



# SARDINE FISHING INDUSTRY

Lake Victoria, Tanzania



## ENERGY TRANSITION AND WOMEN EMPOWERMENT

2 ZERO HUNGER



5 GENDER EQUALITY



7 AFFORDABLE AND CLEAN ENERGY



8 DECENT WORK AND ECONOMIC GROWTH



13 CLIMATE ACTION



17 PARTNERSHIPS FOR THE GOALS



# Millennium Engineers

Is a Tanzanian renewable energy company specialised in solar and wind energy technologies. We develop customized business projects based on the needs of a specific community, industry or business value chain by using either wind or solar technologies or both while working alongside the customer to ensure our solution caters for their needs while still addressing cost, culture, efficiency and the environment.

## OUR CORE VALUES



Integrity



Curiosity



Innovation



Collaboration



Sustainability

## OUR VISION

Is to help alleviate poverty and improve business value chains by providing sustainable and affordable energy solutions while working to achieve SDG 2, 5, 7, 8, 13 and 17 by 2030.

## OUR MISSION

Is to lead the global transition to renewable energy by providing solutions in various sectors that create value to people's lives, businesses and the environment.

## OUR FOCUS

We are committed to driving development on the African continent and the world with a specific focus on renewable energy, women, innovation and social impact business projects.



## PROJECT INTRODUCTION

Lake Victoria is the world's second largest freshwater lake, providing food and jobs for millions of people in Africa. Mwanza and its surrounding islands are situated on the southern coast of Lake Victoria and form the epicenter of Tanzania's sardine fishing industry. The lake supplies around 55% of all fish consumption in Africa (Odongkara et al, 2016), and over half of the lake's total yearly catch is a type of sardine called Dagaa. This industry is a \$13Bn USD market that currently uses pressurized kerosene lanterns and lead-acid batteries during night fishing to attract plankton, which in turn attract sardines.

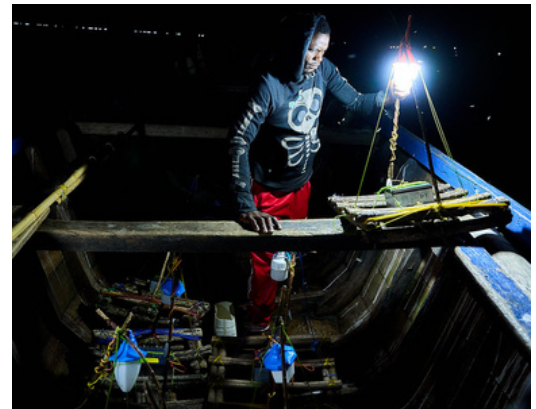
For preservation the fish are dried on the ground in sandy areas or on elevated racks. This practice has caused a high rate of deforestation in the region due to clearing of trees for open drying spaces. Additionally, the current ways of drying cannot guarantee good quality and constant supply of dried fish. Heavy rain is the main culprit that wash the Dagaa away and causes what is left-over to rot. Moreover, in the open sandy beaches, animals and insects have access to the drying Dagaa where they are free to eat and contaminate it. During the rainy season, fishers can lose up to 30% of their catch (Ibengwe, L., 2012) and because of this, the remaining catch ends up having low nutritional value. Often only 30% of the catch is suitable for human consumption and the remaining 70% is used for animal feeds (Bille et al, 2006), leading to huge unnecessary food waste and lack of food security.

Income levels for many fishing families in the area is low, and consequently, their educational and health outcomes. A majority of the communities are dependent upon the fishing industry and as such, other small businesses generate profits based on the primary income flows of the fishing industry. The sardine fishing industry value chain faces a number of challenges around affordable energy for both lighting and sardine drying. Additionally the industry has limited work opportunities for women further hampering household income.



## SOLUTION: SOLAR LAMPS

The current dominating lighting solutions in the market are kerosene lanterns and lead-acid batteries which power a bright, white light that disturbs the marine environment and ecosystem of Lake Victoria. Currently, fishermen who use pressurized kerosene lanterns spend 40% of their monthly profits on kerosene while risking their health and simultaneously contributing to greenhouse gas emissions. As well, the leading solar lanterns in the industry are powered by lead-acid batteries which are facing global criticism over environmental harm and are increasingly being banned in neighboring countries. Hence, our solution uses lithium-ion batteries which delivers a more environmentally friendly solution while reducing costs significantly. By charging \$1 per night to rent the solar lamps the fishermen stand to save up to 55% on their current lighting expenditure. As there are 18 nights of fishing in any given month, renting our lamps generates \$22 USD extra per lamp per month. Over the period of one year each fishing boat stands to generate an additional \$ 2,112 of profit.



## SOLUTION: SOLAR DRYING FACILITIES

Sardines are dried to extend its shelf life. Currently, sunlight and heat are the most common methods employed to dry sardines or dagaa, their local name. Apart from insects, lack of hygienic practices and other predators that reduce the fishermen's catch, the biggest problem for this method is rain. Our drying solution dries faster than the sun, improves the quality of the Dagaa, and makes it possible to dry at all times and in any weather condition. In comparison, the current conventional drying solution can dry 4,000 kg of wet sardines on a 2,500 sqm plot of land in one single fishing cycle (18 fishing days a month). Our solution is geared towards being able to dry 2,500 kg of wet sardines in a single day on a 210 sqm plot in a 79 sqm drying facility. Additionally, by charging \$1 to dry 20 kg of sardines in 2 hours, instead of using 6 hours on the current conventional method the fishers daily income increases in alignment with reduced production time and increased quality of sardines.



## PROJECT GOALS

The project aims to transition the low-income sardine fishing industry in Lake Victoria, away from kerosene lanterns, lead-acid batteries and traditional methods of drying towards cleaner, more affordable renewable energy solutions. In turn this will increase the value of sardines in the global market, while the community benefits four-fold environmentally, economically, socially and through gender impact. This will be achieved by procuring 1,000 solar fishing lamps and setting up five solar drying facilities in three site areas in Mwanza. This includes two island sites on the lake and one site along the shores of the lake in the Mwanza city.

- Empower 330 local women to take up proactive income generation jobs in the sardine fishing industry.
- Capacitate the socioeconomic growth of 2,500 fishermen and their communities in the region.
- Offset a total of 15,787.5 Tons of CO2 for the project period of 2 years from initiation.
- Increase the quality of sardines in the region and consequently its value in the global market.

## TIME FRAME

### 2018-2019: Project Development

Marketing research  
Business Development  
Identifying potential project partners



### 2020: Pilot Project

Testing the Business model  
Assessing level of socioeconomic impact  
Partner with UNEP and AWEEF



### 2021-2022: Demonstration Project

Procure 1000 solar lamps & setup 5 solar drying facilities  
Empower 330 local women  
Impact 1,000 fishermen and their communities  
Offset 15,787.5 Tons of CO2 annually  
Increase quality of dried sardines produced in the region  
Secured financing for development of Project setup  
Industrial site development  
Demonstrate Business Model



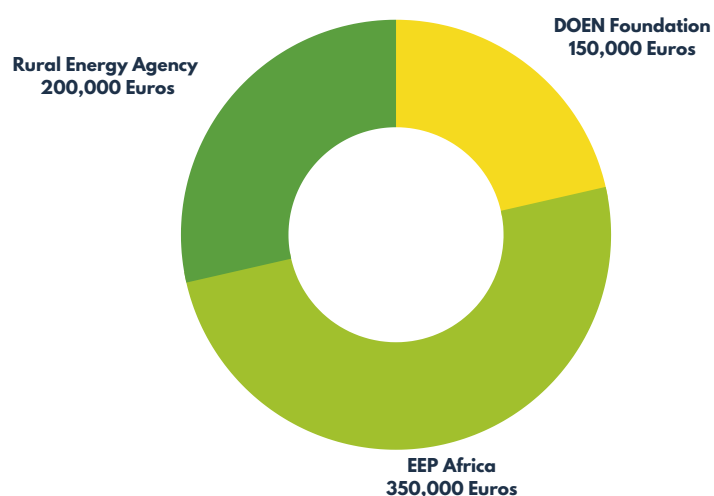
### 2023: Scale up

Securing 1-3 Million Euros  
Expanding export operations by setting up a center for quality testing and packaging  
Adding an additional 5 sites (for drying and lantern distribution)

## PARTNERS

Ever since the project development to the current project demonstration stage we have incorporated strategic partnerships at various levels of engagement. Consequently we were able to form partnerships and work with the Alliance for Rural Electrification (ARE), ANZA Entrepreneurs with VC4A, Fishers Union Organisation (FUO), GOGLA, the Regional Commissioners' Office of Mwanza, Sagar Energy Solutions, SELCO, Tanzanian Renewable Energy Agency (TAREA), UNEP through the African Women Energy Entrepreneurs Framework (AWEEF), along with all relevant government ministries.

## PROJECT COST



Millennium Engineers Enterprises has been able to raise a total of 700,000 Euros from Energy and Environment Partnership for Africa (EEP Africa), DOEN Foundation and the Rural Energy Agency (REA) of Tanzania to execute our impact business-oriented project (Sardines Fishing Industry – Lake Victoria).

## REVENUE MODEL

The business model is in two categories; (i) Lighting services - lease to own model, and (ii) Drying services - pay on services. The pricing strategy for the business implementation has been divided into two categories; (i) high season, and (ii) low season which further classifies customers into weekly and monthly subscribers with discount options for customers subscribed to both services of lighting and drying.

Customers will use Millennium Engineers' customized solar lanterns because they are more efficient, environmentally friendly and will reduce lighting expenses. In addition, our solar dryers will reduce drying time, increase nutritional value of the final product, and increase market value.

The future expansion plan of the business is to enter new markets in islands and fishing sites around Lake Victoria. As well, we will ambitiously explore opportunities in the sardine value chain to distribute and export abroad. Although there is great demand already for sardines in the region, we plan to implement a marketing strategy to increase regional and international demand.

## MARKET SIZE

The sardine fishing industry in Lake Victoria generates an average monthly income of over \$150 to individual fishers/traders and an estimated foreign exchange of over \$2 million annually. The region of Lake Victoria in Mwanza has the largest number of landing sites, fishermen, and fishing vessels of all the lakes in Tanzania. There are over 100,000 fishermen in the Mwanza area supplying 642 landing sites, the most of any region in Tanzania. As well, in 2020 alone Mwanza fishermen generated 48,144 tons of sardines out of Lake Victoria. However, in the same year only 11,140 tons of sardines were exported out of Lake Victoria. The resulting profit being 6 million USD, it is important to focus on the 37,000 tons of sardines that were not exported. By standardizing the process and increasing the value of sardines in the industry with our custom solar dryers, we will increase incomes for traders and fishermen in the industry while generating more profit for the region by increasing exports.

The market also accounts for 280,000 fishing lamps powered by lead-acid batteries and wooden flotillas. Our estimated market share stands at 0.9% of the annual total production of sardines. For solar lanterns, our market share stands at 1.7%, the average of lanterns in the market and our estimated production. Note: there are 59,050 solar lanterns on the market currently. Customers are increasingly willing to pay for our products due to our competitive pricing and efficient solutions.



## OUR MODEL OF OPERATION



- **Innovate:** our solutions are designed for maximum market uptake and the business innovation is centered on our business model and technology.
- **Equip:** We are determined to capacitate local women with the required operations and technical skills to operate the business.
- **Serve Together:** through strategic partnerships we aim to reach our collective goals together while serving the community and our environment on a broad scale.

## CONTRIBUTING TOWARDS THE SUSTAINABLE DEVELOPMENT GOALS



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