

Sustainable Energy driven Healthcare Interventions in response to COVID -19

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for Low Resource settings in Sierra Leone, Ethiopia and Burkina Faso

*Proposed pilots to showcase sustainable and resilient healthcare infrastructure
Solarkiosk, Azimut 360 and SELCO Foundation*

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SOLAR
KIOSK



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Background, Need and Context

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SELCO Foundation, Azimut360 and Solarkiosk are collaborating to pilot critical COVID-19 response sustainable interventions in Sierra Leone, Burkina Faso and Ethiopia.

The COVID-19 crisis has alarmingly brought to front the unpreparedness of humanity to deal with such a crisis. It also lay to bare the glaring gaps in the health supply chains across the world. Even the countries with the best health infrastructure could not bear the stress that the crisis has brought upon. [Especially in parts of Sub-Saharan Africa](#), where healthcare systems are certainly short of intensive care units and beds, testing facilities, as well as respirators- implementing solutions against COVID-19 would not only strengthen their response to the crisis but also improve the overall healthcare delivery.

Global health epidemic preparedness, 2019
(Global health security index, 0-100, where 100 is best)



In this regard, sustainable energy access plays a critical role in improving overall resilience of healthcare facilities. COVID-19 crisis has provided an opportunity to prove that sustainable energy, appropriate building design, utilization of sustainable materials for construction and efficiency of medical equipments are all critical components for delivering emergency services.

Thus, the current crisis has necessitated on-ground implementation organizations to strive for a faster rate of response and most importantly design, develop and deploy solutions in regions with low-resource setting across the COVID-19 healthcare treatment response chain. Especially from a decentralized power source, energy efficiency and healthcare delivery perspective there are a range of possible interventions that could provide timely support that the healthcare sectors of these low-resource setting geographies need.

Chosen Regions

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The World Health Organisation (WHO) [situational report 134](#) specifies that the countries have been classified to be at the ‘community transmission’ stage. The case fatality ratios for Burkina Faso and Sierra Leone are 6.3% and 5.8% respectively, which are one of the highest in Africa, reflecting the dire need for Health Care interventions. Similarly for Ethiopia, the number of cases have reached around 1500 as of [June 3rd](#), and as it can be seen, the cases are increasing and it has been classified to be at the ‘[cluster of cases](#)’ transmission stage. With low access to [energy for healthcare facilities](#) in these chosen countries, the quality of COVID-19 response could be greatly improved by decentralized energy solutions.

Although countries in the region have a [relatively low overall level of preparedness](#) —in terms of their overall ability to prevent, detect and respond to public health emergencies in a timely fashion— there is an opportunity right now to implement solutions by making a [better use of everything that is present](#) - human capacities, learnings from previous disease response strategies, network of organizations, among other factors. Ethiopia, with its [timely interventions](#) of spreading awareness and leveraging its strong community healthcare workers, has been able to contain the rapid spread, but would need complementing efforts such as strengthening healthcare facilities by decentralized solutions to effectively respond to the crisis.

Thus, following factors have been considered while choosing the countries for pilot implementations of COVID solutions:

- Need for better preparedness of healthcare facilities to respond to COVID in coming months and years
- Existing strengths and resources that could be complemented with decentralized COVID response solutions.
- Existing local connect and strong partnerships for all the three organizations to effectively implement solutions

Proposed Pilot Interventions

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- COVID-19 crisis has provided an opportunity to prove that sustainable energy, energy efficient and easy-to-construct building designs, efficient medical equipment and close involvement of local stakeholders are all critical components for delivering emergency services.
- Especially in low resource settings, where the sustainability of solutions require an approach that not only involves suitable technologies and infrastructure, but building local ecosystems (training and skilling, service and maintenance, etc) for effective delivery of solutions.

All the three organizations have worked with stakeholders to consider both the above criterion and have created a blueprint for the interventions across different nodal points. The added advantage being these components and interventions can be used even after the crisis is over, thus making it economically sustainable for governments to invest in them. These solutions will be designed and built in a quick deployment manner keeping with all guidelines of WHO that also take into account and demonstration of the impacts of sustainable built environments and efficient appliances. They will be powered by solar energy to ensure decentralization and resilience of the centers.

Thus, the partnership will complement each other's expertise and develop and implement solutions across these nodal points in COVID-19 response value chain:



Screening & Swab collection

Testing Facilities

Quarantine and Isolation units; Basic & Advanced therapeutic units



Suspected case



Solar suitcases, Screening kiosks, Solar powering mobile screening vans

Solar powered, standalone test centers and laboratory infrastructure

Infrastructure and decentralized solar powered Quarantine facilities

Infrastructure for isolation facilities for Asymptomatic patients/ patients with mild symptoms

Basic and advanced therapeutic care for patients with moderate to severe symptoms - Solar powering critical equipment & energy efficient solutions

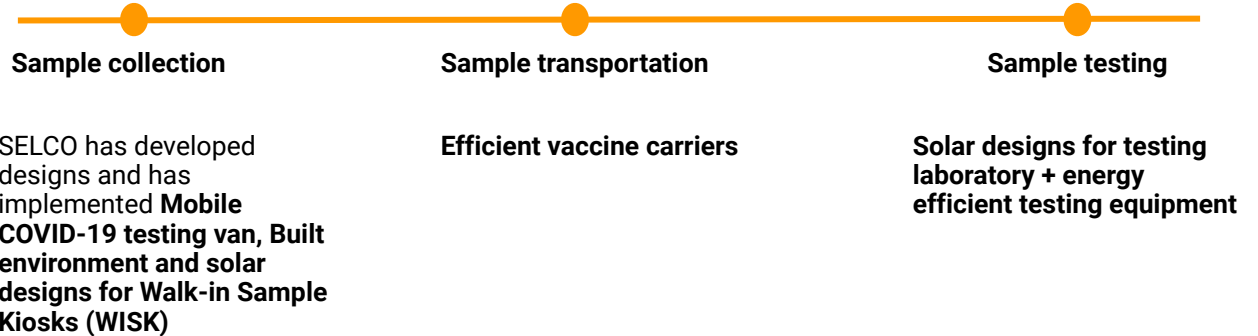
Critical non-technical components of the pilot interventions

- Awareness creation
- Implementation of solutions across nodal points
- Training & Capacity building
- Ecosystem building with local partners
- Developing templates and models that can be replicated in other low-resource settings



Decentralized screening, testing, quarantine/ isolation units and basic and advanced therapeutic interventions from SELCO Foundation

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Decentralized models of COVID testing facilities strengthen the pandemic response strategies in vulnerable areas by providing the initial assurance. In the testing value chain, energy access plays a critical role in powering cold-storage solutions (refrigerators and deep-freezers), Real Time PCRs, centrifuges, microspins, Autoclaves, among other important equipment. SELCO has developed designs for these efficient equipment along with quickly deployable models of walk in testing facilities.

Quarantine wards, Isolation Wards, Therapeutic care units and ICUs

Requirement	Probable exposure		Covid Positive cases	
	Asymptomatic	Asymptomatic / Mild ¹ - 100% approx	Moderate ² - 15% approx	Severe ³ - 5% approx
	Quarantine ward	Isolation ward	Basic Therapeutic Care	ICU
Required Beds		300 beds per 100,000 population	4 beds per 100,000 population is essential	2 ICU beds per 100,000 population is essential
Human Resources (Med)	ANM, ASHA, AWW	Nurses, Medical Officers	General Medical Officer, Medicine Specialist, Paediatric, Microbiologist, Psychiatrists/ Psychologists, Nurses, Lab Technician, Public Health Specialist	Therapeutic Care HR + Respiratory specialist, anaesthesiologists, ICU nurses and technicians
Appliances	Exhaust fans, Pedestal fans, Lights, Mobile charger			
Medical Equipment	1 unit IR Thermometer**, Covid sample collection kits (ratio to affected population, 1hr = 10/15 tests)	1 unit IR Thermometer**	1 unit IR Thermometer**, 3 units Oxygen concentrator/ Cylinder, 6 units Pulse Oximeter (+2), 1 unit X-Ray Machine (for all wards)	4 units [ventilators (with/ without splitters) - cylinders/ oxygen concentrator, infusion pump, suction devices, multipara monitor], 1 unit defibrillator (+1)
Spatial - Patient Beds per module	6ft by 8ft cubicle - 10 beds	6ft by 8ft cubicle - 10 beds	6ft by 8ft floor area - 6 Beds	10ft by 8ft floor area - 4* or 6 beds
Sanitation	4 toilets and 2 showers, 200 LPD Solar water heater Water Pump (as per need)	4 toilets and 2 showers, 200 LPD Solar water heater Water Pump (as per need)	2 toilets and 1 shower 100 LPD Solar water heater Water Pump (as per need)	
Vestibule	Common entry		Designated airlock entry and exit channels	

¹Economical and Practical to set up 4 Bed vs. 2 Bed. Can be used as both therapeutic and ICU care by building 1 six bed unit per 6 Lakh population)

** IR Thermometer is suggested in places where more than 80 people are expected to be screened in a day. Further, in case IR thermometer is being used in a health facility, adequate training of staff on its use needs to be provided.

Decentralized screening, testing, quarantine/ isolation units and basic and advanced therapeutic interventions from SELCO Foundation

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Walk-in Sample Kiosks and Mobile testing vans that are solar powered for critical needs are implemented with local partnerships



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Quarantine units

Isolation units

Basic/ advanced therapeutic units

Since the outbreak of the crisis, SELCO has worked with experts from the medical field across the world, grassroots level health focussed NGOs and local governments to map out the initial set of interventions across different physical infrastructure needed for healthcare sector to respond in an effective manner. Over the last couple of months, SELCO has developed built environment designs along with solar powering designs for Quarantine wards, Isolation wards and Therapeutic units and ICUs. Detailed designs can be found at <http://www.covid-19.selcofoundation.org/isolation-therapeutic-units-for-covid-19-medical-facilities-for-low-resource-areas/>



Therapeutic Care (Moderate Symptoms) ward



Isolation (Symptomatic Patients - Mild) ward



ICU (Severe Symptoms) ward - 6 Beds

Stand alone decentralized screening kits, testing facilities from SOLARKIOSK

Solkiosk seeks to bridge the gaps of lack of training personnel, shortage of testing facilities and inadequate supply of testing kits by its smart and efficiently designed decentralized testing solutions.



SOLARKIOSK would leverage on its established local network and connect with other critical stakeholders to implement solutions across decentralized screening and testing facilities for COVID-19 and beyond. With efficient technologies and supportive training mechanisms for local stakeholders, SOLARKIOSK would complement other health-energy implementations being developed with other two partners.

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Screening

Sample collection

Sample testing

SOLARKIOSK and the United Nations Institute for Training and Research (UNITAR) have launched a multi-sectoral, multi-partner collaboration to fight COVID-19 together. SOLARKIOSK, together with partners has developed two-ring, solar powered healthcare solution to screen, test COVID patients in rural off-grid areas. These would strengthen the screening and testing nodal points in the low resource settings of Ethiopia, Burkina Faso and Sierra Leone.



Nodal points in COVID-19 solutions - SOLARKIOSK

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First Ring – solar powered medical suitcases (SPMS's) for screening purposes in remote rural areas



Second Ring – solar powered, air-conditioned COVID testing labs to test suspected patients and different pathogens



Design and deployment of solar energy interventions and energy efficient equipment for ICUs by Azimut360

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Testing centres

Design, deployment of solar solutions for isolation units, quarantine centers

Equipment for ICUs

Azimut has developed designs and has implemented standalone centers powered by solar energy - that would be critical across the proposed pilot interventions nodal points. Apart from that, their expertise in implementing efficient technologies such as solar powered Oxygen concentrators would be critical in advanced therapeutic care for COVID response. Azimut would play a key role in supporting other two partners through their experience in In-depth experience in providing technical training and capacity building, overall coordination, technical management, feasibility assessment, dissemination and sensitization on sustainable energy - health implementation projects across geographies.



Objectives of Proposed Pilots

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The goal of the proposed pilot interventions is to demonstrate models towards better preparedness of healthcare infrastructure of the three countries to provide improved

Following are the objectives of the proposed pilots in the low resource settings of Burkina Faso, Sierra Leone, Ethiopia:

- Building overall resilience of COVID-19 response ecosystem for these countries by complementing the efforts of the governments and other local and multilateral organizations.
- Setting up infrastructure and facilities, that would not only provide support during the COVID period, but from the countries' overall healthcare perspective as well.
- Reliable Sustainable Energy Solution for Critical Care during COVID19, ensuring uninterrupted running of crucial medical appliances
- Safety of healthcare providers or medical staff will be ensured as well as the risk of transmission of the virus prevented by providing staff quarantine facilities.
- Document and demonstrate the guidelines and impacts of the above for further replication and evidence building for the health and sustainable energy sectors
- Establishing templates of solutions through pilots - that could be replicated in other low resource setting regions across Sub-Saharan Africa.

Activities and processes

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- a. **Energy-health assessment** of chosen interventions in all the regions to evaluate the features of each centre such as geographic terrain, available infrastructure, predominant health issues being treated, skilling requirements for personnel, existing equipment and assess financial allocations for operations and maintenance.
 - b. **Develop appropriate system designs** that include procurement of COVID responsive energy efficient appliances via strong supply chains. This also includes training modules on usage and maintenance of systems.
 - c. **Deployment of solutions** across the nodal points of COVID response value chain in the chosen regions of the three countries by A360 and Solarkiosk along with the local stakeholders.
 - d. **Building capacities of local stakeholders** to understand usage of systems, basic servicing, and maintenance of the systems to ensure long-term sustainability of the project.
 - e. **Capturing evaluation data** that will help in setting up templates for health-energy interventions that it provides a pathway to design resilient health care facilities that takes into consideration the above parameters.

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Three organizations to synergistically develop programs in these 3 countries and with different local stakeholders (community organizations, local governments, multilateral partners, etc) by leveraging on each one's long-term expertise and experience, regional network, and learnings emerging from COVID-19 implementations



SELCO Foundation to bring in its decades of experience in implementing health-energy solutions via program design, knowledge and advisory partnership across various stages of the program, and provide overall support system for regional health and energy partners. Additionally, SELCO has implemented various COVID-19 solutions over the last 2-3 months, which would provide critical learnings.



Solarkiosk to bring in its experience in design, deployment of off-grid physical infrastructure of healthcare facilities from need assessment to implementation, along with their presence and reach to various stakeholders in these countries. Specific to COVID-19, their expertise in deploying testing facilities would play critical role.



Azimuth360 to bring in their vast experience in design and implementing various renewable energy solutions for healthcare across different geographies, especially in vulnerable settings of West Africa. Their expertise in design and implementation of Oxygen Concentrators and other end to end solutions is going to be critical in COVID-19 solutions.



- Designing health-energy nexus solutions that cut across decentralized solar power, energy efficiency and green buildings. In a manner that considers priority health services (maternal care, diagnostic, ante-natal care etc) and delivery models (mobile vans, portable kits, health centres etc) across general healthcare + COVID value chain.
- SELCO can bring in collaborative expertise from its network of Health and Energy Partners and advisors across different contexts
- Recommendations on policy for energy interventions in healthcare Sector
- Support with conducting workshops and training & capacity building in health+energy audits, design, procurement, operations and maintenance aspects of implementation.
- Experience in designing, developing and implementing energy - healthcare interventions from overall resilience of healthcare with their critical relevance for COVID-19 in different geographical contexts.
- In-depth experience in providing technical training and capacity building, overall coordination, technical management, feasibility assessment, dissemination and sensitization on sustainable energy - health implementation projects across geographies.
- Network of local stakeholders in the chosen geographies and strong network with healthcare establishments.
- Expertise on efficient medical equipment such as Oxygen concentrators which would be critical in COVID-19 related implementations.
- Designing and deploying physical infrastructure such as COVID-19 testing centres with their connect with local partners across similar geographies.
- Supporting local stakeholders through their on-ground presence to bring in long-term sustainability of the project through training and support, which can be extended upon request.
- Facilitate connect with different stakeholders such as governments and implementing partners to develop pathways for implementation

Additional Resources (Linked to the text below- click to open and download)

- [Energy Efficient and Climate Responsive Isolation and Therapeutic Units \(Solar System Designs and Equipment recommendation\)](#)
- [Sustainable Energy for Screening and Testing Value Chains](#)
- [Sustainable Energy for Screening Kiosks
Designing Portable, low cost Screening and Swab Collection Units](#)
- Energy Efficiency and Sustainable Energy for Appliances for Critical Care:
 - [Oxygen Concentrators](#)
 - [Ventilators](#)
 - [UV Disinfectant Technologies](#)
- [Other Case Studies \(Solar for Quarantine center, check points, mobile screening kiosks\)](#)
- [Key Insights from a National Webinar hosted in Partnership with Public Health Foundation of India \(PHFI\), Centre for Chronic Disease Control \(CCDC\), Health Care Without Harm \(HCWH\) and Shakti Sustainable Energy Foundation](#)