# Independent terminal evaluation

# Republic of Côte d'Ivoire

# Promoting renewable energy-based grids in rural communities for productive uses in Côte d'Ivoire

UNIDO project No. GF/IVC/12/005, SAP ID: 100186
GEF ID: 4005


UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

**UNIDO INDEPENDENT EVALUATION DIVISION**

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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna, 2016

Distr. GENERAL

ODG/EVQ/IEV/16/R.3

August 2016

Original: ENGLISH

This evaluation was managed by the responsible UNIDO Project Manager with quality assurance by the Independent Evaluation Division

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**Acknowledgements**
The evaluation team would like to acknowledge the time and perspectives provided by UNIDO in the field sites visited. Particular thanks to Javier Guarnizo, Mark Draeck and Manuel Mattiat from UNIDO Headquarters in Vienna, as well as to Issouf Outtara and Koménan Koffi from UNIDO's Country Office in the Ivory Coast.

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**Disclaimer**
The views expressed in this report are those compiled by the author and reflect a best effort to compile and cross-analyse different sources of data and information about the project. The views expressed in this report do not necessarily represent the views of UNIDO. Any errors of factor or in assessment are the responsibility of the evaluation consultant.

**Evaluation support and backstopping**
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Anne Cazemier, New Frontier Services – Verifying evaluation baseline

# Abbreviations and acronyms

| | |
|---|---|
| AFD | *Agence Francaise de Development* |
| Akwaba | *Délégation Fondation Akwaba* |
| BOAD | West African Development Bank |
| CIE | *Compagnie Ivoirienne d'Electricitié* |
| DCI | Development Cooperation Instrument |
| DENR | *Directeur des Energies Nouvelles et Renouvelables, Ministre du Pétrole et de l'Energie, Côte d'Ivoire* |
| DEVCO | European Commission Directorate General for Development Cooperation |
| EC | European Commission |
| EDF | European Development Fund |
| EIB | European Investment Bank |
| EQ | Evaluation Question |
| EU | European Union |
| GEF | Global Environmental Facility |
| GIZ | *Deutsche Gesellschaft für Internationale Zusammenarbeit* |
| GPGC | Global Public Goods and Challenges Programme |
| MDG | Millennium Development Goals |
| MSME | Micro, Small and Medium Sized Enterprises |
| NGO | Non-Governmental Organisation |
| PIR | Project Implementation Report |
| PPG | Project Preparation Grant |
| PPP | Public-Private Partnership |
| PV | Photovoltaic Power System |
| RE | Renewable Energy |
| SDG(s) | Sustainable Development Goal(s) |
| SE4ALL | UN Sustainable Energy for All |
| SME | Small and Medium Sized Enterprises |
| ToR | Terms of Reference |
| UNDP | United Nations Development Programme |
| UNEG | United Nations Evaluation Group |
| UNEP | United Nations Environmental Programme |
| UNFCCC | United Nations Framework Convention on Climate Change |
| UNIDO | United Nations Industrial Development Organisation |
| WB | World Bank |
| WHO | World Health Organisation |

# Glossary of evaluation-related terms

| Term | Definition |
|---|---|
| Baseline | The situation, prior to an intervention, against which progress can be assessed. |
| Effect | Intended or unintended change due directly or indirectly to an intervention. |
| Effectiveness | The extent to which the development intervention's objectives were achieved, or are expected to be achieved. |
| Efficiency | A measure of how economically resources/inputs (funds, expertise, time, etc.) are converted to results. |
| Impact | Positive and negative, intended and non-intended, directly and indirectly, long term effects produced by a development intervention. |
| Indicator | Quantitative or qualitative factors that provide a means to measure the changes caused by an intervention. |
| Lessons learned | Generalizations based on evaluation experiences that abstract from the specific circumstances to broader situations. |
| Logframe (logical framework approach) | Management tool used to facilitate the planning, implementation and evaluation of an intervention. It involves identifying strategic elements (activities, outputs, outcome, impact) and their causal relationships, indicators, and assumptions that may affect success or failure. Based on RBM (results based management) principles. |
| Outcome | The likely or achieved (short-term and/or medium-term) effects of an intervention's outputs. |
| Outputs | The products, capital goods and services which result from an intervention; may also include changes resulting from the intervention which are relevant to the achievement of outcomes. |
| Relevance | The extent to which the objectives of an intervention are consistent with beneficiaries' requirements, country needs, global priorities and partners' and donor's policies. |
| Risks | Factors, normally outside the scope of an intervention, which may affect the achievement of an intervention's objectives. |
| Sustainability | The continuation of benefits from an intervention, after the development assistance has been completed. |
| Target groups | The specific individuals or organizations for whose benefit an intervention is undertaken. |

# 1. EXECUTIVE SUMMARY

## 1.1 About this evaluation

This document comprises the final evaluation report from the project '*Promoting Renewable Energy-Based Grids in Rural Communities for Productive Uses in Côte d'Ivoire*' ("the UNIDO project"). An independent terminal evaluation for this project was foreseen as part of the Budgeted Monitoring and Evaluation Plan in the project document, with the purpose of conducting a systematic and independent assessment of the project in line with UNIDO and GEF Evaluation policies. The evaluation work commenced in February 2016 and was completed in April 2016, and comprised of three core work phases. The first phase consisted of the Inception Phase and involved the reviewing of the project's documents, the mapping of the project's stakeholders and the development of the evaluation approach and evaluation tools. The second phase comprised of field missions to the Zanzan region and to Abidjan. Finally, the third evaluation phase consisted of the analysis of the data and findings, as well as the development of the evaluation reporting.

## 1.2 About the Project

Originally, the project 'Promoting Renewable Energy-Based Grids in Rural Communities for Productive Uses in Côte d'Ivoire' was meant to run for three years from 16 May 2012 to the end of April 2015. The over-arching project goal was to develop a market-based approach for improving the access to PV-based mini grids in rural areas. More specifically, the project aimed at i) creating a critical mass of skilled and knowledgeable technicians and public officers; (ii) building awareness, especially of the private sector, about the appropriate technologies and best practices; (iii) linking energy services with productive uses; and, (iv) formulating and strengthening policies encouraging the involvement of the private sector and promote providing access to innovative and smart financial mechanisms. These objectives are mainly attained through a series of activities, in particular including: 1) institutional, policy and financial mechanisms; 2) identification of resources and preparation of feasibility studies; and, 3) technology demonstration and creation of awareness and technical capacities. Regarding implementation and financing arrangements, the project was implemented by UNIDO, with the Ivory Coast's Directorate of Energy of the Ministre du Pétrole et de l'Energie as the main counterpart agency, and the West African Development Bank (BOAD) as counterpart and donor.

The project was funded through a GEF grant amounting to USD 863,691, with UNIDO providing a co-financing contribution of USD 150,000 (comprising cash and in-kind contributions). Total counterpart co-financing was initially intended to be a total of USD 3,727,270.00 (cash and in-kind contributions), giving a total project budget at the start of the project of USD 4,740,691.00. The GEF also contributed a Programme Preparation Grant of USD 50,000. The project was contracted to UNIDO, with USD 103,497.00 budgeted for project management costs.

However, during the project UNIDO were informed that the BOAD had not been able to mobilise the funds for the project. As the funding from the Ivory Coast *Ministre du Pétrole et de l'Energie* and the West African Development Bank (BOAD) was not mobilised, the project implementation has undergone several modifications due to the shortage of USD 3,727,270.00 of the project funding. This mainly affected the implementation of Project Component 3, the technical demonstration. To ensure a technical demonstration would be implemented under the project, UNIDO worked together with the EU-Akwaba project "*Electrification des communautés Rurales avec des micro-réseaux de generation d'énergie solaire photovoltaïque dans la région du Zanzan en Côte d'Ivoire*" ("the Akwaba project"). The co-operation with the EU-Akwaba regarding the project in Zanzan allowed for efficient project implementation, though the project

was extended for one year, to duration of almost 4 years. The co-operation between EU and UNIDO was a strong solution for both projects; now, UNIDO-GEF would directly finance the technical demonstration in the EU-Akwaba project and could successfully implement a modified version of Component 3 of the project. In its new form, the project aimed at comparing the community-based method from the EU's Akwaba project in Zanzan to the market approach originally chosen by UNIDO.

### 1.3 Evaluation findings and conclusions

Regarding **project relevance**, the project was highly relevant on a number of levels. Firstly, within the broader sustainable development context, the project addresses the sustainable development of Ivory Coast and the needs of the rural population to profit from development in an equal manner to the urban population. The project was also relevant to key UN policy goals and frameworks, as well as to national policies of Ivory Coast. Regarding the **quality of the project design**, the project design had numerous strengths, such as the goal to aid Ivory Coast with developing a long-term strategy to support private investment strategy, thereby ensuring both the sustainability and the feasibility of future renewable energy projects. The project was designed in a manner that supported the goal and properly addressed the problems at hand.

Regarding **project efficiency**, the evaluation findings show an overall good performance of the project with regard to efficiency. Regarding **the overall efficiency of project inputs and costs**, the evaluation findings show that there were factors outside of the direct control of UNIDO, which hindered optimal efficiency of the project's implementation, including the lack of funding mobilisation from partners and the delays with the project partners. However, **project management** has been competent with regard to dealing with the challenges at hand. There were many challenges that occurred outside of the direct influence of the UNIDO management team, for which their reaction showed practical management skills and ensured that pragmatic solutions were found. Regarding **project effectiveness and the extent to which the project achieved its aims**, the project has recorded partial, and sometimes significant, achievement of its target outputs and results.

Regarding **impact**, the project shows positive promise for the future. As the project has only concluded in April 2016, it is too early to make any definitive conclusions on the project's impact. However, the evaluation team sees promise for the feasibility studies to have future impact. Furthermore, the technical demonstration in the Zanzan villages also show promise for sustained impact. Furthermore, the technical demonstration in the Zanzan villages also show promise for sustained impact, which is being promoted further through an attractive short video, publically accessible through the following web blink.[1] Regarding **sustainability**, the evaluation findings in general offer a mixed picture in terms of the extent to which the project's delivered outputs will sustain through national capacities after project completion. The technical demonstrations show large potential for sustainable impact, though it is too early to draw any definitive conclusions. The follow-on from this project could also be scaled-up through two forthcoming projects from the GEF and the EU /EDF (European Development Fund). These could also implement the interest identified across a number of national government ministries and sectors for leveraging improved renewable energy capabilities for the benefit of socio-economic development in key sectors of the economy. The project has also created a professional video, which will be useful as a communication, education and awareness-raising tool, and has already generated significant exposure for the project across business and financial press in Africa, Europe and the USA, as well as significant online interest through Linked groups.

[1] UNIDO, "Clean, sustainable energy for remote rural areas in Côte d'Ivoire", at WWW https://www.youtube.com/watch?list=PLu54zbUJCBPnr0oboV0nQLPCTVEX4Mo8X&v=oyCQIGEQaOo.

There is significant potential for the project in the transition phase to consider the relevance of the Zanzan installations in a wider national context. The **current and future needs** for rural energy access are relevant to the development of a number of economic sectors in Ivory Coast. During discussions held with a number of national government ministries and stakeholders, it was indicated that rural energy access was seen as highly important in the context of their own sector development needs and priorities.

There are six main lessons to be learned from this project, listed below: **Lesson 1:** Delays and confusion regarding legal status of the demonstration installations emphasises the need for clarity for future implementation regarding deployments. **Lesson 2:** The delays, as well as the lack of mobilisation of the co-financing, reduced the speed of project implementation and thus the overall efficiency of the wider UNIDO-GEF project. **Lesson 3:** The limited development of renewable energy in Ivory Coast to date raises questions regarding the real level of commitment by the national government to renewable energy and to securing a quantum leap in rural energy access. **Lesson 4:** The evaluation consultation programme showed significant preliminary interest across other Ivory Coast government ministries in using renewable energy to improve energy provision in rural areas in their respective sector(s) of responsibility. **Lesson 5:** Linked to the question above about national government commitment and resourcing levels, the evaluation findings suggest that both the government and the wider renewable energy and development sectors can benefit from strengthened dialogue, experience-sharing and communication. **Lesson 6:** From a comparative perspective, Ivory Coast is lagging significantly behind many of its peers in the developing world with regard to leveraging renewable energy to secure improved energy access and spur socio-economic development.

## 1.4 Evaluation recommendations

The recommendations in many respects are set out as points for reflection and consideration, as the issues are complex. Their core purpose is to build on some of the strengths and good results of the project under evaluation, as well as to provide suggestions on how some design and implementation weaknesses can be addressed. They also provide a forward-looking perspective, in order to maximise the sustainable impact of this project. **Five recommendations are provided** and these can be grouped into **three Categories**: **i) Recommendation R1**: A recommendation that is **strategic** in nature and relates to the project concept; in other words, the transition of the Zanzan demonstration project into the next phase. This recommendation relates to what should be the objectives of the next phase and how the project can be set up to deliver the biggest impact for all stakeholders. **ii) Recommendations R2 – R3:** Recommendations that are **more operational, but relate to key work processes or intervention approaches, and seek to translate the strategic recommendations into operational processes** to deliver the suggested shift in focus. **iii) Recommendations R4 – R5:** Recommendations targeted towards **developing specific frameworks, strategies and tools to improve sustainability design and performance** in pilot projects on RE in Ivory Coast more generally.

Table 1.1 – Categories of recommendations

| | | |
|---|---|---|
| Category 1 | **Strategic recommendations relating to comprehensive monitoring and impact assessment framework for the demonstration projects** | **R1** |
| Category 2 | **Operational Recommendations that seek to translate the strategic recommendations into operational processes** | **R2, R3** |
| Category 3 | Recommendations targeted to **developing specific frameworks, strategies and tools to improve sustainability design and performance** | **R4, R5** |

The **first recommendation (R1)** is regarding the transition and follow-on phase of the project. To maximise the learning from a demonstration perspective on the Zanzan project, it is recommended that UNIDO and Akwaba **implement a rigorous ongoing monitoring and evaluation framework** during the second half of 2016. Monitoring the core KPIs, the impact on daily lives of the final beneficiaries, the community-based management model, the functioning of the financial model, and the impact on the wider local community are key elements to establish the sustained impact of the demonstration aspect of the project.

The **second recommendation (R2)** pertains to the exploring how the 'Development Impact' of the demonstration sites can be maximised. UNIDO and Akwaba are recommended to **explore how the 'development impact' of the demonstration sites could be maximised** by looking for example at the possibility of using common space areas in the electrification buildings for community activities, including for providing water and sanitation facilities, public health functions or connecting the villagers to the internet or other ICT facilities. Some of these services are already available in some of the villages, while others might develop in the future. This could maximise the wider development impact and interest to development actors in the Ivory Coast for these technical demonstrations of PV mini grids.

The **third recommendation (R3)** regards the need to ensure regulatory clarity for all renewable energy off-grid installations in the Ivory Coast. With a view to bringing **certainty for all actors on the legal framework on renewable energy**, and to all Ivory Coast development actors, it is recommended that **a consultation forum be established for discussion between the Government, donor stakeholders and other development actors on this issue**. This forum could provide opportunity for discussion and exchange of experience on how on-grid and off-grid renewable energy installations are contributing to rural development, as well as for discussion options on a regulatory framework for renewable energy.

The **fourth recommendation (R4)** is regarding the further exploration of the refinement and improvements to the Zanzan Demonstration Project model. To consider if this community-based model, as demonstrated in Zanzan, could be effective for promoting RE in all of Ivory Coast, it is recommended that UNIDO use the post-project transition phase from May 2016 onwards to **explore if further refinement and improvements to the Zanzan Demonstration Project model** are possible, with a view to improve its suitability for scaling. The outcome of these studies could be compared to the studies done under the UNIDO project, where a market-based approach was explored.

The **fifth recommendation (R5)** is directly related to R4, and regards carrying out consultations with the national ministries to develop models for large-scale deployment of renewable energy in rural areas. Several ministries have indicated their interest in renewable energy as a means for ensuring rural energy access, which many ministries regard as crucial for their policy and its implementation. It is recommended that **UNIDO provides a structured process of information sharing, awareness raising and dialogue with relevant national ministries**, in order to further explore how their respective sectors could benefit from scaled up access to energy in rural areas. An open dialogue with multiple ministries to discuss the needs of their stakeholders, together with a broad spectrum of donors, NGOs and other international stakeholders is thus recommended.

# 2. PROJECT AND EVALUATION OVERVIEW

**Section guide**

*This section provides an overview of the following:*

- *About the project (Section 2.1)*
- *The project background context and intervention rationale (Section 2.2)*
- *The project's target results (Section 2.3)*
- *The project's implementation arrangements (Section 2.4)*
- *The evaluation context and objectives (Section 2.5)*
- *The evaluation methodology (Section 2.6)*

## 2.1 About the Project

Originally, the '*Promoting Renewable Energy-Based Grids in Rural Communities for Productive Uses in Côte d'Ivoire*' project ran from 16 May 2012 to the end of April 2015. The over-arching project goal was to develop a market-based approach for improving the access to PV-based mini grids in rural areas. Regarding implementation arrangements, the implementing agency for this project has been UNIDO, with the Ivory Coast's Directorate of Energy of the *Ministre du Pétrole et de l'Energie* being the main counterpart agency. For the latter half of the project, UNIDO worked together with the Akwaba Foundation, where UNIDO took a more supervisory role. UNIDO worked in close co-operation with the government of Ivory Coast, especially with the *Ministre du Pétrole et de l'Energie* on the implementation of the project.

Regarding financing, the project is funded through a through a GEF grant amounting to USD 863,691, with UNIDO providing a co-financing contribution of USD 150,000 (comprising cash and in-kind contributions). Total counterpart co-financing was initially intended to come to USD 3,727,270 (cash + in-kind), giving a total project budget of USD 4,740,691. The GEF also contributed a Programme Preparation Grant of USD 50,000. UNIDO was contracted for the project, playing the role of Implementing Agency and being responsible for technical implementation. Of the total USD 4,790,691 million grant financing, USD 103,497.00 was allocated to UNIDO as a management fee under the project. The total original budget was to be provided by the following organisations:

Table 2.1 – Budget at CEO Endorsement Stage

| Name of Financer | Amount confirmed at CEO endorsement / Approval |
|---|---|
| GEF | USD 863,691.00 |
| Ministry of Finance and Economy Ivory Coast | USD 727,270.00 |
| UNIDO | USD 150,000.00 |
| BOAD Banque | USD 3,000,000.00 |
| Total | USD 4,740,691.00 |

In addition to the above contribution to the budget, the GEF also contributed a Programme Preparation Grant of USD 50,000.00 to the project. However, regarding the **budget commitment**, the pledged USD 3,000,000.00 from the BOAD was unfortunately not mobilised for this project. This mainly affected the implementation of Project Component 3 - *Technology demonstration and creation of awareness and technical capacities,* where the largest part of the external co-financing was supposed to be directed.

Given the failure of the co-financing to materialise, and in order to ensure a technical demonstration could be implemented under the project, UNIDO pursued discussions on a possible cooperation with the Akwaba project from December 2013 onwards. On 23 June 2014 UNIDO informed the *Ministre du Pétrole et de l'Energie* Adama Toungara that UNIDO would co-operate with the EU/ Akwaba project "*Electrification des communautés Rurales avec des micro-réseaux de generation d'énergie solaire photovoltaïque dans la région du Zanzan en Côte d'Ivoire*". The EU-Akwaba project also faced co-financing challenges regarding the implementation of solar PV installations in the region of Zanzan, where three of the seven installation sites faced problems concerning financial management. The co-operation with the EU-Akwaba regarding the project in Zanzan allowed for efficient project implementation, though the project was extended by one year, to duration of almost 4 years. The co-operation between EU and UNIDO was a strong solution for both projects; now, UNIDO-GEF would directly finance the technical demonstration in the three villages of Gansé, Bodou and Kakpin in the EU-Akwaba project, which suffered from a lack of funding.

In its new form, the actual outcomes of the project shift towards the Akwaba community-based method and away from the more market-based orientation foreseen in the CEO Endorsement by GEF. However, by choosing this solution, the project management displayed practical management reflections and enhanced the efficiency of the project in light of its situation. Also, the project aimed to observe the differences, both positive and negative, between the community-based method of the Zanzan project, and the public-private partnership method chosen in its feasibility studies to install and manage PV solar grids. The co-operation with the EU-Akwaba project ensured the installation of the PV mini grids in Zanzan and was crucial for the implementation of Project Component 3. Following the co-operation agreement with the EU-Akwaba project, the budget composition was then as follows:

Table 2.2 – Revised budget after EU-Akwaba co-operation[2]

| Name of financer | Actual amount mobilised |
|---|---|
| GEF | 863,691.00 USD |
| UNIDO (GEF project) | 150,000.00 USD |
| UNIDO (YA project – RE platform under Investment Forum)* | 150,000.00 EUR (195,904.00 USD) |
| National government (Investment Forum and other support) | 650,000.00 USD |
| EU (ACP-EU Energy Facility)* | 2,177,160.00 EUR (2,843,433.00 USD) |
| CI-Energies* | 128,000.00 EUR (167,168.00 USD) |
| Cost of land on which to build the energy houses in Zanzan | 700.00 USD |
| Cost of in-kind labour from communities in Zanzan | 37,000.00 USD |
| Total budget | 4,907,896.00 USD |

* The exchange rate is taken from the date of the start of the project and set at 1EUR=USD1.306.

[2] The Ministry of Finance and Economy of Ivory Coast has committed USD 727,270.00 and reiterated their promise to ensure the mobilisation of the funds. However, this has not materialised at the close of the project and is therefore not included in the presentation of the budget, though when materialised this could be used for the transition phase of the project.

The objectives and the most relevant facts of this project are presented in the table below.

Table 2.3 – Project factsheet

| **Project:** | **Promoting Renewable Energy-Based Grids in Rural Communities or Productive Uses in Côte d'Ivoire** | | |
|---|---|---|---|
| **Objectives** | 1. An effective, market-oriented policy and regulatory framework to stimulate investments in renewable energy;<br>2. A portfolio of renewable energy projects prepared for pilot Public-Private Partnership (PPP) investments during and post GEF-project promoting PPP and productive uses;<br>3. Reduced GHG emissions and increased access to rural electrification following increased awareness and technical capabilities of stakeholders to evaluate technical and commercial viability of photovoltaic-based mini grids and reduced barriers to development of businesses in renewable energies. | | |
| **Donor** | GEF | **Implementing agency** | UNIDO |
| **Timing** | 01/05/2012 to 30/04/2015 with an extension to 30/04/2016 | | |
| **Duration** | ±4 years | | |

*Especially reserved for the financing of the technical demonstration in the Zanzan region, after the co-operation with the EU-Akwaba project started.

## 2.2 Project objectives and intervention rationale

The project's intervention strategy and rationale was based on the problem analysis conducted during the project preparation phase, which identified the main constraints for enabling Ivory Coast from reaching this objective, and the country's renewable energy and solar energy potential. These three main constraints were: i) weak legal and regulatory frameworks, and lack of financial mechanisms; ii) lack of information on available renewable energy resources and its feasibility; and, iii) lack of technical capacities.

The project had as its goal to support PV installations in Ivory Coast by assisting the government to create institutional, policy and financial mechanisms that advocate and support to design a model for public-private partnerships, which could then be utilised to stimulate the use of PV solar grids in Ivory Coast. Furthermore, the project identified renewable energy resources and prepared feasibility studies. In addition, the project aimed to utilise a technology demonstration in seven villages selected during the PPG phase, creating awareness and promoting the technical capacities of PV solar grids.

The project thus specifically aimed at i) creating a critical mass of skilled and knowledgeable technicians and public officers; ii) building awareness, especially of the private sector, about the appropriate technologies and best practices; iii) linking energy services with productive uses; and, iv) formulating and strengthening policies encouraging the involvement of the private sector and promote providing access to innovative and smart financial mechanisms. The project aimed at realising these objectives through three main Project Components (PCs): **Component 1**: institutional, policy and financial mechanisms; **Component 2:** identification of resources and preparation of feasibility studies; and, **Component 3:** technology demonstration and creation of awareness and technical capacities.

## 2.3 Project target results

According to the GEF project plan the primary project aim was to remove the institutional, technical, knowledge and awareness-related barriers to the promotion of a market approach for RE-based mini grid systems to meet the growing needs for electricity in rural areas, which is currently being met, or likely to be met, by fossil fuels such as oil lamps, batteries and diesel generators. The specific Project Components, outcomes and outputs are set out in the table below.

Table 2.4 – Overview project's specific objectives

| | Project component | Expected outcome | Expected output |
|---|---|---|---|
| 1 | **Component 1:** Institutional policy and financial mechanisms | An effective, market oriented policy and regulatory framework to stimulate investments in RE. | **1.1** Strategic framework for RE energy development is prepared and ready for adoption. |
| | | | **1.2** Institutional framework for the renewable energy sector outlined and established, identifying stakeholders, their roles and responsibilities in promoting renewable energy based mini-grids. |
| | | | **1.3** Local financial service providers aware of and have expertise in analysis and evaluation of the risks related to the investments on renewable energies, 3 seminars organized, 7 policy makers trained and 5 financial institutions staff and 5 representatives of private sector trained. |
| | | | **1.4** Model public-private partnership formulated: its structure, functioning criteria and fund flow conditions, administrative unit, etc. defined and promoted as financial mechanism, in close interaction with the institutional structure and stakeholders are informed of this partnership model. |
| 2 | **Component 2:** Identification of RE resources & preparation of feasibility | A portfolio of renewable energy projects prepared for pilot PPP investments during and post GEF project. | **2.1** Project sites identified for the installation of viable RE systems, and prioritized following a pre-defined set of criteria promoting productive uses. |
| | | | **2.2** Pre-feasibility studies for the 11 most promising sites are developed. |
| 3 | **Component 3:** Technology demonstration and creation of awareness and technical capacities | Reduced GHG emissions and increased access to rural electrification, following increased awareness and technical capabilities of stakeholders to evaluate technical and commercial viability of photovoltaic-based mini grids and reduced barriers to development of businesses in renewable energies. | **3.1** Feasibility studies of photovoltaic based mini grids power facilities prepared. |
| | | | **3.2** Seven pilot photovoltaic based mini grids totalling 215 kW of capacity installed and operational. |
| | | | **3.3** In total, approximately 1,750 electricity connections by 2014 of households and small local businesses. In total, approximately 8,750 persons served by access to electricity. |
| | | | **3.4** Training of a team of local authority officers and interested private sector service providers-to-be on operation, maintenance and management provided. |
| 4 | Monitoring and evaluation | N/a | **4.1** A Monitoring and Evaluation Plan has been implemented. |
| | | | **4.2** Publications on lessons learned, and toolkits have been produced and disseminated. |
| | | | **4.3** Special documentaries on the pilot projects prepared and widely disseminated. |
| 5 | Project management | | |

The project co-operated with national partners at the central and local government levels in order to achieve the targets.

## 2.4 Project implementation arrangements

Actual implementation of this project was carried out by UNIDO, acting as the GEF implementing agency. As mentioned previously, the project worked in close co-operation with the government of Ivory Coast, especially with the *Ministre du Pétrole et de l'Energie*. The modification of the Component 3 of the project included co-operation with the Akwaba Foundation on the implementation of the project. While the project experienced several delays, this was mainly outside the scope of UNIDO's influence. The table below presents the expected and actual project dates.

Table 2.5 – Key project milestones

| Milestone | Expected date | Actual date |
|---|---|---|
| Project CEO endorsement/approval date | 30 June 2011 | October 2011 |
| Project implementation start date (PAD issuance date) | May 2012 | May 2012 |
| Original expected implementation end date (indicated in CEO endorsement/approval document) | 30 April 2015 | 30 April 2016 |
| Revised expected implementation end date (if any) | April 2016 | June 2016 |
| Terminal evaluation completion | May 2016 | Early June 2016 |
| Planned tracking tool date | (to be completed) | (to be completed) |

## 2.5 Evaluation context and objectives

An independent terminal evaluation for this project was foreseen as part of the Budgeted Monitoring and Evaluation Plan in the project document, with the purpose of conducting a systematic and independent assessment of the project in line with UNIDO and GEF Evaluation policies. The evaluation work commenced in February 2016 and was completed in May 2016, and comprised three core work phases. The first phase consisted of the Inception Phase and involved the reviewing of the project's documents, the mapping of the project's stakeholders and the development of the evaluation approach and evaluation tools. The second phase comprised of field missions to the Zanzan region and to Abidjan. Finally, the third evaluation phase consisted of the analysis of the data and findings, as well as the development of the evaluation reporting.

This terminal evaluation covers the full duration of the project from its starting date in May 2012 to its completion in April 2016. Regarding **evaluation objectives**, the evaluation's main objectives will be to assess the project's performance in terms of relevance, effectiveness, efficiency, sustainability and impact. Additionally, the evaluation draws lessons and develops recommendations for UNIDO that may help for improving the site selection and for enhancing the design and implementation of similar future projects.

Regarding **evaluation management**, the evaluation has been under the management of UNIDO, specifically the UNIDO Office for Independent Evaluation (EVA). As per the ToR requirements, the evaluation team has worked independently, reporting to UNIDO counterparts on the progress of the evaluation throughout the duration of the evaluation exercise, in particular the UNIDO EVA, UNIDO counterpart staff in Vienna, and the UNIDO Country Office in Abidjan. This has included briefing and liaison meetings with UNIDO staff at UNIDO Headquarters in Vienna.

## 2.6 Evaluation methodology

The **evaluation approach** was based upon desk research and field missions. The evaluation started with a briefing mission to Vienna by the lead evaluator. The next step in the work programme consisted of desk research, which included both a review of relevant project documents, as well as research on wider international policy and initiatives in the area of RE, the country background and development co-operation. Following the desk research phase, field missions were conducted to visit the technical demonstrations in the Zanzan region and to interview several stakeholders within the government, UNIDO, EU and other relevant organisations in Abidjan. All of the findings from this evaluation have been presented in this report.

# 3. EVALUATION FINDINGS

## 3.1 Project relevance

**Section Guide**

*This section provides an overview of the following:*

- *Relevance of the project to the national policy and national development context (Section 3.1.1)*
- *Relevance of the project to target country needs and priorities (Section 3.1.2)*
- *Relevance of the project to EU policies and programmes (Section 3.1.3)*
- *Relevance of the project to UNIDO policies and programmes (Section 3.1.4)*
- *Extent of Participatory project identification process (Section 3.1.5)*
- *Quality of the project design (Section 3.1.6)*

### 3.1.1 Relevance to national policy and the national development context

***National development context***

With an estimated GDP of USD 78 billion in 2015[3], national energy consumption in Ivory Coast is expected to rise exponentially in the coming years, as it has done in recent decades. Even with its current electrification rate, the domestic sector (for lighting, cooking, refrigerating, water heating) takes up about a third of electricity consumption. In rural communities, most of the domestic electricity comes from the burning of biomass (firewood, charcoal, agricultural waste) often-taking place indoors. This does not only lead to deforestation, but also causes health risks and pollution. Table 3.1 below indicates electricity access in Ivory Coast in 2013. While Ivory Coast scores better in relative terms than some West African neighbours such as Guinea, Mauritania and Niger, it lags behind other West African countries such as Ghana and Senegal, and far behind North African countries such as Algeria, Egypt, Morocco, and Tunisia.

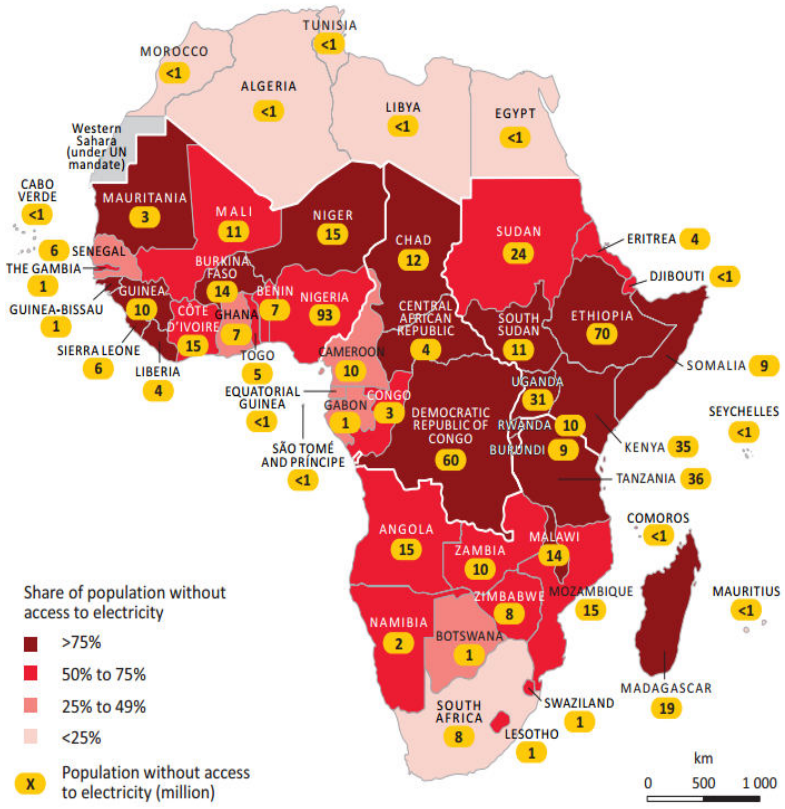
[3] CIA World Factbook on Ivory Coast, at WWW https://www.cia.gov/library/publications/the-world-factbook/geos/iv.html.

Table 3.1 – Overview of electricity access in Africa in 2013[4]

| Region | Population without electricity millions | National electrification rate % | Urban electrification rate % | Rural electrification rate % |
|---|---|---|---|---|
| Africa | 635 | 43% | 68% | 26% |
| Sub-Saharan Africa | 634 | 32% | 59% | 17% |
| Côte d'Ivoire | 15 | 26% | 42% | 8% |
| Ghana | 7 | 72% | 92% | 50% |
| Guinea | 9 | 26% | 53% | 11% |
| Mauritania | 3 | 28% | 47% | 2% |
| Niger | 15 | 15% | 62% | 4% |
| Senegal | 6 | 55% | 90% | 28% |
| Algeria | 0 | 99% | 100% | 97% |
| Egypt | 0 | 100% | 100% | 99% |
| Morocco | 0 | 99% | 100% | 97% |
| Tunisia | 0 | 100% | 100% | 100% |

The figure below provides an overview of national access rates to energy across the African continent, showing the population without access to electricity in Ivory Coast to be approximately 15 million.

Figure 3.1 – Number and share of people without access to electricity by country in 2012[5]




[4] Sources vary on the exact electrification rate of Ivory Coast. These figures are presented in the International Energy Agency, World Energy Outlook 2015, at WWW http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/.
[5] Africa Energy Outlook, World Energy Outlook Special Report 2014, at https://www.iea.org/publications/freepublications/publication/WEO2014_AfricaEnergyOutlook.pdf.

***National policy context***

At the start of the project, the legislator framework was unclear on renewable energy. In 2000, Ivory Coast's National Committee for Solar Energy was founded to promote electrification of the country by renewable energy, a key point of the government agenda. However, the lack of a clearly defined policy hindered the development of renewable energy facilities. As of 2002, the generation, transmission and distribution of electricity are under the monopoly of one national body, 'Compagnie Ivoirienne d'Electricitié (CIE).' While the government founded the Directorate of New and Renewable Energies (DENR) in 2009 responsible for solar power, there are still several levels of government involved in this sector without genuine coordination amongst them. Even though renewable energy is indicated to be of major policy importance, currently, several ministries and government departments are responsible for its implementation. In 2014, new energy legislation came into effect. While renewable energy regulations are not specifically outlined in this legislation, there are some articles that are relevant to PV mini grids. Articles 8 and 30 are relevant to the UNIDO project, especially to Project Component 3. Under Article 8, any installation below a fixed government threshold does not need to be regulated. However, it is unclear how this will exactly be interpreted under the implementation regulations of the legislation, as they are being drafted at this moment. These new and specific implementation regulations are to be specifically aimed at the promotion and regulation of renewable energy.

As it also became clear during the course of the UNIDO project, the new energy legislation created uncertainty regarding the status of the renewable energy generated by off-grid community based systems. Improving legislation on renewable energy, and specifically allowing for small, rural grids based on solar power, is essential for creating a more attractive opportunity for private investments in this field. Without positive enforcement of the government on renewable energy, opportunities for sustainable development of rural areas in Ivory Coast might be missed. The *Ministère du Pétrole et de l'Energie* urgently needs to create clarity in the status of renewable energy. During the evaluation field visit the Ministry showed a clear acknowledgement that such a state of uncertainty should not have been allowed to persist, and that this would be addressed as a priority.

***Relevance of the project***

Regarding the extent to which the project was relevant to national government's development priorities and policies, this was built into the project's design and approach.[6] Through the project's aim to aid the Ivory Coast government – the project's main counterpart organisation – with creating an effective, market-oriented policy and regulatory framework, it aimed to stimulate investments in renewable energy.

### 3.1.2 Relevance to country needs

Currently, electricity is produced in Ivory Coast in thermal stations and hydro power plants, which are the largest source of electricity for the country. However, a large part of the power generated here is exported through inter-connectivity of Ivory Coast's grid network with those of neighbouring countries in the region such as Burkina Faso, Mali, Ghana, Togo and Benin.[7] This electricity is not distributed to the rural areas of the country. Therefore, solar power could be an alternative source of energy production for Ivory Coast's rural areas, as the country has significant potential for solar energy. The International Renewable Energy Agency (IRENA) estimated that the country has a hypothetical potential to produce 103 TWh in solar PV.[8] "Solar

[6] The project's relevance to the needs of the ministries of Ivory Coast were mainly focussed in in Project Component 1 – "An effective, market oriented policy and regulatory framework to stimulate investments in RE" and Project Component 2 – "A portfolio of RE energy projects prepared for pilot PPP investments during and post GEF project".
[7] Othieno, H., Awange, J., *Energy Resources in Africa*, Springer New York, 2016, page 178.
[8] IRENA, *West African Power Pool: Planning and Prospects for Renewable Energy*, 2013, page 21.

energy is abundant in Ivory Coast, where the average solar radiation ranges between 4 kW h/$m^2$ per day (at South) and 6 kW h/$m^2$ per day (at North) with a daily sunshine time of 6 h."[9] The potential for solar energy is especially high in the rural northern part of the country, as the largest amount of sunshine and solar power potential is registered there.[10] The project was thus very relevant to the development needs of the rural areas of Ivory Coast, as was demonstrated during the field visit to Zanzan. This perception was supported in the feasibility studies conducted for 11 sites in Ivory Coast. In the Zanzan region, the project established the test PV facilities. The installation of solar mini-grids as a technical demonstration of the economic and social functioning of a PV mini grid also contributes in a sustainable manner, even if modestly, to achieving national targets of the full electrification of Ivory Coast.

The project is also **relevant to the national context from a wider economic and public finance standpoint**, as increased use of renewable energy sources for electricity generation and any longer-term reduction in fossil fuel imports (which represent one of Ivory Coast's largest import products)[11] would not only positively impact the country's energy security, but also positively affect its balance of payments and public finances.

### 3.1.3 Relevance to EU policies and programmes

Regarding the **extent to which the project was relevant to EC's operational programme strategies and to UNIDO's thematic priorities**, the project was relevant to the **EC's Global Public Goods and Challenges (GPGC) operational programme** and its strategies. In particular, it was relevant to the *Environment and Climate Change* strategic area of the GPGC, as it supports the transformation towards an inclusive green economy and the mainstreaming of environmental sustainability, climate change and disaster risk reduction.[12] The project has contributed directly to the expected result of inclusive green economy policy reforms that are currently underway in a number of partner countries. The project has also promoted the **development of local capacities**, in particular at in-country trainings organised by the project, where a variety of local stakeholders received training on the importance and functioning of the PV mini grids.

Moreover, the project was also relevant to the Sustainable Energy Strategic Area of the GPGC operational programme and in particular to the objective of 'improved access to modern, affordable, secure and sustainable energy and renewable energy as a key driver for poverty eradication and inclusive growth'. The project contributed to the EC's objectives, as it not only provided direct access to sustainable energy for the local villagers, but also promoted the use of sustainable energy in the country by aiming to show that there were socio-economic benefits to the PV mini solar grids.

The project also corresponded with EC priorities and programmes in its national cooperation with Ivory Coast under the **European Development Fund (EDF)** in the programme for the country. The project was especially relevant to Sect. 3 of the 2014-2020 National Indicative Programme (*Programme indicatif national pour la période 2014 – 2020)*, which deals with energy and aims to provide "A better geographic access to electricity of the population together with accessible prices and improved service. Increase of production and use of renewable energies, improving the energy efficiency and promoting the sustainable use of wood energy as

[9] Koua, B.K., Koffi, P.M.E., Gbahab, P., Touré, S., Present status and overview of potential of renewable energy in Cote d'Ivoire, in: *Renewable and Sustainable Energy Reviews*, Volume 41, January 2015, Pages 907–914.
[10] CIA World Factbook, at WWW https://www.cia.gov/library/publications/the-world-factbook/geos/iv.html.
[11] Imports are led by Crude Petroleum which represents 20.5% of the total imports of Cote d'Ivoire, 2014, at WWW http://atlas.media.mit.edu/en/profile/country/civ/.
[12] Programming Thematic Programmes and Instruments, Programme on Global Public Goods and Challenges 2014-2020: Multi-Annual Indicative Programme 2014-2017, p.37 at WWW <https://ec.europa.eu/europeaid/sites/devco/files/mip-gpgc-2014-2017-annex_en.pdf>.

primary source of energy in the short term for rural areas".[13] The UNIDO project, as well as its collaboration with the Akwaba project, has made a very direct and relevant contribution to these objectives through the demonstration sites and improved access to electricity in seven villages in Zanzan area.

### 3.1.4 Relevance to UNIDO policies and programmes

The project was also **relevant to UNIDO's thematic priorities, as it was relevant to UNIDO's mandate, objectives and outcomes defined in UNIDO's Programme & Budget, and its core competencies**. In particular, it was **relevant to UNIDO's mandate to eradicate poverty through inclusive and sustainable industrial development**. Firstly, it aided with the sustainable economic growth of Ivory Coast, one of the key goals of both UNIDO and GEF. By using environmentally friendly methods to develop rural areas, the project facilitates economic growth without negatively impacting the environment. Secondly, by creating or improving the connection of rural areas to a solar powered grid, the project has contributed to stimulating socio-economic development in the Zanzan area. The project's delivery of sustainable energy access in a remote rural area is also consistent with one of the UNIDO's main objectives of not only closing the gap between industrialized and developing countries, but also between urban and rural areas. Thirdly, the project has contributed to economic competitiveness, given its aims to strengthen policies encouraging the involvement of the private sector and to promote providing access to innovative and smart financial mechanisms. This enhances market access in rural areas, and allows people to provide a more competitive product, and thereby improve the resilience of the local economy.

The project is also highly relevant to the **UN Sustainable Energy for All** initiative. In particular is relevant to SE4ALL's first objective regarding universal access to modern energy services and to its third objective to double the share of renewable energy in the global energy mix. Furthermore, as the project also hoped to contribute to promoting PPPs, the element of multi-stakeholder partnerships was also integrated into the UNIDO project.

At the broader development level, the project directly contributes to the realisation of **the Sustainable Development Goals,** particularly SDG 7 (ensuring sustainable energy), SDG 9 (building resilient infrastructure) SDG 10 (reducing inequality), SDG 11 (making human settlement resilient and sustainable), SDG 13 (combatting climate change), SDG 15 (halting land and forest degradation) and SDG 17 (strengthening global partnership). Given that UNIDO is mainly spearheading SDG Goal 9, the project is highly relevant for the wider objectives of UNIDO.

### 3.1.5 Participatory identification processes

The extent to which a participatory project identification process was instrumental in selecting problem areas and national counterparts is high and is one of the strengths of the project. From its design and preparation phase, the project included the government and the local villages where the technical demonstrations are built. Interviews with local persons in the Zanzan area showed that the local communities were exceptionally pleased with the progress made by the technical demonstration, having received training on the management and maintenance of the PV installations. **The project showed transfer of knowledge**, which increases the sustainability of the project, thus ensuring the long-term needs of the local communities are met. The project also aided with the identification of the potential sites for PV mini

[13] République de Côte d'Ivoire – Union Européenne, 11ème Fonds Européen de Développement, Programme indicatif national pour la période 2014-2020. "…l'accès des populations à l'électricité, avec une meilleure répartition géographique, une qualité de service améliorée et un prix accessible, à accroître l'utilisation des énergies renouvelables dans la production d'électricité, à améliorer l'efficacité énergétique et promouvoir la gestion durable du bois-énergie comme principale source d'énergie dans les zones rurales à court terme" pg. 11. http://ec.europa.eu/europeaid/sites/devco/files/nip-cote-d-ivoire-20140619_fr.pdf

grids due to the feasibility studies conducted. Even though the project did not implement the electrification process in the villages selected during the PPG phase, the studies still included the wishes of the population within them. Furthermore, the project aimed to raise awareness in general of the need for RE and PV mini grids.

Regarding **national government participation**, this has been far more mixed, with recurrent delays experienced in national government responses to the UNIDO requests for assistance, support and decisions. Moreover, as mentioned, the government was not able to mobilise its foreseen financial contribution during the project lifetime, even if this contribution has now been confirmed for this year.

#### 3.1.6 Quality of project design

The project has demonstrated that it is able to take into account the changing environmental conditions and has reformulated the project results framework in response to changing needs and realities. This can be seen for example concerning the challenges of obtaining the funding, which meant that the project management team had to ensure the highest impact, efficiency and sustainability of the project under quite different circumstances than originally foreseen. In light of this, the altered project design, operation and goals were commendable and reflected the quality of the project management. **The extent to which the project design properly addressed the problems at hand is satisfactory. Furthermore, in its new form, the project aimed at comparing the community-based method from the EU's Akwaba project in Zanzan to the market approach originally chosen by UNIDO.** This would be interesting to monitor further, as this may influence the design of future UNIDO and EU projects.

**The project's intervention logic was formulated based on the logical framework (project results framework)** provided with the ToR to this evaluation. The project design shows relevance to the needs and constraints of the country. Furthermore, **the project intervention rationale** supports the obtaining of the project's intended results, as well as the modified expected results, after the decision was made to co-operate with the Akwaba project funded under the EC's Energy Facility Programme.

### 3.2 Project effectiveness

**Section Guide**

*This section provides an overview of the effectiveness of the project:*

- *Overview project activities – Planned vs. actual (Section 3.2.1)*
- *Project results (Section 3.2.2)*
- *Work carried out in Zanzan demonstration projects – Overview (Section 3.2.3)*
- *Field mission findings – Zanzan demonstration project (Section 3.2.4)*
- *Progress on developing national policy & regulatory framework (Section 3.2.5)*

#### 3.2.1 Overview project activities – planned vs. actual

The project plan listed several activities in detail, clearly stating which Component outcomes and outputs to which they contributed. Furthermore, the project plan also listed the expected date of the project activities. Despite the challenges, many of the original activities were carried out with no or only minor alterations to the original planning. Additionally, the co-operation with the EU-Akwaba project ensured the project's overall success. The table below presents an overview of the planned activities against the actual activities carried out.

Table 3.2 – Expected versus actual activities

| PC No. | Planned Activity | Expected Date | Actual activity |
|---|---|---|---|
| 1.1.1 | Review existing policy and regulatory framework and prepare a strategic framework for renewable energy development especially focusing on private sector involvement in rural areas under public-private partnership models. | 5 months after start. | Executed as planned. |
| 1.1.2 | Strategic framework is presented to local authorities for consideration. | 5 months after start. | Executed as planned. |
| 1.2.1 | Consultative and awareness building workshops to ensure that main actors of the energy sector and renewable energy subsector in particular understand their role and act in an effective manner for the promotion of a renewable energy market. | Activities 1.2, 1.3 & 1.4 will be bundled together during selected timeframe. | Awareness rising mainly took place through the pre-feasibility studies conducted under PC2 and during the RE panel organised in 2014, which was attended by government stakeholders, representatives of international organisations and the private sector. |
| 1.2.2 | Document outlining the institutional framework is developed and widely disseminated. | See activity 1.2.1. | Executed as planned. |
| 1.3 | Awareness and capacity building workshops for local financial service providers. | See activity 1.2.1. | Congress organised by UNIDO for Ministers, private sector enterprises and international investors, as well as the development banking sector (African Development Bank). |
| 1.4.1 | Formulating a financial mechanism promoting PPP. | 18 months after the start. | Executed as planned. |
| 1.4.2 | Awareness and capacity building workshops for public officers, project developers, equipment suppliers, etc., on the RE investment opportunities in facilities providing access to energy. | See activity 1.2.1. | Congress organised by UNIDO for ministers, private sector enterprises and international investors, as well as the development banking sector (African Development Bank). |
| 2.1.1 | Identifying and prioritizing RE projects, determining the technical and economic potentials, and identifying potential end users. | 8 months after start. | Executed as planned. |
| 2.2.1 | Preparing pre-feasibility studies for the installation of 10 viable RE systems by investors and prioritizing them following a pre-defined set of criteria focusing on productive uses and economic development. | 9 months after start. | Pre-feasibility studies for 11 sites realised. |

| PC No. | Planned Activity | Expected Date | Actual activity |
|---|---|---|---|
| 3.1.1 | Preparing technical / financial feasibility study for the selected sites to be constructed as pilot demonstrations and identifying the appropriate managing modality of the energy production enterprise. | 6 months after start. | Amended after co-operation with EU to execution in Zanzan, as the Akwaba Foundation had already selected sites for the technical demonstration, where UNIDO stepped in. |
| 3.1.2 | Preparing a turnkey subcontract for designing, constructing, installing equipment, constructing transmission and distribution lines, training a team of operators and undertake special campaign to raising the awareness of beneficiaries and other local stakeholders. Undertake international bidding process following UNIDO rules and regulations; select the technically and commercially acceptable best offers. Award the subcontract. | 10 months after start. | Amended after co-operation with EU to Zanzan, as now the tender process was carried out with Akwaba. |
| 3.2.1 | Civil work and equipment procurement – progress reports. | 15 months after start. | Amended after co-operation with EU to Zanzan. |
| 3.2.2 | Installation of equipment, transmission and distribution lines, start up testing and commissioning-progress report. | 25 months after start. | Amended after co-operation with EU to villages in Zanzan, but otherwise executed as planned. |
| 3.2.3 | Training of multidisciplinary team through on-job training on the issues of construction, commissioning, operation and maintenance & management-progress reports. | 28 months after start. | Amended after co-operation with EU to villages in Zanzan, but otherwise executed as planned. |
| 3.2.4 | Developing manuals and handbooks for operation, maintenance and management. | 29 months after start. | Amended after co-operation with EU to Zanzan. |
| 3.2.5 | Preparing as-built documents and final report. | 30 months after start. | Amended after co-operation with EU to Zanzan. |
| 3.3.1 | Training of local authority officers and interested private sector service providers-to-be through on-job training on the issues related to operation and maintenance & management. | 32 months after start. | Amended after co-operation with EU to villages in Zanzan, but otherwise executed as planned. |
| 3.3.2 | Toolkits and final report compiled and widely disseminated. | 32 months after start. | Amended after co-operation with EU to Zanzan. |

### 3.2.2 Project results

As mentioned before many activities were altered from the original project plan after the co-operation with the EU-Akwaba project started. However, that is not to say these activities did not take place at all or that they did not contribute to the successful outcome and outputs of the project.

Under ***Project Component 1*** *(Institutional, Policy and Financial Mechanisms)*, the expected outcomes included: a strategic framework for renewable energy development prepared and ready for adoption; an institutional framework for the renewable energy sector outlined/established identifying stakeholders, with their roles and responsibilities in promoting renewable energy based mini-grids clearly established; 3 seminars organised; 7 policy makers trained; 5 financial institutions staff and 5 representatives of private sector trained. Another expected outcome under this Project Component included a model for public-private partnership, including its structure, functioning criteria and fund flow conditions, and administrative unit defined and promoted as financial mechanism.

For ***Project Component 2*** *(Identification of Resources and Preparation of Feasibility Studies)*, the expected outcome was that project sites would be identified for the installation of viable renewable energy systems, and have them prioritized following a pre-defined set of criteria promoting productive uses. In addition, pre-feasibility studies for the 11 most promising would be also developed.

For ***Project Component 3*** *(Technology Demonstration and Creation of Awareness and Technical Capacities)*, the expected outcomes were that feasibility studies of photovoltaic-based mini grids power facilities would be prepared. In addition, seven pilot photovoltaic-based mini grids totalling 350 kW of capacity would be installed and operational. In total, it was expected that there would be approximately 1,750 electricity connections of households and small local businesses. In total, approximately 8,750 persons would be served by access to electricity. In addition, training of a team local authority officers and interested private sector service providers-to-be on operation, maintenance and management would also be provided.

The table below represents the project's overall outcomes and outputs and clearly indicates that even though the project's activities were changed, most outcomes and outputs were met. Outcomes 1 and 2 were mostly successfully realised; however, due to the lack of co-financing, not all stakeholder trainings could be executed as planned. The creation of a strategic framework for renewable energy development was one of the most important project outcomes, as it could potentially have a large effect on the legislation of Ivory Coast. Project Outcome 2.2 even exceeded the target set, as it carried out feasibility studies for 11 sites.

Project Outcome 3 was the most altered of the three Project Components, due to the lack of co-financing from the BOAD Banque. However, co-operation with the EU-Akwaba project ensured that the UNIDO project could demonstrate the technical possibilities of PV mini grids and thereby largely realise the outcome successfully. Within this project component, elements such as transfer of knowledge and creating potential for sustained impact were also successfully implemented. Because of this, the overall objective of the project to develop a market-based approach for improving the access to PV-based mini grids in rural areas was therefore largely successful.

Table 3.3 – Expected versus actual outcomes and outputs

| PC No. | Planned Outcomes & Outputs | Actual Outcome & Output |
|---|---|---|
| **1** | **An effective, market-oriented policy and regulatory framework to stimulate investments in renewable energy.** | The outcome of Component 1 was successful and executed according to the plan as presented in the project documents. |
| 1.1 | Strategic framework for renewable energy development is prepared and ready for adoption. | Output 1.1 was created by experts and prepared for the government of Ivory Coast. |
| 1.2 | Institutional framework for the renewable energy sector is outlined & established identifying stakeholders, their roles and responsibilities in promoting renewable energy based mini-grids. | Output 1.2 was created by experts and prepared for the government of Ivory Coast. |
| 1.3 | Local financial service providers aware of and have expertise in analysis and evaluation of the risks related to the investments on renewable energies, 3 seminars organized, 7 policy makers trained, and 5 financial institutions staff and 5 representatives of private sector trained. | Output 1.3 was realised through organising a high-level Renewable Energy Panel as part of the Investment Promotion Forum. However, due to the financial constraints, no stakeholders were trained. |
| 1.4 | Model public-private partnership formulated (PPP): its structure, functioning criteria and fund flow conditions, administrative unit, etc. defined and promoted as financial mechanism, in close interaction with the institutional structure and stakeholders are informed of this partnership model. | Output 1.4 was realised successfully as was indicated in the PIR 2014. |
| **2** | **A portfolio of renewable energy projects prepared for pilot PPP investments during and post-GEF project.** | Component 2 was well executed according to the objectives and a portfolio of possible PPP investments in renewable energy was delivered to the government of Ivory Coast. |
| 2.1 | Project sites identified for the installation of viable renewable energy systems and prioritised following a pre-defined set of criteria promoting productive uses. | Output 2.1 was successfully executed in co-operation with the government of Ivory Coast. |
| 2.2 | Pre-feasibility studies for the 10 most promising sites are developed. | Output 2.2 was executed successfully; a feasibility study was carried out in 11 sites. |

| PC No. | Planned Outcomes & Outputs | Actual Outcome & Output |
|---|---|---|
| 3 | **Reduced GHG emissions and increased access to rural electrification following increased awareness and technical capabilities of stakeholders to evaluate technical and commercial viability of photovoltaic-based mini grids and reduced barriers to development of businesses in renewable energies.** | Component 3 was altered most after UNIDO started their partnership with the EU-Akwaba project. However, the overall objective of this PC was still achieved, as the project promoted PV solar grids by demonstrating their technical capability. After the project is completed, the commercial viability and PV solar grids as an economic stimulant will be monitored. |
| 3.1 | Feasibility studies of photovoltaic-based mini grids power facilities prepared. | Output 3.1 was changed after the co-operation with the EU-Akwaba project, as the Akwaba Foundation had already selected sites for the technical demonstration. |
| 3.2 | Seven pilot photovoltaic-based mini grids totalling 350 kW of capacity installed and operational. | Output 3.2 was for the most part successfully achieved, with project co-operation with the EU-Akwaba project resulting in seven villages provided with a PV mini grid, with total capacity installed at 215 KW. |
| 3.3 | In total, approximately 1,750 electricity connections by 2014 of households and small local businesses. In total, approximately 8,750 persons served by access to electricity. | In the Zanzan region, around 728 households were connected to the PV mini grids, providing electricity for around 4,000 persons. Output 3.3 was therefore mostly successfully achieved. |
| 3.4 | Training of a team of local authority officers and interested private sector service providers-to-be on operation, maintenance and management provided. | Output 3.4 was amended by the co-operation with the EU-Akwaba project. However, transfer of knowledge still was an important component of PC 3. Instead of service providers, the project trained local villagers as technicians. |
| **4** | **Monitoring and evaluation** | Currently implementing. |
| 4.1 | Monitoring and evaluation plan has been implemented. | Currently implementing. |
| 4.2 | Publications on lessons learned and toolkits have been produced and disseminated. | For future implementation. |
| 4.3 | Special documentaries on the pilot projects prepared and widely disseminated. | For future implementation. |

### 3.2.3 Work carried out in Zanzan demonstration projects - overview

The section below provides a summary overview of the Zanzan demonstration projects implemented during the project's duration, as well as the core problem they sought to address. In terms of **capacity building of local stakeholders at the demonstration sites in Zanzan, the project produced good results**. People in various stakeholder groups, including women and youth, in the seven villages in Zanzan have received training on various aspects of the maintenance and working of the PV solar grids installed in their villages.

The table below provides a summary of the implementation of the Zanzan cooperation and construction and deployment of the PV mini grid installations.

Table 3.4 – Timeline actions in Zanzan Co-operation

| Date | Action | Results |
|---|---|---|
| 2014 | BOAD has not mobilised the co-financing. | UNIDO searched for alternative sources of funding for Project Component 3 – the technical demonstration. |
| 23 June 2014 | Co-operation with EU-Akwaba officially announced to the *Ministre du Pétrole et de l'Energie.* | UNIDO project started co-operation with the EU-Akwaba project in Zanzan, becoming directly responsible for the financing and oversight of the technical demonstration in three villages in Zanzan, as well as partner to the entire project the in seven villages. |
| 13 November 2014 | UNIDO representatives visit the three villages in Zanzan. | The process for the procurement of services for the technical demonstration was discussed with the Akwaba Foundation. |
| February/ March 2015 | CRTS/WAREX selected for the technical demonstration. | The technical demonstration in the villages in Zanzan was initiated. |
| 2015 | Start of the building of the facilities for the technical demonstrations. | Though experiencing a delay, the building of the facilities happened to the satisfaction of the stakeholders. |
| 21 August 2015 | UNIDO sent documents to *Ministre du Pétrole et de l'Energie* regarding the co-operation with Akwaba in Zanzan. | Co-operation with the EU-Akwaba project officially announced. |
| First half 2016 | The finalisation of the technical demonstration. | Functioning PV mini grids and access to electricity in the seven villages in Zanzan ensured. |
| Second half 2016/Early 2017 | Evaluation of the impact on the stakeholders, especially their economic prospects. | The results of the project will need to be monitored further in order to assess their impact. Furthermore, it would be beneficial to conduct a comparison between the Akwaba community-based approach and the UNIDO market-based approach, as presented in the feasibility studies to the Government of Ivory Coast for the promotion of PPPs. |
| | | |

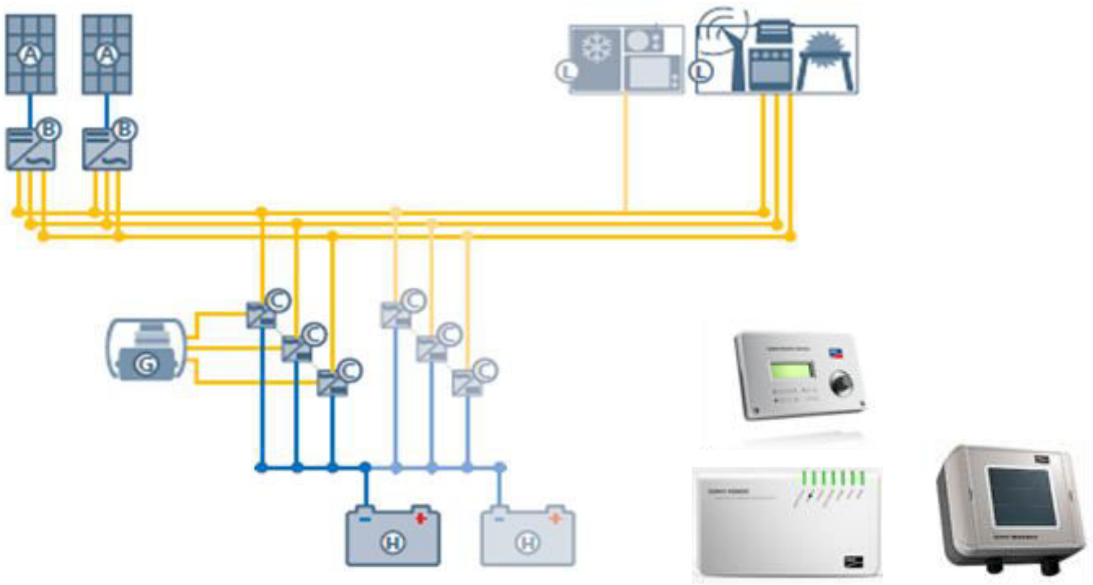
The following sections describe briefly the pilot projects visited during the evaluation field visit programme.

### 3.2.4 Field mission findings – Zanzan demonstration project

From the outset of the project in Zanzan,[14] there were no electrification plans foreseen for the next 10 years in the villages involved in the project. Moreover there was no intention foreseen to link the independent micro-grids to the national grid, due to a loop in the national legislation, nor a practical plan in development to cover this gap. This project offered the possibility to showcase how to integrate the micro-grids into the national grid system and how to provide a suitable management form of such integration, carried out by the end beneficiaries (local populations). This last point is still in discussion with the countries authorities[15].

In this context, the renewable energy mini-grids offered the opportunity of considerably improving the development perspectives for these villages, under the project Component 3 (*Technology demonstration and creation of awareness and technical capacities,* where the largest part of the external co-financing was supposed to be directed). During the day, the networks' inverters are fed their production directly from solar panels to the power grid or batteries. During the night, the inverters produce energy from batteries, which are filled during the daytime. The installed capacity allows the machines a peak power of about 60kVA, which is largely sufficient for the needs of the craft industries of the villages. The workings of the technical demonstrations can be found in the figure and table below.

Figure 3.2 – Schematics of the technical demonstration



It should be mentioned that the solar production varies from 20 to 40 kWp[16] according to the installed grid size, which is correlated to the size of the village. Furthermore, Engine Generators with power capacity between 30 to 45 kWp were installed as a back-up support in case of prolonged weak solar energy production. The design of the solar power production capacity of the facilities has considered an average increase of 1% per year of the population. Furthermore, it was left room on the roofs of the houses were the solar panels were installed, in order to install more panels in the future in case of a higher demand of energy.

[14] "Promoting Renewable Energy-Based grids in Rural Communities, for Productive Uses in Côte d'Ivoire"
[15] The Ivory Cost would like to be represented by a private company of the CIE (Ivory Coast electricity company) for manging the electricity network.
[16] The technical in formation on the capacity of the installation is available on page 5 of the field visit report, Annex 4.

Table 3.5 – Overview capacity by village

| Village | Capacity (W) | Number of PV | Total Capacity (W) |
|---|---|---|---|
| Zamou | 260 | 150 | 39000 |
| Kakpin | 260 | 150 | 39000 |
| Gansé | 260 | 118 | 30680 |
| Kkakpé | 260 | 104 | 27040 |
| Gromandira | 260 | 104 | 27040 |
| Bodou | 260 | 104 | 27040 |
| Solokai* | 260 | 78 | 20280 |
| **Total** | | | **210080** |

As can also be seen in the report for the field mission to Zanzan (see Annex 4), the installation plans for the seven villages were the in principle the same, with only a variation on the power peak of the panels installed, the capacity of the batteries and the size of the actual building facility of the energy house.

Table 3.6 – Steps of the technical demonstration workings

| No. | Step (some steps are depicted in the schematics above) |
|---|---|
| **A.** | Photovoltaic solar panels (265Wp): PV solar parks are 30-36kWp dependent on the size of the town. |
| **B.** | Network injection inverter: These are two inverters of 20kW ensure networks injections with a total capacity of 40kWp. |
| **C.** | Chargers: This includes two times three inverters with a peak power of 5500W and a peak power of 33kW at night. |
| **D.** | Remote control: This changes the devices' settings to different inverters easily. |
| **E.** | WebBox: This is a data-logger to record the different measures of production, consumption and climate data. |
| **F.** | Sensorbox: This is a sunshine and temperature sensor. |
| **G.** | Generator: This can generate between 30 and 45 kVA. |
| **H.** | Batteries: These have power between 3850Ah and 1950Ah, depending on the village. These are OPzS batteries with liquid electrolyte. They use technology designed to resist heat to improve their lifespan. |
| **I.** | Sun cluster: These are used to enable automatic management of a paralleling system inverter. |
| **J.** | Control panel: This is equipped with different systems of protection for the energy system. |
| **L.** | Consumers of different levels: These include public, professionals and individuals. The PV grids also powered the streetlights. |

The solar panels were installed on buildings built for the occasion, defined as 'homes of energy'. The work on the technical demonstrations can be divided into four main parts: i) the construction of the 'homes of energy', ii) the installation of streetlights, iii) the construction of the electrical network, and iv) the construction of the solar panels. The 'homes of energy' include a lobby to receive people and for hosting events.

The size of the lobby is dependent on the installed capacity of solar panels and therefore the available space. The buildings consist of four distinct parts: a room for the electronics (inverters, etc.), a room for the storage of batteries, a room for the generator and a room for community management meetings. The electrical grid wiring has the same characteristics as the wiring of the national network. This heightens its sustainability, as it can simply be connected when the sites are connected to the national grid. Please see below a photo of the exterior of a 'home of energy':

Figure 3.3 – Project Site Installation - A 'home of energy'

The electrification process tendered was won by the Italian consortium JV Warex Srl - CRTS Spa (Warex). During the field mission, the representative of Warex in Ivory Coast and the technicians of Aphelion, the subcontractor, showed solid knowledge of the project, PV mini networks and their installation and inverters settings. Warex facilitated knowledge transfer to the local communities on the electrification process and the technical aspects of the PV installations via 'learning by doing' training. During the installation phase of solar systems, there were several challenges to the installation process caused by the unavailability of imported equipment. Acquiring administrative clearance for the imported materials was a slow and tedious process, as well as the challenges with getting the equipment through customs. For the future, a solution could be for the installation company to purchase the equipment in one batch, as this would create a single customs clearance, not only limiting expenses in economic terms, but also saving time and administrative challenges.

The field mission to Zanzan revealed high levels of local stakeholder satisfaction with the new installations. Moreover, stakeholders underlined their satisfaction with the highly participative manner in which they had been consulted, as well as the level of awareness-raising, discussion and capacity building that had been carried out by the project team. The construction of the 'homes of energy' had been a participatory process, stimulating a sense of local ownership, as well as minimising the cost of the construction. The villagers contributed to the welcoming and housing of the technicians, the construction of the foundation for the network poles and streetlights (mainly by the village youth), the drawing of water during the building construction phase (women), and the installation of the panels and batteries (villagers trained as technicians).

The villagers, as end beneficiaries, are responsible for **the technical management, as well as the social and financial management of the facilities**. Regarding the **technical maintenance** of the facilities, three distinct maintenance levels were created: i) the basic and daily maintenance, carried out by a trained local supervisor in the village; ii) the preventive maintenance, performed by local technicians grouped in an association for the mini-networks; and, iii) the specialised maintenance, carried out by local technicians or by an outside company if the maintenance should be technically complex and sensitive. These three levels of maintenance are key for ensuring optimal performance of the facility and have been further described in the table below.

Table 3.7 – Levels of maintenance

| Level | Tasks |
|---|---|
| **First level: daily supervisor** | The daily supervisor ensures the cleaning of the solar panels during the dry season and runs a parameter check to ensure proper functionality of the PV installations. |
| **Second level: local technical association** | There is one association of technicians for the seven villages. The association is responsible for the maintenance of all PV mini grids in the villages. |
| **Third level: specialised maintenance** | Some technicians were found to be more suited for specialised technical maintenance, due to their prior educational level. Truly specialised maintenance will occur by an external technician as contracted by Akwaba. |

**The administrative management** has been organised into a Local User's Organisation and a Monitoring Committee. Every local association of users across each of the seven villages is composed of 10 members, designed to ensure equal representation of different village groups. It consists of a chairperson, a vice chairperson, a secretary responsible for the general administration tasks and the contract with users, a treasurer who collects the fees from the users, the daily supervisor and his deputy, a women's representative, a men's representative, a youth representative, and a business representative.

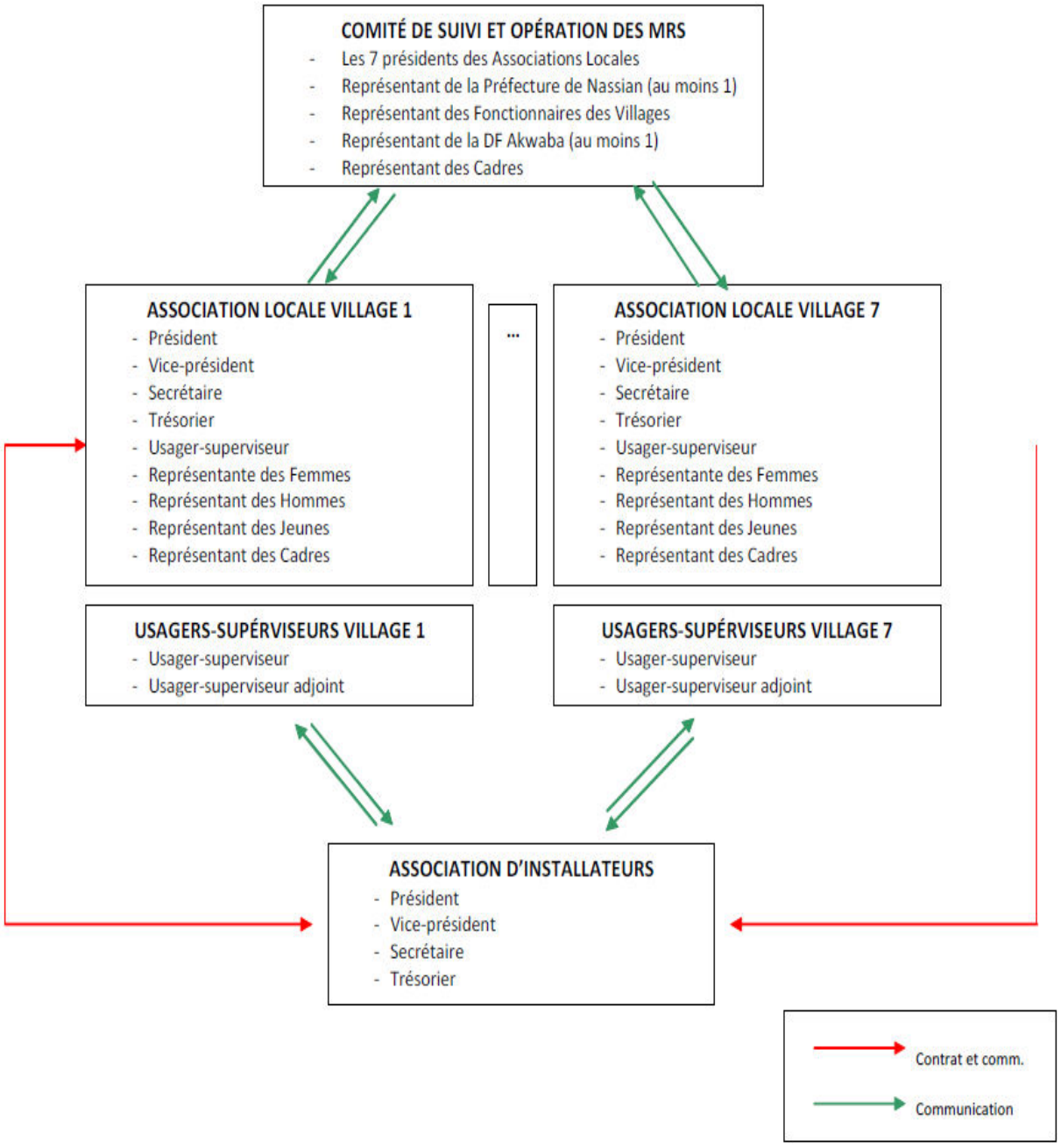
The role of these seven local associations is to ensure the proper functioning of the electrical service, the calling of meetings for decision making when changes to the 'homes of energy' are desired, and the informing of the local community of those decisions. The Monitoring Committee consists of the chairpersons of the seven local associations, a representative of Akwaba, a representative of the business/workers, two representatives of the local authorities, and a village official. The duties of the Monitoring Committee are to monitor and evaluate how PV mini grids are functioning after the end of the project. This is to validate assumptions of the project, ensure that the technical and economic limits of the systems are observed, and monitor the management of eventualities that may have a negative effect on the functioning of the PV mini grids. The flowchart below presents the management of the PV mini grids.

The **financial management** of the PV mini grids is also managed by the two committees. Two separate bank accounts have been created: i) a blocked account, only to be used for the replacement of major equipment (such as replacement of the batteries after 15 years) and unexpected maintenance; and, ii) an open account, used for the daily management of the local association and the overall system (such maintenance of the 'homes of energy' and facilitation of the work of the local technicians). For the withdrawal of funds from the open account, three signatures of the local association of users are required; for the withdrawal of funds from the closed account, the approval of the Monitoring Committee is necessary.

Another important aspect, also related to the **financial impact of the village** but for consumers, is the community financing of the project. Before the technical demonstration of the project commenced, a preliminary study was conducted to determine the tariff levels that could be afforded by the Zanzan villagers.

One of the problems and risks vis-à-vis the financial component of a project of this kind in a rural environment is the uncertainty of villagers' abilities to pay the monthly fee, as their income is dependent on many factors and could vary from month to month. Therefore, the project chose prepaid rates that are known in advance. After a great harvest, which is a major source of income, beneficiaries may pay their dues for several months until the next harvest.

Figure 3.4 – Overview of the management of the technical demonstrations



Furthermore, it should be emphasised that a contributing factor for the strong results obtained with regard to the Zanzan mini-grid demonstration sites has been the well-designed set of different subscription options from which local villagers may choose. This has allowed villagers to choose the tariff level that not only best matches their capacity to pay, but also their electricity needs. To determine the power to be installed per household, a preliminary study examined how many kWh each beneficiary would require and could afford. Villagers could choose between the *Economic Rate* (750F for 8kWh per month), the *Average Rate* (1500F for 17 kWh per month), the *Comfort Rate* (3000F for 33kWh per month), the *Grand Comfort Rate* (5250F for 59 kWh per month), and the *Shop Rate* (5250F for 59 kWh per month). The rates for religious centres, youth centres, social halls and gas stations were also determined beforehand. These figures are also presented in the figure below.

Figure 3.5 – Overview of the rates per kWh installed

| TARIF | NOM | ÉNERGIE MISE À DISPOSITION EMD (kWh/mois) | Frais (FCFA/mois) | Puissance Nominale (W) |
|---|---|---|---|---|
| ECONOMIQUE | T8 | 8 | 750 | 500 |
| MOYEN | T17 | 17 | 1500 | 500 |
| CONFORT | T33 | 33 | 3000 | 500 |
| GRAND CONFORT | T59 | 59 | 5250 | 500 |
| BOUTIQUE | T59 | 59 | 5250 | 500 |
| CENTRE RÉLIGIEUX | T33 | 33 | 3000 | 500 |
| FOYER DE JEUNES | T67 | 67 | 6000 | 1000 |
| SALLE SOCIALE | T100 | 100 | 9000 | 2000 |
| STATION POMPAGE | T67 | 67 | 6000 | 2000 |

As became clear during the evaluation field visit, the majority of villagers subscribed to the *Average Rate*, with the *Comfort Rate* being the second choice. A detailed overview of the ranges chosen can be found in the table below.

Table 3.8– Overview of rates chosen per village

| Village | Zamou | Solokaye | Kapé | Kakpin | Gansé | Boudou | Kromambira | Average |
|---|---|---|---|---|---|---|---|---|
| Economic rate | 8 Hh (6%) | 3 Hh (4%) | 10 Hh (13%) | 20 Hh (14%) | 15 Hh (12%) | 34 Hh (44%) | 20 Hh (19%) | 16% |
| Average rate | 47 Hh (36%) | 31 Hh (46%) | 21 Hh (27%) | 80 Hh (55%) | 21 Hh (17%) | 30 Hh (38%) | 68 Hh (63%) | 40% |
| Comfort rate | 31 Hh (24%) | 26 Hh (38%) | 29 Hh (37%) | 24 Hh (17%) | 6 Hh (5%) | 4 Hh (5%) | 10 Hh (9%) | 19% |
| Grand Comfort rate | 30 Hh (23%) | 5 Hh (7%) | 10 Hh (13%) | 11 Hh (8%) | 50 Hh (41%) | 5 Hh (6%) | 8 Hh (7%) | 15% |
| Shop rate | 13 Hh (10%) | 3 Hh (4%) | 9 Hh (11%) | 10 Hh (7%) | 29 Hh (24%) | 5 Hh (6%) | 2 Hh (2%) | 9% |
| Total | 129 Hh | 68 Hh | 79 Hh | 145 Hh | 121 Hh | 78 Hh | 108 Hh | |

The **development factor** was considered during the design of the installations, as it took into account local needs such as a mill, domestic refrigeration, and the possibility to use light electrical equipment, such as hairdressing equipment in hair salons or electrical tools used by blacksmiths or carpenters. During the course of the project, the villagers spoke of **their need for electricity for several purposes**, including i) street lighting; ii) inside household lighting; iii) television connection and access to information; iv) conservation of fresh water (e.g. in a communal refrigerator); v) refrigeration and freezer capability for core livelihood produce such as fish (e.g. for fishing villages close to the Comoe river); and vi) electricity to power income generating activities, such as mills for yam and cereal production.

Most people in the villages are dependent on agriculture, mainly on the farming of yams and cashews. The villages also produce cereals, while one village near the river is dependent on fishing activities. Having electricity to power mills for producing cereal is particularly important for local villages in the Zanzan region, as this has a significant labour saving impact in the production of cereal. Before the villages had access to electricity, women in the villages ground the cereal by hand or sold the raw materials without adding economic value themselves. Now that there will be access to an electrical machine, the output of crushed grain can be increased and the cereal can be better preserved; this can thus bring a higher profit, as it now becomes a processed good.

Given the new possibilities for the refrigeration of fresh foodstuffs, trade of these more perishable goods between the villages can be improved. However, during the field mission, one of the women representatives indicated the need for improved transportation between the villages in order to improve trading. Currently, travelling between the villages is challenging, limiting villagers' abilities to trade with people from other communities. Better travel options could spread the impact of the project to neighbouring villages and further stimulate economic development of the Zanzan region.

### 3.2.5 Progress on developing national policy & regulatory framework

A key part of the project objectives under Project Component 1 was to stimulate the government to adopt a regulatory framework that supported investments in renewable energy. According to the project documents, "this project component aims at strengthening the policies and regulatory mechanism to effectively promote and support market based development through measures encouraging public-private sector partnership and smart financial mechanisms."[17]

On the policy segment, as briefly mentioned in the section 3.1.1 "***Relevance to National Policy and the National context"***, the new *Code de l'électricité* in 2014 replaced the old legislation on electricity but does not directly address implementing regulations on renewable energy. However, there are some articles that are relevant to PV mini grids, such as the Articles 8 and 30, which are relevant to the UNIDO project, especially to the technical demonstration under Project Component 3. Under Article 8, it mentions that any installation below a fixed government threshold does not need to be regulated. Nevertheless, it is necessary to mention here that the interpretation of the regulations by the legislation, is still not clear as they were only been drafted at the moment of this evaluation. It is hoped that the recommendations made by UNIDO under Component 1 also play a role through another EU project aiding with the drafting of the legislation.

On the public-private partnership, this project has consistently involved government stakeholders in the preparation of the project, the selection of the sites, the implementation of the project and in particular the technical demonstrations. Nevertheless, the project documents indicate that the project partners did not agree on some points, such as the implementation method of the technical demonstration in Zanzan, whose

[17] UNIDO, "Request for CEO Endorsement/Approval", 2011, p. 9.

status is unclear under the new energy legislation that was not in place at the start of the project. However, the project documents do indicate that there was continuous dialogue with the government. During the field visit, in the meeting with the *Ministère du Pétrole et de l'Energie*, the Ministry showed a clear perception that they should as a priority regularise the legal status of the Zanzan sites.

The 11 feasibility studies carried out in the project are promising for the development of renewable energy. However, it is unclear what progress the government is making on the implementation of the feasibility studies, as they are awaiting the outcome of the implementation regulations of the new energy law. The future impact and results of the feasibility studies will therefore depend on the outcome of the new legislation implementation regarding renewable energy, as well as the attitude of different government departments and the private sector on the creation of PV mini grids.

## 3.3 Project efficiency

**Section Guide**

*This section provides an overview of the following:*

- *Efficiency of project implementation and project management (Section 3.3.1),*
- *Implementation challenges (Section 5.2), and*
- *Project monitoring and reporting (Section 5.3).*

### 3.3.1 Efficiency of project implementation and project management

The project's efficiency is determined largely by the difficulties and challenges faced regarding the budget and co-financing shortages. It must be observed that for this project, there were many challenges that occurred outside of the direct control of the UNIDO management team. The reaction to this showed practical management skills in ensuring that pragmatic solutions were found. Regarding project co-ordination resourcing, the project reporting shows that UNIDO became aware of the lack of funding by the BOAD in 2014**.** The lack of funds from the BOAD meant that UNIDO had to adjust the project management, objectives and intervention logic accordingly.

**Project Component 1 – Institutional, Policy and Financial Mechanisms** was satisfactorily achieved according to the project documentation. The PIR 2014 from UNIDO showed that the project has completed a review of legislative framework, "offering [a] diagnosis of existing framework and recommendations of how to improve it to promote use of RE" and as well as the "development of business model."[18] UNIDO mentioned in the PIR that external parties frequently referenced these documents, which are currently also being used by the European Union-funded project aiding the *Ministère du Pétrole et de l'Energie* with writing the implementation regulations on renewable energy. Furthermore, UNIDO reports in the PIR to have organised a "high-level Renewable Energy panel as part of the Investment Promotion Forum in Abidjan, bringing together Ministers, private sector enterprises and international investors, as well as the development banking sector (African Development Bank)."[19]

[18] UNIDO, "Annual Project Implementation Report (PIR) Fiscal Year (FY) 2015 (1 July 2014 – 30 June 2015)", June 2015.
[19] Ibid.

As is indicated in the project documentation, **Project Component 2 - Identification of renewable energy resources and preparation of feasibility** was satisfactorily executed as planned. The project's PIR 2015 reports that 11 potential project sites were identified based on pre-selection by Government and that the pre-feasibility studies were completed.

As a consequence of the lack of funds mobilised by the BOAD, the diminished budget made it impossible to implement the technical demonstration in the sites selected during the PPG phase. Therefore, **Component 3 – Technology demonstration and creation of awareness and technical capacities** was modified to ensure the implementation of a technical demonstration. The co-operation with the EU-Akwaba project entailed UNIDO changing the methodology of implementation of the technical demonstrations of PV solar mini grids to villages in Zanzan by the Akwaba Foundation. **Therefore, the co-operation between EU and UNIDO was a strong solution for both projects; now, UNIDO-GEF would directly finance the technical demonstration in the three villages of Gansé, Bodou and Kakpin in the EU-Akwaba project, which suffered from a lack of funding.** At the same time UNIDO's co-operation with the EU-Akwaba project ensured the UNIDO project contributed to the implementation of a technical demonstration as per its Project Component 3. Through the EU-UNIDO co-operation, the seven villages in Zanzan (Zamou, Solokaye, Kapé, Kakpin, Gansé, Boudou and Kromambira) were provided with PV solar grids. These villages replaced the multiple sites that were selected during the PPG phase by the UNIDO project. EU support concerning the technical demonstration was crucial for UNIDO in order to complete Component 3.

According to the PIR 2015, UNIDO now contributed to "seven solar based mini-grids are being installed in the Zanzan region where the national electricity grid will not be extended to for at least the next 10 years."[20] During the evaluation team's visit to the Zanzan sites in the beginning of April 2016, the completion of the technical demonstrations of the PV solar grids was estimated to finish within the month.

After the change of partners and sites, the budget and expenses of the project were distributed as follows:

***Table 3.9 – Overview of project financing***

| Project component | GEF financing | | | Co-financing |
|---|---|---|---|---|
| | According to CEO endorsement | Adjusted amount | Disbursed up to February 2016 | Promised |
| 1. Institutional, policy and financial mechanisms | 17,000 USD | 126,328.69 USD | 124,732.29 USD | 30,000 USD |
| 2. Identification of RE resources and preparation of feasibility | 20,000 USD | 61,532.60 USD | 60,701.53 USD | 20,000 USD |
| 3. Technology demon-stration and creation of awareness and technical capacities | 752,464 USD | 566,201.37 USD | 550,101.49 USD | 727,000 USD |
| 4. Monitoring and Evaluation | 21,000 USD | 17,168.58 USD | 16,936.47 USD | 50,000 USD |
| 5. Project management | 53,227 USD | 92,460.36 USD | 92,462.90 USD | 50,270 USD |
| Total (in USD) | 863,691 USD | 863,691.60 USD | 844,934.68 USD | 877,270 USD |

[20] Ibid.

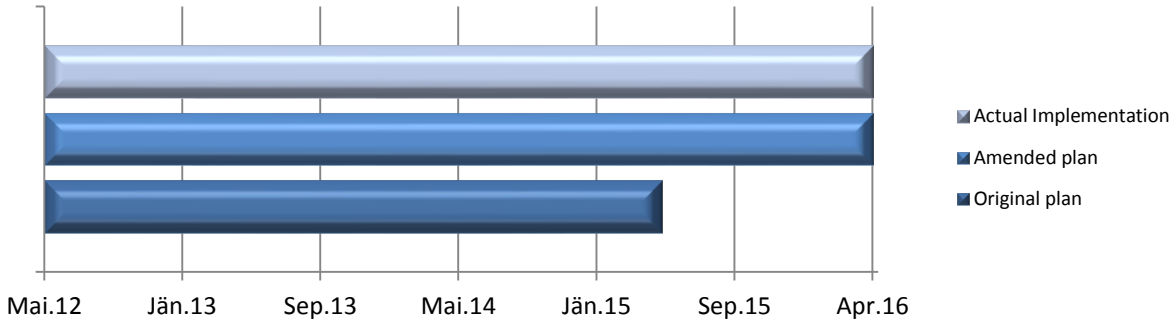
3.3.2 Implementation challenges

As can be inferred from the sections above, the project's implementation was beset with significant challenges and delays. The most important challenges identified include have been identified in the paragraphs below.

**One challenge identified included the obtaining funding when the co-financing partner BOAD did not mobilise the funds,** as previously discussed in the above. However, besides the reduced number of technical demonstrations, the co-operation also resulted in a divergence from the methodology originally presented. The actual outcomes of the project shift **towards the Akwaba community-based method and away from the more market-based orientation foreseen in the CEO Endorsement by GEF/UNIDO**. However, by choosing this solution, the project management displayed practical management reflections and enhanced the efficiency of the project in light of its situation.

**A second challenge identified included the time delays caused by the difficult and slow communication between the government of Ivory Coast and the UNIDO management team**. UNIDO indicated that it had sent several letters to the Government of Ivory Coast requesting approval of the project reports, especially to the *Ministre du Pétrole et de l'Energie* Adama Toungara for signing documents or for the approval regarding the co-operation with the EU-Akwaba project. On multiple occasions, it was indicated that the contact between UNIDO and the *Ministère du Pétrole et de l'Energie* was less than satisfactory, which caused delays in the project's implementation, therefore decreasing its efficiency. Furthermore, regarding the implementation of the technical demonstration in Zanzan, delays were experienced with obtaining and importing the materials into Ivory Coast. This resulted in the project being extended one year, thus lasting in total four years. Figure 5.2 below provides an overview of the timeline and delays.

Figure 3.6 – Project timeline and delays




While the extension was partly due to the delay in communication between UNIDO and the government and *Ministère du Pétrole et de l'Energie*, the above-mentioned challenges with obtaining co-financing also caused delays in the implementation of the action. The last technical demonstrations in Zanzan have been finalised and the project has finished.

The project documentation also indicates that the government had made little progress with the realisation of the feasibility studies since their completion in 2014. In a meeting on 27 March 2015 between UNIDO and Norbert N'Goran, *Directeur des Energies Nouvelles et Renouvelables* of the *Ministère du Pétrole et de l'Energie*, it was indicated that "*Le DENR a indiqué que le nouveau plan national d'électrification rurale (PRONER) en cours d'élaboration a défini la liste des localités de la Côte d'Ivoire programmées pour être électrifiées par mini réseaux. Cette liste de 28 localités ne comprend aucune des 11 localités ayant fait l'objet d'étude de préfaisabilité dans le cadre du projet. Par conséquent, pour la phase d'étude de faisabilité du*

*projet, il faudra mener des réflexions quant à la possibilité de choisir des localités issues de la liste précédemment évoquée*."[21] As the objective of the feasibility studies was to demonstrate market-based renewable energy, it is essential for the Government of Ivory Coast to actively support investment in renewable energy and to ensure the long-term impact of the feasibility studies by utilising the knowledge gathered during the project. The *Ministère du Pétrole et de l'Energie* has indicated they are currently waiting for the implementation regulations on the energy bill to see what actions will be undertaken.

**Another challenged face concerned unclear regulatory and legal framework.** At the start of the project, there was no legislation in place regarding renewable energy, as the energy legislation was several decades old. Project Component 1 aimed at strengthening the government capacity on renewable energy policies and regulatory mechanisms, in order to support market-based development through measures encouraging PPP and smart financial mechanisms.

As previously mentioned, during the course of the project, new energy legislation was introduced in Ivory Coast. In 2014, new energy legislation came into effect, under which renewable energy regulations were somewhat described. The details of the legislation on the specific implementation of renewable energy is still in development, which may affect the long-term impact of the technical demonstrations in the Zanzan region, the impact of the feasibility studies and the long-term value for money of the project.

### 3.3.3 Project monitoring and reporting

The project monitoring and evaluation design was all encompassing and was supported by quantitative progress indicators in order to assist with verifiable monitoring of the outputs and results. The project's annual progress reports were accurate and covered the most relevant topics to the project. Furthermore, several reports on field missions were also produced, creating together with the progress letters to the *Ministère du Pétrole et de l'Energie* a clear picture of the implementation and challenges faced by the project management team. Regarding monitoring long-term change or impact, the project is required by the GEF to have in place a Monitoring and Evaluation Plan. These activities were planned and budgeted for in the CEO Endorsement; however, as the project has only just concluded at the time of writing this report, the evaluation team cannot comment on the quality of the monitoring on the long-term impact. The evaluation team recognises the importance of the transition phase at the end of the project, for which monitoring plays an important role. This will be further discussed in Chapter 5 Current and Future Needs of Ivory Coast.

[21] UNIDO, "Compte Rendu de la réunion du 27 Mars 2015 sur le Projet de promotion des énergies renouvelables pour l'électrification décentralisée en vue de la création d'activités génératrices de revenus", 27 March 2015.

### 3.3.4 Project financing

The table below presents an overview of the project co-financing, as gathered from project documentation and during field interviews. The table further outlines the expected and actual budget provided for the project preparation and project implementation stages.

Table 3.10 – Overview project financing

| Source of (Co-)financing (Name of specific co-financiers) | Type of (Co-) financier | Type of (Co-) financing | Project preparation – CEO endorsement/ Approval stage | | Project implementation stage | | Total project preparation stage & Project implementation stage | |
|---|---|---|---|---|---|---|---|---|
| | | | Expected | Actual | Expected | Actual | Expected | Actual |
| GEF | Donor | Grant | 50,000 USD | 50,000 USD | 863,691 USD | 863,691 USD | 913,691 USD[22] | 913,691 USD |
| UNIDO | Implementing Agency | Cash and In kind | - | - | 150,000 USD | 150,000 USD + 195,904 USD | 150,000 USD | 345,904 USD[23] |
| *Ministère du Pétrole et de l'Energie*, Ivory Coast | National Government | Grant - Cash | - | - | 727,270 USD | - | 727,270 USD | - |
| BOAD | Financial Institution | Grant – cash | - | - | 3,000,000 USD | - | 3,000,000 USD | - |
| EU – Energy Facility | International Organisation | Grant – cash | - | - | - | 2,177,160 EUR | - | 2,177,160 EUR |
| CI-Energies | - | - | - | - | - | 128,000 EUR | - | 128,000 EUR |
| Government of Ivory Coast | National Government | Cash and In kind | - | - | - | 650,000 USD | - | 650,000 USD[24] |
| Villages Zanzan | Beneficiaries | In kind | - | - | - | 37,700 USD | - | 37,700 USD[25] |
| **Total co-financing** ( USD) | | | 50,000 USD | 50,000 USD | 4,740,961 USD | 4,907,896 USD | 4,790,961 USD | 4,957,896 USD |

[22] Project funding 863,691 USD + Project Preparation Grant 50,000 USD = 913,691 USD.
[23] UNIDO funding GEF Project 150,000 USD + UNIDO (YA Project – RE platform under the Investment Forum) 195,904 USD = 345,904 USD.
[24] Estimated contribution from the Government of Ivory Coast to the Investment Forum.
[25] Cost of land on which the energy houses were built 700 USD + Cost of in kind labour from communities in Zanzan 37,000 USD = 37,700 USD.

## 3.4 Project impact and sustainability and learning

**Section Guide**

*This section provides an overview of the project's impact and sustainability:*

- *Project impacts – Preliminary comments (Section 3.4.1),*
- *Impact on national renewable energy policy and renewable energy framework (Section 3.4.2),*
- *Impact on national and local awareness on renewable energy and capabilities (Section 3.4.3),*
- *Impact on the mini-grid installations in Zanzan (Section 3.4.4),*
- *Impact on gender equality and youth inclusion (Section 3.4.5), and*
- *Sustainability and prospects for sustained impact (Section 3.4.6).*

### 3.4.1 Project impact – Preliminary comments

Despite the challenges faced, including the repeated delays and the majority of the foreseen co-financing not being mobilised, the project has managed to produce a range of impacts, for which some are likely to have an important dynamic effect over time. One impact in particular includes the immediate impact and follow-on impact on the villages where the mini-grids have been installed under the cooperation between the EC/Akwaba project and the UNIDO project.

Some impacts, such as socio-economic and income generation, on villages are by nature dynamic; at this point, it is far too early assess these impacts, as most of the mini-grid installations have only become operational during the past weeks and months (during April – May 2016). Nevertheless, these impacts are important and are discussed in more detail below.

### 3.4.2 Impact on national renewable energy policy and renewable energy framework

The project's **impact on the national renewable energy policy and regulatory framework would appear to be potentially quite large.** Currently, the policy framework on the "Diagnosis Study of the Regulatory Framework" are currently being used by the European Union-funded project aiding the *Ministère du Pétrole et de l'Energie* with writing the implementation regulations on renewable energy. Some recommendations from the UNIDO report that have been discussed and taken into account during the writing of the implementation regulations include the creating of a special fund dedicated to the promotion of renewable energy, the drafting a definition and development of a scope of works for renewable energy operators (standards, equipment, conditions of access to national grid, etc), the developing a standard contract for renewable energy power producers, and the establishing of special tariffs for renewable energy projects. However, it is only after the implementation regulations for the energy legislation have been approved that it can become clear how large the impact of the UNIDO advice was.

The decision of the government to not select any locations from the feasibility studies carried out for the UNIDO project, as well as the very practical break on development of market-oriented renewable energy installations by UNIDO following the confirmation that BOAD co-financing would not be forthcoming, affected the impact. This has meant UNIDO, as well as other renewable energy and development

stakeholders like the EC, have not had the opportunity to analyse the different approaches to create PV mini grids in Ivory Coast.

However, it is more difficult to assess what indirect impact the feasibility studies, as well as the Renewable Energy Conference organised by the project in 2014, have had on national government thinking with regard to the future development of the national renewable energy policy and regulatory framework (it is also possible that the forthcoming renewable energy legislation might provide some insight into this). It is likely that the 2014 conference and discussions have made limited contribution to increasing policy and regulatory-related discussions on renewable energy, both within and amongst government ministries, as well as with the private sector, banking sector and civil society actors in attendance. The Renewable Energy Conference in 2014 included senior-level speakers from the *Ministère de l'Environnement et du Développement Durable* (including the Minister), the *Ministère du Pétrole et de l'Energie*, donor stakeholders (including the EU Delegation and the African Development Bank) and private sector representatives.

### 3.4.3 Impact on national and local awareness on renewable energy and capabilities

Regarding the **extent to which the project improved the participants' skills, knowledge and capacities at the local level,** the evaluation work suggests that the project has registered reasonably significant impact. However, the level of activity and impact at national level has been very limited, as the lack of co-financing meant that opportunities and plans for training beyond the 2014 Renewable Energy Panel had to be discarded.

As mentioned earlier, a number of elements from the EU-Akwaba project have meant that the Zanzan mini-grids implementation part of the wider project has had an **important and significant impact on local awareness levels, knowledge levels and management capacity levels.** These elements include the strong design of the community-based approach by the project partners; the extensive information, awareness-raising and consultation carried out in Zanzan during the preparatory phase; and, the significant focus on the provision of capacity building and technical training. UNIDO indicated "the experience of these mini grids will provide important lessons learned for the scale up of renewable energy based mini grids."[26] Furthermore, the project survey reports on the consultation carried out for the pre-feasibility studies also show a general positive attitude towards the installation of PV mini grids, a sentiment that was reiterated by the people of the villages in Zanzan where the technical demonstrations took place.

The project has also created a professional video, which will be useful as a communication, education and awareness-raising tool, and has already generated significant exposure for the project across business and financial press in Africa, Europe and the USA, The video demonstrates the direct benefits for the villages and villagers of access to modern energy, as well as the benefit for the wider country of renewable energy mini-grids, and is of high quality (the video is publically accessible and can be found through this weblink). The project has also carried out significant online promotion work through a range of LinkedIn groups (including: IDF - International Development Forum (13,487 members), The Renewable Energy Network (32,771 members), the Renewable Green Energy Professional Network (8,640 members), and the Sustainable Energy Development Group (9,699 members).

[26] UNIDO, "Annual Project Implementation Report (PIR) Fiscal Year (FY) 2015 (1 July 2014 – 30 June 2015)", June 2015.

3.4.4 Impact of the mini-grid installations in Zanzan

As mentioned above, regarding **the economic, social and health impact** of the project for the villages involved in the technical demonstration, it is difficult to draw definitive conclusions at this moment, given that the mini-grids have only been installed during the past months.

The evaluation findings from the field visit to the Zanzan region show **a number of important direct benefit**s **for local citizens arising from the mini-grids**, including the immediate improvement in livelihoods of local villagers. For example, having electricity to power mills for producing cereal is particularly important for these local villages, as this has a significant labour saving impact in producing the raw materials for making cereal. Before the villages had access to electricity, women in the villages ground the cereal by hand or sold the raw materials without adding value to the product themselves. Now that there will be access to an electrical mill, the output of crushed grain can be increased. Furthermore, the cereal can be better preserved and therefore bring a higher profit as it now becomes a processed good.

The refrigeration capabilities that are now possible due to the mini-grids represent another possibility for increased economic activity and income generation. It was noticed during the field visit that transport, trade and supply of fresh water trade is a strong reality in the villages. Not only will the refrigerator foresee the demand for fresh water in villages near the river, but it will also allow for the preservation of perishable foods, such as meat and especially fish, to be sold at the market. It is also important to note that besides the economic benefit, the refrigerator will also improve the food safety and security in the villages, making the inhabitants less dependent on procuring these goods from outside their villages and stimulate the sales of products from their own labour. It is therefore important that the wider socio-economic impact of the project be monitored closely after the installation of the technical demonstration has finished, as it has significant potential to improve the impact of the overall economic activities of the villages.

Based on the field visit work, the evaluation is positive that the mini-grid installations will not only deliver immediate benefits (such as saving labour and human energy for women in making and processing yam and cereals), but also that there will also be numerous dynamic or follow-on impacts (such as in increased time and human energy savings in lower added value tasks, as well as the knock-on effects of increased time for more productive activities and increased productivity). Other expected impacts will be movement of residents of other villages without access to electricity to these villages.

Regarding **financial sustainability prospects**, the well-designed set of different subscription options for local villagers to choose from (which allows them to choose the tariff level that best matches their electricity needs, use and capacity to pay), the significant capacity building and comprehensive financial management system, and the upfront subscription payment all combine to offer strong prospects for financial sustainability. For facilitating these opportunities, the project partners are again to be complemented. Similarly, regarding **technical sustainability prospects**, the establishing of a maintenance and repair system, as well as the training of local technicians, has also been a strength of the project, which aims well for a sustainable maintenance and operation of the installed mini-grid facilities.

However, as previously mentioned, it is too earlier to assess such impacts. It will be critical that the current post-project and transition periods are used to monitor extensively the nature and scale of impacts on both the Zanzan villages and their inhabitants, particularly with a view of using this information to feed into further design work and related impact assumptions or projections. Recommendations are provided in the evaluation regarding future monitoring and impact assessment work in the post-project period. Positively,

evaluation interviews with UNIDO staff have confirmed that they understand the importance of this and plan to ensure that adequate monitoring and impact assessment work is carried out.

### 3.4.5 Impact on gender equality and youth inclusion

As can be gathered from the project reports, the project **paid attention to the needs of vulnerable groups and gender equality**, although only marginal reference is made to promoting gender equality in the project proposal. During the technical demonstrations, several women were trained as technicians. However, during the field visit, the evaluation team noted that there were fewer female technicians than originally trained, as the women who were trained moved away from their villages. The evaluation team also noted that the promotion of economic activity and SMEs, and the provision of an electrically powered mill for the production of cereal, will affect women positively. In addition, the extra opportunities for schooling for girls during the evening, as well as the possibility to provide better (maternal) healthcare, could have a positive effect on the promotion of gender equality.

There are already important **direct benefits for young persons**, such as improved access to lighting (e.g. for evening study), access to outside information (radio and TV), health (refrigeration of water, foods and medicines), and prospects for parents to increase their income through improved productivity. Importantly, there is likely **significant scope to further increase the gender-related benefits, in particular in terms of increasing opportunities for women of different age groups**. An example of future design work could include a scaled up programme with a component on how to maximise support for women in creating income-generating activities and wider support for women entrepreneurship, such as the potential for local income and wealth generation for women. Similarly, future project design work could explore leveraging the use of the mini-grid buildings' infrastructure for a widened range of activities (e.g. for increased school and extra-curricular educational activities), which could also raise the education and general capacity of youth (students), including girls, and open up increased opportunities for their future.

### 3.4.6 Sustainability and prospects for sustained impact

The evaluation findings suggest a rather mixed picture with regard to the prospects for sustained impact, but with some important and positive sustainability findings.

**Prospects for sustained impact appear to be mixed at this point regarding the work and results from Component 1 and Component 2**, although it is difficult to provide any conclusive judgement in this area, as future developments might change this provisional judgement. Progress on national renewable energy policy and the national regulatory framework has been limited during the project's lifetime, but offers large potential for the future through the strategic framework being used for the writing of the implementation regulations of the new energy legislation.

The **institutional sustainability of the technical demonstrations in Component 3**, which was meant as a model for wider replication in other regions, is affected by the new legislation as well. At the launch of the co-operation with the EU-Akwaba project, there were no legal issues regarding the specific component of the project creating the self-management of PV mini grids by the beneficiaries. However, after the entry into force of the new legislation regarding the management of electricity in 2014, further analysis is required on the future of this project and the ability for other villages to implement PV mini grids according to this model. In this respect, the project has suffered from an environment of some regulatory uncertainty, as many other renewable energy stakeholders in the country. However, somewhat more positive, discussions with the *Ministère du Pétrole et de l'Energie* during the evaluation field visit

programme showed a clear acknowledgement that such a state of uncertainty should not have been allowed to persist, and that this would be addressed as a priority.

Beyond the question marks and uncertainty for the type of community-based mini-grids installed in the Zanzan region (and the uncertainty regarding other productive renewable energy installations), **the sustainability prospects for the Zanzan mini-grids appear very promising**. Sustainability prospects have been significantly enhanced by the good design and preparation work carried out by the Akwaba project partners, as well as the significant consultation and preparatory work. Another factor contributing to strong sustainability prospects is the wider bottom-up community-managed philosophy, the significant capacity building of local leaders and representatives in financial management, technical maintenance and repair, and wider self-governance of the PV solar grids.

Moreover, as mentioned above, there are numerous design, feasibility and testing actions that could be considered to further improve the sustainability of the mini-grid sites, in particular with regard to widening their value as demonstration sites in the widest sense – i.e. not just as technical demonstration sites but also with an enhanced development demonstration value. Examples of possible actions could include the utilisation of the buildings' potential for 'multiple functions' and not just as a technical demonstration. This would not only increase the value for money of the project, but also the potential sustainability and impact. The evaluation team found during the field visit that the buildings had lobbies that were utilised as a reception hall. This is a good practice, which could be expanded on, for example, by building the 'homes of energy' as a community centre,[27] where multiple essential utilities are brought together, such as:

- Water and sanitation facilities;
- Healthcare facilities;
- School buildings;
    - To train the technicians for the maintenance of the PV installations;
    - This could also contribute to gender equality, as it may be safer for girls to study in a lit building during the evening; and,
- Economic activities such as a market during the day, with the shade the building provides;
    - Also, part of the building could be used for housing a shop, hairdressers or other service provider, making the building permanently inhabited.

For the building to be developed into a community centre, landscaping and attention to greenery could be an important factor to stimulate the feeling of the building as the centre of the community. This would also improve environmental sustainability of the project.

Broadening the scope of the technical demonstrations would also help the project address **other areas relevant for the development of rural regions in Ivory Coast**, such as promoting agricultural activity, trade in agricultural products, SME development and promotion of craftsmanship and other forms of industrialisation. This could be beneficial to the sustainability of the PV mini grids and even promote the implementation of the feasibility studies in the form of PPPs. Therefore, a broader look at the challenges facing the rural regions in Zanzan might positively affect the sustainability.

The potential for the development of scaled-up models, and thus sustained impact within the government of Ivory Coast, depends on the way that the project addresses the current and future needs of the different

[27] Inspired by the Philips Community Light Centres, of which UNIDO is also a partner. For more information, please see: WWW http://www.communitylightcenters.philips.com/.

ministries in the government. To better ensure sustained impact, it could be recommended to involve more government departments that are historically favourable to this type of renewable energy project, such as the *Ministère de l'Environnement et du Développement Durable* or the *Ministère de l'Agriculture et du Développement Rural*. This is also discussed in Chapter 8 below.

This potential for the development of scaled-up models is important, as from a technical and economic point of view the project could be replicable on a wider level. The evaluation team believes that there are promising sustainability prospects for the pilot demonstrations, given the high level of community capacity building and local buy-in and ownership. Furthermore, actions should be taken to maximise this over the current post-project transition period. The follow-on and scaling up could be supported by a follow-on project foreseen under the EU's 11th EDF; Programme d'Appui à la Promotion des Energies Renouvelables et l'Efficacité Energétique en Côte d'Ivoire (PAPEREE-CI). Through this project, UNIDO could further build on the capacity strengthening it started during its first project. For PAPEREE-CI it is planned that 30 more settlements will be electrified by PV mini grids combined with a hybrid diesel installation. The implementation of this component of PAPEREE-CI could benefit significantly from applying the good practices and lessons learned from the current UNIDO project.

Furthermore, PAPEREE-CI is aimed at **another important sustainability factor; the significant interest identified across a number of other national government ministries and sectors in leveraging improved renewable energy capabilities**. It aims to support the development of energy efficiency and renewable energy within the offices of the government itself, as well as to build the capacity of the government officials developing and implementing the renewable energy policy through the country. This project has the potential to capitalise the interest of various ministries in renewable energy. Together with the forthcoming GEF funded UNIDO project "Sustainable industrial production in the cassava and other agro-food sectors through the use of renewable energy applications and low-carbon technologies", which will aim to promote low-carbon development for agro-food value chains in the cassava and other agro-food sectors (e.g. cashew, cotton), **renewable energy in rural areas can be used to spur socio-economic development in key sectors of the economy.** The momentum created from the UNIDO project under evaluation in this report could be developed further, adopting the lessons learned, and truly ensure a sustained impact on the governmental policy, private sector growth and rural development in Ivory Coast.

## 3.5 Overall project rating

This section presents the rating on the overall achievement of the project. The scores are ranging from Highly satisfactory (HS) to Satisfactory (S), to Moderately satisfactory (MS), to Moderately unsatisfactory (MU), to Unsatisfactory (U), and finally Highly unsatisfactory (HU). The ratings on sustainability are presented on a scale from Likely (L), to Moderately likely (ML), to Moderately unlikely (MU), and finally Unlikely (U). The ratings are presented in table format, with each rating being given a short explanation. However, for a more widespread explanation, please refer to the analysis of the project as presented above.

Table 3.11 – Overall project rating table

| Criterion | Evaluator's Summary Comments | Evaluator Rating |
|---|---|---|
| **Attainment of project objectives and results (overall rating)**, sub criteria (below) | Overall good, project design, effectiveness and relevance (highly) satisfactory | S |
| Design | Inclusive design, involving government and private sector | HS |
| Effectiveness | Not all results achieved, but also due to factors outside of project's control | S |
| Relevance | Very relevant to the needs of IC, both regarding rural development, industry and agriculture | HS |
| Efficiency | Good management of change in PC3 | S |
| **Sustainability of project outcomes (overall rating)**, sub criteria (below) | Overall positive, further cooperation with government needed to ensure sustainability | ML |
| Financial risks | Financial management of PC3 appears sustainable | L |
| Sociopolitical risks | Replication of success dependent on government, socially very successful | ML |
| Institutional framework and governance risks | Strong management of Zanzan project, execution of PPPs a risk as also clear government policy | ML |
| Environmental risks | Project outcomes contribute to better environment, further sustainability options to be explored (multi-functional constructions, etc.) | L |
| **Monitoring and evaluation (overall rating)**, sub criteria (below) | Overall good monitoring, potential to develop further to ensure sustained impact in 'transition phase' | S |
| M&E Design | Strong monitoring plan, yet need to look further beyond the project's lifetime and assess impact | S |
| M&E Plan implementation (use for adaptive management) | Monitoring activities undertaken several times, at several levels | S |
| Budgeting and Funding for M&E activities | Budget for M&E adequate | S |
| Project management | Good monitoring of collaboration with Akwaba, challenges well managed | HS |
| **UNIDO specific ratings** | Strong project management & relevance to UNIDO goals and IC needs | S |
| Quality at entry / Preparation and readiness | UNIDO relations with government good, co-funding sources could possibly have been verified further | S |
| Implementation approach | Good implementation through partners, flexible and adaptable to changing approach, strong involvement of local communities in the demonstration villages | HS |
| UNIDO Supervision and backstopping | Strong supervision by UNIDO country office, supervision of Zanzan project strong | HS |
| **Overall rating** | Relatively strong project, not all targets met but effective implementation, management & high relevance, significant potential for sustainability and further dissemination of impact and replication | **S** |

Overall, the evaluation team is relatively positive with regard to the achievements of this project. While the project faced many challenges during its implementation that prevented the project from achieving all of its expected results, the project management team overcame these challenges quite well. The project during its lifetime realised direct impact on the population of Zanzan, and has created many opportunities for further impact in the future, in particular if the project can secure the financial and national government support to scale the model. Therefore, the overall rating for the project is *Satisfactory*.

The chapters below discuss the lessons learned and potential future impact of the project, by which UNIDO could ensure continued effect of this project for the people in Ivory Coast.

# 4. LESSONS LEARNED

**Section Guide**

*This section considers some of the learning / lessons learned from the project implementation experience.*

- *Covering a summary of selected lessons learned (Section 4.1)*

Based on the evaluation desk research, field visit findings, general analysis and synthesis, a number of learning points, lessons, and points for reflection may be distilled from the project's implementation experience over its four-year duration.

The following points are among the most important lessons or reflection points learned:

- ***Lesson 1:*** **Delays and confusion regarding legal status of the demonstration installations emphasises the need for clarity for future implementation regarding deployments**. There is a need to determine the legal status of the PV mini grids clearly under national law in order to provide certainty and not to hinder their development. Especially regarding the aims to stimulate PPPs for the installation of PV mini grids, legal uncertainty impairs not only the possible impact of the current technical demonstrations, but also creates uncertainty for business development, the promotion of SMEs and the general development of the rural areas of Ivory Coast. As the Government of Ivory Coast is currently drafting the *texts d'application* for the 2014 energy law, it is vital that renewable energy be incorporated in as well, in order to clarify its status under the law.

- ***Lesson 2:*** **The delays, as well as the lack of mobilisation of the co-financing, reduced the speed of project implementation and thus the overall efficiency of the wider UNIDO-GEF project.** While the project was not implemented according to the original work plan and schedule, the project management team showed creativity and persistence in identifying a viable alternative pathway to achieve some of the project goals. Both UNIDO and the Akwaba project partners should be complemented on this, as well as the EU Delegation for their supportive role.

- ***Lesson 3:*** **The limited development of renewable energy in Ivory Coast to-date raises questions regarding the real level of national government commitment to renewable energy and to securing a quantum leap in rural energy access. It also raises a related question whether existing knowledge and capacity levels within national government need reinforcing.** The significant and repeated delays in obtaining feedback and decisions from the national government, the failure to commit national co-financing, and the general lack of an engaged and proactive counterpart role in this project, raise questions as to how Ivory Coast's government views renewable energy in the country's energy mix and its wider development goals. Beyond a proactive engagement, questions may also made as to whether resourcing is adequate to effectively progress to a robust policy and regulatory framework for renewable energy.

- ***Lesson 4:*** **The evaluation consultation programme showed significant preliminary interest across other Ivory Coast government ministries in using renewable energy to improve energy provision in rural areas in their respective sector(s) of responsibility**. For example, the *Ministère de l'Agriculture et du Développement Rural* emphasised that energy costs was one of the most significant impediments to the development of the rural areas of Ivory Coast, hindering development of the agricultural sector. As particularly farmers in rural areas would have much to benefit from the development of renewable energy and PV mini grids, the lesson that can be learned from this project is to consider co-operation with a diverse group of ministerial departments for future projects.

- ***Lesson 5:*** **Linked to the question above about national government commitment and resourcing levels, the evaluation findings suggest that both government and the wider renewable energy and development sectors can benefit from strengthened dialogue, experience-sharing and communication.** The uncertainty with regard to the current and future regulatory situation also raises the same questions as to whether communication between the government and renewable energy and development stakeholder has been sufficiently effective. Moreover, Ivory Coast has lost significant ground in the development of renewable energy to some of the world's fastest-growing developing nations, as well as the development 'opportunity cost' in areas where there is little short-to-medium prospect of being served by an expanded national grid. The evaluation raises the question of whether all parties would not benefit from an open dialogue and experience-sharing forum? This reflection point is taken up further in the recommendations.

- ***Lesson 6:*** **From a comparative perspective, Ivory Coast is lagging significantly behind many of its peers in the developing world with regard to leveraging renewable energy to secure improved energy access and spur socio-economic development.** Possibly linked in part to the above issues of resourcing and capacity levels in the *Ministère du Pétrole et de l'Energie*, the slow uptake of renewable energy in Ivory Coast leads to the question of whether national government is aware of the level of opportunity cost this entails in terms of boosting Ivory Coast's socio-economic development? Ivory Coast has fallen significantly behind numerous African countries and Asian with regard to using renewable energy as a socio-economic development enabler and poverty reduction catalyst, not to mention countries that were or are at a comparable development stage in Asia. This opportunity cost comes not only in terms of the lost potential for human development and socio-economic development across the country's rural areas, but also in terms of accessing the potentially significant international public and private financing available for promoting sustainable energy.

  Beyond data on global financing and investment in sustainable energy, it is interesting to look at some examples from an EC-funded project *Parliamentary Action for Renewable Action (PARE)*. Financed by

the EC and implemented by UNDP and a UK-headquartered organisation called Climate Parliament, the project targeted capacity building in renewable energy for Parliamentarians in eleven countries across Africa, the Middle East and Asia. Some of the results were impressive, such as **Tunisia's** Parliament passing a constitutional commitment to environmental conservation and a landmark Renewable Energy bill. In countries in India and Bangladesh, the work of the PARE project, cross-party group's advocacy and lobbying work has played a significant role in **significantly increasing the funding available for sustainable energy**, **with more than USD 1,600 million in additional funding for renewable energy being created. Specifically in Bangladesh**, PARE has registered two major achievements, the first being the allocation of Taka 15 million (USD 0.19 million) from the national budget to the newly-established Sustainable and Renewable Energy Development Authority (SREDA), with some prospects for a further increase of more than 20%. A second achievement has the government's launch of a **new USD 52 million Renewable Energy Fund (REF),** which represents a key milestone in the development of renewable energy in the country, as it constitutes the first government renewable energy fund. **Amongst other results, in India**, PARE has played an important role in the 2013 Government to allow certain public sector institutions raise new income through tax-free bonds; this has included allowances for the Indian Renewable Energy Development Agency (IREDA) to raise USD 162.4 million, which has been further boosted by a government allocation from the National Clean Energy Fund (NCEF) to provide low-cost loans through IREDA. These examples show that action and commitment to improved political awareness, well-designed legislation and regulatory frameworks can bring significant financing and investment (both domestic and international) into the sector, with an associated knock-on impact on many other sectors given renewable energy's horizontal and catalyst role in boosting wider human development and socio-economic development.

# 5. CURRENT AND FUTURE NEEDS OF IVORY COAST

**Section Guide**

*This section considers the current and future needs of Ivory Coast regarding the development of RE in several sectors.*

- *Renewable energy for rural development (Section 5.1)*
- *Renewable energy for national electrification (Section 5.2)*
- *Renewable energy for environmental protection (Section 5.3)*
- *Renewable energy for industrial development (Section 5.4)*
- *Renewable energy for economic development (Section 5.5)*

This section considers the current and future needs for rural energy access with regard to the development needs of a number of sectors of the economy, based upon preliminary discussions held with a number of national government ministries and stakeholders during the field interview programme. The rationale of these interviews was in part to understand how selected national government ministries saw rural energy access in the context of their own sector development needs and priorities, with a view to consider the relevance of the Zanzan installations in a wider national context.

## 5.1 Renewable energy for rural development

In January 2016, the *Ministère de l'Agriculture et du Développement Rural* was created from the *Ministère de l'Agriculture*, in order to better combine the tasks of the government regarding the development of the rural areas in Ivory Coast and the stimulating of agricultural innovations, which often go hand in hand. The *Ministère de l'Agriculture et du Développement Rural*, as well as beforehand when it was still was *Ministère de l'Agriculture*, has presented multiple plans to stimulate the development of the agricultural sector in Ivory Coast. In all these plans, the need for innovation within the sector was clear. In 2010, the Ministry presented the *Programme National d'Investissement Agricole (PNIA)*, which aimed at the "*participation de tous les acteurs, la synergie et la complémentarité des actions, la subsidiarité entre acteurs, le recentrage de l'Etat dans ses fonctions de facilitation du développement*."[28] In 2014, the Ministry, together with the World Bank, started the *Projet d'appui au Secteur Agricole* as a part of the PNIA, which aims at supporting smallholders famers access to new technologies and markets.[29]

While the *Ministère de l'Agriculture et du Développement Rural* has not worked in promoting and supporting the implementation of renewable energy in the past, there is much interest within the Ministry to do so in the future. Key constraints that Ivory Coast's agricultural sector is currently dealing with, and which could be aided by the implementation of renewable energy and PV solar grids in particular, are directly traceable to several of the sub-programmes of the PNIA: i) Improving the productivity and competitiveness of agricultural products; ii) Strengthening stakeholders and building capacity in the agricultural sector; and iii) Forestry rehabilitation and rebuilding the timber industry.

The *Ministère de l'Agriculture et du Développement Rural* considered the prospects of renewable energy within the sector as an important tool for its further development for these priority goals. Regarding the potential for using electricity for improving productivity, the Ministry indicated that renewable energy could, for example, be used to power machines for irrigation, water management and general support for the aging farming population. This could represent an important factor to stimulate productivity, especially in today's context where annual rainfalls are becoming less reliable due to the effects of climate change. Renewable energy could also support electrification to increase the processing of agricultural products, given that adding value to agricultural products is an important component of the PNIA. To stimulate local famers to process their products at a competitive price, electrification of the 'transformation' process could be an important component, as it ensures a cheaper and more efficient production. As discussed above, the electrification of rural areas could also support the strengthening of the capacity levels of agricultural and rural development stakeholders, for example by using electricity to power a school or village hall where farmers could come to increase their knowledge and build their capacity to improve their crops. Furthermore, connecting villages to PV mini grids or other forms of energy reduces the need for timber as a source for lighting and basis for cooking.

Ministry stakeholders emphasised that electricity provision in rural areas is critical for the development of the agricultural sector in Ivory Coast, with current energy costs representing a severe constraint to the development of the sector. However, projects such as the UNIDO/GEF project, which can offer the potential to stimulate private investments while also showing the social and economic impact, are much welcomed by the Ministry. The Ministry emphasised that it would like to, and is expected to, increase its

[28] Ministère de l'Agriculture et du Développement Rural, Programme National d'Investissement Agricole, at WWW http://www.agriculture.gouv.ci/index.php?option=com_content&view=article&id=159&Itemid=410.
[29] World Bank, Projet d'appui au Secteur Agricole, at WWW http://www.worldbank.org/projects/P119308/agriculture-sector-support-project?lang=en&tab=overview.

collaboration with the *Ministère du Pétrole et de l'Energie* to support the transformation of the country's rural areas through the development of renewable energy projects.

## 5.2 Renewable energy for national electrification

As the Ministry with which the UNIDO project has collaborated and co-operated, the *Ministère du Pétrole et de l'Energie* has clearly indicated its needs and constraints for the implementation of renewable energy projects in Ivory Coast. Being the main Ministry responsible for the energy sector in Ivory Coast, it published a long list of projects dealing with renewable energy in the country; this list was published in the *Plan Stratégique de Développement 2011-2030* as an annex to the *Rapport du secteur de l'Electricité classique*[30] *et les Energies Nouvelles et Renouvelables*. This strategy presents an overview of the known developmental projects in the country that assist the Ministry with its electrification implementation. However, these projects and the overall strategy could only be successful if the legislation on the renewable energy sector has been fully developed. Nonetheless, it provided a practical example on how Ivory Coast could in the future stimulate the energy supply by the private sector through the feasibility studies.

While the project provided guidance on which direction the implementation regulations on renewable energy could take, it should be kept in mind that the project made its recommendations before the new *Code de l'Electricité* was implemented. Nonetheless, the project report under Component 1 is currently used for the writing of the implementation regulations under the new energy legislation, which should lift the limitations on implementation in this sector. Therefore, the evaluation team considers the implementation of further PV mini solar grids in Ivory Coast under the new legislation a need for the *Ministère du Pétrole et de l'Energie* for the future, as it together with the *Ministère de l'Environnement et du Développement Durable* is responsible for the implementation of renewable energy.

## 5.3 Renewable energy for environmental protection

As the Ministry responsible for the sustainable development of Ivory Coast, the *Ministère de l'Environnement et du Développement Durable* could be a key player in the future for projects regarding renewable energy. After the signing of the Paris Agreement on Climate Change at the UNFCCC COP21, where climate change and the need for all countries in the world to support sustainable development was once more reiterated, the *Ministère de l'Environnement et du Développement Durable* identified eleven vulnerable areas that will be affected by the effects of climate change. Energy production is one of these policy areas that the Ministry deemed vulnerable to the effects of climate change.[31] To both prevent climate change and to build resilience against the consequences of it, renewable energy development is a key factor to the needs of this sector. Therefore, the *Ministère de l'Environnement et du Développement Durable* is also an important stakeholder under the implementation regulations of the new energy legislation.

## 5.4 Renewable energy for industrial development

For the *Ministère de l'Industrie et des Mines*, access to electricity is extremely relevant for their policies on the development of industry in Ivory Coast, for which providing the necessary facilities is a key requirement in order to stimulate increased investment. Furthermore, an important part of the development policy of

[30] Ministère du Pétrole et de l'Energie, Plan Strategique de Developpement, at http://energie.gouv.ci/images/pdf/Plan-Strategique-de-Developpement-Lintegrale.pdf.
[31] UNFCCC, Submission to COP21 from the Government of Ivory Coast, at WWW http://www4.unfccc.int/submissions/INDC/Published%20Documents/C%C3%B4te%20d'Ivoire/1/Document_INDC_CI_22092015.pdf.

the Ministry is to favour local products and producers, for which energy access is also important. Local producers can only compete with foreign products, both in terms of cost and quality, if investment in their production process takes place. For example, one of the key sectors for the *Ministère de l'Industrie et des Mines* is the development of the cashew industry, as cashew nuts are currently brought to the international market without any added value. Developing this industry would add value to the agricultural produce, stimulate gender equality for women working in the cashew industry (as they are mainly the ones producing the processed products), and enable Ivory Coast to compete with other countries exporting processed cashews. To realise development of this industry on a large scale, mechanisation and therefore electrification of the process is required.

The potential for renewable energy to support the local agro-industry is one of the aspects also addressed by the UNIDO project, where the technical demonstrations provided energy to power a mill for the production of cereal. This method could be reproduced on a larger scale for the processing of cashews, cocoa beans and cotton, whose production and value adding-elements for the rural population in Ivory Coast could be increased through the mechanisation of their processing. For this, investment in electrification is necessary.

The project implemented by UNIDO has the potential in the near future to develop capacity of local companies. This potential could be scaled up through the involvement of the EC through the Development Cooperation Instrument (DCI) Programme. The UNIDO project has the potential to prove the importance of electrification for the benefit of industrial development in order to close the gap between the rural and urban living standards, something which the *Ministère de l'Industrie et des Mines* also hopes to contribute to. Furthermore, development of renewable energy facilities could for example also support the new GEF-6 project under development by UNIDO and the Ministry, which was developed to provide energy for centres of production for cassava. For this project, the *Ministère de l'Industrie et des Mines* and UNIDO will co-operate in key sectors, including the agro-industry, the industries structural sector (including cement production) and the industry consumption of plastics for packaging. The project focusses on the promoting the use of renewable energy in this sector, which would not only stimulate economic development, but would also do so at the most sustainable way possible. Renewable energy could also play a large role in the development and management of the mining sector, as well as in adding value to the agro-industry, where greater value could be added to agricultural products if sufficient and affordable energy supply was available.

## 5.5 Renewable energy for economic development

The development of renewable energy infrastructure in rural areas is important for the stimulation of businesses and industry, and therefore is also relevant for the policy areas of the *Ministère du Commerce*. This latter Ministry is charged amongst other things with promoting the development of Small and Medium Sized Enterprises (SMEs),[32] aided by the *Ministère de l'Agriculture et du Développement Rural* and the *Ministère de l'Industrie et des Mines*. One of their areas of focus is the provision of electricity to SMEs.

SMEs contribute greatly to the development of rural and urban areas, especially as they promote the participation of women in the formal economy as owners of small businesses, more than any other form of employment. For SMEs, and women business owners especially, electrification could significantly contribute to their success. Renewable energy off-grid systems for electrification could offer economically

[32] According to the *ORDONNANCE N° 2012 – 487 DU 07 JUIN 2012 Portant Code des Investissements* an SME is "toute entreprise qui emploie moins de deux cent (200) employés permanents et réalise un chiffre d'affaires inférieur à 1 milliard (1.000.000.000) de francs CFA".

viable alternatives for small business owners, and thus help ensure their economic development while keeping fixed charges as low as possible. The 2012 *Code des Investissements* provides 15 years of reduced tax duties and provides other benefits to SMEs and businesses operating in areas with less than 60 thousand people, thereby stimulating SME development in rural areas.

In a recent speech on 1 May 2016, President Ouattara requested all interested parties to invest in the electricity network, and not only the CIE. The president stated that the actual development of RE mini-grids and other RE related implementation in rural areas could also serve as an opportunity for SME business development, whilst bringing development with them. As the UNIDO project has shown through its feasibility studies, electrification could stimulate the formation of PPPs, SMEs and/or other business owners to work in the supplying of materials, services and expertise to construct the PV mini-grids. This opportunity for enterprises to invest in the development of renewable energy off-grid solutions, especially with the reduced taxation in rural areas, was considered by the Ministry as most relevant to the policies of the *Ministère du Commerce*.

# 6. EVALUATION CONCLUSIONS AND RECOMMENDATIONS

**Section Guide**

*This section sets out the evaluation conclusions and recommendations:*

- *The evaluation conclusions (Section 6.1)*
- *The evaluation recommendations (Section 6.2)*

This section sets out the preliminary evaluation conclusions and recommendations. These are based on the analysis conducted and described above in the evaluation findings.

## 6.1 Evaluation conclusions

The UNIDO Ivory Coast Project is **highly relevant** at a number of levels. Firstly, it is **relevant to multiple UN programmes and goals**. The project is relevant to the UN Sustainable Energy for All goals and policy framework through seeking to provide access to modern energy for rural population hitherto deprived of such modern energy access, socio-economic development and quality of life improvement that this could entail. The project was also relevant to other key UN policy goals and frameworks, in particular the Millennium Development Goals (MDGs), the Sustainable Development Goals (SDGs), and the United Nations Framework Convention on Climate Change. It is also relevant to the specific goals of UNIDO and the EU.

The project was also **relevant to national policy of Ivory Coast**, within the broader sustainable development context, as well as the potential long-term sustainable energy supply of the Ivory Coast. The project was relevant for several **national policies on renewable energy**, especially for the *Ministre du Pétrole et de l'Energie*, with regard to development of the national policy and regulatory framework. One of the project's objectives was to provide a clear framework in which the potential of the country's renewable energy resources can start to be harnessed. In particular, it was relevant in improving legislation on

renewable energy, and specifically allowing for small, rural grids based on solar power. It is also essential for creating a more attractive opportunity for private investments in this field. Regarding **relevance to the national sustainable development context**, the project's original objectives were highly relevant to the needs of local rural communities. The field visits to Zanzan showed a clear perception of the project being relevant to rural needs. In this area, the project established the test PV facilities.

Regarding the **quality of the project design**, the project design had numerous strengths, such as the goal to aid Ivory Coast with developing a long-term strategy to support private investment strategy, ensuring both the sustainability and the feasibility of future renewable energy projects. All project components were relevant to the overall project objective, and stakeholders were actively involved in all project planning and implementation. Regarding overall **project efficiency**, the evaluation findings show **an overall good performance with regard to project efficiency**. During the project, it became known to UNIDO that the BOAD had not mobilized the funds for the project. This affected the implementation of technical demonstration, as there was lack of finances for the execution of the technical demonstration PV grids in the sites originally selected. Therefore, UNIDO engaged in a co-operation with the EU-Akwaba project. Here, the project showed shifts towards the Akwaba Community based method and away from the more market-based orientation foreseen in the CEO Endorsement by GEF/UNIDO. However, the project team displayed practical management reflections and enhanced the efficiency of the project given its situation. It ensured that the project's implementation remained closest to its original design, which would not have been possible without co-operation with the EU-Akwaba project. Therefore, **strong efficiency elements** have been the co-operation with the EU regarding the project in Zanzan and the transfer of knowledge to the local villagers ensuring better sustainability of the implemented technology demonstration.

Regarding **project management**, the evaluation findings suggest that **the project has been competent with regard to dealing with the challenges at hand**, mainly brought on due to the lack of co-financing as described above. There were many challenges that occurred outside of the scope of influence of the UNIDO management team. Their reaction showed practical management skills, ensuring that pragmatic solutions were found.

Regarding **project effectiveness and the extent to which the project achieved its aims, the project has recorded partial, and sometimes significant, achievement of its target outputs and results**. Some of the core results obtained by the project were: the promotion of renewable energy to the government and publishing feasibility studies on installing renewable energy in the 11 selected villages; the organisation of a conference panel on renewable energy to promote it to several stakeholders; and, the implementation of a technical demonstration of seven PV mini grids in villages in the Zanzan region. While the lack of funding from the partners meant a divergence from the plans originally presented. The actual outcomes of the project show shifts towards the Akwaba community-based method and away from the more market-based orientation foreseen in the CEO Endorsement by GEF/UNIDO. However, the technical demonstration, which was scheduled to finish in April 2016, has potential to prove the social and economic feasibility of installing PV mini grids.

Regarding **the overall efficiency of project inputs and costs**, the evaluation findings show that there were many external factors that hindered optimal efficiency of the project implementation, including the lack of mobilisation of funding from partners and delays in the co-operation with the project partners. Therefore, it is difficult to draw any definitive conclusions on the overall cost efficiency. However, for the individual Project Components where UNIDO was responsible, the project shows sufficient cost efficiency.

Regarding **impact**, the project shows **positive promise for the future**. As the project has only just been concluded in April 2016, it is too early to make any definitive conclusions on the project impact. However, it is likely that the feasibility studies conducted under Component 2, even if not used directly to-date, can be used in possible future renewable energy deployment work. The field visit work in Zanzan has showed clear and significant benefits to local villages and households regarding access to electricity, such as improved sense of security through public lighting, increased options for non-daylight work, education and entertainment, improved quality of water supply through refrigeration and reduced labour spent by women by no longer having to manually mill yam and cereals. A number of possible dynamic and knock-on impacts and benefits were also identified, such as increased local income generation in villages and it is expected that follow-on impacts might be significant. However, at this point in time, it is too early to assess such impacts; hence, it will be critical that the current post-project and transition period is used to monitor extensively the nature and scale of impacts on the villages in Zanzan and on their inhabitants. This in particular is important with the view to utilise this information to feed into further design work and related impact assumptions or projections. The project has also carried out a significant promotional and awareness-raising effort, which has included a short video on the Zanzan project demonstrating the direct benefits for the villages and the wider country of the mini-grids, as well as a significant promotion effort across a range of LinkedIn groups.

Regarding **sustainability**, the evaluation findings in general **offer a mixed picture in terms of the extent to which the project outputs delivered will be sustained by national capacities after project completion**. The technical demonstrations with support from the EC/Akwaba project allied to the UNIDO/GEF project will most likely have sustainable impact regarding the durability of the materials, the knowledge transferred, and the sustained impact it will have on the lives of the final beneficiaries. What could improve the sustainability of the technical demonstrations would be the utilisation of the buildings' potential for 'multiple functions', not just as a technical demonstration. These technical demonstrations offer potential for the development of the entire village in which they are implemented by also combining them with water and sanitation facilities, community centres or public health functions. By providing a wider purpose to the building, the sense of community responsibility could be increased, as well as providing more opportunities for co-financing with other donors. This is also discussed in the Recommendation section below. Furthermore, the follow-on of this project through two upcoming projects – PAPEREE-CI funded by the EU under the 11$^{th}$ EDF and "Sustainable industrial production in the cassava and other agro-food sectors through the use of renewable energy applications and low-carbon technologies" funded by GEF-6 – could scale-up the technical demonstrations and capitalise its lessons learned further, as well as implement the interest identified across a number of national government ministries and sectors for leveraging improved renewable energy capabilities for the benefit of socio-economic development in key sectors of the economy.

There are several important **lessons learned from this project**. Six of the most important lessons learned for this project are:

1. Delays and confusion regarding legal status of the demonstration installations emphasises the need for clarity for future implementation regarding deployments.

2. The delays, as well as the lack of mobilisation of the co-financing, reduced the speed of project implementation and thus the overall efficiency of the wider UNIDO-GEF project.

3. The limited development of renewable energy in Ivory Coast to-date raises questions regarding the real level of national government commitment to renewable energy and to securing a quantum leap in rural energy access.

4. The evaluation consultation programme showed significant preliminary interest across other Ivory Coast government ministries in using renewable energy to improve energy provision in rural areas in their respective sector(s) of responsibility.

5. Linked to the question above about national government commitment and resourcing levels, the evaluation findings suggest that both government and the wider renewable energy and development sectors can benefit from strengthened dialogue, experience-sharing and communication.

6. From a comparative perspective, Ivory Coast is lagging significantly behind many of its peers in the developing world with regard to leveraging renewable energy to secure improved energy access and spur socio-economic development.

## 6.2 Evaluation recommendations

This section sets out the evaluation recommendations, building on the evaluation findings and conclusions in the previous report sections. Each of the below Recommendations (R1-R5) are set out in the pages that follow, with each Recommendation containing **five types of information**:

1. Rec X: The Recommendation Number;
2. Recommendation Summary: The core recommendation;
3. Detailed Recommendation: A more detailed elaboration of the recommendation, sometimes including a repeat of the rationale, and sometimes setting out example activities or next steps;
4. Recommendation Addressed to: Which stakeholders the recommendation is addressed to;
5. Timeframe: Recommended/suggested timeframe for implementing the recommendation.

The recommendations in many respects are set out as points for reflection and consideration, as the issues are complex. As mentioned, **5 recommendations are provided** and these 5 recommendations can be grouped into **3 Categories** (see text box below): **i) recommendations regarding the national renewable policy and regulatory framework; ii) recommendations regarding maximising the value of the current post-project transition phase**; and **iii) recommendations to contribute to maximising the role of renewable energy in Ivory Coast's socio-economic development:**

Table 6.1 – Recommendation categories

| | | |
|---|---|---|
| Category 1 | Recommendations regarding **national renewable policy and the national regulatory framework** | **R1** |
| Category 2 | Recommendations regarding **maximising the value of the current post-project transition phase** | **R2, R3** |
| Category 3 | Recommendations to **contribute to maximising the role of renewable energy in Ivory Coast's socio-economic development** | **R4, R5** |

The table below sets out the commendations by category:

Table 6.2 – Overview evaluation recommendations by category

| | | | |
|---|---|---|---|
| Category 1 | Recommendations regarding **national renewable policy and the national regulatory framework** | **R1** | Ensure regulatory clarity for all renewable energy off-grid installations in the Ivory Coast – Exploring a dialogue and discussion forum process. |
| Category 2 | Recommendations regarding **maximising the value of the current post-project transition phase** | **R2** | Comprehensive monitoring and impact assessment framework for the demonstration projects. |
| | | **R3** | Explore how the 'Development Impact' of the demonstration sites can be maximised. |
| Category 3 | Recommendations to **contribute to maximising the role of renewable energy in Ivory Coast's socio-economic development** | **R4** | Explore if further refinement and improvements to the Zanzan demonstration project model are possible with a view to improve its suitability for scaling. |
| | | **R5** | Carry out consultations with national government Ministries to develop models for large-scale deployment of renewable energy in rural areas. |

The recommendations are set out below.

| R1 | |
|---|---|
| **Recommendation summary: Ensure regulatory clarity for all renewable energy off-grid installations in the Ivory Coast – Exploring a Dialogue and Discussion Forum Process.** | |
| **Detailed recommendation:** The implementation experience of this UNIDO-GEF project, and the component of joint implementation with the EU-Akwaba "*Electrification des communautés Rurales avec des micro-réseaux de generation d'énergie solaire photovoltaïque dans la région du Zanzan en Côte d'Ivoire*" project, shows an urgent need to bring clarity to the legal and regulatory framework for off-grid renewable energy installations in the Ivory Coast. While the inability of the *Ministre du Pétrole et de l'Energie* to provide a clear regulatory framework may raise some worrying questions about the real commitment of the Ministry on the promotion of renewable energy in the Ivory Coast, it may also point to a lack of staff and capacity resources to deal with the complex are of renewable energy within the Ministry.<br><br>With a view to bringing certainty for all stakeholders, and to all Ivory Coast development actors, it is recommended that a **consultation forum is established as a platform for discussion between the Government, donor stakeholders and other development actors**. Such a forum would have a number of benefits:<br>1. Provide a forum for discussion and exchange of experience on how on-grid and off-grid renewable energy installations are contributing to rural development in other countries in Africa and around the world, interesting success stories and failures to be avoided;<br>2. Provide a forum for discussion options for a regulatory framework for renewable energy, and the learning and good and not-so-good practice that can be derived from other countries, as well as varying examples of how other countries organise their government functions with regard to policy development and regulatory management of renewable energy; and,<br>3. Provide a forum for the Government to explain the current and/or future policy or regulatory framework.<br><br>Such a Discussion and Dialogue forum would allow for a constructive forum for discussion and exchange, as well as for both government and industry and other development stakeholders to explain viewpoints, as well as providing an excellent forum for the Government to obtain feedback on whether existing or planned legislation or policy changes is as clear as they wish it to be. | |
| **Recommendation addressed to:** | UNIDO & All Donors / *Ministre du Pétrole et de l'Energie* |
| **Implementation timeframe:** | June 2016 – September 2016 |

| R2 | |
|---|---|
| **Recommendation summary: Comprehensive monitoring and impact assessment framework for the demonstration projects.** | |
| **Detailed recommendation:** With the end of the UNIDO-GEF project on 30 April 2016, the project is now in a transition and follow-on phase. To maximise the learning from a demonstration perspective, it is recommended that UNIDO and Akwaba implement a rigorous ongoing monitoring and evaluation framework during 2016. This should include, inter alia,<br>• Monthly monitoring on core KPIs (energy consumption, financial payments);<br>• Interviews with different user/tariff groups (housewives, small business etc.) on impact of energy access on their lives and/or business;<br>• Monitoring of the functioning and performance of the community based management model, including technical maintenance and troubleshooting;<br>• Monitoring of the functioning and performance of the financial model; and,<br>• Impact assessment after 5-6 months to assess impact on individual end-users, as well as impact on the wider local community. | |
| **Recommendation addressed to:** | UNIDO |
| **Implementation timeframe:** | June 2016 – December 2016 |

| R3 | |
|---|---|
| **Recommendation summary: Explore how the 'Development Impact' of the demonstration sites can be maximised.** | |
| **Detailed recommendation:** During the follow-up transition project, it is recommended that UNIDO and Akwaba explore how the 'Development Impact' of the demonstration sites (or at least one site) could be maximised, with a view to maximising the wider development impact and interest to development actors in the Ivory Coast. This can be done at both the conceptual modelling level, as well as also as at the practical level in terms of developing new activities or services around the installations. Some of these are already occurring in some of the villages, and others might develop in the future.<br>This could include:<br>• Leveraging the common spaces area for community activities and community learning;<br>• Water and sanitation facilities;<br>• Possibilities related to public health;<br>• Possibilities emanating from ICT and internet access;<br>• Carrying out a wider needs analysis of local development and financing needs, with a view to identifying ways to develop new income-generation activities and/or support existing activities and micro-enterprises. An example was provided in the field visit report, but could be done further; and,<br>• Related to the above needs analysis, exploring what kind of mico-financing or other support could address such needs, and whether a fund could be mobilised. Already, it would be valuable if such a fund, even if for an amount of e.g. EUR 10,000 could be launched during the coming months. The feasibility work could also include considering if and how such a fund could be managed by the local management entities created by the project, thereby enhancing further the bottom-up local development dimension of the project.<br>• Monitor (and count) the population in each at the time of installation of the mini-grids, and then at least every three months thereafter, in order to assess the impact of energy access on the population | |

| R3 | |
|---|---|
| total and the population breakdown. This will likely yield some interesting information on more medium term demographic trends in the villages, as well as allow the project stakeholders to make more precise forecasts for future expansion to new areas.<br>• Similarly, carry out a monitoring of the number of small and medium enterprises (SMEs) in each village at the time of installation and at regular intervals afterwards, in order to build precise information as to any impact on the level of business and income generation activity and related trends. | |
| **Recommendation addressed to:** | UNIDO / Akwaba |
| **Implementation timeframe:** | June 2016 – December 2016 |

| R4 | |
|---|---|
| **Recommendation summary: Explore if further refinement and improvements to the Zanzan demonstration project model are possible with a view to improve its suitability for scaling.** | |
| **Detailed Recommendation:** It is recommended that UNIDO use the post-project transition phase from May 2016 onwards to explore if further refinement and improvements to the Zanzan Demonstration Project model are possible, with a view to improve its suitability for Scaling.<br>This work could include:<br>• Assessing if further efficiencies can be made to the community management model (including the initial communication and awareness-raising, capacity building and training);<br>• Assessing the performance of the financial model; and,<br>• Considering the likely performance of the model in other rural areas, based on the socio-economic profile of Zanzan and its performance there, against data collected from other regions during the pre-feasibility work carried out by UNIDO during this project. | |
| **Recommendation addressed to:** | UNIDO / Akwaba |
| **Implementation timeframe:** | May 2016 – December 2016 |

| R5 | |
|---|---|
| **Recommendation summary: Carry out consultations with national government Ministries to develop models for large-scale deployment of renewable energy in rural areas.** | |
| **Detailed recommendation:**<br>Some of the meetings with different national government ministries have not only emphasised the competitiveness constraint and development opportunity cost that lack of access to adequate and reliable modern energy services is causing in a number of areas in the economy, but also shown keen interest in exploring how increased rural energy access via renewable energy can contribute to accelerated socio-economic development in a number of sectors, including for example in agriculture, rural enterprises, and agro-industry. It is recommended that UNIDO follows up on these discussions with a structured process of information sharing, awareness-raising and dialogue with relevant national ministries, to further explore how their respective sectors could benefit from scaled up access to energy in rural areas.<br>Activities could include:<br>1. Provision of relevant examples from other countries to national ministries where improved energy access in rural areas in other countries has;<br>2. Study visit to the Zanzan region;<br>3. Sector-specific needs analysis and desk research and modelling to assess what could be the | |

| R5 | |
|---|---|
| benefits of access to renewable energy; and,<br>4. Developing outline design, delivery and financial models.<br>Where possible, a goal should be to seek to integrate multiple sector needs in the same renewable energy deployment model, to create efficiencies of delivery. | |
| **Recommendation addressed to:** | UNIDO / National Government |
| **Implementation timeframe:** | June 2016 – December 2016 |

## ANNEXES

Annex 1: List of interviewees

| No. | Name | Organisation |
|---|---|---|
| 1. | Marc Draeck | UNIDO Headquarters Vienna |
| 2. | Manuel Mattiat | UNIDO Headquarters Vienna |
| 3. | Javier Guarnizo | UNIDO Headquarters Vienna |
| 4. | Koffi N'Dri | *Directeur de cabinet du Ministre du Pétrole et de l'Energie* |
| 5. | Norbert N'Goran | *Directeur de Maîtrise d'énergie et des énergies renouvelables, Ministère du Pétrole et de l'Energie* |
| 6. | Jacob Akoussi | *Conseiller technique du Ministre, Ministère du Pétrole et de l'Energie* |
| 7. | Jacques Chevalier | *Conseiller technique du Ministre, Ministère du Pétrole et de l'Energie* |
| 8. | Véhi Toure | *Directeur Général du développement rural et de la maîtrise de l'Eau, Ministère de l'Agriculture* |
| 9. | Manni Zogbe | Agricultural engineer, *Ministère de l'Agriculture* |
| 10. | Mr. Kwame | Assistant to the Director-General, *Ministère de l'Agriculture* |
| 11. | Tié Bi Youan | *Directeur Général de la Promotion du Secteur Privé, Ministère de l'Industrie et des Mines* |
| 12. | Koménan Koffi | UNIDO National Project co-ordinator |
| 13. | Issouf Outtara | National Programme Officer, UNIDO |
| 14. | Emilio Canda Moreno | *Chef de la section Infrastructure et Energie, Délégation UE en Côte d'Ivoire* |
| 15. | Samuel Robert | *Chargé de programme Energie, Délégation UE en Côte d'Ivoire* |
| 16. | Alfred Atta | *Coordonnateur du Projet Zanzan, Délégation Fondation Akwaba* |
| 17. | Quentin Jullian | *Chargé de projet, Agence Française de Développement (AFD)* |
| 18. | Michael Dreyer | *Directeur Pays Bureau de Côte d'Ivoire, GIZ* |
| 19. | Alimata Kone- Bakayoko | Point focal opérationnel FEM, CNFEM |
| 20. | Daniel Cadilla | Azimut360 |
| 21. | Casimir Kouassi | Policy officer Akwaba |

| No. | Name | Organisation |
|---|---|---|
| 22. | Diambra Jacques | Representative Warex in Ivory Coast |
| 23. | Richmond Alla | Technician Aphelion |
| 24. | Ouattara Pascal | President Energy Community Zamou village |
| 25. | Ouattara Boubabacar | Youth representative Energy Community Zamou village |
| 26. | Yao Kouassi Coulibaly | Vice president Energy Community Zamou village |
| 27. | Ouattara Yao | Secretary Energy Community Zamou village |
| 28. | Dondji Aliagui | President Energy Community Bodou village |
| 29. | Daouda Ouattara | Secretary Energy Community Bodou village |
| 30. | Kouame Koffi | Treasurer Energy Community Bodou village |
| 31. | Kouassi Kra | Vice president Energy Community Gansé village |
| 32. | Yao Kouadio Kouma | Supervisor Energy Community Gansé village |
| 33. | Kouame Akoua Kra | Technician Energy Community Gansé village |
| 34. | Dadila Kouakou Nandja | Chief Kakpin village |
| 35. | Nakado Akoua Odette | Women representative |
| | | |

Annex 2: Evaluation Bibliography

## Project documents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Annex 3: Summary project chronology

| Overview project implementation chronology | |
|---|---|
| **December 2011** | GEF approves Project Plan |
| **February 2012** | Charles Koffi informs the Ivorian government that GEF/UNIDO will deposit money for the project. |
| **September 2013** | Komenan Koffi and Andrew Carter report on pre-feasibility visits to villages. |
| **October 2013** | Komenan Koffi and Andrew Carter report on pre-feasibility visits to villages. |
| **November 2013** | Noel Guetat writes to region prefects that UNIDO mission survey will stop by. |
| **December 2013** | Komenan Koffi reports on pre-feasibility visits to villages. |
| **January 2014** | Meeting between delegation of *Ministre du Pétrole et de l'Energie* and UNIDO representatives for project. |
| **February 2014** | Komenan Koffi and Andrew Carter report on pre-feasibility visits to villages. |
| **February 2014** | Report written by Komenan Koffi on the progress of the project in 2013. |
| **February 2014** | Form is drafted to check how many people live in villages, and their electricity need. |
| **March 2014** | UNIDO, through external consultant Fredric Yao, delivers a final report pre-feasibility of 8 locations for solar power. |
| **March 2014** | Doris Hribernigg informs Adama Toungara on the project. |
| **March 2014** | Doris Hribernigg asks Adama Toungara on certain documents key for feasibility of the project. |
| **May 2014** | Meeting between delegation of *Ministre du Pétrole et de l'Energie* and UNIDO representatives for project. |
| **May 2014** | Andrew Carter reports on business model and financial approach of mini PV grids. |
| **May 2014** | UNIDO, through external consultant Fredric Yao, delivers a final report pre-feasibility of 11 locations for solar power. |
| **May 2014** | Andrew Carter final report on the pre-feasibility of 11 local areas examined for implementation project. |
| **June 2014** | Meeting between delegation of *Ministre du Pétrole et de l'Energie* and UNIDO representatives for project. |
| **June 2014** | Meeting between delegation of *Ministre du Pétrole et de l'Energie* and UNIDO representatives for project. |
| **June 2014** | Doris Hribernigg informs Adama Toungara on partnership between EU/DFA and UNIDO/GEM on the projects in Zanzan and rest of Ivory Coast. |
| **August 2014** | Doris Hribernigg informs Adama Toungara on the progress of the project. |
| **Second half 2014** | UNIDO writes Mid-term progress report on fiscal year 2014 (1 July 2013-30 June 2014). |

| Overview project implementation chronology | |
|---|---|
| **October 2014** | Doris Hribernig informs Adama Toungara on progress of project and budget spending. |
| **November 2014** | Komenan Koffi visits and reports on DFA project in Zanzan that the UNIDO co-finances. |
| **November 2014** | Komenan Koffi writes report on the institutional framework of Ivory Coast regarding renewable energy. |
| **January 2015** | Komenan Koffi works with DFA to open the procedure for bidding to install PVs in Zanzan. |
| **March 2015** | Komenan Koffi presents the progress report up to February 2015. |
| **8 March 2015** | Komenan Koffi visits Zanzan with the technical and financial partners. |
| **20 March 2015** | Doris Hribernigg requests from the Director General of the *Ministre du Pétrole et de l'Energie* to approve documents of the project, as otherwise the project cannot continue. |
| **27 March 2015** | Meeting between EU, UNIDO and Konan N'Goran on the progress of the EU/DFA Zanzan project, and the UNIDO/GEM project. |
| **April 2015** | DFA asks for an extension of their contract until December 2015. |
| **28 May 2015** | Doris Hribernigg request the Director General of *Ministre du Pétrole et de l'Energie* to approve documents of the project, as otherwise the project cannot continue |
| **22 June 2015** | Director General Ministry of Energy N'Dri Koffi, UNIDO, GEM, DFA meet to discuss the EU/DFA Zanzan project, and the UNIDO/GEM project |
| **July 2015** | Komenan Koffi works with DFA to determine who will be selected to install the solar power PVs in Zanzan |
| **Second half 2015** | UNIDO Annual Implementation Report on the fiscal year 2015 (1 July 2014-30 June 2015) |
| **Second half 2015** | Progress report on the implementation of the EU/DFA project in Zanzan |
| **August 2015** | Doris Hribernigg writes to the Minister of Energy to announce the collaboration between the EU solar energy project in Zanzan and the UNIDO/GEM project elsewhere |
| **August 2015** | Doris Hribernigg writes to Adama Toungara to congratulate him on the new Energy Law, and to announce her leaving |
| **September 2015** | DFA asks for information regarding their project in Zanzan from the *Ministre du Pétrole et de l'Energie* |
| **25 September 2015** | Director General *Ministre du Pétrole et de l'Energie* N'Dri Koffi informs UNIDO that some action must be taken to unblock the progress of the project |
| **28 September 2015** | Director General *Ministre du Pétrole et de l'Energie* N'Dri Koffi informs the Minister of Energy that some action must be taken to unblock the progress of the project |

| Overview project implementation chronology | |
|---|---|
| **October 2015** | Komenan Koffi writes progress report on implementation of the both EU/DFA Zanzan project and UNIDO/GEM project |
| **October 2015** | Meeting between Konan N'Goran and UNIDO and EU to discuss progress on both EU/DFA Zanzan project and UNIDO/GEM project |
| **November 2015** | Cisse Sabati writes to representative of region Zanzan that delegation of EU is coming to visit to Zanzan |
| **November 2015** | Komenan Koffi is present for the arrival of PV solar materials for the installation in Zanzan |
| **28 January 2016** | Cisse Sabati writes letter to UNIDO requesting financial and technical implementation reports |
| **January 2016** | DFA/EU progress report on the Zanzan project |
| **June 2016** | Project finish |
| | |

Annex 4: Field visit report Zanzan

UNITED NATIONS

INDUSTRIAL DEVELOPMENT ORGANIZATION

# Independent Terminal Evaluation

*of the UNIDO Project*

***Promoting Renewable Energy-Based Grids in Rural Communities for Productive Uses in Côte d'Ivoire***

UNIDO Project Number: GFIVC12005

UNIDO SAP ID: 100186

GEF ID: 4005

**FIELD VISIT TO ZANZAN**

**FIELD REPORT**

**DAVID ACHI**

**MAY 2016**

# 1. Introduction and background context

**Field visit overview**

Initialement il y avait le projet de l'Unido qui porté sur 11 localités. Cependant la banque BOAD qui devait financer la majeure partie du projet à travers un prêt de l'état de Côte d'Ivoire n'à pas engager les fonds. Le projet Unido n'a donc eu que le financement d'un des bailleurs à savoir le FEM.

D'un autre coté il y avait un projet identique de mini-grid porté par l'association DF Akwaba. Ce projet est financé par l'union européenne et les collectivités locales (mairies et conseils généraux). Cependant ces derniers n'ont pas pu honorer leurs promesses financières. Le projet DF Akwaba s'est retrouvé lui aussi avec un manque de financement.

Les deux projets se sont donc réunis pour n'en former qu'un avec deux bailleurs principaux : l'union européenne (75% du financement) et le FEM. Le coût du projet total est de 2.53 millions d'euros.

La part de l'UNIDO a finance les équipements solaires de 3 villages (Gansé, Bodou et Kakpin).

Durant ma visite terrain, j'ai pu visiter les 7 villages et faire des interviews dans chaque village.

J'ai pu interviewer les villageois, les techniciens solaires locaux, les techniciens solaires de l'entreprise installatrice, les membres de l'association de chaque village, le représentant de l'ONG Akwaba, un chef de village, une représentante des femmes, une technicienne solaire locale et le sous –prefet.

**Short regional profile of Zanzan**

La région du Zanzan où se déroule le projet se trouve dans le nord ouest de la Côte d'Ivoire. La zone où se situe les villages a très peu d'infrastructure routière et un seul centre de santé pour les 7 villages.

La principale source de revenu des villageois est l'agriculture. Les cultures sont celles de l'igname et de l'anacarde.

La plupart des villages sont frontalières au parc national de la Comoé.

Il n'y a pas d'électricité dans les villages. Le réseau électrique national se trouve à 16 km du premier village.

Au début du projet il n'y avait aucun plan d'électrification de prévue dans les 10 prochaines années. Sur le terrain nous avons vu plusieurs poteaux électriques dans certains villages sur la route. Cependant, bien qu'il y ait les lignes électriques de placées depuis plusieurs années, il n'y a pas de courant à l'intérieur.

# 2. Relevance

**The level of involvement and consultation of local stakeholders**

Les bénéficiaires et autorités locales (préfet, mairie, chef traditionnelle) ont été impliqué à la base du projet pour apporter tout leur soutien tout au long du processus.

La consultation de différents villages a permit d'identifier 7 villages qui souhaitaient être électrifiés par énergie solaire. Durant cette phase de consultation, 2 villages ont refusés d'être électrifiés à partir d'énergie solaire. La raison principale est qu'ils avaient peur que s'ils étaient électrifiés par l'énergie solaire, le réseau national ne viendrait pas jusqu'à eux. Le deuxième point est qu'ils ne croyaient pas que l'énergie

solaire pouvait fournir de l'énergie de qualité et capable de supporter de forte puissance. Finalement ils ont fait une lettre pour décliner l'offre qui leur avait été faite et 2 nouveaux villages plus volontaires furent accepter dans le projet.

Les 7 villages restant étaient pleinement impliqués dans le projet. Ils participèrent à différentes réunion d'explication avec l'ONG DF Akwaba. Cette dernière a expliqué ce que pouvais alimenter l'énergie solaire et comment il fallait l'utiliser. Les populations ont été sensibilisé à l'efficacité énergétique des équipements utilisable dans les maisons mais aussi à la manière de bien consommer l'énergie (sobriété énergétique)

**Relevant existing local development plans**

Il n'y avait pas de plan d'électrification des villages du projet dans les 10 ans quand le projet Zanzan à commencer en 2011.

Cependant, la question de lier ces réseaux indépendants au réseau national est une bonne question dont personne n'a encore de réponse pratique en raison d'un flou législatif dans ce domaine. Ce projet prototype va permettre de lever beaucoup de questionnement que peuvent se poser les autorités ivoiriennes (direction générale de l'électricité entre autre). Voir comment intégrer ce genre de micro-réseau dans le réseau national. Voir d'autre forme de gestion d'un tel réseau, c'est-à-dire gestion par les populations bénéficiaires elles mêmes.

**Articulation and collection of principal local stakeholder wishes/objectives for the mini-grids**

Au début du projet, les villageois étaient consultés pour savoir ce qu'ils attendaient du projet et ce que ce projet d'électrification solaire pouvait leur apporter. Ils ont pu ainsi indiquer leur souhait pour développer leur village et accroitre leur niveau de confort de vie.
Durant les différentes interviews, les souhaits étaient dans l'ordre:

- L'éclairage public (lampadaire) afin d'augmenter la sécurité et de se croire en pleine ville moderne
- Avoir la possibilité d'avoir la télévision pour avoir accès aux informations (régionales, nationales et internationales)
- L'eau fraiche (avec les réfrigérateurs)
- L'éclairage dans les maisons
- Réfrigérateur (plus spécifiquement dans le village prêt du fleuve afin de conserver les poissons dans un but de les conserver et les vendre)
- Moulin pour moudre les céréales et l'igname pour faire des produits transformer, plus facilement séchable et donc conservable.

Tous les vœux et souhaits des villageois sont prévues dans le projet.

**Effectiveness of the support from the relevant international and government actors**

Au début du projet, il y en avait 2 avec un manquement de co-financement chacun.

Le lien entre le projet Zanzan financé par l'union européenne (75% : 1.92millions d'euros) et le projet Unido financé par le FEM ($500.000) a permis la réalisation concrète du projet d'un coût globale de 2.56 millions d'euros

Les fonds initialement prévu de la part du gouvernement ivoirien à manquer durant la phase opérationnelle. Durant la phase d'évaluation (avril 2016), l'UNIDO a reçu une lettre de la part du gouvernement ivoirien précisant qu'il avait reçu les fonds pour ce projet. Bien que ce projet soit presque fini, ces fonds pourront être utilisés pour améliorer le confort de vie des populations à travers l'achat de pompe électrique à la place de pompe à motricité humaine.

Ce que nous avons noté durant cette évaluation est que les fonds internationaux ont été directement attribués à une ONG et à une agence d'exécution comme l'ONUDI. Si ces fonds avaient été envoyé à une structure étatique, le projet aurait certainement prit plus de temps à se réaliser.

De plus, cela permet au porteur de projet d'avoir une certaine indépendance dans la manière de voir et de réaliser son projet même s'il doit se conformer aux lois nationales. Par exemple : « Côte d'Ivoire Energie » qui est la compagnie national qui représente l'état de Côte d'Ivoire souhaitait que ce soit une société privé ou la CIE (compagnie ivoirienne d'électricité) qui gère le réseau électrique. Cependant, le porteur de projet voulait expérimenter une autre forme de gestion à savoir, la gestion communautaire du réseau par les bénéficiaires eux mêmes. Ce point est toujours en cours de discussion, mais le projet à bien avancer déjà.

## 3. Design of the project

**Quality of the design**

Le projet est de construire 7 mini-réseaux électriques alimentés à base de centrale solaire hybride dans 7 villages sans électricité et où il n'y a pas de plan d'électrification à moyen et long terme. La région considérée est fortement ensoleillée.

L'idée du projet est de démontrer la capacité technique de la technologie solaire pour alimenter une région rurale en énergie solaire (**capacité en terme de puissance et longévité mais aussi de rapidité d'exécution**).Un autre point est de montrer une **autre forme de gestion** de ce type de réseau que celui d'une compagnie privée d'électricité. Dans ce projet, les villageois s'occupent eux-même de collecter les fonds et de prendre soins du bon fonctionnement des installations et de leur maintenance.
Il y a 7 villages et 7 installations. La puissance solaire installée par village diffère selon la taille de ces derniers. Plus les besoin énergétique exprimés dans la phase de pré-étude étaient importante, plus la capacité de production solaire installée dans les villages est importante. Elle varie de ~30 à 36kWc. Il y a un groupe électrogène qui vient en renfort de l'installation en cas de mauvaise production solaire prolongée par exemple.

La conception de la capacité de production de la centrale a prit en compte l'augmentation de la population de 1% par an. De plus, de la place a été laissé sur les maisons où ont été installé les panneaux solaires afin d'accroitre leur nombre au cas où les besoins énergétiques augmenteraient.

Les groupes électrogènes ont une puissance de 30 ou 45kVA. Cela veut dire qu'ils ont la capacité de remplacer entièrement la centrale solaire si besoin est. De plus, si les besoins énergétiques augmenteraient plus vite que ce qu'il était prévu initialement, ces groupes pourraient subvenir aux besoins énergétiques complémentaires. La marque du groupe électrogène est Eurosystems. C'est une marque Italienne de qualité.

Le parc de batterie est constitué de 2 rangées (strings) de 24 batteries de 2V, soit une tension de parc de 48V. La capacité de ces batteries est de 3850Ah(C120) pour les plus grandes et de 1950Ah (C120) pour les plus petites. La capacité énergétique totale du parc batterie est respectivement de 369kWh et 187kWh. La marque est Discover. C'est Canadien. C'est une bonne marque de batterie.

Le réseau électrique est triphasé.

Il y a 2 sortes d'onduleurs dans ce réseau. Deux onduleurs réseaux de 20kW (Tripower) et 2 clusters de 3 onduleur/chargeur de 5kw chacun (Sunny Island).

Ce genre d'installation est optimisé pour des mini-réseaux.

Durant le jour, les onduleurs réseaux injectent directement leur production à partir des panneaux solaires sur le réseau électrique ou dans les batteries.

Durant la nuit, les Sunny Island produisent de l'énergie à partir des batteries remplis dans la journée.
La puissance installée permet de démarrer des machines d'une puissance de pointe d'environ 60kVA ce qui est largement suffisant pour les besoins « d'industries » artisanales.

La section des câbles observée était adaptée aux installations même si les installations n'étaient pas finis lors de notre visite.

Sur les différentes installations existe un système de monitoring pour vérifier la performance du système et enregistrer les données de production et de consommation ainsi que les données météorologiques. Cela permettra d'avoir des données pour l'évaluation de la performance dans le temps de ce système. Ces données seront intéressantes d'un point de vue technique et climatique.

Au niveau des câbles et poteaux du réseau électrique, les spécifications techniques sont identiques à ceux du réseau national. C'est un standard au dessus du besoin de ce mini-réseau mais il a été fait ainsi en prévision d'un raccordement éventuel du réseau national.

Le résultat est d'avoir l'impression d'être dans un village électrifié par le réseau national lorsque l'on y rentre.

Les lampadaires ont la même couleur d'éclairage que ceux conventionnels même si les ampoules des têtes de lampadaire utilisent la technologie de sodium haut pression qui ont une efficacité énergétique

importante (70W contre 250W pour les conventionnelles) et une durée de vie plus importante encore (comparativement à l'électronique des têtes de lampadaires LED).

La qualité des équipements est bien et le résultat final global est très bien.

**Incorporation of the 'Development factor' in the design of the project**

Le facteur de développement a été pris en compte dans la conception du projet par le porteur du projet. Il a prit en compte les besoins locaux comme le moulin, le réfrigérateur, la possibilité d'utiliser des équipements électrique comme ceux d'un salon de coiffure (demandé par les populations) ou un ferronnier ou menuisier.

Le moulin: la région est riche en céréale et il y a un réel besoin des populations locales, surtout des femmes pour ce genre de machine électrique. Les céréales écrasées se conserve mieux et se vendent plus chers car elles ont déjà suivie une phase de transformation.

Réfrigérateur : le commerce d'eau fraiche est une réalité forte lorsque l'on arrive dans les villages. De plus, le réfrigérateur permettra la conservation des denrées alimentaires périssables comme la viande et surtout le poisson.

La puissance des onduleurs installés peut supporter des équipements d'artisans.

**Incorporation of relevant environmental and social risk considerations**

Durant les études de faisabilité et d'étude sociale, il y a eu beaucoup de réunion et de formation avec les populations locales. Les villageois ont choisis eux même les personnes ressources pour gérer les différentes associations de gestion technique et administrative.

Pour la partie technique des formations techniques ont été données.

Au cours des installations ces techniciens locaux ont participés à l'installation des panneaux et batteries avec les techniciens professionnels ce qui leur a permit d'être confiant dans leur capacité à intervenir même en l'absence plus tard des techniciens professionnels pour changer par exemple les batteries. Cette confiance dans leur capacité à changer les batteries a été forte lors des interviews.

Parce que les villageois ont choisis eux même leur techniciens, superviseurs, trésorier, etc…. ces derniers sont bien accepté dans le village.

## 4. Technical & construction works and installations (efficiency, effectiveness)

**Detailed technical description of the installations and the construction works**

*PV installations, wiring, battery and energy generation capacity*

*Please include photos if possible*

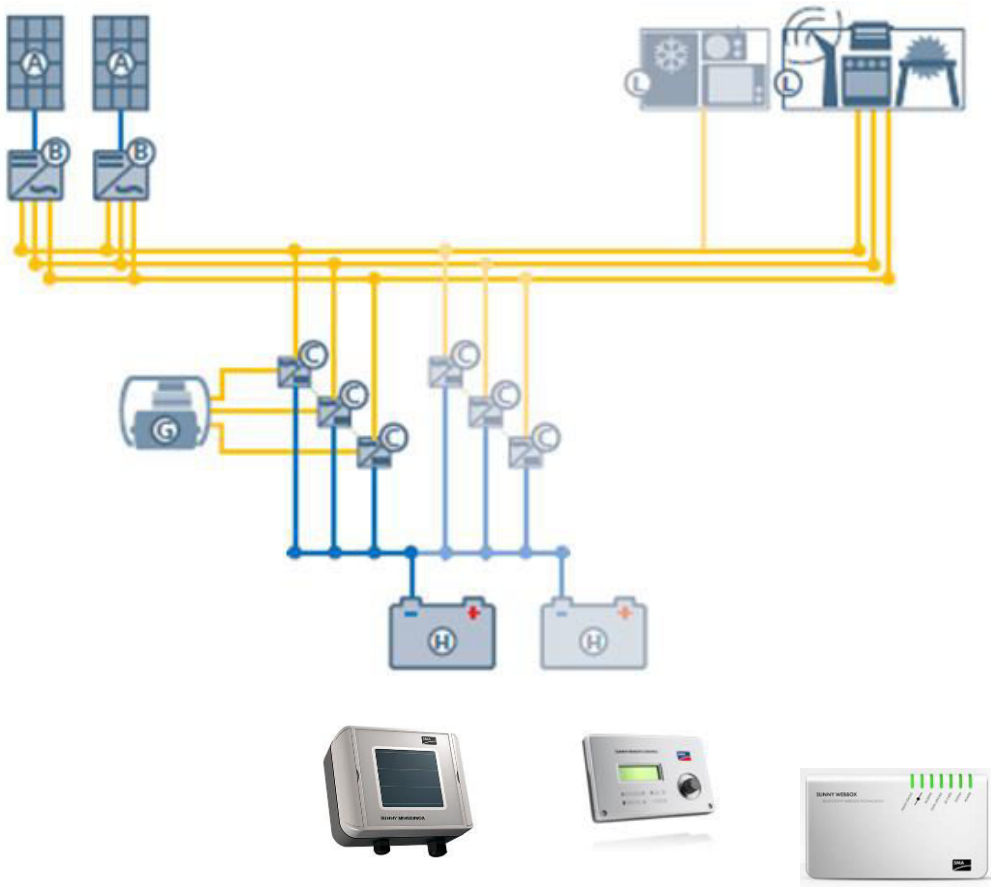


Schéma 1 : Installation du système solaire hybride AC triphasé

A: Panneaux solaires photovoltaïques (265Wc) Bisol

Parc solaire photovoltaïque de 30-36kWc selon la taille du village

B : Onduleur injection réseau SMA Tripower 20000TL

2 onduleurs injections réseaux triphasés 20kW d'une capacité totale de 40kWc

C: Onduleur chargeur SMA Sunny Island 4.4M

2*3 onduleurs de 5500W de puissance de pointe. Soit 33kW de puissance de pointe la nuit.

D : Remote control : appareil de paramétrage des différents onduleurs plus simplement

E: Sunny webbox: Dattalogger pour enregistrer les différentes mesures de production, consommation et de données climatiques.

F: Sensorbox: capteur d'ensoleillement et de température (avec un autre capteur de mesure de vitesse du vent: anémomètre)

G : Groupe électrogène

Les groupes électrogènes sont de 30 et 45 kVA en triphasé Eurosystems

H: Les batteries sont des batteries de 3850Ah et 1950Ah C120 selon le village.
Ce sont des batteries OPzS à électrolyte liquide. Elles utilisent la technologie plomb ouvert qui résiste le mieux à la chaleur en termes de durée de vie.
I: Sunny cluster : pour mieux gérer de manière automatique et fiable un système de mise en parallèle des onduleurs Sunny Island et onduleur Tripower.
J: tableau de protection : Il est équipé des différents systèmes de protection du système énergétique (protection panneaux solaires, onduleur réseau, onduleur/chargeur, groupe électrogène, consommateur, etc.…)
L: consommateurs AC (public, professionnel et particulier)

Ces installations solaires ont été faites sur des maisons construites pour l'occasion. Elles ont été appelées les maisons de l'énergie. Elles sont construites d'un hall pour recevoir des personnes et manifestations. Selon la puissance installée de panneaux solaires et donc de la place disponible, le hall est plus ou moins grand.
Il y a 4 pièces distinctes :

- 1 pour l'emplacement de l'électronique (onduleurs, box, tableau AGCP)
- 1 pour le stockage des batteries
- 1 pour le stockage du groupe électrogène
- 1 pour la sale de gestion communautaire où il y a l'informatique pour imprimer les factures par exemple.


Plan 1: Plan de la maison de l'énergie

**Detailed account of the construction and installations works/work plan and progress to-date**

Les schémas d'installation sont les mêmes entre village. La différence vient de la puissance crête de panneaux installée et de la capacité du parc batteries.

Les maisons de l'énergie ont aussi la même structuration. La différence vient de la puissance du champ de panneaux solaires et donc de la taille du hall.

Photo 1 : petit hall

Photo 2 : Grand hall

Les lampadaires utilisent des lampes à sodium haut pression ce qui permet de réduire la consommation énergétique de ces dernières à 70w au lieu de 250W avec une qualité d'éclairage équivalente si ce n'est supérieure aux lampes classiques d'éclairage publique.

Le choix de lampe à sodium est judicieux par rapport aux lampes LED car ces derniers ont un système électronique qui peut défaillir en quelques années. Les lampes à sodium nécessitent moins de maintenance et moins de changements de tête de lampadaire.

Le nombre de lampadaire change en fonction de la taille des villages.

Les 3 villages électrifiés par le financement de l'Unido sont : Gansé – Bodou - Kakpin

Gansé : 120 panneaux PV de 260Wc soit 31.2kWc et un parc batterie de 3850Ah C120 de deux (2) strings de batterie en 48V

Bodou : 114 panneaux de 260Wc soit 29,6 kWc et un parc batterie de 1950Ah C120 de deux (2) strings de batterie en 48V

Kakpin : 150 panneaux de 260Wc soit 39kWc et un parc batterie de 3850Ah C120 de deux (2) strings de batterie en 48V.

Au cours de mon voyage dans la région du ZANZAN le 05/04/2016, il y avait 2 villages où l'électricité avait été mise en route pour l'éclairage publique et la maison de l'énergie. Dans ces 2 maisons de l'énergie alimentée, il y avait à chaque fois d'un réfrigérateur et d'une télévision pour les enfants. Ces installations permettaient de faire un test des installations et de voir si tout fonctionner bien.

Pour les autres localités, le manque de câble électrique faisait que les installations n'avaient pas pu être finalisées. Une partie de ces câbles avaient été amené par notre mission et l'autre partie arrivée en fin de cette semaine.

Le travail restant été estimé à 12% et devait être fini en 1 semaines environ.

Au jour de la rédaction de ce rapport, le travail est fini et une mission avec les différents bailleurs (UE, FEM, DGE, DF Akwaba) est organisée.

**The quality of the construction and technical installation carried out to-date**

On peut décomposer le travail accomplie en trois grosses parties :

- La partie construction de maison de l'énergie
- La partie sur l'éclairage publique (pose des lampadaires)
- La partie réseau électrique
- La partie énergie solaire

La partie maison de l'énergie présente une bonne structure et de belle finition.
Il y a même un accès handicapé à cette maison.

La partie éclairage publique : les poteaux sont les mêmes que ceux en ville (en béton). Les têtes de lampadaires sont au sodium haut pression. Le rendu éclairage est bon, voir supérieur à ceux des lampadaires conventionnels tout en ayant une meilleur efficacité énergétique.

La partie réseau électrique : le câblage présente les mêmes caractéristiques que celui utilisées pour faire le câblage du réseau national. Une de ces caractéristiques est par exemple la section du câble qui est supérieure à la capacité de production du système solaire. Elle peut donc supporter largement le système en place et aussi, le jour où le réseau électrique arrive sur le site, réaliser un raccordement sans faire de changement.

La partie énergie solaire a été réalisée avec les onduleurs du leader dans le domaine, à savoir SMA. Les éléments le plus sensible dans un système sont les batteries. La marque des batteries faits partie des bonnes marques donc de bonne qualité. Le choix de la technologie des batteries utilisée au plomb ouvert est aussi la meilleure en considérant qu'il y a des techniciens formés à l'entretien de ces batteries. En effet, ces batteries OPzS nécessitent une maintenance plus régulière que les batteries OPzV. En contre partie elles ont une durée de vie plus importante surtout dans un milieu chaud.

En termes de recommandation technique, nous pourrions dire que le raccordement du mini-réseau solaire et le réseau national peut se faire sans aucun changement de matériel et un léger changement de paramétrage. Les onduleurs réseaux injecteront sur le réseau (qui est maintenant national) et les onduleurs/chargeur avec batterie interviendraient uniquement en cas d'absence de courant, c'est-à-dire durant les phases de délestage sur l'ancien minin-réseau.

Pour la production, un compteur classique placé dans le bon sens peut compter la production produite par les panneaux solaires. Lorsque le cadre législatif sera mis en place, un tarif de revente de l'électricité pourra être établi avec l'état afin que la communauté qui a installé ces mini-centrales puisse récolter ces fonds.

Avec les premières années qui auront permis à ces communautés d'apprendre à gérer par eux même (d'après le projet initial de la DF Akwaba) des fonds. Ils auront acquis une certaines expériences qui pourront leur servir pour gérer cette deuxième étape de revenu complémentaire dus à la revente de l'électricité à l'état au lieu de n'avoir que le revenu des cotisations que faisait les villageois précédemment. Grâce à l'ONG, ils pourront même utiliser ces ressources comme fonds pour investir dans des mini-projets communautaires.

**Overview of the implementation experience**

a) Procurement process

Le processus qui a permit de sélectionner l'entreprise adjudicatrice du marché est un appel d'offre.

C'est le consortium WAREX/CRTS qui a gagné l'appel d'offre. Une fois le vainqueur choisis, il a été appelé pour négocier car son budget demandé était supérieur à celui qu'avait à disposition l'ONG DF Akwaba. Une négociation a permis d'adapter le budget aux équipements et au nombre de village à électrifier qui est passé de 10 à 7.

b) Contractor and subcontractor performance

Pour la partie sous-traitant, WAREX qui est une société italienne, a sous traité avec une entreprise locale qui avait soumissionné avec une autre entreprise étrangère mais qui n'avais malheureusement pas été retenu essentiellement pour des raisons budgétaires.

Au cours de ma visite sur site, j'ai eu à discuter avec le représentant de Warex en Côte d'Ivoire et aussi avec les techniciens de la société sous traitante (Aphelion). Ils ont montré tout deux de solide connaissance dans le secteur des énergies solaires photovoltaïques. Le représentant de Warex avait de bonne connaissance dans le mini-grid. Les techniciens sur chantier avaient de bonne connaissance en énergie solaire conventionnel et ils ont acquis durant ces installations de bonne compétence dans les mini-réseaux (installation et paramétrage des onduleurs).

Le transfert de connaissance a été fait via la formation « learning by doing ». Le représentant de Warex était souvent avec eux pour la réalisation des parties sensibles des installations. Ils semblent pouvoir refaire un paramétrage d'un autre mini-réseau en côte d'ivoire.

Ils ont acquis une double compétence dans l'installation de mini centrale solaire pour l'injection réseau comme ce qui se fait en Europe et de plus en plus dans les autres pays africain. Ils ont aussi acquis des connaissances dans les mini-grid avec des onduleurs/chargeurs utilisant des parcs batteries.

c) Project management (Contractor level and UNIDO level)

Le consultant de l'Unido, Koffi Komenan a montré une très bonne connaissance du projet de Zanzan ainsi que les différents contours du projet, tant d'un point de vue technique, terrain, administratif et social. Il a montré une grande humilité et un bon professionnalisme.
Le porteur du projet de l'ONG, Mr Atta a su nous répondre à toutes les interrogations que nous avions sur le projet.

**Challenges encountered (and solutions found)**

Durant la phase d'installation des systèmes solaires, il y a eu plusieurs phases d'arrêt provoquées par la non disponibilité du matériel importé.

Une solution serait de permettre à l'entreprise qui réalise l'achat du matériel de pouvoir le faire de manière unique. Cela permettrait de réaliser un dédouanement unique et donc beaucoup moins couteux en terme économique mais aussi temporel et administratif.

La partie administrative de dédouanement a aussi été une étape lente et fastidieuse. Le problème douanier.

**Inputs and support (direct or indirect) by local stakeholders during construction works**

Les villageois ont beaucoup participés au projet en apportant leur aide à différent niveaux :

- L'accueil et le logement des techniciens (les anciens et cadres)
- La participation pour creuser des trous pour placer les poteaux et lampadaires (les jeunes)
- Le puisage de l'eau durant les phases de construction des bâtiments (les femmes)
- L'installation des panneaux et batteries avec le soutien des techniciens villageois formés. (les techniciens du village)

**Installations management (including security managment) and maintenance**

L'une des particularités du projet qui découle du nom exacte du projet : « projet d'électrification des communautés rurales avec des micro-réseaux de génération d'énergie solaire photovoltaïque **autogérés** dans la région du Zanzan. » est la gestion du micro-réseau par les bénéficiaires.

Cela implique que les bénéficiaires, à savoir les communautés villageoises, gèrent la partie technique des installations mais aussi la partie management économique pour la collecte de fond pour pourvoir aux dépenses liées à l'entretien et aux frais annexe.

Du point de vue de **l'entretien** des installations, 3 niveaux d'entretien doivent être couverts:

- Entretien *basique et quotidien*, réalisé par un **superviseur** local au village et ayant été formé à cela.
- Entretien *préventif spécialisé*, réalisé par des **techniciens locaux** regroupés en une association pour les mini-réseaux
- Entretien *correctif spécialisé* ; soit réalisé par les **techniciens locaux** soit par une **entreprise extérieure** si l'opération devrais être techniquement complexe et sensible.

C'est très important que les trois niveaux d'entretien soient couverts, de façon à garantir une performance optimale des installations.

Le **superviseur** assure l'entretien journalier : Il y en a un par village. Il s'occupe du nettoyage des locaux voir des panneaux solaires en période d'Armatant (période sèche), vérification du niveau de carburant du groupe, vérification du bon fonctionnement des équipements de production (vérification des consignes de sécurité (ou signal d'erreur) allumé ou pas). En cas de problématique remarqué, il fait appel aux techniciens locaux pour une intervention de leur part.

Les **techniciens locaux** : ils sont regroupés en une (1) association des techniciens pour les 7 villages. Au départ il y avait 3 techniciens par villages. Il y avait 4 femmes dans le groupe des techniciens au total. Au cours de ma visite, il y en avait plus qu'une et certain village n'avait plus 3 techniciens. Les raisons de ces mouvements étaient personnelles, professionnelles ou familiale. (Ex : trouvé un travail ailleurs, pour les femmes, tombé enceinte (cas majeur remarqué) ou suivre son mari)

Le fait d'avoir une association de technicien « régionale » permet justement de palier à cette problématique de personne ressource préalablement formé mais qui ont migré par la suite.

Pour ces techniciens formés, cela permet à certains d'avoir un « nouveau » métier complémentaire d'installateur solaire dans la région. (Cela est déjà arrivé que l'on fasse appel à eux pour faire une petite installation solaire).

Dans le programme de formation de ces techniciens, une recommandation est faite de proposer justement l'apprentissage à ces techniciens d'installation de petite système solaire relativement facile à réaliser comparativement au mini-grid. De plus cela leur permet de garder la main.
Il est à noter aussi que les techniciens ne ressortent pas au même niveau à la suite de la formation. Cela dépend du niveau éducatif de départ mais aussi de l'implication qu'ils mettent dans ce projet.

Pour les entretiens correctif spécialisé ; soit c'est réalisé par les techniciens locaux soit ils ont la possibilité avec des contrats déjà définis avec l'ONG DF Akwaba de faire appels à une **structure spécialisée en solaire**. Ils pourront faire appel à la structure qui à réaliser l'installation ou à une autre car les compétences nationales dans le domaine du solaire existe.

Du point de vue de la partie **management économique**, il a été mis en place :

- Une association de gestion par village : association locale des usagers
- Un comité de suivi et Opération

L'association locale des usagers est composée de 10 membres :

- D'un président : Représentant institutionnel
- D'un vice-président : assure l'intérim du président
- D'un secrétaire : Tâches d'administration générale dont contrat avec usagers
- D'un trésorier : Contrôle général de la comptabilité dont collecte des fonds auprès des usagers
- Superviseur et son adjoint : nettoyage et surveillance maisons de l'énergie et de ses équipements et sollicitation des techniciens locaux au besoin
- Représentant des femmes : Représenter et informer les femmes
- Représentant des hommes ; Représenter et informer les hommes
- Représentant des jeunes : Représenter et informer les jeunes
- Représentant des cadres : Représenter et informer les cadres

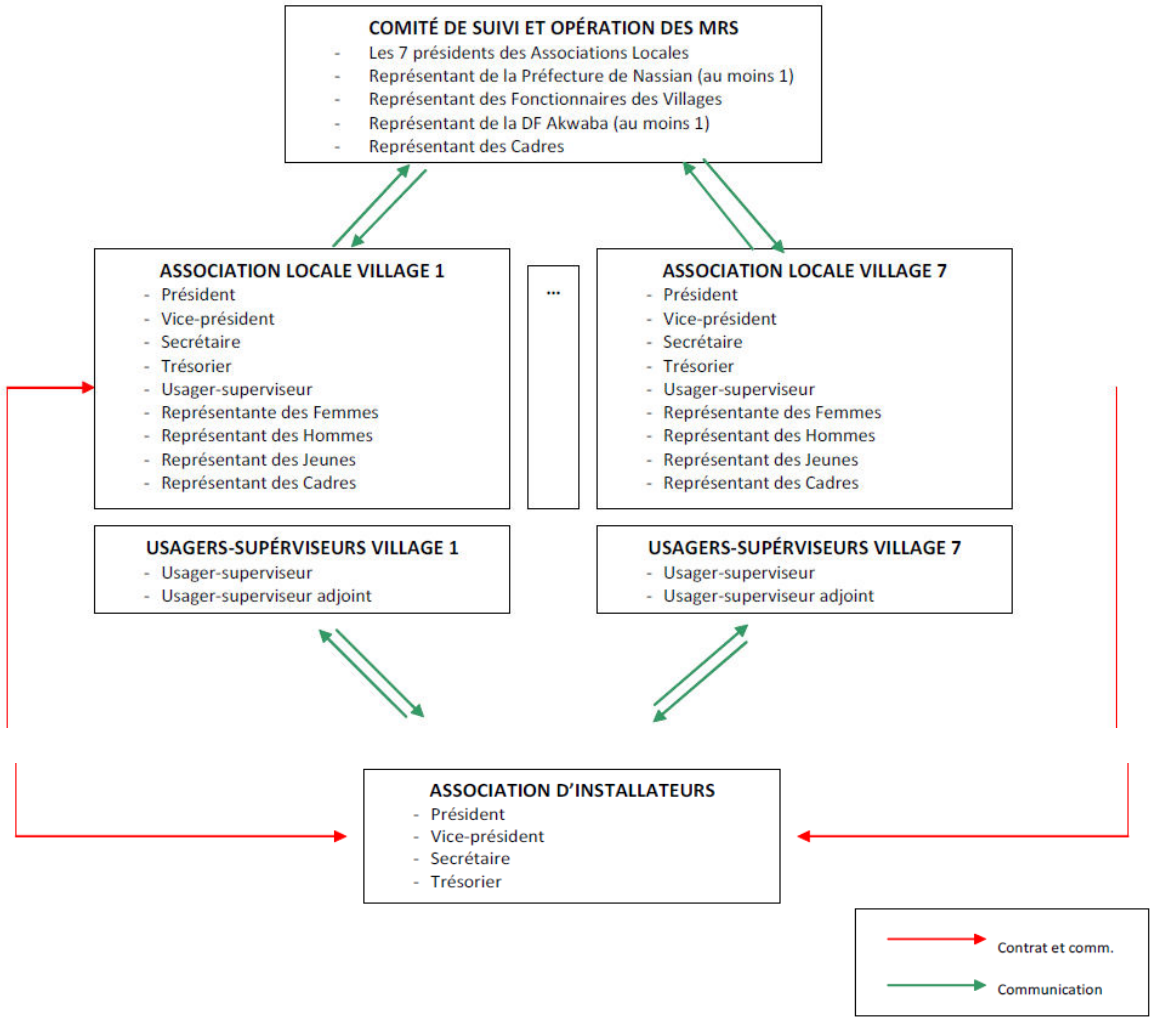
Le rôle de ces 7 associations est d'assurer le bon fonctionnement du service électrique, la convocation des réunions de prise de décision et l'information de ces décisions à la communauté

Le comité de suivi et Opération est composé :

- Des 7 présidents des associations de villages
- D'un représentant de la DF Akwaba
- D'au moins un représentant des cadres
- Un a 2 représentants des autorités locales (préfet et sous-préfet)
- Functionaries des villages

Les fonctions du Comité de Suivi et Opération consistent à suivre et évaluer le fonctionnement des micro-réseaux solaires après la finalisation du projet, valider les hypothèses du projet, garantir que les limites techniques et économiques des systèmes sont respectées et que des changements qui puissent avoir un effet négatif.

Pendant le sixième, septième et huitième semestre du projet est prévu une supervision du fonctionnement du modèle de gestion proposé. Le suivi de tous les acteurs décrits antérieurement sera faite par la DF Akwaba et une adaptation du modèle de gestion, économique et technique  pourra être adapté si besoin est.




**Organigramme 1 : du modèle de gestion proposé**

Une particularité est a apporté pour la **gestion de fond.** Il est prévu l'ouverture de 2 comptes en banque par l'association locale.

- Un compte bloqué : utilisé pour le remplacement des équipements importants (comme les batteries au bout de 15ans) et la gestion d'imprévu.
- Un compte ouvert : utilisé pour la gestion au « quotidien » de l'association locale et de l'entretiens du système globale (gestion de la maison de l'énergie, du système énergétique (ex : frais de déplacement des techniciens locaux)).

Pour débloquer des fonds du compte ouvert, il faut 3 signataires. Pour le déblocage de fond du compte bloqué, il faut l'approbation du comité de suivi.

Dans de tel projet, l'arrivé de l'électricité amène divers AGR (activité génératrice de revenu) que l'on a du mal à tout imaginer. Ces activités vont par la suite générer d'autres besoins. Il serait intéressant de voir comment les revenus du projet pourraient alimenter un fond local au village pour proposer du micro crédit à des projets communautaires.

Durant mon séjour sur le site, une des représentantes des femmes et des jeunes m'ont sollicité par rapport à un besoin de financement d'un projet de transport pour acheminer les produits agricoles et alimentaires (poisson réfrigéré) d'un village à un autre village ou une ville. (Les villages sont isolés et le trafic routier est faible.) Un fond de ce genre pourrait être utilisé à cette fin. Il pourrait de plus contribuer à emmagasiner un peu plus d'argent pour le projet en lui-même avec le remboursement du taux d'intérêt.

**Views of the quality of works carried out**

Les villageois sont très contents des installations qui ont été réalisés.

Ils sont contents de l'éclairage public.

Ils sont aussi très satisfaits du service du réfrigérateur car j'ai pu observer que depuis lors, il n'y avait plus beaucoup de personne qui buvait de l'eau chaude.

# 5. Impact /Impact potential

**Overview of the tariff structure (i.e. 4 levels you mentioned)**

**Pour définir la puissance à installer en termes de panneau solaire, une étude préalable a été faite pour** savoir le nombre de foyer qui souhaiterais avoir le tarif économique (750F/mois) ; moyen (1500F/mois) ; confort (3000F/mois) ; grand confort (5250F/mois), boutique (5250F/mois). Le nombre de centre religieux, de foyer des jeunes et de salle sociale étant déjà connu. Cela à permit de définir une puissance à installer.

| TARIF | NOM | ÉNERGIE MISE À DISPOSITION EMD (kWh/mois) | Frais (FCFA/mois) | Puissance Nominale (W) |
|---|---|---|---|---|
| ECONOMIQUE | T8 | 8 | 750 | 500 |
| MOYEN | T17 | 17 | 1500 | 500 |
| CONFORT | T33 | 33 | 3000 | 500 |
| GRAND CONFORT | T59 | 59 | 5250 | 500 |
| BOUTIQUE | T59 | 59 | 5250 | 500 |
| CENTRE RÉLIGIEUX | T33 | 33 | 3000 | 500 |
| FOYER DE JEUNES | T67 | 67 | 6000 | 1000 |
| SALLE SOCIALE | T100 | 100 | 9000 | 2000 |
| STATION POMPAGE | T67 | 67 | 6000 | 2000 |

Tableau 1 : Tarif de souscription

| Village | Zazou | | SOLOKAYE | | Kapé | | Kakpin | | Gansé | | Boudou | | KROMAMBIRA | | **moyenne** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| tarif économique | 8 | 6% | 3 | 4% | 10 | 13% | 20 | 14% | 15 | 12% | 34 | 44% | 20 | 19% | **16%** |
| tarif moyen | 47 | 36% | 31 | 46% | 21 | 27% | 80 | 55% | 21 | 17% | 30 | 38% | 68 | 63% | **40%** |
| tarif confort | 31 | 24% | 26 | 38% | 29 | 37% | 24 | 17% | 6 | 5% | 4 | 5% | 10 | 9% | **19%** |
| tarif grand confort | 30 | 23% | 5 | 7% | 10 | 13% | 11 | 8% | 50 | 41% | 5 | 6% | 8 | 7% | **15%** |
| boutique | 13 | 10% | 3 | 4% | 9 | 11% | 10 | 7% | 29 | 24% | 5 | 6% | 2 | 2% | **9%** |
| total | 129 | | 68 | | 79 | | 145 | | 121 | | 78 | | 108 | | |

Tableau 2 : La répartition des tarifs prévue en termes de souscription

Une des problématiques et risques vis-à-vis du volet financier d'un projet de ce type en milieu rurale est la non capacité des villageois à faire face au tarif mensuel à payer.

Ces tarifs sont des tarifs prépayés est sont donc connu à l'avance. A la grande récolte, source de revenu majeure, les bénéficiaires peuvent s'acquitter de leur cotisation pour plusieurs mois en attendant la prochaine récolte.

De plus, une étude préalable a été faite pour savoir le niveau de tarif que pouvait et était prêt à payer les bénéficiaires. On remarque d'ailleurs dans le tableau 2 ci-dessus que la majorité des tarifs souscrits sont le tarif moyen puis confort. Le tarif le plus économique et le plus élevé étant au même niveau d'abonné.

Dans un des villages prés du fleuve où l'activité de pêche est importante et où les besoins de conservation de poisson sont élevés, les tarifs grand confort et boutique sont les plus importants.

Le coût du raccordement au réseau était de 82.000 Fcfa. Ce coût a été trouvé trop élevé par les villageois. L'ONG DF Akwaba a pu trouver des financements pour réduire ce coût à 40.000 Fcfa. Depuis plus d'un an l'ONG collecte ces fonds pour que le jour où le courant est enfin distribué, tout le monde puisse avoir accès en même temps à l'électricité. Une majorité des abonnés c'est acquittée de cette cotisation lors de ma visite et les retardataires vus l'échéance de la mise en marche total du système se sont mobiliser pour le faire. C'est d'ailleurs une volonté de l'ONG que tout les abonnées puissent avoir en même temps l'électricité chez lui lorsqu'elle viendra.

**The impact prospects of the mini-grid installations for the local communities**

Il est attendu est une augmentation du confort de vie des populations.
C'est une forte aspiration que les populations ont. En effet, durant ma visite de site, un des villages en phase de test avait un congélateur qui était en permanence remplis car la majorité des populations voulait avoir accès à l'eau fraiche.
La source de revenu principale des populations de la région est l'agriculture. L'arrivé du courant va permettre d'utiliser des moulins pour moudre et écraser les céréales.
L'éclairage public augmente le niveau de sécurité pour toute la population.

L'exode rural est moins important et les ressources humaines restent plus longtemps.
Lors de notre visite, une fêtes des jeunes avait été organisé dans un des villages pour pâques (photo 16 en annexe) ce qui avait attiré les autres jeunes des villages alentours et ceux partie en ville à revenir dans le village.

Les fonctionnaires, comme les enseignants sont plus enclins à rester dans les villages électrifiés. Le niveau éducatif augmente donc.
La migration des villageois dans les zones non électrifiés vers les villages du projet vont accroitre le nombre de personne de passage dans le village ce qui va permettre d'accroitre la rentabilité des petits commerces.

d) Impact prospects with regard to improved health

L'éclairage public permet de réduire le nombre d'accident. Cela éloigne aussi les animaux dangereux comme les serpents.

Un des villages possède un centre de santé. L'accès à l'énergie va permettre de meilleurs soins tout en attirant et en sédentarisant des sages-femmes, des infirmières voir des docteurs.

Les accouchements pourront se faire dans de meilleures conditions.

e) Impact prospects with regard to improved income generation opportunities

Les activités principales que les villageois ont demandées lors de ma visite étaient :

- L'accès à un moulin
- Les congélateurs pour conserver les denrées alimentaires
- L'accès à l'énergie pour les coiffeurs
- Pour les artisans comme soudeur et menuisier

L'éclairage public permettra une plus grande plage d'ouverture des commerces.

f) Impact prospects with regard to moving towards a low/lower carbon community

Il n'y a pas trop de groupe électrogène dans les villages. Il a été estimé une consommation de 75000Fcfa (115€) de consommation de gasoil par an pour un des villages qui utilisé un groupe électrogène à l'occasion de fête communautaire (ex : cérémonie religieuse, mariage, etc.).

**Gender-related potential impacts**

L'éclairage public permet d'accroitre le nombre de petit commerce majoritairement tenu par les femmes ainsi que le temps d'ouverture et donc d'augmenter la rentabilité.

Souvent les pompes à eau se trouvent éloignées du centre du village. Avant l'éclairage public, les femmes devaient s'organiser pour aller chercher l'eau avant la nuit ce qu'elles peuvent faire maintenant plus aisément même lorsque le soleil est couché.

L'accès à l'éclairage dans les centres de santés réduit aussi le taux de mortalité des femmes lors des accouchements.

**Monitoring and measuring of the long term impact of the project**

Une mesure du nombre d'activité génératrice de revenu avant et après le projet pourra être faite pour connaitre l'influence du projet sur l'activité entrepreneurial que cela à susciter.
Un impact sur la réduction de l'exode rurale et l''augmentation du retour à la terre des populations pourra être fait en fonction du nombre de maison construit.

Le nombre de fonctionnaire installé suite à l'arrivé du courant sera chiffrable assez facilement. Cela permettra de mesurer dans une certaine mesure l'augmentation du niveau d'accès à un service éducatif et de santé de qualité.

Les données de production de la centrale solaire grâce au monitoring de la centrale avec les différents appareils de mesure pourront donner des informations intéressantes et réutilisables pour des projets d'énergies solaires dans la région mais aussi à l'échelle nationale pour montrer la potentialité de la technologie.

## 6. Sustainability and risks

**Level of awareness-raising and capacity building and knowledge transfer to local stakeholders,**

**Level of local ownership**

Une des particularités de ce projet est celui porté sur la formation et sensibilisation des bénéficiaires sur la sobriété énergétique et l'accès aux équipements d'efficacité énergétique. Les équipements que les villageois utiliseront seront des équipements d'efficacités énergétiques. Ainsi, pour une dépense financière donnée ils auront accès à un plus grand nombre de service énergétique (nombre et durée d'utilisation d'équipement électrique moins énergivore. Exemple : 8 ampoules LED de 5W est équivalent à 1 ampoule de 40W classique).

Une phase d'apprentissage de l'utilisation de son niveau de consommation est prévue. Un usager qui dépasse son niveau de consommation sera prévenu de son dépassement sans forcément que on lui coupe le courant directement. Cependant, si cela se répète, lorsque son quota énergétique sera dépassé, le courant lui sera coupé et il devra attendre le début du mois suivant pour bénéficier à nouveau de l'électricité.

Comme dis précédemment, les techniciens formés en énergie solaire peuvent réaliser des petites installations solaires pour les populations locales en dehors des villages électrifiés.

**Sustainability – Technical and management**

Le projet c'est donné les moyens d'avoir une autosuffisance financière pour avoir une durée de vie sans cesse renouveler.

La partie entretiens aussi a été prise en compte ave la formation d'un superviseur pour la gestion quotidienne du système solaire, de techniciens pour la partie maintenance préventive mais aussi de l'entretiens correctif, si possible, ou l'utilisation de contrat type pour faire appel à une entreprise spécialisé dans le domaine spécifique nécessaire.

**Sustainability of the institutional/management arrangements**

Une association a été créée pour gérer la bonne marche des équipements qui lui ont été confié.

Des formations leurs ont été données pour cela. Des comptes en banques pour la gestion au quotidien ont été ouverts mais aussi des comptes en banques pour le remplacement des équipements aussi.

Le niveau d'acquisition des informations nécessaires à cette gestion est d'un très bon niveau à mon sens car même ceux qui ont un niveau de français moyen ont réussi à m'expliquer le rôle de la fonction de chacun des membres de l'association de gestion et le rôle des techniciens locaux. Ils savaient aussi qu'elles étaient leurs options en cas de problématique sur la centrale de production, ou sur le mode d'encaissement des villageois (niveau des tarifs, reçu à donner après paiement, modalité d'adaptation en cas de non paiement, procédure pour nouvelle abonné).

Néanmoins une remarque est à faire par rapport au niveau de la formation initiale des personnes proposées pour gérer l'association. Les personnes qui ont été proposées par les villageois pour être dans l'association de gestion des villages a été faite en fonction de la notoriété de ces personnes. Cependant elles n'ont pas toutes un niveau éducatif apte à bien appréhender les formations qui leur sont octroyés. Certaines personnes ne savaient ni lire ni écrire, une mise à niveau dans ce domaine serait à prévoir pour les prochains projets de ce genre. (Exemple : un trésorier désigné se devait de savoir lire et écrire pour mieux maitriser le poste informatique pour la partie gestion administratif des factures).

**Sustainability – Financial**

i. Contribution of the pre-feasibility studies carried out by UNIDO

Les études de préfaisabilités de l'ONUDI étaient faites sur d'autres villages (11) que ceux du projet Zanzan. Cependant l'ONUDI a été pour l'ONG DF Akwaba comme une structure support en termes techniques mais aussi informatif vis-à-vis des questions qu'elle pouvait avoir au niveau des mini-réseaux.

L'ONUDI a été aussi un allié toujours présent pour la partie négociation avec les différents parties comme la direction générale de l'énergie, celle des énergies renouvelables et l'union européen.

**Sustainability – Institutional/Regulatory (including potential for the model as a basis for wider replication_**

Lors du lancement du projet, il n'y avait pas de problématique à ce qu'une composante spécifique du projet, à savoir l'auto gestion du mini-réseau par les bénéficiaires soit mise en application.

Cependant, le nouveau code de l'électricité qui prévoit donnée essentiellement la gestion de la distribution et de la commercialisation de l'électricité à la Compagnie national d'électricité CIE amène quelque discussion dans le déroulement du projet. Cette loi étant arrivé a postériori des autorisations initiales, des discussions sont en cours pour savoir comment trouver le meilleur compromis.

D'un point de vue technique et économique, le projet est réplicable à une échelle supérieure.

La problématique du financement initiale est un point majeur important néanmoins.

## 7. Field visit conclusions and closing remarks

L'idée principale de la visite de terrain est que parmi tout les villageois interroger (chef de village, sous-préfet, techniciens et technicienne, superviseur, représentante des femmes, présidents d'association et trésoriers et simple villageois) tous sont très content du projet et n'ont trouvé aucun reproche au projet et à son déroulement si ce n'est le temps que cela prend et l'impatience qu'ils ont enfin d'avoir le courant partout chez eux.

Le travail et les équipements utilisés pour la réalisation du projet sont à mes yeux de très bonne qualité et finition.

Les recommandations et suggestion que je pourrais faire pour le projet sont :

- D'associer des ministères historiquement favorables à ce type de projet d'EnR comme le ministère de l'environnement ou le ministère de l'agriculture intéressé de trouver des solutions pour lutter contre l'exode rural.
- D'ouvrir un fond pour le développement d'activité communautaire pour les villages afin de faire face aux nouvelles activités génératrices de revenu qui nécessiterait un léger appui pour faciliter encore plus leur développement.

# ANNEXE

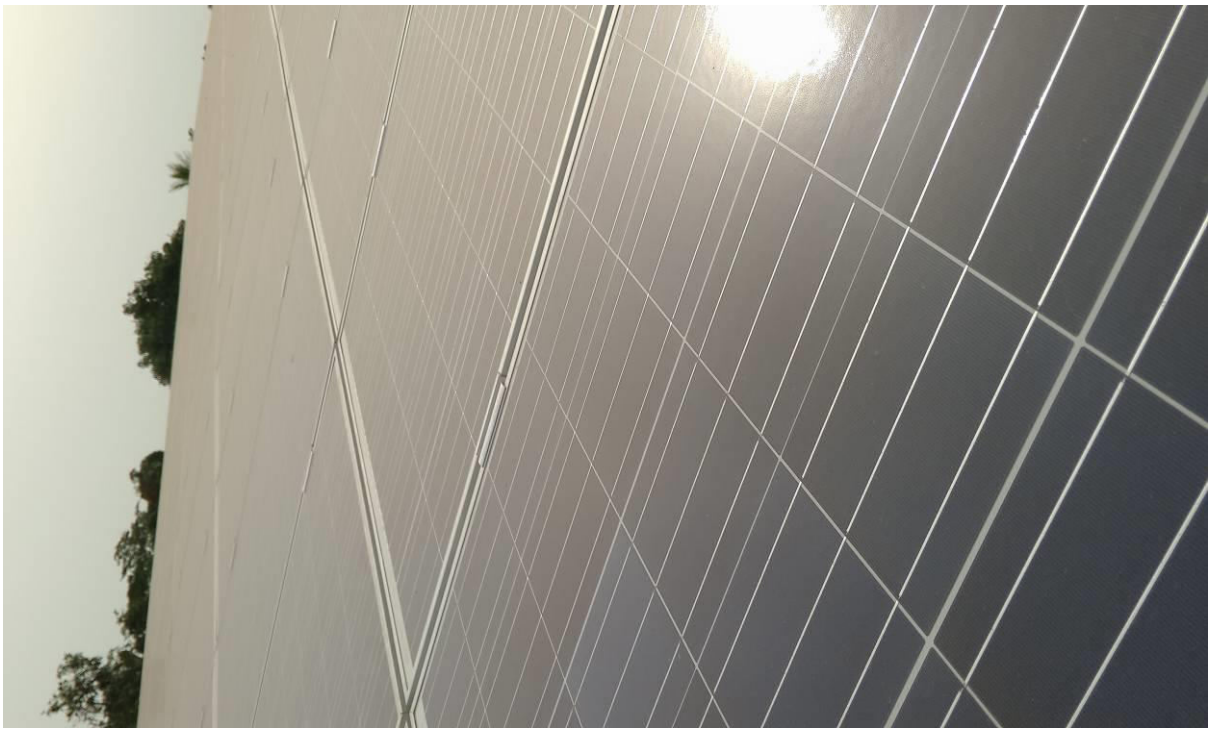


Photo 3: Champs des panneaux solaires sur la maison de l’énergie de Zamou

Photo 4 : Maison de l’énergie de Kakpin

Photo 5 : Parc batterie

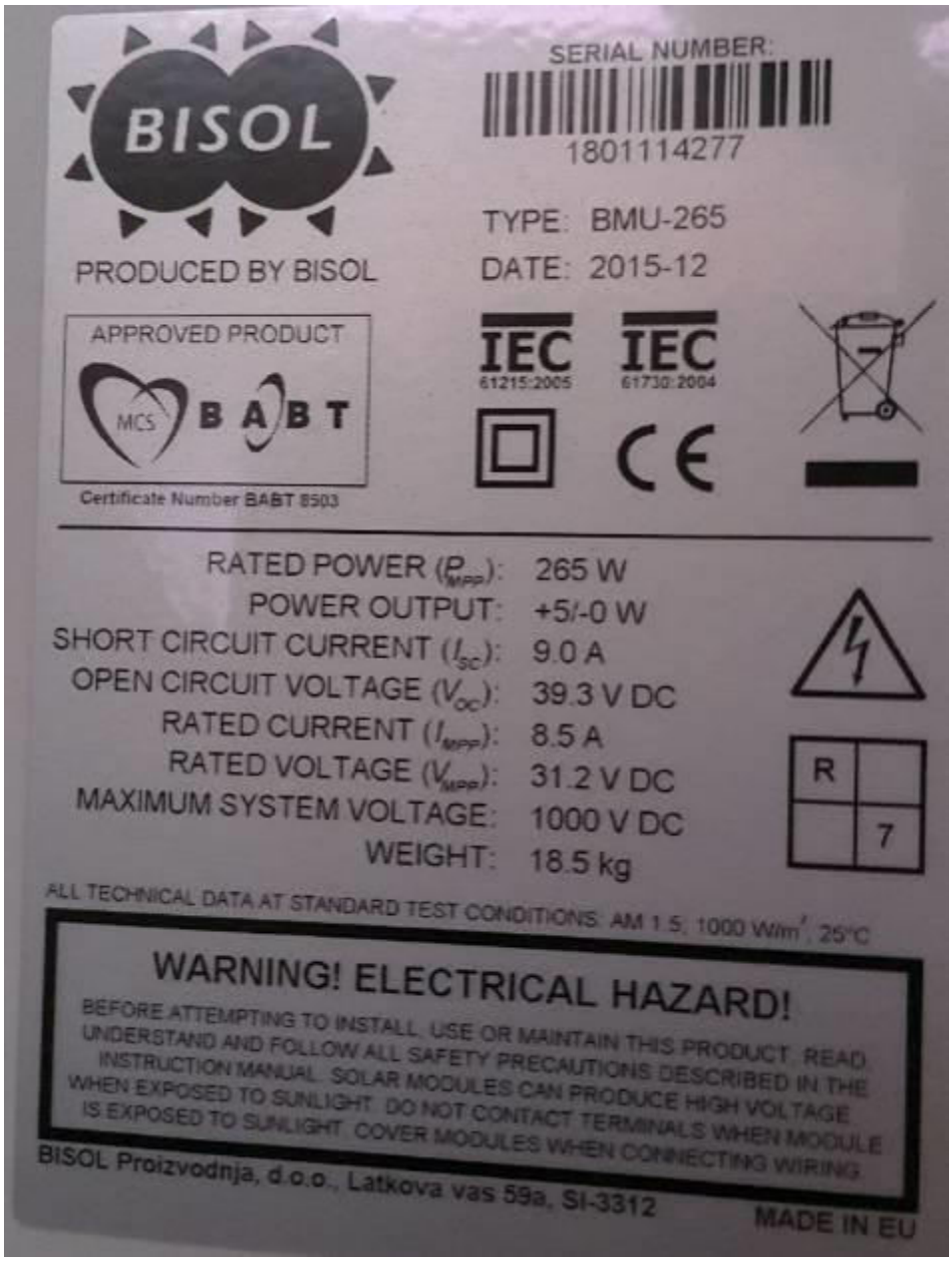



Photo 6 : caractéristiques des panneaux solaires photovoltaïques


Photo 7: Lampadaire

Photo 8: Poteau de raccordement électrique au maison des abonnés

Photo 9: Tableau de raccordement électrique


Photo 10 : Onduleur réseau Tripower SMA

Photos 11-12: Onduleur réseau et onduleur/chargeur installés sur site

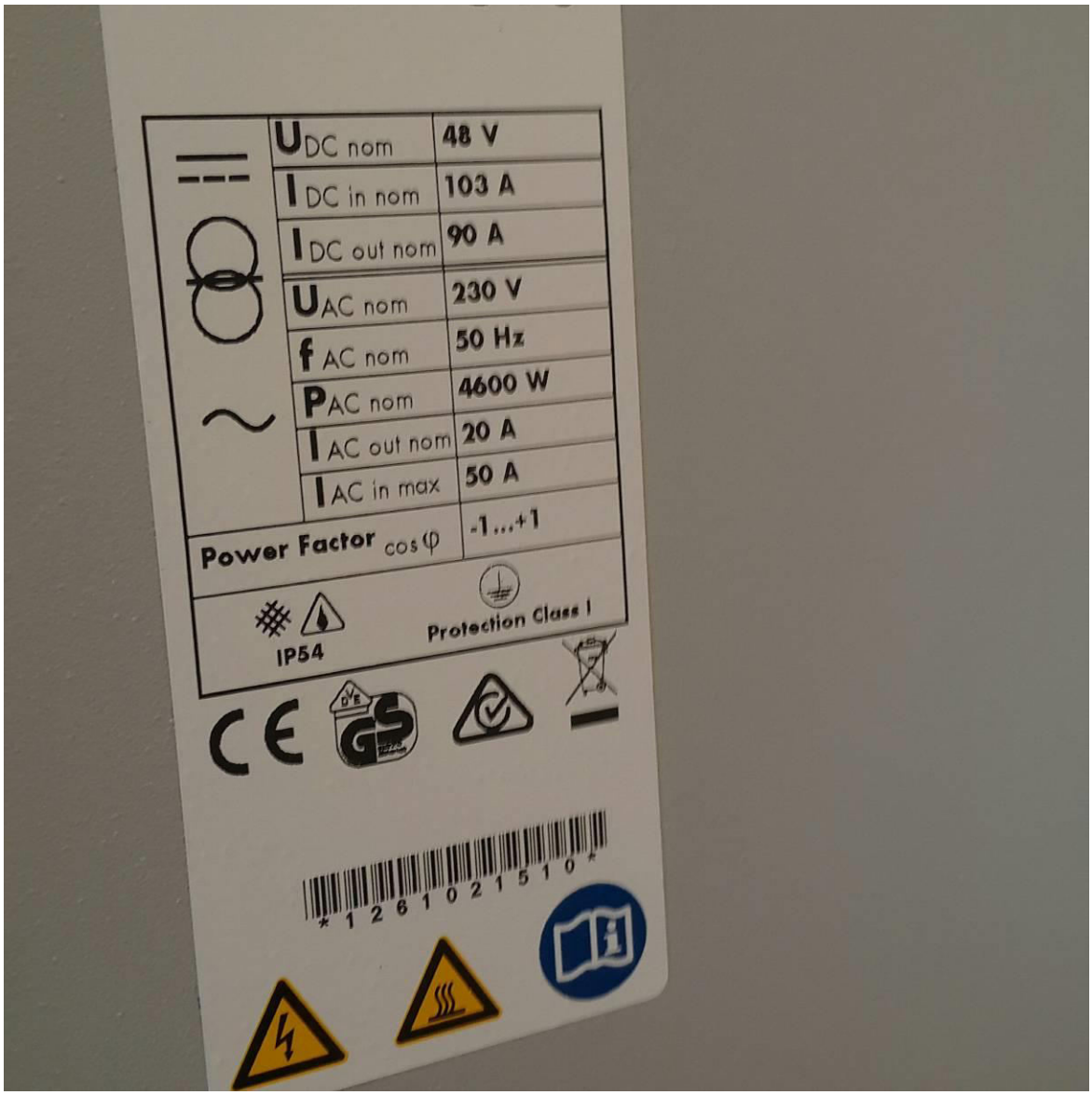



Photo 13: Caractéristique de l’onduleur/chargeur sunny island

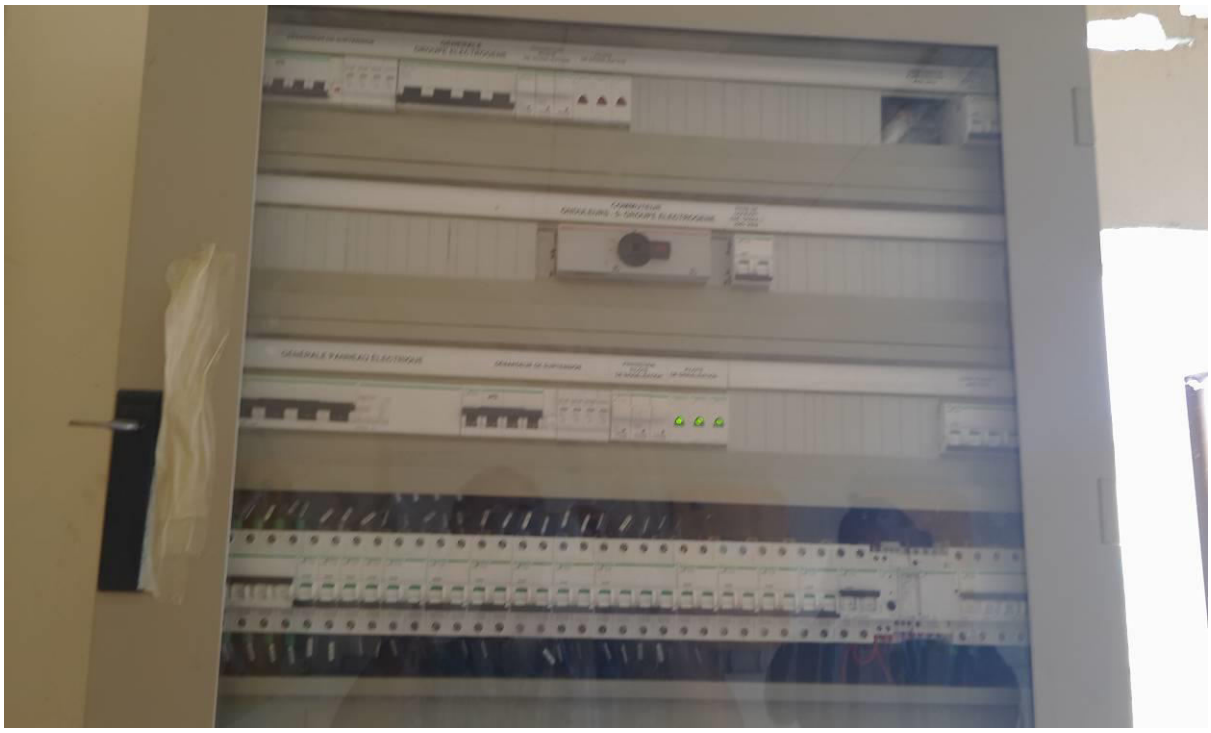


Photo 14: Tableau de sécurité du système de production

Photo 15: Chef de projet ONUDI – technicien local – évaluateur national ONUDI

Photo 16: Début de la fête des jeunes organisée à la maison de l’énergie pour Pâques

Annex 5: Evaluation Terms of Reference

**UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION**

**TERMS OF REFERENCE**

**Independent terminal evaluation of the UNIDO project:**

***Promoting Renewable Energy-Based Grids in Rural Communities for Productive Uses in Côte d'Ivoire***

UNIDO project number: GFIVC12005
UNIDO SAP ID: 100186
GEF ID: 4005

**October 2015**

**Project background and overview**

**Project factsheet**

| | |
|---|---|
| **Project Title** | **Promoting Renewable Energy-Based Grids in Rural Communities for Productive Uses in Côte d'Ivoire** |
| **UNIDO project No. and/or SAP ID** | **GFIVC12005 / SAP ID: 100186** |
| **GEF project ID** | **4005** |
| **Region** | **Africa** |
| **Country(ies)** | **Ivory Coast** |
| **GEF focal area(s) and operational programme** | **Climate Change CC-3** |
| **GEF implementing agency(ies)** | **UNIDO** |
| **GEF executing partner(s)** | |
| **Project size (FSP, MSP, EA)** | **MSP** |
| **Project CEO endorsement / Approval date** | **04 April 2012** |
| **Project implementation start date (First PAD issuance date)** | **16 May 2012** |
| **Expected implementation end date (indicated in CEO endorsement/Approval document)** | **30 April 2016** |
| **Revised expected implementation end date (if applicable)** | |
| **Actual implementation end date** | **30 April 2016** |
| **GEF project grant (excluding PPG, in USD)** | **863,691** |
| **GEF PPG (if applicable, in USD)** | **50,000** |
| **UNIDO co-financing (in USD)** | **150,000 (cash+In-kind)** |
| **Total co-financing at CEO endorsement (in USD)** | **3,877,270 (cash+In-kind)** |
| **Materialized co-financing at project completion (in USD)** | |
| **Total project cost (excluding PPG and agency support cost, in USD; i.e., GEF project grant + total co-financing at CEO endorsement)** | **4,790,691** |
| **Mid-term review date** | |
| **Planned terminal evaluation date** | **January-March 2016** |

*(Source: Project document)*[33]

[33] Project information data throughout these TOR are to be verified during the inception phase.

**Project background and context**

Ivory Coast is located in Western Africa, bordering the North Atlantic Ocean, between Ghana and Liberia. It shares a border with Burkina Faso, Ghana, Guinea, Liberia and Mali. It has a population of around 23.3 million, with only around 8% of the population 55 years of age and above and population growth rate of 1.9% (2015). Literacy rate of population is less than 44%. 42% of the population lives below the poverty line.

Ivory Coast has a GDP of around USD 34 billion (official exchange rate, 2014) and a GDP real growth rate of 7.5% (2014 estimate), which has been contracting since 2012 (10.7%; 2013: 8.7%). Services constitute the highest contribution to the GDP with 52%, followed by agriculture with almost 26% and the smallest contribution by industry with around 32%. However, almost 70% of the labour force is engaged in agriculture.

Agricultural products are coffee, cocoa beans, bananas, palm kernels, corn, rice, cassava (manioc, tapioca), sweet potatoes, sugar, cotton, rubber and timber. Industries are in the following sectors: foodstuffs, beverages, wood products, oil refining, gold mining, truck and bus assembly, textiles, fertilizer, building materials and electricity. Growth rate of industrial production is estimated to be at 8.4% (2014).

Export commodities are cocoa, coffee, timber, petroleum, cotton, bananas, pineapples, palm oil and fish. Main export partners are Ghana (9.1%), US (8.5%), Nigeria (7.9%), Netherlands (7.4%), Gabon (5.4%), Germany (5%), France (5%), Belgium (4.3%) (2014). Ivory Coast imports fuel, capital equipment, foodstuffs, mainly from Nigeria (21.8%), France (11.7%), China (11%), The Bahamas (6.2%) (2014).

Ivory Coast is party to various international environmental agreements, such as Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Hazardous Wastes, Law of the Sea, Marine Dumping, Ozone Layer Protection, Ship Pollution, Tropical Timber, Wetlands. Current environmental issues are deforestation (most of the country's forests - once the largest in West Africa - have been heavily logged); water pollution from sewage and industrial and agricultural effluents.

60% of total installed capacity for electricity is generated from fossil fuels; and 40% from hydroelectric plants. Over 40% of the population lacks access to electricity. In rural areas, electricity is considered a luxury. The access rate is only 14% in rural households, compared to 77% in urban areas. In those regions not serviced by electricity, charcoal, fuel wood and kerosene are the most important sources of energy. Majority of the population relies on fuel wood and charcoal for cooking.

The project is expected to remove the institutional, technical, knowledge and awareness-related barriers to the promotion of a market approach for renewable energy based mini grid systems to meet the growing needs for electricity in rural areas. The project aims at promoting solar photovoltaic-based mini-grids in order to increase the rate of modern energy access of the rural populations to replacing the presently used fossil energies. This is through an integrated approach that combines substantial capacity building and learning-by-doing with technical assistance interventions at the policy and demonstration project level.

The project is funded through a GEF grant, amounting to USD 863,691 (and PPG Grant of USD 50,000), a UNIDO contribution of USD 150,000 (cash and In-kind); and the counterparts' co-financing of USD 3,877,120 (cash and in kind), which amount to total project budget of USD 4,790,691.

Project implementation started in May 2012 and the initial project end date was in April 2016. The same was revised to December 2016. Actual implementation end date is _____.

Continuous Monitoring is foreseen in the project document, as well as a terminal evaluation (TE). The TE is scheduled to take place from _____ - _____.

**Project objective and structure**

The project will focus mainly on:
(i) creating a critical mass of skilled and knowledgeable technicians and public officers;
(ii) building awareness, specially of the private sector, about the appropriate technologies and the best practices;
(iii) linking energy services with productive uses, and (iv) formulating and strengthening policies encouraging the involvement of the private sector and promote providing access to innovative and smart financial mechanisms.

The end of project situation included establishing a total of 120 kW photovoltaic based generation capacity, composed of 3 photovoltaic based mini grid facilities. The project aimed at establishing 3 pilot demonstration sites in off-grid isolated communities and implement the pilots through the learning-by-doing approach and by building local capacity.

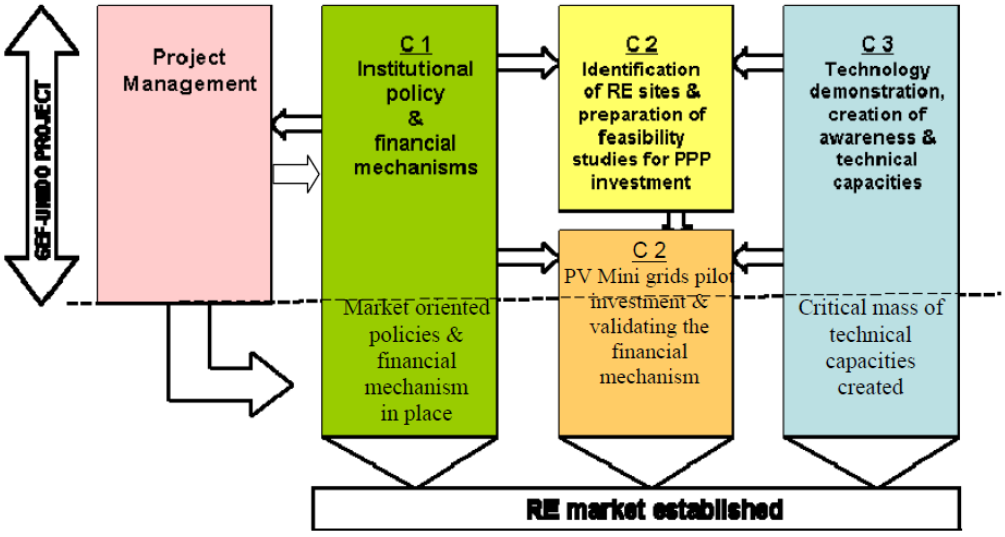
The project consists of 3 technical components, in addition to monitoring and evaluation and project management, as follows:

Project Component 1: Institutional, Policy and Financial Mechanisms
Expected outcome: An effective, market-oriented policy and regulatory framework to stimulate investments in RE

Project Component 2: Identification of Resources and Preparation of Feasibility Studies
Expected outcome: A portfolio of RE energy projects prepared for pilot PPP investments during and post project

Project Component 3: Technology Demonstration and Creation of Awareness and Technical Capacities
Expected outcome: Reduced GHG emissions and increased access to rural electrification following increased awareness and technical capabilities of stakeholders to evaluate technical and commercial viability of photovoltaic-based mini grids and reduced barriers to development
of businesses in renewable energies.

The following figure illustrates how the project components interact together to enable the facilitation of a renewable energy market in Ivory Coast.



**Project implementation and execution arrangements**

UNIDO: is the Implementing Agency for the project and responsible for, amongst others, the general oversight of the project management conducted by the Project Coordination Unit (PCU).

Directorate of Energy of the Ministry of Mines and Energy: is the main counterpart agency.

Project Coordination Unit (PCU): was to be established within the Directorate of Energy of the Ministry of Mines and Energy, and be responsible for overall day to day coordination and supervision of field activities.

Project Steering Committee (PSC): to be constituted by representatives of main stakeholders, to advise the project on strategic directions of support activities to be provided.

## 5. Budget information

As envisioned at the time of CEO Endorsement/Approval, the project is funded through a GEF grant, amounting to USD 863,691 (and PPG Grant of USD 50,000), a UNIDO co-financing contribution of USD 150,000 (cash + in-kind); and the counterparts' total co-financing of USD 3,727,270 (cash + in-kind), which amount to total project budget of USD 4,790,691.

**Financing plan summary for the project (in USD):**

| | ***Project Preparation*** | ***Project*** | ***Total*** |
|---|---|---|---|
| GEF financing | 50,000 | 863,691 | 913,691 |
| Co-financing (Cash and In-kind) | 50,000 | 3,877,270 | 3,927,270 |
| Total | 100,000 | 4,740,961 | 4,840,961 |

*(Source: CEO endorsement document)*

**Project budget:**

| **Project outcomes** | **GEF ($)** | **Co-Financing ($)** | **Total ($)** |
|---|---|---|---|
| 1. Institutional, Policy and Financial Mechanisms | 17,000 | 30,000 | 47,000 |
| 2. Identification of Resources and Preparation of Feasibility Studies | 20,000 | 20,000 | 40,000 |
| 3. Technology Demonstration and Creation of Awareness and Technical Capacities | 752,464 | 3,727,000 | 4,479,464 |
| Monitoring and Evaluation | 21,000 | 50,000 | 71,000 |
| Project Management | 53,227 | 50,270 | 103,497 |
| Total | 863,691 | 3,877,270 | 4,740,961 |

**(Source: CEO endorsement document)**

**Expected co-financing source breakdown is as follows:**

| Name of Co-financier (source) | Classification | Type | Project |
|---|---|---|---|
| Ministry of Mines and Energy | Government | Cash | 727,270 |
| UNIDO | IA | Cash | 50,000 |
| | | Cash | 100,000 |
| BOAD Banque | Financial Institution | Cash | 3,000,000 |
| Total Co-Financing | | | 3,877,270 |

(Source: CEO endorsement document)

**UNIDO GEF-grant disbursement breakdown:**

| Item | EXECUTED BUDGET in 2013 | EXECUTED BUDGET in 2014 | EXECUTED BUDGET in 2015 | Total Expenditure (2013-present) (12 Oct. 2015) |
|---|---|---|---|---|
| Contractual Services | | 7,408.30 | | 7,408.30 |
| Equipment | | 492,608.00 | | 492,608.00 |
| Internat. Cons/Staff | 62,128.88 | 54,675.03 | 19,517.71 | 136,321.62 |
| Local Travel | 15,220.51 | 4,369.97 | 3,723.68 | 23,314.16 |
| Nat. Consult./Staff | 18,093.69 | 41,683.67 | 90,543.75 | 150,321.11 |
| Other Direct Costs | 196.67 | 4,109.67 | 2,933.26 | 7,239.60 |
| Premises | | 60.22 | 330.53 | 390.75 |
| Staff Travel | 7,312.84 | 6,365.38 | 7,189.66 | 20,867.88 |
| Training/Fellowship/Study | | | | 0.00 |
| **Total** | **102,952.59** | **611,280.24** | **124,238.59** | **838,471.42** |

**(Source: SAP database, 10 October 2015)**

**Scope and purpose of the evaluation**

The terminal evaluation (TE) will cover the whole duration of the project from its starting date in May 2012 to the estimated completion date in April 2016. It will assess project performance against the evaluation criteria: relevance, effectiveness, efficiency, sustainability and impact.

From the knowledge management perspective, the TE has an additional purpose of drawing lessons and developing recommendations for UNIDO and the GEF that may help improving the selection, enhancing the design and implementation of similar future projects and activities in the country and on a global scale upon project completion. The TE report should include examples of good practices for other projects in the focal area, country, or region.

The TE should provide an analysis of the attainment of the project objective(s) and the corresponding technical components. Through its assessments, the TE should enable the Government, the national GEF Operational Focal Point (OFP), counterparts, the GEF, UNIDO and other stakeholders and donors to verify prospects for development impact and promoting sustainability, providing an analysis of the attainment of global environmental objectives, project objectives, delivery and completion of project outputs/activities, and outcomes/impacts based on indicators, and management of risks. The assessment includes re-examination of the relevance of the objectives and other elements of project design according to the project evaluation parameters defined in chapter VI.

The key question of the TE is whether the project has achieved or is likely to achieve its main objective of removing the institutional, technical, knowledge and awareness-related barriers to the promotion of a market approach for renewable energy based mini grid systems to meet the growing needs for electricity in rural areas; and to what extent the project has achieved its expected outcomes.

**Evaluation approach and methodology**

The TE will be conducted in accordance with the UNIDO Evaluation Policy[34], the UNIDO Guidelines for the Technical Cooperation Programme and Project Cycle[35], the GEF Guidelines for GEF Agencies in Conducting Terminal Evaluations[36], the GEF Monitoring and Evaluation Policy[37] and the GEF Minimum Fiduciary Standards for GEF Implementing and Executing Agencies[38].

It will be carried out as an independent in-depth evaluation using a participatory approach whereby all key parties associated with the project are kept informed and regularly consulted throughout the evaluation. The evaluation team leader will liaise with the UNIDO Office for Independent Evaluation (ODG/EVA) on the conduct of the evaluation and methodological issues.

The evaluation team (ET) will be required to use different methods to ensure that data gathering and analysis deliver evidence-based qualitative and quantitative information, based on diverse sources, as necessary: desk studies and literature review, statistical analysis, individual interviews, focus group meetings, surveys and direct observation. This approach will not only enable the evaluation to assess causality through quantitative means but also to provide reasons for why certain results were achieved or

[34] UNIDO. (2015). Director General's Bulletin: Evaluation Policy (UNIDO/DGB/(M).98/Rev.1)

[35] UNIDO. (2006). Director-General's Administrative Instruction No. 17/Rev.1: Guidelines for the Technical Cooperation Programme and Project Cycle (DGAI.17/Rev.1, 24 August 2006)

[36] GEF. (2008). Guidelines for GEF Agencies in Conducting Terminal Evaluations (Evaluation Office, Evaluation Document No. 3, 2008)

[37] GEF. (2010) The GEF Monitoring and Evaluation Policy (Evaluation Office, November 2010)

[38] GEF. (2011). GEF Minimum Fiduciary Standards: Separation of Implementation and Execution Functions in GEF Partner Agencies (GEF/C.41/06/Rev.01, 3 November 2011, prepared by the Trustee)

not and to triangulate information for higher reliability of findings. The specific mixed methodological approach will be described in the inception report.

The evaluation team will develop interview guidelines. Field interviews can take place either in the form of focus-group discussions or one-to-one consultations.

The methodology will be based on the following:

- A desk review of project documents, including, but not limited to:

- The original project document, monitoring reports (such as progress and financial reports to UNIDO and UNIDO-GEF annual Project Implementation Reports (PIRs)), mid-term review report, output reports (case studies, action plans, sub-regional strategies, etc.), back-to-office mission report(s), end-of-contract report(s) and relevant correspondence.
- If applicable, notes from the meetings of committees involved in the project (e.g. approval and steering committees).

- Other project-related material produced by the project.

- The evaluation team will use available models of (or reconstruct if necessary) theory of change for the different types of intervention (enabling, capacity, investment, demonstration). The validity of the theory of change will be examined through specific questions in interviews and possibly through a survey of stakeholders.

- Counterfactual information: In those cases where baseline information for relevant indicators is not available, the evaluation team will aim at establishing a proxy-baseline through recall and secondary information.

- Interviews with project management and technical support including staff and management at UNIDO HQ and in the field and – if necessary - staff associated with the project's financial administration and procurement.

- Interviews with project partners and stakeholders, including, among others, government counterparts, GEF OFP, project stakeholders, and co-financing partners as shown in the corresponding sections of the project documents.

- On-site observation of results achieved by demonstration projects, including interviews of actual and potential beneficiaries of improved technologies.

- Interviews and telephone interviews with intended users for the project outputs and other stakeholders involved in the project. The evaluation team shall determine whether to seek additional information and opinions from representatives of any donor agency (ies) or other organizations.

- Interviews with the relevant UNIDO Field Office and the project's management members and the various national and sub-regional authorities dealing with project activities as necessary.

If deemed necessary, the evaluation team shall also gain broader perspectives from discussions with relevant GEF Secretariat staff.
Other interviews, surveys or document reviews as deemed necessary by the evaluation team and/or UNIDO, ODG/EVA.

The inception report will provide details on the methodology used by the evaluation team and include an evaluation matrix.

**Evaluation team composition**

The evaluation team will be composed of one international evaluation consultant acting as the team leader and one national evaluation consultant.

The evaluation team is required to provide information relevant for follow-up studies, including terminal evaluation verification on request to the GEF partnership up to three years after completion of the terminal evaluation.

Both consultants will be contracted by UNIDO. The tasks of each team member are specified in the job descriptions annexed to these terms of reference.

Members of the evaluation team must not have been directly involved in the design and/or implementation of the projects/programme under evaluation.

The UNIDO project manager and the project team in Ivory Coast will support the evaluation team. The UNIDO GEF Coordinator and the GEF OFP will be briefed on the evaluation and provide support to its conduct. GEF OFP will, where applicable and feasible, also be briefed and debriefed at the start and end of the evaluation mission.

**Time schedule and deliverables**

The evaluation is scheduled to take place from 1 November 2015 to 31 December 2015. The evaluation mission is planned for 20 to 26 November 2015. At the end of the field mission, there will be a presentation of the preliminary findings for all stakeholders involved in this project/programme in Ivory Coast.

After the evaluation mission, the evaluation team leader will come to UNIDO HQ for debriefing and presentation of the preliminary findings of the terminal evaluation. The draft TE report will be submitted 4 to 6 weeks after the end of the mission. The draft TE report is to be shared with the UNIDO PM, ODG/EVA, the UNIDO GEF Coordinator and the GEF OFP and other relevant stakeholders for receipt of comments. The evaluation team leader is expected to revise the draft TE report based on the comments received, edit the language and form and submit the final version of the TE report in accordance with UNIDO ODG/EVA standards.

**Project evaluation parameters**

The evaluation team will rate the projects. The ratings for the parameters described in the following sub-chapters A to J will be presented in the form of a table with each of the categories rated separately and with brief justifications for the rating based on the findings of the main analysis. An overall rating for the project should also be given.

**Design**

The evaluation will examine the extent to which:

The project's design is adequate to address the problems at hand;

A participatory project identification process was instrumental in selecting problem areas and national counterparts;
The project has a clear thematically focused development objective, the attainment of which can be determined by a set of verifiable indicators;
The project was formulated based on the logical framework (project results framework) approach;
Was there a need to reformulate the project design and the project results framework given changes in the country and operational context?
The project was formulated with the participation of national counterparts, stakeholders and/or target beneficiaries through a participatory and broad public consultation approach;
Relevant country representatives (from government, industries, gender groups, and civil society), including the GEF OFP, have been appropriately involved and were participating in the identification of critical problem areas and the development of technical cooperation strategies;
All GEF-4 and GEF-5 projects have incorporated relevant environmental and social risk considerations into the project design.

**Relevance**

The evaluation will examine the extent to which the project is relevant to the:

National development and environmental priorities and strategies of the Government and the population, and regional and international agreements. See possible evaluation questions under "Country ownership/drivenness" below.
Target groups: relevance of the project's objectives, outcomes and outputs to the different target groups of the interventions (e.g. companies, civil society, beneficiaries of capacity building and training, etc.).
GEF's focal areas/operational programme strategies: In retrospect, were the project's outcomes consistent with the GEF focal area(s)/operational program strategies? Ascertain the likely nature and significance of the contribution of the project outcomes to the wider portfolio of GEF's Focal area, Climate Change/CC-3/SP-3 (GEF-4).
UNIDO's thematic priorities: Were they in line with UNIDO's mandate, objectives and outcomes defined in the Programme and Budget and core competencies?
Does the project remain relevant taking into account the changing environment?

**Effectiveness**

The evaluation will assess the objectives and final results at the end of the project – what outputs and outcomes has the project achieved so far (both qualitative and quantitative results)?
The evaluation will assess to what extent results at various levels, including outcomes, have been achieved. In detail, the following issues will be assessed: To what extent have the expected outputs, outcomes and long-term objectives been achieved or are likely to be achieved? Has the project generated any results that could lead to changes of the assisted institutions? Have there been any unplanned effects?
Are the project outcomes commensurate with the original or modified project objectives? If the original or modified expected results are merely outputs/inputs, the evaluators should assess if there were any real outcomes of the project and, if there were, determine whether these are commensurate with realistic expectations from the project.
How do the stakeholders perceive the quality of outputs? Were the targeted beneficiary groups actually reached?
Identify actual and/or potential longer-term impacts or at least indicate the steps taken to assess these (see also below "monitoring of long term changes"). Wherever possible, evaluators should indicate how findings on impacts will be reported in future.

Describe any catalytic or replication effects: the evaluation will describe any catalytic or replication effect both within and outside the project. If no effects are identified, the evaluation will describe the catalytic or replication actions that the project carried out. No ratings are requested for the project's catalytic role.

**Efficiency**

The extent to which:

The project cost was effective?Was the project using the most cost-efficient options?

Has the project produced results (outputs and outcomes) within the expected time frame? Was project implementation delayed, and, if it was, did that affect cost effectiveness or results? Wherever possible, the evaluator should also compare the costs incurred and the time taken to achieve outcomes with that for similar projects. Are the project's activities in line with the schedule of activities as defined by the project team and annual work plans? Are the disbursements and project expenditures in line with budgets?

Have the inputs from the donor, UNIDO and Government/counterpart been provided as planned, and were they adequate to meet the requirements? Was the quality of UNIDO inputs and services as planned and timely?

Was there coordination with other UNIDO and donors' projects, and did possible synergy effects happen?

**Assessment of risks to sustainability of project outcomes**

Sustainability is understood as the likelihood of continued benefits after the GEF project ends. Assessment of sustainability of outcomes will be given special attention but also technical, financial and organization sustainability will be reviewed. This assessment should explain how the risks to project outcomes will affect continuation of benefits after the GEF project ends. It will include both exogenous and endogenous risks. The following four dimensions or aspects of risks to sustainability will be addressed:

Financial risks. Are there any financial risks that may jeopardize sustainability of project outcomes? What is the likelihood of financial and economic resources not being available once GEF assistance ends? (Such resources can be from multiple sources, such as the public and private sectors or income-generating activities; these can also include trends that indicate the likelihood that, in future, there will be adequate financial resources for sustaining project outcomes.) Was the project successful in identifying and leveraging co-financing?

Socio-political risks. Are there any social or political risks that may jeopardize sustainability of project outcomes? What is the risk that the level of stakeholder ownership (including ownership by governments and other key stakeholders) will be insufficient to allow for the project outcomes/benefits to be sustained? Do the various key stakeholders see that it is in their interest that project benefits continue to flow? Is there sufficient public/stakeholder awareness in support of the project's long-term objectives?

Institutional framework and governance risks. Do the legal frameworks, policies, and governance structures and processes within which the project operates pose risks that may jeopardize sustainability of project benefits? Are requisite systems for accountability and transparency and required technical know-how in place?

Environmental risks. Are there any environmental risks that may jeopardize sustainability of project outcomes? Are there any environmental factors, positive or negative, that can influence the future flow of project benefits? Are there any project outputs or higher level results that are likely to have adverse environmental impacts, which, in turn, might affect sustainability of project benefits? The evaluation should assess whether certain activities will pose a threat to the sustainability of the project outcomes.

**Assessment of monitoring and evaluation (M&E) systems**

M&E design. Did the project include an M&E plan in the project design? Did it have an M&E plan to monitor results and track progress towards achieving project objectives? The evaluation will assess whether the project met the minimum requirements for the application of the Project M&E plan (see annex 3).

M&E plan implementation. The evaluation should verify that an M&E system was in place and facilitated timely tracking of progress toward project objectives by collecting information on chosen indicators

continually throughout the project implementation period; annual project reports were complete and accurate, with well-justified ratings; the information provided by the M&E system was used during the project to improve performance and to adapt to changing needs; and the project had an M&E system in place with proper training for parties responsible for M&E activities to ensure that data will continue to be collected and used after project closure. Was monitoring and self-evaluation carried out effectively, based on indicators for outputs, outcomes and impacts? Are there any annual work plans? Was any steering or advisory mechanism put in place? Did reporting and performance reviews take place regularly?
Budgeting and Funding for M&E activities. In addition to incorporating information on funding for M&E while assessing M&E design, the evaluators will determine whether M&E was sufficiently budgeted for at the project planning stage and whether M&E was adequately funded and in a timely manner during implementation.

**Monitoring of long-term changes**
The M&E of long-term changes is often incorporated in GEF-supported projects as a separate component and may include determination of environmental baselines; specification of indicators; and provisioning of equipment and capacity building for data gathering, analysis, and use. This section of the evaluation report will describe project actions and accomplishments towards establishing a long-term monitoring system. The evaluation will address the following questions:

Did the project contribute to the establishment of a long-term monitoring system? If it did not, should the project have included such a component?
What were the accomplishments and shortcomings in establishment of this system?
Is the system sustainable — that is, is it embedded in a proper institutional structure and does it have financing? How likely is it that this system continues operating upon project completion?
Is the information generated by this system being used as originally intended?

**Assessment of processes affecting achievement of project results**
Among other factors, when relevant, the evaluation will consider a number of issues affecting project implementation and attainment of project results. The assessment of these issues can be integrated into the analyses of project design, relevance, effectiveness, efficiency, sustainability and management as the evaluators deem them appropriate (it is not necessary, however it is possible to have a separate chapter on these aspects in the evaluation report). The evaluation will consider, but need not be limited to, the following issues that may have affected project implementation and achievement of project results:

Preparation and readiness / Quality at entry. Were the project's objectives and components clear, practicable, and feasible within its time frame? Were counterpart resources (funding, staff, and facilities), and adequate project management arrangements in place at project entry? Were the capacities of executing institution and counterparts properly considered when the project was designed? Were lessons from other relevant projects properly incorporated in the project design? Were the partnership arrangements properly identified and the roles and responsibilities negotiated prior to project approval?
Country ownership/drivenness. Was the project concept in line with the sectoral and development priorities and plans of the country—or of participating countries, in the case of multi-country projects? Are project outcomes contributing to national development priorities and plans? Were relevant country representatives from government and civil society involved in the project? Was the GEF OFP involved in the project design and implementation? Did the recipient government maintain its financial commitment to the project? Has the government—or governments in the case of multi-country projects—approved policies or regulatory frameworks in line with the project's objectives?
Stakeholder involvement and consultation. Did the project involve the relevant stakeholders through continuous information sharing and consultation? Did the project implement appropriate outreach and public awareness campaigns? Were the relevant vulnerable groups and powerful supporters and opponents of the processes involved in a participatory and consultative manner? Which stakeholders were involved in the project (e.g., NGOs, private sector, other UN Agencies) and what were their immediate

tasks? Did the project consult with and make use of the skills, experience, and knowledge of the appropriate government entities, nongovernmental organizations, community groups, private sector entities, local governments, and academic institutions in the design, implementation, and evaluation of project activities? Were perspectives of those who would be affected by project decisions, those who could affect the outcomes, and those who could contribute information or other resources to the process taken into account while taking decisions?
Financial planning. Did the project have appropriate financial controls, including reporting and planning, that allowed management to make informed decisions regarding the budget and allowed for timely flow of funds? Was there due diligence in the management of funds and financial audits? Did promised co-financing materialize? Specifically, the evaluation should also include a breakdown of final actual project costs by activities compared to budget (variances), financial management (including disbursement issues), and co-financing.
UNIDO's supervision and backstopping. Did UNIDO staff identify problems in a timely fashion and accurately estimate their seriousness? Did UNIDO staff provide quality support and advice to the project, approve modifications in time, and restructure the project when needed? Did UNIDO provide the right staffing levels, continuity, skill mix, and frequency of field visits for the project?
Co-financing and project outcomes and sustainability. Did the project manage to mobilize the co-financing amount expected at the time of CEO Endorsement? If there was a difference in the level of expected co-financing and the co-financing actually mobilized, what were the reasons for the variance? Did the extent of materialization of co-financing affect project outcomes and/or sustainability, and, if so, in what ways and through what causal linkages?
Delays and project outcomes and sustainability. If there were delays in project implementation and completion, what were the reasons? Did the delays affect project outcomes and/or sustainability, and, if so, in what ways and through what causal linkages?
Implementation and execution approach. Is the implementation and execution approach chosen different from other implementation approaches applied by UNIDO and other agencies? Does the approach comply with the principles of the Paris Declaration? Is the implementation and execution approach in line with the GEF Minimum Fiduciary Standards: Separation of Implementation and Execution Functions in GEF Partner Agencies (GEF/C.41/06/Rev.01) and the relevant UNIDO regulations (DGAI.20 and Procurement Manual)? Does the approach promote local ownership and capacity building? Does the approach involve significant risks? In cases where Execution was done by third parties, i.e. Executing Partners, based on a contractual arrangement with UNIDO was this done in accordance with the contractual arrangement concluded with UNIDO in an effective and efficient manner?
Environmental and Social Safeguards. If a GEF-4 or GEF-5 project, has the project incorporated relevant environmental and social risk considerations into the project design? What impact did these risks have on the achievement of project results?

The evaluation team will rate the project performance as required by the GEF. The ratings will be given to the following criteria: Project Design, Relevance, Effectiveness, Efficiency, Sustainability, Monitoring and Evaluation, and UNIDO related issues as specified in Annex 2. The ratings will be presented in a table with each of the categories rated separately and with brief justifications for the rating based on the findings of the main analysis. An overall rating for the project should also be given. The rating system to be applied is specified in the same annex. As per the GEF's requirements, the report should also provide information on project identification, timeframe, actual expenditures, and co-financing in the format in annex 5, which is modelled after the GEF's project identification form (PIF).

**Project coordination and management**
The extent to which:
The national management and overall coordination mechanisms have been efficient and effective? Did each partner have assigned roles and responsibilities from the beginning? Did each partner fulfil its role and responsibilities (e.g. providing strategic support, monitoring and reviewing performance, allocating funds, providing technical support, following up agreed/corrective actions)?

The UNIDO HQ-based management, coordination, monitoring, quality control and technical inputs have been efficient, timely and effective (e.g. problems identified timely and accurately; quality support provided timely and effectively; right staffing levels, continuity, skill mix and frequency of field visits)?

**Assessment of gender mainstreaming**
The evaluation will consider, but need not be limited to, the following issues that may have affected gender mainstreaming in the project:
Did the project/programme design adequately consider the gender dimensions in its interventions? If so, how?
Was a gender analysis included in a baseline study or needs assessment (if any)?
How gender-balanced was the composition of the project management team, the Steering Committee, experts and consultants and the beneficiaries?
Have women and men benefited equally from the project's interventions? Do the results affect women and men differently? If so, why and how? How are the results likely to affect gender relations (e.g., division of labour, decision-making authority)?
To what extent were socioeconomic benefits delivered by the project at the national and local levels, taking gender dimensions into account?

**Reporting**

**Inception report**
These terms of reference (TOR) provide some information on the evaluation methodology, but this should not be regarded as exhaustive. After reviewing the project documentation and initial interviews with the project manager, the International Evaluation Consultant will prepare, in collaboration with the national consultant, a short inception report that will operationalize the TOR relating to the evaluation questions and provide information on what type of and how the evidence will be collected (methodology). It will be discussed with and approved by the responsible UNIDO Evaluation Officer in the UNIDO Office for Independent Evaluation. The inception report will focus on the following elements: preliminary project theory model(s); elaboration of evaluation methodology, including quantitative and qualitative approaches through an evaluation framework ("evaluation matrix"); division of work between the international evaluation consultant and national evaluation consultant; mission plan, including places to be visited, people to be interviewed and possible surveys to be conducted and a debriefing and reporting timetable[39].

**Evaluation report format and review procedures**
The draft report will be delivered to UNIDO Office for Independent Evaluation (the suggested report outline is in annex 1) and circulated to UNIDO staff, the GEF OFP, and national stakeholders associated with the project for factual validation and comments. Any comments or responses, or feedback on any errors of fact to the draft report provided by the stakeholders will be sent to UNIDO, ODG/EVA for collation and onward transmission to the project evaluation team who will be advised of any necessary revisions. On the basis of this feedback, and taking into consideration the comments received, the evaluation team will prepare the final version of the terminal evaluation report.

The evaluation team will present its preliminary findings to the local stakeholders at the end of the field visit and take into account their feedback in preparing the evaluation report. A presentation of preliminary findings will take place at UNIDO HQ after the field mission.

The TE report should be brief, to the point and easy to understand. It must explain the purpose of the evaluation, exactly what was evaluated, and the methods used. The report must highlight any

[39] The UNIDO Office for Independent Evaluation will provide the evaluation team with a Guide on how to prepare an evaluation inception report.

methodological limitations, identify key concerns and present evidence-based findings, consequent conclusions, recommendations and lessons. The report should provide information on when the evaluation took place, the places visited, who was involved and be presented in a way that makes the information accessible and comprehensible. The report should include an executive summary that encapsulates the essence of the information contained in the report to facilitate dissemination and distillation of lessons.

Findings, conclusions and recommendations should be presented in a complete, logical and balanced manner. The evaluation report shall be written in English and follow the outline given in annex 1.

**Evaluation work plan**

The "Evaluation Work Plan" includes the following main products:

- Desk review, briefing by project manager and development of methodology: Following the receipt of all relevant documents, and consultation with the Project Manager about the documentation, including reaching an agreement on the methodology, the desk review could be completed.

- Inception report: At the time of departure to the field mission, all the received material has been reviewed and consolidated into the Inception report.

- Field mission: The principal responsibility for managing this evaluation lies with UNIDO. It will be responsible for liaising with the project team to set up the stakeholder interviews, arrange the field missions and coordinate with the Government of Ivory Coast. At the end of the field mission, there will be a presentation of preliminary findings to the key stakeholders in Ivory Coast.

- Preliminary findings from the field mission: Following the field mission, the main findings, conclusions and recommendations would be prepared and presented in the field and at UNIDO Headquarters.

- A draft TE report will be forwarded electronically to the UNIDO Office for Independent Evaluation and circulated to main stakeholders.

**Final terminal evaluation report will incorporate comments received.**

| **Evaluation phases** | **Deliverables** |
|---|---|
| Desk review | Development of methodology approach and evaluation tools |
| Briefing with UNIDO Office for Independent Evaluation, Project Managers and other key stakeholder at HQ | Interview notes, detailed evaluation schedule and list of stakeholders to interview during field mission |
| Data analysis | Inception evaluation report |
| Field mission<br>Present preliminary findings and recommendations to key stakeholders in the field | Presentation of main findings to key stakeholders in the field |
| Debriefing at UNIDO HQ | Present preliminary findings and recommendations to the stakeholders at UNIDO HQ<br>Additional interviews and analysis |
| Analysis of the data collected | Draft terminal evaluation report |

| Evaluation phases | Deliverables |
|---|---|
| Circulation of the draft report to UNIDO/relevant stakeholders and revision | Final terminal evaluation report |

**Quality assurance**

All UNIDO evaluations are subject to quality assessments by the UNIDO Office for Independent Evaluation. Quality assurance and control is exercised in different ways throughout the evaluation process (briefing of consultants on methodology and process by the UNIDO/ ODG/EVA, providing inputs regarding findings, lessons learned and recommendations from other UNIDO evaluations, review of inception report and evaluation report by UNIDO/ ODG/EVA). The quality of the evaluation report will be assessed and rated against the criteria set forth in the Checklist on evaluation report quality, attached as Annex 4. The applied evaluation quality assessment criteria are used as a tool to provide structured feedback. UNIDO/ ODG/EVA should ensure that the evaluation report is useful for UNIDO in terms of organizational learning (recommendations and lessons learned) and is compliant with UNIDO's evaluation policy and these terms of reference. The draft and final evaluation report are reviewed by the UNIDO Office for Independent Evaluation, which will submit the final report to the GEF Evaluation Office and circulate it within UNIDO together with a management response sheet.

**Annex 1 - Outline of an in-depth project evaluation report**

**Executive summary**
Must provide a synopsis of the storyline which includes the main evaluation findings and recommendations
Must present strengths and weaknesses of the project
Must be self-explanatory and should be maximum 3-4 pages in length

**Evaluation objectives, methodology and process**
Information on the evaluation: why, when, by whom, etc.
Scope and objectives of the evaluation, main questions to be addressed
Information sources and availability of information
Methodological remarks, limitations encountered and validity of the findings

**Country and project background**
Brief country context: an overview of the economy, the environment, institutional development, demographic and other data of relevance to the project
Sector-specific issues of concern to the project[40] and important developments during the project implementation period
Project summary:
Fact sheet of the project: including project objectives and structure, donors and counterparts, project timing and duration, project costs and co-financing
Brief description including history and previous cooperation
Project implementation arrangements and implementation modalities, institutions involved, major changes to project implementation
Positioning of the UNIDO project (other initiatives of Government, other donors, private sector, etc.)
Counterpart organization(s)

**Project assessment**
This is the key chapter of the report and should address all evaluation criteria and questions outlined in the TOR (see section VI - Project evaluation parameters). Assessment must be based on factual evidence collected and analysed from different sources. The evaluators' assessment can be split into the following sections:

**Design**
Relevance (report on the relevance of project towards countries and beneficiaries)
Effectiveness (the extent to which the development intervention's objectives and deliverables were achieved, or are expected to be achieved, taking into account their relative importance)
Efficiency (report on the overall cost-benefit of the project and partner countries' contribution to the achievement of project objectives)
Sustainability of project outcomes (report on the risks and vulnerability of the project, considering the likely effects of socio-political and institutional changes in partner countries, and its impact on continuation of benefits after the GEF project ends, specifically the financial, socio-political, institutional framework and governance, and environmental risks)
Assessment of monitoring and evaluation systems (report on M&E design, M&E plan implementation, and budgeting and funding for M&E activities)
Monitoring of long-term changes
Assessment of processes affecting achievement of project results (report on preparation and readiness / quality at entry, country ownership, stakeholder involvement, financial planning, UNIDO support, co-financing and project outcomes and sustainability, delays of project outcomes and sustainability, and implementation approach)

[40] Explicit and implicit assumptions in the logical framework of the project can provide insights into key-issues of concern (e.g., relevant legislation, enforcement capacities, government initiatives)

Project coordination and management (report project management conditions and achievements, and partner countries commitment)
Gender mainstreaming

At the end of this chapter, an overall project achievement rating should be developed as required in annex 2. The overall rating table required by the GEF should be presented here.

**Conclusions, recommendations and lessons learned**
This chapter can be divided into three sections:

**Conclusions**
This section should include a storyline of the main evaluation conclusions related to the project's achievements and shortfalls. It is important to avoid providing a summary based on each and every evaluation criterion. The main conclusions should be cross-referenced to relevant sections of the evaluation report.

**Recommendations**
This section should be succinct and contain few key recommendations. They should be:
Based on evaluation findings
Realistic and feasible within a project context
Indicating institution(s) responsible for implementation (addressed to a specific officer, group or entity who can act on it) and have a proposed timeline for implementation if possible
Commensurate with the available capacities of project team and partners
Taking resource requirements into account.

**Recommendations should be structured by addressees:**
UNIDO
Government and/or counterpart organizations
Donor

**Lessons learned**
Lessons learned must be of wider applicability beyond the evaluated project but must be based on findings and conclusions of the evaluation
For each lesson, the context from which they are derived should be briefly stated

**Annexes** should include the evaluation TOR, list of interviewees, documents reviewed, a summary of project identification and financial data, including an updated table of expenditures to date, and other detailed quantitative information. Dissident views or management responses to the evaluation findings may later be appended in an annex.

**Annex 2 - Overall rating table**

| Criterion | Evaluator's summary comments | Evaluator's rating |
|---|---|---|
| **Attainment of project objectives and results (overall rating), sub criteria (below)** | | |
| **Design** | | |
| **Effectiveness** | | |
| **Relevance** | | |
| **Efficiency** | | |
| **Sustainability of project outcomes (overall rating), sub criteria (below)** | | |
| **Financial risks** | | |
| **Sociopolitical risks** | | |
| **Institutional framework and governance risks** | | |
| **Environmental risks** | | |
| **Monitoring and evaluation (overall rating), sub criteria (below)** | | |
| **M&E Design** | | |
| **M&E Plan implementation (use for adaptive management)** | | |
| **Budgeting and Funding for M&E activities** | | |
| **Project management** | | |
| **UNIDO specific ratings** | | |
| **Quality at entry / Preparation and readiness** | | |
| **Implementation approach** | | |
| **UNIDO Supervision and backstopping** | | |
| **Overall rating** | | |

**RATING OF PROJECT OBJECTIVES AND RESULTS**

Highly satisfactory (HS): The project had no shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Satisfactory (S): The project had minor shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Moderately satisfactory (MS): The project had moderate shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Moderately unsatisfactory (MU): The project had significant shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Unsatisfactory (U) The project had major shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Highly unsatisfactory (HU): The project had severe shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Please note: Relevance and effectiveness will be considered as critical criteria. The overall rating of the project for achievement of objectives and results may not be higher than the lowest rating on either of these two criteria. Thus, to have an overall satisfactory rating for outcomes a project must have at least satisfactory ratings on both relevance and effectiveness.

**RATINGS ON SUSTAINABILITY**

Sustainability will be understood as the probability of continued long-term outcomes and impacts after the GEF project funding ends. The evaluation will identify and assess the key conditions or factors that are likely to contribute or undermine the persistence of benefits beyond project completion. Some of these factors

might be outcomes of the project, i.e. stronger institutional capacities, legal frameworks, socio-economic incentives /or public awareness. Other factors will include contextual circumstances or developments that are not outcomes of the project but that are relevant to the sustainability of outcomes.

**Rating system for sustainability sub-criteria**

On each of the dimensions of sustainability of the project outcomes will be rated as follows.
Likely (L): There are no risks affecting this dimension of sustainability.
Moderately likely (ML). There are moderate risks that affect this dimension of sustainability.
Moderately unlikely (MU): There are significant risks that affect this dimension of sustainability.
Unlikely (U): There are severe risks that affect this dimension of sustainability.
All the risk dimensions of sustainability are critical. Therefore, overall rating for sustainability will not be higher than the rating of the dimension with lowest ratings. For example, if a project has an Unlikely rating in either of the dimensions then its overall rating cannot be higher than Unlikely, regardless of whether higher ratings in other dimensions of sustainability produce a higher average.

**RATINGS OF PROJECT M&E**

Monitoring is a continuing function that uses systematic collection of data on specified indicators to provide management and the main stakeholders of an ongoing project with indications of the extent of progress and achievement of objectives and progress in the use of allocated funds. Evaluation is the systematic and objective assessment of an on-going or completed project, its design, implementation and results. Project evaluation may involve the definition of appropriate standards, the examination of performance against those standards, and an assessment of actual and expected results.

The Project M&E system will be rated on M&E design, M&E plan implementation and budgeting and funding for M&E activities as follows:
Highly satisfactory (HS): There were no shortcomings in the project M&E system.
Satisfactory(S): There were minor shortcomings in the project M&E system.
Moderately satisfactory (MS): There were moderate shortcomings in the project M&E system.
Moderately unsatisfactory (MU): There were significant shortcomings in the project M&E system.
Unsatisfactory (U): There were major shortcomings in the project M&E system.
Highly unsatisfactory (HU): The Project had no M&E system.

M&E plan implementation will be considered a critical parameter for the overall assessment of the M&E system. The overall rating for the M&E systems will not be higher than the rating on M&E plan implementation.

**All other ratings will be on the GEF six-point scale:**

| | | |
|---|---|---|
| HS | = Highly satisfactory | Excellent |
| S | = Satisfactory | Well above average |
| MS | = Moderately satisfactory | Average |
| MU | = Moderately unsatisfactory | Below average |
| U | = Unsatisfactory | Poor |
| HU | = Highly unsatisfactory | Very poor (appalling) |

**Annex 3 - GEF Minimum requirements for M&E**[41]

**Minimum requirement 1: Project design of M&E**
All projects will include a concrete and fully budgeted M&E plan by the time of work program entry for full-sized projects (FSP) and CEO approval for medium-sized projects (MSP). This M&E plan will contain as a minimum:

SMART indicators for project implementation, or, if no indicators are identified, an alternative plan for monitoring that will deliver reliable and valid information to management;

SMART indicators for results (outcomes and, if applicable, impacts), and, where appropriate, indicators identified at the corporate level;

Baseline for the project, with a description of the problem to be addressed, with indicator data, or, if major baseline indicators are not identified, an alternative plan for addressing this within one year of implementation;

Identification of reviews and evaluations that will be undertaken, such as mid-term reviews or evaluations of activities; and

Organizational set-up and budgets for monitoring and evaluation.

**Minimum requirement 2: Application of project M&E**
Project monitoring and supervision will include implementation of the M&E plan, comprising:

SMART indicators for implementation are actively used, or if not, a reasonable explanation is provided;

SMART indicators for results are actively used, or if not, a reasonable explanation is provided;

The baseline for the project is fully established and data compiled to review progress reviews, and evaluations are undertaken as planned; and

The organizational set-up for M&E is operational and budgets are spent as planned.

[41] http://www.thegef.org/gef/sites/thegef.org/files/documents/ME_Policy_2010.pdf

**Annex 4 - Checklist on terminal evaluation report quality**

Independent terminal evaluation of UNIDO-GEF project:
Project Title:
Project NO:
Checklist on evaluation report quality

| Report quality criteria | UNIDO Office for Independent Evaluation: Assessment notes | Rating |
|---|---|---|
| The terminal evaluation report presented an assessment of all relevant outcomes and achievement of project objectives in the context of the focal area program indicators if applicable. | | |
| The terminal evaluation report was consistent, the evidence presented was complete and convincing, and the ratings were well substantiated. | | |
| The terminal evaluation report presented a sound assessment of sustainability of outcomes. | | |
| The lessons and recommendations listed in the terminal evaluation report are supported by the evidence presented and are relevant to the GEF portfolio and future projects. | | |
| The terminal evaluation report included the actual project costs (totals, per activity, and per source) and actual co-financing used. | | |
| The terminal evaluation report included an assessment of the quality of the M&E plan at entry, the operation of the M&E system used during implementation, and the extent M&E was sufficiently budgeted for during preparation and properly funded during implementation. | | |

**Rating system for quality of evaluation reports**

A number rating 1-6 is used for each criterion: Highly satisfactory = 6, Satisfactory = 5, Moderately satisfactory = 4, Moderately unsatisfactory = 3, Unsatisfactory = 2, Highly unsatisfactory = 1, and unable to assess = 0.

**Annex 5 – Required project identification and financial data**

The evaluation report should provide information on project identification, timeframe, actual expenditures, and co-financing in the following format, which is modelled after the project identification form (PIF).

**I. Dates**

| Milestone | Expected date | Actual date |
|---|---|---|
| Project CEO endorsement/approval date | | |
| Project implementation start date (PAD issuance date) | | |
| Original expected implementation end date (indicated in CEO endorsement/approval document) | | |
| Revised expected implementation end date (if any) | | |
| Terminal evaluation completion | | |
| Planned tracking tool date | | |

**II. Project framework**

| Project component | Activity type | GEF financing (in USD) | | Co-financing (in USD) | |
|---|---|---|---|---|---|
| | | Approved | Actual | Promised | Actual |
| **1.** | | | | | |
| **2.** | | | | | |
| **3.** | | | | | |
| **4.** | | | | | |
| **5.** | | | | | |
| **6.Project management** | | | | | |
| **Total (in USD)** | | | | | |

**Activity types are:**
Experts, researches hired
Technical assistance, Workshop, Meetings or experts consultation scientific and technical analysis, experts researches hired
Promised co-financing refers to the amount indicated on endorsement/approval.