Engineering Brighter Tomorrows

An Engineers Without Borders Canada Project

ABOUT THE PROJECT

Engineering Brighter Tomorrows (EBT) is dedicated to addressing energy access gaps in schools and health centers in Zambia and Malawi. Our mission is to bring electricity to these facilities through thoughtfully designed solar systems that meet their critical needs holistically. Ensuring a steady, cost-effective electricity supply will transform schools and healthcare centers, enhancing educational and health outcomes and attracting and retaining skilled staff. EBT collaborates with local organizations to align projects with government plans and community needs. By promoting sustainable environments, we aim to improve learning, healthcare services, and overall development. Reliable electricity is crucial for enhancing and preserving lives.

OBJECTIVES

1. Improve Education Outcomes. For example:

- Through the provision of lighting for evening classes and internet access for educational technology, teachers can effectively educate students, who also learn better, leading to improved test results and increased lifetime earnings.

2. Enhance Healthcare Services and Save Lives:

- Supplying stable power to vital medical equipment, including refrigeration of vaccines and crucial medications, and enabling electricity supply to healthcare staff living quarters, greatly enhances overall performance and quality of care. This, in turn, enables more patients to receive quality care and helps mothers and children thrive.

3. Sustainability:

- By sourcing high-quality components and establishing strong partnerships with community stakeholders, the project sustainably strengthens local capabilities, empowers communities, and leads to lasting health and education outcomes.

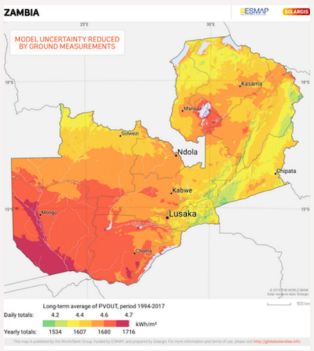
EWB'S ROLE

- **Collaboration:** Working with local communities to facilitate engagement and government bodies for regulatory support are imperative to ensure the project aligns with local needs and integrates into existing social and economic structures.
- **Localisation**: We will be providing one year of comprehensive maintenance, spare parts, and training that will empower local technicians and community members to enhance the likelihood that project benefits are enduring and self-sustaining.
- **Sustainable Governance**: Transitioning maintenance to local entities after one year aims to ensure that the infrastructure remains functional and integrated into the local framework.

ENERGY POTENTIAL:
ZAMBIA AND MALAWI

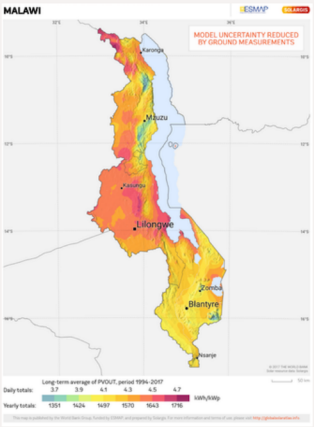
Access to electricity plays a crucial role in reducing inequalities and promoting long-term human development, especially in the areas of healthcare and education. Introducing solar energy in these regions is a smart move, as it allows for the use of an easily accessible and affordable natural resource: plentiful sunlight.

ZAMBIA



The high reliance on hydropower is problematic due to climate-induced disruptions, leaving 70% of Zambia's population without reliable energy access. Despite having the potential to generate 2,300 MW of solar energy, only 76 MW has been installed due to traditionally high initial costs, energy storage challenges, and grid integration issues (Global Solar Atlas).

MALAWI



Malawi faces major electricity access challenges, with only 18% of the population connected to the grid and just 4% in rural areas. This affects schools and healthcare centers, hindering education and health services. Solar power offers a sustainable solution, leveraging Malawi's 3,000 hours of annual sunshine. 10kW solar systems can provide reliable electricity for mid-sized schools and healthcare centers, improving learning and critical medical services (Global Solar Atlas).

KEY FACTS

- 1 billion people globally lack access to electricity in their homes. 75% of them live in sub-Saharan Africa. *(NIH)*
- 50,000+ rural healthcare facilities within the region lack electricity. *(NIH)*
- 70% of medical equipment fails on a regular basis, often due to unreliable power. *(NIH)*
- One-third of child hospital admissions are anaemic children, 50% of which do not survive beyond 8 hours due to poor or no (refrigerated) blood bank supply.

THE LANDSCAPE
EDUCATION AND HEALTHCARE BARRIERS IN AFRICA

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TRANSFORMING EDUCATION

Educational disparities within Africa are caused by complex systemic barriers related to wealth, education, and geography. **Building Brighter Tomorrows** aspires to address education disparities by increasing access to electricity through solar systems, which in turn, will enable schools to utilize digital inclusion initiatives. Access to modern digital technologies and internet significantly impact student access to online learning resources, leading to improved academic performance. The project's impact on the targeted schools and beyond has immense potential to enhance the efficiency of educational systems, improve test scores and cognitive abilities, impact attendance rates and teacher retention, breakdown educational barriers and inequalities, and more - at an attainable low cost. In this case, the **benefit-cost ratio (BCR) for electricity are $22 to over $60 generated for every dollar invested.** *(Journal of Benefit-Cost Analysis)*

**Please refer to the full project report for more on this BCR breakdown.*

[WE BELIEVE THE PROJECT CAN DELIVER RETURNS OF $25-$100 FOR EVERY DOLLAR INVESTED IN ELECTRICITY ACCESS.]

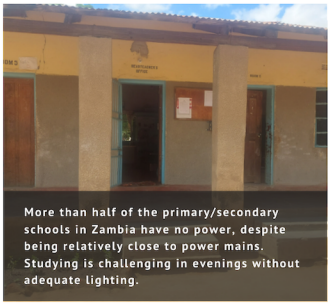
EDUCATION CONCERNS

LOW LITERACY RATES

Sub-Saharan Africa has the highest number of illiterate youth. Approximately 9 in 10 children are unable to read or write simple expressions about their daily lives *(African Library Project)*.

LOW SCHOOL ATTENDANCE

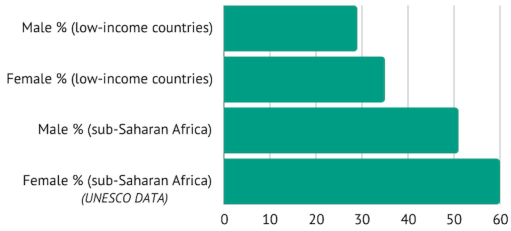
1 in 5 students aged 6-11 do not attend school, often because they live too far from a school or are unable to afford in-person learning. E-learning could help eliminate some of those barriers *(UNESCO)*.



More than half of the primary/secondary schools in Zambia have no power, despite being relatively close to power mains. Studying is challenging in evenings without adequate lighting.

PRIMARY AND SECONDARY SCHOOL EXCLUSION RATES

Exclusion rates are derived from the primary and secondary net enrolment rates.



Sub-Saharan Africa has the highest rate of education exclusions. Across the region, 9 million girls between age 6-11 will never attend school, compared to 6 million boys *(UIS)*. The disadvantage for girls starts at a very early age, 23% do not attend primary school and by the time they reach adolescence, the exclusion rate is 36% for girls and 32% for boys.

TRANSFORMING HEALTHCARE

Access to electricity has the potential to profoundly transform healthcare facilities, bringing life-saving improvements to communities while also creating a safer environment for both patients and healthcare providers. In sub-Saharan Africa, approximately 5 million children under the age of five die each year, many of whom could have survived with basic medical treatment such as vaccinations. In fact, 10% of the children born in the region today will die within their first year of life. Reliable electricity is crucial for these facilities to function effectively, ensuring the operation of essential medical equipment and proper storage of vaccines, which are vital for preventing common diseases.

Another example, neonatal hypothermia, or low body temperature, is a leading cause of infant mortality in these areas, and can otherwise lead to poor growth and neurodevelopmental delays. The prevalence of it varies by country, ranging from 11% to 95%, with the highest prevalence rates in sub-Saharan Africa. (Journal of Global Health Reports). Stable electricity allows healthcare facilities to operate life-saving devices like infant incubators and heaters.

Additionally, access to electricity enables facilities to utilize **digital health technologies**, which have immense potential to enhance health outcomes by addressing inefficiencies and improving healthcare access through e-health services. Digital tools can help in better managing records, providing remote consultations, and improving diagnostics, thus bridging the healthcare gap in underserved regions. By ensuring reliable power supply, these technologies can be fully leveraged to provide continuous, high-quality care, significantly reducing preventable deaths and improving overall health outcomes in sub-Saharan Africa.

HEALTHCARE CHALLENGES

HIGH MORTALITY RATES

70% of the total number of global maternal deaths occur in the region annually. Many of which are preventable via access to reliable energy and medical equipment *(NIH)*.

RISING POPULATION

Population levels across the African continent are expected to more than double by 2050, addressing healthcare disparities is a critical race against time *(Forbes)*.

Baby receiving a vaccine in Tanzania. *(Getty Images)*

SOLAR ACCESS WOULD MEAN 50% MORE

out-patients each month, institutional deliveries, and admitted in-patients at health centres.

CHILD MARRIAGES DROP BY 64%

after education opportunities are enhanced for young women.

MATERNAL DEATHS DROP BY 61%

after electricity access in Uganda in rural health clinics.

HOW WE ARE GOING TO DO IT
THE SYSTEMS THINKING APPROACH

Engineering Brighter Tomorrows exemplifies a systems thinking approach, **emphasizing sustainability, local capacity building, and addressing systemic barriers to development.** This strategy fosters community resilience and ownership. A key component of this approach is learning and adapting through a feedback process, ensuring continuous improvement and responsiveness to community needs. This involves forging strong strategic partnerships, robust project structures, and maintenance plans to ensure the project's long-term success and scalability, allowing for adaptation and replication in other regions facing similar challenges.

JUST ENERGY TRANSITION

The project effectively aligns with the principles of a Just Energy Transition (JET), which aims to shift towards sustainable energy while enabling greater social equity and community empowerment. The project enhances local capacities through training and job creation, fostering economic resilience, and promotes the benefits of renewable energy to extend beyond immediate electricity needs, contributing to long-term development and improved quality of life for underserved communities. Through this alignment, the project not only supports global climate goals but also embodies the equitable and inclusive ideals central to a just transition.

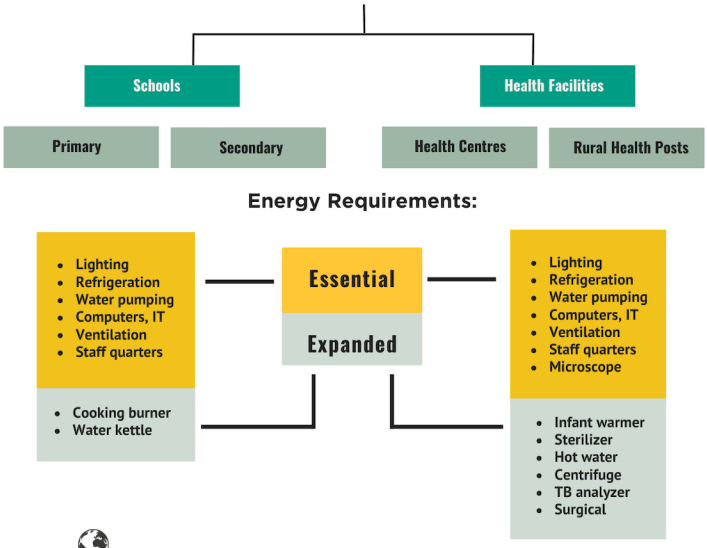
REQUIRED SOLAR SYSTEM CAPACITY

Initial calculations suggest that a 10kW solar system would be suitable for either:

1. **School Facility**
- Enough power to accommodate the needs of 1,000 students and teachers, including for essentials such as power for pumping water, lighting, computers and teacher living quarters.

2. **Health Facility**
- Enough power to accommodate a catchment basin of 5,000 people for essentials such as medical equipment, lighting, refrigeration, inpatient accommodations, obstetrics and health staff living quarters.

PROJECT TARGETS

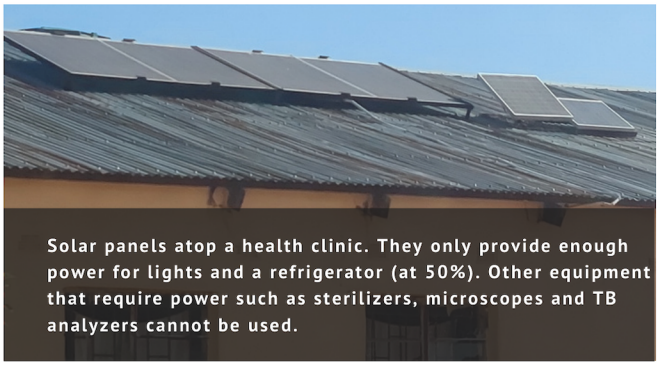


PRELIMINARY ESTIMATE OF COSTS

Based on estimates of current costs for system components, including spare parts, civil work, installation, project management, and maintenance contracts, the overall cost for a 10kW system is approximately CAD$25,000

Health post in Zambia. Over 50,000 rural healthcare facilities in sub-Saharan Africa lack electricity.

Solar system at a health clinic. The panels are well-situated, but their protective enclosure prevents easy maintenance such as cleaning panels.



Solar panels atop a health clinic. They only provide enough power for lights and a refrigerator (at 50%). Other equipment that require power such as sterilizers, microscopes and TB analyzers cannot be used.

HELP US ENGINEER BRIGHTER TOMORROWS

By making a donation, you are fuelling our mission to engineer a brighter tomorrow by addressing these major challenges and creating systemic change.

Visit www.donations.ewb.ca

For additional project information, email:
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