Enabel

FUNAE
FUNDO DE ENERGIA

RESULTS REPORT

2019

RENEWABLE ENERGY FOR RURAL DEVELOPMENT PHASE 2 (RERD2) MOZAMBIQUE

Community work and its results in the framework of the preparation of a hydroelectric power plant

Belgian development agency

enabel.be

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Acronyms

ARENE	*Autoridade Reguladora Nacional da Energia* (National Energy Regulatory Authority)
CB	Capacity Building
CBMIREME	Capacity Building Ministry of Mineral Resources and Energy
CEO	Chief Executive Officer
CNELEC	*Conselho Nacional de Electricidade* (National Electricity Council)
DEP	*Divisão de Estudos e Planificação* (Research and Planning Division)
DMH	*Divisão de Mini-Hidricas* (Mini-Hydro Division)
DPREME	Provincial Directorate of the Ministry of Mineral Resources and Energy
DSO	Distribution System Operator
DSSE	*Divisão de Sistemas Solares e Eolicos* (Solar and Wind Systems Division)
EDM	*Electricidade de Moçambique* (Mozambican Power Company)
Enabel	The Belgian development agency
ENE	The National Electrification Strategy
EPC	Engineering, Procurement and Construction
ESWG	Energy Sector Working Group
EUR	Euro
FUNAE	*Fundo de Energia* (National Energy Fund)
GIS	Geographical Information System
HCB	*Hidroeléctrica de Cahora Bassa*
HQ	Headquarters
HR	Human Resources
IMU	Intervention Management Unit
IPP	Independent Power Producer
IT	Information Technology
ITA	International Technical Assistant
JE	Junior Expert

MDG	Millennium Development Goals
MEF	*Ministerio de Economia e Finanças* (Ministry of Economy and Finance)
MIC	*Ministerio de Inductria e Comercio* (Ministry of Industry and Commerce)
MITADER	*Ministério da Terra , Ambiente E Desenvolvimento Rural* (Ministry of Land , Environment and Rural Development
MIREME	*Ministério dos Recursos Minerais e Energia* (Ministry of Mineral Resources and Energy)
MO	*Market Operator*
MONOP	Operational Monitoring report of the Country
MOPRH	*Ministério das Obras Públicas, Habitação e Recursos Hídricos* (Ministry of Public Works, Housing and Water Resources)
MTR	Midterm Review
MW	Megawatt
M&E	Monitoring and Evaluation
n/a	not available
NGO	Non-governmental organization
PAYG	Pay-As-You-Go systems
PV	(Solar) Photovoltaic
RE	Renewable Energy
RERD1	Renewable Energy for Rural Development Phase 1
RERD2	Renewable Energy for Rural Development Phase 2
SC	Steering Committee
SE4All	Sustainable Energy for All
RR	Resident Representative
TA	Technical Assistant
TFF	Technical and Financial File (=Project Document)
TSO	Transmission System Operator
UM (O&M)	*Unidade de Manutenção* (Operations and Maintenance Unit)

1 Intervention at a glance (max. 2 pages)

1.1 Intervention form

Intervention title	Renewable Energy for Rural Development Phase 2 (RERD2)
Intervention code	MOZ 15 034 11 / DGD Code 3016524
Location	Mozambique
Total budget	12,000,000 EUR
Partner Institution	Fundo de Energia (FUNAE)
Start date Specific Agreement	16 March 2018 (6 years)
Date intervention start /Opening steering committee	1 july 2018
Planned end date of execution period	30 June 2023 (60 months)
End date Specific Agreement	16 March 2024 (72 months)
Target groups	FUNAE, rural population in intervention provinces who do not have access to reliable and adequate energy services (households, institutions and small businesses)
Impact[1]	Contribute to rural economic and social development by increased sustainable access to energy
Outcome	Increase access to energy in rural areas by investments in renewable energy systems and support mechanisms ensuring sustainability
Outputs	1. Mini-grids provide reliable and adequate energy services
	2. Technical and financial sustainability of existing systems is improved
	3. The capacity of FUNAE in planning and project management is improved
Year covered by the report	2019

1.2 Budget execution

	Budget	**Expenditure**		**Balance**	**Disburse-ment rate at the end of 2019**
		Previous years	**Year covered by report (n)**		
Total	**12,000,000**	**255,396.47**	**764,278.27**	**10,980,325.26**	**8.50%**
Output 1	6,400,000	8,933.80	140,064.64	6,251,019.56	2.33%
Output 2	1,260,000	8,000.00	24,219.55	1,243,780.76	1.29%
Output 3	2,750,000	130,135.33	409,785.91	2,210,078.76	19.63%
IVA	0	170.04	3,731.15	3,901.19	
Contingencies	326,000	-	-	326,000.00	0.00%
General means	1,264,000	124,157.30	186,495.02	953,347.68	24.59%

[1] Impact refers to global objective, Outcome refers to specific objective, output refers to expected result

1.3 Self-assessment performance

1.3.1 Relevance

	Performance
Relevance	**A**

The government's five-year plan (2014-2019) has recently expired, but the new 2020-2024 five-year plan continues to provide for the development of economic and social infrastructure to promote productive activity in the private and associative sectors. As energy plays a key role in the development of productive and income-generating activities, the government has launched an ambitious plan for 'Energy for All' in 2030, in which renewable energy will play an important role.

With its objective of increasing access to energy in rural areas through investment in renewable energy and support for mechanisms to ensure sustainability, the project is well aligned with public policies and responds to the needs of beneficiaries. The project therefore is and will remain highly relevant.

In parallel with the past government's five-year plan, FUNAE, the project's counterpart organization, reached the end of its 2014-2019 strategy. FUNAE however is announced to continue to play a principal role in the increase of energy access in rural areas, notably through the development of mini-grids. The organisation is now about to develop its new strategy (2020-2030). In its first full year the project has firmly anchored itself in FUNAE and is expected to continue to support the organization in accomplishing its new mission.

The intervention logic of the programme is appropriate; it consists of activities aimed at (a) developing mini-grids, (b) improving the technical and financial sustainability of existing systems and (c) improving the planning and management capacity of FUNAE. The context, however, requires more attention from the government and the local partner as described in the section of sustainability.

1.3.2 Effectiveness

	Performance
Effectiveness	**B**

The partial institutional anchoring of Enabel technical staff in FUNAE headquarters and in DPREME in Zambezia facilitates the collaboration with counterpart staff and provincial services. Full participation of FUNAE and DPREME staff is effective in all field missions to date. In Maputo the project team works from two offices. The technical team is embedded in FUNAE while the financial/administrative/logistics support is based in the Enabel representation. Consequently, the intervention manager moves between the two offices dividing his time +/- 50% - 50% between FUNAE (in the mornings) and the Representation (in the afternoons). Embedding the project in the organization definitely has its merits but it also has its implications for the project's operational clout. FUNAE is quite a compartmentalized and centrally managed organization with its internal bureaucracy. Communication lines are long and seemingly small decisions are readily transferred to the leadership, thus taking time. Moreover, RERD2 is only one out of more

externally funded renewable energy projects[2]. As such it has to compete for the attention of the FUNAE's leadership trying to stretch the organization's absorption capacity. Nevertheless, the results obtained in 2019 indicate progression to the achievement of the output and outcome. The chances of achieving the specific objective are real and significant.

1.3.3 Efficiency

	Performance
Efficiency	**B**

The arrival of the intervention manager and the energy engineer, half October 2018[3], marked the full mobilisation of technical staff and administrative, financial and logistic staff, deemed necessary for the achievement of results. The team was complemented with a junior expert (50%) in digital data management in March 2019.

The management of the project's resources is generally satisfactory but low in terms of financial execution. For an implementation period at the end of 2019 of 30 % of the time, and since arrival of the head of the project at 24% of the time, budget consumption stands at 8.50%. This low rate of consumption is mainly linked to the project's logic that requires an intensive study phase prior to investment decisions but also to deferral of certain initiatives at the request of the counterpart pending feasibility study results and completion of new corporate strategies following completion of the former strategy / planning cycle in 2019.

1.3.4 Potential sustainability

	Performance
Potential sustainability	**B**

Sustainability of the project will very much depend on whether innovative approaches involving the private sector can be developed[4]. The legal and regulatory framework continue to be unfavourable and requires informed attention from the government so that important conditions such as (a) the adoption of the new Electricity Act, (b) a well-defined strategy for private sector participation and investment in the renewable energy sector and (c) the removal or reduction of import taxes for renewable energy equipment are achieved. In view of promoting these developments the steering committee (SC) adopted the project's proposal to add a fourth result to the project's logical framework with a dedicated budget line enabling the local partner to exert influence the new legal framework.

In the meantime, and in view of attracting the private sector, the project remains in close contact with sister projects funded by DFID and the Italian Cooperation. The approach of these projects, in collaboration with the Energy Ministry, resides in the drafting and ministerial approval of special derogations for private sector involvement. The project is aware though that the success of this so-called 'sandbox' method cannot be guaranteed

[2] The number of which increased quite significantly over the past year.

[3] Both arrived mid-October 2018, 3.5 months after the official start of the project.

[4] RES4Africa's recent report *RE-thinking Access to Energy Business Models Ways to Walk the Water-Energy-Food Nexus Talk in Sub-Saharan Africa showed that projects 100% public financed will not / are very unlikely to be sustainable.*

and also embodies a certain risk due to the lack of experience with this approach. The Energy Sector Working Group (ESWG), of which the project is part, will continue to closely monitor developments in the above policy areas and is likely to have a positive impact on developments and thus on the sustainability of project actions in the medium and longer term.

1.4 Conclusions

Below is a summary of the main activities and an indication of their respective results:

- A review of documents of 4 hydropower projects, site visits to hydroelectric installations, including visits to rehabilitation works at Majaua hydroelectric power plant[5] and study of a series of mini-grids have led to the project's understanding of the current existing renewable energy infrastructure, technologies and management practices.
- A 'Feasibility study for a small hydro power plant in Nintulo, Gurué District, Zambezia (Moz 183)' was concluded recommending the construction of a 11.2-Megawatt hydroelectric plant connected to the national grid (total cost was calculated some 25.9 M$). For this project to become a reality it was recommended to increase the attractiveness of the investment by extending the EDM distribution network to 8 villages in the Nintulo area (Gurué district) and improve access roads. This will require RERD2 to continue assisting the partner with data collection and carrying out studies to prepare the hydro plant's executive project.
- The undertaking of 19 mini-grid pre-feasibility studies (on the basis of the FUNAE project portfolio) resulted in the selection of 5 sites eligible for project investment in solar mini-grids. All sites were approved by the steering committee. Terms of reference for in-depth feasibility studies were drafted for 3 sites. Two sites were recommended to immediately advance with 'Engineering, Procurement and Construction' (EPC) tenders.
- Consultations with representatives in communities helped in assessing feasibility of mini-grid projects and prepare communities for next steps. In the case of the hydroelectric plant of Nintulo 60 inhabitants of several communities were actively involved in preparatory works. This included, among others, the construction of a water flow measuring weir and involvement in daily data collection. These activities increased local ownership of the (future) hydro plant project.
- A preliminary mapping of NGOs and an inventory of Vocational Training Institutes in Zambézia identified possible future cooperation opportunities with local organizations, particularly in the area of stakeholder consultation and stimulation of productive use of electricity. The involvement of a Gurué training institute in energy needs assessments allowed for gathering experience with such collaboration.
- A literature study on the impact of mini-grids on the livelihood of the rural folk, with specific attention to gender, led to the identification of areas of concern with regard to the differential gender impacts of rural electrification and thus guide future work.
- Contacts were established with companies in the agricultural, forestry and telecommunications sectors to assess possible anchor loads and private sector involvement in (future) management of mini-grids.

[5] As follow up to a RERD1 co-financing contribution with the EU following flood damage of 2015

- Collaboration with the FUNAE operation and maintenance unit (O&M) and the administration and finance division, on monitoring of operational status of installations allowed for increased understanding of issues such as of work planning, revenue collection and inventory and stock management.
- A Survey in Zambezia collected data on 377 solar RERD1 funded solar systems (schools, health centers, local administration buildings) and allowed (a) the establishment of some baseline indicators, (b) gain experience with new digital data collection techniques and (c) to confront the FUNAE GIS database with field reality thus serving as excellent input for a workplan to improve FUNAE's geo-database.
- An Inventory of IT equipment and software, followed by an assessment of software and hardware needs and subsequent purchase, installation and staff training allowed to increase capacities of FUNAE HQ staff in various domains.
- Verification of remote-control systems (Victron, EMS, Belgian Campus) allowed to assess their future relevance for FUNAE and the project.
- Missions to FUNAE mini-hydroelectric plants and a series of mini solar networks confirmed that the digital monitoring system are essentially manual, and that no remote monitoring exist to date. The outcome of these studies was input in discussions on the opportunity to develop a centralized (possibly cloud-based) remote monitoring system for FUNAE's renewable energy installations. An analysis of the evolution of electricity consumption in these mini-grids was shared with DEP, DMH, DSSE. Discussions, importantly, focused on improved sizing of mini-grids.
- The Study of payment and fee collection systems studied in 4 mini-networks disclosed that also these systems mainly operate manually without any significant automation and / or remote connections. Together with O&M exploratory discussions were held with main existing telecommunications operators to explore Pay-As-You-Go (PAYG) systems. Discussions were equally held with a private operator on the possibilities of management of a mobile service for the payment services (in house or outsourced).
- A methodology for accelerated assessment of training needs was developed and proposed. A document on the concept of productive use of electricity was prepared, distributed and discussed.
- Training of staff from Maputo and Zambézia - DPREM and FUNAE - in numerous field missions led to improved knowledge on topics such as socio-economic research, energy needs assessments, topographic, geological and hydrological studies as well as the undertaking of surveys with the help of tablets.
- Analysis of management processes and information exchange (FUNAE HQ <-> Delegations) helped the team to better understand current inhouse practices.
- A start-up / baseline workshop was held and a fourth results was added to the logical framework "The new legal framework is influenced by FUNAE".

Enabel execution official[6]
 Mark Hoekstra

[6] Name and signature

2 Results Monitoring[7]

2.1 Evolution of the context

2.1.1 General context

Mozambique remains in debt distress and on a subdued growth trajectory. Progress has been made in debt restructuring, but the outlook remains unknown.

As to the - renewable - energy sector earlier announcements of important changes in sector policies and partner institutions were reconfirmed in 2019 (see 2.1.2. below) but most still await concrete implementation. Approval of relevant legislation and key nominations remained on hold pending the October 2019 elections. 2019 also did not provide clarity on the consequences of the adoption of decree 41/1 of June 2018 that lays down new rules for public institutions / funds, such as the project's counterpart organization FUNAE.

Two consecutive cyclones, IDAI and KENNETH, struck Mozambique in March and April 2019. Cyclone IDAI alone left more than 600 people dead and millions in need. Coordination of relief and rehabilitation works made important claims on public resources in central ministries as well as the directly affected but also neighboring, provinces. A substantial claim was made on the project's main partner FUNAE, notably its Zambezia[8] delegation for repair works on electricity infrastructure in the hard-hit province of Sofala (south of Zambezia) necessitating modification of planned project field missions.

In a general sense the lack of progress on the electricity law remains among the main preoccupations of the intervention as it complicates the projects quest for innovative business models for mini-grids. It is difficult to stipulate at this stage in how far delays of adoption of the electricity law will have a negative influence on the intervention.

2.1.2 General and Institutional context

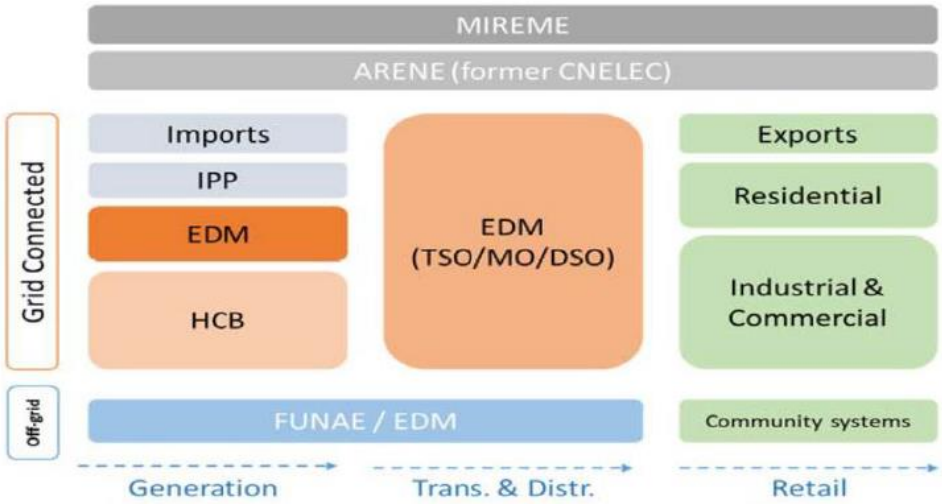
In terms of the Institutional set up[9] the following diagram summarizes the role and name of the key entities.

[7] Impact refers to global objective, Outcome refers to specific objective, output refers to expected result

[8] The project's prime geographical target province.

[9] that stems from the current regulation of the sector

Institutional set up of the Energy Industry and regulatory bodies



The Ministry of Mineral Resources and Energy (MIREME)

The Ministry of Mineral Resources and Energy (MIREME) remains responsible for national energy planning, policy formulation and overseeing the operation and development of the energy sector. The mandate of the newly established Renewable Energy and Energy Efficiency Directorate (DER) is to boost the development of renewable energies and diversification of sources in the national energy matrix, thus contributing to the achievement of the (new) Integrated Master Plan and in the National Electrification Strategy objectives. One of the major objectives is to achieve the target of universal access to energy by 2030. At the time of drafting this report it was announced that the Minister of Energy had been reappointed to the same position in government. This can only benefit continuity in the sector. It would seem reasonable to assume that new policies and legislation developed in the last two years will evolve and become reality in the coming term of government, thus paving the way for innovative solutions in mini-grids as foreseen by the project.

Establishment of the National Energy Regulatory Authority (ARENE)

ARENE (created by law in 2017) has been quite inactive for most of 2019 due to delays in the nomination of the chairman of the board. The chairman was finally appointed in November 2019 and attended the project's third steering committee of 5 December 2019. ARENE, as MIREME, continues to be supported by the Belgium funded CB-MIREME project.

The National Electrification Strategy 2018 (ENE)

The in 2018 approved National Electrification Strategy (ENE) is an important step in Mozambique's strategy to achieve universal access to electricity by 2030. The strategy identifies institutional, financial and technical challenges and focuses on promoting electrification regardless of customer location (rural, urban, peri-urban) and the type of customers (commercial or social). It distinguishes between Expansion Areas (AEPs) and Subsidized Expansion Areas (AES). Building off-grid systems is and remains the responsibility of FUNAE. Once a system is installed, FUNAE will transfer it to EDM for operations. EDM may in turn outsource to private operators or communities. FUNAE projects will, besides other sources, be financed by an Electrification Account without the

obligation to reimburse. FUNAE and EDM should coordinate efforts on specific projects where their areas may overlap. The lack of such coordination affected the project at various times during the past year and led to it having to change course at various occasions.

Master Plan for Electricity
In October 2018 government approved the Integrated Master Plan for electricity infrastructure (2018-2043). This plan aims at increasing the country's capacity to generate, consume and export electricity over the next 25 years. The plan (US$34 million) seeks to ensure diversification of energy sources including hydropower, natural gas and coal. $18 billion will be invested in energy generation.

Review of Electricity Law
A proposal for a new Electricity Law (to replace the 1997 law) aims to promote the efficiency of the electricity sector in accordance with internal, regional and international markets and includes, among others, encouraging participation of the private sector and redefinition of the role of FUNAE. Formal governmental approval and parliamentary consideration of the draft was placed on hold pending the October 2019 elections. A preliminary draft of the general regulations has been prepared and would be completed once the revised law is in final form and approved. There are a series of specialized regulations, rules and standards which would be required regarding items such as mini-grids, solar home systems, storage, self-generation and net-metering rules for incorporating isolated grids into the national grid. Once the decision is taken to proceed with the revision of the Electricity Law, the procedure would include generally the following steps a) Submission by MIREME to the Council of Ministers and distribution to the principal ministries (MEF, MOPRH, MITADER, MIC) for comment and harmonization and b) Approval (or not) for submission to Parliament.

The National Energy Fund (FUNAE)
The Energy Fund (*Fundo de Energia*, FUNAE) – the project's counterpart organization - is a public body subordinated to MIREME with the aim of promoting the development and use of different forms of low-cost energy and the sustainable management of energy resources. Initially setup as a fund, FUNAE today mostly implements off-grid access projects. FUNAE is slowly but surely becoming aware that full electrification of the country cannot be achieved by 2030 without the involvement of the private sector. In addition to the Electricity Law, private investments in the electricity sector are also governed by the Public-private Partnership (PPP) Law (2011).

FUNAE will be subject to new regulations following adoption of decree 41/1 in June 2018 that lays down new rules for public funds and institutes on how to operate. At the level of RERD2 implementation of the decree may have consequences on whether, or not, an operation and maintenance division can be created, as foreseen by the project document.

2.1.3 Management context

2.1.3.1 Partnership modalities

FUNAE is the government entity responsible for the intervention. The FUNAE Chief Executive Officer is designated as sponsor, responsible for achieving the results and the specific objective of the intervention. The CEO equally acts as Authorizing officer, who is responsible for authorizing and liquidating expenditure following the modalities laid

down in the project document. Co-managed procurement will be used for all works involving the appropriation of results by FUNAE after the end of the project. For co-managed acquisitions, the Mozambican legislation will be used, as it applies to acquisitions financed by the government. These specifically concern acquisitions under the following co-managed activities; 'Development of mini-grids' (6 Mio Eur), 'Implementation of Remote Monitoring Systems (360k Eur) and 'Implementation of Payment Systems' (500k Eur).

2.1.3.2 Operational modalities

Considering the expected results, the operational modalities of the project are still appropriate and have, in 2019, driven two FUNAE / RERD2 2019 priorities. At the same time the experience of 2019 indicates that the project should remain vigilant as explained below.

The partner's top priorities for 2019 were:

- study of the feasibility of a hydro plant in Nintulo, Zambezia province, and
- the undertaking of prefeasibility studies in 12 Zambezia province locations for the possible construction of solar-hybrid mini-grids. These locations were drawn from FUNAE's project pipeline.

A proposal (in November 2018) to investigate more than one hydropower plant was strongly rejected by FUNAE. A "plan B" for a hydropower plant was thus ruled out in advance. The status of the Nintulo hydro project as FUNAE's single number one priority[10] also implied that any decision to invest in solar mini-grids would depend on the outcome of the mini-hydro feasibility study.

The hydro feasibility tender was launched in April 2019. In parallel the project carried out a series of pre-feasibility studies in fourteen locations. By June three locations had been judged suitable for immediate launch of full feasibility studies. The launch of feasibility studies, proposed for August were, at request of FUNAE deferred to December 2019 / January 2020, pending the outcome of the above hydro study.

The hydro plant feasibility study[11], completed end October, then revealed an unexpectedly high potential of 11,2 Megawatt, with a particularly attractive 'Levelized Cost of Energy' (LCOE). The projected investment cost of 25.9 Mio$ however was more than three times the RERD2 budget for mini-grid investments (6 Mio). As such funding the project was beyond the capacity of the project[12].

This experience underlines the dependency of the project on the strategy of the partner and suggests that the project should remain vigilant in order to avoid further similar types of delays.

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[10] The FUNAE position has been that if the Nintulo hydro plant would have absorbed the whole of the project's investment budget of 6 Mio Euro, there would have been zero investment in solar mini-grids.

[11] Contrato N°. MOZ 183 'Feasibility Study for a small hydro power plant based mini-grid in Nintulo, Gurué district in the Province of Zambezia, Mozambique', 160pp. (also available in Portuguese).

[12] It was also concluded that it was too early to establish that project funds could be used for (future) co-financing schemes, pending a number of necessary next steps to prepare this very attractive project for private investment. The government did ask the project however to take the first (three) next steps in 2020.

2.2 Performance outcome

2.2.1 Progress of indicators

Monitoring matrix extracted from the Technical and Financial File.

Outcome: Access to energy in rural areas is increased by investments in renewable energy and in support mechanisms to ensure sustainability.					
Indicators	**Baseline value**	**Value[13] year N-1**	**Value year N**	**Target year N**	**End Target**
Access to electricity in rural areas	5,97% of rural population (Global Tracking framework)	na	na	na	7,97% of rural population of Zambezia province

2.2.2 Analysis of progress made

The first year of the project was largely devoted to studies of possible locations for mini-grids. After SC decisions to invest in 4 sites (December 2019), studies in other locations[14] will certainly - have to - continue in 2020. The logic of the project and in particular the (a) stringent selection criteria for sites and (b) the importance of proper sizing of mini-grids forces the project to invest in studies, which logically take the necessary time. Taking this into account, it is clear that the project, so far, did not impact on the above-mentioned indicator of energy access. In addition, it has, for mainly two reasons, been decided that the project not venture into setting up costly and time-consuming research similar to the *SE4ALL Global Tracking Framework* study from which the indicator was drawn. The first argument was the need to avoid an overkill of studies due to the considerable number of research already necessary (site screening and pre-feasibility studies). Secondly the Mozambican Energy Ministry and the National Institute of Statistics are in partnership with the Norwegian Water Resources and Energy Directorate (NVE) working on improving analytical capacity in the energy sector. Work is ongoing on the undertaking of a pilot survey on access to energy in Mozambique. In this context, it is also noted that this initiative has serious doubts as to whether a study of all five tiers of access to energy is possible and has suggested that only research into the first two tiers is feasible. The project is in contact with this initiative[15] and it was decided not to duplicate efforts in this field. Verification of the above indicator will therefore continue to rely mainly on secondary sources.

2.2.3 Potential Impact

The potential impact of the project remains significant, not only because of the mini-grids that will be constructed, but also because of the medium-term prospects for the realization of a grid connected hydroelectric power plant of approximately 11.2 MW, for which the dossier continuous to be prepared by the project.

[13] These 3 value columns are maintained throughout this report even though values have not yet been assessed or projected. The quoted baseline and end target values are from the TFF.

[14] Possibly even in other provinces, as requested by the partner.

[15] Three meetings with the Norwegian consultants took place in the past year.

2.3 Performance output 1 Mini-grids provide reliable and adequate energy service

2.3.1 Progress of indicators

Monitoring matrices extracted from the TFF.

Output 1: Mini-grids provide reliable and adequate energy service					
Indicators	**Baseline value** (from TFF)	**Value year N-1 2019**	**Value year N 2020**	**Target year N 2021**	**End Target**
Multi-tier framework (World Bank)	5,97% of rural population (Global Tracking framework)	n/a	-	-	7,97% of rural population of Zambezia province
Reviewed, revised and updated studies	13 existing studies on PV and hydro	1	-	-	1 to 3 studies revised and updated
Awareness and stakeholder consultations	0 campaigns	0.5[16]	-	-	1 to 3 awareness campaigns on sites
Mini-grid developed with productive uses of energy	3 large existing hydro mini grids (Sembezia, Murora, Majua) and 3 large solar mini grids	0	-	-	1 to 3 additional large hydro mini-grids
Publication	0 publications	0	-	-	Minimum one publication

2.3.2 Progress of main activities

Progress of main activities [17]	**Progress:**			
	A	B	C	D
1 Review and update of existing feasibility and baseline studies and site selection in view of productive uses of energy (socio economic surveys)		X		
2 Awareness and stakeholder consultations for each site including the private sector		X		
3 Mini-grid development with productive uses of energy		X		
4 Result dissemination		X		

2.3.3 Analysis of progress made

In the first full year of the project, work was primarily guided by FUNAE's project pipeline, commonly referred to as the '*carteira de projectos*'. This pipeline exists since a number of years and was not established on the basis of specific - selection – criteria, and certainly not those mentioned in the RERD2 project document (i.a. - productive use of electricity and - innovative business models involving the private sector in ownership and / or management). On the contrary FUNAE is considered to be fulfilling a social role and is expected to bring electricity to - often - isolated rural regions where investment in electricity generation is unattractive for EDM and private operators. An area's economic potential is thus, as opposed to the project's criteria, not a criterium for inclusion in the

[16] We mark 0.5 because important consultations took place in Nintulo but we cannot pretend it was a full campaign.

[17] A: The activities are ahead of schedule
B The activities are on schedule
C The activities are delayed, corrective measures are required.
D The activities are seriously delayed (more than 6 months). Substantial corrective measures are required.

FUNAE's pipeline. Whilst FUNAE, during the course of the year, has started to understand and accept the project's selection criteria it continues to present its project pipeline as the prime entry point for RERD2 to 'choose' from. With this in mind it was not surprising that this discrepancy in - selection - criteria resulted in only 20% of the sites visited studied being retained for - potential – project investment.

Map of 15 of the 20 sites studied in 2019

This however does not mean that 80% of the work did not contribute to the expected output. Starting from the FUNAE project pipeline has also led to the identification, and technical design, of an extremely attractive hydroelectric power plant. It is likely that in the medium term this project work will significantly contribute to electricity supply in the north of Mozambique through a grid-connected power plant realized via a co-financing partnership between government, development agencies/banks and the private sector. Enabel is now in a unique position to play a proactive role in the realization of this project. First year's work on hydro and solar mini-grids is described in a bit more detail below.

The area of Nintulo in Zambezia province was top of FUNAE's (read government's) list for the development of a small hydro power plant. A feasibility study was thus undertaken, investigating 5 electrification options for 8 settlements. In parallel four already developed hydro plants were equally studied by the project to understand the operational mechanisms of power generation, distribution and sales. As a rule, all 2019 field missions took the opportunity to visit isolated solar installations developed under the first phase project RERD1, be they at administrative posts, schools, health posts or water pumping stations. The resulting reviews increased the project's knowledge on the hydro energy potential in the centre-north of Mozambique and the impact of the first phase of the project (RERD1).

The Nintulo feasibility study indicated a '*Grid connected small hydro plant*', as the best option out of five electrification options studied. The capacity calculated of 11,2 MW, turned out to be eighteen times higher than indicated in earlier FUNAE studies[18]. The projected cost of this 11.2 MW hydro power plant is some 25.9 Million USD. This is more than twice the RERD2 budget and more than 3 times the amount that RERD2 budgeted for investments in mini-grids.

As this hydropower plant exceeds the financial possibilities of the project (and arguably the mandate or technical competence of FUNAE) the December 2019 steering committee recommended the creation of a working group composed of MIREME/EDM/FUNAE to carry the project forward. The steering committee equally requested Enabel to accompany this process.

Concerning follow up steps the below needs to be undertaken and is being planned:

[18] The feasibility study conducted during RERD1 indicated 108 kW so this is what FUNAE expected. During the first two field visits the Enabel ITAs identified a new possible intake also thanks to a desk-study on a NASA digital elevation model (DEM) of the Nintulo area. Together with FUNAE, a power of 620 kW was then estimated for an off-grid plant which turned out be the same as ENCO's study for the off-grid option.

- Continue data collection of daily water flow and rainfall during 2 years.
  This entailed among others that the project adapts the originally constructed measuring weir so as to be able to measure 5m3/sec flows during the rainy seasons[19], purchase and installation of a rain meter in the area (ongoing) and payments of compensation to local responsible(s) for data collection.
- Undertake a power evacuation study and a feasibility study of grid connection lines (these two studies are foreseen for 2020 and can possibly be combined), and
- Final design including a review of the 2019 feasibility study after conclusion of a period of two years of data collection.


Community consultation in Nintulo

It's worth already mentioning that the local Nintulo community was involved from the earliest stages as described further below.

We also mention a number of project visits to the rehabilitation works of the Majaua hydropower plant that after the disastrous floods of 2015 were co-financed by the EU and the first phase of the RERD project (the Belgian contribution amounted to 462,049 euros).

As to solar mini-grids a total of 19 locations benefitted from pre-feasibility studies jointly carried out by FUNAE (Maputo and delegation) and Enabel staff. Results were documented in respective mission reports.


Energy needs assessment survey

For the first investment cycle, the steering committee adopted the project's recommendations and decided for the development of 5 PV mini-grids in the following locations: Naburi, Alto Maganha and Namanla, (all coastal locations in Pebane district located) and two inland locations i.e. Alto Benfica in Mocuba District and Mugulama in Ilé District. It was also decided to proceed with full feasibility studies in the three coastal locations whereas the two inland locations would proceed with the launching of 'Engineering, Procurement and Construction' tenders (EPD), based on technical specifications to be developed by FUNAE and Enabel engineers.

Days after the steering committee FUNAE was informed that Naburi had just been included EDM's project pipeline and, as such, was not anymore available for development by FUNAE / RERD2.

[19] The weir originally constructed could measure up to 3.5m3/sec.

As evident from the above the project, in this first year, mainly studied sites in preparation of concrete investment decisions in mini-grids. In the absence of these decisions' stakeholder consultations of a respectable size[20] have consequently been few and essentially limited to Nintulo. In Nintulo the project collaborated closely with key community representatives and explained the different stages of the hydro project from the study phase(s) to possible concrete project implementation. The feasibility study in Nintulo required important preparatory work to be carried out by the community, thus creating the conditions for the undertaking of the feasibility study. This implied: a) the rehabilitation of an 8 km access road, b) repair and construction of four (4) small bridges, c) construction of a 21-meter-wide measuring weir and d) bush and undergrowth clearance to enable topographical work with the help of a drone - aerial – survey. The high intensity of manual labor in these works required the involvement of some sixty men and women from different villages. Daily water flow measurements at the measuring weir are since August 2019 recorded by a local agent who transmits the data to FUNAE / project staff with the help of his mobile phone provided by the project.

Topographical survey for the hydroelectric plant

In view of concrete location selection for mini-grids a preliminary mapping of NGOs active in Zambezia province was undertaken. The project also started with the inventory of vocational training institutes in Zambezia as far as relevant for further project activities. This work is undertaken in cooperation with the Zambezia Provincial Education Service. In the meantime, the undertaking of the energy needs assessment in the 8 communities in the Nintulo area provided a good opportunity to involve 6 students from the vocational training Institute "*Centro Polivalente Leão Dehon, Gurué*" (that also administers courses on electricity) as enumerators. In view of anticipated investments in mini-grids and the importance of possible anchor loads and / or private sector involvement in mini-grid management, contacts were equally established with a few large Zambezia based companies in the agricultural, forestry and telecommunication sector.

Given the first year of project activity there are no activities or results to be reported on result dissemination.

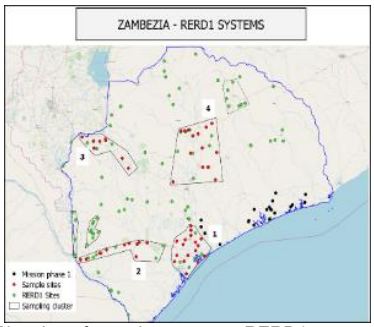
[20] Within the framework of some 20 (pre)feasibility studies, hundreds of individual and small group interviews were held, but these are not considered here as 'stake holder consultations'

2.4 Performance output 2: Technical and financial sustainability of existing systems is improved

2.4.1 Progress of indicators

Monitoring matrix extracted from the TFF.

Output 2: Technical and financial sustainability of existing systems is improved					
Indicators	**Baseline value** (from TFF)	**Value year N-1 2019**	**Value year N 2020**	**Target year N 2021**	**End Target**
Revenues from the systems	Fee collection at 50%	Zambezia Survey on RERD1 systems indicate 0%[21]	-	-	Fee collection raised to 80%
Percentage of systems working	Working systems: 50%	Zambezia Survey on RERD1 indicates 61% working[21]	-	-	80% of working systems
GIS implemented beyond a static database and used for planning and asset management purpose	GIS currently not used = 0%	0%	-	-	GIS interconnected with other databases and used for planning purpose 100%
The existing maintenance strategy for PV is implemented	PV maintenance strategy implemented at 25%	25%	-	-	PV maintenance strategy implemented at 80%
Level of functionality of maintenance unit	Half functional 50%	50%	-	-	Maintenance unit strengthened 90%
Degree of connectivity / sharing GIS database with other departments	0% sharing with other departments	0%	-	-	GIS and data base connected and used for asset management, site identification and planning
Number of installed remote monitoring systems and technologies	8 systems installed, 3 different technologies	20	-	-	Number of systems installed One technology
Number of meters and pre-payment systems purchased and operational	1000*) meters and pré-payment systems purchased but not operational yet 0% of systems operational	119 are operational (against 726 purchased)	-		Pre-payment (for domestic users) and meters systematic on the mini-grids financed by RERD2 100% of mini-grids equipped with pre-payment systems
*) Actually, a total of 726 meters (incl. 3 payment system computers) were purchased in October 2016. All meters were intended for use in 3 hydro mini-grids funded by RERD1. The details are as follows: 60 meters + 1 payment system computer was installed to administer Sembezeia & 58 meters + 1 payment system computer were installed to administer Muoha. 605 meters + 1 payment system computer were sent to Majaua and installation is imminent after inauguration in Q2 2020.					



Planning of sample survey on RERD1 systems

[21] Zambezia survey indicates that 0% of public institutions pay and that 61% of systems working, 23% is not working and 16% is

2.4.2 Progress of main activities

Progress of main activities [22]	Progress:			
	A	B	C	D
1 Planning, operation and maintenance processes are strengthened			X	
2 Strengthening of Information systems		X		
3 Remote metering and monitoring systems allow for more efficient maintenance of the systems.		X		
4 Implementation of payment systems (metering, fee collection, pre-payment)		X		

2.4.3 Analysis of progress made

In the context of improving sustainability of systems the project worked with the operations and maintenance unit, the solar and hydro divisions, the Zambezia delegation, the ICT unit and the administration and finance division on matters such as monitoring of operational status of systems, the status of revenue collection, strengthening of information systems, methods for work planning and the functioning (and possible improvement) of inventories and stock management.

Surveying operational status of systems with tablets

A survey, undertaken together with FUNAE's Zambezia delegation, collected data on 377, RERD1 funded, solar systems. The survey, with the help of tablets, not only allowed to generate baseline values[23] but also to gain experience with digital data collection techniques. The survey also allowed for the identification of - types of - errors in the FUNAE geographical database and ways in which new (open source) software and innovative data collection techniques can be deployed in future monitoring and maintenance planning. The Portuguese language version of the report[24] was distributed among FUNAE staff and, apart from providing interesting insights, serves as an excellent starting point for the formulation of a strategy / workplan for the FUNAE GIS unit. Developing information exchange procedures and workflows, for example, are clearly identified needs and work is well underway.

With a view of improving data collection and processing techniques as well as technical mini-grid design the project completed an inventory of existing IT equipment and software followed by a detailed needs assessment. New hard- and software was

problematic.

[22] A: The activities are ahead of schedule
B The activities are on schedule
C The activities are delayed, corrective measures are required.
D The activities are seriously delayed (more than 6 months). Substantial corrective measures are required.

[23] The report reveals 61.7% of the systems as functional - against 50% as indicated in the project document, 22.6% out of service and 15.7% problematic. Approximately 70 % of the breakdowns are due to problems with the batteries (38%) and/or the inverter (32%). None of the systems users (0%) pay their monthly due to FUNAE. It is reported however that districts sometimes pay in lieu of 'their' social infrastructures, such as health clinics. An inhouse study on revenue collection undertaken by the administration and finance has started.

[24] "Relatório da missão 024 - Avaliação e monitoria dos sistemas RERD1 na Zambézia", 38pp,. December 2019, Prepared by the project's Junior Expert in digital data management.

subsequently acquired and software installed[25]. Open source software alternatives were equally investigated[26] and tests carried out on Photo Voltaic system design software[27]. Identification of miscellaneous software needs for distribution line design (MV and LV), photogrammetry, structural calculations, architectural BIM CAD software remain to be undertaken.

Work with the GIS unit has so far mainly taken place with the help of the junior expert (JE) digital data management.

As to the implementation of remote monitoring systems interviews confirmed that information on system status (working, damaged, stolen, …) is currently only obtained via a) local clients directly contacting the call center (the so-called green line) at HQ Maputo, b) local clients contacting the provincial FUNAE delegation or a FUNAE technician, or c) FUNAE technicians registering the system status during field missions. It was clearly confirmed that there is no systematic feedback between the maintenance unit and the GIS team.

Investigations also revealed that remote monitoring (Victron, EMS, Belgian Campus), have clearly not worked to date. This is notably explained by a lack of budget for mobile credit / communication. During the Zambezia survey (mentioned above) attempts were made to read out the systems' SD cards. Quite a lot of SD cards were no longer readable, exact reasons of which remained unknown. Research on the 'Belgian Campus systems' revealed that since the first RERD1 trials the technology had not further evolved. Systems do not answer key questions such energy consumption and functionality of the solar panels. Discussions with the solar and maintenance divisions have led to the conclusion that it makes little sense to continue work on remote monitoring systems for isolated / individual solar installations[28]. Further work should rather concentrate on remote monitoring and payment systems on existing RERD1 funded hydro mini-grids (Muoha, Sembezeia, Majaua) and to be developed RERD2 solar mini-grids.

Monitoring systems were studied in a few FUNAE hydro power plants and solar mini-grids in the provinces of Manica and Niassa. The RERD1 funded hydro plants (Sembezeia and Muoha) are monitored manually[29]. The collected data are supposed to be transcribed in the delegation and transmitted to Maputo as aggregated data. The solar plants (Muembe, Mavago and Mecula) have digital monitoring systems but they are not connected to internet, so no plant- or mini-grid remote monitoring system exist today. Data are stored in a local computer in Excel or csv files and can be copied on an external support (mainly a USB pen drive) and send to the FUNAE HQ in Maputo.

Currently the solar and hydro divisions in Maputo seem to be more interested in aggregated data on electricity production (because they need to inform the research and

[25] * one powerful desktop PC (HW) for (drone) imagery analysis and 3D applications, * Homer Pro (SW), * Arquimedes (SW), * ArcEditor (HW) * 2 Drones and accessories (HW), * 6 Tablets (HW) for field data collection, * PV-Sol premium (SW), * 14 Garmin GPS (HW) and * ARCGIS online (SW).

[26] Such as LibreCAD, QCAD, ZWCAD, BricsCAD, Draftsight, all interesting alternatives to the commercial package AUTOCAD.

[27] PVSOL premium, Solarius-PV, ETAP, PVsyst, EasySol, BlueSol Design

[28] This is not only for technical reasons. Discussions are also ongoing suggesting that FUNAE transfers ownership of solar installations to sectoral ministries (health, education, ..) and / or regional governments (provinces or districts).

[29] Every 2 hours the technicians fill a paper maintenance sheet that includes data on: turbine operational level, pressure in the penstock, produced power, voltage and currents of the generator and the transmission line (three-phase MV), power consumption and temperature of the main parts of the plant.

planning) than in an analysis on a) the load curve evolution, b) efficiency and c) correct operation of the systems.

The project researched the evolution of electricity consumption and the associated pre-payment, metering and fee collection systems in 4 FUNAE mini-grids i.e. in Muhoa (Manica province) and Mecula, Mavago and Muembe (Niassa province)[30]. Pre-payment systems were also studied in the two RERD1 funded hydro based mini-grids of Sembezeia and Muoha and the government funded mini-hydro of Rotanda[31].

A few observations regarding the pre-payment meters are given below.

The most widely used brand (and in FUNAE the only one) is "Conlog". The prepaid meters[32] are installed in the consumers' premises (houses, shops, …) and are standalone, not connected to a centralized monitoring system. FUNAE uses one computer per mini-grid, with a second computer as backup, with specific software to register the payments. In Manica there is only one computer, with a second backup, for 5 mini-grids. The system mainly works manually. There is no significant automation and there are no remote connections. The full procedure is described in the project report[33]. The base station registers all the transactions, but it cannot communicate with the FUNAE HQ or the Delegation office because it is not connected to the internet or any other communication system. All the information is stored on local hard discs and can be consulted only in the field. FUNAE HQ receives regular reports on the monthly amount of energy sold, but no information is broken down by customer. In other words, any analysis at FUNAE's HQ only considers aggregated data.

The above referred - need for - analysis of the evolution of electricity consumption has been object of lengthy technical discussions with FUNAE staff as its draws attention to fundamental aspects of mini-grid design, and thus future work for the project i.e. projection of a) evolution of load and consumption, b) required mini-grid size (as related to consumption) and thus c) the total cost of the mini-grid.

Lastly, together with the O&M unit, exploratory discussions have taken place with two main existing telecom operators in Mozambique (Vodacom and Movitel) to explore how their services could be used in future (not necessarily only RERD2 funded) Pay-As-You-Go (PAYG) systems.

Parallel to the above a collaboration started with the company that owns FUNAE's current energy sales system ('Prism') to investigate possibilities of either managing a mobile money service in house (with a server owned by FUNAE) or outsource the services to Prism. This will be further explored in 2020.

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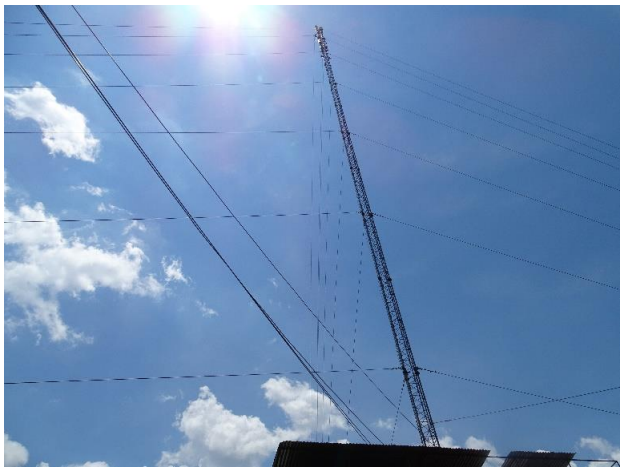
30 Ref. "*Análise de consumo das mini-redes existentes geridas pelo FUNAE*" (Consumption analysis of existing mini-grids managed by FUNAE), 56pp, December 2019, prepared by the project energy engineer.

31 These missions equally assessed damages inflicted by the cyclone Idai.

32 When a customer buys some credit, it is allowed to consume an amount of energy corresponding to the value of the credit. When the customer terminates the credit the meter no longer allows to consume energy.

33 Ref. "Análise de consumo das mini-redes existentes geridas pelo FUNAE" (Consumption analysis of existing mini-grids managed by FUNAE), 56pp, December 2019, prepared by the project energy engineer.

Lastly it needs mention that remote metering in, and monitoring of, mini-grids are in their early infancy in Mozambique. The project therefore intends to be inspired by experiences in the southern and eastern Africa region through exchange visits in 2020.



2.5 Performance output 3: The capacity of FUNAE in planning and project management is improved:

2.5.1 Progress of indicators

Monitoring matrix extracted from the TFF.

Output 3: The capacity of FUNAE in planning and project management is improved					
Indicators	**Baseline value** (from TFF)	**Value year N-1 2019**	**Value year N 2020**	**Target year N 2021**	**End Target**
Capacity building plan	No plan for capacity building	0	-	-	Agreed plan for capacity building
Quality of tender documents	n/a	n/a	-	-	Na
Quality of socio-economic survey methodology	No standard method for socio-economic surveys	No standard method	-	-	Standard template for surveys
Processes and working procedures	Not updated	-	-	-	Clear processes and tools for project management
Planning process with DPREME	unclear	unclear	-	-	Clear working processes and structure; technicians better trained
Quality of working procedures	Incomplete procedures	-	-	-	Working procedures are operational

2.5.2 Progress of main activities

Progress of main activities [34]	Progress:			
	A	B	C	D
1 Project management is improved at FUNAE central level		X		
2 Capacity of selected delegations of FUNAE are strengthened in sector planning and coordination			X	
3 Technical assistance		X		
4 Surveys, field trips workshops and seminars, study tours		X		

2.5.3 Analysis of progress made

Analysis of documents made available by the Human Resources division led to the conclusion that, contrary to what was stated earlier, there is no real FUNAE capacity building programme, but rather a - very extensive - list of training courses/opportunities, complete with the name of the training institutes, the duration, the costs, etc. A proposal to launch an open call for tenders to draw up a capacity building programme was considered premature on the grounds that FUNAE was in the final months of its five-year strategy. [35] A proposal with an accelerated methodology for the assessment of training needs was then proposed to the HR division. To date, no concrete further feedback was obtained.

Through observations and discussions revealing widespread manual data processing, it became clear that there is a need for training in advanced data analysis with MS Excel. A market survey in Maputo led to the identification of various training possibilities. It was agreed that the Human Resources division would quantify the need for/interest in such courses prior to implementation. The project is - still - awaiting feedback from the HR division.

An important concept in the project is productive use of electricity. It is among the selection criteria for project investments in mini-grids. In response to a need expressed by FUNAE a document on this concept was drawn up, presented and discussed. The document i.a. explains the importance of productive use for the financial and technical sustainability of RE mini-grids. The exercise clearly raised awareness on the subject within FUNAE.

Working with Research and Planning Division (DEP) staff allowed the team to better understand DEP's role in attracting project funding. In this context assistance was provided to DEP in project preparation and logical framework analysis.[36]

Chapter 2.4.3 referred to the importance of load development and evolution of electricity consumption for the design of (optimally sized) mini grids and its importance to attract private investors. The results of the study in 4 mini-grids (Muoha, Muembe, Mavago and

[34] A: The activities are ahead of schedule
B The activities are on schedule
C The activities are delayed, corrective measures are required.
D The activities are seriously delayed (more than 6 months). Substantial corrective measures are required.

[35] At the end of the year it appeared that this position, shared by senior staff, had not been communicated with the CEO who did not seem to be of the same opinion.

[36] In this same context DEP/FUNAE was assisted in an investigation, and possibly acquiring containerized solutions for, small mini-grids.

Mecula)[37] were disseminated and discussed with the most relevant FUNAE technicians from DEP, DMH, DSSE and O&M drawing particular attention to the need to define standards for estimation of project loads, and the importance of avoiding (observed) oversizing of mini-grids.

With a view of raising awareness, in FUNAE as well as MIREME, on recent insights into key aspects of rural electrification such as * productive use of energy, * techno-financial benchmarks and * business models, recent international literature was processed into an easy-to-use presentation[38].

An investigation started on the use of satellite imagery and geospatial tools for energy planning. This work includes the use of GIS software for identification of river catchment areas. Interestingly a good example of such work is included in the Nintulo hydro plant feasibility study that contains a map of a Digital Elevation Model of the Lotiwa river basin, elaborated via GIS software.

Participation of Maputo and Zambezia based staff - of DPREME and FUNAE - in numerous field missions, be they hydro (ENCO, Enabel) or solar (Enabel) mini-grid oriented allowed for capacity building of counterpart staff. These missions included the undertaking of socio-economic research, energy needs assessments, detailed topographical, geological and hydrological work as well as the development and use of innovative digital data collection techniques (tablets). The topographical work mentioned above involved the use of a project acquired drone[39]. FUNAE staff training in piloting of the drones will continue in 2020. Future training will equally include topographical site modelling with photogrammetry. This is notably relevant for DMH staff. Apart intensive participation of DEP staff in the socio-economic study / energy needs assessment in Nintulo and the 19 pre-feasibility studies, the project engineer has started collaboration with DEP on the development of a FUNAE methodology for such studies. Also in the context of this work the drone has started to be used for identifying settlement patterns, estimating numbers of households, existing infrastructure, etc.


On the job training in operating the drone

The Quelimane based project engineer started analysis of the important - existing - management and support processes at DPREME and FUNAE. The analyses mainly focus on planning, reporting, communication, monitoring and evaluation. A number of - procedural - shortcomings in information exchange between the FUNAE delegations

[37] Cf. "Análise de consumo das mini-redes existentes geridas pelo FUNAE" (Consumption analysis of existing mini-grids managed by FUNAE), 56pp, December 2019, prepared by the project energy engineer.

[38] The resulting document was discussed internally in Enabel and is being re-edited prior to presentation to FUNAE and MIREME.

[39] On request of FUNAE a second drone was acquired which at the time of drafting this report was prepared for transfer to FUNAE.

(notably the one in Zambezia) and Maputo HQ were also dealt with in the chapter 2.4.3.[40] Project participation in a CB-MIREME organized workshop in Quelimane including a SWOT analysis, also allowed for a better understanding of existing constraints at the provincial level.[41]

As to the international technical assistance we limit ourselves to the following observations. The RERD2 Enabel technical team[42] is essentially embedded in FUNAE. The Quelimane based capacity building expert working 50% for RERD2 and 50% for the CB-MIREME project is based in the DPREME office in Quelimane. The March 2019 steering committee encouraged the project to benefit from the possibility provided by the Enabel headquarters to contract additional junior experts. A proposal for a second junior expert[43] was drafted and accepted at HQ in Q3. Three excellent juniors were preselected. Unfortunately, one withdrew his candidacy just before and two just after their interview. The project will submit its next request in February 2020.

In its first year the project undertook well over thirty field missions, the results of which have shaped the strategy for the coming, remaining, three and a half years of the project. A start-up / baseline workshop, bringing together personnel from both Enabel and FUNAE, was successfully held in March 2019. It aimed to update the project's logical framework, the M&E matrix and to contribute to the baseline study

2.6 Transversal Themes

2.6.1 Gender

In order to prepare for future community consultations, the project undertook a desk study of international literature on the impact of mini-grids on livelihoods of rural folk, specifically focusing on identification of differential gender impacts of electricity access. The reviewed studies were from nine countries, eight in Africa and one Asia. Most of these studies only occasionally mention the gender issue. Only one study specifically focused on differential gender aspects comparing experiences from Ghana, Tanzania and Myanmar. Without going into too much detail - there are subtleties - it suffices to state here that in general, women benefit less than men. This is thus flagged as a point of attention in the project's future work.

2.6.2 Environment

Environmental impact studies are mandatory by law.

As to the hydro component of the project; the terms of reference of the Nintulo hydro feasibility study[44] included collection and systematization of the necessary information for the preparation of the hydro project's environmental impact study[45] and the undertaking

[40] cf. "Relatório da missão 024 - Avaliação e monitoria dos sistemas RERD1 na Zambézia", 38pp,. December 2019, Prepared by the project's Junior Expert in digital data management.

[41] Maybe worth mentioning also is the RERD2 project support to a CB-MIREME initiative for the installation of a 15kWp solar power plant at the DPREME office in Quelimane intended to provide power to a set of air conditioners and as such improve working conditions in the DPREME office.

[42] Intervention manager (100%), energy engineer (100%), Capacity development and change management expert (50%) and a Junior Expert digital data management (50%)

[43] for digital surveying and promotion of productive use via introduction of new technologies in collaboration with the private sector

[44] The ENCO team included an Environmental Engineer / Hydrologist

[45] In accordance with Decree 45/2004 of 29 September.


Nintulo village leader (center) working with his fellow villagers on the water flow measuring weir

of a preliminary environmental assessment. The final report lists the positive and negative environmental impacts and mitigation measures of the project. The report indicated that the Hydropower Plant will not affect used lands and irrigations while the distribution grid will run along the entire villages and existing infrastructure. The land uptake concerns will have minimal negative impact. No deforestation, relocation of facilities or re-settlements should be required to set the infrastructure. Furthermore, it will not entail any changes in community's habits, being a not used land identified together with the local authorities. The location of the plant as well as the construction of distribution grid do not require deforestation and consequent compensation. Since the land where the plant is designed is completely free and flat, no tree will be cut and no sizeable amount of soil will be moved: the soil preparation will simply consist in removing wild grass and levelling minimum differences in height.

As to the solar component of the project the terms of reference for feasibility studies (about to take off) include the undertaking of an environmental impact study even if environmental impacts are normally significantly lower than hydro projects.


All villagers bought a bicycle with the proceeds of the preparatory works for the hydro project

2.6.3 Digitalization

Work related to digitalization is mainly described in chapter 2.4.3. of this report.

Since March 2019, the project benefits from the services of a Junior Expert in digital data management. His skills are highly relevant for the project components of 'Strengthening of information systems', 'Implementation of remote monitoring systems', 'Implementation of [mobile] payment systems' and 'capacity building'. The Junior Expert not only contributes to innovative digital data collection in the field, but is also a driving force in improving the functioning of FUNAE's GIS unit and the implementation of measures to pave the way for a future link between the current stand-alone databases in the organisation such as those of the GIS - and the Operations and Maintenance Unit.

Both the project Energy Engineer and the Junior Expert are active and appreciated members of Enabel's 'Digital Believers' group. The objective of this group is to be a community of practice of colleagues interested in digitalization/digital for development and to co-create the operational approach of Enabel in Digital 4 Development.

2.7 Risk management

Risk Identification			Risk analysis			Risk Treatment			Follow-up of risks	
Description of Risk	Period of identification	Risk category	Probability	Potential Impact	Total	Action(s)	Resp.	Deadline	Progress	Status
Instability due to presidential elections in 2019 leads to insecurity in the provinces, which would hamper the implementation of activities and project quality.	TFF	OPS	Medium	Medium	Medium Risk	The geographical concentration will be adapted to the security situation. The focus will be on two provinces.	FUNAE	Nov19	Four provinces were initially chosen: Zambezia, Niassa, Nampula and Manica. The Steering committee of May 2018 assigned Zambezia as the project only target province.	Closed
						Close monitoring of events in provinces in the run-up to the elections	RR, PMT	throughout the project period	-	
Difficult access to sites due to natural occurrences (heavy rains) which block roads	TFF	OPS	Medium	Medium	Medium Risk	In the planning of activities, consider the period from December – February as months not suitable for works/rehabilitations but for other activities (procurement/acquisition of goods, trainings, etc.)	PMT	throughout the project period	Late arrival of annual rains have enabled 3 important field missions in Zambezia end 2018. Heavy rains in Jan. 2020 (and likely February) indeed handicap access to the Nintulo hydro site and newly identified soar sites.	In progress
Slow pace of intervention due to procurement procedures	TFF	OPS	Medium	Medium	Medium Risk	Optimized implementation modalities based on lessons learned from RERD1	Enabel / FUNAE	throughout project period	The steering committee of December 2019 adopted a RERD2 proposal to transfer funds to a co-management budget line to a regie line to speed up (hydro and solar) feasibility studies.	In progress
						Projects will build on existing studies developed by RERD1	Enabel /FUNAE	throughout project period	Done sofar but because of choices made the number of locations sofar was liited to only one.	
						All travel, study tours and surveys in Enabel management mode.	Enabel	throughout project period	Done so far and will continue.	

						Vehicles purchased on RERD1 must be made available to the project staff when needed	Enabel	throughout project period	Available	
						Within the IMU: Procurement expert for the program	Enabel	throughout project period	Available	
						Within the IMU: Support from international RAFi	Enabel	throughout project period	Available	
Resistance to change in FUNAE	TFF	OPS	Medium	Medium	Medium Risk	Full-time long term technical assistance with adequate profile regarding capacity reinforcement and change management (see budget line A03 05)	Enabel	throughout project period	Project recruited 2 ITAs in October 2018 in addition to the one already based in Zambezia province since july 2018.	In progress (the baseline workshop suggested to delete this statement on resistance from this risk management table)
						Budget for activities and support devoted to sustain change processes (see Z03 04 Missions cost)	Enable	throughout project period	Aailable	
						Involve FUNAE staff on change processes and build on the high degree of openness showed by the management of FUNAE.	Enabel	throughout project period	-	
Low private sector interest for operating mini-grids	TFF	DEV	High	High	Very High Risk	The intervention works on several axes, including with other actors than the private sector.	Enabe l /FUNAE	throughout project period	Done also under (political) pressure from the partner. Lack of advances in the legal domain are likely to increase those pressures.	In progress
						Create enabling conditions for private sector interest in mini-grids, including receptiveness of FUNAE (activity R1.A2 , R3.A4)	Enabel / FUNAE	throughout project period	A fourth result with a budget line was included in the project log-frame facilitating FUNAE's influence on the legal reform.	
						Start with outsourcing only operation and maintenance	Enabe l /FUNAE	throughout project period	-	
						Make a thorough economic feasibility study and attract private sector with interesting business models	Enabel / FUNAE	throughout project period	Done in as far as hydro is concerned. About to be undertaken for solar sites.	
						Involve private sector from the start and build a sustainable model for public-private	Enabel / FUNAE	throughout project period	-	

						partnership for the operation of grids.				
						Envisage other management modes than the private sector	Enabel / FUNAE	throughout project period	-	
						Small mini-grids can be clustered for operation & maintenance to form an attractive package	Enabel / FUNAE	throughout project period	Clustering of minigrids has effectively been proposed to FUNAE (to date one inland / agriculture area cluster and one coastal / fishing area cluster.	
						Make a careful selection of sites and target large sites with economic potential	Enabel / FUNAE	throughout project period	This has rigorously been done in 2019 resulting in selection of (only) 20% of the FUNAE proposed project pipeline.	
Financial sustainability of the systems is problematic	TFF	DEV	High	High	Very High Risk	Better estimation and budgeting of OM costs I Feasibility studies	Enabel / FUNAE	throughout project period	-	In progress
						Continue implementation of preventive maintenance (reducing OM Costs)	Enabel / FUNAE	throughout project period	-	
						Make a strong users awareness campaign on correct use of systems (PV) to lower OM costs (reducing OM Costs)	Enabel / FUNAE	throughout project period	A Junior expert proposal to work - among others - on this aspect - has been positively received in HQ Brussels. Unfortunately all three (excellent) candidates declined.	
						Inform the authorities on real OM costs of mini grids and advocate for government subsidies (increasing OM resources)	Enabel / FUNAE	throughout project period	Indicative (high) OM cost have been demonstrated through some field missions to selected mini-grids in the provinces of Manica and Niassa. Reports were distributed among division heads in FUNAE.	

						Propose a well-studied adapted tariff structure (increasing OM resources)	Enabel / FUNAE	throughout project period	-	
						Increase revenue collection by generalizing use of pre-payment systems (R2 A3) (increasing OM resources)	Enabel / FUNAE	throughout project period	-	
						Involve local authorities at the planning stage and define their role in the project to increase willingness to pay (increasing OM resources)	Enabel / FUNAE	throughout project period	In progress a good example is described re the hydro project in Nintulo	
						Design the project in a rural development perspective that promotes economic uses of energy to increase ability to pay (thus increasing OM resources)	Enabel / FUNAE	throughout project period	Economic use is at the core of all discussions on site selection and decision and the reason why 80% of the pipeline sites were rejected	
Lack of policy and regulation for mini-grids hampers private sector interest. No operational independent regulator.	TFF	DEV	Medium	Medium	Medium Risk	Planned establishment of ARENE as independent regulator	ARENE	throughout project period	ARENE's CEO was (finally) nominated in November 2019.	In progress
						Support from CBMIREME to ARENE on regulatory functions	Enabel	throughout project period	Conducted HR consultancy for ARENE	
						Undertake seminars targeted at the private sector on regulatory issues	Enabel / FUNAE / ARENE	throughout project period	This is an activity that is being undertaken by different donor funded projects.	
High numbers of non-functioning RERD1 installations	TFF	REP	High	High	Very High Risk	Capacity building, monitoring systems and reinforcement of FUNAE Delegations (R2; R3)	Enabel / FUNAE	throughout project period	As described in this report.	In progress
Technical failure or low quality of mini-grid construction	TFF	REP	Medium	High	High Risk	Strong ITA; review of feasibility studies (R1 A1)	Enabel	As described in this report.	As described in this report.	In progress
Import taxes exemption not granted	TFF	FIN	High	Low	Medium Risk	Request (import and VAT) tax exemption for the importation of quality PV systems	Enabel	throughout project period	Is on the agenda of each Steering Committee to date. Awaiting conclusive action from government.	In progress
						Cooperation with other donors to put reduction of fiscal barriers as a priority	Enabel	throughout project period	Being done via the Energy Sector Working Group.	

						Use locally produced TUV certified PV panels	Enabel / FUNAE	throughout project period	-	
Low value for money of bids for construction contracts	TFF	FIN	High	High	Very High Risk	Publish tenders in English; publish internationally	Enabel / FUNAE	throughout project period	Sofar public tenders were in English as well as Portuguese.	In progress
						Tender in euros	Enabel	throughout project period	Tenders sofar were in Euros.	
						Split tenders for power plant and for distribution network	Enabel / FUNAE	throughout project period	Integrated as such in operational project plan.	
Establishment of capital controls on foreign currency accounts in Mozambique	TFF	FIN	Low	High	Medium Risk	Derogation to have a DB EURO account in co-management	Enabel	Throughout project period	See status	Terminated
Forced conversion of foreign currency accounts into local currency	TFF	FIN	Low	High	Medium Risk	Derogation to have a DB EURO account in co-management	Enabel	Throughout project period	See status	Terminated
Devaluation of the local currency	TFF	FIN	Medium	High	High Risk	Derogation to have a DB EURO account in co-management	Enabel	Throughout project period		In progress
Delayed refund of VAT	TFF	FIN	High	High	Very High Risk	Continue with the existing set up for VAT compensation as in RERD1	Enabel / FUNAE	Throughout project period	Is on the agenda of each Steering Committee to date. Awaiting conclusive action from government.	In progress
						After the first two years of project execution, make an assessment of VAT refund.	Enabel	Throughout project period		

3 Steering and Learning

3.1 Strategic re-orientations

In this first year of the project, FUNAE's sustainable energy atlas and the organization's project pipeline largely identified the locations that needed to be further investigated through pre-feasibility and feasibility studies.[46]

The partner's strategy regarding hydro sites to be investigated combined with the outcome of the Nintulo feasibility study (described in Chapter 2.3.3) led on the one hand to the identification of a highly attractive hydro project but at the same time excluded the realization of any other hydro mini-grid within the timeframe of the project. Work on hydro energy will, at the explicit request of government, continue but only as preparation of the dossier for the construction of the already mentioned grid connected hydro power plant of approximately 11 Megawatt. The provisional timetable for implementation indicates that this plant could be completed by 2027.

The exhaustion of the project pipeline by the end of 2019 recently led to FUNAE's request to open the project to other provinces. It is worth recalling that the project document proposes to focus geographically on a maximum of two provinces, to be chosen from Zambezia, Nampula, Niassa and Manica. However, the first steering group had chosen only one province, namely Zambezia. During the drafting of this report, the discussion with the partner on this subject had only just begun.

The stagnation in formal governmental and parliamentary approval of proposed changes to the legal framework is at odds with the innovative approach propagated by the project. An important observation made by the participants of the baseline workshop (see also Chapter 2.5.3.) was that without a solid, favorable legal framework the project would have difficulties attaining its objectives and guaranteeing sustainable impact, especially with regards to Public Private Partnerships and private sector involvement. Therefore, a fourth results area was deemed necessary: *"4. New legal framework is influenced by FUNAE"*. This fourth result area was proposed to the steering committee of 5 December and approved. The December steering committee decisions regarding this point and the final outcome of the hydro study in Nintulo provided the clarity needed to proceed with finalization of the project's baseline report.

[46] A total of twenty as indicated in chapter 2.3.3.

3.2 Recommendations

Recommendations	Actor	Deadline
On the basis of a list of RERD2 pre-selected sites decide on those that merit further studies in view of project investments in hydro-and solar mini-grids.	JLCB	Q1 2019
Start feasibility studies in 1. Naburi, 2. Alto Maganha and 3. Namanla in Pebane district and advance with EPC's in 4. Mungulama in Ile district and 5. Alto Benfica in Mocuba district.	PM	Q1 2020
Financial reinforcement of the direct management budget line R1A1 "Review and update of existing studies", to speed up the process of contracting solar feasibility studies.	PM/RERD2	Q1 2020
Include a 4th result in the project logical framework denominated "The new legal framework is influenced by FUNAE" with a budget line "R4A1 Carrying out specialized studies to strengthen the legal framework".	PM/RERD2	Q1 2020
Draft baseline report (following SC approval of addition of 4th results)	PM/RERD2	Q1 2020

3.3 Lessons Learned

The project cannot pretend, at this stage, to have generated any significant lessons learned.

Annexes

3.4 Quality criteria

1. RELEVANCE: The degree to which the intervention is in line with local and national policies and priorities as well as with the expectations of the beneficiaries		
In order to calculate the total score for this quality criterion, proceed as follows: 'At least one 'A', no 'C' or 'D' = A; Two times 'B' = B; At least one 'C', no 'D'= C; at least one 'D' = D		
Assessment RELEVANCE: total score	**A**	X
	B	
	C	
	D	
1.1 What is the present level of relevance of the intervention?		
X	**A**	Clearly still embedded in national policies and Belgian strategy, responds to aid effectiveness commitments, highly relevant to needs of target group.
	B	Still fits well in national policies and Belgian strategy (without always being explicit), reasonably compatible with aid effectiveness commitments, relevant to target group's needs.
	C	Some issues regarding consistency with national policies and Belgian strategy, aid effectiveness or relevance.
	D	Contradictions with national policies and Belgian strategy, aid efficiency commitments; relevance to needs is questionable. Major adaptations needed.
1.2 As presently designed, is the intervention logic still holding true?		
	A	Clear and well-structured intervention logic; feasible and consistent vertical logic of objectives; adequate indicators; Risks and Assumptions clearly identified and managed; exit strategy in place (if applicable).
X	**B**	Adequate intervention logic although it might need some improvements regarding hierarchy of objectives, indicators, Risk and Assumptions.
	C	Problems with intervention logic may affect performance of intervention and capacity to monitor and evaluate progress; improvements necessary.
	D	Intervention logic is faulty and requires major revision for the intervention to have a chance of success.

2. EFFICIENCY OF IMPLEMENTATION TO DATE: Degree to which the resources of the intervention (funds, expertise, time, etc.) have been converted into results in an economical way		
In order to calculate the total score for this quality criterion, proceed as follows: 'At least two 'A', no 'C' or 'D' = A; Two times 'B', no 'C' or 'D' = B; at least one 'C', no 'D'= C; at least one 'D' = D		
Assessment EFFICIENCY : total score	**A**	
	B	X
	C	
	D	
2.1 How well are inputs (financial, HR, goods & equipment) managed?		
X	**A**	All inputs are available on time and within budget.
	B	Most inputs are available in reasonable time and do not require substantial budget adjustments. However there is room for improvement.
	C	Availability and usage of inputs face problems, which need to be addressed; otherwise results may be at risk.
	D	Availability and management of inputs have serious deficiencies, which threaten the achievement of results. Substantial change is needed.

2.2 How well is the implementation of activities managed?		
	A	Activities implemented on schedule
X	**B**	Most activities are on schedule. Delays exist, but do not harm the delivery of outputs
	C	Activities are delayed. Corrections are necessary to deliver without too much delay.
	D	Serious delay. Outputs will not be delivered unless major changes in planning.
2.3 How well are outputs achieved?		
	A	All outputs have been and most likely will be delivered as scheduled with good quality contributing to outcomes as planned.
X	**B**	Output delivery is and will most likely be according to plan, but there is room for improvement in terms of quality, coverage and timing.
	C	Some output are/will be not delivered on time or with good quality. Adjustments are necessary.
	D	Quality and delivery of outputs has and most likely will have serious deficiencies. Major adjustments are needed to ensure that at least the key outputs are delivered on time.

3. EFFECTIVENESS TO DATE: Degree to which the outcome (Specific Objective) is achieved as planned at the end of year N				
In order to calculate the total score for this quality criterion, proceed as follows: 'At least one 'A', no 'C' or 'D' = A; Two times 'B' = B; At least one 'C', no 'D'= C; at least one 'D' = D				
Assessment EFFECTIVENESS: total score	**A**	**B**	**C**	**D**
		X		

3.1 As presently implemented what is the likelihood of the outcome to be achieved?		
	A	Full achievement of the outcome is likely in terms of quality and coverage. Negative effects (if any) have been mitigated.
X	**B**	Outcome will be achieved with minor limitations; negative effects (if any) have not caused much harm.
	C	Outcome will be achieved only partially among others because of negative effects to which management was not able to fully adapt. Corrective measures have to be taken to improve ability to achieve outcome.
	D	The intervention will not achieve its outcome unless major, fundamental measures are taken.
3.2 Are activities and outputs adapted (when needed), in order to achieve the outcome?		
	A	The intervention is successful in adapting its strategies / activities and outputs to changing external conditions in order to achieve the outcome. Risks and assumptions are managed in a proactive manner.
X	**B**	The intervention is relatively successful in adapting its strategies to changing external conditions in order to achieve its outcome. Risks management is rather passive.
	C	The intervention has not entirely succeeded in adapting its strategies to changing external conditions in a timely or adequate manner. Risk management has been rather static. An important change in strategies is necessary in order to ensure the intervention can achieve its outcome.
	D	The intervention has failed to respond to changing external conditions, risks were insufficiently managed. Major changes are needed to attain the outcome.

4. POTENTIAL SUSTAINABILITY: The degree of likelihood to maintain and reproduce the benefits of an intervention in the long run (beyond the implementation period of the intervention).		
In order to calculate the total score for this quality criterion, proceed as follows: At least 3 'A's, no 'C' or 'D' = A ; Maximum two 'C's, no 'D' = B; At least three 'C's, no 'D' = C ; At least one 'D' = D		
Assessment POTENTIAL SUSTAINABILITY : total score	**A**	
		X
	B	
	C	
	D	
4.1 Financial/economic viability?		
	A	Financial/economic sustainability is potentially very good: costs for services and maintenance are covered or affordable; external factors will not change that.
	B	Financial/economic sustainability is likely to be good, but problems might arise namely from changing external economic factors.
X	**C**	Problems need to be addressed regarding financial sustainability either in terms of institutional or target groups costs or changing economic context.
	D	Financial/economic sustainability is very questionable unless major changes are made.
4.2 What is the level of ownership of the intervention by target groups and will it continue after the end of external support?		
	A	The steering committee and other relevant local structures are strongly involved in all stages of implementation and are committed to continue producing and using results.
X	**B**	Implementation is based in a good part on the steering committee and other relevant local structures, which are also somewhat involved in decision-making. Likeliness of sustainability is good, but there is room for improvement.
	C	The intervention uses mainly ad-hoc arrangements and the steering committee and other relevant local structures to ensure sustainability. Continued results are not guaranteed. Corrective measures are needed.
	D	The intervention depends completely on ad-hoc structures with no prospect of sustainability. Fundamental changes are needed to enable sustainability.
4.3 What is the level of policy support provided and the degree of interaction between intervention and policy level?		
	A	Policy and institutions have been highly supportive of intervention and will continue to be so.
X	**B**	Policy and policy enforcing institutions have been generally supportive, or at least have not hindered the intervention, and are likely to continue to be so.
	C	Intervention sustainability is limited due to lack of policy support. Corrective measures are needed.
	D	Policies have been and likely will be in contradiction with the intervention. Fundamental changes needed to make intervention sustainable.
4.4 How well is the intervention contributing to institutional and management capacity?		
	A	Intervention is embedded in institutional structures and has contributed to improve the institutional and management capacity (even if this is not an explicit goal).
X	**B**	Intervention management is well embedded in institutional structures and has somewhat contributed to capacity building. Additional expertise might be required. Improvements in order to guarantee sustainability are possible.
	C	Intervention relies too much on ad-hoc structures instead of institutions; capacity building has not been sufficient to fully ensure sustainability. Corrective measures are needed.
	D	Intervention is relying on ad hoc and capacity transfer to existing institutions, which could guarantee sustainability, is unlikely unless fundamental changes are undertaken.

3.5 Decisions taken by the steering committee and follow-up

Decision					Action			Follow-up	
Decision	**Period of identification**	**Timing**	**Source**	**Actor**	**Action(s)**	**Resp.**	**Deadline**	**Progress**	**Status**
Composition and management of Joint Steering Committee	11 May 2018	Immediate	JLCB		Directors of *Direcção de Planificação e Cooperação* and of *Direcção Nacional de Energias Novas e Renováveis* will be invited members of the Steering Committee on a permanent basis	JLCB	Next steering committee	Noted	ONGOING
					Joint Steering Committees of CB MIREME and RERD2 will be held jointly; additional Steering Committees may be held for each project individually if need be	JLCB	Next steering committee	Noted	ONGOING
TFF's reference to CNELEC applies to ARENE	11 May 2018	Immediate	JLCB		-	-	-	Noted	ONGOING
CB MIREME and FUNAE to provide more detailed activity planning until end of 2018	11 May 2018		JLCB		After planning sessions formulate more detailed planning	PM	-	FUNAE provided a plan for 2018 which was integrated in the 2019 operational plan.	CLOSED
On the basis of a list of RERD2 pre-selected sites decide on those that merit further studies in view of project investment.	Q1 2019		JLBC		Proposed by the project in the JLCB of 4 December 2019	PM / JLBC	Dec. 2019	Sites to advance with EPCs and in-depth feasibility studies.	CLOSED
Approval of the following sites for building solar mini-grids: 1. Naburi, 2. Alto Maganha and 3. Namanla in	Q4 2019	Immediate	PM/ JLBC		Proposed by the project in the JLCB of 4 December 2019 and approved				CLOSED

Pebane district; 4. Mungulama in Ile district and 5. Alto Benfica in Mocuba ents in hydro-and solar mini-grids									
Financial reinforcement of the direct management budget line R1A1 "Review and update of existing studies", to speed up the process of contracting solar feasibility studies.	Q4 2019	Immediate	PM/JLBC		Proposed by the project in the JLCB of 4 December 2019	PM	Q1 2020		ONGOING
Include a 4th result in the project logical framework denominated "The new legal framework is influenced by FUNAE" with a budget line "R4A1 Carrying out specialized studies to strengthen the legal framework".	Q4 2019	Immediate	PM/JLBC		Proposed by the project in the JLCB of 4 December 2019	PM	Q1 2020		ONGOING

3.6 Updated Logical framework

General Objective	Indicators	Means of verification	Base values	Target	Assumptions
Rural Economic and Social Development is promoted by increased sustainable access to energy	Poverty indicators of target area	• Government statistics (INE - *Instituto Nacional de Estatistica*) • UNDP	•Zambezia: 70.5% •Nampula 54.7% •Niassa 31.9% •Manica 55.1% •Nat. average 54.7% • (UNDP 2019 Report on MDGs)		Successful integration of the RERD2 intervention with other interventions promoting productive uses of energy
Specific Objective	Indicators	Means of verification			Assumptions
Access to energy in rural areas is increased by investments in renewable energy and in support mechanisms to ensure sustainability	Access to electricity in rural areas	• Existing multi-tier framework surveys (SE4All) • Household surveys	5,97% of rural populations (Global Tracking framework)	7,97% of rural population of one province	Target based on Zambezia population data

Result 1	Indicators	Means of verification	Base values	Target	Assumptions
Mini-grids provide reliable and adequate energy service	• Multi-tier framework (World Bank)	• Household surveys	5,97% of rural population (Global Tracking framework)	7,97% of rural population of one province	Suitable operator models can be found
Activities for R1	Actors involved	Estimated Budget			assumptions
R1.A1: Review and update of existing feasibility and baseline studies and site selection in view of productive uses of energy (socio economic surveys)	Consultancy, NGOs, FUNAE, business associations, businesses, other donors, local authorities	€200.000	13 existing studies on PV and hydro	1 to 3 studies revised and updated	• Quality consultants are found • The existing FUNAE pipeline for mini-grids is relevant to the objective • Existing studies are of good quality
R1.A2 : Awareness and stakeholder consultations for each site including the private sector	NGOs, FUNAE, business associations, businesses, local authorities	€50.000	0 campaigns	1 a 3 awareness campaigns performed on future sites	NGOs and actors with sufficient knowledge of local conditions can be found
R1.A3: Mini-grid development with productive uses of energy	Private sector, FUNAE, consultants, NGOs, communities, local authorities	€ 6.120.000	3 large existing hydro mini grids (Sembezia, Murora, Majaua) and 3 large solar mini grids	1 to 3 additional large hydro mini-grids	• A financially sustainable management system for mini grid is agreed upon • Enforcement of payment for services • Sufficient ability to pay
R1.A4 Result dissemination	FUNAE	€ 50.000	0 publications	Minimum one publication	

Result 2	Indicators	Means of verification	Base values	Target	Assumptions
Technical and financial sustainability of existing systems is improved	• Revenues from the systems	• Baseline for systems and for payments • Systems database • FUNAE accounts	Fee collection at 50%	Fee collection raised to 80%	• Continuity in management and continued openness to other stakeholders • Users are willing and able to pay for the energy services • FUNAE is open to a level of decentralization process giving more autonomy to the Delegations, including financial. • Agreement can be found on tariffs and subsidies
	• Percentage of systems working	• Baseline for systems and for payments • Systems database	Working systems: 50%	80 % of working systems	
	• GIS implemented beyond a static database and used for planning and asset management purpose	• GIS system • Activity reports	GIS currently not used = 0%	• GIS interconnected with other data bases and used for planning purposes 100%	
	• The existing maintenance strategy for PV is implemented	• Satisfaction surveys about FUNAE • Operation and maintenance report	PV maintenance strategy implemented at 25%	PV maintenance strategy implemented at 80%	

	Activities for R2	Actors involved	Estimated Budget			assumptions
	R2.A1 Planning, Operation and maintenance	FUNAE with focus on maintenance unit, and other relevant divisions (solar, mini-hydro)	€ 200.000	Maintenance unit half functional 50%	Maintenance unit strengthened 90%	Integration with other departments is simulated Qualified human resources are kept in FUNAE
	R2. A2 Strengthening of Information systems	FUNAE maintenance unit and delegations	€ 200.000	Data base and GIS not connected Information not shared between departments 0%	GIS and data base connected and used for asset management, site identification and planning 100%	Integration with other departments is simulated Qualified human resources are kept in FUNAE

	R2 A3 Implementation of monitoring remote monitoring systems	FUNAE delegations in the provinces and relevant divisions	€ 360.000	8 systems installed; 3 different technologies	One technology chosen. Number of systems installed according to budget	Monitoring systems are adequate for the targeted systems.
	R2 A4 Implementation of payment systems (metering, fee collection, pre-payment)	FUNAE maintenance unit and Delegations in the provinces	€500.000	1000 Meters and pre-payment systems purchased but not operational yet 0 % of systems operational 1000	Pre- payment (for domestic users) and meters systematic on the mini-grids financed by RERD2 100% of mini-grids equipped with pre-payment systems	Users are willing and able to pay for services

Result 3	**Indicators**	**Meeans of verification**	**Base values**	**Target**	**Assumptions**
The capacity of FUNAE in planning and project management is improved	• Capacity building plan • • Quality of tender documents • • Quality of socio-economic survey methodology • • Quality of working procedures	• Surveys • Activity reports • Coordination reports	No plan for capacity building No standard method for socio-economic surveys Incomplete procedures	Agreed plan for capacity building Standard template for surveys Working procedures are operational	• Continuity in management • Cooperation between divisions • FUNAE retains qualified human resources
Activities for R3	Actors involved	Estimated budget			Assumptions
R3.A1 Project management is improved at HQ level	• FUNAE relevant divisions in HQ	€ 100.000	Processes and working procedures not updated	Clear processes and tools for project management	• Integration with other departments is simulated • • Qualified human resources are kept in FUNAE
R3.A2. Capacity building of Delegations in sector planning and coordination	FUNAE maintenance unit and delegations	€ 200.000	Planning process with DIPREME unclear	Clear working processes and structure; Technicians better trained	• • Qualified human resources are kept in FUNAE • • More autonomy for FUNAE Delegation
R3 A3 Technical assistance	Enabel	€2.250.000			• Experts with adequate profiles are found
R3 A4 Surveys, field trips workshops and seminars, study tours	FUNAE and Enabel staff	€200.000			

3.7 MoRe Results at a glance

Logical framework's results or indicators modified in last 12 months?	The December steering committee agreed with a change in the Logical Framework (i.a. addition of a fourth result)
Baseline Report registered on PIT?	No
Planning MTR (registration of report)	MTR currently planned for November 2020 (registration of report in Q1 2021)
Planning ETR (registration of report)	Not yet determined
Backstopping missions since 01/01/2018	0

3.8 "Budget versus current (y – m)" Report

Enabel

					Budget Version 2017 C04		UBW Expenses 2019					Total UBW expenses		
			Budget Execution/Activities											
			MOZ1503411 RERD 2		Budget	2018	Q1	Q2	Q3	Q4	Expenses UBW 2019		planning	Total FIT Expenses + planning
A			**Increase access to energy**		**10,410,000**	**131,239.17**	**102,556.23**	**114,989.06**	**189,255.12**	**170,982.84**	**577,783.25**	**709,022.42**	**9,700,977.59**	**10,410,000.01**
A	01		Mini-grids provide reliable and adequate energy services		6,400,000	8,933.80	5,089.58	13,765.14	64,916.86	56,275.06	**140,046.64**	**148,980.44**	**6,197,118.37**	**6,346,098.81**
A	01	01	Review and update of existing studies	REGIE	200,000	8,933.80	5,089.58	13,765.14	64,916.86	56,275.06	**140,046.64**	**148,980.44**	**228,200.00**	**377,180.44**
A	01	02	Awareness and stakeholder consultations	REGIE	150,000						-	-	**130,000.00**	**130,000.00**
A	01	03	Mini grid development	COGEST	6,000,000						-	-	**5,784,918.37**	**5,784,918.37**
A	01	04	Result dissemination	REGIE	50,000						-	-	**54,000.00**	**54,000.00**
A	02		Technical and financial sustainability of existing systems is improved		1,260,000	- 8,000.00	-	0.20	19,437.13	4,782.22	**24,219.55**	**16,219.55**	**1,243,780.45**	**1,260,000.00**
A	02	01	Planning, operation and maintenance	REGIE	200,000		-	0.20	1,085.55	-	**1,085.75**	**1,085.75**	**204,000.00**	**205,085.75**
A	02	02	Strenghtening of information systems	REGIE	200,000	- 8,000.00	-	-	18,351.58	4,782.22	**23,133.80**	**15,133.80**	**179,780.45**	**194,914.25**
A	02	03	Implementation of remote monitoring systems	COGEST	360,000						-	-	**360,000.00**	**360,000.00**
A	02	04	Implementation of payment systems	COGEST	500,000						-	-	**500,000.00**	**500,000.00**
A	03		Capacity building of FUNAE in planning and project management		2,750,000	130,135.33	97,005.74	100,754.67	102,999.88	109,025.62	**409,785.91**	**539,921.24**	**2,210,078.77**	**2,750,000.01**
A	03	01	Project management at HQ level	REGIE	100,000		-	-	-	458.69	**458.69**	**458.69**	**127,000.00**	**127,458.69**
A	03	02	Capacity building of Delegations	REGIE	200,000		-	-	-	770.69	**770.69**	**770.69**	**199,000.00**	**199,770.69**
A	03	03	Technical assistance	REGIE	2,250,000	130,135.33	96,041.28	100,754.67	102,999.88	106,215.25	**406,011.08**	**536,146.41**	**1,732,078.77**	**2,268,225.18**
A	03	04	Surveys, field trips, workshops and seminars, study tours	REGIE	200,000		964.46	-	-	1,580.99	**2,545.45**	**2,545.45**	**152,000.00**	**154,545.45**
A	04		IVA		-	170.04	460.91	469.05	1,901.25	899.94	**3,731.15**	**3,901.19**	-	**3,901.19**
A	04	01	IVA	REGIE		170.04	460.91	469.05	1,901.25	899.94	**3,731.15**	**3,901.19**	-	**3,901.19**
A	04	02	IVA	COGEST							-	-	-	-
A	05		New legal framework influenced by FUNAE		-	-	-	-	-	-	-	-	**50,000.00**	**50,000.00**
A	05	01	Carrying out specialised studies to strengthen the legal framework".	REGIE							-	-	**50,000.00**	**50,000.00**
X			**Contingencies**		**326,000**	-	-	-	-	-	-	-	**326,000.00**	**326,000.00**
X	01		Contingencies		326,000	-	-	-	-	-	-	-	**326,000.00**	**326,000.00**
X	01	01	Contingencies	COGEST	163,000						-	-	**163,000.00**	**163,000.00**
X	01	02	Contingencies	REGIE	163,000						-	-	**163,000.00**	**163,000.00**
Z			**General Means**		**1,264,000**	**124,157.30**	**48,992.45**	**42,737.24**	**46,250.85**	**48,514.48**	**186,495.02**	**310,652.32**	**953,347.68**	**1,264,000.00**
Z	01		Personnel Costs		690,000	115,553.72	39,885.71	33,158.07	34,605.14	37,411.56	**145,060.48**	**260,614.20**	**442,382.14**	**702,996.34**
Z	01	01	Regional Administration & Finance	REGIE	450,000	107,227.56	32,320.15	24,875.15	26,622.98	28,271.88	**112,090.16**	**219,317.72**	**295,980.09**	**515,297.81**
Z	01	02	Finance/admin/procurement staff	REGIE	120,000	8,326.16	7,565.56	8,282.92	7,982.16	9,139.68	**32,970.32**	**41,296.48**	**108,000.00**	**149,296.48**
Z	01	03	Driver	REGIE	120,000						-	-	**38,402.05**	**38,402.05**
Z	02		Investment costs		40,000	3,857.39	2,709.22	247.48	338.37	210.15	**3,505.22**	**7,362.61**	**28,800.00**	**36,162.61**
Z	02	01	ICT/ERP	REGIE	40,000	3,857.39	2,709.22	247.48	338.37	210.15	**3,505.22**	**7,362.61**	**28,800.00**	**36,162.61**
Z	03		Operating Costs		372,000	4,712.55	5,939.45	9,035.72	6,134.25	10,892.77	**32,002.19**	**36,714.74**	**320,550.00**	**357,264.74**
Z	03	01	Office consumable	REGIE	12,000	229.94	600.51	- 6.37	-	505.40	**1,099.54**	**1,329.48**	**8,400.00**	**9,729.48**
Z	03	02	Communication costs	REGIE	30,000	245.68	477.82	383.45	790.28	1,763.56	**3,415.11**	**3,660.79**	**22,800.00**	**26,460.79**
Z	03	03	Fuel and maintenance	REGIE	60,000	1,010.06	901.68	4,416.86	1,058.85	6,093.25	**12,470.64**	**13,480.70**	**47,000.00**	**60,480.70**
Z	03	04	Mission costs	REGIE	105,000	-	1,572.65	1,900.14	2,216.05	373.31	**6,062.15**	**6,062.15**	**80,900.00**	**86,962.15**
Z	03	05	Other operation costs	REGIE	5,000	95.11	339.68	373.62	101.04	189.22	**1,003.56**	**1,098.67**	**3,450.00**	**4,548.67**
Z	03	06	Office rental	REGIE	150,000	3,131.76	1,968.03	1,968.03	1,968.03	1,968.03	**7,872.12**	**11,003.88**	**150,000.00**	**161,003.88**
Z	03	07	Office renovation and maintenance	REGIE	10,000	-	79.08	- 0.01	-	-	**79.07**	**79.07**	**8,000.00**	**8,079.07**
Z	04		Audit, Follow-up and Evaluations		162,000	33.64	458.07	295.97	5,173.09	-	**5,927.13**	**5,960.77**	**161,615.54**	**167,576.31**
Z	04	01	Audit	REGIE	50,000						-	-	**50,000.00**	**50,000.00**
Z	04	02	Mid-term and final evaluation	REGIE	80,000						-	-	**80,000.00**	**80,000.00**
Z	04	03	Follow-up and backstopping	REGIE	32,000		192.23	-	4,772.71	-	**4,964.94**	**4,964.94**	**31,615.54**	**36,580.48**
Z	99	98	Conversion rate adjustment	REGIE		33.64	265.84	295.97	400.38	-	**962.19**	**995.83**	-	**995.83**
				Total:	12,000,000	255,396.47	151,548.68	157,726.30	235,505.97	219,497.32	**764,278.27**	**1,019,674.74**	**10,980,325.27**	**12,000,000.01**
				COGEST	7,023,000	0	0	0	0	0	0	0	6,807,918	6,807,918
				REGIE	4,977,000	255,396	151,549	157,726	235,506	219,497	764,278	1,019,675	4,172,407	5,192,082
				Total:	**12,000,000.00**	**255,396.47**	**151,548.68**	**157,726.30**	**235,505.97**	**219,497.32**	**764,278.27**	**1,019,674.74**	**10,980,325.27**	**12,000,000.01**

3.9 Communication resources

RERD2 article on the “Open Enabel” website.