



POWER HER FUTURE

School Electrification for Girls'
Education & Opportunities
in Tanzania



STUDENT
ENERGY

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Disclaimer:

This report was developed by five participants of the Student Energy Career Training (SECT) Program – Cohort 6, in collaboration with Sustainable Energy for All (SEforALL), as part of their applied learning experience. The research was conducted and written between August and December 2025 and, where possible, reflects the most current statistics available during that period.

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ABBREVIATIONS

ASCENT TZ	Accelerated Scaling of Energy Access in Tanzania	RSC	Royal Society of Chemistry
EAA	Education Above All	SCOL FILLE	Scolarisation des Filles
EAUSS	Energy Access and Use Situation Survey	SDG	Sustainable Development Goal
ELPAf	End Learning Poverty for All in Africa	SEforALL	Sustainable Energy for All
EJSSS	European Journal of Social Sciences Studies	SPARC	Solar-Powered Access to Raspberry Computers
FYDP-III	Third National Five-Year Development Plan	STEM	Science, Technology, Engineering and Mathematics
FYDP-IV	Fourth National Five-Year Development Plan	TCU	Tanzania Commission for Universities
GEAPP	Global Energy Alliance for People and Planet	TDHS-MIS	Tanzania Demographic and Health Survey & Malaria Indicator Survey
GPI	Gender Parity Index	TREEP	Tanzania Rural Electrification Expansion Programme
HDI	Human Development Index	UN	United Nations
IEA	International Energy Agency	UNESCO	United Nations Educational, Scientific and Cultural Organization
ICT	Information and Communication Technology	UNICEF	United Nations Children's Fund
IGC	International Growth Centre	WASH	Water, Sanitation and Hygiene
IMF	International Monetary Fund	WFP	World Food Programme
JNHPP	Julius Nyerere Hydropower Plant		
JRC	Joint Research Centre		
MoEST	Ministry of Education, Science and Technology		
MoFP	Ministry of Finance and Planning		
MW	Megawatt		
NREP	National Rural Electrification Program		
NBS	National Bureau of Statistics		
NGO	Non-Governmental Organisation		
O&M	Operations & Maintenance		
PAYGO	Pay-As-You-Go		
PPP	Public-Private Partnership		
PSMP	Power System Master Plan		
REA	Rural Energy Agency		

EXECUTIVE SUMMARY

In response to the global challenges, the United Nations (UN) Member States defined 17 interconnected Sustainable Development Goals (SDGs) to be achieved by 2030. These goals, known as the 2030 Agenda, outline targeted action towards global development, including reducing poverty, addressing inequities, and responding to the challenges of climate change. A key SDG is SDG 7, which concerns sustainable energy access. Currently, an estimated 666 million people lack access to electricity, the majority living in Sub-Saharan Africa, according to the International Energy Agency (IEA 2024). Despite incremental progress towards electrification, UN Women estimates that by 2030, 341 million women and girls will remain without electricity (UN Women 2023). In consideration of the 272 million children and youth not currently in education (UNESCO 2025; UIS 2025), the pressing challenges of both electrification and education access require a deeper understanding.

In the region of East Africa, Tanzania is currently lagging behind its peers in terms of share of the population with access to electricity, though the country has made remarkable progress in expanding electricity access, rising from about 14 percent of the population in 2011 to approximately 48 percent by 2023 (World Bank 2025; Macrotrends 2023). By mid-2024, government and utility reports indicated that electricity infrastructure had reached more than 12,200 villages nationwide, indicating near-universal village-level coverage. By the end of March 2025, the government reports that national grid coverage will expand to 100 percent of the country. However, village-level electrification does not automatically translate into electricity access for households or schools. There remains a challenge in last-mile connections as households in electrified villages may be unable to afford wiring costs and remotely located settlements smaller than villages ('hamlets') are not currently connected to electricity (Africa Energy Portal 2025). As such, electricity access remains low in rural areas, with only around 27 percent of households connected. This reflects similar constraints faced by rural schools (World Bank 2022; NBS 2022). By 2023, approximately 60 percent of primary schools and 70 percent of secondary schools had electricity. Among these, about 13 percent rely on diesel generators or small solar systems, which are costly, intermittent, and often fail to support full school operations (World Bank 2023; IEA et. al 2023). This means that national progress has not yet produced equitable educational outcomes, especially for learners in rural or under-resourced areas.

The consequences are particularly severe for girls. Poorly lit schools raise safety concerns, unreliable power limits evening study hours, and restricted access to science labs and digital tools reinforces gender gaps in education and career opportunities (World Bank 2025). In rural areas, about 75 percent of girls drop out before finishing primary school, compared with 25 percent in urban areas (Tanzania Data Portal 2023). Field evidence from primary research reinforces these findings. Across three regions, Dar es Salaam, Dodoma and Kigoma, teachers and students reported that reliable power extends study hours, enhances safety, and enables the use of digital and science equipment. Girls gain additional advantages where household responsibilities and safety concerns limit their learning. Respondents identified access to

technology, extended study time and improved safety and security as the most impactful changes.

Without stronger support, the gender gap in access to education and Science, Technology, Engineering, and Mathematics (STEM) opportunities will persist. Ensuring stable electricity in schools therefore means investing in human capital and unlocking innovation through inclusive education.

Bridging the school-level electrification gap is critical to achieving Tanzania's commitments to SDG 4 (Quality Education), SDG 5 (Gender Equality), and SDG 7 (Affordable and Clean Energy). Practical implementation of these goals requires not only infrastructure expansion but also gender-responsive policies, financing, and community engagement that ensure every child, especially every girl, can learn in an electrified, safe, and inspiring environment.

Key Policy Recommendations

- Scale last-mile school electrification through hybrid solar systems that reduce costs and outages.
- Integrate gender targets into national energy and education programmes so outcomes are tracked and addressed jointly.
- Provide financing and technical support for rural school connections, with special attention to affordability and maintenance.
- Strengthen community awareness, community engagement, and girls' participation in STEM.



CHAPTER ONE

INTRODUCTION

1.1 Background & Challenges

Approximately 666 million people globally still lack access to electricity, with 80 percent residing in Sub-Saharan Africa. This energy poverty profoundly hinders livelihoods, economies, and overall development, with women and girls disproportionately affected. According to UN Women, if current electrification trends persist, as many as 341 million women and girls will remain without electricity by 2030 (UN Women 2023). Electricity is a necessary precursor and reinforcement mechanism for livelihoods, equity, job creation, food security, and educational opportunity, underpinning almost every Sustainable Development Goal (SDG).

Global energy deficits also intersect with broader education challenges. In 2023, 272 million children and youth worldwide were out of school, with a breakdown of 78 million primary aged children, 64 million lower-secondary aged children, and 130 million upper-secondary aged youth (UNESCO 2025). Of these, approximately 129 million (or about 47 per cent) are girls, with the gender gap widening in Sub-Saharan Africa where girls account for over 55 per cent of out-of-school youth (UNESCO 2023; UN Women 2023; Plan International 2022). This reveals how education deprivation and energy poverty often reinforce one another: lack of electricity limits evening study, digital learning, and safe school environments factors that disproportionately restrict girls' learning continuity.

At the same time, young people aged 15 to 24 make up 16 percent of the global population, representing the workforce of the future who will drive the energy transition, green industrialisation, and sustainable development (United Nations n.d.). Equipping this demographic, especially young women, with reliable energy access and quality education is therefore both a social investment and an economic strategy. It builds the technical and digital skills essential for

emerging low-carbon industries and enhances national resilience in the face of accelerating global transitions (Moner-Girona et al. 2025; Evans et al. 2024).

Understanding these interconnected global challenges of energy access, poverty, education exclusion, and gender inequality, underscores the need for coordinated action by governments, development partners, and international agencies to ensure that energy and education investments advance gender equality and inclusive development.

A powerful case study to explore these dynamics at national scale is Tanzania. Due to national efforts driven at scale by the government and international commitments, by mid-2024, electricity infrastructure had reached more than 12,220 of Tanzania's 12,318 villages; however, many schools remain without reliable connections or proper infrastructure, such as wiring, transformers, and meters, with only around 60 percent of primary and 70 percent of secondary schools connected to the grid (World Bank 2025a; MoEST 2023; Statista 2023). This disconnect between connectivity and actual service delivery illuminates the persistent gap between infrastructure provision and meaningful access. Section 1.2 examines this gap in greater detail, highlighting school-level electrification trends.

Tanzania's electricity generation capacity: Tanzania's electricity generation mix is dominated by hydropower, with the Julius Nyerere Hydropower Plant (JNHPP) contributing approximately 2,115 MW, or about 52 percent of the total installed capacity of 4,000 MW. Thermal gas-fired plants contribute around 951.6 MW, while other hydropower and renewable sources make up the remainder (Africa Energy Portal 2025; Trade.gov 2024). This energy mix is crucial for expanding grid reliability and supporting school electrification initiatives.

Closing this energy gap is therefore critical to advancing the United Nations' Agenda 2030, with a particular emphasis on Sustainable Development Goal (SDG) 4 (Quality Education), SDG 5 (Gender Equality), and SDG 7 (Affordable and Clean Energy). Reliable school electrification enables inclusive and equitable quality education by extending study hours, supporting digital learning, and improving learning outcomes, driving progress towards SDG 4. Concerning SDG 5, access to safe, well-lit, and modern school environments reduces dropout risks for girls, supports their retention in secondary education, and expands opportunities in science and technology fields where they are underrepresented. Expanding reliable electricity access in schools contributes to the broader objective of SDG 7, universal energy access, particularly in underserved rural areas, while demonstrating how modern, clean energy solutions can directly strengthen social development outcomes (World Bank 2025b; IEA et al. 2023; SEforALL 2024b). Reliable generation is the backbone of the access gains described in the next section, translating national investment into tangible improvements in classrooms and communities. The progress of national electrification and energy generation outlined above provides essential context for understanding how these investments translate to schools and communities. The following section (1.2) examines the current status of school electrification in Tanzania in detail.

1.2 Current Status of Primary Education in Sub-Saharan Africa

Education in Africa faces several challenges, and these challenges vary from one country to another. In Sub-Saharan Africa, challenges often include lack of electricity access, a shortage of basic furniture, such as school desks, computers, internet and education materials. These deficits

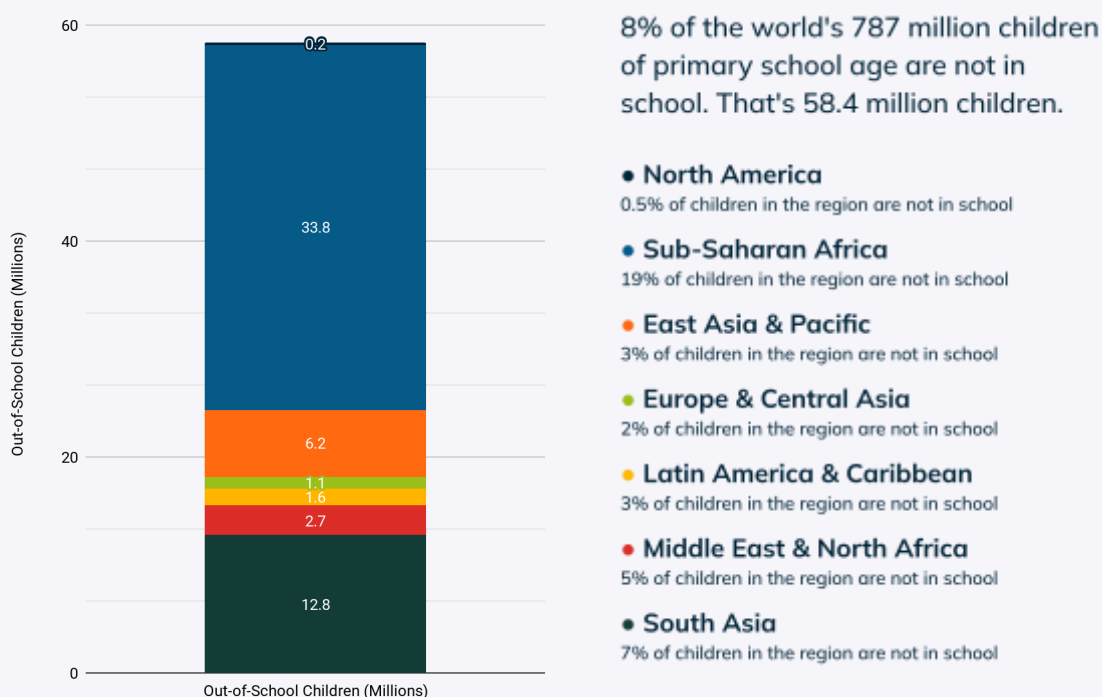
directly affect students' ability to engage with learning, particularly in modern, digital, or STEM-based curricula.

Beyond physical infrastructure, systemic issues exacerbate educational inequalities: high poverty rates often force children, especially girls, to drop out of school; rural communities frequently experience limited school availability; and gendered household responsibilities disproportionately affect girls' school attendance. Additionally, teacher shortages, low teacher training levels, and inadequate support for inclusive learning environments further hinder educational outcomes. Together, these challenges contribute to low enrolment, high dropout rates, poor learning performance, and reduced transition to secondary education across many countries in the region (Global Alliance 2022; UNESCO 2023).

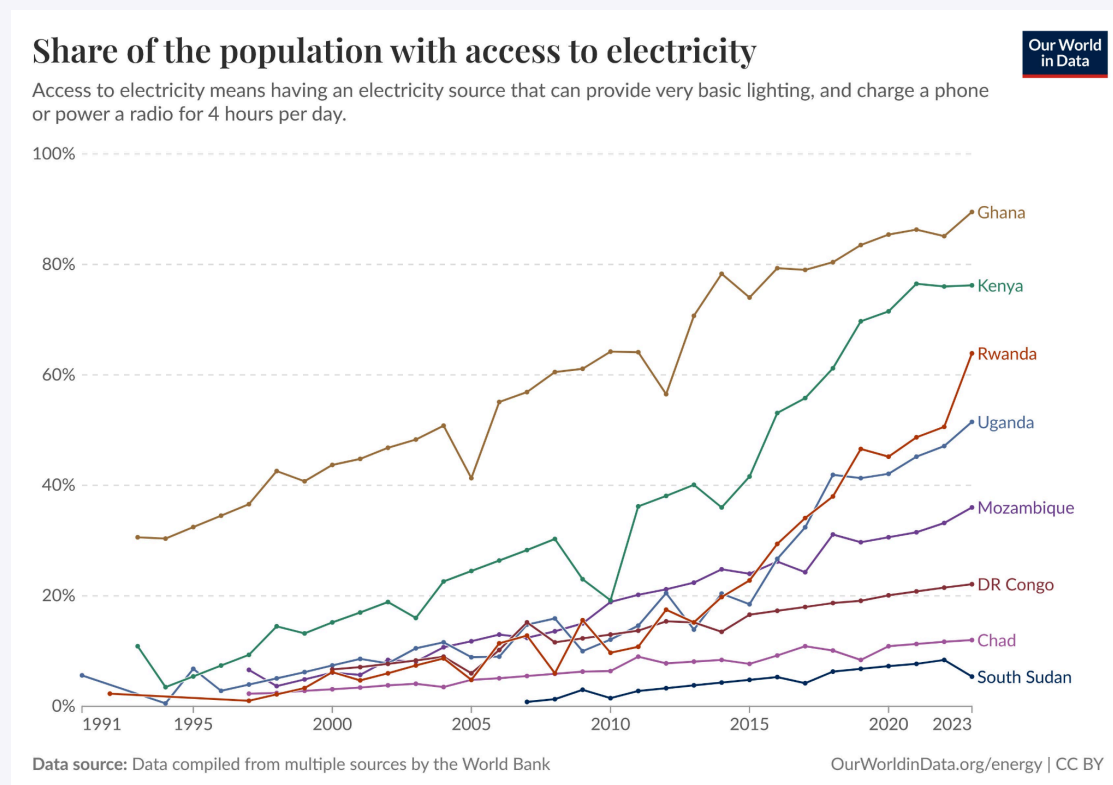
The situation concerning access to electricity is gradually improving, but it remains far from ideal. For the first time in 2021, access to electricity in Sub-Saharan Africa exceeded 50 percent, but in rural areas, this figure is still significantly lower, reported at 27 percent. For example, in Rwanda, only 18 percent of rural households have access to electricity: 12 percent are connected to the grid, while 6 percent use off-grid solar devices (Global Alliance 2022).

Figure 1: Out-of-School children in primary education in the world

Where are the 58 million primary school age children who are not in school?



Adapted from: Our World in Data, 2019, adapted from UNESCO. Out-of-School children in primary education in the world. The diagram displays the location of the 58 million primary school age children out-of school.

Figure 2: Electricity access rates in Sub-Saharan Africa

Source: Our World in Data, 2019, adapted from the World Bank.

Tanzania is still among the least electrified countries in Sub-Saharan Africa, with an electrification rate of 48 percent in 2023. Although this has grown rapidly, the country still lags behind its peers in the East Africa region.

Tanzania remains behind the other regional leaders such as Kenya, which has seen electrification rates increase from 40 percent in 2013 to 76 percent in 2023. To achieve this, Kenya has put in place several strategies and initiatives at the local level, including a robust regulatory framework, active promotion of the off-grid sector, and an enabling environment that allowed mini-grid developers and PAYGO (Pay-As-You-Go) solar companies to operate and scale. The decentralization of off-grid and clean energy systems in rural areas and connection of both urban and rural areas to the national grid has significantly reduced the country's urban-rural energy access gap.

In contrast, Tanzania's policy and investment landscape has not been equally favourable to private-sector participation in the off-grid market. Over the past decade, restrictive regulatory changes and uncertainty have discouraged long-term private investment, causing many developers to exit the country. As a result, while Tanzania's electrification rate has improved over the past decade, it still lags behind regional leaders such as Kenya because progress has not been equally distributed between urban and rural areas.



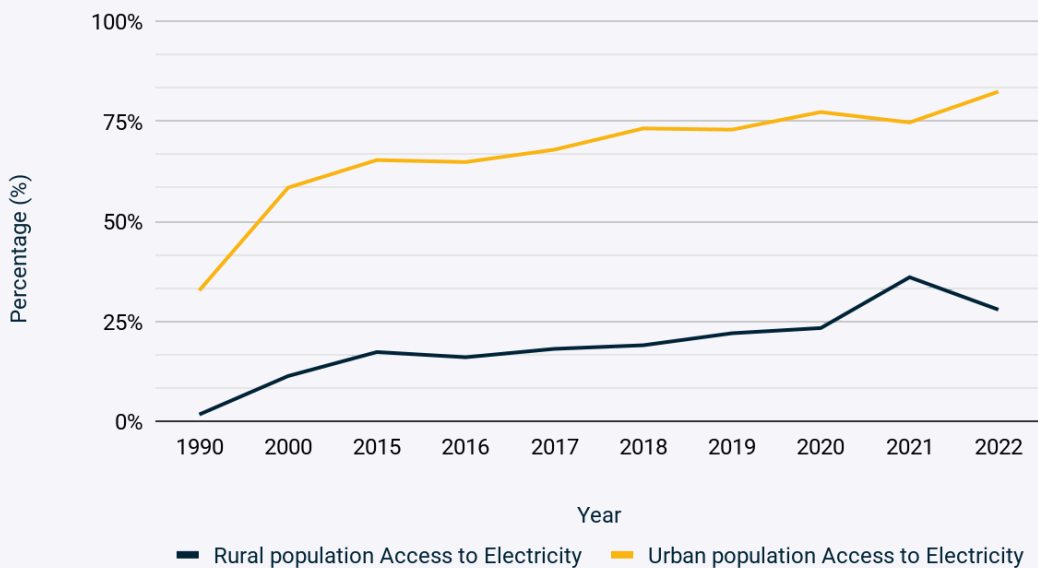
STEM Trainees in SEforALL's 2025-2026 Tanzania STEM Traineeship Programme, supported the "Accelerating a Clean Cooking Transition in Schools" initiative in partnership with the World Food Programme, where they conducted data collection and monitoring at Kibasila Primary School in Dar es Salaam, Tanzania.

Continuing with the example of Kenya, rural electrification expanded rapidly due to coordinated grid extension, strong off-grid policies, and sustained private-sector participation. In contrast, Tanzania's rural areas have benefited far less from national electrification efforts because of regulatory barriers, slower grid expansion outside major towns, and a decline in private off-grid investment. This uneven development has resulted in a much wider urban–rural energy access gap in Tanzania than in Kenya, leaving rural communities disproportionately underserved.

1.3 Current Status of School Electrification in Tanzania

1.3.1 Electrification Status in Tanzania

Education in Africa faces several challenges, and these challenges vary from one country to another. In Sub-Saharan Africa, challenges often include lack of electricity access, a shortage of basic furniture, such as school desks, computers, internet and education materials. These deficits directly affect students' ability to engage with learning, particularly in modern, digital, or STEM-based curricula.

Figure 3: Energy access in Urban and Rural areas of Tanzania

Source: Our World in Data, 2022, Tanzania: Energy Country Profile. The curves display the evolution of rural and urban population access to electricity.

Tanzania has made notable progress in expanding electricity access over the past decade, driven by strong government commitment and effective public-private collaboration. Nationally, electricity access rose from about 14 percent in 2011 to approximately 46 percent in 2022 (World Bank 2025a; Macrotrends 2023), and further to 48 percent of households having electricity by 2023, up from 33 percent in 2016/17 (NBS 2022). This reflects Tanzania's ambitious policy framework, including the National Energy Compact, a policy platform to drive electrification efforts in coordination with Mission 300, a joint initiative operated by the World Bank Group, African Development Bank, Global Energy Alliance for People and Planet (GEAPP), and Sustainable Energy for All (SEforALL). This plan, published in January 2025, commits to increasing household electricity connectivity to 75 percent by 2030, scaling clean cooking access to 80 percent by 2034, and boosting the share of renewable energy from 61.8 percent to 75 percent (World Bank 2025). These commitments are reinforced by the Third National Five-Year Development Plan (FYDP III) and the Power System Master Plan (PSMP 2020), which emphasize grid modernization, renewable integration, and private-sector investment (Gogla 2024).

Although significant efforts have been made by the government, international organizations, and the private sector, rural electrification in Tanzania continues to lag behind urban rates. According to 2022 data, the gap remains substantial: approximately 82.4 percent of the urban population had access to electricity, compared to only about 27 percent of the rural population. These figures reflect a persistent disparity in energy access, particularly affecting rural communities.

Comparing these findings to the 2020 Tracking SDG 7 Report, the government reported connectivity rates of 99.6 percent in urban areas and 69.6 percent in rural areas, more recent estimates in 2022 indicate that national electricity connectivity reached 46 percent, with urban areas at 79 percent and rural areas at 36 percent, confirming that while progress has been made the urban-rural divide remains significant (Africa Energy Portal 2025).

Reflecting global trends, women and girls are disproportionately affected by energy poverty in Tanzania. In rural areas, energy scarcity intersects with inadequate water, sanitation and hygiene (WASH) facilities, menstruation challenges, and child marriage, resulting in higher dropout rates from age 12 onwards (Education n.d.). Energy poverty thus consistently exacerbates barriers to education, particularly for rural girls.

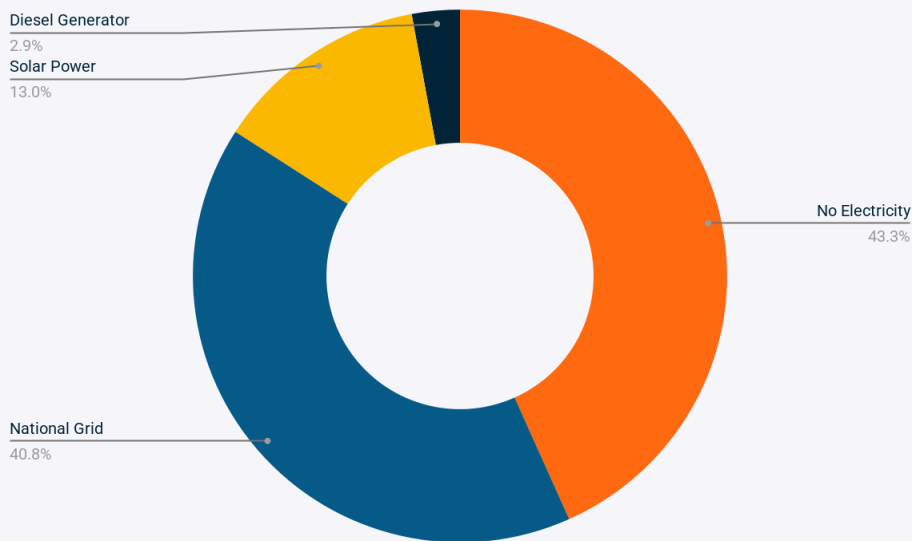
However, national averages obscure the realities at the school level, such as whether classrooms have sufficient lighting for evening study, reliable electricity for digital learning tools, or affordable access for students and teachers. Data linking electricity access to specific education outcomes, such as girls' enrolment, study hours, staff retention, academic performance, technology use, and school continuation, remains scarce, highlighting the need for localized, gender-disaggregated analysis.

1.3.2 Current Status of School Electrification in Rural Regions of Tanzania

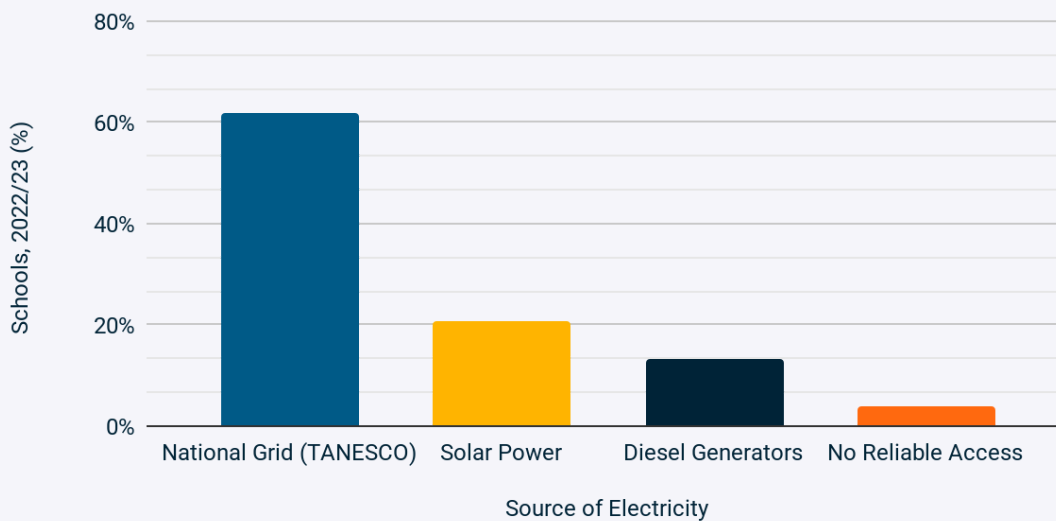
According to government and utility reports, more than 99 percent of Tanzania's villages had been connected to the national grid or mini-grids by mid-2024 (Daily News 2024b; World Bank 2025a). This marks one of the fastest rural electrification drives in Sub-Saharan Africa. The Rural Energy Agency (REA), through programmes such as the Tanzania Rural Electrification Expansion Programme (TREEP) and the Accelerated Scaling of Energy Access in Tanzania (ASCENT TZ), has connected over 6,500 schools and 1,600 health facilities nationwide (World Bank 2025a). These efforts demonstrate strong collaboration between the Government of Tanzania, development partners such as the World Bank and African Development Bank, and local civil society actors. Off-grid solutions, including mini-grids and PAYGO solar models, are also expanding opportunities for communities beyond the reach of reliable grid supply.

However, this village-level coverage does not translate into universal electricity access, as household connections remain at around 48 percent nationally and 27 percent in rural areas (Daily News 2024b; World Bank 2025a). In Dar es Salaam, the largest city and industrial centre of Tanzania, nearly nine in ten households are connected, while in rural areas only one in three homes has power (NBS 2022). There remains a challenge in last-mile connections as households in electrified villages may be unable to afford wiring costs and remotely located settlements smaller than villages ('hamlets') are not currently connected to electricity (Africa Energy Portal 2025).

Similarly, concerning schools, village-level connections often stop at the grid termination point, requiring schools to fund internal wiring, transformers, and meters, costs that many cannot afford (World Bank 2023; IEA et al. 2023). Rural schools face the highest energy access deficits, with many remaining unelectrified or experiencing frequent outages due to weak distribution infrastructure and limited generation capacity (IEA et al. 2023; Daily News 2024a). Recent datasets provide further evidence of this progress, highlighting both the sources of electricity used in schools and the growing shift toward more sustainable supply options (Figures 4-5).

Figure 4: Sources of school electricity: Electricity, grid, solar, diesel generators

Source: Statista, based on Tanzania education sector data (2018). The figure represents the distribution of electricity sources across all schools in Tanzania, complementing earlier data on national electrification in section (1.2).

Figure 5: Sources of electricity in Tanzanian primary schools (2022/23)

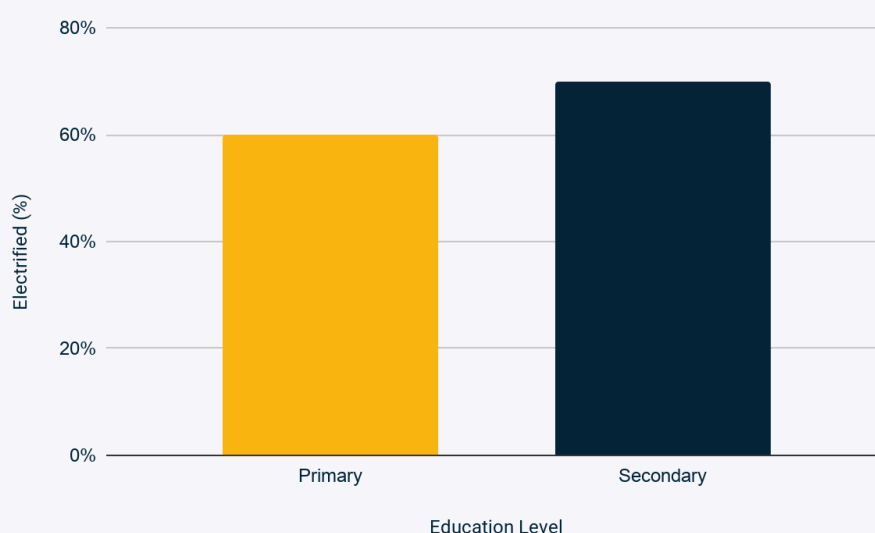
Source: Tanzania Ministry of Education, Science and Technology (MoEST), Tanzania Education Statistical Yearbook 2022/23. Data primarily reflect primary schools, with grid connectivity used as a proxy for overall school access.

The 2018 Statista data (Figure 4) provide a baseline picture of electricity access across all schools in Tanzania, showing the dominance of the national grid as the primary source of electricity, alongside modest reliance on solar systems and diesel generators. By contrast, the 2022/23 yearbook data (Figure 5) give a more updated view, revealing a noticeable increase in grid connections (from about 41 percent in 2018 to 62 percent in 2022/23) and a higher share of

solar adoption. These figures are drawn from different sources, MoEST 2022/23 and Statista 2023a, but both confirm that a majority of schools now have electricity, with consistent reporting of around 60–62 percent of primary schools connected.

In 2018 (Figure 4) less than half of all schools were connected to the national grid, with solar and diesel generators filling much of the gap. By 2022/23 (Figure 5), data on primary schools show a significant expansion of grid connections (62 percent), alongside increased reliance on solar and declining use of fuelled generators as the primary source of electricity. Together, these figures highlight steady progress in school electrification, with a shift toward more sustainable and reliable energy sources, although universal access has not yet been achieved.

Figure 6: Percentage of schools with electricity by education level (primary vs. secondary)



Source: Statista 2023a; Tanzania Affairs 2025. As shown in Figure 1.3, secondary schools have higher electrification rates than primary schools, reflecting disparities that often align with gender and regional differences discussed in Section 2.1.

By 2023, approximately 60 percent of primary schools and 70 percent of secondary schools had some form of electricity access (Statista 2023a; Tanzania Affairs 2025). However, this national progress masks a deep urban–rural divide. Nearly nine in ten urban schools are connected to the grid, compared to fewer than half of rural schools, where many rely on basic solar systems or remain unelectrified altogether (World Bank 2025; MoEST 2023; IEA et al. 2023). While these numbers are significant, the quality and usability of electricity often remains a major challenge. Many schools depend on diesel generators, which provide intermittent and insufficient supply.

For instance, over 100 rural secondary schools in the Arusha region reported frequent grid outages, forcing reliance on costly backup systems (EEP Africa 2017). These figures show that access alone is not enough. Unreliable supply continues to limit learning, especially for girls, and raises costs that many rural schools cannot sustain.

Affordability also poses a critical barrier. In districts such as Kasulu, the largest city of the Kigoma region, and Uyui, one of the seven districts in Tabora region, grid connection costs can exceed 30 percent of annual household income, mirroring findings across Sub-Saharan Africa that high upfront fees and monthly bills remain a key obstacle to last-mile access (Ngalason et al. 2024; Peters et al. 2019). Underfunded schools face similar constraints, with recurrent electricity expenses diverting scarce resources from core education expenditures (EEP Africa 2017). This means that even when connections exist, the cost of using electricity can be just as limiting as the lack of it. For many rural schools, affordability remains the difference between being connected on paper and being powered in practice.

While renewable energy has been viewed as a solution, there are key challenges. Solar energy initiatives have expanded, but coverage and maintenance remain insufficient, limiting the sustainability of off-grid systems (Statista 2023b). Without targeted financing, technical support, and capacity building from both the government and its development and private-sector partners, rural schools risk being left behind, undermining digital learning opportunities, evening study hours, and gender-equity objectives (World Bank 2021b). Ensuring reliable and affordable electricity for schools is therefore essential to advancing equitable education access, achieving Tanzania's national development targets, and furthering efforts towards international development goals.



School chefs prepare meals using the upgraded Electric Pressure Cookers as part of the “Accelerating the Clean Transition in Schools” initiative by SEforALL and the World Food Programme at Kibasila Primary School in Dar es Salaam, Tanzania, that saw STEM Trainees providing on-the-ground support.

1.4 Identifying Gender Disparities in Access to Education

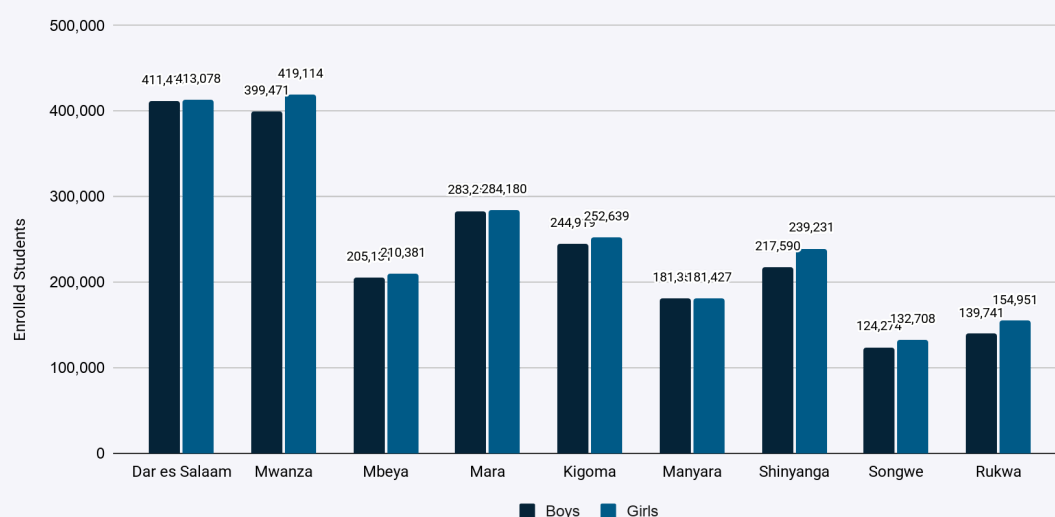
For this research, a sample of eight regions was selected, representing both developed and underdeveloped areas in terms of energy access. The urban regions included Dar es Salaam (100 percent), Mwanza (89.9 percent), Mbeya (89 percent), and Mara (87.7 percent), while the rural regions comprised Kigoma (56.3 percent), Manyara (58.1 percent), Shinyanga (61.7 percent), and Songwe–Rukwa (64.8 percent) (Our world in data 2022).

Additionally, Dodoma was considered due to its strategic importance and availability of data. According to the 2019/20 Energy Access and Use Situation Survey, Dodoma's population-level electricity access stands at 74.4 percent, with 100 percent urban access and 70.3 percent rural access. Household-level electricity connections are lower, at 34.4 percent nationally for Dodoma, highlighting a gap between community-level access and individual household connections.

Dodoma provides additional insights into primary student energy access, particularly in transitioning regions where urban and rural access differ significantly. However, it is important to note that these figures do not directly indicate school-level electricity availability, classroom lighting, or access to digital learning tools. Further primary data collection will be necessary to assess how electricity access at the school and household levels affects educational outcomes for primary students.

1.4.1 Primary Enrolment in Tanzania's Regions

Figure 7: Primary enrolment by region and sex, 2024



Source: Tanzania Data Portal from the Ministry of Education, Science and Technology - Tanzania, 2024, Primary Enrollment by Region and Sex.

Figure 7 displays primary enrolment rates in selected urban and rural regions of Tanzania, disaggregated by sex. As expected, girls from urban regions are considerably more likely to be enrolled in primary school than girls from rural regions. Regions such as Dar es Salaam, Tanzania's major industrial city, and Mwanza have among the highest enrolment numbers (on the order of approximately 410,000 students), whereas rural regions such as Songwe and Rukwa have far lower enrolment (e.g., approximately 181,000), implying that roughly 57 percent of enrolled female primary-school students in the studied sample come from urban regions.

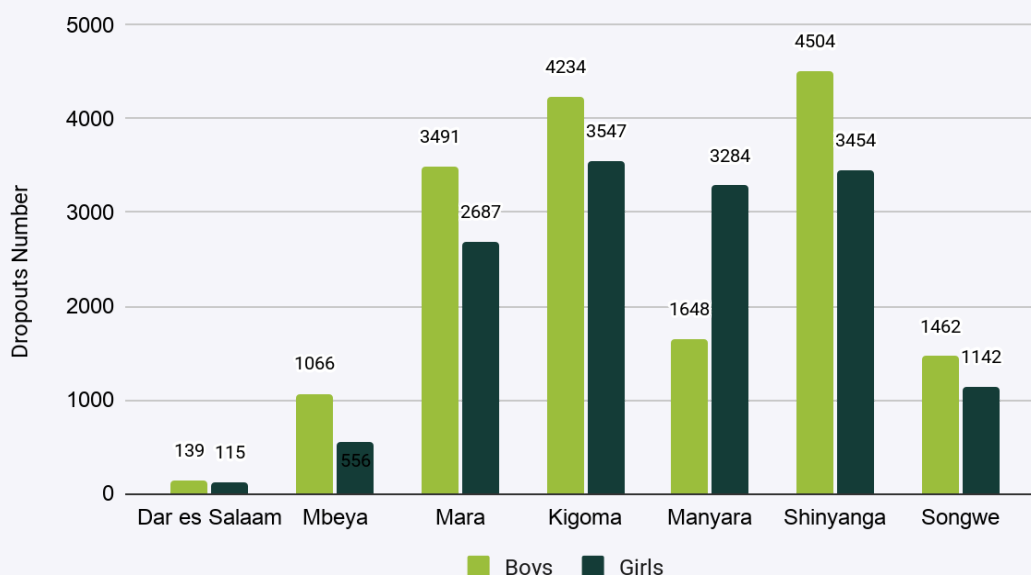
Several interrelated factors likely contribute to this disparity, beyond simple population density and help build an initial explanatory argument:

- **Inadequate WASH and menstruation-friendly infrastructure in rural schools:** Lack of proper sanitation, private changing rooms, clean water, and menstrual hygiene facilities is widely documented as a barrier to regular attendance and retention for girls in Tanzania (UNESCO 2021). In many rural schools, a majority of latrines are unsuitable, lacking doors, water, soap, disposal for sanitary products, which undermines girls' dignity and safety during menstruation and can drive absenteeism or dropout (World Bank 2022). Such deficiencies may reduce girls' likelihood of remaining enrolled, especially after puberty, skewing the rural enrolment figures downward relative to urban counterparts.
- **Long distances and poor transport infrastructure to reach school:** In rural areas of Tanzania, schools may be located many kilometres from children's homes; in some cases, students walk long distances or navigate difficult terrain to attend school (EJSSS 2023). For girls, this burden may be heightened by concerns for safety (e.g., risk of harassment) or by gendered norms that restrict their mobility, making long commutes a greater deterrent than for boys (EJSSS 2023). As a result, remote location and lack of reliable transport contribute to lower enrolment and higher dropout in rural girls.
- **Energy poverty and lack of electricity in rural homes and schools, limiting study time, lighting, and digital learning:** Rural electrification in Tanzania remains uneven, meaning many households and possibly rural schools lack reliable lighting, electricity for studying in the evening, or the infrastructure to support digital learning tools (World Bank 2021a). This constrains out-of-school study hours and reduces the quality of the learning environment, disadvantages that tend to disproportionately affect students in rural areas—often girls who may already have greater household responsibilities—reducing their ability or motivation to enrol, stay, or perform well.
- **Socio-cultural and economic pressures, including household chores, early marriage/pregnancy, and gender norms:** Evidence suggests that in rural Tanzanian communities, girls are more likely to bear domestic responsibilities such as fetching water, cooking, and caring for siblings, which competes with time for schooling, studying, or travel (World Bank 2021a). Additionally, early marriage and adolescent pregnancy remain significant barriers to girls' continued education, especially in rural regions where school infrastructure and support systems are weak (Human Rights Watch 2017).

Together, these structural and socio-cultural factors help explain the lower enrolment rates observed among girls in rural Tanzania, highlighting the need for integrated interventions that address school infrastructure, energy access, and gender-specific barriers.

1.4.2 Primary Dropouts in Tanzania's Regions

Figure 8: Primary dropouts by grade and sex



Source: Tanzania Data Portal from the Ministry of Education, Science and Technology - Tanzania, 2023, Primary Dropouts by Grade and Sex.

Figure 8 illustrates dropout rates for both girls and boys in urban and rural regions of Tanzania in 2023. Urban regions show relatively low dropout numbers, with the highest being 2,687 and the lowest 115 in Dar es Salaam. In contrast, rural regions experience substantially higher dropout rates. For example, in Kigoma, Manyara, Shinyanga, and Songwe, the lowest number of girls dropping out is 1,142 and the highest reaches 3,547.

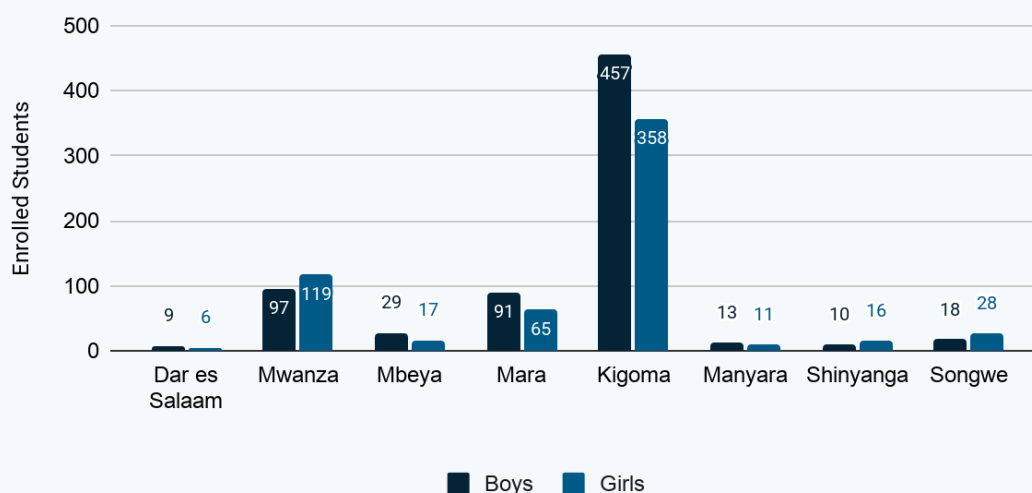
These figures highlight a striking disparity between rural and urban areas. In rural regions, approximately 75 out of every 100 girls are at risk of leaving primary school, compared with only 25 out of 100 in urban regions (Tanzania Data Portal 2023). This highlights a deeply concerning gap in education retention and points to the urgent need for interventions addressing the structural, socio-economic, and energy-related factors that disproportionately affect rural students, particularly girls.

This gap is important because high dropout rates among girls in rural regions reflect broader structural inequalities beyond schooling alone. Research shows that girls in rural areas face multiple overlapping barriers, including household poverty, long travel distances, limited access to safe learning environments, early marriage pressures, and reduced exposure to technology or modern learning resources. Studies by UNESCO and the World Bank consistently demonstrate that these challenges are further intensified when schools lack reliable electricity, as poor lighting, limited access to Information and Communication Technology (ICT) tools, and restricted opportunities for after-school study disproportionately disadvantage girls, particularly in rural and low-income settings (UNESCO 2017; World Bank 2018). Therefore, the dropout disparity is not simply an educational statistic, it is an indicator of systemic gender inequality that limits girls'

future employment prospects, earning potential, and social mobility. Addressing these rural–urban gaps is essential for ensuring equitable learning outcomes and breaking cycles of disadvantage that continue to affect girls in Tanzania's rural communities.

1.4.3 Primary Re-enrolment in Tanzania's Regions

Figure 9: Primary re-enrolment by grade and sex



Source: Tanzania Data Portal from the Ministry of Education, Science and Technology - Tanzania, 2024, Primary Re-enrolment by Grade and Sex.

Figure 9 displays the re-enrolment rate of primary students in the analysed regions in 2024. Globally, re-enrolment after dropout remains low, particularly in low- and middle-income countries. For example, in parts of Sub-Saharan Africa such as Malawi and Niger, fewer than 40% of children who leave primary school return the following year (UNICEF 2022; World Bank 2023). Within Tanzania, re-enrolment in rural regions is generally lower than in urban areas, although notable exceptions exist.

In Kigoma, both girls and boys experienced a significant spike in re-enrolment, which can be directly correlated with a 2022 campaign initiated by the Government of Tanzania, UNICEF, and the Education Above All Foundation (EAA) targeting out-of-school children. This programme aimed to improve enrolment and retention for over 100,000 children through multiple interventions: renovating classrooms and WASH facilities, establishing satellite education centres in remote areas, distributing essential school supplies, providing menstrual hygiene products to adolescent girls, and supplying assistive devices to children with disabilities. To strengthen the broader school ecosystem, teachers were trained in inclusive pedagogy, guidance, counselling, and life skills to support these initiatives (UNICEF 2024).

Despite the success in Kigoma, re-enrolment rates remain low in many other regions of Tanzania. This means a substantial number of young people are still excluded from education, particularly girls, which reduces their likelihood of completing primary education. Low re-enrolment also limits opportunities for later vocational training and employment, especially in sectors requiring digital

literacy, technical skills, or formal certifications, outcomes closely linked to school infrastructure, including reliable electricity for learning environments.

Education and school electrification are common challenges African countries encounter. Looking at the initiatives other countries have made to mitigate this is important in crafting the recommendations of this report.

1.5 Other Countries Attempts to Education Access for All

Currently, 32 percent of primary and nearly 50 percent of secondary African schools operate off the grid, which creates significant barriers to quality education and socio-economic progress. To address this issue, a team of researchers from the European Commission's Joint Research Centre (JRC), the Kids Research Institute, UNICEF, International Monetary Fund (IMF), the University of Sussex and the University of South Africa have developed a first-of-its-kind continental-scale database. This geospatial database maps over 500,000 schools across Africa, providing detailed insights into capacities and costs required to meet their electricity needs using solar systems. The aim was to demonstrate how solar technology could revolutionize education (European Commission 2025).

According to the study, adopting solar electricity could deliver far-reaching benefits like improving learning outcomes, fostering economic growth, and reducing CO2 emissions. Electrifying schools closer to communities would save students up to six hours on foot or 45 minutes by motorized transport, improving accessibility. Reliable electricity would also enable electric cooking, supporting school meal programmes and addressing hunger and malnutrition while further boosting attendance and academic performance (European Commission 2025).

In **Burkina Faso**, socio-cultural barriers hinder girls' access to education. Many girls in Burkina Faso do not go to school or drop out early for reasons including lack of consideration for girls' education, poverty, early marriages, low self-esteem among girls, and girls' relegation to household chores. Given the lack of awareness of the importance of girls' schooling and the persistence of gender-based violence in certain communities, the Scolarisation des Filles (SCOLFILLE) Project, an initiative by Action in Education, implements social mobilization initiatives, building the skills of key community players and providing educational support in order to improve the conditions for enrolling, maintaining and completing primary education for 2,000 vulnerable girls between 6-11 years in the Centre-West region of Burkina Faso. Key achievements of the SCOLFILLE Project include 180 teachers and headteachers trained in gender inequality with support courses for girls and 630 members of management committees, family associations, and 500 vulnerable families sensitized on the right and importance of girls' access to education, and an opened dialogue on menstruation, considered for some as a taboo (Action in Education 2021).

In **Zimbabwe**, pass rates are less than 50 percent for national examinations, with only a 49 percent pass rate for students in Grade 7 and a 33.7 percent pass rate for students taking their O levels. The country joined the End Learning Poverty for All in Africa (ELPAf) Campaign, led by the African Union and UNICEF, in 2024. This programme is a continental movement and aims to expand cost-effective approaches to improve early childhood education and foundational learning, leading to quality basic education, therefore ending education poverty in Africa and

achieving SDG 4. The ELPAf campaign directly addresses this challenge by shifting focus from access alone to actual learning outcomes, targeting the critical need for political leaders, policymakers, development partners, and communities to tackle learning poverty among school-going children. The campaign seeks to mobilize education stakeholders across African Union Member States through expert conferences, high-level policy dialogues, teacher capacity-building workshops, South-South cooperation, and school competitions (African Union 2025).

In **Liberia**, the Enrolment Drive Committee initiative aims to increase enrolment rates among school-age children across the country. Led by the Ministries of Health, Education, and Gender, Children & Social Protection, the initiative receives strong support from international partners, including UNICEF, Save the Children, and Street Child. The campaign addresses low enrolment and high dropout rates in primary schools, with a particular focus on girls. Its key objectives include highlighting declining school enrolment; establishing sustainable systems to bring all school-age children back to school; raising awareness of the benefits of education; tracking children's enrolment; strengthening school, community, district, and county mechanisms for enrolment and retention; and using multimedia platforms to promote social and behavioural change. The initiative also communicates messages on age-appropriate enrolment, immunization, and birth registration. This campaign is ongoing and continues to implement interventions across Liberia to ensure that more children, especially girls, have access to quality primary education (Ministry of Education 2024).

In the **Ivory Coast**, the rural community, once grappling with limited access to electricity, has seen progress thanks to a collaborative initiative between the Alstom Foundation and Electriciens Sans Frontières. The solar electrification project at Ouattafouekro Primary School aimed to enhance the educational environment and help local families to champion their children's continued learning. Before electrification, the school's reliance on daylight limited educational opportunities and compromised student safety. Two years later, 156 students and teachers benefit from extended study hours, a safer learning environment, and use of modern educational tools such as computers and video projectors. The school has also become a community hub for social events and adult literacy classes, declared the project manager of this initiative (Alstom Foundation 2024).

1.6 Impact of Energy Access on Girls' Education & Wellbeing

Girls' academic progress and confidence grow substantially when schools gain access to stable electricity, as recent examples across Tanzania show that dependable power quickly translates into measurable improvements in how students learn and succeed. In 2024, Tanzania's Rural Energy Agency (REA) worked to connect Lukaranga Secondary School to the national grid to enable evening study hours, printing of study materials, and greater student safety. Within three months, the school recorded improved exam performance and reduced operational costs (World Bank 2025). This case illustrates how reliable electricity directly improves academic outcomes, safety, and school efficiency, particularly benefiting girls who study after dark.

Reliable electricity also expands access to ICT and STEM, opening new learning opportunities for girls. Programmes such as Powering Potential's SPARC Labs have provided critical gateways to ICT education, installing solar-powered computer labs in over 14 schools and reaching more than

1,200 students across rural Tanzania (Powering Potential 2024). By enabling girls to develop digital and technical skills, these initiatives contribute to a more inclusive and innovative energy workforce.

Clean cooking initiatives led by SEforALL further demonstrate the gendered benefits of integrated school electrification. The 2024 Kibasila Primary School pilot integrated solar electrification with clean-cooking facilities, reducing smoke exposure for students and staff and improving girls' safety and well-being (SEforALL 2024). When considered within the global context, that approximately 2% of global emissions come from burning woodfuels for cooking, black carbon (or soot) has a warming impact that is 460 to 1,500 times stronger than CO₂, and nearly four million people die every year due to household air pollution, these approaches show that electrification can deliver multiple co-benefits, including improved health, safety, and equality within learning spaces (Clean Cooking 2023; WEF 2021). Beyond its technical value, such integration shows that well-designed energy interventions can address both educational and social challenges, reinforcing the need for inclusive and gender-responsive electrification policies.

These examples form the practical evidence base guiding the analysis and recommendations in this research.



CHAPTER TWO

RESEARCH METHODOLOGY

Secondary research highlighted Tanzania's significant progress in expanding electricity access through national programs such as the Tanzania Rural Electrification Expansion Program (TREET) and ASCENT TZ. While village-level electrification is nearly universal, many schools—particularly in **rural and underserved regions**—continue to face unreliable supply, affordability challenges, and gaps in technical support.

2.1 Identified Knowledge Gaps

Disparities are highlighted in primary education between urban and rural areas, indicating that female students in rural zones are more likely to start but not finish primary education, or to not enrol at all, which has clear implications for girls' future employment and economic opportunities. While existing research shows that additional years of schooling are strongly associated with higher earnings, with estimates for Tanzania indicating wage increases of approximately nine to 11 percent per additional year of education, there is currently no publicly available data that directly compares the income outcomes of individuals who drop out at the primary level with those who complete secondary education. As a result, the long-term economic costs of early school dropout remain insufficiently quantified in the Tanzanian context (Psacharopoulos & Patrinos 2018; World Bank 2022b). This lack of data limits our ability to quantify the full socioeconomic impact of dropout, particularly for rural girls. To address this, the present research proposes a primary data collection approach, including surveys and interviews with teachers, school staff, students, and families. This will provide context-specific evidence on the causes of educational disparities and their long-term impacts, enabling the identification of targeted interventions to support girls' retention and success in school.

However, while we can infer the cause of these disparities from the graphs and prior research, a further understanding can be derived from primary data analysis. Factors such as poorly lit classrooms, lack of electricity for evening study, limited ICT facilities, safety concerns at school, and gendered household duties are not captured in official statistics and as such, cannot be directly linked to them. This research seeks to rectify this data gap by conducting a survey, targeting the people directly experiencing these situations, such as teachers, cooks, and students, to provide insight to the causes and origins of the disparities identified. This will allow for a deeper analysis of the gendered disparities within energy and education in Tanzania, with solutions to move forward identified.

These gaps underscored the importance of conducting primary research that not only disaggregates outcomes by gender but also compares rural and urban contexts. Rural schools often face limited infrastructure, unreliable electricity, and higher poverty levels, while urban schools generally have better access to energy, teaching resources, and digital learning opportunities. By comparing these contexts, the study can identify how energy access disparities contribute to unequal educational outcomes, highlight regions where interventions are most needed, and provide evidence for targeted, equitable policies that ensure girls and young women in underserved rural areas are not left behind.

Building on the knowledge gaps identified in secondary research, the primary study will be guided by the following questions:

- What gender-specific barriers or opportunities arise in electrified schools compared to non-electrified schools?
- How does school electrification affect students' **enrolment, retention, academic performance, and graduation**, and how do outcomes **differ by gender** and location?
- How does school electrification shape girls' and young women's educational aspirations, career choices, and employment opportunities, particularly in relation to STEM?
- What factors explain gender differences in how students experience the impacts of school electrification?

2.2 Research Design & Methodology - Primary Research Approach

Both quantitative and qualitative methods were used to ensure a comprehensive understanding of the research findings. Quantitative data sought to identify trends and relationships between school electrification and gendered educational outcomes, while qualitative insights aimed to explain the underlying reasons and contextual factors behind these patterns. Together, they provided both measurable evidence and nuanced understanding to inform policy and programme recommendations.

2.2.1 Quantitative Research

Surveys were administered to school staff (teaching & non-teaching) and community leaders across both electrified and non-electrified schools in rural and urban regions, specifically Dar es Salaam, Dodoma, and Kigoma. The data will allow for comparative analysis between groups (female vs male, electrified vs non-electrified, rural vs. urban), enabling the identification of

statistically significant associations between school electrification and gendered educational outcomes. The research specifically seeks to measure the extent to which school electrification affects student enrolment, attendance, retention, performance, and aspirations, while also identifying barriers and opportunities that shape boys' and girls' experiences differently.

As this research was carried out within the context of the “Accelerating Clean Cooking in Schools in Tanzania” project with SEforALL and the WFP, we have partnered with the SEforALL STEM Trainees to conduct primary data collection in-country.¹

2.2.2 Qualitative Research

The qualitative component will provide in-depth insights into the lived experiences of school staff like teachers and cooks, and graduate students. Methods included:

- **Key Informant Interviews (KIs):** With school staff (e.g., teachers, administrators, cooks) to explore institutional level perspectives.
- **Surveys:** A primary survey was conducted in both urban and rural regions, in **Dar es Salaam, Dodoma, and Kigoma regions of Tanzania**. These regions were chosen primarily to capture both urban and rural realities and to collect firsthand insights on how electrification influences gendered educational outcomes.

All responses were kept anonymous and the survey explored six main areas:

- Differences in attendance and performance between boys and girls.
- How electricity access shapes girls' aspirations, digital readiness, and interest in STEM.
- The most significant benefits and challenges experienced after electrification.
- Barriers preventing girls from fully benefiting from school electricity.
- The reliability and consistency of power supply.
- Changes in community attitudes toward girls' education since electrification.

Responses from these survey questions were coded to generate key indicators on attendance, study hours, reliability, and gendered participation. These findings are summarised in the Findings section.

2.3 Research Limitations

While this research provided valuable insights into the impact of school electrification on girls' education and employment opportunities in the country of Tanzania, it is of great importance to mention several methodological and socioenvironmental constraints or limitations that have affected the depths and generalisability of the findings.

¹ The SEforALL STEM Traineeship Programme is specifically designed for young women to excel in sustainable energy careers. Through practical hands-on experience, participants gain valuable skills applicable to the energy sector, which can lead to job opportunities in target countries. The programme's ultimate aim is to provide a comprehensive learning experience directly related to employment prospects. By December 2025, the programme has successfully trained 42 women across Chile, Ecuador, Ghana, Honduras, Kenya, Mexico, Panama, and Sierra Leone.

- **Network and internet disturbances:** The research reliance on digital communication with the local teams, accessing the survey form and transmitting the survey responses from Tanzania was greatly impacted by the shortage of network access and internet connection all over the country. This situation was exacerbated during the presidential election in October 2025, which saw widespread internet shutdowns. These disturbances caused a delay in data collection and transmission, and even an interruption of the data collection process. This has resulted in a reduction of the initially planned sample size.
- **Challenges in accessing rural population:** Logistical, financial and human challenges made access to the target regions and population difficult. The majority of members of the local team were located in urban regions of the country, that is Dar es Salaam and Dodoma. The lack of logistics and finances did not allow the team to overcome those geographical barriers. This resulted in an urban-dominant sample (92 percent urban with 0 percent rural) which restricted perspectives from rural schools, the most affected by electrification lack.
- **Difficulties to conduct direct interviews with students and parents:** The cultural norms and ethical protocols did not allow the research team to conduct direct interviews and discussion with primary education students, parents or students' guardians. This challenge has restricted the understanding of household-level decision-making on education; parental perceptions of the value of girls' education; and internal parameters influencing girls' school enrolment, dropout, attendance to lectures, secondary education enrolment and post-graduate opportunities or challenges. This limitation induced an overrepresentation of certain roles like cooks, teachers and graduates.
- **Small sample size (n=13),** limiting generalisability.
- **Language and Translations barriers:** Despite the fact that this survey and interviews were conducted by a team speaking the local language, nuances in exact meaning that may have been lost in translation, resulting in discrepancies between the message and the reported version. The reliance on mediators adds a layer that can occasionally obscure the emotional depth of a respondent's answer or its real intent. This could have impacted the qualitative data outcomes.



CHAPTER THREE

FINDINGS & ANALYSIS

3.1 Findings from Desktop Review

3.1.1 Gender & Energy Inequality in Education

Research has consistently demonstrated that women and girls globally are affected by a lack of energy access (UN DESA et al. 2016; ENERGIA 2021). Findings indicate that women and girls experience an increased time burden, as they spend significantly more hours completing energy-intensive household tasks such as cooking and collecting firewood. Globally, women and girls spend an estimated 200 million hours daily collecting water and firewood (UN Women 2023), reducing the time they can dedicate to education, income-generating activities, or leisure. In Sub-Saharan Africa, more than 85 percent of household firewood collection is performed by women and girls (ENERGIA 2021), and exposure to smoke from traditional fuels contributes to nearly 700,000 premature deaths annually among women and children (WHO 2023). Without access to modern energy, girls often bear a double burden of domestic chores and unsafe school environments, reinforcing gender disparities in education access and achievement.

Reflecting these global patterns, this gender inequality is mirrored in Tanzania. Unequal energy access is primarily geographic, reflecting urban–rural divides with lasting effects on education and livelihoods. Across educational levels, gender gaps persist in enrolment, retention and completion rates, underscoring how inequitable access to energy continues to reinforce broader educational disparities.

Although primary enrolment is nearly gender balanced, since 2013, Tanzania's Gender Parity Index (GPI) has exceeded 1.0, the benchmark for equality in enrolment, showing equal or slightly higher enrolment for girls than boys at the primary level (UNESCO 2023). However, gender parity

declines at higher levels: the GPI drops to about 0.94 in lower secondary and 0.88 in upper secondary education (UNESCO 2023). This parity is significant given the scale of the school-age population: Tanzania has approximately 12.3 million primary school-age children and 8.9 million secondary school-age youth, totalling around 21.2 million, of whom roughly half are girls (UNSDG–UIS 2023). This progress is largely attributed to government reforms such as the Free Basic Education Policy (2015), which eliminated school fees at the primary and lower secondary levels, as well as national campaigns aimed at boosting girls' participation in education (UNESCO 2022). Removing school fees has reduced one of the biggest barriers for low-income families, allowing parents to keep daughters in school instead of relying on them for income or domestic chores such as collecting firewood (UNESCO 2022; World Bank 2021).

National awareness campaigns have also begun to shift social attitudes by challenging gender stereotypes and promoting girls' education as a collective investment in community development and future skills (UNESCO 2022; UNICEF 2023). While these achievements mark progress towards gender parity, true equality requires ensuring that girls not only enrol but also remain in school and have access to the same quality of learning resources, including electricity and digital tools (SEforALL 2024; World Bank 2025). This shows that getting more girls into school is not often enough on its own; lasting equality depends on changing attitudes and making sure every girl has the tools, including reliable power, to keep learning and build her future.

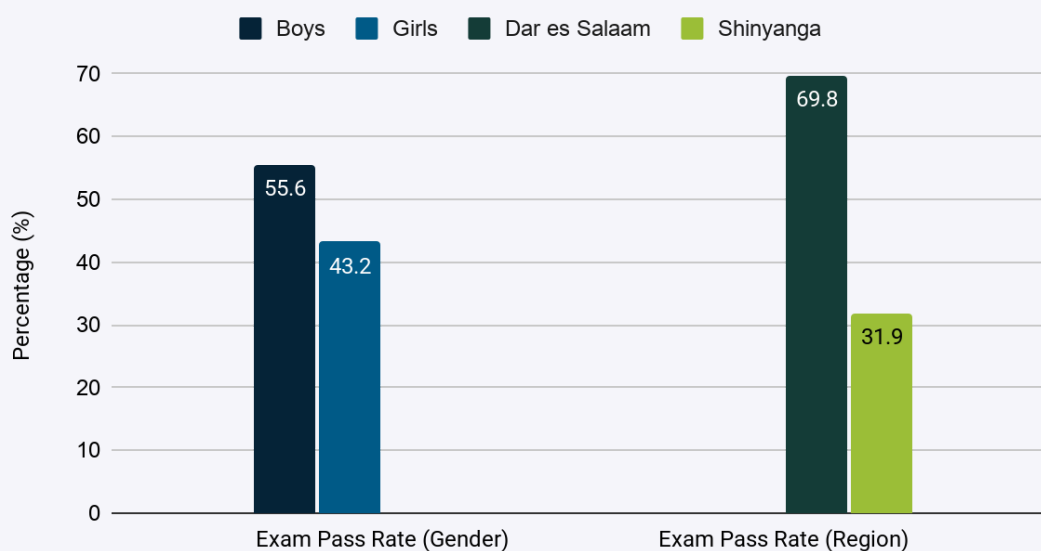
As indicated, geographic inequities across Tanzania remain significant for educational enrolment and attainment. Girls in rural areas are less likely to transition to secondary and tertiary education due to early marriage (Plan International 2022), household responsibilities (UNESCO 2022), and inadequate school infrastructure (World Bank 2025). For instance, in 2012, 31 percent of rural women across Tanzania had no formal education, whereas only 6 percent in Dar es Salaam had no access, indicating a shrinking gap in urban cities (UNESCO 2022). However, more recent data from the Tanzania Demographic and Health Survey show that progress remains uneven: as of 2022, nearly one in five rural women aged 15 to 49 (19.7 percent) still had no formal education, compared to 6.4 percent in urban areas (TDHS-MIS 2022). This highlights persistent rural–urban inequalities in educational access despite national progress.

These barriers are closely tied to limited energy access, as poorly lit classrooms and long hours spent on chores like collecting firewood leave little time for study. This shows that improving gender equality in education is not only about social reform but also about making sure schools and homes have reliable power so girls can learn safely and stay in school. Consequently, these challenges highlight that education equity cannot be achieved through social policy alone; improving girls' educational outcomes requires addressing the energy deficits that shape daily routines, safety, and access to learning resources.

Education outcomes also vary regionally and by gender. Nationally, primary school exam pass rates stand at approximately 55.6 percent for boys and 43.2 percent for girls, with urban regions such as Dar es Salaam showing higher pass rates (69.8 percent) compared to rural regions such as Shinyanga (31.9 percent) (MoEST 2023; NBS 2022a). Literacy rates follow similar trends, with Dar es Salaam reaching nearly 97 percent, while rural areas lag significantly. Gender disparities in secondary and tertiary education enrolment persist, affecting future employment and empowerment opportunities (TCU 2024). These patterns reflect the intersection of electricity access, educational infrastructure, and regional socioeconomic development, illustrating that while electrification is a necessary foundation for equitable education outcomes, it is not on its

own sufficient. These disparities mirror the regional energy-access gaps described earlier, showing how infrastructure and social inequality reinforce one another.

Figure 10: Primary school exam pass rates in Tanzania by gender and region (2025)



Source: TCU 2024; MoEST 2023; compiled by author based on national data.

Figure 10 illustrates how gendered learning outcomes often mirror the same regional disparities in electricity access and infrastructure quality discussed earlier. Rural schools are disproportionately affected, often lacking basic electricity infrastructure such as lighting, ICT, and modern teaching resources. Poor lighting reduces evening study hours for girls, while unsafe, unlit environments increase dropout risks (World Bank 2025). Together, these factors explain why inadequate school electrification continues to undermine educational quality, gender equity, and the achievement of national development goals (World Bank 2025; SEforALL 2024). Closing this gap is essential to ensure that every girl learns in a safe, well-lit environment and is equipped to contribute to Tanzania's social and economic development.

3.1.2 Electrification & Education Reinforcing Equity

Although challenges are significant, there are clear benefits in creating an enabling environment for investments and action towards electrification, education, and equity. Evidence from global studies shows that schools with reliable electricity report higher female retention and better academic performance, particularly in STEM subjects (World Bank 2025b; UNESCO 2023; SEforALL 2024b).

Programmes such as Zanzibar's *Solar Mamas* illustrate how decentralised energy access supports girls' education and gender empowerment. Since 2015, 65 women have been trained to install solar systems, reaching nearly 1,860 households in rural villages (The Guardian 2025). These women have become entrepreneurs and community leaders, demonstrating that when women gain technical skills and resources, they reinvest in their communities through improved

energy access, education, and livelihoods. Similarly, the nonprofit Powering Potential has introduced the *Solar-Powered Access to Raspberry Computing (SPARC)* programme, establishing solar-powered computer labs in rural Tanzanian schools. These labs, equipped with Raspberry Pi computers and offline digital libraries, are now operational in more than 14 schools, providing a critical gateway to ICT and STEM education in underserved communities (Powering Potential 2024).

This is significant given that women who perform better in STEM fields tend to have stronger innovation and problem-solving skills that contribute to sustainable development and climate action (UN DESA et al. 2016). Gender equality matters because when women and girls have equitable access to energy, education, and finance, they accelerate innovation, improve community resilience, and expand the reach of sustainable energy solutions. Empowering girls through electrified learning environments therefore not only enhances gender equality but also strengthens the talent pipeline for future clean energy and technology sectors.

At a broader level, the benefits of women's participation extend into leadership and policy. Research shows that when women participate in decision-making, societies are more likely to adopt progressive environmental and climate policies. Countries with higher proportions of women in parliament are significantly more likely to ratify international environmental treaties and enact stronger climate measures (Norgaard and York 2005, 510-511; Mavisakalyan and Tarverdi 2019, 155). Likewise, companies with greater female representation in senior management achieve better financial performance and demonstrate stronger sustainability commitments. For instance, S&P 500 firms with women in leadership above the median record 30 percent higher returns on equity and 30 percent lower earnings risk than peers (Bank of America 2023). Firms with women on their boards are also more likely to reduce energy intensity and greenhouse gas emissions (Salamon 2022; European Investment Bank 2023).

These findings underscore that energy access and gender equity are mutually reinforcing drivers of progress. Electrified schools do more than power classrooms; they expand opportunities for girls to build green skills, pursue STEM careers, and participate in the clean energy transition. Women entrepreneurs in decentralised energy markets, for instance, often outperform men in reaching rural customers because of their community trust and understanding of household energy needs (SEforALL 2018).

Girls' education has also been recognised as a transformative climate solution. Research from Brookings (2023) shows that investing in girls' education advances climate strategies in three ways: by promoting reproductive health and rights, strengthening girls' leadership in climate action and environmental decision-making, and developing green skills that prepare young women for emerging jobs in sustainable industries.

Ultimately, electrifying schools is more than a technical upgrade; it is an investment in human potential. When women and girls are empowered through education and energy access, they do not only benefit individually; they also transform entire systems, driving innovation, inclusion, and resilience from the classroom to the boardroom. Also, when girls learn in well-lit classrooms, access digital tools, and see women leading in energy and climate sectors, it signals that equality and innovation can grow together. Electrification, education, and equity are not separate goals but interconnected pathways toward a more inclusive and sustainable future.

3.1.3 The Socioeconomic Impacts of Energy Access in Education

Building on the evidence that electrification strengthens gender equity and educational inclusion, this section explores the broader socioeconomic implication of energy access in Tanzania's education system.

There is notable regional variation in electricity access, which correlates strongly with socioeconomic indicators such as the Human Development Index (HDI) and poverty rates. For example, Dar es Salaam, the largest city and economic hub, reports 99.6 percent household electricity access and a relatively high HDI of 0.653, paired with a poverty rate of 11.6 percent. In contrast, regions such as Rukwa and Tabora have electricity access rates below 60 percent, HDI values under 0.50 and poverty rates exceeding 50 percent (NBS 2022b; UNDP 2022; EAUSS 2020). These disparities underscore the need for targeted energy interventions in regions with lower access and demonstrate how energy access is not only an educational issue but also a driver of broader socioeconomic opportunity.

Beyond the reinforcing benefits of gender, energy, and education, evidence also shows that electrification directly improves educational quality and opportunities. For example, in 2023 the Government of Tanzania distributed more than 17,700 desktop computers and 10,384 laptops to primary schools, and an additional 31,000 desktops and 10,000 laptops to secondary schools, enabled largely through recent electrification progress (Tanzania Affairs 2025). At Lukaranga Secondary School, connection to the grid in 2024 enabled evening study hours, printing of study materials and greater student safety. Just three months after electrification, the school reported improved exam performance and reduced operational costs, mainly due to savings from reduced diesel use and generator maintenance (World Bank 2025d). This demonstrates how reliable electricity not only improves learning environments but also directly supports Tanzania's broader development goals, reinforcing the need for targeted last-mile solutions discussed in earlier sections.

Energy access also affects teacher effectiveness and retention. Studies highlight that limited or absent electricity constrains teachers' ability to prepare lessons, use ICT tools, and deliver quality instruction, particularly in rural areas where access gaps remain largest. Inadequate working and living conditions linked to energy poverty reduce morale and make it difficult to attract and retain qualified teachers, which in turn undermines instructional quality and student performance (IGC 2017; Mgaya 2024; World Bank 2025). A teacher in rural Tanzania explained, *"Three newly appointed teachers chose not to return after their preliminary visit to the school."* Another added, *"Young teachers tend to have laptops and smartphones, and when they realised they couldn't use them here, they left"* (World Bank 2025d). These experiences reveal how the absence of reliable electricity can stall the professional growth of teachers and limit students' access to consistent, motivated instruction. In many remote communities, teachers' living quarters also remain unelectrified, forcing them to work and reside in low energy environments. Expanding school electrification to include staff housing would not only improve retention but also create a more stable and motivated teaching workforce, ultimately enhancing student learning outcomes (World Bank 2025d; IGC 2017; MoEST 2023).

Building on its impact on teachers, reliable electricity enables clean cooking in some schools, reducing reliance on firewood, lowering health risks for students and staff, and improving girls' safety by decreasing time spent collecting fuel (World Bank 2025b; SEforALL 2024a). In 2024, a

pilot clean cooking and solar electrification project was launched at Kibasila Primary School, with plans to expand to 50 schools nationwide (SEforALL 2024). This shows that energy access is not only about lighting classrooms but also about protecting health and dignity. When schools adopt clean cooking solutions, girls no longer need to gather firewood, giving them more time to study and reducing their exposure to unsafe environments.

At the socioeconomic level, electrified schools foster digital literacy and technical competence, which are skills essential for modern economies and low-carbon growth. They create environments where both students and teachers can use technology for research, communication, and innovation, linking education directly to future employment opportunities. Electrification therefore strengthens national productivity, supports gender inclusion in the workforce, and contributes to the climate agenda by enabling energy-efficient learning spaces that replace biomass use with clean power (World Bank 2025; SEforALL 2024).

Consequently, the impact of energy access in education extends well beyond the classroom. It builds a foundation for inclusive economic development, retains skilled teachers, and empowers young people, particularly girls, to participate in a sustainable energy future. Studies show that every dollar invested in school electrification yields long-term social and economic returns through improved learning outcomes, higher labour productivity, and reduced energy poverty (World Bank 2025; SEforALL 2024). This underscores that expanding electricity access to schools is not merely an infrastructure goal but a long-term investment in human capital, resilience, and equitable growth. For policymakers and investors, it represents one of the most direct and measurable pathways to advancing national development and achieving the SDGs.

3.2 Field Survey Insights

This field data analysis is based on survey responses collected from 13 respondents. The survey explored how access to reliable electricity in schools is influencing learning, safety, and future opportunities, particularly for girls. Respondents were asked to share their experiences and observations on issues ranging from academic performance and digital learning to community attitudes and barriers that still prevent girls from fully benefiting from electrified school facilities.

To guide the analysis, the survey was structured into two main parts. The first section gathered background information about the respondents, including their gender, age, location, and roles within the school community. The second section focused on respondents' insights and lived experiences with school electrification, such as its impact on students, gender differences in educational outcomes, changes in aspirations for girls, and the wider effects on the community.

3.2.1 Demographic Characteristics of Respondents

The sociodemographic characteristics of the respondents, including their gender, age, location, and role at the schools were analysed to provide insights into the profile of the respondents to the survey. The demographic characteristics of the respondents are shown in the tables and figures below.

3.2.1.1 Gender Characteristics of Respondents

Out of the 13 respondents, 12 were female and one was male.

Table 1: Gender characteristics of the respondents

Variable (Gender)	Frequency	Percentage (%)
Male	1	7.7
Female	12	92.3
Total	13	100

3.2.1.2 Age Characteristics of Respondents

The age distribution of the respondents shows that more than half, more specifically, 53.8%, were between 25 and 34 years old, indicating that the survey primarily engaged young adults. Additionally, 23.1% of the respondents were aged between 18 and 24, while the other 23.1% fell within the ones aged between 45 and 54 age group.

Table 2: Age characteristics of the respondents

Variable (Age Range) in Year	Frequency	Percentage (%)
18-24	3	23.1
25-34	7	53.8
45-54	3	23.1
Total	13	100

3.2.1.3 Location of Respondents

The majority of respondents, 12 out of 13, reported living in urban areas, which suggests that most responses reflect experiences from individuals working in or familiar with more developed school settings. Only one respondent was from a semi-urban area, and none were from rural communities, indicating that rural perspectives were not represented in this sample.

Table 3: Location of the respondents

Variable (Location)	Frequency	Percentage (%)
Semi-urban	1	7.7
Urban	12	92.3
Rural	0	0
Total	13	100

3.2.1.4 Region of Residence of Respondents

The respondents came from a range of locations, with the majority residing within Tanzania. As presented below in Table 1.4, most respondents, 61.5 percent, were based in the Dar es Salaam region, making it the most represented area in the survey. This was followed by Dodoma, where 23.1 percent of the respondents lived. A smaller proportion, 7.7 percent, resided in the Kigoma region. Notably, one respondent, also representing 7.7 percent of the total, was located outside of Tanzania, residing in Nigeria, considering the scope of the situation in Africa overarchingly. Overall, the geographical distribution shows that the sample was predominantly Tanzanian, with a slight representation from outside the country.

Table 4: Region of the respondents

Variable (Region)	Frequency	Percentage (%)
Dar es Salaam	8	61.5
Dodoma	3	23.1
Kigoma	1	7.7
Nigeria	1	7.7
Total	13	100

3.2.1.5 Respondents' Role & Occupational Background

The surveyed respondents represented a mix of roles, reflecting the diversity of individuals engaged in the survey. As shown below in Table 1.5, cooks and graduates made up the largest share of respondents, each accounting for 30.8 percent of the total. Teachers and youth each constituted 15.4 percent of the respondents, showing a balanced representation from both professions and young community members. Meanwhile, students accounted for 7.7 percent.

Table 5: Role of the respondents

Variable (Role)	Frequency	Percentage (%)
Cook	4	30.8
Teacher	2	15.4
Youth	2	15.4
Graduates	4	30.8
Student	1	7.7
Total	13	100

3.2.2 Respondents' Experience with School Electricity

3.2.2.1 Impact of Reliable Electricity on Educational Outcomes

The respondents were asked to assess how the presence of reliable electricity in schools affects educational outcomes such as attendance, performance, and graduation rates for boys and girls. 69.23 percent of the respondents indicated that access to reliable electricity benefits both genders equally. This perspective was shared by cooks, teachers, graduates, community youth, and students across different regions, including Dar es Salaam, Dodoma, and Kigoma. They reasoned that electricity supports learning for all students, allowing them to study at home or at school after dark and use educational appliances. They emphasized that reliable electricity improves safety and overall engagement in learning for all genders.

However, 23.07 percent of the respondents highlighted gender specific differences in the impact. One graduate student from Dodoma noted that electricity tends to have a slightly more positive effect on boys rather than girls due to the society's prioritization of the education of males. Conversely, two respondents observed that girls benefit more, as reliable electricity helps them to overcome barriers related to home chores and safety, enabling extended study hours and better participation in school activities and evening classes. Notably, one female teacher from Dar es Salaam observed that electricity has no noticeable impact on either gender, citing the reason as all the students study in the same classroom.

Overall, the responses indicate that while most respondents perceive electricity as equally beneficial for boys and girls, there are contexts in which girls may experience slightly greater advantages, particularly in areas where household responsibilities, or safety concerns limit their study time.

3.2.2.2 Impact of School Electrification on Girls' Future Aspirations & Preparedness for Employment in STEM Sectors

The respondents overwhelmingly indicated that school electrification has a positive impact on girls' future aspirations and preparedness for employment, particularly in STEM and modern sectors requiring digital or STEM skills such as understanding scientific concepts, conducting experiments, using computers and digital tools, coding, and others. Particularly, 69.23 percent of the respondents agreed that electricity significantly influences and opens completely new career paths and provides girls with critical job skills, while 23.07 percent agreed that access to reliable electricity has a moderate influence by raising awareness and improving their skills and confidence.

Several respondents highlighted practical benefits of electrification, such as the ability to study during early morning or late evening hours when it is dark, access to digital tools like computers and the internet, and engagement in practical science and ICT lessons, which not only enhances girls' learning but also broadens their career awareness and opportunities.

Some respondents described indirect benefits, such as improving study conditions, safety, and exposure to science learning opportunities. They noted that while electrification may not fully develop advanced skills immediately, it raises awareness, confidence, and curiosity among girls, encouraging them to pursue careers in STEM and digital economy.

One respondent noted potential challenges, explaining that without electricity, some subjects requiring projectors or laptops cannot be effectively taught, which could hinder girls' learning.

Overall, respondents from different age groups, roles, and locations consistently emphasized that electrification enables girls to access resources and experiences that would otherwise be unavailable, making a significant contribution to their aspirations, skill development, and preparedness for future employment.

3.2.2.3 Most Impactful Change of School Electrification on Female Students

The respondents were asked to identify the single most impactful change for female students resulting from access to reliable school electrification. Three main areas of impact were observed by the respondents, which were mainly improved safety and security, extended study hours, and access to technology.

"Access to technology" was reported as the most significant impact by 46.15 percent of the respondents, especially graduates and students from Dar es Salaam, Dodoma, Kigoma, and Nigeria. Reliable electricity enables the use of computers, internet, and other digital learning tools, exposing female students to modern educational resources, digital skills, and STEM-related opportunities.

"Extended study hours" was indicated by 30.77 percent of respondents, particularly teachers and youth, as a key impact of school electrification as it allows girls to study safely in the evenings, enhancing their learning opportunities, and enabling them to complete homework or participate in school activities beyond regular daylight hours.

Finally, close to a quarter of the respondents selected “improved safety and security” as the primary benefit as better lighting on school grounds and within facilities reduces risks and provides a safer environment for girls.

Overall, the responses indicate that school electrification has multiple benefits for female students, combining safety, extended study hours, and access to technology, all of which contribute to improved educational experiences and future career preparedness.

3.2.2.4 Barriers Preventing Girls from Fully Benefitting from School Electricity

The responses highlight several factors that limit girls' ability to fully benefit from school electrification. The most frequently cited barrier, reported by 61.54 percent of respondents, was the burden of household duties, which is consistent with common household responsibilities such as firewood collection, fetching and other domestic tasks that reduce the time girls have available for studying or using electrified school facilities.

Safety concerns were also noted by 15.38 percent of respondents. Another equally agreed upon barrier was lack of resources such as computers and well-trained teachers to support students' learning, which indicates that electricity alone does not guarantee full access to digital learning opportunities for girls.

Further, one teacher from Dar es Salaam identified social norms, such as beliefs that technical subjects such as STEM fields are not suitable for girls, as limiting factors because they discourage girls from fully engaging with STEM related opportunities, even when electricity is available.

Overall, the findings suggest that although school electrification created new opportunities for girls, household responsibilities, social norms, and lack of resources still restrict girls from fully benefiting from the opportunities school electrification presents.

3.2.2.5 Importance of Access to Reliable Electricity for Long-Term Educational Benefits

Access to reliable electricity was identified by respondents as essential for ensuring that girls fully benefit from school electrification. In fact, 61.54 percent of respondents described reliable electricity as crucial. This perspective was shared by teachers, graduates, and students across Dar es Salaam, Dodoma, Kigoma, and Nigeria, demonstrating that the quality of electricity is as important as its availability.

As well, 38.46 percent of respondents, cooks and youth, agreed that reliable electricity is very important as occasional outages can significantly disrupt learning and school activities.

These insights underscore that school electrification alone is not enough; the long-term educational benefits for girls depend heavily on a reliable and high-quality power source.

3.2.2.6 Changes in the Community's Attitude and Behaviours After School Electrification

Significant positive changes in their community's attitude toward girls' education post school electrification were observed by 92.30 percent of respondents. These respondents reported that electrified schools are safer, support evening study, and encourage parental support, including

providing digital resources and promoting STEM participation. In contrast, 15.38 percent of respondents observed only minor changes, such as slightly increased enrolment or extended study time for girls after chores. One respondent reported not noticing any change. These findings suggest that school electrification not only improves learning environments but also positively influences community perceptions and support for girls' education.

**CHAPTER FOUR**

INTERPRETATION & POLICY IMPLICATIONS

The baseline findings confirm that electrification is a critical enabler of education quality, gender, and regional development. Quantitative data shows that regions with higher electricity access demonstrate better school pass rates, lower poverty and higher HDI scores (NBS 2022a; World Bank 2025b). However, the evidence also shows rural-urban inequalities. Many rural and low-income communities are still left behind, facing unreliable power, high connection cost, and limited opportunities for girls and women. This highlights the need for energy solutions that are not only reliable and affordable but also designed to meet the realities of each community. Building on these findings, policy efforts should focus on closing access gaps, strengthening partnerships, integrating sectors, and embedding gender equality in all energy-education intervention.

4.1 Expanding Rural Electrification & Last-Mile Access

Expanding rural electrification remains one of the most direct ways to close Tanzania's education and gender gaps. The Government of Tanzania should prioritise school electrification within rural access programmes, such as those led by the REA, to ensure that national grid expansion translates into tangible improvements in learning conditions. When schools are powered, teachers can prepare lecture notes after dark, ICT tools can be used effectively, and students, particularly girls, can study safely in the evenings. Government-led investment in last-mile infrastructure, paired with private-sector participation through mini-grids and solar solutions, would ease the financial burden on schools that currently struggle to pay for wiring and meters. Development partners can reinforce these efforts through concessional finance, technical assistance and community-level training to ensure sustainability. By targeting underserved

districts where access and literacy levels are lowest, electrification becomes not only a tool for education but also a driver of social equity, directly addressing the rural–urban divide identified in this baseline.

4.2 Supporting Off-Grid Solar Systems in Unreliable Grid Areas

Although national grid expansion remains vital to Tanzania's energy strategy, achieving full and reliable electrification for remote schools will also require decentralised renewable solutions. In areas where the national grid remains unreliable or has not yet been extended to, off-grid solar systems and mini-grids offer the most practical and sustainable path to universal school electrification. The Government of Tanzania should continue to create an enabling regulatory environment that supports decentralised renewable solutions, by simplifying licensing for small power producers, providing tax incentives for solar imports, and ensuring fair tariffs for mini-grid operations.

Likewise, the private sector, particularly local energy enterprises and innovators, can expand last-mile delivery through pay-as-you-go models and community-based ownership schemes that make solar systems affordable and maintainable for schools. Also, development partners can bridge the gap by offering concessional finance, grants for pilot projects, and technical support to strengthen after-sales service and long-term system sustainability.

These decentralised solutions are particularly powerful for off-grid or peri-urban (outskirts of urban cities) schools that struggle with frequent power cuts or high grid connection costs. When classrooms are powered by solar energy, classes can continue uninterrupted, evening study sessions become possible, and the use of digital tools no longer depends on the stability of the national grid. For girls, this means safer learning environments and greater access to science and technology education, turning renewable energy into a bridge between education equity and climate resilience. By investing in off-grid systems, Tanzania can transform its energy challenges into opportunities for innovation, job creation, and inclusive growth.

4.3 Integrating Energy Access with Educational Infrastructure

Integrating energy access with educational infrastructure is essential to ensure that electrification delivers more than light, it must also power opportunity. The Government of Tanzania, through closer coordination between the Ministry of Education, Science and Technology, the Ministry of Energy, and the Ministry of Community Development, Gender, Women and Special Groups or Associations, should link school electrification directly to education-sector planning. This approach ensures that every new connection is matched with functional classrooms, digital learning tools, and safe, well-lit facilities. In some cases, schools are connected to the grid but remain unable to use electricity productively because they lack computers, laboratory equipment, or trained teachers. Therefore, when energy and education investments are aligned, each connection becomes meaningful, supporting ICT-enabled teaching, laboratory work, and evening study sessions that help students, especially girls, reach their full potential.

Furthermore, the private sector has a vital role in this effort by developing scalable, technology-driven solutions such as solar-powered computer labs, e-learning hubs, and

clean-cooking facilities that reduce time spent collecting firewood and improve health outcomes for students and staff. Likewise, development partners can complement these efforts with financing and technical expertise to pilot integrated energy-education models that can later be replicated across regions.

To make this integration work in practice, the government should embed school-electrification targets within national energy planning and the forthcoming *Fourth Five-Year Development Plan (FYDP IV)*, which outlines Tanzania's national priorities for sustainable economic growth, social development, and infrastructure investment for 2026–2031 (Ministry of Finance and Planning, 2024). To support this, establishing a joint coordination task force between the Ministries of Energy, Education, and Gender would help ensure that investments are directed where they can have the greatest social impact.

Likewise, development partners and finance institutions can also strengthen this coordination by expanding results-based financing (RBF) schemes that reward verified school connections and by supporting blended-finance models that combine public, private, and concessional funds. Similarly, the private sector and civil-society organisations can co-invest in pilot projects that demonstrate viable business models for sustainable school electrification and digital learning.

When energy access is fully integrated into education planning, it creates a powerful multiplier effect. Electrified schools become digital learning centres, community hubs, and safe spaces that encourage girls to remain in school. Moreover, coordinated financing and clear institutional leadership ensure that every investment delivers lasting educational and social impact by avoiding fragmented efforts and improving accountability for results. Ultimately, this approach does not only enhance learning outcomes but also builds the human capital and resilience needed to sustain Tanzania's clean-energy transition and inclusive growth.

4.4 Embedding Gender Equality Across Energy-Education Policies

Although previous sections have shown that electricity can improve how students learn, its real power lies in how it helps remove the everyday barriers faced by girls and women. Embedding gender equality within energy and education policies is therefore not just about providing access, but about creating opportunities that reach everyone. The Government of Tanzania can lead this effort by including gender targets and indicators in all national electrification programmes. That is, this means tracking not only how many schools are connected, but how those connections improve girls' enrolment, attendance, and participation in science and technology subjects.

In addition, the private sector has a vital role to play by creating pathways for women's inclusion within the clean energy workforce by training female technicians, supporting women-led energy enterprises, and ensuring women are included in the design and delivery of school electrification projects. Similarly, development partners can build on this by supporting data collection and gender analysis to show how access to energy changes girls' educational outcomes and community wellbeing. This evidence can then shape programmes that are more responsive to the needs of women and girls.

When girls learn in safe, well-lit, modern classrooms and see women leading as engineers, teachers, technicians, and innovators, they begin to see new possibilities for themselves, and they

gain the confidence to pursue careers that shape their communities and the energy transition. Placing gender equality at the centre of energy and education planning is therefore not just a social priority but a smart investment in the nation's future. Empowered girls grow into women who drive innovation, strengthen communities, and power Tanzania's clean energy transition.



CHAPTER FIVE

REPORT RECOMMENDATIONS

This report highlights significant disparities in both energy access and educational outcomes between urban and rural regions of Tanzania. While reliable electrification of schools has shown potential to improve attendance, performance, and gender equity, the analysis reveals that energy access alone is not sufficient to guarantee inclusive educational development and must therefore be integrated with broader social and gender policies. Based on the baseline review, energy gap analysis, and survey insights, the following recommendations are proposed:

5.1 Strengthening Rural School Electrification through Sustainable Energy Systems

To reduce educational disparities and improve gender equality in rural regions, priority should be given to electrifying rural schools through decentralized and renewable energy systems. Stable and affordable electricity in schools enhances learning outcomes, increases girls' safety, supports evening study sessions, and enables participation in STEM subjects and digital learning. While rural school electrification does not close the overall urban–rural electricity gap, it directly addresses the education and gender equality gaps arising from energy poverty in schools.

Key recommendations include:

- Deploy standalone solar PV systems with a robust operation and maintenance (O&M) plan to provide reliable and sustainable electricity for schools in remote areas not connected to the national grid. Solar mini-grids may also be considered for clusters of schools but are more complex and slower to deploy.

- Integrate e-cooking solutions in schools to reduce reliance on firewood or kerosene for cooking, improve nutrition, and provide a holistic energy solution. This approach can also attract additional funding and donor support for school electrification.
- Incorporate battery storage solutions to enable uninterrupted electricity supply, support evening learning sessions, and mitigate the intermittency of renewable energy.
- Build local capacity for maintenance and repair by training teachers, community youth, and technicians, ensuring sustainability and minimizing downtime.
- Promote community–school partnerships that allow shared use of power infrastructure, strengthening local ownership and responsibility.
- Enhance inter-ministerial coordination between the Ministry of Energy and Ministry of Education to prioritize school electrification in national energy and education strategies. Additionally, align electrification programs with donor and development agency priorities to mobilize funding and technical support.

By implementing these measures, rural school electrification can become a catalyst for improving educational outcomes, closing gender gaps, and enabling sustainable development in underserved communities.

5.2 Linking Electrification with Educational and Gender Outcomes

The ultimate goal of school electrification should be to enhance learning quality and promote gender equity. Reliable electricity must contribute directly to educational transformation rather than remain an isolated infrastructure project.

Key recommendations include:

Digital learning integration:

- Develop programmes that combine electrification with ICT-based learning, such as digital literacy courses and STEM clubs, with a particular focus on engaging girls.
- Facilitate teachers' training on the use of technology to ensure effective incorporation of ICT tools into classroom learning and promote innovative teaching methods.

Monitoring & alignment:

- Establish gender-responsive frameworks to track how electrification affects student attendance, performance, and retention, ensuring inclusivity and equitable monitoring for all genders.
- Collaborate with education and gender ministries, non-governmental organizations (NGOs), and development partners to align school electrification efforts with national goals on gender inclusion and educational access.

Expected Outcomes

By integrating electrification with digital learning, teacher capacity building, and gender-responsive frameworks, schools are expected to achieve improved student performance, higher retention rates, especially for girls and increased participation in STEM and technology-based learning, ultimately contributing to a more equitable and inclusive education system.

5.3 Addressing Socioeconomic Barriers Beyond Energy Access

While electrification significantly improves the learning environment, it does not address the broader socioeconomic challenges that continue to limit school attendance, particularly for girls in rural areas. Many barriers such as poverty, inadequate WASH facilities, household responsibilities, and gender norms continue to hinder consistent participation. Therefore, electrification efforts must be complemented by social support programmes that tackle the underlying factors keeping children, especially girls, out of school.

Key recommendations include:

- Provide school supplies such as textbooks, uniforms, and stationery to reduce financial burdens on low-income families. Integrate school meal programmes, which have been widely shown across Sub-Saharan Africa to increase both enrolment and attendance, particularly for vulnerable children.
- Ensure schools have clean, safe toilets, handwashing stations, disposal systems, and access to menstrual hygiene products. These interventions have a direct impact on attendance by enabling adolescent girls to participate fully and consistently throughout the school year.
- Design community-based incentive programmes and initiatives that motivate families to keep girls in school and encourage consistent attendance, for example:
 - small conditional transfers tied to regular attendance,
 - recognition awards for families who support girls' education,
 - community education dialogues that address gender norms,
 - “back-to-school” drives supported by local leaders.

These programmes help shift household priorities and reduce pressure on girls to undertake domestic or income-generating work.

Key recommendations include:

- Foster multi-stakeholder partnerships among private sector organizations, NGOs, and donors to pair electrification projects with material support such as school kits, digital devices, or scholarships. Examples include:
 - Corporate social investment programs providing solar-powered digital labs,
 - Donor-funded scholarship schemes targeting girls in remote areas,
 - NGO initiatives supplying hygiene kits alongside WASH upgrades.

These partnerships ensure that energy access is matched with the resources needed for students, especially girls, to thrive.

5.4 Enhancing Data Collection & Impact Monitoring

A major barrier to effective planning is the limited availability of detailed, school-level data on electricity access, reliability, and their educational impacts. Strengthening monitoring systems will enable policymakers to track how electrification influences attendance, learning outcomes, and gender equity.

Key recommendations include:

- Establish a national monitoring framework that links school electrification status with key educational indicators, such as attendance, retention, performance, and progression, while mainstreaming gender-disaggregated data. This enables a clear understanding of how electrification affects girls and boys differently and supports evidence-based interventions.
- Strengthen collaboration between the Ministries of Energy, Education, Gender, and other relevant bodies by harmonizing databases and reporting mechanisms. This integrated approach supports cross-sector accountability and enables holistic evaluation of school electrification initiatives.

5.5 Strengthening Policy Integration

Achieving sustainable school electrification requires strong institutional coordination to ensure that energy and education priorities reinforce one another.

Key recommendations include:

- Strengthen policy collaboration between the Ministry of Energy, the Ministry of Education, Science and Technology, and the Ministry of Community Development, Gender, Women and Special Groups to align objectives, budgets, and implementation strategies for school electrification and gender-responsive education.
- Establish inter-ministerial working groups that regularly review progress, coordinate resource mobilization, and monitor how electrification supports broader education and gender equity goals.
- Promote public-private partnerships (PPPs) to finance and scale rural school electrification, enabling innovation, sustainable operation and maintenance systems, and long-term impact.

5.6 Promoting Community Awareness & Engagement

For electrification to translate into improved educational outcomes, especially for girls, communities must be aware of the benefits and actively involved in sustaining progress.

Key recommendations include:

- Launch community awareness campaigns highlighting the importance of girls' education and the role of electricity in improving safety, learning hours, digital skills, and overall school performance.
- Engage school committees, parents' associations, and local leaders in co-designing and supporting electrification projects, ensuring community ownership and increased accountability.
- Implement targeted outreach for rural households, addressing concerns related to school attendance, early marriage, and socio-economic barriers that often hinder girls' participation.



CHAPTER SIX

CONCLUSION

Reliable and sustainable electricity supply is a foundational enabler of educational transformation, yet it cannot independently resolve the broader structural and gender-specific barriers that limit learning opportunities, especially for girls in rural Tanzania. The analysis reveals persistent disparities between rural and urban regions in electricity access, school attendance, dropout rates, and re-enrolment. These gaps are closely linked to socioeconomic challenges, inadequate WASH facilities, long travel distances, limited digital learning infrastructure, and entrenched gender norms.

The recommendations outlined in this chapter highlight the need for a holistic and integrated approach to school electrification, one that extends beyond infrastructure to directly support gender equality and educational outcomes. Strengthening rural electrification through solar PV systems and targeted O&M support, integrating electricity with ICT and STEM learning for girls, addressing material and social barriers, and improving cross-ministerial coordination all form essential components of a comprehensive response. Enhanced data collection and gender-responsive monitoring frameworks are also necessary to track the real impact of electrification on attendance, performance, and retention.

If effectively implemented, these combined strategies can help close the rural–urban divide, improve girls' educational participation, reduce dropout rates, and create learning environments where all students, especially girls, can thrive. Ultimately, electrification should serve as a catalyst for equitable educational development, enabling schools to become safer, more accessible, and better resourced hubs for inclusive learning across Tanzania.

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STUDENT ENERGY

About SEforALL

Sustainable Energy for All has a global mandate to accelerate progress on the energy transition in emerging and developing countries. Hosted by UNOPS, we work at the intersection of energy, climate and development, partnering with governments and organizations worldwide to end energy poverty, double energy efficiency, significantly expand renewable energy and combat climate change.

About Student Energy

Student Energy is a global youth-led organization empowering the next generation of leaders who are accelerating the transition to a sustainable, equitable energy future. We work with a network of 50,000 young people from over 120 countries to build the knowledge, skills, and networks they need to take action on energy. Student Energy collaborates with governments, companies, and organizations to facilitate meaningful youth engagement and mobilize resources to support youth-led energy solutions.