



SOPHIA

Sustainable Off-grid solutions for Pharmacies and Hospitals In Africa

Aims to improve quality of life of populations through better treatment & working conditions in rural and remote health facilities in Africa

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By providing:

- 🔥 Safe, clean drinking water and deionized water for medical purposes
- 🔥 Hot water and steam production for hospital thermal requirements
- ⚡ Emergency electricity supply for surgical and intensive care units
- 🧊 Ultra-low temperature storage of sensitive medication at -70°C
- 🧊 Low temperature storage of blood plasma at -30°C
- ❄️ Cooling of medicines and food at $+5^{\circ}\text{C}$

Data collection activities on social acceptance

Under SophiA's Work Package 7, data collection activities on social acceptance have been conducted in all the four pilot countries. Data collection took place in Buvuma, Uganda on February 15-17, 2023 and April 17-19, 2023; in Malawi on May 8-12, 2023; in Burkina Faso on May 23-25, 2023; and in Cameroon on July 31-August 4, 2023. In each of these locations, the SophiA team from the Makerere University (MAK) and selected hospital stakeholders came together for a one-day workshop during which they engaged in participatory data collection exercises, including the famous SWOT analysis (analysis of Strengths, Weaknesses, Opportunities and Threats) and PESTELE analysis (analysis of Political, Economic, Social, Technological, Environmental, Legal and Ethical factors). In Uganda, up to 40 stakeholders participated in the workshop, and 20 to 30 stakeholders attended the workshops in the other countries. Such stakeholders included hospital management and medical staff, non-medical staff, representatives of the ministries of health and other relevant government agencies, local governments, the private sector, and communities. Beyond the workshop, individual interviews were also conducted with selected key informants. These events provided an opportunity to further popularise SophiA amongst the stakeholders, and to share more information about SophiA its objectives, and the roles of the different parties involved. Overall, SophiA was well received by the stakeholders in all the four sites. Stakeholders were excited about SophiA's wide range of technologies.



Figure 1. Stakeholders for Buvuma Health Centre (Uganda) after a workshop with MAK-SophiA team.



Figure 2. SophiA stakeholders at the workshop at Chitsulo Lodge and Convention Centre for Staff of Mua Mission Hospital (Malawi).



Figure 3. Social acceptance workshop in progress in Leo, Burkina Faso.



Figure 4. Participants at the Cameroon workshop



Status of the SophiA systems

From July 24 to 28, 2023, the second edition of the International Summer School on Sustainability, jointly organised by the Karlsruhe University of Applied Sciences (HKA), the University of Applied Sciences of Eastern Switzerland (OST) from Rapperswil and the Transilvania University Braşov (UNITBV) from Braşov, welcomed 34 students from five different countries (Germany, France, Romania, Switzerland and Sudan) in Romania. Presentations on sustainable energy systems, wastewater treatment, energy storage, artificial intelligence for agriculture, and green computing were particularly fascinating. This year's Sustainability Summer School was not only about sustainability and science, but also about personal growth, with interventions from the Braşov Toastmasters club on overcoming the fear of public speaking and AIESEC Braşov on brand management and entrepreneurship. Team building activities created the spirit of a community with the same goal: to inspire the new generation to create a better and more sustainable world.



At the end of August 2023, 22 African engineers from a postgraduate course at Hochschule Weihenstephan-Triesdorf had the opportunity to learn more about solar technologies used in SophiA, with a focus on solar thermal cooking. A theoretical and practical session was held at the facilities of SophiA partner Simply Solar in Germany.



In the meantime, the preparation of the content and materials for the on-site knowledge exchange, training, and education activities will lead to the first workshop in Burkina Faso.

HKA Lab test progress

SophiA HKA Lab test is intended to provide a better understanding of the cooling system in the field. It is built inside a small cooling chamber where the three different temperature levels are created with the same components as in the containers. In addition, thyristor-controlled resistance heaters are installed to simulate the higher heat fluxes at the four different demo locations. Initially, it was planned to have a plate HX as a cascade heat exchanger since the cost would be much lower and the space needed would be less compared to a tubes-in-shell HX. However, the lab tests showed that a height difference is required in order to push the liquid out of the plate, thus reducing the heat exchanging area. The tests also showed a sufficient and homogeneous ice growth in 8 hours and that the thermal energy storage could hold the ice for over 50 hours with no additional heat input into the chamber. The design of the CO₂ cycle then changed after discussions with many experts. The fear was that the oil of the CO₂ compressor could be trapped at the lowest point of the cycle, which is the bottom of the thermosiphon. The flow velocity of the two-phase refrigerant is not sufficient at this point to entrain the oil and return it to the compressor. The CO₂ system was therefore modified, and results of the -30°C room will be shown in the next newsletter.

