: Women entrepreneurs often face additional challenges related to balancing family and domestic responsibilities alongside their entrepreneurial pursuits. Cultural expectations regarding women's care giving roles[3] and responsibilities can place significant burdens on women entrepreneurs, making it more challenging to dedicate sufficient time and energy to their green innovation ventures. These responsibilities can limit their availability for networking, business development, and other critical entrepreneurial activities. Women often face unique challenges in balancing work and family responsibilities. These challenges[3] can be further amplified in the green sector, where new technologies, immature markets, lack of

finance and opportunities, as well as increased need for education, training and testing by entrepreneurs demands significant time, effort, and commitment. Inadequate support systems, such as affordable childcare and flexible work arrangements, can limit women's ability to participate fully in the green sector as entrepreneurs.

g) Risk Aversion and Fear of Failure: Cultural norms and expectations may discourage women from taking risks or embracing entrepreneurial endeavors due to fear of failure. The fear of deviating from societal expectations or the potential consequences of failure can create hesitancy among women entrepreneurs in the green innovations sector. This risk aversion can inhibit their ability to pursue innovative ideas or seek funding for their ventures.

4.3.5 Mindset Barriers



Mindset barriers can significantly impact women entrepreneurs in the green innovations sector, influencing their confidence, decision-making, and overall success. These barriers are often deeply ingrained and can be both internal and external and these may include the following;

a) Self-Limiting Beliefs: Women entrepreneurs may harbor self-limiting beliefs that undermine their confidence and ambition. These beliefs can include doubts about their abilities, fear of failure, or the belief that they are not qualified or experienced enough to succeed in the green innovations sector. Such negative self-perceptions can hinder their willingness to take risks, pursue growth opportunities, or seek funding for their ventures.

b) Imposter Syndrome: Imposter syndrome refers to feelings of inadequacy and self-doubt, where individuals believe that they are not deserving of their achievements or fear being exposed as frauds. Women entrepreneurs in the green innovations sector can experience imposter syndrome, especially in male-dominated fields, which can undermine their confidence and hinder their ability to seize opportunities or seek funding. This mindset barrier can lead to self-sabotage and prevent them from fully realizing their entrepreneurial potential.

***c) Lack of Confidence in Pitching and Negotiating*:** Confidence plays a crucial role in pitching ideas, negotiating deals, and securing funding. However, women entrepreneurs may experience lower confidence levels in these areas, which can

negatively impact their ability to communicate the value of their green innovations effectively. The fear of being perceived as too aggressive or assertive can deter women from advocating for themselves and their ventures, leading to missed opportunities for funding and growth.

d) Risk Aversion: Women entrepreneurs in the green innovations sector may exhibit a greater aversion to risk compared to their male counterparts. Risk aversion can stem from societal conditioning or cultural expectations that discourage women from taking risks or stepping outside their comfort zones. This mindset barrier can prevent women entrepreneurs from pursuing ambitious and innovative ideas, limiting their ability to attract investors or secure funding for their ventures. Further, as most market segments of the green sectors are relatively young and emerging, the products and services developed within are often innovations that have not been tested or marketed in the African context before. While new technologies and innovative solutions can open up untapped markets, there is also a high risk of failure. If there is a lack of comparable products, services, and business models, success is hard to predict. This is even more true for the context of many African countries, where economic, political and financial conditions might change rapidly. Green sector entrepreneurs face a variety of risks along the whole business journey and value chain - from product development and sourcing, to market and capital access - most success parameters are fluctuating, or simply unknown. This might make women, who are often more risk averse as well as more vulnerable to risk than men, shy away from green sector entrepreneurship.

e) Lack of Resilience and Persistence: The entrepreneurial journey is often fraught with challenges, setbacks, and failures. Women entrepreneurs may face additional pressures due to societal expectations or cultural norms, making it harder for them to bounce back from failures or setbacks. A lack of resilience and persistence can hinder their ability to navigate obstacles, learn from failures, and persevere in the face of adversity, thereby impeding their progress in the green innovations sector.

f) Underestimation of Value and Impact: Women entrepreneurs may downplay the value and impact of their green innovation ventures due to modesty or societal conditioning. This mindset barrier can result in a lack of assertiveness when seeking funding or negotiating partnerships. Women entrepreneurs may undervalue their achievements, leading to missed opportunities for growth and financial support. Additionally, because women tend to be more collaborative and community driven in their approaches to entrepreneurship, competitions, pitching dens, demo days etc. tend to be both less attractive and accessible for them. Statistics show that women have a stronger inclination to "make a difference in the world", whereas men focus their business goals more around wealth creation (GEM Women's Entrepreneurship Report 2022). Along the same lines, many entrepreneurs in green sectors might not only be driven by filling a market gap or "making it" as an entrepreneur, but also have a passion for sustainability and environmental topics. Many women entrepreneurs in the green sector have for example to some extent incorporated a social enterprise model in their business (add raw data source Nambula). While this can be a great motivator that helps overcome challenges and low points in the start-up journey, there is also the risk in this: If environmental sustainability is a (too) important factor in decision making, entrepreneurs might ignore market realities, de-prioritise profitability, or hesitate to change their model based on financial and business considerations.[9]

g) Limited Access to Mentors and Role Models: Mindset barriers can be perpetuated by the absence of mentors and role models who can inspire and guide women entrepreneurs in the green innovations sector. Without relatable examples of successful women in their field, women may struggle to envision themselves as leaders and trailblazers. The lack of mentorship and role models can impede their personal and professional development, contributing to mindset barriers such as self-doubt and a limited belief in their capabilities.

9 https://www.gemconsortium.org/report/gem-202122-womens-entrepreneurship-report-from-crisis-to-opportunity

4.3.6 Policy and Institutional Barriers

Policy and institutional barriers faced by women entrepreneurs in Africa in the green innovation sector can significantly impede their ability to start and grow their ventures. These barriers are often rooted in systemic challenges and require targeted interventions to promote gender equality and support women's entrepreneurship. Key policy and institutional barriers specific to women entrepreneurs in Africa's green innovation sector include:

***a) Limited Access to Finance*:** Women entrepreneurs in Africa face significant challenges in accessing finance for their green innovation ventures. Financial institutions may have stringent collateral requirements, high interest rates, or limited knowledge about the potential of green businesses. Additionally, women may have limited awareness of available financial resources, policies or lack the necessary financial literacy to navigate the funding landscape. Addressing this barrier requires developing financial products and mechanisms that specifically target women entrepreneurs, providing financial education and training, and promoting gender-responsive lending practices.

***b) Legal and Regulatory Constraints*:** Women entrepreneurs often encounter legal and regulatory constraints that hinder their ability to operate and grow their green innovation businesses. These constraints may include complex business registration processes, discriminatory property rights, and restrictive licensing requirements. Governments need to review and reform regulations to create an enabling environment that simplifies business registration, ensures equal property rights, intellectual property and facilitates access to necessary permits and licenses.

***c) Legal of Gender-Responsive Policies*:** The absence of gender-responsive policies and strategies in the green innovation sector can perpetuate inequalities and hinder women's entrepreneurship. Governments need to develop policies and programs that specifically address the needs and challenges faced by women entrepreneurs.[10] This includes creating gender-specific targets for funding allocation, establishing mentorship and training programs, and promoting gender equality in entrepreneurship support initiatives.

***d) Limited Institutional Support and Capacity Building*:** Women entrepreneurs often lack access to supportive institutions, such as business development centers, incubators, and innovation hubs, that provide mentorship, training, technology transfer mechanisms and networking opportunities. This is heightened for women entrepreneurs building solutions in the green economy in rural areas as such infrastructure is often limited to urban areas.

10 Agarwal, B. (2010). Gender and Green Governance: The Political Economy of Women's Presence Within and Beyond Community Forestry. Oxford Development Studies, 38(1), 25-40.

PFurther, there is a general lack of quality across the board in many existing hubs particularly when it comes to technical skills required to support the green sector. Lastly, because hub business models are predominantly underwritten by donor funding; they do not always meet the needs of the communities they serve as they are not paid for by the entrepreneurs, nor are their income models linked to the commercial success of the entrepreneurs.

Establishing and strengthening such institutions can facilitate capacity building for women entrepreneurs, foster knowledge exchange, and promote collaboration and innovation in the green innovation sector.

***e) Gender Bias and Stereotypes*:** Gender bias and stereotypes can influence the perception and treatment of women entrepreneurs in the green sector. Biased attitudes may lead to a lack of recognition, limited access to networks and resources, and lower confidence in the abilities of women entrepreneurs. Governments and institutions need to actively challenge gender biases, promote positive portrayals of women in entrepreneurship, and implement awareness campaigns to address stereotypes and biases.

***f) Limited Representation in Decision-Making Processes*:** The underrepresentation of women in key decision-making bodies and institutions within the green innovation sector can hinder their ability to influence policies and shape the sector's development. Efforts should be made to promote gender diversity and inclusion in decision-making processes, including the appointment of women to relevant advisory boards and committees.

***g) Lack of Data and Research*:** Insufficient data and research on women entrepreneurs in the green innovation sector in Africa can hinder evidence-based policy development and decision-making. Governments and institutions should invest in comprehensive data collection and research initiatives that specifically focus on women entrepreneurs, their challenges, and their contributions to the green sector.

***h) Public-private intersections and pressure to scale*:** While there is a sizable potential market and strong opportunity for growth within Africa's renewable energy, water and waste management sectors, it is important to note that many businesses within these are and will have to be infrastructure projects. This is because energy, water and waste disposal are considered basic human needs that in many cases are answered through the setup of permanent infrastructure such as grid lines, pipes and logistic systems. Business models and products in these sectors often substitute or compete with public infrastructure, and have to grow rapidly and operate at scale in order to be successful. Rapid growth requires robust supply of management, technical expertise and investment. At the same time, scaling infrastructure in rural and remote areas, as well as maintaining and managing dispersed infrastructure - be it water pipes, solar batteries or small scale waste plants - over time can be costly and challenging (World Bank: Performance of Water Utilities in Africa). These conditions make it difficult for entrepreneurs to grow and succeed in some renewable energy, waste and water market segments.[11]

Furthermore, as entrepreneurs create foundational infrastructure for countries, they are subject to major influence of the governments that regulate them. Governmental support and partnerships can provide stability and market access (Ande Green Entrepreneurship in Kenya Snapshot, 2023), but can also make businesses dependent on political actors and changes. This can cause considerable impact on the entrepreneurs setting up businesses - especially in unstable or intransparent political settings. While policies, subsidies, investment conditions and even price points might change rapidly, it is difficult for private start-ups to adjust to these changes while still struggling for scale and profitability. An example is the electricity price in off-grid solar systems that always has to compete with the price in (subsidized) governmental grid systems.

11 Http ://andeglobal.org/wp-content/uploads/2023/02/ANDE_Ecos

***i) Disjointed Agendas of Policy Makers*:** Lastly, there is often a disjoint in agendas of policy makers and development institutions and a lack of clarity of their role in the larger picture of developing the green sector. This can often be in conflict with local and community needs and efforts as well as local government focus areas. This could result in women being unwilling to participate in these agendas as they are often the custodians of initiatives at community levels. .

4.4 Key Insights

Women entrepreneurs in the green innovations sector are at the forefront of driving positive change in sustainable industries. However, despite their immense potential, they face numerous challenges that impede their progress. In this context, it is crucial to understand and address the barriers they encounter, ranging from access to markets and finance to cultural biases and policy limitations. By recognizing and addressing these challenges, we can create a more inclusive ecosystem that empowers women entrepreneurs and harnesses their innovative potential to drive sustainable development. In this chapter, we took a dive into the challenges faced by women entrepreneurs in the green innovations sector, including access to markets, finance, networks, cultural barriers, mindset, policy, and education among others. Key findings and insights include the following;

01	Difficulty in accessing markets is a major barrier faced by women entrepreneurs in the green innovations sector which is often driven by existing gender biases and stereotypes, difficulty in achieving product market fit, limited market information, lack of contacts, and discrimination in supply chains and procurement processes. When it comes to access to finance, women entrepreneurs often encounter challenges in securing adequate funding for their green innovation ventures. They face barriers such as limited access to capital, biased lending practices, and a lack of investment opportunities. Additionally, women may face difficulty in convincing investors and lenders of the profitability and viability of their ventures.
02	Similarly, building professional networks is crucial for business success, but women entrepreneurs may face difficulties in accessing supportive networks. Male-dominated networks, gender biases, and limited opportunities for networking and mentorship can pose obstacles for women seeking to grow their businesses. Cultural norms and societal expectations can also create additional challenges for women entrepreneurs in the green innovations sector. Gender roles, stereotypes, and biases can limit women's opportunities, hinder their decision-making authority, and affect their credibility in male-dominated industries.

03	We also learnt that mindset and lack of confidence could equally have a negative impact on how women entrepreneurs in the green sector start and build their business from startup to scale up. Few incubators and accelerators are designed to address power skills in women founding teams. As a result, when women entrepreneurs face internal challenges related to mindset and confidence around how they do business, it tends to undermine their belief in their own abilities, leading to self-doubt and reluctance to take risks. Building confidence and overcoming imposter syndrome are crucial for women entrepreneurs to succeed in the green innovations sector and given the low number of women led businesses that venture and succeed, it is critical to have more female role models.
04	With regards to policy and regulation, the absence of gender-responsive policies and regulations can further hinder women entrepreneurs in the green innovations sector. Policies that address gender inequality, provide support for women-owned businesses, and promote inclusive procurement practices can create a more conducive environment for women entrepreneurs to thrive.
05	Lastly, access to quality education and skills is essential for women entrepreneurs to develop the necessary skills and knowledge in the green innovations sector. Limited access to education and training opportunities can hinder women's ability to innovate, adapt to market demands, and compete effectively.

Addressing these challenges requires a multifaceted approach involving various stakeholders, including governments, businesses, investors, and support organizations. Promoting gender equality, providing targeted financial and business support, fostering inclusive networks, and implementing gender-responsive policies can help overcome these barriers and create a more equitable and inclusive environment for women entrepreneurs in the green innovations sector.

3

3

Existing mechanisms and practices to support women entrepreneurs in the green sectors in Africa

In Africa, several support mechanisms exist to promote and nurture women's green innovation and entrepreneurship activities. These initiatives aim to empower women and address the gender gap in this critical sustainable development sector. A recent report by ANDE (2023) highlighted that over half of organizations supporting green entrepreneurship are headquartered in Kenya (51%), with 43% being headquartered in Europe and the United States cumulatively; and only 3% in other African nations. Collectively however, this places Africa as a leader in this space. Intriguingly, whilst there appears to be several such initiatives focused on women entrepreneurs in areas such as clean energy, reforestation and sustainable agriculture. There remains gaps in women specific initiatives in areas such as water and sanitation, green infrastructure and the blue economy. In spite of these gaps, the research revealed that opportunities for channelling active women engagement in green entrepreneurship exist in 6 key areas as follows:

i. Capacity Building and Training: Many organizations provide capacity-building programs and training specifically designed for women in green entrepreneurship. These programs offer business development skills, technical knowledge, and mentorship, enabling women to enhance their entrepreneurial capabilities and successfully navigate the green sector.

ii. Networking and Collaboration: Networking events, conferences, and platforms connect women entrepreneurs with mentors, industry experts, potential investors, and other like-minded individuals. These networking opportunities facilitate knowledge exchange, collaboration, and the formation of partnerships, which can further support women's engagement and growth in green entrepreneurship.

iii. Access to Finance: Various funding opportunities, grants, and investment programs are available to support women entrepreneurs in the green sector. These include government grants, impact investing funds, angel investors and venture capital firms focused on sustainability, and crowdfunding platforms. These financial resources can help women start and scale their green businesses.

iv. Access to Market: Access to market activities plays a crucial role in channelling more women into green innovation in Africa. By providing opportunities for women entrepreneurs to reach customers, expand their networks, and explore market potential. These activities contribute to the growth and success of women-led green businesses. Some key opportunities in access to market activities for women in green innovation in Africa include market linkages; international trade and export opportunities; ecommerce and market places and; market research and business intelligence.

v. Policy Support: Whilst most Small business and Startup acts across the continent are either silent on green sector specific interventions or focus on overall development and support of startups (Innovation for Policy Foundation, 2023), governments and international organizations are increasingly recognizing the importance of women's involvement in the green economy. Supportive policies and initiatives are being developed to promote gender equality, remove barriers, and provide incentives for women to participate in green entrepreneurship.

vi. Research and development: Climate change has been noted to have a disproportionate impact on women compared to men and the lack of gender-disaggregated data hampers efforts to design effective interventions that address women's specific needs in coping with and adapting to climate change (Frontiers, 2022). While there is limited consensus on gender-responsive solutions to climate vulnerability, there is evidence that promoting women's participation in areas such as research and development can improve the outcomes for women within the frameworks and solutions being created across the continent.

This section will examine the mechanisms and practices that exist at the different stages of business development for women entrepreneurs in the sector citing some examples of programs under the various support organizations.

5.1 Mechanisms and Practices to Support Women Entrepreneurs in the Business Formation Stage

5.1.1 Support from Development Organizations

Development organizations play a crucial role in supporting women entrepreneurs in the business formation stage in the green sector. They provide various resources, programs, and initiatives tailored to address the specific needs and challenges faced by women at the beginning of their entrepreneurial journey.

Example: The United Nations Development Programme (UNDP, 2022) offers capacity-building programs to equip women entrepreneurs with essential skills and knowledge in areas such as business management, finance, marketing, and sustainable practices (UNDP, 2022).
These development organizations also provide financial support through grants, startup loans, and microfinance programs designed for women entrepreneurs (UNDP, 2015).

5.1.2 Support from Development Funders :

Funders, such as impact investors, angel investors and venture capitalists, and donors contribute to the support ecosystem for women entrepreneurs in the business formation stage. They offer financial resources, mentorship, and*Example: The Empress Pilot Fund (Shell Foundation, 2022) was a pilot fund managed by Africa Trust Group and established to*

Example: The Empress Pilot Fund (Shell Foundation, 2022) was a pilot fund managed by Africa Trust Group and established to provide pre-seed funding to women entrepreneurs in the Green sector in East and Southern Africa unitilising innovative financing instruments. This pilot fund was raised through investments from African angel investors on the continent and in the diaspora; the Shell Foundation (UK) and; the Foreign Commonwealth and Development Office (FCDO).

Whilst such Angel and VC funds like the Empress Pilot Fund enable women entrepreneurs in the sector through the formation and validation phases, there remains need for further funding that is sector specific and women focused in the scale and growth phases. A key learning from the Empress pilot fund was that many fund of funds perceive the intersection of gender and climate as high risk particularly because many green sector businesses may be located in rural areas with little support mechanisms. And thus in spite of return and impact being created at these early stages, there remains limited sector and gender specific funding support upstream. Additionally, donors such as Shell Foundation through collaborations like the example above or directly in their own capacity tend to play a crucial role in shaping the agenda as they have the power to influence and prioritise specific areas of focus within the green sector such as clean energy (Shell Foundation, 2019). This then plays an important role in which sectors within the economy get interest and funding from them as they are key funders particularly in the

early stages of business development when commercial viability is not yet established and businesses are less attractive to commercial funders.

5.1.3 Support from Academia

Academic institutions contribute to supporting women entrepreneurs in the business formation stage by offering educational programs, research opportunities, and entrepreneurship resources. They develop specialized courses, workshops, and certificate programs to equip women entrepreneurs with the knowledge and skills required to start and manage green businesses successfully.

Example: The Gender for Energy Security (GENS) is a Stellenbosch University Tier 1 Africa-UK Trilateral Research Chair, in collaboration with Brunel University London and University of Nairobi to build research capacity and produce knowledge across Africa concerning gender-informed innovation and commercialisation opportunities in alternative energy technology and services (GENS, 2021). They also run multi-stakeholder workshops to disseminate case study finding and contribute to policy development

Academic institutions also run business incubation centers that provide infrastructure, mentoring, technical expertise in sector-specific areas and access to research facilities to help women entrepreneurs refine their business ideas and validate their concepts. Such facilities have been critical in building expertise in the space and creating an intersection for academia to intersect with practice and create leverage.

5.1.4 Support from Accelerators and Incubators

Hubs in the form of both accelerators and incubators play a significant role in supporting women entrepreneurs in the business formation stage as there tends to be overlaps in their reach. These play a particularly key role in supporting green businesses focused on technology-driven green innovations. They provide co-working spaces that offer office infrastructure, laboratories, prototyping facilities, high-speed internet, and a collaborative environment for women entrepreneurs (World Bank, 2019). These resources help entrepreneurs reduce overhead costs and access the necessary infrastructure to develop and test their green innovations.

Accelerators and Incubators also organize training programs, mentorship initiatives, and provide access to specialized resources such as laboratories and prototyping tools.

Example:
The future females tech hub (Future females, 2022) whilst virtual, provides a 12 week accelerator that supports female entrepreneurs, with a core focus on those in the green economy. The aim of the program is to increase the number of and support the success of female entrepreneurs in the sector.

Accelerator and incubator programs include guidance on business planning, market research, product development, and financial management. The aim is to help the entrepreneurs to refine their business models, develop viable products or services, and create sustainable business strategies.

Lastly, accelerators and incubators also lend credibility and legitimacy to the entrepreneurs especially where they themselves have a good reputation (Entrepreneur India, 2018). This creates significant value as it increases the entrepreneurs ability to access key networks where they can find co-founders and key hires, strategic partners and clients, as well as accessing funding.

5.1.5 Support from Policy Makers

Policy makers are meant to create an enabling environment for entrepreneurs to thrive. An analysis of 21 African Small business and Startup Acts, however, revealed that only 36% of the acts had women-specific interventions in spite of an understanding of the additional barriers that women face in entrepreneurship (Innovation for Policy Foundation, 2022). Additionally, most remain silent on green sector specific interventions.

In spite of these gaps in Startup acts, policy makers are increasingly starting to design and implement stand alone supportive policies and initiatives that address the specific challenges faced by women entrepreneurs in the green sector and provide financial incentives such as tax breaks or grants to such businesses and/or financial institutions that support them (United Nations Economic Commission for Africa, 2020). Policy makers also collaborate with development organizations, funders, academia, accelerators and incubators, and other stakeholders to ensure a coordinated approach to supporting women entrepreneurs.

Example:
The Zambian government through a multi-stakeholder project involving government, development organisations, private sector and civil society developed a Climate Change Adaptation Policy that looked to incentivise private sectors involvement in investing in the green sector. The policy included a focus on gender and ensuring that women entrepreneurs are not left behind in the opportunities that exist in the sector (GWP, 2021).

Through this kind of convening power, policy makers create opportunities for networking and collaboration among entrepreneurs, industry experts, investors, and other stakeholders which can open up potential partnerships. Further, these networks can be valuable for accessing resources, market insights, and more business opportunities. Lastly, policy makers have been noted to create curricula and learning materials targeted at aspiring women entrepreneurs that are made available to entrepreneur support organisations such as hubs and non-governmental organizations (ILO, 2004).

5.2 Mechanisms and Practices to Support Women Entrepreneurs in the Business Validation Stage

5.2.1 Support from Development Organisations

Development organizations continue to provide support to women entrepreneurs in the business validation stage in the green sector. They offer targeted assistance to help women entrepreneurs refine their business models, validate their products or services, and prepare for market entry. This also includes initiatives that offer funding during the validation phase in forms of grants and/or loans.

Example:
The Africa Development Bank through its Africa Adaptation Acceleration Program (AAAP) partnered with the Africa Climate Change Fund to launch the YouthADAPT program that looks at empowering women and youth in green sector entrepreneurship to advance innovative, transformative climate-resilient bankable projects and create jobs. The program included a grant facility of $1m (AfDB, 2022).

5.2.2 Support from Funders

Funders play a critical role in supporting women entrepreneurs in the business validation stage by providing financial resources, mentorship, and strategic guidance to help women entrepreneurs refine their business models, validate their products or services, and prepare for market entry.

Example:
The Green Pioneer Accelerator program supported by funders including the Climate Investment Funds and the United Nations Development Programme, focuses on supporting early-stage entrepreneurs in developing countries, working on innovative climate solutions. The program provides a comprehensive package of support, including access to funding, mentorship, technical expertise, and networking opportunities. Through the program, women entrepreneurs in the green sector receive financial support in the form of seed funding or grants to validate their business ideas, develop prototypes, and conduct market testing. The funding helps cover the costs associated with product development, market research, and early-stage operations (Impact Amplifier, 2015).

Additionally, funders offer investment readiness programs to help women entrepreneurs develop their pitch decks and business plans (European Investment Bank, 2021) as well as provide access to networks and connect women entrepreneurs with potential investors and partners (UNCDF, 2021).

5.2.3 Support from Academia

Academic institutions continue to support women entrepreneurs in the business validation stage by offering resources, expertise, and access to networks. They develop business validation programs and research collaborations that assist women entrepreneurs in refining their business models and assessing the market feasibility of their ventures.

Example:
Strathmore University in Kenya offers training programs and workshops specifically designed to empower women in the green sector. This includes programs such as Solar Training for Women (Strathmore University, 2023) and Gender Equality and Social Inclusion (GESI) in the Energy Sector (Strathmore University, 2021). These programs assist the different stakeholders including the women entrepreneurs in the sector to collaboratively work together to develop data-driven plans to increase access to clean energy.

Academic institutions also leverage alumni networks to provide mentorship and networking opportunities for women entrepreneurs (Chaminade & Peneder, 2017).

5.2.4 Support from Accelerators and Incubators

Accelerators and Incubators continue to support women entrepreneurs in the business validation stage, particularly those focused on technology-driven green innovations. They offer validation programs, product iteration support, and access to investor networks. Accelerators and Incubators provide assistance in refining prototypes or minimum viable products (MVPs) based on user feedback and market research (Ventures Africa, 2020).

Example: Enrich in Africa through its partner incubators and accelerators across the African continent launched the Green Economy Start-up project for innovators, entrepreneurs, start-ups or SMEs working to achieve SDG 12 & SDG 13. The program provided promising start-ups with an opportunity to participate in a four-month programme to support them to the next level of growth through advancing their business skills, providing expert advice, and nourishing potential investor relationships. The Start-ups had to be 50% owned by women (Enrich in Africa, 2022).

These hubs also facilitate connections with potential investors and organize pitch events for women entrepreneurs to attract investment (World Bank Group, 2018). Others, such as the Grindstone X accelerator, even provide funding themselves to entrepreneurs at this stage as the businesses have some proven commercial viability at this stage (Ventureburn, 2023).

5.2.5 Support from Policy Makers

Policy makers continue to support women entrepreneurs in the business validation stage by creating an enabling policy environment. They establish regulatory support mechanisms and funding programs that facilitate validation and testing of green innovations (IISD, 2020).

Example:
The South African government through a collaborative process between the Department of Trade, Industry and Competition (the dtic) and Department of Women, Youth and Persons with Disabilities released a report on the "Empowerment of Women in Green Industry Policy Assessment" in 2021. It was an important step towards developing an informed, coherent and co-ordinated policy and implementation framework for increasing women's leadership and participation in the green industry and green entrepreneurship in South Africa (DTIC, 2021).

Policy makers also promote collaboration and knowledge sharing among women entrepreneurs, industry experts, and research institutions (African Union Commission, 2019).

5.3 Mechanisms and Practices to Support Women Entrepreneurs in the Business Growth Stage

5.3.1 Support from Development Organizations

Development organizations continue to provide tailored resources, programs, and initiatives that assist women entrepreneurs in scaling up their businesses in the growth stage. This includes programs that enable them to expand their markets and access new opportunities as well as catalytic funding (ESI Africa, 2022).

Example: The Africa Development Bank through the Africa Climate Change Fund runs a call for proposals called Gender Equality and Climate Change, where scale stage businesses can apply for funding as it aims to triple climate financing efforts and foster a climate-resilient Africa. Since inception, a total of $15m+ has been invested in the form of grants (AfDB, 2022).

Development organizations also facilitate market access and trade facilitation through intermediaries thus, connecting women entrepreneurs with potential buyers, distributors, and international markets (UNDP, 2017).

5.3.2 Support from Funders

Funders play a crucial role in supporting women entrepreneurs in the business growth stage by providing financial resources, mentorship, and strategic guidance. They offer growth capital in form of grants, venture capital, private equity and / or traditional loans to women entrepreneurs to support their expansion plans.

Example: ShEquity's purpose is to provide smart and sustainable investments into African female entrepreneurs and innovators as well as the operational support needed to unlock their full potential. This support enables more female-led businesses to grow, create more jobs, embark on scaling paths, and contribute to sustainable development (ShEquity, 2020).

Funders also facilitate access to networks and connect women entrepreneurs with potential investors, strategic partners, and industry experts.

5.3.3 Support from Academia

Academic institutions continue to businesses in the green sector through their growth stage by offering resources, expertise, and access to networks. Whilst not specifically tailored to women entrepreneurs, Universities develop executive education programs focusing on leadership development, strategic planning, and financial management which are key for scaling as well as sector specific education.

Example: BA Isago University in Botswana launched the first ever Climate Change and Entrepreneurship Centre on the 20th of October 2022. The aim of the center is to do research and training that enhances the University research output through workshops and short courses to stimulate professional development on Climate Change (BA Isago, 2022).

Academic institutions also engage in research collaborations to provide insights, analysis, and recommendations for business growth in key sectors such as climate for entrepreneurs as well as policy makers. An example of this was the launch of the Business Schools for Climate Leadership Initiative that aims at building a collaborative framework for climate action to transform business education and match the needs to the realities of the African continent. The initiative saw 6 key universities from across the continent being involved in creation and launch (GIBS, 2022).

5.3.4 Support from Accelerators and Incubators

There is a growing number of Accelerators and Incubators focused on scaling green sector businesses at the growth stage. Whilst not gender specific, these programs provide access to tailor made support to enable the businesses to scale including entrepreneurship education, access to investor networks of venture capitalists, angel investors, and impact investors.

Example:
The ASAP project by Village Capital aims to build a global ecosystem for small- to medium-sized companies in emerging markets that create technologies, products, and services geared towards climate adaptation and building resilience to the impacts of climate change (Village Capital, 2022).

Accelerators and Incubators also offer programs that provide resources, mentorship from industry experts, investors, and ecosystem partners and enable entrepreneurs to access the tools they need to attract investment and grow their businesses and impact (Village Capital 2022).

5.3.5 Support from Policy Makers

Policy makers across the continent have been driving towards specific gender interventions within the green sector especially where climate adaptation is involved. Policy interventions are meant to address the intersection and gender and race and ensure that women entrepreneurs survive the startup phases and get into the business growth stage by creating an enabling policy environment.

Example: In March 2022, African countries adopted a common African position to integrate gender into the climate change action agenda. The AU aims to enhance continental responses by better addressing the intersectional impacts of climate change, gender and migration (ISS, 2023).

Additionally, there are efforts to establish policies that promote access to government contracts and procurement for women entrepreneurs. Policy makers also provide regulatory support, such as streamlining regulations and reducing administrative burdens, to facilitate business growth in key sectors such as climate, albeit not gender specific.

5.4 Key Insights

Several support mechanisms exist in Africa to promote women entrepreneurs in the green sector, aiming to empower women and address the gender gap. The follwing keys insights highlight the diverse support mechanisms and practices available to support women entrepreneurs in the green sectors in Africa, aiming to overcome barriers and promote their participation in the green economy and sustainable development overall.

01	While there are initiatives focused on women entrepreneurs in areas like clean energy, reforestation, and sustainable agriculture, there are gaps in women-specific initiatives in areas such as water and sanitation, green infrastructure, and the blue economy.
02	Six key areas provide opportunities for active women engagement in green entrepreneurship: capacity building and training, networking and collaboration, access to finance, access to market, policy support, and research and development.
03	Mechanisms and practices to support women entrepreneurs exist at varying stages of business development and include support from development organizations, funders and donors, academia, accelerators and incubators, and policy makers.
04	Development organizations provide resources, programs, and financial support through grants and other funding both directly to women entrepreneurs or to support organizations that work with them. Funders offer financial resources, mentorship, and industry connections. Donors work with funders and entrepreneur support organizations through direct and indirect funding as well as with setting the agenda of focus and offering technical assistance. Academia offers educational programs, research opportunities, and entrepreneurship resources. Accelerators and incubators provide co-working spaces, training programs, mentorship, and access to specialized resources. Policy makers create an enabling environment and collaborate with various stakeholders.
05	While there are mechanisms and funding programs that specifically target women entrepreneurs in the earlier stages of business formation and validation, there is often a lack of disaggregated funding support for women in the later stages of business growth.

Opportunities and Synergies

Africa holds immense potential to lead in the development of the green sector entrepreneurship, with a notable advantage already in place. Currently, an impressive 54% of entrepreneur support organisations dedicated to nurturing green sector entrepreneurs are based in Africa (ANDE, 2023). This presents a real opportunity for the continent to assert itself as a global leader in environmentally conscious and sustainable business practices. Moreover, Africa has the potential to drive progress by actively promoting gender equality within this sector. This section focuses on some key opportunities that can be harnessed and synergies that can be leveraged to make this a reality and ensure that women entrepreneurs are at the core of this development.

6.1 Funding

When it comes to funding, there are 4 core opportunity areas where funders, policy makers and civil society in the form of philanthropic organisations can participate:

6.1.1 Pre-seed financing

Women entrepreneurs in the green sector in Africa can be better supported in accessing pre-seed financing for the formation to validation stages of their businesses through targeted programs and initiatives. This can involve establishing funds specifically dedicated to supporting women-led green startups, providing more accessible type of funding such as grants, and offering low-interest loans.These would provide women entrepreneurs with the confidence and opportunity to test out their ideas, build prototypes and experiment with the indigenous knowledge they have on more commercially viable scales. It could also involve collaborations that embed pre-seed funding from existing funds within organisations already working with green women entrepreneurs which may help to reduce fund management overheads while leveraging existing mechanisms, pipeline and familiarity and access with and to entrepreneurs.

6.1.2 Pre-seed financing

There is an increasing case for enabling more innovative financing mechanisms tailored to the needs of women entrepreneurs in the green sector in Africa (Shell Foundation, 2023). This could include the use of more revenue based financing instruments that take into consideration the unique cultural context of women entrepreneurs such as lack of collateral as well business contexts such seasonality of some of the business models that are present in the sector. Additionally there are opportunities in utilising crowdfunding platforms such as Africa Venture Philanthropy Alliance that promote venture philanthropy and have a platform for gender-lens investing (AVPA, 2023) to showcase women-led green ventures for funding. Lastly, there are opportunities for promoting collaboration between financial institutions, NGOs, philanthropic organisations and government agencies that can facilitate for the development of these innovative financing models such as the partnership between Shell Foundation, FCDO and Africa Trust Group that allowed for the creation and testing of innovative financing instruments into early stage women-led ventures in the green economy (Ventureburn, 2021).

6.1.3 Sector and women-specific funding for business growth

There is a unique opportunity for establishing venture capital and private equity funds at the intersection of gender and race to invest in women entrepreneurs in the scaling and growth stages of business where there is less segmentation by gender for both funding and programmatic support. This is a potential opportunity for impact investment funds that may already be either funding with a gender lens or a climate lens to consider the benefits and return potential at the intersection. At a higher level, there is additional opportunity for considering the role that gender and climate bonds could play in stimulating investments into such funds to enable their establishment.

6.1.4 Creative incentives for investing into the sector

Incentives are crucial for driving investment into the green sector. They stimulate economic growth, job creation, and innovation by attracting investments from the private sector into the space as they help to mitigate risks (perceived and real), promote market competitiveness, foster research and innovation, and align investments with green and sustainability goals. These can include things such as guarantee funds from both governments and local and regional development finance institutes that encourage private funders to invest into the sector such as the LEAF program by AfDB (AfDB, 2022). By offering financial incentives focused on the intersection of gender and the green economy, governments can accelerate the transition to a greener and more sustainable future whilst enabling and ensuring the equal participation of women entrepreneurs.

6.2 Capacity development

When it comes to capacity development for women entrepreneurs in the green sector, there are again **3 core areas of opportunity** highlighted below:

6.2.1 Capacity development in areas of the green sector which have received less focus

Enhancing capacity building and academic educational opportunities for women entrepreneurs in sectors like water, sanitation, and hygiene (WASH) and green building is essential in order to widen participation of women entrepreneurs in the green sector. This can involve organising workshops, training sessions, and entrepreneurship programs that equip women with the necessary skills and knowledge in these specific areas that have seen less focus.

6.2.2 Funding specific capacity development

Enhancing capacity building and academic educational opportunities for women entrepreneurs in sectors like water, sanitation, and hygiene (WASH) and green building is essential in order to widen participation of women entrepreneurs in the green sector. This can involve organising workshops, training sessions, and entrepreneurship programs that equip women with the necessary skills and knowledge in these specific areas that have seen less focus.

6.2.3 Flexible or hybrid training programs

It is important for the designers of capacity building programs such as accelerators and incubators to take into consideration the unique cultural contexts facing women entrepreneurs in Africa such as the fact that women are still considered the primary caregivers of families. As such, ensuring that such programs have some level of flexibility in how they are delivered as well as time of completion becomes key. Additionally, with increased access to technology via mobile phones, ensuring that delivery can incorporate hybrid options that incorporate both in person attendance for those that can attend in person and with digital access for those that may not be able to, will go a long way to widening adoption by women entrepreneurs.

6.2.4 Training of supporting actors in the sector

The training of enabling and support actors such as government officials, hubs, and academia on the needs of the green sector in Africa, particularly women within it, is of utmost importance. This would enable a more coordinated support environment that takes into consideration the differing needs in the sector. By providing targeted training, these key stakeholders can gain a comprehensive understanding of the specific challenges, opportunities, and support required for the advancement of women entrepreneurs in the green sector.

It would also equip them with the knowledge and tools to develop effective policies, initiatives, and programs that address the unique needs of women entrepreneurs in the green sector, fostering an inclusive and supportive environment for their success. Much effort is put into supporting ESOs specifically to enhance their gender inclusivity in sourcing, programming and providing access to finance to entrepreneurs.

A number of valuable toolkits and guides have been developed, providing specific tips, templates and ToDos for incubators and accelerators to better serve women. Examples for green sector specific toolkits are the Climate KIC WeClim Equally Gender Smart Handbook,[12] as well as USAid's Workbook for Clean Energy Incubators on Gender Inclusive Recruitment and Selection.[13]

6.3 Role modeling to stimulate culture shifts

The media plays a vital role in shaping perceptions and can contribute to a culture shift that supports women entrepreneurs in the green sector. Highlighting success stories and achievements of women in the green sector through media platforms can inspire others and challenge stereotypes.

Additionally, promoting role models and organising networking events that bring together successful women entrepreneurs and aspiring green leaders can help foster a supportive ecosystem and encourage more women to enter the sector.

12 https://www.climate-kic.org/wp-content/uploads/2022/05/EIT-Climate-KIC-WeClim-Equally-Gender-Smart-Handbook_reduced.pdf

13 https://www.climatelinks.org/sites/default/files/asset/document/2019_USAID-RALI-Project_Recruitment-Guidance_0.pdf

6.4 Key Insights

01	Africa has the potential to lead in the development of the green sector and promote gender equality within it. The continent already houses a significant number of entrepreneur support organizations dedicated to nurturing green sector entrepreneurs, presenting an opportunity for Africa to assert itself as a global leader in environmentally conscious and sustainable business practices.
02	Capacity development for women entrepreneurs in the green sector can be improved through the increase in focus in areas of the green economy that have received less attention such as water and sanitation; technical assistance funding that includes navigating technical skills as well as the financing landscape; creation of hybrid programs with flexibility of delivery methods; and training of support actors such as government officials and hubs.
03	Funding opportunities for women entrepreneurs in the green sector can be enhanced through strategies such as increased pre-seed financing to support the formation and validation stages; creation of more innovative financing mechanisms better suited to the context and cultures of women in the sector; sector and women specific funding for the business growth stages; and provisions of incentives for private sector involvement in the funding of the intersection of gender and climate.
04	Highlighting success stories of women in the green sector through media platforms, promoting role models, and organizing networking events that normalize women's participation in the green economy can contribute to a culture shift that supports and inspires more women to enter the sector.

Conclusion and Recommendations

7.1 Conclusion

The green sector is a critical sector for sustainable development, and women entrepreneurs play a vital role in driving its growth. This report has shed light on the status and challenges surrounding women's inclusion in the green innovation ecosystems as well as the existing support organizations and mechanisms. By examining these aspects, we have gained valuable insights into the opportunities that can help increase women's participation at various levels of the ecosystems and have provided recommendations for moving forward on key areas affecting women in the sector. Our ultimate goal is to contribute to the overall inclusion of women in the green innovation and entrepreneurship sectors across Africa.

By ensuring that women entrepreneurs are actively involved in the green innovations ecosystem, we can unlock a multitude of positive outcomes and potential developments. Firstly, their inclusion can lead to greater diversity of perspectives and ideas, fostering innovation and creativity within the sector. Women possess unique insights and experiences that can contribute to more comprehensive and sustainable solutions to environmental challenges.

Furthermore, when women are empowered and provided with equal opportunities in the green innovation ecosystem, it has a ripple effect on society as a whole. Women become role models and inspirations for future generations, encouraging more women to pursue careers in this field. This not only promotes gender equality but also strengthens the overall talent pool, enhancing the sector's ability to tackle complex environmental issues.

To achieve these positive outcomes, the report has put forward several recommendations and strategies to enhance women's participation and impact in the green innovations ecosystem. These include:

Promoting access to education and training: Investing in educational initiatives that specifically target women in green innovation can equip them with the necessary skills and knowledge to thrive in the sector. This includes technical training, business development programs, and mentorship opportunities.

Fostering supportive networks and collaborations: Creating networks and platforms that facilitate connections between women entrepreneurs, investors, and industry experts can foster collaboration, knowledge sharing, and access to resources. This can help women overcome the barriers they may face and provide them with the support needed to succeed.

Addressing funding and investment gaps: Increasing access to capital is crucial for women entrepreneurs in the green innovation ecosystem. Governments, development organizations, and private investors should develop financial mechanisms and programs that specifically target women-led ventures and provide them with adequate funding opportunities.

Promoting policy and institutional changes: Advocating for policies that promote gender equality and inclusivity within the green innovation ecosystem is essential. This includes removing legal and regulatory barriers, promoting gender-responsive procurement practices, and encouraging gender-balanced representation in decision-making bodies.

7.2 Recommendations

Recommendations	Target Helix actor(s)	Business stage
Access to Finance		
Addressing barriers of funding requires a multifaceted approach that involves various stakeholders. Encouraging diversity in investor networks and decision-making roles, promoting gender-inclusive policies, providing targeted mentorship and networking opportunities, and offering financial education and support specifically tailored to women entrepreneurs in the green innovations sector can help bridge the funding gap and create a more equitable entrepreneurial landscape.		
Funding opportunities for women entrepreneurs in the green sector can be enhanced through strategies such as	Funders, Capital Providers, Development Partners, Investors	Seed to Growth/ Mature
Increased pre-seed financing to support the formation and validation stages of women led-startups/ventures	Grant providers, Angel investors	Pre-seed
Creation of more innovative financing mechanisms better suited to the context and cultures of women in the sector	Banks, MFIs, Development Finance Providers- Blended finance through/ grants and loans	Growth/Mature
Creation of sector and women specific funding for the business growth stages	Government through green bonds, Venture capitalists, Angel investors, Accelerators	Growth/Mature
Provisions of incentives for private sector involvement in the funding of the intersection of gender and climate	Government -public funds/empowerment funds	Pre-accleration/ Growth/Mature

Recommendations	Target Helix actor(s)	Business stage
Capacity Development, Education and Training		
Addressing educational barriers requires a multi-faceted approach involving various[1] stakeholders, including governments, educational institutions, academia, business incubators and accelerators, Enterprise Support Organizations (ESOs) and private sector actors.		
Promoting Gender-Inclusive Education is critical. Governments and educational institutions should work towards eliminating gender biases in education systems and ensure equal access to quality education for girls and women. Encouraging girls' participation in STEM fields and providing scholarships or financial assistance can help bridge the educational gap.	Tech Hubs, Academia, Research agencies, ESOs, Civil Society, Media	Ideation to Growth
Efforts should be made to **disseminate information on green innovations, funding opportunities, and training programs** through diverse channels, including online platforms, community centers, and women-focused organizations. This can be achieved through partnerships between government agencies, ESOs, and private sector entities.	Tech Hubs, Academia, Research agencies, ESOs, Civil Society, Media	Ideation to Growth
Investing in digital literacy programs targeted at women entrepreneurs can enhance their access to information and communication technologies.	Tech Hubs, Academia, Research agencies, Innovation Centers	Ideation to growth
Providing training on using online resources, social media platforms, and digital marketing can help women overcome the digital divide and gain better access to relevant information and training.	Tech Hubs, Media, Digital training providers	Ideation
Establishing Mentorship and Networking Programs that connect experienced women entrepreneurs with aspiring ones can provide guidance, support, and networking opportunities	Tech Hubs, Universities, Enterprise Support Organisations	Ideation to Growth
It is also important for the designers of capacity building programs such as accelerators and incubators **to take into consideration the unique cultural contexts facing women entrepreneurs in Africa** such as the fact that women are still considered the primary caregivers of families	Tech Hubs, Universities, Enterprise Support Organisations	Ideation to Growth

Recommendations	Target Helix actor(s)	Business stage
Access to Markets		
Creating Gender-Inclusive Market Access Programs: Governments and organizations should develop programs that specifically target women entrepreneurs in green innovations and facilitate their access to markets. These programs can include training on market research, pricing strategies, and negotiation skills, as well as providing platforms for showcasing and promoting their products and services to increase their visibility and participation in the sector.	Market Builders, Trade Associations, Chambers of Commerce, Green Industry agencies	Validation to Growth
Creating networks and mentorship programs that connect women entrepreneurs with experienced industry professionals and potential business partners can help provide guidance, support, and access to new market opportunities. These programs should focus on fostering collaboration, knowledge sharing, and relationship building.	Tech Hubs, Universities, Enterprise Support Organisations, Mentorship Networks	Ideation, Validation, Growth
Promoting Gender Diversity and Inclusion: Encouraging gender diversity and inclusion in industry associations, trade fairs, conferences, and other business events can provide women entrepreneurs with networking opportunities and enhance their visibility.	Women Entrepreneurship Resource Centers, Accelerators, Incubators, ESO's,	Validation to Growth
Ensuring equal representation in decision-making spaces can help address systemic barriers and create a more supportive ecosystem for women in the green innovation sector.	Government, Incubators, Accelerators, Civil Society, Academia	Ideation to Growth
Strengthening Access to Information and Resources: Governments and organizations should invest in providing women entrepreneurs with access to relevant market information, business development programs, and resources. This can be done through capacity-building initiatives, targeted training programs, and the establishment of online platforms or directories that provide information on market opportunities, funding options, and support services.	Market Enablers, Information Resource Centers, Government, Academia, Tech Hubs, Accelerators, Media	Ideation to Growth

Recommendations	Target Helix actor(s)	Business stage
Cultural and Societal Barriers		
Encouraging cultural shifts that challenge gender stereotypes, promoting entrepreneurship education and training for women, establishing mentorship programs, and celebrating the achievements of successful women entrepreneurs can help dismantle these cultural barriers and create a more enabling environment for women in the green innovations sector.		
There is a need for increased visibility and recognition of women's achievements in the sector through media coverage] , awards, and showcases. This can inspire more women to pursue green entrepreneurship and create role models for future generations.	Intersections, Civil Society, Media	Ideation to Growth
Additionally, policy interventions that promote gender equality and address discriminatory practices can also play a significant role in overcoming these cultural barriers. It is **crucial to foster a supportive and empowering ecosystem for women entrepreneurs.**	Civil Society, Academia, Government	Ideation to growth
Providing mentorship programs, leadership development initiatives, and networking opportunities can help women overcome self-limiting beliefs, build confidence, and strengthen their entrepreneurial mindset.	Tech Hubs, Universities, Enterprise Support Organisations, Innovation Centers	Ideation to Growth
Encouraging risk-taking, celebrating achievements, and promoting a growth-oriented mindset can also play a significant role in empowering women entrepreneurs in the green innovations sector.	Tech Hubs, Universities, Enterprise Support Organisations, Media	Growth
Raising awareness about imposter syndrome and providing support systems to combat it can help women recognize and overcome this mindset barrier. The media plays a vital role in shaping perceptions and can contribute to a culture shift that supports women entrepreneurs in the green sector. **Highlighting success stories and achievements of women in** the green sector through media platforms can inspire others and challenge stereotypes.	Leadership Centers, Accelerators, Mentorship Networks, Incubators, Digital Agents	Ideation to Growth
Promoting role models and organizing networking events that bring together successful women entrepreneurs and aspiring green leaders can help foster a supportive ecosystem and encourage more women to enter the sector.	Leadership Centers, Accelerators, Mentorship Networks, Incubators, Digital Agents	Ideation to Growth

Recommendations	Target Helix actor(s)	Business stage
Policy and Regulation		
Addressing policy and institutional barriers requires a coordinated effort from governments, policymakers, institutions, and civil society organizations. It involves:		
Creating an enabling policy environment that puts women at the forefront	Governments, Policy Makers, Public/private regulators, Standards and Certification Agencies	Ideation to Growth
Promoting gender-responsive programs and initiatives	Government, Tech Hubs, Accelerators, Incubators, Civil Society, Academia	Ideation to growth
Enhancing institutional support systems in the green innovation sector	Government, Tech Hubs, Accelerators, Incubators, Civil Society, Academia	Ideation to Growth
Fostering a culture of gender equality and inclusivity in the green innovation sector	Government, Tech Hubs, Accelerators, Incubators, Civil Society, Academia	Growth
Helping Tech Hubs and NGO actors to become more gender inclusive, for example through guided self-assessments, tools and resources that enhance gender inclusivity in programming, resourcing, organizational development and interactions with the ecosystem (see for example the Gender Resource Library of the Hub Collective)	Government, Academia, Policy Makers, Enterprise Support Organizations, Resource Centers, Tech Hubs	Ideation to Growth
Academic institutions **could be more deliberate about linking to the green sectors** in even more meaningful ways. For example, in addition to seeding innovative ideas and creating entrepreneurs, they could also produce research, development, technology, and training staff of startups both in terms of interns but also full time staff.	Leadership Centers, Accelerators, Mentorship Networks, Incubators, Digital Agents	Ideation to Growth

Further details on the recommendations can be found in the following section of the chapter.
In conclusion, by implementing these recommendations and strategies, we can create an environment that encourages and supports women's inclusion in the green innovation ecosystem. It is thus imperative that stakeholders across Africa come together to prioritize and act upon the recommendations outlined in this report. By doing so, we can pave the way for a more inclusive and sustainable future, where women are active participants and leaders in the green innovation and entrepreneurship sectors that contribute not only to the achievement of sustainable development goals but also drive economic growth, social empowerment, and environmental preservation.

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