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Research Article

Technical, Economic and Social Feasibility Analysis of Photovoltaic Solar Systems for Rural Electrification in Mapai District-Mozambique

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Abstract

This study assesses the technical, economic and social feasibility of implementing photovoltaic solar systems for rural electrification in the Mapai district, Gaza province, southern Mozambique. The research was conducted in the locality of 16 de Junho, in the village of Regua, involving ten households without access to the national electricity grid. The methodology included a socioeconomic and energy survey, identification and calculation of daily electrical loads, estimation of average energy demand, and technical sizing of the photovoltaic system based on local solar irradiance conditions ranging from 5.0 to 5.5 kWh/m^2/day. Field surveys, direct observation and measurements were carried out, and the collected data were processed and analysed in Microsoft Excel. The dimensioning covered the main components of the photovoltaic system, including the solar generator, battery bank, charge controllers and inverters, ensuring reliability, autonomy and compatibility with household energy needs. The proposed system, a standalone Photovoltaic Solar System (SPS), is validated as the most suitable solution. An economic comparison was performed between the total installation and operational costs of the photovoltaic system and the hypothetical extension of the public grid. The results demonstrate that the photovoltaic system is technically viable and economically advantageous in the long term, due to the absence of monthly tariffs, reduced maintenance requirements and greater predictability of operational costs. From a social perspective, the adoption of photovoltaic systems enhances energy inclusion, reduces inequalities and significantly improves living conditions, contributing to local sustainable development. The findings indicate that decentralized solar electrification constitutes a clean and efficient solution for remote rural communities, particularly in Mapai, where access to modern energy services remains limited. The study recommends the expansion of similar systems in other rural regions as a strategic pathway to promote sustainable development and support national and global efforts toward universal access to clean energy.

Keywords

Photovoltaic Systems, Rural Electrification, Energy Access, Technical and Economic Feasibility, Solar Irradiance

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1. Introduction

Access to electricity is one of the essential pillars for socioeconomic development and the improvement of living conditions for populations. In Mozambique, although there have been significant advances in the expansion of the national electricity grid, a large part of rural areas still faces limited and unreliable access to electricity. According to data from the National Institute of Statistics [5, 3], less than 40% of rural households have a formal connection to the public grid, which compromises domestic, productive and educational activities, limiting local development and social well-being.

In this context, solar photovoltaic systems (SPS) have emerged as a viable, sustainable, and decentralized alternative to meet the energy demand of remote communities. Solar energy is a clean, renewable, and abundant source, presenting significant economic and environmental advantages, especially in regions with high solar irradiance, such as the province of Gaza, whose annual average exceeds 5 kWh/m^2/day [2, 7] Studies indicate that the use of SPS contributes to reducing dependence on fossil fuels, decreasing greenhouse gas emissions, and promoting energy inclusion [6, 7, 1].

The use of decentralized photovoltaic technology is increasingly recognized as a key strategy for mitigating energy poverty in remote areas, where the cost of extending the conventional grid is prohibitively high [6, 3].

The Mapai district, particularly the 16 de Junho locality in the village of Régua, has low levels of electrification, limiting the development of small economic activities and directly affecting the quality of life of households. Given this scenario, the technical and economic design of photovoltaic systems adapted to the local reality becomes fundamental, considering factors such as consumption profile, number of users, solar availability, and investment and maintenance costs.

The general objective of this study is to design a photovoltaic solar system capable of meeting the energy needs of ten households in the 16 de Junho locality, as well as to carry out a comparative analysis between the cost of the solar system and supply from the public electricity grid. The relevance of this work lies in providing technical and socioeconomic support for rural electrification policies, contributing to future clean energy projects and to the achievement of Sustainable Development Goals 7 (Affordable and Clean Energy) and 13 (Climate Action).

2. Materials and Methods

This study is characterized as applied, descriptive, and exploratory research, with a quantitative and qualitative approach, aimed at analysing domestic energy consumption and dimensioning photovoltaic solar systems in the Mapai District, Gaza Province, southern Mozambique. The research was conducted in the village of Régua, locality 16 de Junho (coordinates: -22°36(31°55′S, 31°55′E), bordering Chicualacuala to the north and west, Chigubo to the east, and Mabalane and Massingir to the south. The region has a semi-arid climate, an average annual temperature of 26 °C, and rainfall below500 mm/year and average solar potential from 5.0 to 5.5kWh/m^2/day, making it favourable for the installation of photovoltaic systems. The local population is mainly dedicated to subsistence farming and livestock raising, facing energy constraints that limit socioeconomic development.

Source: Extracted from NASA POWER (2024).

Figure 1. *Satellite image map of Mapai District.*

The sampling was intentional, involving ten households and 55 beneficiaries, chosen according to: geographic location, absence or limited access to the electricity grid, and willingness to provide information on energy consumption and habits. The selection sought to represent different profiles of domestic and productive consumption.

Data collection utilized structured questionnaires (interview guides), direct observation, and field measurements. Variables included: available electrical equipment and its rated power (W), average daily usage time (h/day), and daily and monthly energy consumption. Estimated energy consumption (Wh and kWh), socioeconomic characteristics (income, household size, alternative energy sources), and level of knowledge and acceptance of solar technologies were considered. The variables were coded to allow for comparative analysis and categorization of consumption profiles.

The data were processed and analysed in Microsoft Excel using descriptive and comparative statistics. Daily consumption was converted to Wh/household, and averages, percentages, and weighted averages representative of the community were calculated. Climatic data (solar irradiance, average temperature, diffuse radiation) were obtained from official time series.(NASA POWER) and processed to ensure statistical consistency. The total energy demand was compared with the potential energy of the photovoltaic system, generating the energy coverage index (%).

The dimensioning of the photovoltaic system considered daily consumption, load profile, average irradiance availability, and system efficiency, including conversion and storage losses. Components sized included solar panels, batteries with 10 hours of autonomy, charge controllers and inverters. Detailed simulations and calculations were performed in Excel, allowing for technical and energy analysis.

The comparative economic analysis considered the initial investment costs (CAPEX), the operating and maintenance costs (OPEX), and the average domestic electricity tariffs from EDM [2] set at 8 MT/kWh.

3. Presentation and Discussion of Results

3.1. Data Collection Socioeconomic Profile

Questionnaires administered to ten households in the 16 de Junho locality reveal that the majority depend on subsistence farming, with a monthly income of less than 5,000 meticais (approximately 78 USD). Around 60% of households are headed by men and 40% by women, while the level of education is low, with only 20% of heads of household possessing any formal education. These results reflect a rural context marked by poor access to basic services and high energy poverty, with the identified average income clearly insufficient to ensure a decent life.

3.2. Solar Radiation Profile

In the Mapai district, located in Gaza province, data obtained from climatological series and satellite sources (NASA POWER) indicated an average annual global horizontal radiation (GHI) of approximately 5.6kWh/m^2/day, which characterizes the region as having high solar potential.

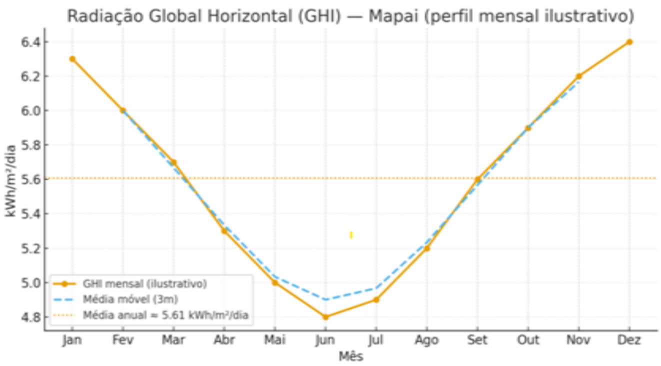

Figure 2. *Energy Consumption Profile.*

Before the implementation of the photovoltaic solar system, households depended on traditional energy sources, such as candles, batteries, kerosene, and firewood, for lighting. The estimated average electricity consumption, considering the appliances used (LED lamps, radio, mobile phone, and occasionally a television), was 1,200 Wh/day per household, corresponding to approximately 12 kWh/day for the community.

Table 1. *Average estimate of daily electricity consumption per household.*

Equipment	Average quantity	Power (W)	Usage time (h/day)	Daily consumption (Wh)
LED lamps	4	10	5	200
Radio	1	15	6	90
Mobile phone (charger)	2	10	2	40
Television (LED)	1	50	3	150
Average daily total	—	—	—	480 Wh/household

Source: Data from the field survey (2025).

The average daily consumption per household is therefore estimated at 480 Wh/day, which corresponds to 0.48 kWh/day for each household.

3.4. Photovoltaic Solar Dimensioning

3.4.1. Calculation of the Necessary Daily Demand

$$E_t = \frac{E_c}{n_s} = \frac{480}{0{,}8} = 600Wh/dia \quad (1)$$

Where:

1) E_t – total energy required $\left(\frac{\text{Wh}}{\text{day}}\right)$
2) E_c – daily energy consumption (Wh/day)
3) n_s – system efficiency

Each household requires 0.6 kWh/day of usable generation (already considering losses).

3.4.2. Panel Dimensioning

The energy generated by photovoltaic modules is approximately.

$$P_{FV} = \frac{E_t}{G_m} = \frac{600Wh/dia}{\frac{5500wh}{m^2}/dia} = \frac{0{,}6kWh/dia}{\frac{5{,}5kWh}{m^2}/dia} = \frac{0{,}109kWp}{familia} \quad (2)$$

$$N_{fam} = \frac{P_{FV,fami}}{P_{painel}} = \frac{109}{150} = 0{,}73 \approx 1 \ \ painel \quad (3)$$

Table 2. Data for sizing solar panels.

Parameter	Symbol	Value	Unit
Daily consumption per household	$E_{c,fam}$	480	Wh/day
System efficiency	n_s	0.8	—
Total energy required (including losses)	$E_{t,famil}$	480 / 0.8 = 600	Wh/day
Average daily irradiation	G_m	5.5	kWh/m^2/day = 5500 Wh/m^2/day
Panel power	P_{painel}	150	Wp

Where:

1) P_{FV} –Total peak power required by photovoltaic system (Wp)
2) G_m – average daily solar irradiation $\left(\frac{\frac{\text{kWh}}{\text{m}^2}}{\text{day}}\right)$
3) N_{fam} – number of photovoltaic panels;
4) P_{painel} – nominal power rating of each panel (Wp).

3.4.3. Battery Bank Dimensioning

The battery bank capacity (Cb) is calculated using the following expression:

$$C_b = \frac{E_t \times A}{V_s \times DOD} \quad (4)$$

Where:

1) E_t – total daily energy required
2) C_b – battery bank capacity
3) A- day (desired autonomy)
4) V_s – 24 V (system voltage);
5) DOD – 0.5 (recommended depth of discharge: 50%).

$$C_b = \frac{E_t \times A}{V_s \times DOD} = \frac{600 \times 1}{24 \times 0{,}5} = \frac{600}{12} = 50Ah$$

Therefore, each household needs a battery bank with 50 Ah at 12 V.

3.4.4. Dimensioning Using 12V / 200Ah Batteries

1) Each 12V/200Ah battery provides 200Ah at 12V.
2) To obtain 24 V, we connect 2 batteries in series, maintaining the same capacity (200 Ah).

Table 3. Data for dimensioning a bacterial bank.

Parameter	Symbol	Value	Unit
Daily consumption per household	$E_{c,fam}$	480	Wh/day
System efficiency	n_s	0.8	—

Parameter	Symbol	Value	Unit
Total energy required (including losses)	$E_{t,famil}$	480 / 0.8 = 600	Wh/day
Average daily irradiation	G_m	5.5	kWh/m^2/day = 5500 Wh/m^2/day
System voltage	(Vs)	12	V
Panel power	P_{painel}	150	Wp
Desired autonomy	(THE)	1	day
Discharge depth	(DOD)	0.5	—
Individual battery capacity	12 V / 200 Ah	—	—

Practical conclusion by household

1) Batteries required:2 x 12V / 200Ah batteries
2) Bank tension:12 V
3) Bank capacity:200 Ah (4 times the minimum required capacity, guaranteeing autonomy and safety)

Autonomy:1 day of consumption without solar radiation

3.5. Economic Parameters of Photovoltaic (PV) Systems and the Public Electricity Grid

3.5.1. PV

Table 4. Data for dimensioning a bacterial bank.

Component	Technical Specification	Approximate Unit Cost (MZN)	Quantity per Family	Total Cost per Family (MZN)
Photovoltaic Panel	150 Wp, monocrystalline	6,370.65	1	6,370.65
Gel Battery 12V/200 Ah	Gel technology, 12 V / 200 Ah	18,000.00	2	36,000.00
200 W Inverter	Pure sine wave, 12 V DC → 220 V AC	2,499.00	1	2,499.00
MPPT Charge Controller 10 A	MPPT(Maximum Power Point Tracking) technology, 12/24 V	5,250.00	1	5,250.00
Cables and Accessories	Includes cables, connectors, and supports	500.00	—	500.00
Total per Family	—	—	—	52,619.65
Total for 10 Families	—	—	—	526,196.5

3.5.2. Materials for Connecting an Area Located 17 km from the Electrical Grid (Approximate Prices)

Table 5. Price table of electrical materials for the public Medium Voltage (MV) distribution network.

ORD	DESCRIPTION	UNIT	QTY	UNIT VALUE (MZN) / TOTAL VALUE (MZN)
01	Three-phase Transformer 33/0.4 kV, 160 kVA	UN	1	400,000.00 / 400,000.00
02	Concrete Pole 1250 B – 3.1	UN	60	1,500.00 / 90,000.00
03	Foundation Block	UN	4	2,500.00 / 10,000.00
04	Fencing with tubular mesh	UN	1	300,000.00 / 300,000.00
05	Polymeric Drop-out with cartridge	UN	4	200,000.00 / 800,000.00

ORD	DESCRIPTION	UNIT	QTY	UNIT VALUE (MZN) / TOTAL VALUE (MZN)
06	33 kV Surge Arresters	UN	2	150,000.00 / 300,000.00
07	LV Distribution Structure 250 A	UN	2	350,000.00 / 700,000.00
08	Crossarm Type U 100x50x38 with accessories	UN	10	50,000.00 / 500,000.00
09	MV Conductor — ACSR	M	51,000	38.34 / 1,955,340.00

Subtotal: 5,205,340.00 MZN

Table 6. Table with prices of electrical materials for the public Low Voltage grid.

ORD	DESCRIPTION	UNIT	QTY	UNIT VALUE (MZN) / TOTAL VALUE (MZN)
09	9 m Wooden Pole	UN	300	4,800.00 / 1,440,000.00
10	ABC Cable 3x50+55+25 mm^2	M	6,000	263.48 / 1,580,880.00
11	LVAV 4x150 mm^2, 0.6/1 kV	M	30	357.60 / 10,728.00
12	AL/CU Mechanical Tightening Terminal 9 mm^2	UN	30	145.37 / 4,361.04
13	PC3 Connectors (25–95)/(25–95)	UN	50	129.00 / 6,450.00
14	PC2 Connectors	UN	100	118.40 / 11,840.40
15	Suspension Clamp (4x50/4x95) mm^2	UN	80	120.72 / 9,657.60
16	Anchoring Clamp (4x50/4x95) mm^2	UN	40	275.24 / 11,009.76
17	Complete LV Stays	UN	20	2,358.94 / 47,178.72
18	M16 Anchoring Hooks	UN	100	624.00 / 62,400.00
19	LED 5 m Cast Iron Bracket/Streetlight Arm	UN	30	4,349.18 / 130,475.52
20	MV Insulators	UN	1,020	383.40 / 391,068.00
21	MV Fuses / Cutouts	UN	5	1,191.70 / 5,751.00
22	Earthing Rods	UN	400	639.00 / 255,600.00

Subtotal: 3,967,400.04 MZN

4. Analysis and Discussion of Results

The analysis of the results obtained allows for an integrated understanding of the socioeconomic and energy reality of the 16 de Junho locality, as well as an assessment of the technical and economic viability of implementing photovoltaic solar systems in a rural context. As described in the methodology, the data collected through questionnaires and local measurements reveal a scenario of economic vulnerability and energy scarcity, recurring characteristics in rural areas of Mozambique [5, 8].

The socioeconomic profile of the ten households surveyed shows an almost exclusive dependence on subsistence agriculture, with average incomes below 5,000 MZN per month (approximately 78 USD). This value, according to the World Bank (2024), is below the extreme poverty line, which compromises access to basic goods and services. The low level of education—only 20% of heads of household have any formal education—also limits the adoption of modern energy technologies, reinforcing the social and economic vulnerability already identified [10] in communities with similar profiles.

Regarding the energy profile, prior to the introduction of solar systems, the reliance on traditional sources such as kerosene, candles, and firewood is consistent with that observed by [8] who highlight the predominance of inefficient and polluting solutions in rural areas. The estimated average electricity consumption of 480 Wh/day per household (0.48 kWh) confirms the low energy demand, although sufficient to cover basic lighting and communication needs, which is in line with the typical consumption of rural communities in sub-Saharan African countries [6].

Technical dimensioning indicates that each household requires approximately 0.6 kWh/day of useful generation, with the installation of a 150 Wp photovoltaic module and two 12 V/200 Ah batteries connected in series being sufficient to guarantee one day of autonomy. These results are in line [7]. technical recommendations, which point to small-scale systems as an efficient and sustainable solution for decentralized rural electrification.

From an economic standpoint, the comparison between the solar system and the extension of the public grid (17 km) reveals a striking contrast. While the estimated total cost of the photovoltaic system for ten households is approximately 526,000 MZN (52,600 MZN per household), the grid extension would represent more than 9 million meticais, or more than 900,000 MZN per household. Thus, the solar investment presents an initial cost approximately seventeen times lower and a payback time of 5 to 6 years, corroborating the results of studies [9]. which highlight the competitive potential of isolated solar systems compared to conventional electrification in remote areas.

In addition to the economic benefit, the photovoltaic system eliminates direct CO_2 emissions and reduces annual operating costs, contributing to the sustainable energy transition foreseen in the goals of the 2030 Agenda and the National Renewable Energy Plan of Mozambique [11]

Discussion of Main Findings

The analysis of the results provides an integrated understanding of the socioeconomic and energy reality of the locality of 16 de Junho, as well as an assessment of the technical and economic feasibility of implementing photovoltaic solar systems in a rural context

Socioeconomic Profile and Verification of Energy Demand

The near-exclusive dependence on subsistence agriculture, with average household incomes below 5,000 MZN per month, reflects a scenario of economic vulnerability and energy scarcity—conditions commonly observed in rural areas of Mozambique [5]. The low level of schooling (only 20% with formal education) further limits the adoption of modern technologies, reinforcing this vulnerability. The average household electricity consumption of 480 Wh/day (0.48 kWh) confirms the low demand profile, sufficient only to meet basic needs (lighting and communication), and is consistent with typical consumption patterns in rural communities across Sub-Saharan Africa [6].

Technical Robustness and Economic Advantage

The technical sizing indicates that a 150 Wp photovoltaic module and two 12 V / 200 Ah batteries connected in series are sufficient for each household, providing one day of autonomy and ensuring technical robustness in accordance with [7] recommendations. The installation of a single 150 Wp panel per household is feasible given the high Global Horizontal Irradiance (GHI) values in the region.

From an economic perspective, the comparison between the standalone solar system and the extension of the national grid (17 km) reveals a striking contrast. The total estimated cost of the SPS for ten households (526,000 MZN) is approximately seventeen times lower than the cost of grid extension (≈ 9 million MZN). This solar investment presents a payback period of 5 to 6 years, corroborating the competitive potential of isolated systems when compared to conventional electrification in remote areas [12]

Study Limitations

It is important to acknowledge certain limitations that influence the generalizability and accuracy of the results:

Reduced Sample Size

Data collection was limited to ten households in a single locality, which may not fully represent the heterogeneity of the broader Mapai district. The results should therefore be interpreted as a detailed case study.

Seasonal Variability of Solar Irradiance (GHI)

The sizing calculations were based on the annual average Global Horizontal Irradiance (GHI) of 5.5 kWh/m^2/day. However, local GHI exhibits seasonal fluctuations, dropping to approximately 4.8 kWh/m^2/day during the winter months (June/July). System autonomy and performance during prolonged periods of low solar insolation were not dynamically modeled.

Economic Modeling Assumptions

The comparative economic analysis relies on estimated costs for public grid extension and on average electricity tariffs. Moreover, the analysis did not explicitly incorporate the Life Cycle Cost (LCC), which considers factors such as battery replacement (every 5 to 7 years), inflation rates, or specific financing costs (interest/subsidies).

5. Conclusions

This study demonstrated that the dimensioning of photovoltaic solar systems is a technically, economically, and environmentally viable solution to meet the energy needs of ten households in the 16 de Junho locality, Mapai district. Through the analysis of daily consumption, a socioeconomic survey, and the dimensioning of panels, batteries, controllers, and inverters, it was possible to propose an efficient system, guaranteeing one day of autonomy for each household, and reducing dependence on traditional energy sources. Comparison with the expansion of the public electricity grid showed that decentralized electrification presents lower initial costs, reduced maintenance, and zero CO_2 emissions, making it economically sustainable in the medium term.

This study is directly aligned with the United Nations Sustainable Development Goals. SDG 7 – Affordable and Clean Energy – advocates for universal access to modern, reliable, and sustainable energy services, which is achieved by providing solar electricity to isolated rural households. SDG 13 – Climate Action – emphasizes the need to reduce greenhouse gas emissions and promote renewable energy sources, and the implementation of solar systems directly contributes to this goal by replacing polluting sources such as kerosene and firewood. In summary, the results confirm the hypothesis that decentralized solar energy is an effective alternative to mitigate energy poverty, improve household well-being, and foster sustainable development. The adoption of photovoltaic systems, when properly sized and accompanied by supporting policies, represents a practical way to expand access to clean energy and reduce environmental impacts in rural communities in Mozambique.

Implementation Guidelines

To ensure that the proposed technical solution results in effective and sustainable electrification, the following implementation guidelines are recommended:

Financial and Institutional Model

Given the low-income profile of the community (less than 5,000 MZN per month), direct purchase of the system is not feasible. It is recommended that implementation be based on a subsidized model [4] or a 'Pay-As-You-Go' (PAYG) financing scheme adapted to the local economy, in order to facilitate access to the initial CAPEX.

Local Capacity Building and Maintenance

To ensure long-term sustainability and operability, local residents should be trained in basic system operation, monitoring, and routine maintenance of the batteries and MPPT charge controllers.

Standardization and Logistics

The system design should be standardized (e.g., 150 Wp panel and 2 × 12 V / 200 Ah batteries) across the ten households to optimize procurement and inventory management for future replacement of components.

Abbreviations

PV	Photovoltaic
SPS	Solar Photovoltaic
RE	Renewable Energy
GHI	Global Horizontal Irradiance
DNI	Direct Normal Irradiance
POA	Plane of Array Irradiance
STC	Standard Test Conditions
Wp	Watt-peak
kWp	Kilowatt-peak
kWh	Kilowatt-hour
MPPT	Maximum Power Point Tracking
VOC	Open Circuit Voltage
ISC	Short Circuit Current
DOD	Depth of Discharge
CAPEX	Capital Expenditure
OPEX	Operational Expenditure
NPC	Net Present Cost
LCOE (ou COE)	Levelized Cost of Energy
LCC	Life Cycle Cost
IRR	Internal Rate of Return
NPV	Net Present Value
CRF	Capital Recovery Factor
PP	Payback Period
LV	Low Voltage
MV	Medium Voltage
HV	High Voltage
ACSR	Aluminium Conductor Steel Reinforced
PT	Power Transformer Station
BT	Low Voltage
MT	Medium Voltage
EDM	Electricity of Mozambique
GIS (SIG)	Geographic Information System
LEAP	Consumption
ERA5	Fifth Generation ECMWF Atmospheric Reanalysis

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Author Contributions

Flugencio Punguane: Conceptualization, Methodology, Investigation, Formal Analysis, Data Curation, Resources, Project Administration, Supervision, Validation, Visualization, Writing – original & draft

Jossias Arnaldo Vilanculo: Methodology, Data curation, Software, Validation, Investigation, Visualization, Writing – review & editing

Marsilio Onesio Neves de Andrade: Resources, Funding acquisition, Supervision, Project Administration, Validation, Writing – review & editing

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Biography

Flugencio Punguane is a lecturer and researcher at Universidade Save, Department of Natural and Exact Sciences, Massinga Campus. He completed his Bachelor's degree in Physics and is currently pursuing his Master's research focused on renewable energy systems and local climate variability in southern Mozambique. His academic work includes rural electrification, photovoltaic system design, and energy access modelling, particularly within low-income and off-grid communities. He has coordinated institutional development projects, including the Soil Laboratory Implementation Project in Mapai, and collaborates in field-based energy research supported by the Institutional Development Fund (FDI). His research contributions emphasize sustainable energy solutions, solar resource assessment, and environmental resilience.

Jossias Arnaldo Vilanculo is a lecturer, researcher, and currently the Scientific Director of Save University, based at the Chongoene Campus within the Department of Natural and Exact Sciences. He holds academic training in Physics and Renewable Energy and has been actively involved in research initiatives focused on solar energy technologies, rural electrification, and applied computational modelling. His work includes field data collection, energy consumption profiling, environmental data analysis, and methodological support for photovoltaic system design in remote communities. As Scientific Director, he contributes to strengthening the university's research capacity, academic coordination, and the promotion of scientific initiatives aligned with sustainable development. He has collaborated on Institutional Development Fund (FDI)–supported projects aimed at enhancing scientific and technological capabilities within the institution.

Marsilio Onesio Neves de Andrade is a lecturer and senior researcher at Universidade Save, Massinga Campus, in the Department of Natural and Exact Sciences. With extensive experience in academic leadership and scientific project coordination, he has contributed to several institutional development initiatives and supports research activities in renewable energy, climate analysis, environmental management, and community-based development. His academic background includes training in natural sciences and applied environmental studies. His work focuses on project supervision, resource mobilization, and promoting applied research for socio-economic transformation in rural Mozambique.