

EVI-SICEE-RESEARCH BRIEF-09

Scaling youth- and women-led clean energy enterprises in South Africa: challenges and enabling factors

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KEY MESSAGES

- Youth- and women-led clean energy enterprises are contributing to South Africa's energy transition through innovative solutions in solar energy, biogas sectors.
- Enterprise growth and scaling remain constrained by limited access to finance, regulatory bottlenecks, weak market development, infrastructure challenges, and persistent gender inequalities.
- Strengthening financing mechanisms, business incubation, policy coordination, skills development, and innovation networks is critical to enabling inclusive participation in South Africa's clean energy transition.

1. BACKGROUND

70% of electricity is produced from coal-fired power stations in South Africa, many of which were constructed during the 1960s and 1970s under apartheid. Since 2007, South Africa has experienced recurring load shedding (scheduled electricity outages), driven by ageing coal-based infrastructure, underinvestment in maintenance, generation shortfalls, and governance challenges within the electricity sector (IEA, 2024). Renewable energy sources now contribute approximately 12% (see Fig.1) of national electricity generation and an increasing share of installed generation capacity, reflecting the country's commitment to diversifying its energy mix, improving energy security, and supporting a low-carbon transition (IEA, 2024).

South Africa's commitments under international frameworks such as the Paris Agreement and the outcomes of COP26, together with national policy initiatives including the Integrated Resource Plan (IRP 2019) and the Just Energy Transition Investment Plan (JET-IP), have accelerated efforts to expand renewable and low-carbon energy deployment (DMRE, 2019). These initiatives seek to diversify the country's energy mix through the increased use of clean energy sources, including solar, wind, hydropower, bioenergy, gas and nuclear power. Expanding clean energy capacity is expected to reduce dependence on fossil fuels, strengthen energy security, enhance system resilience, and contribute to South Africa's climate mitigation commitments (IRENA, 2024; IEA, 2024). However, Anekwe et al. (2024) highlights that South Africa's approach to integrating clean energy into its energy mix is often fragmented and lacks sufficient institutional and financial support. This limits the pace of clean energy expansion and highlights the need for a more coordinated and robust policy environment to drive sustainable energy development.

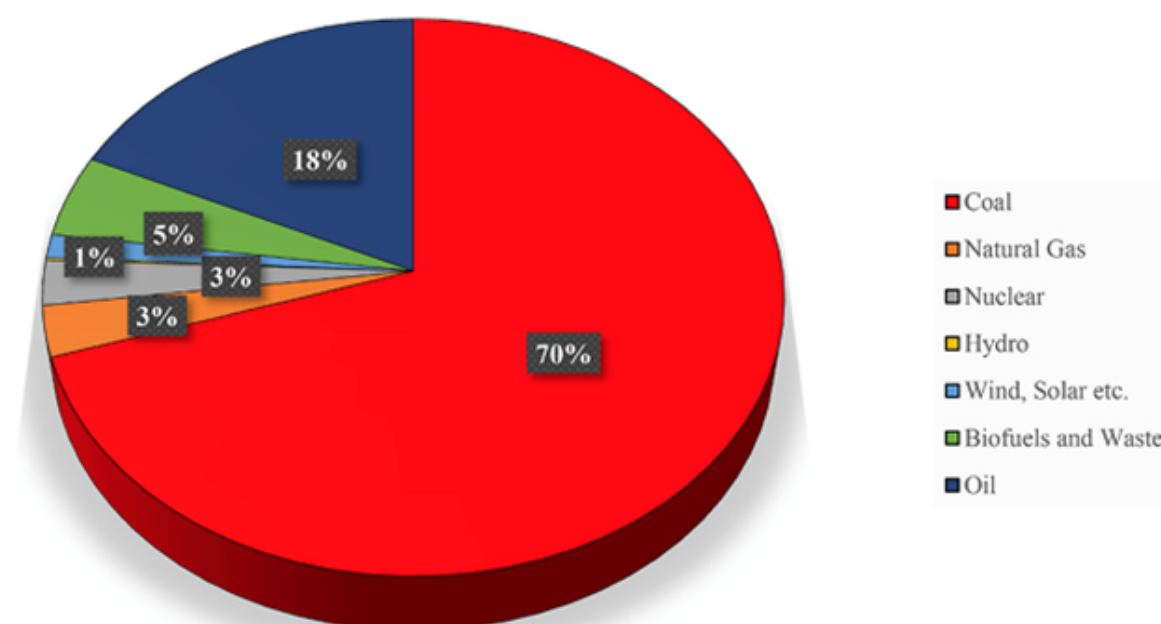


Figure 1: South Africa energy mix. Source (IEA, 2024)

The solar and biogas sub-sectors, represent two critical pillars of South Africa's clean energy landscape, each addressing unique challenges related to energy access, environmental sustainability, and equitable participation in the clean energy economy. Solar energy sector has expanded steadily, with increasing applications across various fields. Solar energy is utilized in a wide range of applications, including household devices, water heating, lighting, pumping systems, communications, transportation, and electricity generation (Anekwe et al., 2024). Biogas on the other hand, presents a clean energy option particularly suited for thermal energy needs in rural communities, helping to address ongoing national energy challenges. However, its adoption particularly in rural households remains limited. (Kamusoko & Mukumba, 2025).

The country is also focusing on the 'just transition' which goes beyond simply supplying energy; it requires the fair allocation of resources and opportunities, ensuring that society's most vulnerable groups are not excluded or left behind (IRENA, 2025). This takes a broader focus on the impacts and opportunities of the transition from dirty fuel technologies to clean energy technologies. Empowering youth and women-led clean energy enterprises (CEEs) and increasing their participation in energy production and distribution not only fosters innovation and entrepreneurship but also ensures that the benefits of the clean energy transition are more equitably distributed, contributing to sustainable development goals (SDGs) and broader socio-economic transformation across the region. Addressing these gaps requires evidence-driven interventions that effectively connect market opportunities with the needs, skills, and ambitions of women and youth. This research article is focused on understanding the status of youth and women-led CEEs in South Africa and reflecting on the challenges existing within the clean energy ecosystem that hinder the access to scaling opportunities.

2. METHODOLOGY

Analytical focus

This research article examines the key factors influencing the development and scaling of women- and youth-led clean energy enterprises in South Africa. Specifically, it explores the systemic barriers and enabling conditions that shape entrepreneurial participation and growth within the clean energy ecosystem. Drawing on evidence from the EVI-SICEE project, the analysis focuses on how access to finance, policy and regulatory frameworks, skills development, innovation support services, partnerships, and market opportunities affect enterprise performance.

Research design

A qualitative case study approach was adopted to explore enterprise experiences, support systems, and ecosystem dynamics affecting youth & women-led CEEs.

Data collection

Data was collected using a combination of primary and secondary sources. Primary data was obtained through Key Informant Interviews (KIIs) with entrepreneurs in the solar and biogas sectors. Secondary data was gathered through a review of relevant literature, policy documents, industry reports, and project documents. The use of multiple data sources enabled a comprehensive assessment of the barriers and enabling factors affecting women- and youth-led CEEs.

Case studies

The study focused on four enterprises drawn from Gauteng and its environs.

Table 1: Research Case studies

Enterprise	Sector	Ownership
Amahlathi Eco-Tech	Solar	Woman-led
Kusini Water	Solar	Youth-led
Kaeane Renewable Energy	Biogas	Youth-led
Tshilidzi Tshawe Cooperative	Biogas & Agriculture	Youth & Women-led

Data analysis

The data were analysed using thematic analysis. Interview transcripts and secondary sources were reviewed and coded to identify recurring themes, patterns, and relationships relating to the challenges and enabling factors affecting youth- and women-led CEEs.

3. FINDINGS

3.1 Youth and women entrepreneurs are important actors in South Africa's clean energy transition

The evidence demonstrates that youth- and women-led enterprises are increasingly contributing to South Africa's clean energy transition through innovative solutions across solar energy, biogas, energy efficiency, waste-to-energy, and water-energy nexus technologies. Comprehensive national statistics specifically tracking youth- and women-owned clean energy enterprises remain limited. Existing evidence suggests that these enterprises are predominantly concentrated within the broader small, medium, and micro-enterprise (SMME) sector and operate across various segments of the clean energy sector, including technology distribution, installation, maintenance, energy services, consulting, waste-to-energy solutions, and energy efficiency services.

The expansion of the clean energy sector, particularly in response to recurring load shedding, has created new entrepreneurial opportunities for emerging businesses led by women and young people. Most youth- and women-led enterprises in South Africa's clean energy sector are concentrated in urban and peri-urban economic areas such as Gauteng, Western Cape, and KwaZulu-Natal, where access to markets, finance, technical expertise, and innovation support institutions is relatively stronger. Nevertheless, a growing number of enterprises are also emerging in rural areas, particularly in provinces such as Eastern Cape, Limpopo, and Mpumalanga, where clean energy solutions are addressing energy access challenges and supporting local economic development while contributing to livelihood improvement and climate resilience.

Solar PV systems dominate the activities of youth- and women-led clean energy enterprises. This reflects South Africa's abundant solar resources, declining solar technology costs, and increasing demand for alternative energy solutions from households, businesses, and public institutions. Many enterprises are involved in solar PV installation, solar water heating, battery storage solutions, and solar-powered productive-use applications. Other enterprises focus on energy efficiency technologies, clean cooking solutions, biogas systems, waste-to-energy innovations, and water-energy nexus technologies, although these subsectors remain comparatively smaller.

The case studies examined under the EVI-SICEE project demonstrate the diversity and innovative potential of women- and youth-led clean energy enterprises in driving locally relevant innovation. Amahlathi Eco-Tech, a woman-led enterprise, developed energy-efficient technologies aimed at reducing household electricity consumption. Kusini Water has combined solar-powered systems and water purification technologies to improve access to safe drinking water in underserved communities. Kaeane Renewable Energy Developers and Tshilidzi Tshawe Cooperative have promoted biogas technologies that convert organic waste into clean energy while addressing environmental and livelihood challenges. These enterprises demonstrate how locally driven innovation can contribute to both climate action and socio-economic development. The experiences of these enterprises further illustrate the important role that women and youth can play in shaping South Africa's energy future. Beyond providing energy services, they are creating employment opportunities, supporting local livelihoods, and developing solutions that respond directly to community needs. Their work aligns closely with South Africa's Just Energy Transition agenda, which seeks to ensure that the benefits of the energy transition are shared equitably across society.

3.2 Scaling constraints are ecosystem challenges rather than individual enterprise failures

Despite their growing contribution to the clean energy sector, women- and youth-led enterprises continue to face significant barriers that constrain their growth, sustainability, and ability to scale. The findings reveal that these challenges are not isolated business-level problems but reflect broader weaknesses within the clean energy ecosystem.

Limited access to finance

Limited access to finance emerged as the most significant challenge across all case studies. Many enterprises rely heavily on personal savings, internally generated revenue, and occasional grant funding to support their operations. Accessing commercial loans, investment capital, and financing for expansion remains difficult, particularly for early-stage enterprises. As a result, many entrepreneurs struggle to invest in equipment, expand operations, recruit skilled staff, or commercialize new technologies. For enterprises operating in emerging sectors such as biogas and energy efficiency, the absence of dedicated financing mechanisms presents a major obstacle to scaling.

Weak market development and low technology awareness

Weak market development and limited public awareness of clean energy technologies also emerged as important constraints. Several enterprises reported that consumers, investors, and even financial institutions often lack sufficient understanding of technologies such as biogas and energy-efficient systems. This creates additional costs for entrepreneurs who must invest significant time and resources in awareness raising, demonstrations, and customer education before technologies can gain acceptance. Historical failures of poorly implemented clean energy projects have further contributed to public scepticism, particularly in rural communities.

Regulatory and certification barriers

Regulatory and certification processes were identified as another major barrier. The experience of Amahlathi Eco-Tech highlights the challenges faced by innovators attempting to commercialize new technologies within existing regulatory frameworks. Difficulties obtaining certification and complying with standards delayed market access and limited opportunities for expansion. These findings suggest that current regulatory systems are often poorly adapted to support emerging clean energy innovations developed by small enterprises.

Infrastructure and operational constraints

Infrastructure challenges also affect enterprise operations. Kusini Water reported difficulties associated with aging municipal infrastructure, unreliable water systems, and theft of solar equipment in some communities. These challenges increase operating costs and require enterprises to continuously adapt their business models and technologies to local conditions. For many small enterprises, such constraints reduce profitability and create uncertainty regarding future growth.

Gender-based barriers and social inequalities

Gender inequalities continue to affect women entrepreneurs operating within the clean energy sector. Women-led enterprises often encounter bias and scepticism in technical and manufacturing environments that remain heavily male dominated. These barriers can affect access to finance, partnerships, procurement opportunities, and leadership positions within the sector. Although women entrepreneurs continue to demonstrate resilience and innovation, structural inequalities remain a significant obstacle to inclusive participation in South Africa's clean energy economy.

Skills gaps and business development challenges

The study also found that many entrepreneurs require stronger business development support. While technical expertise is often available, enterprises frequently lack skills in marketing, financial management, strategic planning, and organizational development. Strengthening these capabilities is essential if enterprises are to move beyond survival and achieve sustainable growth.

3.3 Enterprise growth depends on stronger support ecosystems

The findings reveal that enterprise scaling is most successful when entrepreneurs operate within supportive innovation systems that provide access to knowledge, networks, finance and business development support.

Business incubation, mentorship and innovation support

One of the key enablers of growth are the availability of business incubation, mentorship, and innovation support services. Several enterprises benefited from programmes offered by institutions such as the Technology Innovation Agency (TIA), the Council for Scientific and Industrial Research (CSIR), the Small Enterprise Development Agency (SEDA), Prime Cubate, and the University of Venda. These organizations provided technical support, business development services, commercialization assistance, and mentorship that helped entrepreneurs strengthen their operations and improve investment readiness.

Strategic partnerships and collaborative networks

Strategic partnerships emerged as another critical success factor. Enterprises that established strong relationships with universities, financial institutions, development partners, municipalities, and community organizations were better positioned to access resources, knowledge, and market opportunities. Kusini Water's collaboration with organizations such as Nedbank, Edge Growth, and other development partners illustrates how strategic partnerships can support enterprise expansion and improve long-term sustainability.

Capacity building initiatives

Capacity-building initiatives were also found to play a significant role in strengthening enterprise performance. Training programmes focusing on entrepreneurship, financial management, communication, technical skills, and leadership development helped improve business resilience and organizational effectiveness. For example, both Kaeane Renewable Energy Developers and Tshilidzi Tshawe Cooperative reported that training programmes enhanced their ability to engage clients, manage operations, and position themselves for future growth.

Community engagement and market acceptance

The findings further highlight the importance of community engagement in supporting the adoption of clean energy technologies. Enterprises that actively engaged local communities through awareness campaigns, demonstrations, and participatory approaches were more successful in building trust and increasing acceptance of their technologies. Community involvement therefore emerges as an important component of scaling strategies, particularly in underserved and rural areas where clean energy technologies remain relatively unfamiliar.

4. CONCLUSION

Youth- and women-led clean energy enterprises are making important contributions to South Africa's transition towards a more sustainable and inclusive energy future through innovation, job creation and the provision of locally relevant energy solutions. Through innovation in solar energy, biogas, energy efficiency, and water-energy technologies, these enterprises are addressing critical development challenges while creating new economic opportunities within local communities. Their activities illustrate the potential of clean energy entrepreneurship to contribute simultaneously to climate resilience, energy access, job creation, and inclusive development. However, the ability of these enterprises to scale remains constrained by systemic challenges that extend beyond the capabilities of individual entrepreneurs. Addressing financing gaps, strengthening market development, improving regulatory responsiveness, tackling infrastructure constraints and reducing gender-based barriers will be essential to unlocking their full potentials. At the same time, investments in business incubation, entrepreneurial skills development and community engagement can create a more enabling ecosystem that supports enterprise growth and promotes a more inclusive and equitable clean energy transition.

5. RECOMMENDATIONS

The findings highlight the need for targeted and coordinated interventions to strengthen the participation and scalability of youth- and women-led CEEs. While the case studies demonstrate significant innovation potential and social impact within the solar and biogas sectors, they also reveal persistent systemic barriers related to financing, market access, technical capacity, policy support, and gender inequality. Addressing these challenges will require collaborative efforts from government, development finance institutions, private sector actors, research institutions, and innovation support organizations to create an enabling ecosystem that supports inclusive clean energy entrepreneurship and accelerates South Africa's just energy transition.

Improve access to finance for women and youth entrepreneurs

There is a need to expand accessible and targeted financing mechanisms for youth- and women-led CEEs. Government institutions, development finance agencies, and private sector partners should establish blended finance instruments, concessional loans, grant programmes, and innovation funds specifically tailored to emerging clean energy SMEs. Financing support should also extend beyond startup capital to include commercialization, certification, market expansion, and operational scaling.

Strengthen entrepreneurial skills and capacity development

Strengthening entrepreneurship incubation programmes, mentorship initiatives, and technical training platforms will be essential for improving enterprise sustainability. Capacity-building interventions should combine technical clean energy skills with business management, financial literacy, marketing, digital innovation, and leadership development. Universities, innovation hubs, and technical institutions can play an important role in strengthening entrepreneurial ecosystems for women and youth.

Create an enabling policy and regulatory environment

There is a need for more coherent and inclusive policy frameworks that support small-scale clean energy enterprises. Regulatory systems should be streamlined to reduce certification barriers and improve market entry opportunities for grassroots innovations. Institutions such as the South African Bureau of Standards (SABS) should develop adaptive certification pathways suitable for emerging clean technologies developed by SMEs.

Promote gender equality and inclusion in the clean energy sector

Policy interventions should intentionally address gendered inequalities within the clean energy sector by promoting women's participation in technical, managerial, and leadership roles. Gender-responsive financing, mentorship programmes, procurement frameworks, and innovation support mechanisms can strengthen women's participation within clean energy sector.

Enhance market development and public awareness

Public awareness campaigns, demonstration projects, and community engagement initiatives are needed to improve understanding and acceptance of clean energy technologies, particularly within the biogas sector. Supporting local market development will help strengthen consumer confidence, reduce misconceptions, and create sustainable demand for clean energy solutions.

Strengthen collaboration and ecosystem coordination

Greater collaboration among government agencies, financial institutions, universities, incubators, private sector actors, and civil society organizations is necessary to strengthen the broader clean energy entrepreneurship ecosystem. Integrated support systems can improve coordination, reduce duplication, and enhance access to resources, training, investment, and market opportunities for SMEs.

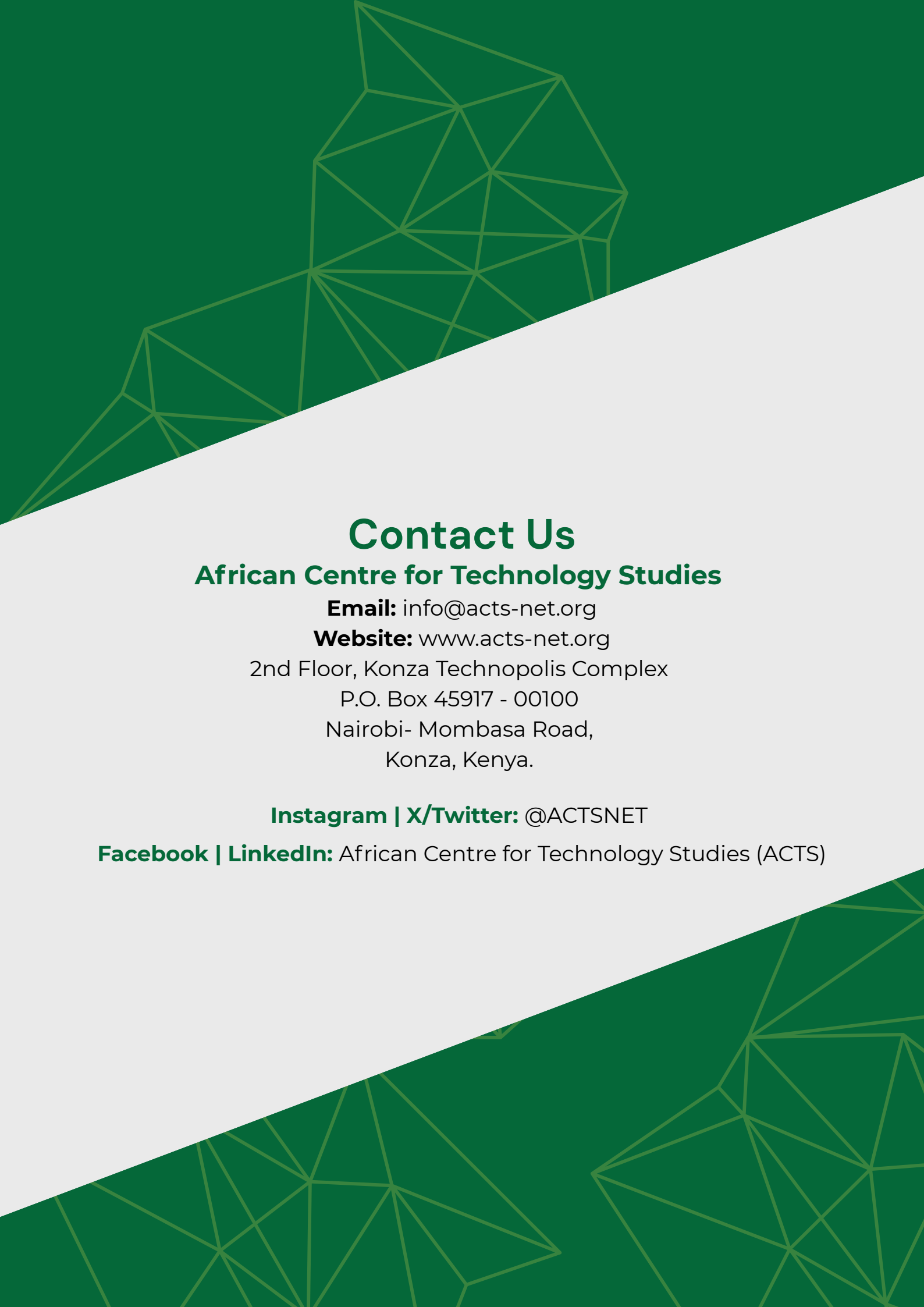
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