SUSTAINABLE OFF-GRID SOLUTIONS FOR PHARMACIES AND HOSPITALS IN AFRICA (SOPHIA)

The Sustainable Off-grid Solutions for Pharmacies and Hospitals in Africa (SophiA) project will enable beneficiary communities in **Africa** that visit a Health Center IV, **to access carbon-neutral energy** for **electricity, heating and cooling of food and medicine** as well as **safe and clean drinking water**, as a sustainably way of enhancing the quality of life. A broad implementation of SophiA systems, **a hybrid, modular, plug-in energy system,** will bring **environmental, economic, social and especially health benefits**. SophiA systems will be demonstrated at four health facilities in different geographical regions (Burkina Faso, Cameroon, Malawi and Uganda) where aid is most needed, by providing sustainable solutions appropriate to the African context. SophiA will focus on electricity supply to health facilities with no access to grid power or provide a backup in case of power failure from the grid at a rural Health Center, solar cooling of the facility, and supply of safe and clean drinking water. The multinational, multidisciplinary SophiA team comprises all capabilities to develop this innovative combination of a modular and flexible structure, easy to integrate without needing to re-design the existing infrastructures at the Health Center (Fig. 1.1).

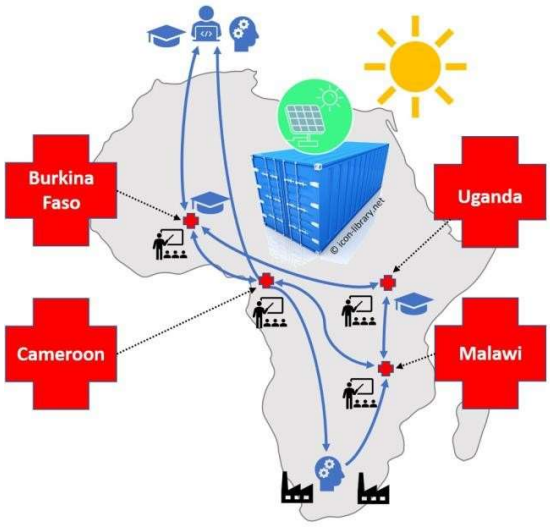

Figure 1.1: Organisation of SophiA showing the knowledge transfer from the European research partners and companies to the African partners as well as the 4 demo sites for SophiA systems on the African continent, the networking and capacity building in Africa.

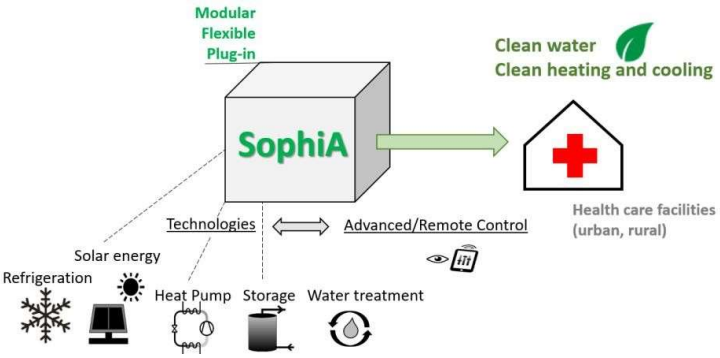

Figure 1.2: Innovative, modular, flexible, affordable and efficient solar powered SophiA system combining PV panels mounted on top of containers with multi- temperature refrigeration system, battery and controls, ice thermal energy storage, water purification and treatment, hot and cold water storage.

SophiA will develop and manufacture locally, **innovative, modular, flexible, affordable and efficient solar powered** (Fig. 1.2):

i. Electricity supply to be used by facilities with no access to grid power or during grid power failure
ii. **Safe and clean drinking water**
iii. Hot water and steam for use at the facility
iv. Cooling of surgery or intensive care unit facilities
v. **Cooling of medicine at +5°C** (perhaps food cooling), **blood plasma at -30°C** and of **sensitive medication** (e. g. some Covid-19 or Ebola vaccines) **at -70°C**

It is anticipated SophiA will support remote communities in achieving sustainable development growth and economic transformation**.**

The 4-year project has nine (9) work packages. Makerere University will take lead on two of them namely WP1 and WP 7.

- **WP 1** will deal with the investigation of the needs of hospitals / Health Center IVs in different urban and rural areas in 4 African countries: Burkina Faso, Cameroon, Malawi and Uganda. These will be used to derive specifications for SophiA water, cooling and electricity systems.

- **WP 7** will deal with the investigation of the environmental, economic, and social aspects to demonstrate the benefits of the SophiA solutions. Life Cycle Assessment (LCA) and Life Cycle Costing (LCC) and business modeling tools shall be employed.

Makerere University will be able to enhance her training, research, and outreach potential through the following activities:

i. **Transfer to new applications and markets**
Modify SophiA cooling system to accommodate food cooling/freezing, heating and water treatment for other areas, such as building requirements in rural and urban areas, process heat and cooling for food industry and agriculture.

ii. **Skills training** of students /student exchange program. In order to push development in Africa further, it is most critical to have knowledgeable and highly skilled workforce that will determine the future of the continent. Therefore, SophiA wants to encourage students, ensure knowledge transfer, and support education by building a strong network and by Development of **educational set-ups** about renewable energies and autarky, SophiA refrigeration system with natural refrigerants, water treatment and electricity and heat/cold storage.

iii. **Capacity building and support of spin-off / start-up companies**
iv. It is important to support local workforce with the objective to support local sustainable economic development. Three different groups are targeted for this purpose: (i) the end-users in the hospitals (Health Center IVs), (ii) the electricians and refrigeration technicians including the technical staffs of the Health facility and (iii) local companies interested in the commercialization of the concept. Each group will be provided with the required knowledge through small educational set-ups for local training mainly, supported by an elaborated handbook for building SophiA systems on-site and for maintenance. This will ensure that the maintenance of the system is properly done and SophiA concept may also be adapted or applied by the experts in other context, different from the initial Health Center IV application.

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