



An English Summary of the Report on:

“Feasibility Study on Options of Using and Financing Renewable Energy and Energy Efficiency in Church Buildings in Tanzania and Rwanda”

Dipl. Ing., Dipl. Volkswirt Dieter Seifried

In cooperation with

Edgar Boes-Wenner

Richard Madete, Dipl.-Ing (FH)

With assistance from

Dr. Sebastian Albert-Seifried

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PS: The full version of the report is in German, 57 pages

0.1 Summary

Büro Ö-quadrat was commissioned by the Vereinigten Evangelischen Mission, Wuppertal to conduct a “Feasibility Study on Options of Using and Financing Renewable Energy and Energy Efficiency in Church Buildings in Tanzania and Rwanda” in cooperation with “ONE FOR THE CLIMATE”.

The task was to identify suitable objects and structures that allow economic investment within the goals of the "One Climate Club". Thereby, the investments in renewable energy sources and energy efficiency need to fulfill the following objectives:

- serve the environment and climate;
- be profitable to the churches in Tanzania and Rwanda;
- improve the economic situation of the poorer population;
- allow joint funding by civil societies in the North and South;
- facilitate a payback of the capital from the north at a reasonably low interest rate.

In order to achieve the above objectives, inspections has been made in schools, clinics, hospitals, guest houses, hotels owned by the Church, universities and churches in both countries to study their electricity and energy consumption in particular the saving potentials and the use of alternative solar energy. The studies took place in the period 8th - 21st June 2017.

The following presents a summary of the projects that are suitable as joint investment projects between the Church and "One Climate Club".

In the case of **Tumaini Universität Dar es Salaam College (TUDARCo)**, we propose the installation of a **PV system with 50 kWp**. This PV system will produce approximately 75,000 kWh per year. Although it represents only about 17 percent of the total electricity consumption, the advantage of such system is that almost all the electricity generated can be self-consumed. We propose that the company Merrywater builds the PV system and maintain it (for a service contract). With an expected total investment of 80,000 Euro, the Church as the owner of the building should contribute 30 percent of the investment sum i.e. 24,000 Euro. Furthermore, the company Merrywater should contribute 16,000 Euro to the capital cost. Becoming a stakeholder of the capital investment will raise the interest of the company to ensure a successful execution and supervision of the PV system.

In addition, the initial investment is expected to be financed by two loans. The first loan of 28,000 EURO will be granted by "ONE FOR THE CLIMATE" with an interest

rate of 3 percent and a runtime of 8 years. A second loan of 12,000 EURO could come from the Maendeleo Bank for a runtime of 10 years and an interest rate of 18 percent.

The prevailing lighting technology in all buildings of the Church are fluorescent lamps in various forms. In principle, **each compact fluorescent or T8 lamp can be replaced by an LED lamp** that gives the same brightness and at the same time saves around 50 percent of the electricity consumption.

For this reason, it is firstly recommended that all lamps that are used as security lighting at night in the church buildings to be replaced by LED lamps or LED spotlights. The investment cost will be paid back in less than a year!

In a second step, the fluorescent lamps in rooms that are used regularly but have little or no access to daylight should be replaced by LEDs.

Besides higher efficiency, LED lamps also have the advantage of longer lifetime than fluorescent lamps. Good LED lamps have a lifetime of around 25,000 hours and also they do not use mercury. Nevertheless, there are differences in quality among LEDs with respect to the light output (Lumen/Watt) and lifetime.

Therefore, it is proposed that the Church makes a central purchase and tests some lamps. The products that are found to have good quality are then purchased in larger quantities and passed on to individual dioceses.

For better planning of energy efficiency and solar energy investments in the future, the churches are recommended to install **energy meters**. For each meter, a monthly reading should be registered and the values should be recorded¹ and evaluated by a dedicated person in the church administration.

The measurement can lead to the following outcomes:

- a) Raise the awareness of the use of resources
- b) Faults and misuse in individual buildings can be detected early and be eliminated
- c) Establishment of a basis for identifying and rewarding energy-efficient behavior
- d) The profitability of the energy efficiency measures and solar power generation can be determined using information about current energy consumption and the operating period of the technology. These data form an essential basis for a concrete calculation of the effect of the measures.

In parallel to the introduction of energy metering, a **campaign to raise awareness** and to encourage energy-efficient behavior is proposed. This is aimed at the operation of the university, other church buildings as well as energy-efficient behavior at personal level.

¹ The simplest is in an Excel worksheet

The Rural Development Inter-Diocesan Service (RDIS) is currently conducting a campaign on fuel-saving stoves and water filters through the office Shoughwe. In the next stage of dissemination, over 6,000 poor families in off-grid areas will be provided the devices. The Center already had good experiences with the introduction of efficient stoves and water filters. The project is financed primarily by the sale of CO₂ certificates. As part of a collaboration project with "ONE FOR THE CLIMATE", these (and other) families can receive a **Solar-Home-System as an additional offer** to improve their living conditions.

We have discussed this project idea with Mr. Viateur Ntarindwa, the Executive Secretary of the RDIS offices, who heads the "Efficient Stove" campaign. He finds the approach appealing and is interested in a cooperation. The cooperation can be kick-started by a pilot project. After a successful test run, the project can be rolled out at a larger scale.

The EPR Church in Rwanda has some **accommodation and hotels**, which are managed as independent business. We visited a hotel of the Bethany Investment Group Ltd and learnt the local experience of savings through thermal solar collectors. With further savings in lighting and an installation of a small solar power plant, the electricity costs can be reduced by about 80 to 90 percent.

Based on this case study (section 5.2), it can be derived that:

- **Solar thermal collectors are an economically attractive solution** to reduce electricity consumption for hot water. With good utilization in hotels, investments is expected to be paid back in about two years. Solar thermal water heaters can also be used in schools to reduce the amount of fire wood or gas.
- **Efficient lighting** performs as well as solar thermal collectors leading to high savings (about 50 percent, based on the electricity use for lighting) and has a very good cost-benefit relationship.
- Along with a package of energy efficiency measures, **investments in solar power generation is economically feasible** even without Net Metering.
- According to this case study, the goals of the implementation of a project should be an extensive exploitation of the saving potential and use of solar energy (thermal and PV).

Other project approaches were analyzed and evaluated within the report.