

# Funding Proposal

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## **FP138: ASER Solar Rural Electrification Project**

Senegal | Banque Ouest Africaine de Développement (West African Development Bank) (BOAD)|  
Decision B.26/02

21 August 2020



# Funding Proposal

Project/Programme title:	<b>ASER Solar Rural Electrification Project</b>
Country(ies):	Senegal
Accredited Entity:	West African Development Bank (BOAD)
Date of first submission:	2020/01/21
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Version number	<u>V.1.5</u>



GREEN  
CLIMATE  
FUND

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### *Note to Accredited Entities on the use of the funding proposal template*

- Accredited Entities should provide summary information in the proposal with cross-reference to annexes such as feasibility studies, gender action plan, term sheet, etc.
- Accredited Entities should ensure that annexes provided are consistent with the details provided in the funding proposal. Updates to the funding proposal and/or annexes must be reflected in all relevant documents.
- The total number of pages for the funding proposal (excluding annexes) **should not exceed 60**. Proposals exceeding the prescribed length will not be assessed within the usual service standard time.
- The recommended font is Arial, size 11.
- Under the [GCF Information Disclosure Policy](#), project and programme funding proposals will be disclosed on the GCF website, simultaneous with the submission to the Board, subject to the redaction of any information that may not be disclosed pursuant to the IDP. Accredited Entities are asked to fill out information on disclosure in section G.4.

**Please submit the completed proposal to:**

[fundingproposal@gcfund.org](mailto:fundingproposal@gcfund.org)

**Please use the following name convention for the file name:**

"FP-[Accredited Entity Short Name]-[Country/Region]-[YYYY/MM/DD]"

## ACRONYMS

**ASER** : Senegalese Agency for Rural Electrification (Agence Sénégalaise d'Électrification Rurale)  
**ASN** : Standards Association of Senegal (Association Sénégalaise de Normalisation)  
**AML/CFT** : Anti-money laundering - combating finance of terrorism  
**APR** : Annual Performance Report  
**BCEAO** : Central Bank of West African States  
**BE** : Baseline Emissions  
**BOAD** : West African Development Bank (Banque Ouest Africaine de Développement)  
**CDM** : Clean Development Mechanism  
**CoP** : Conférence of Parties [to the United Nations Framework Convention on Climate Change]  
**COPERES** : Council of Professionals of Renewable Energies in Senegal  
**CRSE** : Electricity Sector Regulatory Commission (Commission de Régulation du Secteur de l'Électricité)  
**DER** : General Delegation for Women and Young Entrepreneurs (Délégation générale à l'Entrepreneuriat Rapide des Femmes et des Jeunes)  
**DEEC** : Direction de l'Environnement et des Etablissements Classés  
**DREEC** : Divisions Régionales de l'Environnement et des Établissements Classés  
**ER** : Emission Reduction  
**ESMF/ESMP** : Environmental and social management Framework/Plan  
**ECOWAS** : Economic Community of West African States  
**ECREEE ECOWAS** : Centre for Renewable Energies and Energy Efficiency  
**ERIL** : Local Rural Electrification Initiative (Électrification Rurale d'Initiative Locale)  
**ERPA** : Emission Reductions Purchase Agreement  
**ESIA** : Environmental and Social Impact Assessment  
**FONGIP** : Priority Investment Guarantee Fund (Fonds de Garantie des Investissements Prioritaires)  
**FONSIS** : Sovereign Strategic Investment Fund (Fonds Souverain d'Investissements Stratégiques)  
**FSE** : Special Support Fund for the Energy Sector (Fonds Spécial de Soutien au secteur de l'Énergie)  
**GCF** : Green Climate Fund  
**GDP** : Gross Domestic Product  
**GEF** : Global Environment Facility  
**GHG** : Green House Gases  
**IPP** : Independent Power Producers  
**IRENA** : International Renewable Energy Agency  
**KYC** : Know Your Customer  
**LPDSE** : Letter of Development for the Energy Sector (Lettre de Développement du Secteur de l'Énergie)  
**MCC** : Millennium Challenge Corporation  
**MEP** : Ministry of Energy and Petroleum  
**MFI** : Microfinance institutions  
**MEFP** : Ministry of Economy, Finance and Planification  
**M/SME** : Micro/Small Medium Enterprises  
**NDA** : National Designated Entity  
**NDCs** : Nationally Determined Contributions  
**NGO** : Non-Governmental Organization  
**O&M** : Operation and Maintenance  
**OECD** : Organization for Economic Cooperation and Development  
**PE** : Project Emissions  
**PMU** : Project Management Unit (Unité de Gestion du Projet)  
**PNER** : National Rural Electrification Program (Programme National d'Électrification Rurale)  
**PoA** : (CDM) Programme of Activities  
**PPER** : Priority Rural Electrification Program (Programme Prioritaire de l'Électrification Rurale)  
**PPPs** : Public Private Partnership  
**PREM** : Multi-Sectoral Energetic Projects (Projets Energétiques Multi-sectoriels)  
**PSE** : Plan Senegal Emergent  
**PUDC** : Emergency Community Development Program (Programme d'Urgence de Développement Communautaire)  
**PV** : Photovoltaic  
**RE** : Renewable Energy  
**ROGEP** : Regional Off-Grid Electrification Project  
**SENELEC** : Société Nationale d'Electricité du Sénégal  
**SDGs** : Sustainable Development Goals  
**SHS** : Solar home system  
**ToR** : Terms of Reference  
**UNFCCC** : United Nation Framework Convention on Climate Change  
**WAEMU** : West African economic and monetary union

(\*) Some institutions' names and acronyms are retained in French

A. PROJECT/PROGRAMME SUMMARY			
A.1. Project or programme	Project	A.2. Public or private sector	Public
A.3. Request for Proposals (RFP)	Not applicable		
A.4. Result area(s)	<p>Check the applicable <a href="#">GCF result area(s)</a> that the overall proposed project/programme targets. For each checked result area(s), indicate the estimated percentage of <a href="#">GCF budget</a> devoted to it. The total of the percentages when summed should be 100%.</p> <p><b>Mitigation:</b> Reduced emissions from:</p> <p><input checked="" type="checkbox"/> <b>Energy access and power generation:</b></p> <p><input type="checkbox"/> Low-emission transport:</p> <p><input type="checkbox"/> Buildings, cities, industries and appliances:</p> <p><input type="checkbox"/> Forestry and land use:</p> <p><b>Adaptation:</b> Increased resilience of:</p> <p><input type="checkbox"/> Most vulnerable people, communities and regions:</p> <p><input type="checkbox"/> Health and well-being, and food and water security:</p> <p><input type="checkbox"/> Infrastructure and built environment:</p> <p><input type="checkbox"/> Ecosystem and ecosystem services:</p> <p><b>GCF contribution:</b> <u>100%</u></p>		
A.5. Expected mitigation impact	1,127,447 tCO <sub>2</sub> eq (2021 – 2045)	A.6. Expected adaptation impact	Adaptation co-benefits to <b>344,000 beneficiaries</b> (38,900 households) 4% of Senegal rural population
A.7. Total financing (GCF + co-finance)	198,692,182 Euros	A.9. Project size	Medium (Upto USD 250 million) <sup>1</sup>
A.8. Total GCF funding requested	75,445,176 Euros		
A.10. Financial instrument(s) requested for the GCF funding	<p>Mark all that apply and provide total amounts. The sum of all total amounts should be consistent with A.8.</p> <p><input checked="" type="checkbox"/> Grant EUR 1,821,945 <input type="checkbox"/> Equity <a href="#">Enter number</a></p> <p><input checked="" type="checkbox"/> Loan EUR 73,623,231 <input type="checkbox"/> Results-based payment <a href="#">Enter number</a></p> <p><input type="checkbox"/> Guarantee <a href="#">Enter number</a></p>		
A.11. Implementation period	2021 - 2026	A.12. Total lifespan	25 years (PV equipment lifetime)
A.13. Expected date of AE internal approval	2/24/2020	A.14. ESS category	B
A.15. Has this FP been submitted as a CN before?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	A.16. Has Readiness or PPF support been used to prepare this FP?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
A.17. Is this FP included in the entity work programme?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	A.18. Is this FP included in the country programme?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

<sup>1</sup> Equivalent to EUR 225 million

<b>A.19. Complementarity and coherence</b>	Does the project/programme complement other climate finance funding (e.g. GEF, AF, CIF, etc.)? If yes, please elaborate in section B.1. Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
<b>A.20. Executing Entity information</b>	Government of the Republic of Senegal represented by the Senegalese Rural Electrification Agency (ASER)
<b>A.21. Executive summary (max. 750 words, approximately 1.5 pages)</b>	
<p>This proposal aims to foster the development of off-grid renewable energy mini-grids to reduce CO<sub>2</sub> emissions from the Senegal power sector whilst contributing to electricity access objectives and promoting gender-balanced rural economic growth. Low-carbon universal access is a critical pillar of the Emerging Senegal Plan (PSE) phase II, as the energy sector was considered one of the greatest success of PSE phase I<sup>2</sup>, with national power generation increasing two-fold between 2012 and 2018, and 20% of the energy mix derived from clean energy sources.</p> <p>Currently, only 42% of Senegal's rural population has access to electricity. Electricity access rate is still relatively low and reveals a great disparity between urban and rural populations, with regional disparities that are even more dramatic in terms of the level of coverage. With coverage rates ranging from 12% in Kedougou to 70% in Dakar, only five other regions (Diourbel, Saint-Louis, Matam, Thiès, Ziguinchor) have been able to achieve an electrical coverage rate of at least 50%. Two regions (Kolda and Kedougou) have a coverage rate of less than 20%. At the departmental level, Salémata, Medina Yoro Foulda, Ranerou and Saraya have an electrical coverage rate of less than 10%<sup>3</sup>. These low rates are due to excessively high costs of investment and operations, dispersal and low level of consumption, yet the benefits of rural electrification are undisputed, significantly improving the quality of life of communities and increasing productivity. Distributed renewable energy generation also help increase the reliability and resilience of power supply by making it less vulnerable to disruptions caused by natural disasters. Multiple socio-economic and socio-ecological co-benefits can further contribute to improving living standards of the communities.</p> <p>The Government of Senegal is thus committed to tackle this issue and has pledged to reach universal energy access by 2025. Meanwhile, lack of resources means that any improvements are likely to be met through carbon-intensive grid extensions and diesel-powered generators (lower upfront cost). However, the Government of Senegal (GoS) has committed, through the Paris Agreement (2015) and COP21, to contribute to the international collective effort to mitigate climate change emissions and put in place adequate adaptation measures. In the energy sector, this commitment has resulted in the definition of strategies and the implementation of priority actions presented in the Nationally Determined Contribution (NDC) of Senegal.</p> <p>The objective of the proposed project is to support the GoS by providing concessional co-funding needed to mobilise private sector participation in the domestic renewable energy market and achieve its low-carbon rural electrification goals as proclaimed in the Nationally Determined Contribution (NDC) of Senegal, under the form of sovereign loan and grant de-risking local operators' involvement while alleviating GoS tariff compensation burden following harmonization.</p> <p>Climate change in Senegal is predicted to affect average yearly rainfall with an increase in rain intensity leading to flooding, along with increased air temperatures and sea level rise. Its effects on water resources thus include stressors affecting hydropower production, which contributes more than 10 percent to the country's electricity supply and is susceptible to variable rainfall and increased evaporation rates of retention ponds and dams<sup>4</sup>. Its effects are also particularly faced by the agriculture sector where the majority of agricultural activities are heavily dependent on the pumping of underground water. Rural electrification improves access to groundwater and thereby supports higher agricultural productivity and better food security. In addition, other income-generating activities are made possible through access to electricity and thereby information and communications technologies, improving household resilience.</p> <p><b>Proposed intervention</b></p> <p>In line with Senegal NDCs<sup>5</sup> and its national ambition of universal access to electricity by 2025 (SE4All), this project, to be executed by the Senegalese Rural Electrification Agency (ASER) under delegation of the Government of Senegal, aims at deploying <b>100% solar mini-grids in a thousand (1,000) isolated villages across Senegal, i.e. half of the most vulnerable, least attractive locations to be electrified</b>, by rural electrification concessionaires. By channelling</p>	

<sup>2</sup> Official speech of President Macky Sall in Paris in December 2018

<sup>3</sup> MPE 2019. SE4All Universal Access Operational Plan for Implementation of the rural electrification program

<sup>4</sup> USAID, 2017. Climate Change Risk in Senegal: Country risk profile<sup>5</sup> See Senegalese NDC energy sector pledges in section B1, including solar rural electrification targets

<sup>5</sup> See Senegalese NDC energy sector pledges in section B1, including solar rural electrification targets

concessional funding and by easing the connection of beneficiaries and facilitating access to productive users of energy, the project will accelerate and perpetuate the electrification of communities that remain outside the perimeter of PPER (Rural Electrification Priority Plan') private concessionaires and Senelec intervention.

The project will mobilize concessional resources from the GCF to engage private sector local operators with acceptable risk-reward conditions, complementing BOAD co-financing and Senegal resources mobilized towards 1,000 newly electrified villages through 100% solar photovoltaic mini-networks. In addition, a grant is requested for strengthening the capacity of the main rural electrification stakeholders, for facilitating first connection access to most vulnerable eligible social services and women & youth-entrepreneurs based on the experience of JAPPALE coupons<sup>6</sup> and lessons learned from PPERs, and a loaned guarantee facility for catalyzing access to local micro-financing towards productive and gender users of energy.

#### *Climate impacts*

Whilst the energy sector is very exposed to diverse impacts of climate variability and change through changes in energy supply (e.g. disruption of operations and distribution) and demand (growing populations and evolving power needs), it is a strong contributor to the drivers of climate change, namely through the emission of greenhouse gases.

The proposed project seeks to place Senegal on a low-carbon energy trajectory relative to its energy sector high-GHG baseline. By benefitting 38,917 newly electrified rural households within 5 years (32 MW total solar PV mini-grids ultimate capacity) across 1,000 villages, **it will result in an estimated 45,098 tCO<sub>2</sub> annual emission reductions impact i.e. 1.13 M. tCO<sub>2</sub> to be avoided over its technical lifetime, resulting in an abatement cost of 28.8 GCF€/tCO<sub>2</sub>e.**

Moreover, access to electricity from renewable sources will co-benefit the resilience of rural livelihoods to climate variability and their adaptive capacity related to disaster risk reduction and recovery, alleviating climate stress and improving access to water and agriculture productivity, health and community empowerment, and information and communication services.

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<sup>6</sup> See section B.3 for description of this innovative voucher system helping rural households in Senegal afford the fees to connect to electricity solutions that best fit their needs



## B. PROJECT/PROGRAMME INFORMATION

### B.1. Climate context (max. 1000 words, approximately 2 pages)

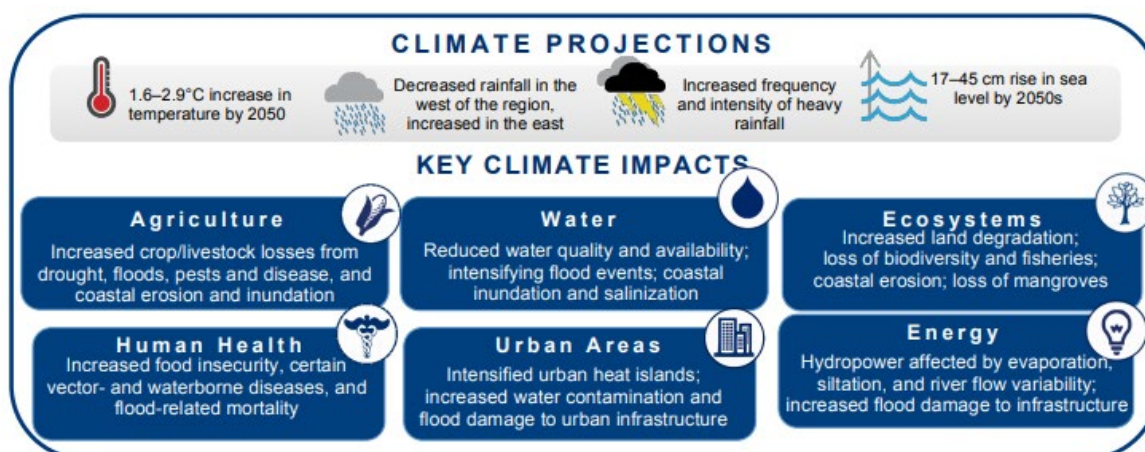
#### GENERAL OVERVIEW OF KEY CLIMATE CHANGE IMPACTS AND DRIVERS IN SENEGAL

Senegal's climate is generally characterized as tropical, with one rainy season from May–November and a dry season dominated by dry, hot harmattan winds between December and April. Temperatures and rainfall vary across regions, with rainfall generally increasing from north to south and temperatures increasing from coast to interior. Along the coast, temperatures are cool, ranging from 17–27°C. In the northern Sahelian zone, the climate is characterized by cool nights (minimum of 14°C) and hot days (maximum of 40°C). The north has a longer dry season from November–May, and receives about 360 mm of rainfall the rest of the year. Moving south, rainfall increases and reaches up to 1,500mm per year in the extreme south. Hot and humid, the southern region averages temperatures of 30°C throughout the year.

Climate trends since the 1960s include<sup>7</sup>:

- Increase in average temperatures by 0.9°C, with higher rates of warming in the north and more pronounced between October and December.
- Twenty-seven more 'hot' nights per year since 1960.
- Decline in rainfall; although rains have partially recovered since the mid-1990s, they have not recovered their pre-1970 levels and remain 15 percent below the long-term average.
- Rainfall decline is most significant in the southern region during the wet season (June– September).

Regional key climate hazards and climate projections consistently make West Africa one of the world's most vulnerable regions to climate variability and change, in particular at the energy sector level (Figure 1):



Source: USAID, 2018. Climate Risk Profile: West Africa

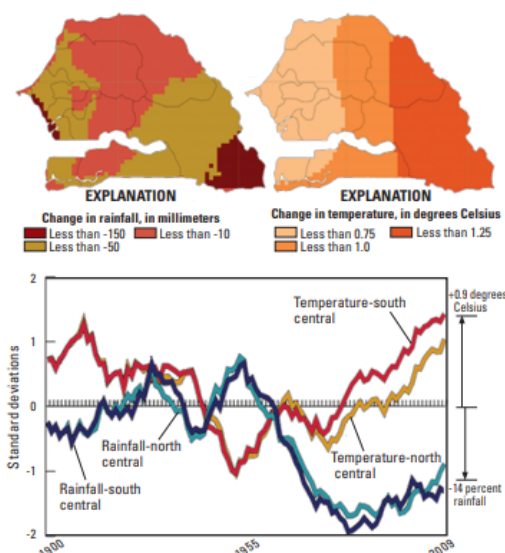
<sup>7</sup> USGS 2012. A Climate Trend Analysis of Senegal



The four climate indices that are most relevant for the energy sector in Senegal and West Africa are as follow:

- Mean Annual Temperatures (projected to increase by 2.1°C in 2050 based on RCP 8.5 high emissions scenario used in IPCC 5th Assessment Report)<sup>8</sup>
- Temperature Seasonal Variability (changes in cooling degree days that capture the amount of heat that society would like to reduce by period through some form of active cooling)
- Extreme Events Precipitation (as warmer air has a higher capacity to carry moisture in form of water vapor, future climate raises the likelihood for strong rainfall events and particularly towards extremes), while Mean Annual Precipitation will fall by -46.0mm in 2050
- Drought / Wet-conditions Standardized Precipitation Evapotranspiration Index (raising pressure on water resources for direct hydropower production or indirectly through power plants cooling)

**Figure 2:** Observed and projected change in June–September rainfall and temperature for 1960–2039 (top), together with smoothed rainfall and air temperature time series for June–September for southern and north-central Senegal (bottom right). Mean rainfall and temperature are based on the 1920–1969-time period.



Actually, more extreme heavy rainfall events, and reduced river flow in some areas, are projected to increase evaporation and siltation, damage to dams and turbines creating challenges for hydropower development ; hence the relevant diversification of energy sources promoted by the solar rural electrification project, as opposed to the predominant strategy of national grid extension.

Research estimates that by 2050, climate effects exacerbating unsuitable development practices will reduce hydropower potential in the Volta River Basin by nearly 50%. River flow in Senegal and the Gambia will decrease by 8 percent and 22 percent, respectively. Regional hydropower systems at risk on both Senegalese cross-border river basins are:

- Organisation for the Promotion of the Senegal River (OMVS) which includes Senegal, Mauritania, Guinea and Mali around common hydropower assets:
  - Manantali hydropower plant (200MW operating since 2002, 30% owned by Senegal)
  - Felou hydropower plant (62 MW operating since 2013, co-sponsored by Mali, Mauritania, and Senegal)
  - Gouina hydropower plant (140 MW, in construction in Mali)
  - Koukoutamba hydropower plant (294 MW in construction, which will be OMVS' fourth and largest hydropower project)
- Gambia River Basin Organisation (OMVG) which covers the Gambia, Guinea, Guinea-Bissau and Senegal shared hydropower project(s):
  - Kaleta (240 MW operated by Guinea since 2015, exporting 30% of its power to Senegal and Guinea-Bissau)
  - Sambangalou (128 MW, in construction, owned at 48% by Senegal)
  - Souapiti (450 MW, in construction)
- Multiple regional interconnections as part of the West African Power Pool (around 1/3 of annual electricity consumption within ECOWAS is exchanged on the interconnected network)

**Multi-variable climate vulnerabilities of the region's energy sector are summarized in below Table 1:**

<sup>8</sup> at the shorter horizon of 2035, scenario RCP4.5 forecasts for Senegal are:

- Cumulative rainfall decrease of 9.40 mm
- Rainy season start delays of 5 days  $\pm 3.34$
- Rainy season duration reduction by 8.3 days  $\pm 4.46$
- Minimal and maximal temperatures are expected to increase by 0.6-0.7 °C.

Climate Stressors and Climate Risks ENERGY	
Stressors	Risks
Rising temperatures and evaporation rates	Decreased or more variable water availability for hydropower generation and thermal power generation cooling systems
Increased frequency and intensity of heavy rainfall events	Reduced hydropower reservoir capacity due to increased sedimentation
Reduced rainfall and longer dry spells in western Sahel	Increased damage to hydropower infrastructure (dams and turbines) from flooding and river sediment loads
Sea level rise	Increased damage to power transmission and distribution infrastructure from surface and seawater flooding, landslides, coastal erosion, and storm surges, leading to outages or shortages

Source: USAID, 2018. Climate Risk Profile: West Africa

Whilst the energy sector is very exposed to diverse impacts of climate variability and change through changes in energy supply (e.g. disruption of operations and distribution) and demand (growing populations and evolving power needs), it is a strong contributor to the drivers of climate change, namely through the emission of greenhouse gases.

According to the World Resources Institute Climate Analysis Indicators Tool (WRI CAIT), 27% of Senegal's 2011 GHG emissions arose from **energy**, making it the second most emitting sector as per below chart (Figure 3). Emissions in the energy sector (Figure 4) are forecast to quadruple by 2030 in the business-as-usual scenario, dominated by fossil fuel consumption (Senegal NDC).

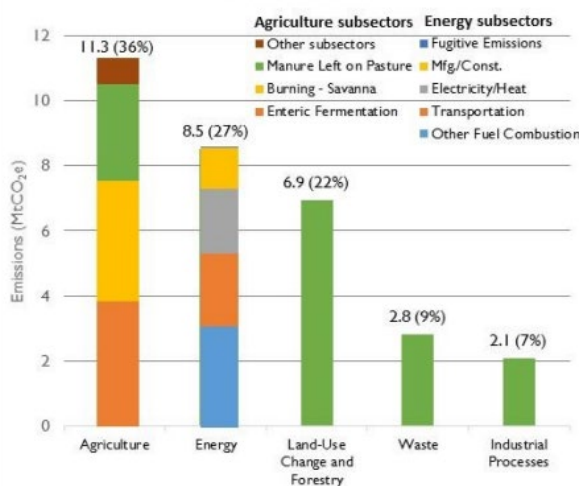


Figure 3: Senegal GHG Emissions by sector (2011)

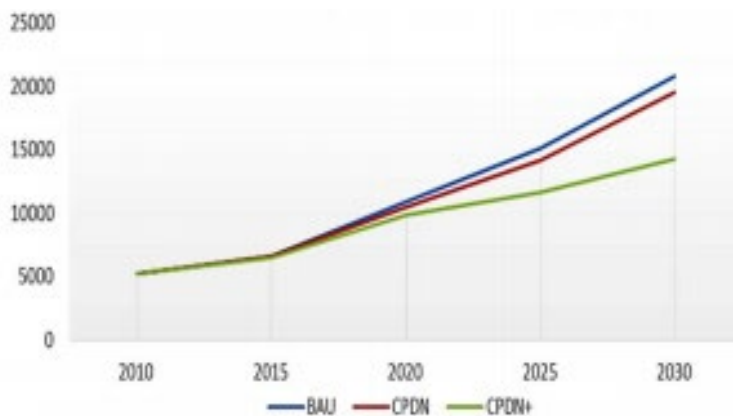


Figure 4: Senegal Energy sector CO<sub>2</sub>eq emissions forecast 2010-2030 (GgCO<sub>2</sub>e)

## KEY CHALLENGES OF THE ENERGY SECTOR RELATED TO CLIMATE CHANGE IN SENEGAL

Senegal is a regional leader for West Africa, with a reputation of economic and political stability. The country is expected to maintain its strong rate of economic growth, having registered over 6 percent per annum for the last four years. With a highly urban population — roughly half is concentrated around cities — the Government of Senegal is focused primarily on grid expansion in urban areas due to their high population densities and lower expansion costs efforts. However, rural populations, low density and remotely located, present more challenges than opportunities regarding energy access. With 196,000 square km, 54% of the 15 million population of Senegal live in rural areas. Whilst the GDP per capita is 1,521 \$ (2018), over 50% of the rural population lives under the poverty line. In this context, the energy sector faces three major challenges: (i) meeting the National commitments for clean energy and mitigation; (ii) responding to the adaptation for beneficiary communities; and (iii) building capacities at institutional level in the rural electrification subsector.

### Meeting the National commitments for clean energy and mitigation

#### The Sustainable Energy for All (SE4ALL) targets

Following the declaration of the United Nations General Assembly which considered 2012 as “The International Year of Sustainable Energy for All (SE4ALL)”, an initiative called “global access to sustainable energy for all by 2030” was launched by the UN, in collaboration with several development partners such as the World Bank, with the main specific objectives to be achieved by 2030 below:

- Guarantee universal access to modern energy services;
- Double the rate of improvement in energy efficiency, and
- Double the share of renewable energies in the overall energy mix.

Senegal joined this initiative and worked to achieve appreciable results in terms of access to electricity: 64% national access rate and 33.2% in rural areas in 2016, with interesting prospects that leave glimpse the execution of current projects and programs. Indeed, the Government aimed to reach a rural electrification rate of 60% in 2019 and universal access to sustainable electric services by 2025.

To achieve these results, the country has mainly used, apart from the grid-connected system, isolated secondary and regional power plants operating mainly on fossil fuels. These plants have reduced profitability, very high production costs and emit significant greenhouse gases (GHG). However, Senegal is endowed with a large solar energy resource. Over most of country's territory, the solar irradiation is above 2 000 kWh /m<sup>2</sup>/year for Global Horizontal Irradiation and above 1 800 kWh/m<sup>2</sup>/year for Direct Normal Irradiation (Ministere des Energies Renouvelables, 2011). This provides good prospects for photovoltaic solar power projects.

Today, among the 14 regions of Senegal, 9 have an electrical coverage rate of less than 60%. These show a rate of between 31% and 56%, with the exception of Kédougou and Kolda who are the most disadvantaged with 12% and 17% respectively. These figures obviously indicate a significant effort is expected in these two regions in particular, but also mask the equation of the absolute number of localities that remain to be electrified in each region. With the exception of Dakar (4), Kédougou (423), Matam (762), Sedhiou (748) and Ziguinchor (473), all the other regions each have at least 1,000 localities to be electrified. Overall, 14,519 localities remain to be electrified and a population of 3,372,458 to be covered by 2025.

Achieving universal access by the end of 2025 is listed as a priority of the GoS Emerging Senegal Plan, translated into a National Rural Electrification Program (PNER) under implementation according to the following phases:

The National Emergency Program for Rural Electrification (PNUER 2015-2019)

- Accelerating the implementation of Rural Electrification Concessions and Local Initiative Rural Electrification (ERIL)
- Carrying out PNUER projects with State and partner funding

The Complementary Program for Universal Access by 2025

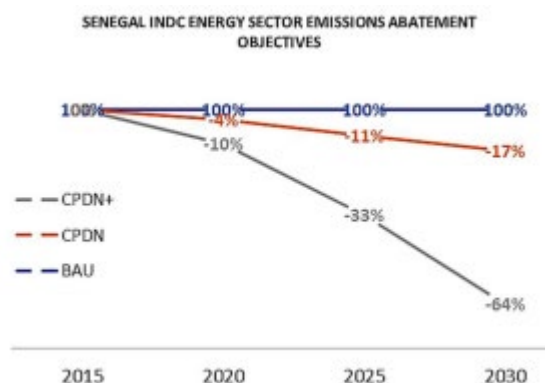
- Implementation of a "Universal Access" investment program

The Complementary Program for Universal Access is structured according to 6 key axes, including the promotion of decentralized systems through installation of 100% solar or hybrid mini-grids to connect 4% of the remaining rural population whilst 95% will be connected to the national grid.

## Senegal NDC<sup>9</sup>

Following on from the ratification of the UNFCCC (1994) and the Kyoto Protocol (1991), Senegal has submitted three National Communications (NC) to the UNFCCC: the First NC was submitted in 1997; the Second NC in 2010; and the Third NC in January 2016). During this period (2011), Senegal also established the National Climate Change Committee (COMNACC) in 2011 and 14 Regional Climate Change Committees (COMRECCs) at regional levels. These committees will orchestrate the implementation of Senegal's INDC, which later became its First NDC when Senegal ratified the Paris Agreement in September 2016.

Senegal's NDC targets an economy-wide relative emission reduction of 21% by 2030 compared to BAU (blending CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O), at an estimated cost of implementation of 6.80 billion USD. The unconditional part of its mitigation target amounts to 5% reduction while the additional 16% (\$5 billion estimated costs of implementation) are conditional on the support of the international community. Its mitigation objectives span, on the one hand, the production of electricity from renewable sources and with improved energy efficiency, including in off-grid areas, the reduction of greenhouse gas emissions in terms of biomass and waste, and the planning of resource mobilization that involves the implementation of national development strategies, and, on the other hand, reduction of GHG emissions through energy efficiency in buildings, transport and industry.



The contribution of the energy sector has been broken down into 3 sub-sectors:

- (i) electricity and domestic fuel;
- (ii) energy efficiency; and
- (iii) transport.

Part of the emissions reduction policy in the sector is based on the increase of renewable energies in electricity production by 30% by 2030. The above **Figure 5** shows the reduction commitments of the corresponding emissions, according to the unconditional (CPDN) and conditional (CPDN+) scenarios depicted in below **Table 2 (electricity sub-sector)**:

Electricity sub-sector's unconditional (CPDN) options	Electricity sub-sector's <u>conditional</u> (CPDN+) options
<b>Programme EnR (Renewable Energies) 1</b> <ul style="list-style-type: none"> <li>Solar PV: power plants of a total capacity of 160 MWc</li> <li>Wind: power plants of a total capacity of 150 MW</li> <li>Hydro: power plants of a total capacity of 144 MW / 522 GWh</li> </ul>	<b>Programme EnR 2 (2020 - 2025)</b> <ul style="list-style-type: none"> <li>Solar PV: commissioning of an additional capacity of 200 MWc</li> <li>Wind: commissioning of an additional capacity of 200 MW</li> <li>Biomass: commissioning of an additional capacity of 50 MW</li> <li>Solar – CSP: commissioning of an additional capacity of 50 MW</li> <li>Hydro: commissioning of an additional power generation of 200 GWh in 2025</li> <li>Replacement of Jindal 320 MW coal power plant by two Liquefied Natural Gas Combined Cycle of 400 MW (2025: 200 MW and 2028: 200 MW)</li> </ul>
<b>Rural Electrification (PNUER)</b> <ul style="list-style-type: none"> <li>392 villages electrified with solar or hybrid mini-grids (diesel / solar)</li> </ul>	<ul style="list-style-type: none"> <li>5,000 villages electrified by solar mini-grids for universal access to electricity*</li> </ul>

\* Senegal 2015 NDC number of 5,000 villages suitable for solar mini-grids was recently updated as being 2,348 remaining vulnerable localities in the latest PNER Operational Plan, of which the proposed project aims at fast-tracking 1,000 – almost half – with the support of the GCF.

### Responding to the adaptation for beneficiary communities

Among climate change threats, Senegal is vulnerable to drought, flooding and related health epidemics. Priority areas for adaptation measures include agriculture and health sectors with particular attention to promoting access to: (i) weather & climate information in order to mainly reduce vulnerability to flooding that affects most of the peri-urban populations in one hand, and agricultural lost and damages due to drought towards rural communities; and (ii) basic installations for achieving communities resilience mainly to climate-induced health hazards (health centres) and stress on agriculture (water pumping).

The importance of access to energy in improving the resilience of poor communities to the negative effects of climate change, has been demonstrated, particularly in the health sectors, access to water for consumption and agriculture (through electrical pumping), in the diversification of livelihoods and in the field of climate information systems for the establishment of an effective early warning system. For example, according to the World Health Organization, the world's poorest populations are more frequently exposed to number of climate-sensitive diseases from extreme weather events and disasters. However, for many people the basic requirements for achieving resilience on health, such as a safe energy supply for cold storage of medicines, operation of health centres at night, etc., are not being met. Climate change implies, in particular, the quality and composition of water which is compromised, thus



affecting the nutritional status of populations and water security. Severe cholera epidemics have occurred due to floods with major riverbed overflow and subsequent water contamination. Similarly, salinization is a predominant handicap of public health, at the origin of the recrudescence of cardiovascular diseases in the regions of Kaolack and Fatick and in Casamance in particular, but also of dental fluorosis which is rampant in the area, this salinization seriously threatens Casamance.

A safe energy supply is also important to put in place an effective early warning system in allowing populations to have access to climate information or previsions thanks to their mobile phone which need to be recharged (currently forcing some women to walk up to 6-7km away), their television sets or radios, and Internet. Agriculture in Senegal is predominantly rain-fed and so erratic weather patterns present an ever-increasing risk to smallholder farmers across the country. Late onset of rain can lead to a reduced growing season; unexpected torrential rain and flash-flooding can lead to farmers losing scarce resources of seed, other farm inputs and labour together with the loss of topsoil, resulting in declining food security. These climate change effects also combine with socio-economic changes – population growth and competition for scarce resources – to provide challenges to any development strategy. Being able to anticipate climate fluctuations from a few days to a few months in advance can be decisive in allowing smallholder farmers to adapt their agricultural practices to compensate. Vulnerability analysis with farmers identified that accurate and early weather information is essential for farmers to mitigate risk and practice effective adaptation measures. Information may be available both internationally and through national meteorological agencies and would be access via mobile phone, TV or radio and help overcome the challenges of other early warning systems that struggle to get the information down to the “last mile” to farmers on the ground, especially farmers with low literacy levels.

In terms of livelihoods, Senegal women and youth are very active in the agricultural value chain and they are found in the processing and petty trade segments. In the processing chain, they are organized into women's promotion groups (GPF) or economic interest groups (GIE) or micro enterprises to jointly address the challenges and issues of empowerment. They face many constraints, especially those related to the correct supply of inputs and other factors of production such as energy. The poor access to productive energy limits their activities of transformation, storage of raw materials, conservation and packaging of finished products. Hence rural electrification can support more income-generating activities and thereby increase the resilience of vulnerable people and households.

Giving that all of the sectors targeted for the growth of the Senegalese national economy, such as agriculture, livestock, fishing, tourism, health and nutrition issues, access to water, remain vulnerable to the effects of climate change, the Government of Senegal has made the issue of adaptation to climate change a priority as part of the country's NDCs. To this end, a special place has been given to the promotion of climate information and the establishment of an early warning system which requires access to reliable and sustainable energy.

### **Building capacities at institutional level in the rural electrification subsector**

Under the Priority Rural Electrification Program (PPER), Senegal is divided into 11 overall services territories: those belonging to Senelec and 10 territories slated for concession to private operators. Operators for each territory are responsible for all generation, transmission, and distribution within those territories and are mandated to undertake grid extension. From 2008–2013, six of these concessions were successfully tendered to private consortiums, while the remaining four concessions were officially granted to Senelec in late 2018:

**Table 3** below details the six concessions awarded to private operators for 25 years, following international procurement process, and remaining four concessions attributed to SENELEC:

Geographic concession	Private concessionnaire	Concession signature date	Entry into force
▪ Dagana-Podor-Saint Louis	Compagnie Marocco-Sénégalaise d'Electricité (COMASEL Louga)	30/05/2008	29/03/2011
▪ Louga-Linguère-Kébémér	Compagnie Marocco-Sénégalaise d'Electricité (COMASEL Louga)	19/11/2009	29/11/2011
▪ Kaffrine-Tambacounda-Kédougou	Energie Rurale Africaine (ERA)	29/06/2011	24/12/2013
▪ Kaolack-Nioro-Fatick-Gossas	Electricité Du RIP (EDR)	22/11/2012	12/11/2014
▪ Kolda-Vélingara	Kolda Energy	29/07/2013	09/04/2015
▪ Mbour	SCL Energie Solutions	09/11/2012	16/11/2018

- Sédhiou - Ziguinchor - Oussouye - Bignona
- Foundiougne
- Matam – Bakel
- Diourbel - Bambey - Mbacké - Rufisque - Thiès - Tivaouane

SENELEC

The Senegalese Rural Electrification Agency (ASER) was formally created by decree in 1999 with the sole aim of promoting rural electrification. The Agency is autonomous, however it functions under the tutelage of the Ministry for Energy and the Ministry of Finance, whilst also reporting to the CRSE. Its roles and responsibilities are laid out

in Article 30 of the 1998 Electricity law which include:

- Development of rural electrification programs in line with national plans;
- Provision of financial and technical assistance to support rural electrification initiatives;
- Encouragement of 'bottom-up' rural electrification project proposals from private operators;
- Organisation of invitations to tender for 'top-down' electricity distribution concessions;
- Provide loans and grants to licensed entities that operate in rural areas;
- Supervision of the contracted installations resulting from these activities;
- Manage the Rural Electrification Fund.

**Table 4** below provides an overview of mini-grids coordinated by ASER over the past 15 years:

YEAR	PROGRAM / DONOR	NUMBER OF MINIGRIDS
2005-2006	Isofoton-ASER/ SPAIN Govt	9
2008	PERACO-ASER/Govt of Netherlands	18
2010	PERACO-ASER/Govt of Netherlands	70
2011	Daye Ouwens-ASER/ Govt of Netherland	10
2011	Merl-ASER/Govt Austria	27
2019	ECREE-ASER / UE Facility	40

**Source:** USAID Power Africa 2019 – Off-Grid market assessment for Senegal

In addition to this situation, from 2000 to 2019, ASER has realized more than 12 Grid extension projects enabling the electrification of more than 3,000 villages.

Issues contributing to the unsustainability of O&M included non-cost-reflective tariffs, under-sizing of the grid, and lack of metering and monitoring. In response to the former, the concept unrolled end of 2019 behind harmonization is that the government now compensates operators for the difference between their cost-reflective tariff and the harmonized tariff, implying systematic metering. The GoS pays this compensation through its Special Fund for Energy Sector Support (Fonds Special de Soutien au Secteur de l'Energie).

The grid expansion modeling for 2025 demonstrates a clear densification of the Medium Voltage network planned in the western parts of the country, where population density and consumption are higher, as well than a significant number of off-grid solutions in the eastern part of the country. This densification is made in great majority by ramifications of the existing Medium Voltage backbones and planned.

There is a need to strengthen operational capacities of the solar rural electrification stakeholders, especially ASER, for planning, implementing and monitoring of the 100%-photovoltaic mini-grids component

## PROPOSED INTERVENTION

The proposed project intends to uphold the renewable share of Senegal's ambition to reach universal energy access by 2025 by fostering solar-powered mini-grids development in isolated villages that are not connected to the national electricity grid, which would still rely on fossil fuels or suffer from unmet needs under the baseline scenario. GCF funds are sought for financial and technical assistance to align Senegal energy access program with its NDC, decarbonizing and climate-proofing rural electrification with the following outputs:

- strengthened operational capacities of the solar rural electrification stakeholders for planning, implementing and monitoring of the 100%-photovoltaic mini-grids component
- 38,900 households electrified by 1,000 mini-grids within 5 years,**
- enhanced access to 3,739 gender-balanced productive uses equipment and social services in all the targeted villages

Having opted for the concept of rural electrification concession and public-private partnership to make the private sector a major player in rural electrification, Senegal has already been able to mobilize significant funding - over 67 billion CFA (EUR 102 M) raised through KfW-Ipex.

Together with BOAD co-funding and the GCF-requested remaining financial need, this 1,000 solar mini-grids project will generate direct emission reductions of 45,098 tonnes of CO<sub>2</sub> equivalent per year over 25-y lifetime. ASER rural electrification program (grid extensions, solar home systems and distinct mini-grids that will be clearly demarcated from the GCF project) being already registered under the Clean Development Mechanism (CDM),<sup>10</sup> its monitoring and reporting of emission reductions will be conducted in accordance with the UNFCCC-approved renewable-powered rural electrification CDM methodology AMS III.BL "Integrated methodology for electrification of communities". The CDM offers a recognised MRV framework that will enable BOAD to transparently track the GHG impact of invested funds over time and subsequently report progress to the GCF as well as integrate them into Senegal's NDC accounting and reporting. While separate carbon finance from the World Bank PoA replenishes the JAPPALE household connection voucher scheme, however, the GCF supported activities will not result in carbon credits issuance and trading, unlike the CDM-supported complementary program.

In parallel of the CDM PoA synergies, ASER will coordinate the collaboration between other relevant initiatives in both Senegal and neighbouring countries in order to optimise the project outcome. These include: Lighting Africa's initiative in Senegal<sup>11</sup>, the regional off-grid electrification project (ROGEP) overseen by the ECOWAS Centre for Renewable Energy and Energy Efficiency, and the World Bank's Scaling Solar, which represents a significant driving force in achieving Senegal's NDC targets with regards to solar PV installed capacity, yet outside of the scope of the GCF project.

#### Linkages between energy access, resilience and adaptation co-benefits

- Access to weather & climate information: rural electrification will improve access to forecasts, early warnings systems knowledge & best practices through Information and Communication Technologies (ICTs) such as radio, TV, mobile phones, and reliable, affordable and resilient types of energy services
- Livelihood viability: rural electrification fosters new income and employment sources, water pumping and agriculture processes and irrigation systems that improve productivity and food access, efficient time savings for new enterprises, and more climate-adapted productive users
- Gender circumstances: rural electrification opens opportunities for women empowerment, social development and wellbeing, improved health and access to health services particularly beneficial for women and children, improved socio-economic status by access to better education, and time savings allowing time to be used more productively

## B.2. Theory of change (max. 1000 words, approximately 2 pages plus diagram)

### Senegal's off-grid electricity market and barriers

The solar PV market is growing in Senegal, and the country is showing its intention to become the solar leader in the region, tapping on its favourable photovoltaic power potential (opposite **Figure 6**). However, these efforts are almost exclusively focused on large-scale implementation – in only 2017, 6 grid-connected PV plants are being connected for a cumulative capacity of 113.5 MW. The vast majority of this power feeds back to urban areas.

The attractiveness of decentralised solar PV mini-grids and solar home system (SHS) products is also becoming apparent due to decreasing costs of solar panels and related technologies; however, implementation of these technologies has remained limited to date. This is largely due to access to finance barriers and lack of technical expertise, which this project aims to tackle.

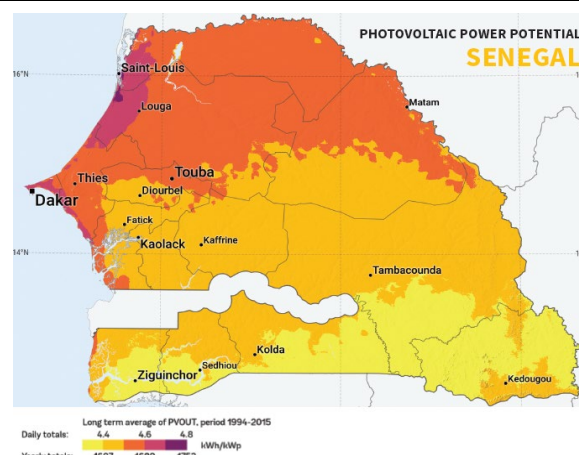


Figure 6: World Bank, Solargis, 2017.

<sup>10</sup> UNFCCC (2018) Senegal Rural Electrification Program. CDM programme documentation is available [here](#). Note that none of the grids to be developed under this project will be included in the CDM PoA.

<sup>11</sup> Lighting Africa – Senegal. More information available at: <http://bit.ly/2eXf12m>



The majority of the decentralised energy provision services currently in place in Senegal have been implemented in the 3 ‘top-down’ PPER pilot concessions of Dagana-Podor-Saint Louis, Louga-Linguère-Kébémér and Kaffrine-Tambacounda-Kédougou. Despite the documented potential, these initial concessions have only delivered a fraction of their planned results in their first implementation phase. Progress in the first half of 2018 was insufficient to meet the 30% electrification target for this first phase, due to the slow start-up of dealers, the high connection costs and the difference between the rates applied by the dealers and those of SENELEC making the cost per kWh higher in rural areas than in urban areas. In addition, local financial institutions have limited familiarity with renewable energy investments, and project finance at attractive terms (e.g. cost of capital, tenors) is not widely available in Senegal. As of end of 2018, 4,138 rural villages have been electrified out of 21,170 rural villages in total and 2,513 rural villages are already under development; hence 14,519 villages are still awaiting electrification, which represents 2.3 million inhabitants to address by 2025.

In parallel to the paradigm shift in terms of avoiding substantial GHG emissions for the country by diversifying energy supply from thermal-powered national grid extensions, solar rural electrification can tackle established climate vulnerabilities of off-grid communities to health & water sanitation, agricultural & economic productivity as well as empower women and young populations to build more climate informed & resilient livelihoods. Droughts, floods and other severe weather events indeed have serious consequences for rural livelihoods and economies, pushing vulnerable communities further into poverty – all the more as climate variability and change can make these events more frequent and more damaging.

Besides households, solar energy could indeed power a myriad of different productive activities that can be mechanized across agriculture, industry and commerce, transforming people lives while avoiding emissions. These include appliances for trades-people such as sewing machines and carpentry tools, equipment for farmers such as water pumps and processing machines, and for retail outlets such as refrigerators and blenders. The productive use sector is dominated by pumping, however, limited development has occurred around solar mills or regarding cold chain applications. Given the importance of agriculture in predominantly rural off-grid areas and since close to 50% (over 750,000) of Senegalese households are active in the agricultural sector, a focus can thus be made on water pumping/irrigation, refrigeration and cooling, and processing use cases<sup>12</sup>:

- Water pumping & irrigation - The area of land in Senegal with good potential for irrigation is estimated at 497,500 ha. Electric and diesel pumps are frequently used, e.g. pumping for banana plantations.<sup>13</sup>
- Agro-processing - the most important agricultural products in terms of gross production value include groundnuts and rice, before milk, hence an established potential for solar-power milling, threshing, and drying.
- Refrigeration & cooling – since over 450,000 households in Senegal are involved in livestock breeding, the potential in this market is significant. It is estimated that an installed capacity of close to 20 MW would be required to serve all livestock farmers for milk storage.<sup>14</sup>

In the sector of social services, the project’s focus also targets safe energy supply for cold storage of medicines, operation of health centres at night, and effective Information & Communication Technologies and early warning systems allowing populations to have access to climate information or previsions.

However, several obstacles still prevent the full realization of solar power potential for servicing communities and productive users<sup>15</sup>:

- Information-wise, the advantages and possibilities of solar energy are poorly known and sometimes misunderstood. Users do not necessarily have the right information on quality or reliability of solar products on the market, nor enough visibility on the costs as compared to their limited ability and willingness to pay. Required implementation capacities include technical, transactional, marketing and communication expertise.
- Upfront investment costs of solar infrastructures and equipment are out of the affordability range of most households and rural microenterprises<sup>16</sup>. Available financial resources rates and maturities mismatch real needs from operators and end-users, both towards traditional financial institutions and households credit sources.
- Incentives are unclear in the context of an evolving regulatory sector, existing concessions model update, applicable tax and tariff, resulting in frustrations among the private sector. Focusing on distribution channel efficiency, tax/fiscal policies and financing costs is necessary for facilitating the uptake of productive applications to serve as anchor loads and sustain solar mini-grids business models.

<sup>12</sup> [https://www.get-invest.eu/wp-content/uploads/2019/06/GETinvest-Market-Insights\\_SEN\\_PV\\_Guide\\_2019.pdf](https://www.get-invest.eu/wp-content/uploads/2019/06/GETinvest-Market-Insights_SEN_PV_Guide_2019.pdf)

<sup>13</sup> Limited information is available about the exact number of traditional pumps in operation in the country with a frequently stated number — from sector stakeholders in country — being 25,000.

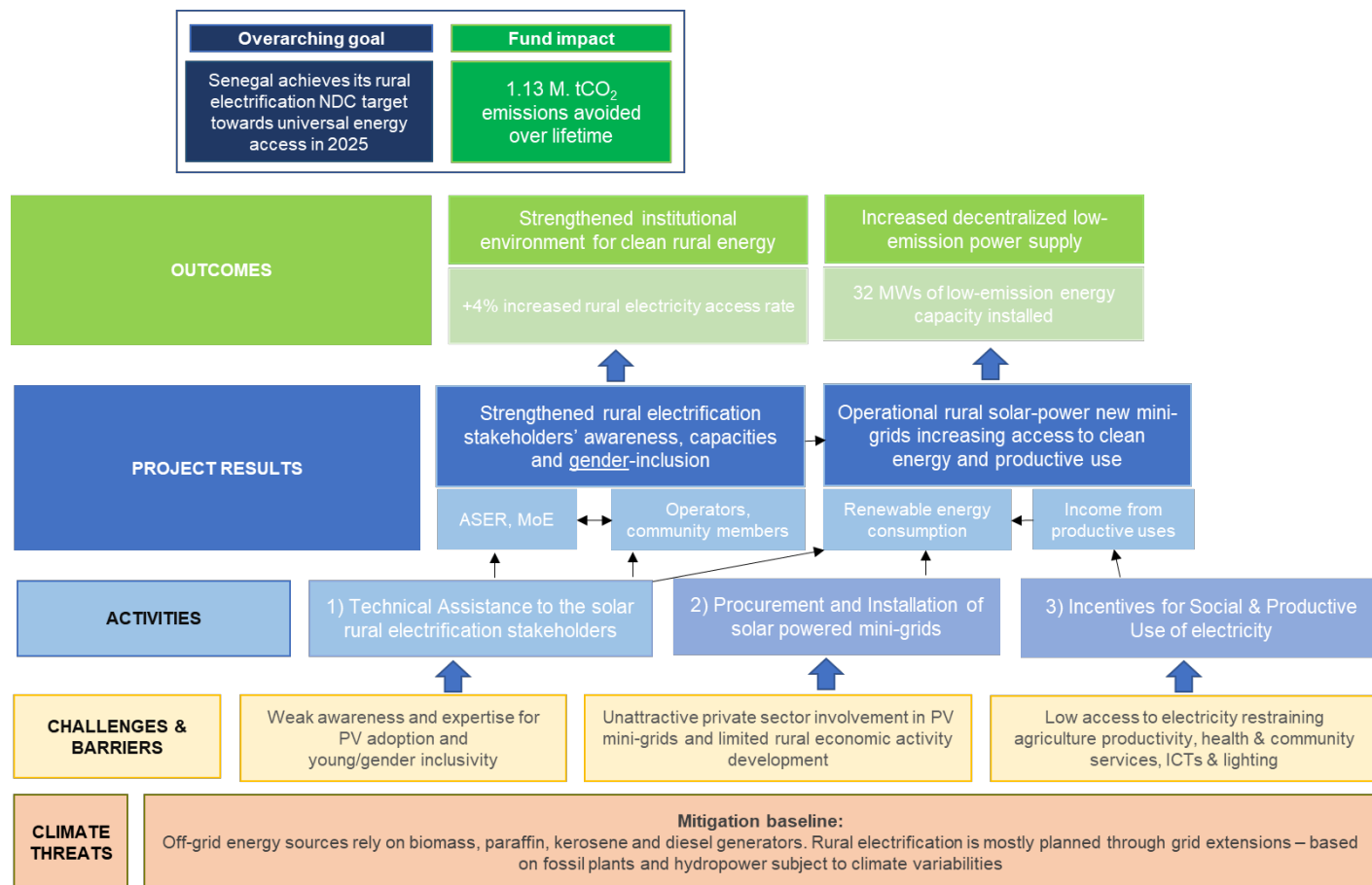
<sup>14</sup> Using the data from Progrès-Lait led by ASER & ENDA Energie, covering 100 milk conservation platforms by solar systems with 20kWp batteries

<sup>15</sup> Cartographie du secteur de l’énergie solaire au Sénégal. 2017

<sup>16</sup> <https://www.lightingglobal.org/wp-content/uploads/2019/09/PULSE-Full-Study.pdf>

Recognising this, the Ministry of Energy and ASER planned to adapt the financing model to be applied across all 10 concessions to help overcome the access to affordable finance barrier currently hampering progress, hand-in-hand with efforts to harmonise electricity tariffs nationwide in order to alleviate the current pricing disparities witnessed in the 'pilot concessions'. Outside of the concessions and grid extension-targeted localities (7,559), remaining off-grid solar-targeted villages thus call for the following shift framework to meet Senegal's rural electrification Nationally Determined Contribution and Universal Access ambitions:

**Figure 7 : Theory of change diagram**



**Table 5** below provides details of the project's objectives achievement logic:

Barrier removal actions to be undertaken by the project	Assumptions underlying the project actions
<ul style="list-style-type: none"> <li>▪ <b>Capacity building</b> of the project's key stakeholders for enabling solar mini-grids deployment framework, starting with the end-user beneficiaries' awareness and appropriation, the socially-equitable competencies of ASER-hosted Project Management Unit and gender-based community groups, and the environmental expertise and knowledge management required upstream and downstream</li> <li>▪ <b>Concessional co-financing</b> of the low-carbon power generation assets to de-risk local operators' participation and secure the best combination of tariff and service from the conceded solar energy mini-grid networks, meters and public lighting</li> <li>▪ <b>Incentives</b> for connection of eligible social services (such as Information &amp; Communication Technologies, health centers and schools), women &amp; youth-entrepreneurs to the PV mini-grids and mechanism to facilitate access to resilient productive</li> </ul>	<ul style="list-style-type: none"> <li>▪ Senegal politically recognized rural vulnerabilities to climate change and its Rural Electrification National Plan offers potential for 100% solar electrification in remaining 2,348 off-grid villages</li> <li>▪ Senegal aims to integrate climate change mitigation into institutions that exist and can host and retain trained staff</li> <li>▪ GCF involvement brings down the WACC to an acceptable level to Senegalese treasury</li> <li>▪ Private operators are interested in investing low upfront capital risk</li> <li>▪ Appropriate micro-finance network is available in rural areas</li> <li>▪ Households are aware of climate change and have the capacity to pay for clean energy</li> </ul>

equipment financing through microfinance (such as water boreholes, refrigerators), climate information and early warning

▪ *Rural energy development success builds on extensive community mobilization, and capacity building for efficient electricity use*

### B.3. Project/programme description (max. 2000 words, approximately 4 pages)

#### Overall Objective

The objective of the proposed project is to contribute to reducing GHG emissions by boosting the solar PV mini-grids component of the country's ambitious goal of reaching universal energy access<sup>17</sup> in 2025 by providing concessional co-funding needed to mobilise private sector participation in the domestic renewable energy market, thus supporting the achievement of Senegal's Nationally Determined Contribution, which mentions rural electrification as a key objective. Vulnerable and geographically dispersed rural communities currently disconnected from any grid are the key beneficiaries of this program, with a special focus on women and children through productive uses, community services and early warning systems.

To meet Senegal's target pledged under the SE4ALL initiative, a national rural electrification investment program has been prepared by the government. The execution of the program is delegated to the *Agence Sénégalaise d'Electrification Rurale* (ASER), the Senegalese rural electrification agency, on the basis of an Operational Plan released in December 2019. The overall 2019-2025 Complementary Program for Universal Access is valued at FCFA 690 billion (USD 1.17 billion), which mostly covers a) medium-voltage grid extension; and b) rural mini-grids electrification investments. **Financial support from the Green Climate Fund is requested to contribute concessional and grant co-finance to triple its solar mini-grids electrification component** for the benefit of 344,000 inhabitants (4% of the 8.64 million rural population).

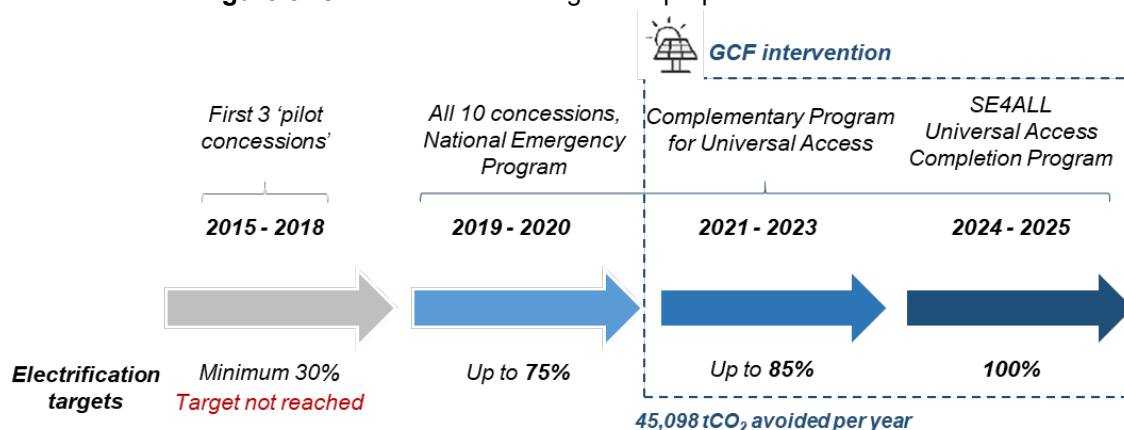
#### GCF Project's components

The project presented for the GCF's consideration targets a FCFA 130 billion (EUR 198.7 million) investment package pursuing decentralised, renewable energy generation in rural communities, through 100% solar PV mini-grids as a sustainable, climate-friendly solution for vulnerable communities' electricity access. The project is to be implemented between 2021 and 2025 by ASER as the Delegated Executing Entity by the State of Senegal, nationwide.

Of this amount, FCFA 47 billion (EUR 71.7 million) of concessional, sovereign loan from GCF is to be dedicated to procuring and installing solar mini-grids, lowering up-front risk for private sector to 5% of the investment costs to step-in and operate the solar power mini-grids assets (Component 2). FCFA 940 million (EUR 1.4 million) of grant will be dedicated to Technical Assistance (Component 1) and Project Management, besides FCFA 1.5 billion (EUR 2.3 million) of financial incentives for productive use (Component 3). The grant will cover two components: (i) the provision of technical assistance – transactional, marketing and communication expertise to enable the uptake of productive uses including a gender equality promotion program to ensure women and children noticeably benefit from the realised electrification efforts, and (ii) the financial incentive for community services and productive users connection through redeemable vouchers, while the productive equipment acquisition through microcredit guarantees will be loaned.

<sup>17</sup> 'Access' as defined by the multi-tier framework developed by World Bank under the Sustainable Energy 4 All initiative. This multi-attribute framework includes seven dimensions - Capacity, Duration, Reliability, Quality, Affordability, Legality, Safety

**Figure 8: Overview of the timing of the proposed investment<sup>18</sup>**



**Component 1: Technical Assistance to the solar rural electrification stakeholders (EUR 3.7 mln<sup>19</sup>)**

Outputs	Activities
Output 1.1 - Capacity building of rural electrification stakeholders	Activity 1.1.1 - Trainings on procurement procedures, project management and GCF requirements
	Activity 1.1.2 - Seminars and trips and workshops (technology watch, public consultations, conferences, sharing of experiences, etc.)
Output 1.2 - Gender action plan implementation	Activity 1.2.1 - gender-relevant community-organizations mapping & tutoring
	Activity 1.2.2 - gender-stakeholders training (PMU – local operators – community organizations)
	Activity 1.2.3 - gender-oriented communication campaign
Output 1.3 - Environmental & social downstream activities	Activity 1.3.1 - E&S measures implementation and monitoring
	Activity 1.3.2 - Establishment of a recycling unit for batteries and other waste (CFL, other electronics)

This component targets capacity building of the project's key stakeholders (ASER-hosted Project Management Unit, Ministry of Energy, local operators, rural beneficiaries incl. community-based organizations), to favour the implementation of a sustainable framework of the delivered services and benefits of the solar mini-grids, starting with the end-user beneficiaries' climate information, solar power benefits awareness and appropriation, the technical and administrative competencies of the PMU, gearing gender and youth institutionalization, and the environmental expertise and knowledge management required upstream and downstream:

**To the benefit of the Project Management Unit and the Ministry of Energy**

- Trainings on procurement procedures, project management and GCF requirements
- Seminars and trips and workshops (technology watch, public consultations, conferences, sharing of experiences, etc.)

**To the benefit of the targeted rural beneficiaries (prioritizing women and young involvement)**

- Gender action plan implementing activities (gender-oriented training, awareness raising, and community-organizations tutoring) in partnership with DER<sup>20</sup>, leveraging and rolling-out its framework in the remote villages of the GCF intervention

<sup>18</sup> other programme activities (including PPER) are not directly related to the GCF project and do not impact on the achievement of the GCF project's goals

<sup>19</sup> excluding Project Management Costs of EUR 0.4 mln

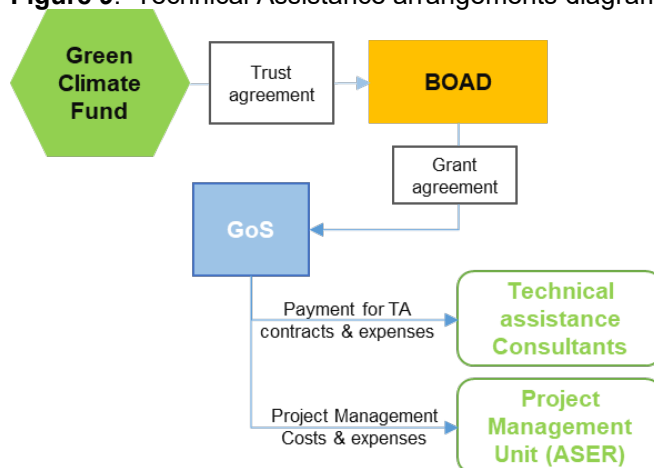
<sup>20</sup> The General Delegation for Women and Young Entrepreneurs has been set up by the President of Senegal to help boost entrepreneurship, which is the main occupation of the Senegalese population, while promoting economic, financial and social inclusion as well as territorial equity.

in order to (i) Organize awareness, financial education and entrepreneurship events for vulnerable youth and high school students, and identify potential entrepreneurs, (ii) Accompany and coach young people in the development of their idea and the creation of their business plan, and (iii) Providing tailor-made technical support to local incubators and spaces dedicated to their employability

**To the benefit of local concessionnaires operating the targeted villages mini-grids**

- Monitoring of ESMP implementation and environmental and social support
- Setting up a recycling unit for batteries and other waste (CFL, other electronics), in order to manage the potential negative cumulative effect of the used batteries and other systems on the environment. The recycling unit is to be installed on governmental land, however its construction and operation will be procured from private sector and conceded for exploitation under the supervision of the State (who will retain ownership of the assets) based on ASER-DEEC convention. Local operators will remain responsible for the collection and transportation of the e-waste; the recycling operator's responsibility starting at reception towards treatment

**Figure 9: Technical Assistance arrangements diagram**



N.B. in order to prevent conflicts of interest, the Ministry of Finance will also be involved under delegation from the GoS Executing Entity for Component 1 that includes ASER and the Ministry of Energy as beneficiaries.

**Component 2: Procurement and Installation of solar powered mini-grids (EUR 192.2 mln)**

Outputs	Activities
Output 2.1 - Preparation of detailed Engineering Studies	Activity 2.1.1 - Site selection, engineering studies & Specific environmental and social analysis for each site
Output 2.2 - Supply, installation and commissioning of equipment	Activity 2.2.1 - Solar PV power plants construction and minigrid deployment
	Activity 2.2.2 - Smart meters installation & miscellaneous aleas
Output 2.3 - Modern public lighting	Activity 2.3.1 - Deployments of solar street lighting
Output 2.4 - Control and supervision of work	Activity 2.4.1 -Control and supervision of work

Financing the bulk of the technology investment to de-risk local operators' participation in funding solar energy production equipment, synchronization and control tools, low-voltage mini-grid networks and connections, civil engineering (competitive Request for Proposals, which control and supervision of construction will be assigned to independent experts), allowing private operators to offer the best combination of tariff/service. Pending detailed Engineering studies, the mini-grids will include solar PV plants ranging from approximately 15-45 kW peak (expected average of 32 kW) together with inverters and clean battery systems for energy storage, as well as local distribution lines and meters tailored to villages categories by size, ranging from:



- Kit I: villages with populations between 100 and 200 inhabitants: 15 kWp
- Kit II: villages with populations between 200 and 400 inhabitants: 23 kWp
- Kit III: village with a population between 400 and 750 inhabitants: 30 kWp
- Kit IV: village with a population between 750 and 1500 inhabitants: 45 kWp

From ASER's experience in designing and implementing solar mini-grids projects in Senegal (more than 130 mini-grids already installed and 270 under implementation), the compartmentalization was carried out on the basis of an initial classification of villages done, considering their respective population and level of equipment in terms of productive and social basic infrastructures (school, health, boreholes, etc.). On the basis of this village segmentation by population, a demand analysis questionnaire has been elaborated and a survey done after sampling of villages reflecting the main characteristics of each type of village.

After the survey, a standard energetic profile has been elaborated for each type or category of village. From these energetic profiles, different standardized types of PV kits have been selected for the project at this feasibility level (see Annex 2 Feasibility Study for details tools utilized and sample modelling results).

At this stage, the sites are selected on the basis of their access rate of the non-electrified areas. Department having an electrification rate below 10, 20% are priority areas. In addition, high priority is given to remote areas located far from the existing MV grids (more than 5 to 7km) with small population (less than 700 inhabitants) for the GCF intervention.

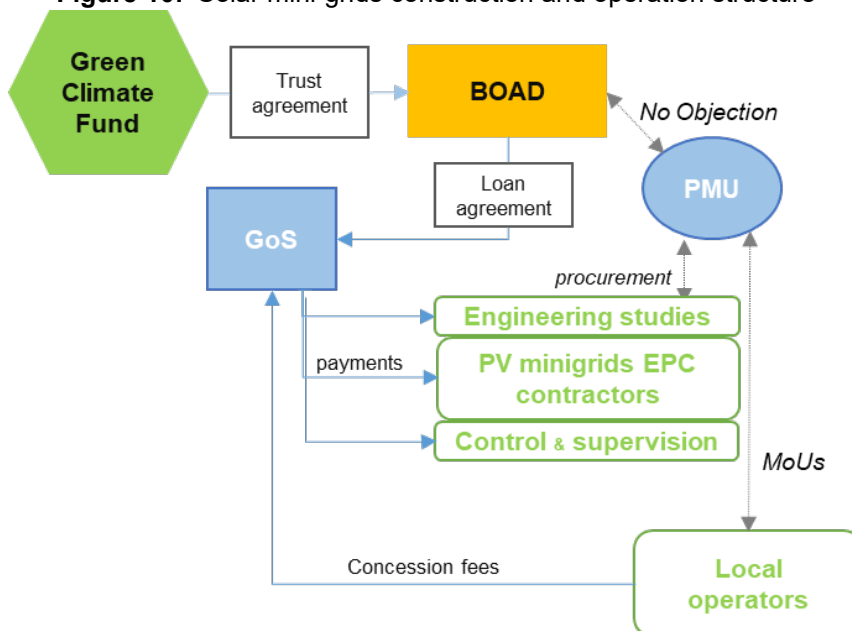
The mini-grid connections will cater for Tier 3 to Tier 5 service levels. A consumer may upgrade from a lower service level to a higher service level, and vice-versa.

Service level	Power demand (watts)	Daily capacity (kW-hrs)
Tier 3	>200	> 1 kWh/day
Tier 4	>800	> 3.4 kWh/day
Tier 5	> 2kW	> 8.2 kWh/day

Local concessionnaires will not be involved in the mini-grids construction (procured to EPC by ASER) but in the meters initialization & official connection activation once low-voltage and indoor installations of the households and productive users have been realized. Therefore, the GoS represented by ASER (i.e. the EE) will remain responsible for implementation of this Activity, rather than concessionaires, and it will engage concessionaires as service provider to assist with the implementation of this Activity.

- **Deployment of modern public lighting** from solar energy will also be realized in the project's rural areas and help provide suburban security and economic growth in the villages.  
The Germany-financed deployments of solar street lighting will consist of the procurement and installation of energy-efficient (LED) public lighting equipments.

**Figure 10:** Solar mini-grids construction and operation structure



**Component 3: Incentives for Social & Productive Use of Electricity (EUR 2.3 mln)**

Outputs	Activities
Output 3.1 - Gender & social connections	Activity 3.1.1 – Connection of eligible social services, women & youth-entrepreneurs to the PV mini-grids
Output 3.2 – Micro-financed productive equipment credits guarantees	Activity 3.2.1 - Implementation of mechanism to facilitate access to productive equipment financing through microfinance

Social services and productive equipment will respectively lead to the development of sustainable livelihoods and enhance the capacity of villages to pay for solar power supply, strengthening the mini-grids business model viability while maximizing social and gender inclusivity. This bottom-up component aims at supporting productive use & services access to off-grid solar power and related revenue-generating production/transformation equipment through a two-level financial assistance:

- **Gender & Social connections** (result-based payment) for eligible social services and women & youth-led enterprises 'PREM' (Multi-Sectoral Energetic Projects), lifting the upfront connection costs related to the indoor installation of community services (such as health clinics & schools) and gender-focus productive users (predominantly agriculture-related) , to stimulate anchor load demand and ground the mini-grids sustainable operation.

Besides general eligibility criteria (geographic location within a village where electricity is available from the concessionaire, first electrification of the women or youth entrepreneur with productive use intention or community service need justification and compliance with the technical conditions required by the concessionaire), the identification of beneficiaries of the coupons distribution will be empowered to the gender-mainstreaming communities in selected villages once informed about the rules and objectives, to build ownership and commitment among beneficiaries. A Memorandum of Understanding (MoU) will govern between ASER and the concessionaires, containing the legally-binding rules of the project towards Subsidy Payment Requests, the eligibility of beneficiaries and a set of rights of the coupon beneficiaries. ASER will pre-approve the concessionaries coupon distribution plans on a periodic basis.

When making use of the coupon, the beneficiary must: remit the coupon to the concessionaire, pay the remaining value and sign the payment receipt. Concessionaires will only be able to confirm the coupon in the coupon software after initializing the electrical connection. This confirmation will allow ASER to be informed on the beneficiary's connection, and honor the corresponding Subsidy Payment Request (SPR) from concessionnaires. After payment to the concessionaires, ASER will issue a Subsidy Payment Confirmation, in order to link payment to specific SPRs, which will allow the traceability of payments, and to keep the financial history for each coupon.

This mechanism inspires from the original JAPPALE coupon program, a World Bank carbon-finance voucher system to reduce electricity connection costs for rural households, thus making connection costs accessible to rural populations in order to increase access to electricity and significantly increase the rate of dealer penetration into the electrification market<sup>21</sup>. For productive users, the vouchers nominal value will be set at 100,000 CFA (150 EUR) and prioritize youth & women-involving activities, giving right to a reduction on connection fees which can be redeemed by the operator upon verified completion of connections, aiming at the following objectives:

- Eliminate the access barrier constituted by connection costs (installations, connection or first top-up costs),
- Guarantee the safety of installations and the application of energy efficiency measures,
- Increase the service rate in electrified villages,
- Contribute to achieving the overall goal of universal access

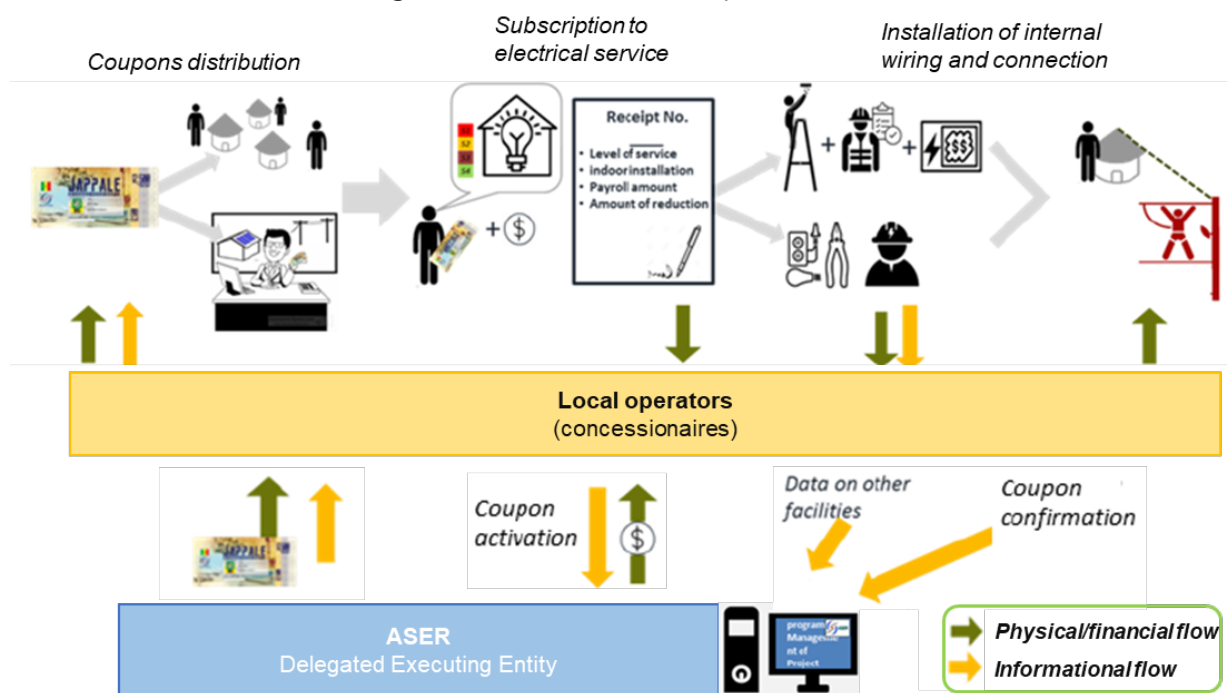
A JAPPALE scheme concept evaluation and adaptation in relation to tariff harmonization as well as best practices for scaling up throughout the territory have been released in 2019, including a valuable set of recommendations about the software, the training material, villages selection, activation payments, e-codes confirmation and communication<sup>22</sup>. Likewise, ASER will provide coupons to concessionaires, who will distribute coupons in villages or at their agency, for eligible clients who opt to go directly to the agency.

<sup>21</sup> Emission reductions achieved under Component 2 will not be used to subsidize the coupons of the World Bank JAPPALE programme, because distinctly monitored and not to be issued under the CDM.

<sup>22</sup> As per World Bank 2018-11 minutes from the last steering committee of the JAPPALE vouchers project, and World Bank 2019-01 pilot implementation report



**Figure 11: Scheme of the coupon mechanism**



- **Productive equipment acquisition credit access facility;** Guarantee issued to cover the loans extended by a micro-finance institution for the purchase of resilient productive use equipment by rural entrepreneurs and support for the development of micro businesses<sup>23</sup> across agriculture, industry and commerce (equipment for farmers such as water pumps and processing machines like grinding mills, appliances for trades-people such as sewing machines and carpentry tools, and for retail outlets such as refrigerators and blenders).

Examples show that there is increased interest in financing renewable energy applications for productive use in Senegal. Nevertheless, the lack of access to medium and long-term agriculture financing and credit, in particular for smallholders facing land tenure issues, remains a critical barrier and will need further attention if the country is to successfully tap into these markets<sup>24</sup>.

**Table 6: Top six Micro-Finance Institutions (MFIs) in Senegal by outstanding loan amount<sup>25</sup>**

MFI	Total loan portfolio (USD million)	Number of Borrowers	Total deposits (USD million)
CMS	202.5	nc	242.9
ACEP Senegal	73.9	49,000	19.4
MicroCred – SEN	101.11	48,000	48.44
PAMECAS	60.98	89,000	60.69
U-IMCEC	17.77	21,000	12.52
MECAP	11.9	Nc	7.53

MFI selection will remain at the discretion of the Government of Senegal (Ministry of Economy and Finance) and be subject to eligibility criteria (including geographical proximity with rural target beneficiaries, energy-related products management abilities and financial capacity criteria) & BOAD due diligence that will assess civil / criminal and regulatory antecedents and sanctions lists – on top of obligations in the AMA between GCF and BOAD; the Bank will conduct also administrative investigations into corruption, fraud, coercion, collusions and inconvenient practices, and make use of the relevant national authorities for the necessary criminal investigations. Upon BOAD's experience, this financial guarantee will be a loan proceed committed for covering part of the risk taken by the microfinance institutions (maximum 40% of receivables deemed irrecoverable). The resources will be managed by a Partner Financial Institution to be competitively selected by the Government of Senegal among national institutions like Banque Agricole,

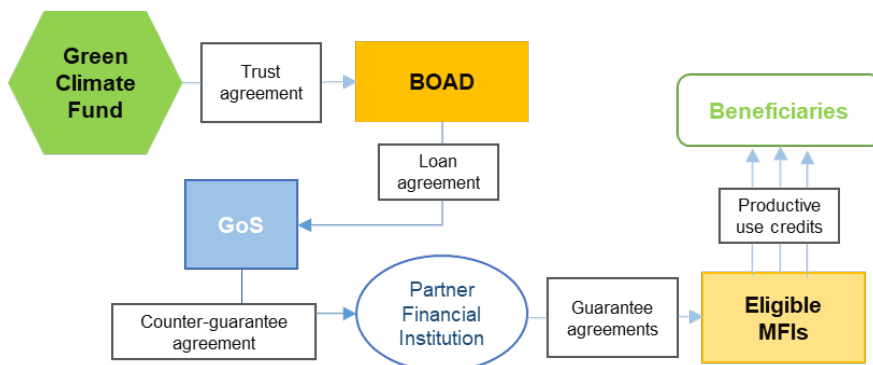
<sup>23</sup> Principles and operational guidelines to be further developed during Year 1

<sup>24</sup> 2019. GET.Invest market insights — Senegal: renewable energy applications in agricultural value-chains

<sup>25</sup> MIX. Link: <https://www.themix.org/> — accessed January 2019

Crédit Mutuel, COFINA, FONGIP, following BOAD due-diligence and general minimum criteria including reputational/recognition, governance and regulation, systems and experience.

**Figure 12:** Microfinance guarantees structure diagram



### Business Model

The GCF sovereign loan to the Government of Senegal intends to reduce local operators' risks in operating and maintaining solar mini-grids in the smallest, most remote vulnerable villages to be electrified in Senegal. Based on the limited upfront concession fee of 5% of investments levied from the local operators and the applicable compensation from harmonized tariffs, private sector profitability can be expected above 12%, when full equity investment from operators in the same context would return a negative IRR (unless governmental tariff compensations payable to operators are increased fivefold to reach a comparable return, given the communities limited ability to pay which translated in tariff harmonization). Project arrangements, procurement and ownership remain under the GoS, while construction is contracted to private suppliers and local operations & maintenance to historical concessionnaires.

The project will create an enabling environment for the private sector to step in and to provide the necessary co-finance and expertise, **delivering the following outputs by 2025:**

- strengthened institutional capacities for mobilizing private sector towards Universal Access completion, enhancing rural stakeholders' awareness and gender-driven participation
- 38,917 households electrified by rural mini-grids, focusing on solar solutions with battery storage
- financially-incentivized implementation of 3,739 'Projets Énergétiques Multi-sectoriels', for the solar powering of productive uses (mostly irrigation, refrigeration and agro-processing) and community services (such as schools, clinics) in villages with more than 250 inhabitants.

In doing so, the project will reach up to over 344,000 rural inhabitants, tabling on a progressive growth in demand, diversified between households improving their living standards, emerging productive economic uses and reinforced community services. Based on its 25 years projected supply, the project is estimated to contribute to the mitigation of at least 45,098 tonnes of CO<sub>2</sub>e equivalent per year, i.e. 1.13 M. tCO<sub>2</sub> to be avoided over its technical lifetime.

Besides its **mitigation impact** and environmental co-benefits including (i) reduction of air pollution due to fossil fuel consumption and improvement of air quality thanks to promotion of renewable energies and (ii) reduction of pollution by waste oils at thermal power plants, the project's **adaptation co-benefits** will feature:

- Greater resilience to climate-stresses through reduced vulnerability to water scarcity, diseases and farming yields
- Illuminated studying and access to ICTs
- Socially-equitable avenues for income generation

Indeed, the introduction of modern energy and related productive incentives in the rural communities will actually lead to specific socio-economic and gender-sensitive development effects including:

- better sanitation and social services and increased possibility of activities during evening hours
- long-term effects through schooling and information, as well as changed migratory patterns
- increased availability of safe drinking water, refrigeration and mechanization for food production and sale
- improved access to climate / weather / best practises information through radio, television, and the Internet
- better health of especially women and girls following improved indoor lighting and decreased air pollution as well as safer streets and reduced distances to cover in search of energy services and/or resources
- local economy stimulation, employment generation and value-added revenue increases lifting rural areas out of poverty
- fossil fuel imports savings, improving households power purchase and in turn, the country's energy security & fiscal balance

**Figure 13:** proposed alternative technologies by type of settlement (ASER)

SIZE OF VILLAGES		MINI-GRID				OFF-GRID
		Grid	DIESEL	HYBRIDE SOLAR/DIESEL (50% SOLAR ENERGY)	100% PV	SHS
>500 INHABITANTS		✓	✓	✓	✓	✗
100 - 500 INHABITANTS	DENSE AREAS	✓	✓	✓	✓	✗
	DISPERSED AREAS	✓	✓	✓	✗	✓
<100 INHABITANTS	DENSE AREAS	✓	✗	✗	✓	✗
	DISPERSED AREAS	✓	✗	✗	✗	✓

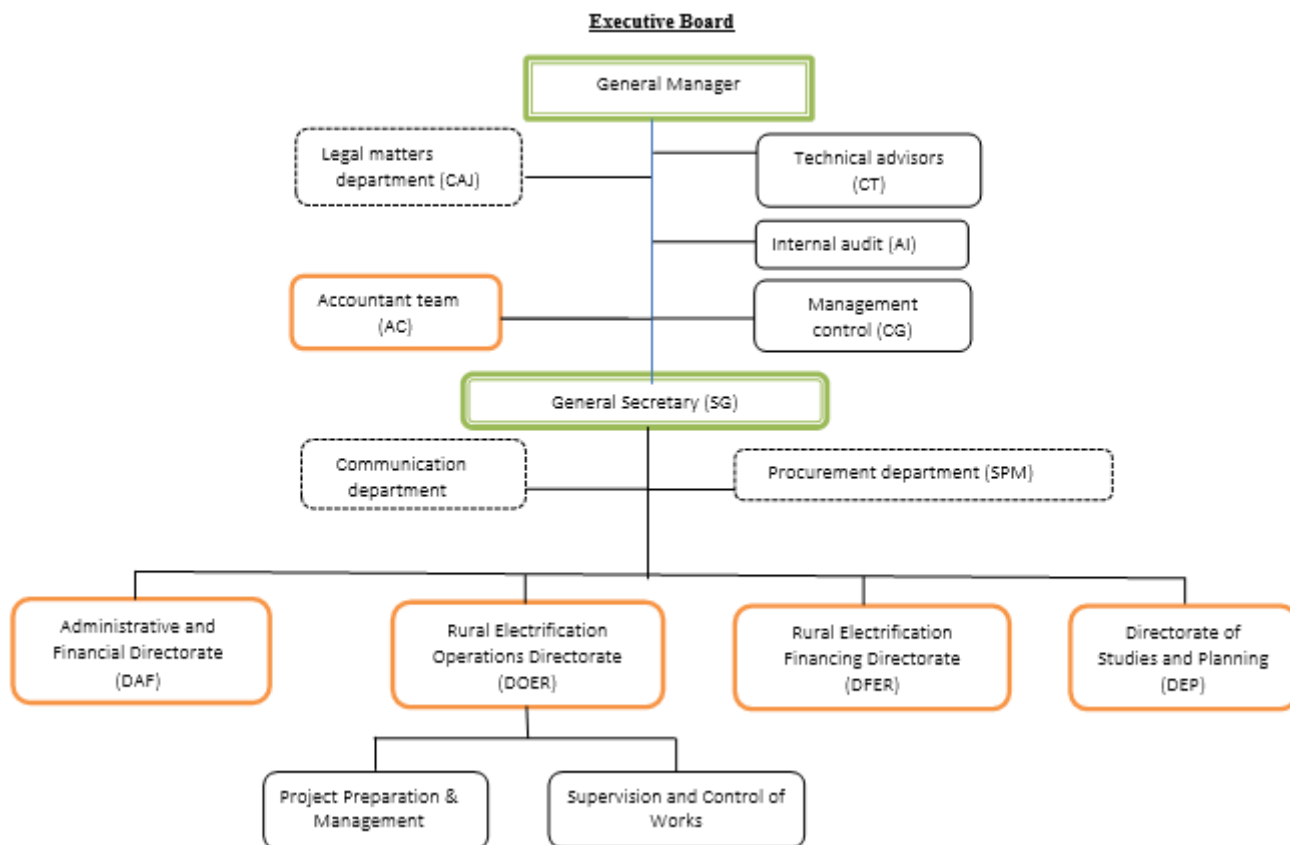
- At the peri-urban level, off-grid solutions are not suitable given the presence of networks MT and BT
- past experiences using diesel have shown that the logistics of fuel can be very expensive and complex (with supply disruptions in more isolated regions)
- Investments in SHS can be envisaged in very small villages and isolated (in the eastern parts of the country) for which an investment in the extension of the network or in a mini-network is not justified from an economic point of view.

#### B.4. Implementation arrangements (max. 1500 words, approximately 3 pages plus diagrams)

In its role as representant of the Executing Entity (Government of Senegal), ASER will ensure operational supervision of the project from procurement and construction of all mini-grids until end-beneficiary installations. The project implementation unit will be integrated at ASER general management level, with a Project Coordinator acting under the supervision of a Steering Committee (*Comité de Pilotage – CP*). It will rely on the following structures to assume its coordination functions:

- the Technical Monitoring Committee (CTS) which will support the coordination and monitoring of the project work implementation;
- the operational structures (management units) of ASER General Management which will be responsible for the implementation of the project.

**Figure 14: ASER management organogram**



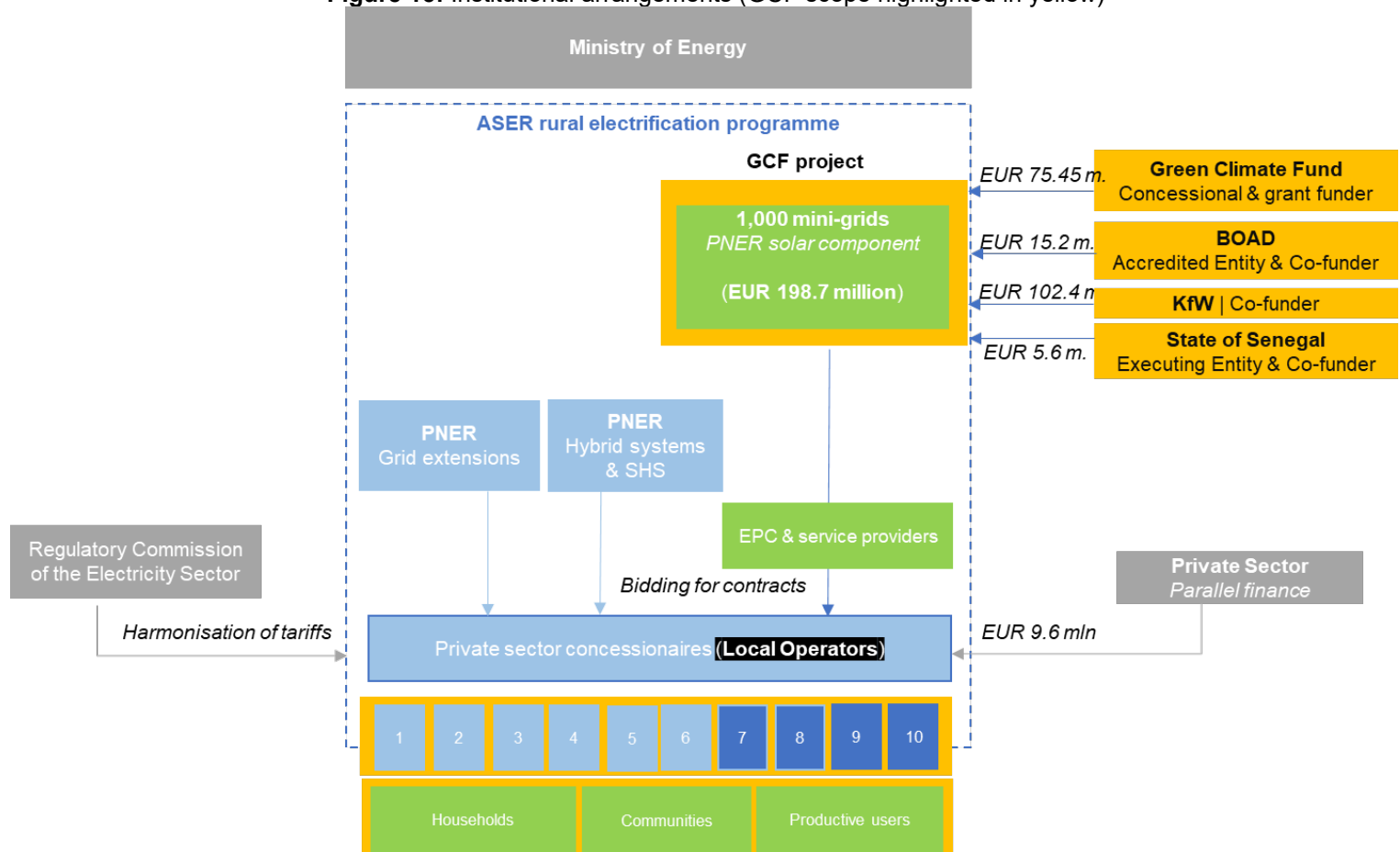
ASER Project Management Unit will be based within ASER premises and comprise:

- a Project Coordinator
- an expert Engineer in Renewable Energies (solar)
- a Financial Analyst
- an UN Procurement Specialist
- a person in charge of Monitoring and Evaluation,
- an Environmental and Social Safety officer

The project's legal, contractual, institutional and financial arrangements will include the following stakeholders:

- **NDA (National Designated Entity):** The Ministry of Environment and Sustainable Development acts as the Senegalese NDA and is supportive of the ASER program and the proposed GCF project. It was introduced to the NDA during the Senegalese National Committee on Climate Change, as early as September 2017. The NDA has provided a letter of no objection upon the Funding Proposal preparation stage.
- **AE (Accredited Entity):** BOAD will act as the AE, trustee and co-financier of the ASER GCF project. BOAD already has an ongoing financing relationship with the Senegalese government, and made available a total sum of CFA 12.22 billion (USD 22.00 million) through subordinate, longer-term loan, no yet disbursed and conditional upon the provision of concessional co-finance by a partner financier, as part of the total budget for the 1,000 villages. It will enter into a Trust Agreement with GCF for the entire amounts to be loaned and granted to the GoS.
- **CRSE (Regulatory Commission of the Electricity Sector):** The Commission is mandated to protect consumers against excessive electricity tariffs, ensure access and quality of service, enhance competition among IPPs and supervise SENELEC's performance. In the project, the CRSE will be responsible for monitoring compliance of operators against set tariffs and terms of reference as well as grievances once the assets are commissioned.

**Figure 15: Institutional arrangements (GCF scope highlighted in yellow)**



### Regulatory framework for the development of mini solar grids

- ✓ Law 98-29 relating to the Electricity Sector
  - o Guarantee the country's electricity supply at the lowest cost
  - o Broaden people's access to electricity, especially in rural areas
  - o Attract the significant private investments required for the development of the sector
- ✓ Law 2010-21 on renewable energies
  - o Diversify sources of production by using renewable energies.
  - o Promote the dissemination of equipment related to renewable energy technologies.
- ✓ Decree 98-334, setting the terms for issuing and withdrawing licences or concessions for the production, distribution and sale of electrical energy
- ✓ Decree 98-335 relating to the principles and procedures for determining and revising tariff conditions.
- ✓ LPDSE/2019-2023 (Policy Letter for the Development of the Electricity Sector), including mini-grids related advocacies:
  - o Implementation of the electricity tariff harmonization at national level
  - o Electrification of community services and productive uses by integrating the gender approach for sustainable improvement of rural people's living conditions
  - o Support for renewable energy development by setting up incentives for facilitation of the acquisition of renewable energy equipment
  - o Establishment of a promotion and quality control system of renewable energy equipment

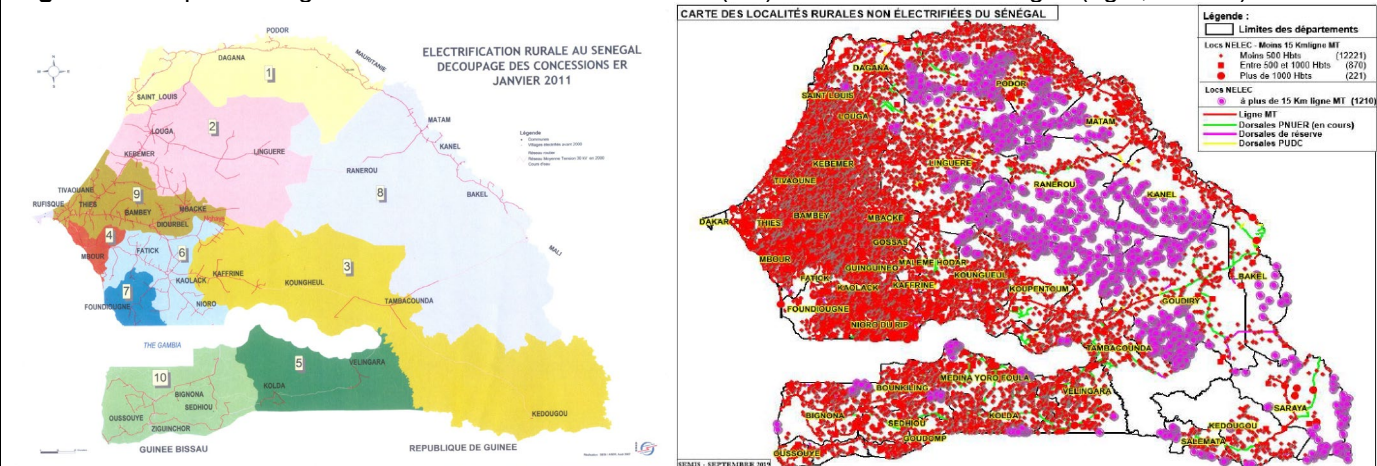
### Project implementation map

The country has been divided into 10 geographic concessions, whereby each concession groups a number of localities for which an international bidding process was enacted. An international bidding process has been completed in 6 out of the 10 concessions,



identifying the most competitive private sector concessionaires<sup>26</sup> that are tasked to build, operate and maintain assets for a fixed period, while the remaining 4 have been attributed to SENELEC public scope; the first phase of implementation ('Programme National d'Urgence d'Électrification Rurale' covering the period 2015 – 2018) being under finalisation.

**Figure 16:** map of Senegal rural electrification concessions (left) and unelectrified villages (right, SEMIS) as of 2019



Lack of adequate (debt) finance has forced private sector concessionaires in the initial 'pilot concessions' to charge excessive electricity tariffs to rural customers to allow investors meet their financial return requirements. While the national electricity tariff has been set at harmonized levels of FCFA 90-97 (EUR 0.14-0.15) per kWh<sup>27</sup> for low to medium power domestic subscribers, concessionaires currently charge as high as FCFA 250 (EUR 0.38) per kWh. The gap is compensated by the Government in a harmonization effort aiming at removing the disparity in electricity tariffs – representing a burden of 11 billion FCFA (USD 19 million) per year, which the GCF intervention will help phasing out. When factoring high grid-connection costs (and internal house wiring), only the most affluent rural households could afford to sign up for such services, leaving the vast majority disconnected.

ASER, the Government's delegated contracting authority for the development of rural electrification in Senegal, has set up a new organisation to meet current challenges. To guarantee a successful implementation of this program, ASER has developed a Strategic Development Plan (PSD) which defines the main axes around which its intervention will be articulated during the period 2019-2023. It has also formulated an operational plan for implementing the 'Complementary Program for Universal Access' enabling Senegal to reach its objective of universal access by 2025.

### The Accredited Entity

The West African Development Bank (BOAD) will act as the Accredited Entity, Trustee (the FAA between GCF and BOAD will be in the form of a trust arrangement) and co-financier of the ASER project. BOAD, in its role as AE, will be responsible for the overall management of this project, including (i) all aspects of project appraisal; (ii) administrative, financial and technical oversight and supervision throughout project implementation; (iii) ensuring funds are effectively managed to deliver results and achieve objectives; (iv) ensuring the quality of project monitoring, as well as the timeliness and quality of reporting to the GCF; and (v) project closure and evaluation.

BOAD has been active in Senegal since its inception and has cooperated with both the Senegalese Ministry of Finance and the ASER program for a long time. As of December 2019, BOAD has a total of FCFA 128.8 billion in public sector loans in Senegal, supporting 191 projects and initiatives. BOAD is also closely engaged in the Senegalese energy market, managing an aggregate amount of FCFA 239.9 billion in loans to the sector, equivalent to 23.3% of all outstanding loans to the Senegalese government.

BOAD recognises the potential of the ASER program to scale-up and contribute to the Bank's ambition to promote rural electrification and development in its target region, hereby both tackling climate change mitigation and strengthening the resilience of the most vulnerable communities. In 2014, BOAD provided a medium-term (2 year) loan valued at FCFA 5 billion (USD 9.06 million) to the

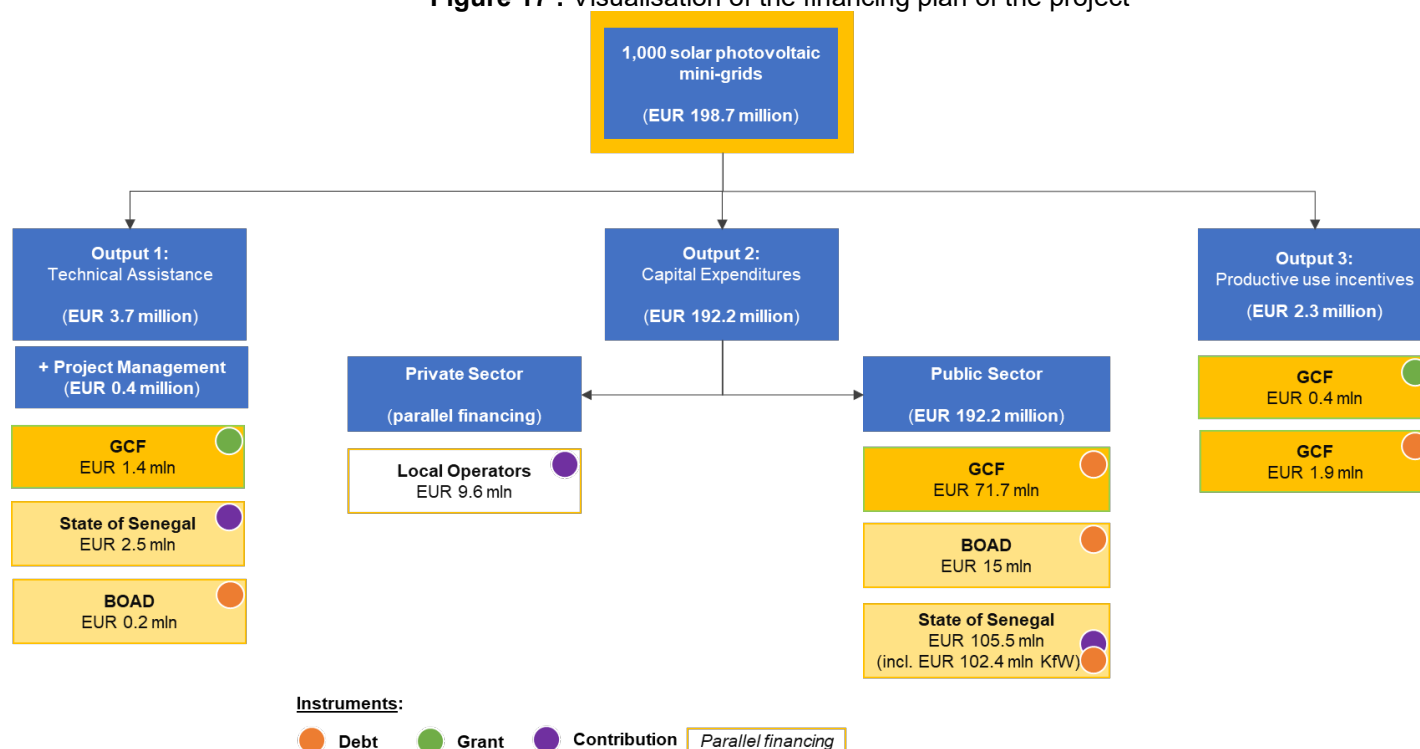
<sup>26</sup> These include ERA - African Rural Energy, COMASEL - Maroc-Sénégal Electricity Company, ENCO - Energy Service Company, and SCL - Energy Solutions

<sup>27</sup> The national tariff of FCFA 97 per kWh is based on a SENELEC 2017-2030 production plan that defines the average cost of electricity generation at FCFA 62 per kWh; a cost of transmission estimated at 20 FCFA per kWh; and the cost of distribution of 15 FCFA per kWh; and the remainder linked to electricity loss.

Senegalese government, which was used to support the initial development phase of the ASER program. In 2015, a second longer-term loan valued at FCFA 10 billion (USD 18.12 million) was issued to the government, to be serviced by the project.

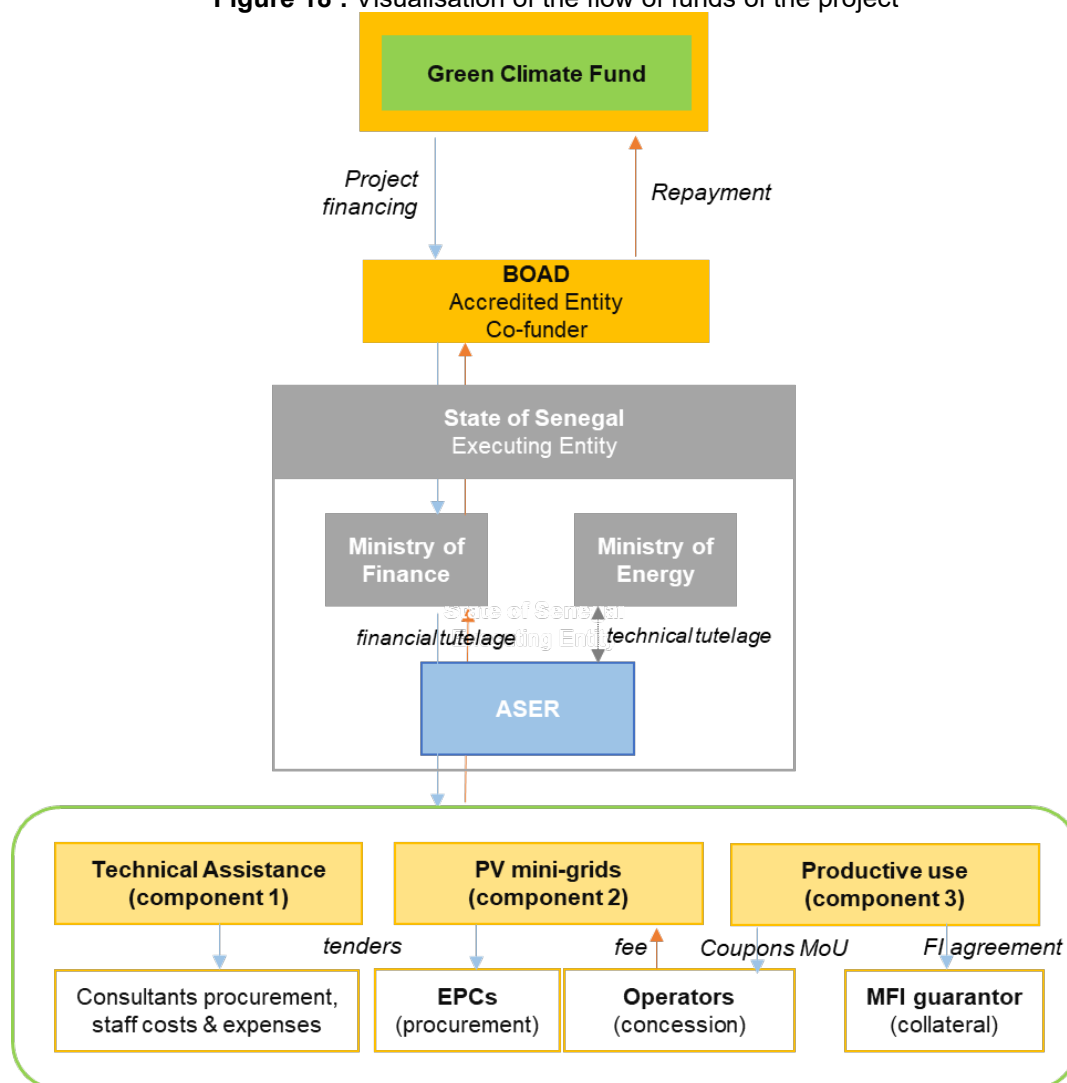
BOAD promotes the balanced development of its member countries and fosters economic integration within West Africa by financing priority development projects. BOAD has identified the off-grid renewable energy generation component of the ASER program as a highly relevant and viable investment opportunity given its transformational mitigation impacts. BOAD's contribution of FCFA 10 billion (EUR 15 million) to this project is conditional upon the provision of concessional co-finance by a partner financier. This will enable BOAD to offer debt finance with more attractive terms to the targeted concessionaires by a) lowering the cost of capital by 2.4%; and b) softening the repayment terms by extending the loan tenors and introducing longer grace periods – two barriers currently hampering scaled-up investments by the private sector in the domestic energy market.

**Figure 17 : Visualisation of the financing plan of the project**





**Figure 18 :** Visualisation of the flow of funds of the project



## Eligibility criteria

<i>EPCs</i>	<i>Operators</i>	<i>MFIs</i>
<ul style="list-style-type: none"> <li>Detailed technical selection criteria to be developed as part of the Technical Assistance in component 1</li> </ul>	<ul style="list-style-type: none"> <li>✓ existing concessionnaires Licensed by the Ministry of Energy</li> <li>✓ ability to invest 5% of the total cost per minigrid</li> </ul>	<ul style="list-style-type: none"> <li>✓ approved by the Ministry of Economy and Finance</li> <li>✓ regulated and licensed for the duration of the guarantee</li> <li>✓ number of years of experience and operation in the target rural areas &amp; products,</li> <li>✓ financial situation over the last three (03) years through</li> <li>✓ pre-agreed effective lending rate cap to be applied to end-users</li> </ul>
<i>Beneficiaries under Activity 3.1.1 and Output 1.2</i>		<i>Partner Financial Institution</i>
<ul style="list-style-type: none"> <li>✓ geographic location within a village where electricity is available from the concessionaire,</li> <li>✓ first electrification of woman-led or youth-led enterprise with productive use intention, or social service need</li> <li>✓ compliance with the technical conditions required by the concessionaire</li> </ul>	<ul style="list-style-type: none"> <li>✓ the identification of beneficiaries of the coupons distribution will be empowered to the gender-mainstreaming communities in selected villages once informed about the rules and objectives, to build</li> </ul>	<ul style="list-style-type: none"> <li>✓ Rating of BB or higher or industry recognition as a key player in the microfinance sector</li> <li>✓ Reputable and sound ownership, management, and governance standards</li> <li>✓ Status as a duly registered, regulated, and licensed entity in Senegal</li> </ul>

✓ priority to women and youth (below 40 years old)	<i>ownership and commitment among beneficiaries</i>	✓ Acceptable underwriting systems and servicing platforms in place ✓ 3 years of experience in lending to MFIs
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### Applicable tariff structure

Senegal has completed a tariff harmonization process since 2019 that brings all electricity tariffs in the country in line with those charged by the national utility SENELEC, on the basis of the Prepaid WOYOFAL category described below.

Tariff Option	1 <sup>st</sup> tranche	2 <sup>nd</sup> tranche	3 <sup>rd</sup> tranche
UD-PP	From 0 to 150 kWh	151 - 250 kWh	> 250 kWh
UD-MP	From 0 to 50 kWh	51 - 300 kWh	> 300 kWh
UP-PP	From 0 to 50 kWh	51 - 500 kWh	> 500 kWh
UP-MP	from 0 to 100 kWh	101 - 500 kWh	> 500 kWh

Tariff CATEGORIES	Electricity Price in FCFA/kWh			Fixed monthly prime FCFA/kW
	1 <sup>st</sup> Tranche	2 <sup>nd</sup> Tranche	3 <sup>rd</sup> Tranche	
<b>Domestic usage (UD)</b>				
Domestic Small Capacity (DPP)	90.47	101.64	112.65	
Domestic Medium Puissance (DMP)	96.02	102.44	112.02	
<b>Professional Usage (UP)</b>				
Professional Small Capacity (PPP)	128.85	135.68	147.68	
Professional Medium Capacity (PMP)	129.81	136.53	149.24	
<b>Prepaid (WOYOFAL)</b>				
Domestic Small Capacity (DPP)	90.47	101.64	101.64	
Domestic Medium Capacity (DMP)	96.02	102.44	102.44	
Professional Small Capacity (PPP)	128.85	135.68	135.68	
Professional Medium Capacity (PMP)	129.81	136.53	136.53	
Street Light	118.16			3.007.21

**Source :** CRSE decision on SENELEC new applicable tariff

### B.5. Justification for GCF funding request (max. 1000 words, approximately 2 pages)

Senegal is a regional leader for West Africa, with a reputation of economic and political stability and a long track record of peaceful democratic elections. The country is expected to maintain its strong rate of economic growth, having registered over 6% per annum for the last four years. However, it is facing delays and difficulties in realizing its universal access milestones and associated NDC contributions for the rural electrification sub-sector, especially in the most remote and smallest vulnerable villages where grid extension is not feasible.

It is noted that in rural areas, due to high investments costs, concessionaires charge high electricity tariffs. The differentiated tariffs between SENELEC (the national utility company) and concessions have generated a lot of resistance to electrification in rural areas. To enable the government to reach universal (and equitable) energy access by 2025, an adapted financing approach that enables access to affordable finance and creates investor confidence needs to be adopted.

According to the study funded by the European Union to help Senegal define the appropriate procedure for the harmonisation of tariffs (aligning the cost of electricity for rural consumers to grid-connected terms), a compensation mechanism towards the concessionaires' initial tariff levels as a consequence of the reduction in retail tariffs amounts needs an effort of 11 billion FCFA (USD 19 million) per year. The analysis showed that 100% solar systems – if funded by grants or other sources of funding – could be profitable, since the vast majority of costs are related to the investment.<sup>28</sup>

The requested GCF contribution has a dual aim:

<sup>28</sup> GESTO 2018 SE4ALL Rural Electrification Program for Senegal | Action Plan & Investment Prospectus

- GCF's concessional contribution is required to ensure that, in combination with BOAD's loan and other nationally mobilized resources, the average cost of capital of outstanding debt does not exceed 4%. Without GCF financing, the Senegalese government will have to borrow more from international financial institutions<sup>29</sup> at unfavourable terms and delays. Hence the need for external support becomes more urgent if climate change mitigation is to be achieved within the ambitious timeframe.

With the help of GCF concessional loan, ASER project's average cost of capital is reduced by 2.4% (to a level of 3.9%, instead of 6.3% without the GCF) thus lightening its debt obligations weigh on the government's balance sheet. The long tenor of 40 years further optimizes its debt servicing schedule to viable instalments.

- Furthermore, by providing a mix of long-term concessional debt and grant to ASER, BOAD and the GCF will make the investment proposition significantly more attractive for private sector investors, who are required to contribute 5% of the total investment cost in equity. This lowered contribution level is necessary to an acceptable rate of return to equity investors above 12.6 %<sup>30</sup> and strengthen the debt service coverage ratios of new investments, in the most remote and vulnerable villages that would otherwise not be financially viable on the private sector's own funding.

Based on the limited upfront concession fee levied from the local operators and the applicable compensation from harmonized tariffs, private sector profitability can be expected at 12.6%, when full equity investment from operators in the same context would return a negative IRR (unless governmental tariff compensations payable to operators are increased fivefold to reach a comparable return, given the communities limited ability to pay which translated in tariff harmonization).

The GCF's grant contribution will further de-risk the investment by reinforcing capacities and stimulating productive anchor demand through components 1 and 3.

#### **B.6. Exit strategy and sustainability (max. 500 words, approximately 1 page)**

Beyond the GCF intervention, the project benefits will be sustained throughout the Universal Access Completion Program as follows:

- The estimated cost reduction from the diversification from imported fossil fuels through the introduction of renewable power generation will reduce the cost of grid-based rural electrification and will free public resources that will be redirected to rural electrification. In the medium-term, this will result in improved public debt conditions and lower the cost at which Senegalese entities (both public and private) will be able to secure debt. Lowered cost of capital will, in turn, strengthen the case for investments in the domestic renewable energy sector, mobilising private sector capital.
- The Technical Assistance component will contribute to ensure that a stable regulatory framework is created to oversee the national electricity tariff regulation. ASER being a state body, the loan will be made to the Government of Senegal which will be the Executing Entity, represented by ASER as the delegated project owner; this arrangement will avoid legal problems. Long-term certainty concerning the tariff policy will further strengthen investor confidence in the domestic energy sector, creating an investment environment where by 2025 new investments in the decentralised power generation projects can be supported on a purely commercial basis.

Project sustainability and exit provisions will also be embedded in contractual arrangements (cf. draft ministerial order relating to the conditions and modalities of realization and operation of off-network rural electrification projects in Senegal), entailing:

- operating titles with a duration of 25 years
- provision for the renewal of equipment included in the rate base provided that these provisions are used to fund an escrow account
- case of extension of the network of SENELEC or of a concessionaire in the perimeter of an off-grid electrification project before the end of the current operating permit on said perimeter

<sup>29</sup> Rural Electrification lenders round table expected in April 2020

<sup>30</sup> UNFCCC CDM energy sector expected return on equity threshold in Senegal  
(<https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-27-v10.0.pdf>)

## C. FINANCING INFORMATION

### C.1. Total financing

(a) Requested GCF funding (i + ii + iii + iv + v + vi + vii)		Total amount		Currency	
		75.445176		million euro (€)	
GCF financial instrument		Amount	Tenor	Grace period	Pricing
(i)	Senior loans	73.623231	40 years	10 years	0 %
(ii)	Subordinated loans	-			
(iii)	Equity	-			
(iv)	Guarantees	-			
(v)	Reimbursable grants	-			
(vi)	Grants	1.821945			
(vii)	Results-based payments	-			

(b) Co-financing information		Total amount		Currency		
		123.247006		million euro (€)		
Name of institution	Financial instrument	Amount	Currency	Tenor & grace	Pricing	Seniority
BOAD	Senior Loans	15.244902	million euro (€)	10 years 3 years	7.6 % <sup>31</sup>	senior
Senegalese Government	Grant	5.606169	million euro (€)	Enter years Enter years	Enter%	Options
KfW	Senior Loans	102.395935	million euro (€)	10 years 0.5 years	6.14 %	senior

(c) Total financing (c) = (a)+(b)		Amount		Currency		
		198.692182		million euro (€)		

(d) Other financing arrangements and contributions (max. 250 words, approximately 0.5 page)		<p>With regards to the tenor between the GCF and BOAD, it should be noted that BOAD funding has already been approved by its board of directors for the project, mobilizing resources from States and on the international financial market according to characteristics which are reflected in the cost of the resource. Each year, the characteristics of the resources are fixed by the senior authorities of the Bank accordingly. As the cost of BOAD resources is higher, the request for GCF concessional resources is meant at reducing the project's WACC for the Senegalese State which is the borrower, and lighten its debt servicing in smaller instalments to improve viability.</p> <p>Private sector parallel equity financing will amount to EUR 9.6 mln, which will be channeled for the tariff harmonisation funding (result-based compensation), beside their operational expenditures and batteries replacement cost to be provisioned yearly in escrow account.</p> <p>Tax exemptions will be granted to rural electrification equipment supply by framework convention between ASER and the Ministry of Finance.</p>				
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### C.2. Financing by component

Component	Output	Indicative cost million euro (€)	GCF financing		Co-financing		
			Amount million euro (€)	Financial Instrument	Amount million euro (€)	Financial Instrument	Name of Institutions

<sup>31</sup> Fixed interest rate, on top of which a commitment fee (0,5%) and a service fee (1%) are due.

1. Technical assistance to the solar rural electrification stakeholders	1.1 Capacity building of rural electrification stakeholder	0.94	0.23	Grants	0.24 0.47	Loan Grant	BOAD GoS
	1.2 Gender action plan implementation	1.23	0.61	Grants	0.61	Grant	GoS
	1.3 Environmental & social downstream activities	1.57	0.5	Grants	1.07	Grant	GoS
2. Procurement and Installation of solar powered mini-grids	2.1 Preparation of detailed Engineering studies	3.49	0.58	Loan	0.24 2.660	Grant Loan	GoS KfW
	2.2 Supply, installation and commissioning of equipment	177.16	70.81	Loan	2.91 89.36 14.09	Grant Loan Loan	GoS KfW BOAD
	2.3 Modern public lighting	6.10			6.10	Loan	KfW
	2.4 Control and supervision of work	5.48	0.29	Loan	4.27 0.91	Loan Loan	KfW BOAD
3. Incentives for Social & Productive Use of Electricity	3.1 Gender & social connections	0.39	0.39	Grants	-		
	3.2 Microfinanced productive equipment credits guarantees	1.94	1.94	Loan	-		
Project Management Cost	-	0.39	0.09	Grants	0.30	Grant	GoS
<b>Indicative total cost (EUR)</b>		198,692,182	75,445,176		123,247,006		

**C.3 Capacity building and technology development/transfer (max. 250 words, approximately 0.5 page)**

C.3.1 Does GCF funding finance capacity building activities? Yes ☒ No ☐

C.3.2. Does GCF funding finance technology development/transfer? Yes ☐ No ☒

GCF-funded Technical Assistance to the solar rural electrification stakeholders will amount to EUR 3.7 mln, including among others, *Gender action plan implementing activities, Monitoring of ESMP implementation and environmental and social support, Subsidy for setting up a recycling unit for batteries and other waste (CFL, other electronics) and Training on procurement procedures and GCF requirements*

## D. EXPECTED PERFORMANCE AGAINST INVESTMENT CRITERIA

This section refers to the performance of the project/programme against the investment criteria as set out in the GCF's [Initial Investment Framework](#).

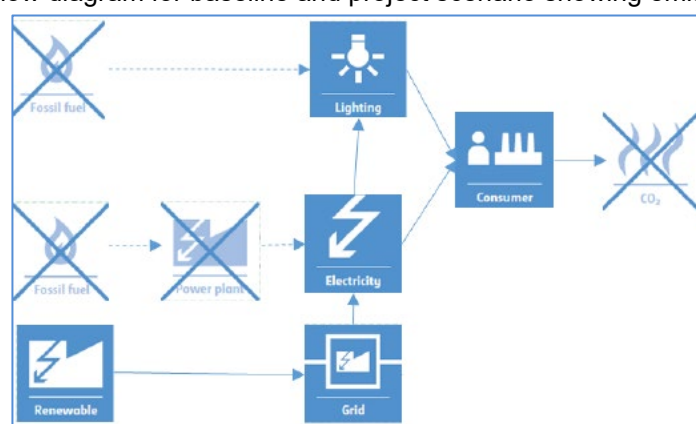
### D.1. Impact potential (max. 500 words, approximately 1 page)

In terms of **mitigation**, the project will contribute to climate action in the generation of emission reductions of 1.13 M. tonnes of CO<sub>2</sub> equivalent by 2045. The estimated emission reduction potential arises from the implementation of renewable energy-based rural electrification replacing the continuous, alternative use of fossil fuel-based solutions.

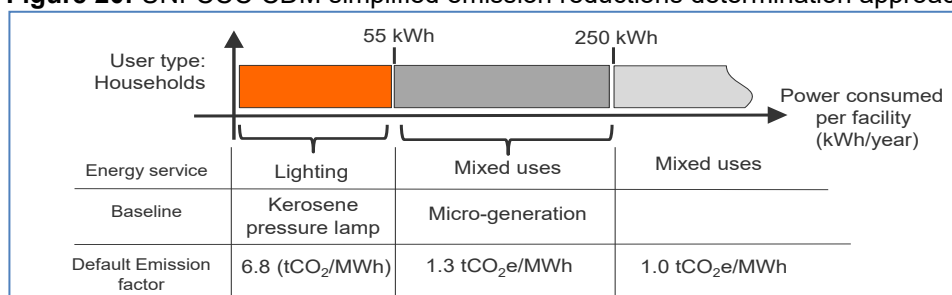
ASER rural electrification initiatives are registered under a Clean Development Mechanism (CDM) Programme of Activities (PoA), including technological distinctions<sup>32</sup> between Project Activities of Mini-Grids, Grid Extension, Solar Home Systems and (upcoming) Portable Solar Lamps.

Approved Methodology applied is AMS-III.BL. - Integrated methodology for electrification of communities<sup>33</sup>.

**Figure 19:** Flow diagram for baseline and project scenario showing emissions sources



**Figure 20:** UNFCCC CDM simplified emission reductions determination approach



### Summary calculations:

$$BE_y = \sum (ECT_{x,y} \times EFCO_{2,T})$$

Where:

- $BET_{y,y}$  = Baseline emission from consumers Types in year y (tCO<sub>2</sub>)
- $ECT_{x,y}$  = Annual electricity consumption of consumer Types in year y (MWh)
  - If  $ECT_{x,y}$  is equal to or less than 0.055 MWh, then a default value of 6.8 (tCO<sub>2</sub>/MWh);
  - If  $ECT_{x,y}$  is less than or equal to 0.250 MWh but greater than 0.055 MWh, then:
    - o For the portion up to and including 0.055 MWh, a default value of 6.8 (tCO<sub>2</sub>/MWh);
    - o For the portion greater than 0.055 MWh, a default value of 1.3 (tCO<sub>2</sub>/MWh);
  - If  $ECT_{x,y}$  is greater than 0.250 MWh but less than or equal to 0.500 MWh, then:
    - o For the portion up to and including 0.055 MWh a default value of 6.8 (tCO<sub>2</sub>/MWh);

<sup>32</sup> UNFCCC (2018) Senegal Rural Electrification Program. CDM programme documentation is available [here](#)

<sup>33</sup> N.B. Under this CDM methodology's eligibility requirements, at least 75% (by number) of the project consumers shall be households



- o For the portion greater than 0.055 MWh and less than 0.25 MWh/y a default value of 1.3 (tCO<sub>2</sub>/MWh); and
- o For the portion greater than 0.250 MWh a default value of 1.0 (tCO<sub>2</sub>/MWh);
- If EC<sub>T1M,j,y</sub> is greater than 0.500 MWh then a default value of 1.0 (tCO<sub>2</sub>/MWh) for the entire portion (i.e. default values of 1.3 (tCO<sub>2</sub>/MWh) or 6.8 (tCO<sub>2</sub>/MWh) are not eligible for any of the portions)

		1	2	3	4	5	->25
	year	2021	2022	2023	2024	2025	years
Households connections	#	11 675	23 350	38 917	38 917	38 917	38 917
PREM completion	#	374	1 122	2 617	3 739	3 739	3 739
Electricity demand growth	%/y	3.2 percent per annum					
Baseline emissions	tCO <sub>2</sub> e/y	7 782	19 932	33 220	34 272	35 357	1 127 447
Project emissions	tCO <sub>2</sub> e/y	-	-	-	-	-	-
<b>Emissions reductions</b>	<b>tCO<sub>2</sub>e/y</b>	<b>7 782</b>	<b>19 932</b>	<b>33 220</b>	<b>34 272</b>	<b>35 357</b>	<b>1 127 447</b>

**Table 7: Underlying mini-grids beneficiaries' specific consumption breakdown**

User type	Specific consumption (kWh/day)	Emission factor (kgCO <sub>2</sub> /kWh)
School	2,5	1,0
Mill	15	1,0
Dispensary	7,68	1,0
Health center	15,28	1,0
Health shop	4	1,0
Boutique	8	1,0
Sewing maching	0,5	1,0
Borehole pump	33	1,0
Public lighting	0,3	1,0
Religious center	1,5	1,0
Socio-educational house	1,5	1,0
<b>Household</b>	<b>1,2</b>	<b>2,67</b>

In terms of **adaptation co-benefits**<sup>34</sup>, the programme will contribute to fostering resilience and sustainable development in the following ways:

- Increasing access to electricity in (remote) rural areas, with a particular focus on women and children as the key beneficiaries, with equalized gender roles and enhanced access to education and information (a dedicated EUR 1.2 million gender equality promotion program will target this development).
- Diversifying energy generation portfolio in relation to scattered geography (decreased vulnerability to disasters), fuel use needs (no fuel supply at risk of extreme weather events), cooling/refrigeration needs and water use needs (removed dependence on water challenges), supporting a more climate-resilient power system
- Climate-resilient productive assets deployment thanks to the revolving guarantees of up to 40% of nominal loans of 3-y average duration (the GCF funding being worth EUR 20 mln total borrowings), improving reliability of water and food chains, as well as services in health, education and social institutions, throughout 3,739 'Projets Energétiques Multi-sectoriels' including farmers, entrepreneurs, schools and clinics lacking electricity
- Providing employment opportunities and supporting economic growth in rural areas. Affordable renewable electricity will further strengthen the economic resilience of rural households as it will improve community income levels and reduce migration patterns.

## D.2. Paradigm shift potential (max. 500 words, approximately 1 page)

The project is designed to produce a paradigm shift by supporting the transition away from a traditional energy pathway that would otherwise continue to be dependent on imported fossil fuels<sup>35</sup> especially in the most remote and smallest vulnerable villages where grid extension is not feasible, to a progressive, low-carbon and sustainable

<sup>34</sup> see CCKN and IISD (2014) case study on adaptation benefits from rural solar electrification projects in Senegal

<sup>35</sup> Senegal imported 655 ktoe of oil in 2015 and used 305 ktoe of it to generate electricity, according to the African Energy Commission



pathway that prioritises decentralized energy generation and gender involvement, focusing both on electricity for economic development (value-added productive use) and for improved access (community adaptive capacity) of marginalised rural areas. The project intends to achieve the following paradigm shift potentialities:

- *Crowd in private sector capital and expertise*  
Given the lack of technology track-record and the financial sector's limited know-how of clean energy investments (particularly when it comes to decentralised power generation), private capital for the targeted investments is prohibitively expensive. The proposed financing package offers a solution to incentivise participation of the private sector by increasing investor confidence. Confidence is enhanced by making available concessional finance and grant funding that significantly lower the WACC by over a third (2.4%), thereby strengthening debt-service coverage ratios and increasing overall profitability in the long run. The private sector, which is required to contribute 5% of the total investment in equity (concession fee), furthermore brings in much-needed technical expertise to operate these assets cost-effectively and sustainably. This collaboration will greatly improve the business environment in the energy sector, which, according to the IMF, currently stands out as the weakest of all economic sectors in Senegal.<sup>36</sup>
- *Improve the investment framework and disseminate knowledge through knowledge-sharing and learning*  
The TA component will focus on designing and implementing productive use-targeted de-risking tools that both satisfy the capacities of the final beneficiaries and reflect the needs of private sector operators, which is expected to generate a powerful trickle-down effect on the national economy. Combined with the gender equality promotion plan, the programme is expected to have significant positive co-benefits on the economic resilience of the most vulnerable communities in Senegal.
- *Modernise the rural economy through increased solar-powered productive use*  
The demonstration of transformative potential of productive uses leveraging solar energy will provide a compelling case for their adoption in agriculture and other sectors of activity. The vast majority of Africa's off-grid households are in rural areas and largely engaged in agricultural activities – for sustenance, for income, or both. Most are smallholder farmers, often without access to electricity to power electrical appliances which would help them increase their yields, water access and sanitation. Solar rural electrification is an effective way of improving community assets through cheaper delivery of services (health, education, water & agriculture), increasing quality of life and enhancing the adaptive capacity of communities.
- *Enhance Senegal readiness for leveraging further climate finance opportunities*  
Senegal already has a proven leadership in accessing climate finance for adaptation purposes – Centre de Suivi Ecologique (CSE), a public utility association based in Senegal, was the first national institution to access international climate finance (as the nominated National Implementing Entity for the Adaptation Fund since 2010), based on a proposal from the National Committee for Adaptation to Climate Change (COMNACC) through the Designated Authority (MEDD, which is also the GCF NDA for Senegal).  
The Technical Assistance embedded in this project will contribute to building expertise in public-private mitigation activities coordination and implementation in the rural electricity sector, backed by a robust MRV system, which will also help to further attract public and private climate finance, including from carbon markets.
- *Encourage regional replication by advancing fossil-fuel grids to clean energy and low-carbon development*  
Senegal's electricity access rate is 68% nationally and it stands only at 42% in rural areas. Senegal is a Least Developed Country and lacks the resources to finance the roll-out of the planned rural electrification activities. Under a business-as-usual scenario, any improvements in the rates of rural electrification are likely to be met through diesel-powered generators (due to its relatively low upfront cost). Neighbouring countries, including some of BOAD's other member countries, face similar obstacles. The financial package proposed by BOAD and complemented by the requested GCF contribution will enable ASER to mobilise private sector investment in the domestic energy sector by facilitating access to affordable, long-term finance. Without this concessional finance, private sector concessionaires will struggle to get their projects financed or will only do so against excessively high tariffs to end-customers. Such business-as-usual scenario would lock in carbon intensive infrastructure – a pathway that the Government of Senegal aims to avoid.

<sup>36</sup> IMF African Department (2015) *Making Senegal a Hub for West Africa*

The ambition of this program is to demonstrate a blueprint to a clean-energy future that can be followed by other nations. The shift from BOT regional concessions to a public pre-financed concession fee model will lower long-term power generation costs and secure improved energy access for all segments of the population.<sup>37</sup> Proof of concept will allow other countries in the ECOWAS region to replicate this sovereign approach, with a higher likelihood of commercial financiers stepping in to provide the required pre-finance directly to the private sector project developers. Collection of the concession fees (5% of the solar mini-grids CAPEX) will contribute to funding tariff harmonisation and off-grid renewable electrification through the Special Support Fund for the Energy Sector (FSE), which in turn support the country's NDC implementation plans without needing to rely on international, concessional (climate) finance.

Lessons learned throughout the project lifetime (2021 – 2025) will be disseminated regionally. The ambition of these activities will be to encourage replication of best-practice approaches both within WAEMU member states (e.g. Benin, Burkina, Côte d'Ivoire, Guinea Bissau, Mali, Niger, and Togo) as well as across the entire ECOWAS region. This will be achieved through the development of knowledge products, delivery of regional workshops, and publication of relevant resources targeted at partner countries that face similar technical, financing and institutional issues.

### D.3. Sustainable development (max. 500 words, approximately 1 page)

The implementation of ASER project will place Senegal on a sustainable, climate-resilient development pathway in relation to several Sustainable Development Goals:

- **SDG 7 (ensuring access to affordable, reliable, sustainable and modern energy for all),**
- SDG 1 (poverty reduction - Improved Productivity and economic diversification)
- SDG 3 (health improvement – Avoided use of diesel/kerosene/paraffin)
- SDG 5 (gender equality and empowerment of women and girls)
- SDG 8 (decent work and economic growth)

It will contribute to these sustainable development benefits in the following ways:

#### Economic co-benefits

- Enabling productive uses of electricity and income-generating activities through improved reliability of power supply, including for irrigation and climate-resilient agriculture practices
- Improving the country's energy security budget deficit which is negatively impacted by the import of fossil fuels in foreign denominated currencies
- Lowered operating costs for enterprises benefitting from the generated renewable energy, including clinics and schools that will reduce or eliminate their dependence on diesel
- Direct creation of employment opportunities including construction and maintenance provision services, highly relevant given the decentralised nature of the rural electrification program
- Indirect creation of employment opportunities by creating possibilities for shop owners and entrepreneurs to manufacture or import new technologies that can be powered by electricity.

#### Social co-benefits

- Improved health conditions, as renewable energy-powered lights will reduce the use of kerosene lamps and eliminate indoor air pollution which causes eye irritation and lung injury
- Enhanced conditions in educational and social institutions
- Poverty reduction through the promotion of income-generating activities
- Improved access to potable water and water pumping for crop irrigation.

#### Environmental co-benefits

- Reducing the risk of ground-water contamination caused by leaking diesel generators
- Reduction in local air pollution and noise disturbances on local communities by eliminating the use of diesel-generated electricity (by 2025 no diesel-only mini-grids will remain in Senegal).

#### Gender co-benefits

<sup>37</sup> Gesto Energy Consulting (2016) Programme d'électrification rurale pour le Sénégal 2015-2025 : Plan de Financement

- Increasing access to electricity in (remote) rural areas, ensuring that men and women are equally benefitting from the initiative. ASER will offer special support to promote equal opportunities arising from the rural electrification project through the TA component for both men and women
- Freeing up time for women (previously allocated to household tasks, through the use of mills and access to drinking water supply among others) and children (increasing light time available at night) to engage in productive and education activities that improve income generation and strengthen social standing.
- Positive discrimination will be made against women's microenterprises by setting up mechanisms to take better advantage of the energy opportunities that will arise: training of target groups in trades, design of business plans around activities identified beforehand and access to micro-financing for equipment and provision of connection coupons to the most vulnerable, support for a good organizational and institutional structuring of women's organizations

#### D.4. Needs of recipient (max. 500 words, approximately 1 page)

##### Vulnerability of recipients

The electricity sector in Senegal (a Least Developed Country) is mostly exposed to mitigation-related climate risks through (i) decreased/variable water availability for hydropower generation and thermal power generation cooling, (ii) increased damage to hydropower infrastructure from flooding and river sediment loads, and (iii) increased damage to power transmission and distribution infrastructure from sea level rise and coastal erosion. Adaptation-related climate vulnerabilities of off-grid rural communities span disruptions caused by natural disasters like increasing mean temperatures, rainfall variability and droughts with consequences in terms of diseases, water scarcity, food insecurity, lower agricultural and economic productivity as well as disempowerment of women and young populations from building more resilient livelihoods. These water resources, agriculture, livestock and health risks are further aggravated by the expensive fossil fuels, low income and limited employment burdens on development and wellbeing.

##### Growing national debt level

Senegal's public debt currently stands at USD 7.5 billion, representing 57% of the country's GDP. A combination of exchange rate depreciation and a dependence on foreign debt places the treasury at risk. The Ministry of Finance is committed to reduce debt ratios over the medium term by means of fiscal consolidation, improvements in the current account and improved debt management policies.<sup>38</sup> With the help of GCF concessional loan, ASER project's average cost of capital is reduced by 2.4% (to a level of 3.9%, instead of 6.3% without the GCF) thus lightening its debt obligations weigh on the government's balance sheet. The long tenor of 40 years further optimizes its debt servicing schedule to viable instalments (further sustained by private operators' 5% concession fee collection towards the harmonization fund).

##### Local capital market constraints

Given the pricing risk and lack of track-record of similar projects in the country, local financial institutions are unwilling to provide affordable financing solutions to project developers. High costs of capital force project developers to charge excessive electricity tariffs, denting demand and sustainability of investments. Lessons learned from the first phase of the initial 3 'pilot concessions' indicate that investor confidence in off-grid renewable energy IPPs is still weak. Furthermore, there is a significant mismatch between the amount of money that rural consumers can pay for electricity and the minimum tariffs that private concessionaires need to charge to meet their required rates of return. As such, a shift from the current BOT scheme to a concessional finance model is required to offer local financial lenders a de-risked proposition and help the sector mobilise private sector finance sustainably.

Without the concessional co-finance extended through BOAD and the GCF, the investment hurdle for local financiers will continue to exist and access to affordable finance will remain an issue for the concessionaires. The result will be lagging rural electrification rates, highly variable electricity tariffs and the inability to meet the government's target of achieving universal access by 2025. By demonstrating successful engagement of private sector concessionaires in the proposed project, the perceived risk of future interventions is expected to decline. Consequently, commercial funders will have more confidence to step in by the time GCF's involvement comes to an end.

<sup>38</sup> In accordance with the 'Plan Senegal Emergent' launched in 2014 – the country's new development model aimed at accelerating its progress toward emerging market status – low inflation and controlled public debt are key objectives to contribute to sustainable long-term economic growth

### Limited institutional capacities

Despite the recent liberalisation of the national energy market and allowance of IPPs to compete with SENELEC, institutional capacities in both the public and private sectors are still insufficient to lay the foundation for an enabling environment. Technical support to strengthen the technical and gender capacity of the PMU, implementing partners, private concessionnaires and community beneficiaries with a focus on gender mainstreaming throughout the project cycle is necessary. Furthermore, outreach to national and regional commercial financiers is needed to maximise the replication potential of the project in neighbouring countries. The proposed EUR 3.7 million TA component aims to overcome the current institutional gaps.

### D.5. Country ownership (max. 500 words, approximately 1 page)

The project falls under the auspices of the Ministry of Energy and is fully endorsed and co-financed by the Ministry of Finance, also processing all disbursement requests with BOAD acting as the Trustee for the sovereign loan and grants from the GCF. The Ministry of Environment and Sustainable Development (the NDA) has been following the preparation of this project since its inception and assured BOAD and ASER of its willingness to support this GCF funding application due to its clear alignment with the following national strategies and development plans:

- The Senegalese Nationally Determined Contribution submitted to the UNFCCC in September 2015, which lists rural electrification as a key component of this action plan. The document refers to the commissioning of 392 mini-grid systems (unconditional pledge) and up to 5,000 villages connected through PV mini-grids contingent on external support (conditional target)<sup>39</sup>
- The government's commitment to the SE4ALL initiative, which identifies rural electrification as one of the most important components of the global program. Senegal has committed to achieve universal access to electricity by 2025
- The National Strategy for Economic and Social Development adopted in 2012 (SNDES), in which the government is committed to increase access to electricity in rural areas in an affordable and equitable way
- Universal access to energy in rural areas is considered in the '*Plan Sénégal Emergent*' as a fundamental factor for economic development and for the fight against poverty. The main objective of the plan is the emergence of Senegal to promote economic growth as a strong leverage for human development
- The '*Plan Sénégal Emergent*' also aims to reduce the cost of generation to a value between 60 and 70 FCFA / kWh (EUR 0.09-0.11) in the long-term. Investment in renewable energy generation will reduce the government's dependence on fossil fuels which are expensive to import.
- Fiscal exemption on VAT was granted by the State of Senegal to all rural electrification related equipment. This agreement shall be subject to periodic renewal by mutual agreement.

Implementation of these mitigation activities is slower than desired because of various constraints, including absence of capital and insufficient institutional capacity and experience. However, the country has instituted the agencies and structures required to finalise and implement these climate action plans/strategies.

### D.6. Efficiency and effectiveness (max. 500 words, approximately 1 page)

The adequacy of the instruments proposed to the GCF (long term, subordinated project debt to be mixed with private sector concessionnaires' equity and grant finance towards the public sector) is based on the following elements:

- Given the relatively high CAPEX investment required by off-grid renewable energy technologies relative to other fossil-based alternatives (which offer lower CAPEX demands but higher operational costs), there is need for project debt with longer tenors of at least 10 to 15 years. Local financial institutions, if at all willing to provide debt co-finance to the concessionnaires, limit debt tenors to 5 to 7 years. Such short repayment schedules, combined with high costs of capital, negatively impact the competitiveness of the concessionnaires and dent scale-up potential.
- The proposed financing plan, whereby a) BOAD's loan and the GCF's concessional loan contribution enable ASER to reduce WACC by over a third for the overall project CAPEX until 2025; and b) longer-term concessional debt offered to ASER subsequently lower concessionnaires required equity investments (down to 5% concession fee, to be collected on the Special Support Fund for the Energy Sector administered by CRSE for tariff harmonization and renewable energy development) as well as commercial loans from local financial institutions. Lower upfront CAPEX demands combined with softer financing terms will strengthen the concessionnaires' debt service coverage ratios and profitability, a prerequisite to a maturing, private sector-led market space.

<sup>39</sup> UNFCCC (2015) *Contribution Prévue Déterminée au Niveau National*

- Experience in other countries indicates that extended debt tenors are capable of increasing returns on equity by 3%, or even higher. Such increase will positively impact the attractiveness of new investments to sponsors, and reduce the burden of tariff harmonization compensation for the Senegalese Treasury.

The GCF's total contribution of EUR 75.45 million will leverage a total public-private investment of EUR 208 million, representing a leverage ratio of 1.8. In terms of cost-effectiveness of the proposed intervention, the impact is estimated as follows:

- Total project financing EUR 198.7 million
- Requested GCF contribution of EUR 75.45 million
- Estimated emission reduction potential generated over the project lifetime is a cumulative 1.13 M. tonnes of CO<sub>2</sub>e
- Calculated cost per tonne CO<sub>2</sub>e equals EUR 176.2
- Calculated GCF cost<sup>40</sup> per tonne CO<sub>2</sub>e equals EUR 28.8

Although the estimated abatement cost of the project may be higher than the abatement cost of typical larger-scale renewable energy programmes, it should be noted that the project aims to promote decentralised systems with battery storage capacity in disperse and isolated areas with relatively low consumption where connection to the national network is not technically or economically justifiable.

### Best practices

ASER "Minima Techniques - Règles Environnementales" (Minimum Technical & Environmental Standards) including technical standards for low voltage and medium voltage distribution systems, and comprehensive standards for the solar components and systems (IEC 61215 and IEC 61646 for the PV modules, and a laboratory testing standard IECQ QC 001002)

## E. LOGICAL FRAMEWORK

*This section refers to the project/programme's logical framework in accordance with the GCF's [Performance Measurement Frameworks](#) under the [Results Management Framework](#) to which the project/programme contributes as a whole, including in respect of any co-financing.*

### E.1. Paradigm shift objectives

*Please select the appropriated expected result. For cross-cutting proposals, tick both.*

- ☒ Shift to low-emission sustainable development pathways
- ☐ Increased climate resilient sustainable development

### E.2. Core indicator targets

E.2.1. Expected tonnes of carbon dioxide equivalent (t CO <sub>2</sub> eq) to be reduced or avoided (mitigation and cross-cutting only)	Annual	45,098 t CO <sub>2</sub> eq
	Lifetime	1,127,447 t CO <sub>2</sub> eq
E.2.2. Estimated cost per t CO <sub>2</sub> eq, defined as total investment cost / expected lifetime emission reductions (mitigation and cross-cutting only)	(a) Total project financing	<u>198.7 mln</u> Euros
	(b) Requested GCF amount	<u>75.4 mln</u> Euros
	(c) Expected lifetime emission reductions	<u>1,127,447</u> t CO <sub>2</sub> eq
	<b>(d) Estimated cost per t CO<sub>2</sub>eq (d = a / c)</b>	<u>176.2</u> Euros / t CO <sub>2</sub> eq
	<b>(e) Estimated GCF cost per t CO<sub>2</sub>eq removed (e = b<sup>40</sup> / c)</b>	<u>28.8</u> Euros / t CO <sub>2</sub> eq
E.2.3. Expected volume of finance to be leveraged by the proposed project/programme as a result of the Fund's financing, disaggregated by public and	(f) Total finance leveraged	<u>132.8 mln</u> Euros
	(g) Public source co-financed	<u>123.2</u> Euros
	(h) Private source finance leveraged	<u>9.6 mln</u> Euros
	<b>(i) Total Leverage ratio (i = f / b)</b>	<u>1.8</u>

<sup>40</sup> In grant-equivalent, i.e. concessional funding costs accounted at 5% discount rate



private sources (mitigation and cross-cutting only)	(j) Public source co-financing ratio ( $j = g / b$ )	<u>1.6</u>
	(k) Private source leverage ratio ( $k = h / b$ )	<u>0.1</u>
E.2.4. Expected total number of direct and indirect beneficiaries, (disaggregated by sex)	Direct	344,040 172,208 of females <sup>41</sup>
	Indirect	-
E.2.5. Number of beneficiaries relative to total population (disaggregated by sex)	Direct	4% of Senegal rural population (2.2% of Senegal total population)
	Indirect	-

### E.3. Fund-level impacts

Expected Results	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term	Final	
M1.0 Reduced emissions through increased low-emission energy access and power generation	M1.1 Tonnes of carbon dioxide equivalent (tCO <sub>2eq</sub> ) reduced or avoided - gender-sensitive energy access power generation	Annual CO <sub>2</sub> emission reductions Monitoring, Reporting and Verification by independent CDM-DOE auditor or local carbon verifier	0 (tCO <sub>2eq</sub> )	44,324 tCO <sub>2eq</sub>	130,563 tCO <sub>2eq</sub>	Renewable energy-based rural electrification replacing the continuous, alternative use of fossil fuel-based solutions (CDM AMS-III.BL baseline methodology) in households, commercial facilities such as shops, public services/buildings and small, medium and micro enterprises (SMMEs).

### E.4. Fund-level outcomes

Expected Outcomes	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term)	Final	
M5.0 Strengthened institutional and regulatory systems	M5.1 Institutional and regulatory systems that improve incentives for low-emission planning and development and their effective implementation	Micro-Finance Institutions balance sheet summary verified by the Partner Financial Institution	No subsidy/ guarantee for rural productive users [Emerging Senegal Plan]	2.5 mln Euros micro-finance borrowings guaranteed for productive uses	3.3 mln Euros micro-finance borrowings guaranteed for productive uses	Rural energy development success builds on extensive community mobilization, and capacity building for efficient electricity use Barriers for mainstreaming solar PV projects are

<sup>41</sup> <http://www.ansd.sn/>

						overcome, the capacity of the stakeholders developed and the financial incentives implemented
M6.0 Increased number of small, medium and large low-emission power suppliers	<i>M6.3 MWs of low-emission energy capacity installed, generated and/or rehabilitated as a result of GCF support</i>	ASER database & CRSE independent verification/clearance	0	19 MW	32 MW	Private operators are interested in investing in the sector

#### E.5. Project/programme performance indicators

Expected Results	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term	Final	
<b>Strengthened rural electrification stakeholders awareness, capacities and gender-inclusion</b>	Percentage of rural electrification procedures, communications and decisions reflecting women & youth priorities	Community-based gender committees meeting minutes, gender-sensitive communication tools and PREM MoUs	0 (no gender-specific framework, communication strategy in use by ASER or Community-Based Organizations)	50%	75%	Senegal politically recognized rural vulnerabilities to climate change and the interest of gender institutionalization at both national bodies and local committees levels Investment targets are achieved, less turnover and higher retention rate of trained agents Rural energy development success builds on extensive community mobilization, and capacity building for efficient electricity use
	Number of additional vulnerable localities attributed to rural electrification operators	ASER database & CRSE independent verification	0	600 localities	1,000 localities	
<b>Operational rural solar-power new mini-grids increasing access to clean</b>	MWh energy consumption from installed solar plants	Installation project reports and concessionaires billing	0	24,815 MWh	74,879 MWh	GCF involvement brings down the WACC to an acceptable level to Senegalese treasury

<b>energy and productive use</b>	% of sales income from total productive use by SMEs and community services of clean energy	Local operators tariff harmonization requests breakdown, ASER aggregated database	Baseline to be surveyed according to the implementation sites of the mini-grids <sup>42</sup>	30% of total clean power sales from SMEs and community services	60% of total clean power sales from SMEs and community services	Appropriate micro-finance network is available in rural areas and access coupons mechanism understood
<b>Energy-improved basic needs services for achieving resilience</b>	Number of coupon-subsidized connections of eligible social services, women & youth-entrepreneurs to the PV mini-grids	ASER coupon distribution plans & Subsidy Payment Confirmation s database	Baseline to be defined according to the implementation sites of the mini-grids <sup>42</sup>	1,529 newly connected eligible social services, women & youth-entrepreneurs to the PV mini-grids	2,548 newly connected eligible social services, women & youth-entrepreneurs to the PV mini-grids	Access to electricity fosters agriculture productivity, health & community services, ICTs & lighting benefits

#### E.6. Activities

Activity	Description	Sub-activities	Deliverables
1. Technical Assistance to the solar rural electrification stakeholders	Capacity building of the project's key stakeholders, to favour the implementation of a sustainable framework of the delivered services and benefits of the solar mini-grids, starting with the end-user beneficiaries' awareness and appropriation, the technical and administrative competencies of ASER Project Management Unit, and the environmental expertise and knowledge management required upstream and downstream	<p>Activity 1.1.1 Trainings on procurement procedures, project management and GCF requirements</p> <p>Activity 1.1.2 - Seminars and trips and workshops (technology watch, public consultations, conferences, sharing of experiences, etc.)</p> <p>Activity 1.2.1 - gender-relevant community-organizations mapping &amp; tutoring</p> <p>Activity 1.2.2 - gender-stakeholders training (PMU – local operators – community-based organizations)</p> <p>Activity 1.2.3 - gender-oriented communication campaign</p> <p>Activity 1.3.1 - E&amp;S measures implementation and monitoring</p> <p>Activity 1.3.2 - Establishment of a recycling unit for batteries and other waste (CFL, other electronics)</p>	<p>Project Launch workshops and public consultations report</p> <p>Gender committees creation MoU, trainings and communication strategy</p> <p>Entrepreneurship awareness and tutoring events attendance/minutes</p> <p>Operational facility for used batteries, CFL and electronic waste recycling</p> <p>Independent survey on income generating activities implemented by capacitated rural women organisations</p>
2. Procurement and Installation of solar powered mini-grids	Financing the bulk of the technology investment to de-risk local operators' participation in competitive Request for Proposal to select the bidder who offers the best combination of	<p>Activity 2.1.1 - Site selection, engineering studies &amp; Specific environmental and social analysis for each site</p> <p>Activity 2.2.1 - Solar PV power plants construction and minigrid deployment:</p> <ul style="list-style-type: none"> <li>- PV energy equipment</li> <li>- Civil works</li> <li>- LV grids</li> </ul>	<p>Detailed engineering studies &amp; specific environmental and social analysis reports</p> <p>EPC ToRs for procurement</p> <p>Contractualization of supply, factory inspection</p>

<sup>42</sup> Baseline to be defined during inception and reported/agreed to the satisfaction of the GCF in the project inception report

	tariff and service for solar energy production equipment, synchronisation and control tools, low-voltage mini-grid networks and connections, civil engineering.	<ul style="list-style-type: none"> <li>- Control &amp; synchronisation devices</li> <li>- LV connections</li> <li>- Indoor installations</li> </ul> <p>Activity 2.2.2 - Smart meters installation &amp; miscellaneous aleas</p> <p>Activity 2.3.1 - Deployments of solar street lighting</p> <p>Activity 2.4.1 -Control and supervision of work</p>	<p>of first kits and installation reports</p> <p>Commissioning reports of the 1,000 mini-grids implemented and handed over to local operators</p>
3. Incentives for Social & Productive Use of Electricity	Social services and productive equipment will lead to the development of sustainable livelihoods and enhance the capacity of villages to pay for solar power supply, strengthening mini-grids business model visibility while maximising social & gender inclusivity	<p>Activity 3.1.1 - Connection of eligible social services, women&amp; youth-entrepreneurs to the PV mini-grids</p> <p>Activity 3.2.1 - Implementation of mechanism to facilitate access to productive equipment financing through microfinance</p>	<p>PREM baseline surveys</p> <p>Coupons design workshop</p> <p>Coupon software dashboard</p> <p>MFIs due-diligence</p> <p>Guarantee issuer selection and contract</p> <p>Micro-finance guarantee facility summary for the 3,739 solar-powered SMEs and community services</p> <p>Final Monitoring and Evaluation Report</p>

#### E.7. Monitoring, reporting and evaluation arrangements (max. 500 words, approximately 1 page)

##### Monitoring

As with all projects supported by BOAD, this intervention will be monitored by BOAD project management team as per the relevant internal policies and procedures. As the accredited entity agency, BOAD will be responsible for supervising monitoring activities, implementation conditions and for reporting periodically to the GCF under the terms to be defined by GCF and BOAD. The project progress will be monitored by the entity responsible for M&E in the Project Management Team based in Senegal.

The present project will comply with the BOAD appraisal, approval, monitoring and supervision standards and procedures involving all relevant teams (engineer, financial analyst, procurement expert, E&S specialist, climate finance specialist, financial management officer, and monitoring specialist). The implementation and monitoring of each stage of the project will be guided and managed by the BOAD project cycle management framework.

Monitoring and reporting of achieved emission reductions will be conducted in accordance with the approved CDM methodology AMS III.BL "Electrification of rural communities using renewable energy". The CDM offers a UNFCCC-approved MRV framework that will allow BOAD to transparently track the GHG impact of invested funds over time, and subsequently report progress to the GCF. Moreover, using consistent baseline and monitoring methodologies across different climate finance programs enables NDC integration.

The Division in charge of climate finance will perform due diligence, implementation monitoring, risk monitoring and mitigation. For that purpose, the Division in charge of climate finance, assisted by the Department in charge of Monitoring and Evaluation, will be working closely with the project management team based in Senegal in order to monitor the progress of each component of the Project.

##### Reporting

Reporting by the project management team based in Senegal to BOAD will be in line with the standard loan agreement, and the BOAD will conduct a biannual supervision. Reporting of the BOAD to GCF: The BOAD will comply with the relevant GCF policies in the reporting and evaluation arrangements for this framework. The BOAD will provide the annual performance report (APR) to the GCF during the four-year implementation period. In addition, during the sub-loan lifetime, semi-annual activity report on the status of the GCF-financed individual sub-projects will be provided. In addition, following the arrangement under the AMA, an inception report, interim and final evaluation reports, and financial information reports (semi-annually throughout the life of the loan) will be submitted.

#### Evaluation

The evaluation arrangements for this framework will comply with the related BOAD and GCF policies. The GCF funded activity interim and final evaluations will be conducted by an independent expert evaluator recruited by BOAD. The final evaluation is conducted 06 months after the reception of the project completion report.

After two to five years of closing, the project will undergo ex-post evaluation that is guided by internationally accepted principles for the evaluation of development assistance, in particular, the Organisation for Economic Co-operation, and Development Assistance Committee (OECD DAC) evaluation guiding principles, and the good-practice standards.



## F. RISK ASSESSMENT AND MANAGEMENT

### F.1. Risk factors and mitigations measures (max. 3 pages)

#### Selected Risk Factor 1

Category	Probability	Impact
Other	Low	High

#### Description

##### Awareness, capacity & marketing risk

*There is a risk that the solar powered mini-grids' potential and their de-risked investment opportunity, which the project aims to create, do not get sufficient communication and promotion and fail to mobilise the relevant local operators/investors. Similarly, beneficiaries (households and especially productive users and communities) require proper information, awareness raising and marketing efforts to overcome the lack of knowledge and sometimes negative perception that populations might have about solar technology as a permanent electrification solution.*

#### Mitigation Measure(s)

*This is mitigated by the implementation of component 1 Technical Assistance activities as well as component 3 to incentivise productive use. Besides, a two-level grievance mechanism (ASER & CRSE) will be available to all targeted customers:*

i) in relation to the selection of villages, sites, and the electrification process in general, the populations can address directly to ASER which will take the appropriate measures to remedy, in relation with its operational service providers in the field. For this purpose, a computerized system allowing a good feedback of information is being deployed, in addition to the classic system of referral and processing by administrative mail.

(ii) in relation to the operation of the service in rural areas (quality of service, incidents, damage, safety, performance in providing the services described and validated in the concessionaire's service regulations), the population first addresses its complaints to the concessionaire, which is required to give a contact number to customers and to intervene in the event of solicitation, according to the procedures described in the concession contract and its specifications. The concessionaire is also obliged to keep a register of complaints and to report regularly to the Electricity Sector Regulatory Commission (CRSE). Nevertheless, if the operator's customer is not satisfied with the reaction of the concessionaire, it must refer the matter to the CRSE, which is mandated to monitor the implementation of the concession contracts and compliance with commitments on behalf of the State.

iii) in relation to regulatory or legal claims made by the concessionaire who feel aggrieved or in danger in relation to the operating conditions, they shall refer to ASER and the CRSE for handling the matter. For this purpose, activity reports are required by ASER and which the concessionaire is obliged to transmit at the intervals laid down in the concession contract.

#### Selected Risk Factor 2

Category	Probability	Impact
Technical and operational	Medium	Medium

#### Description

##### Variable commercial risk

The slow uptake or progressive ramp-up of rural electrification beneficiaries might impair the first year(s)' financials of the local operators/investors. Similarly, all productive demand load profiles may not be suited to solar power solutions. Unlike non time-critical energy demand (e.g. irrigation and manufacturing/agro-processing), time-critical demand (e.g. cooling & refrigeration) involve surges in power needed to bring and keep temperatures down regardless of the instant availability of solar power.

#### Mitigation Measure(s)

*Sound market assessment and modular sizing of the proposed technical solutions should be tailored to the circumstances of each mini-grid in order to cater for power demand extension as per the growth in demand; over-sizing of photovoltaic panels & storage capacities (batteries) shall be considered.*

### Selected Risk Factor 3

Category	Probability	Impact
Technical and operational	Low	Medium
Description		

#### Operations & Maintenance risks

Underperformance of decentralised renewable energy technologies could lead to lower production of energy and revenues, as there has been limited experience with financing decentralised renewable energy projects in rural parts of Senegal to date. Limited track record and data on nationwide historical performance implies that higher-than-expected variability in performance can occur, impacting the revenue-generation potential of the concessionaires.

#### Mitigation Measure(s)

*This risk will be mitigated by ensuring:*

- the choice of quality pieces of equipment at procurement & construction (cf. ASER "Minima Techniques"). The concessionaires will minimise risks by only sourcing commercially proven, independently certified solar panels, storage solutions and inverters*
- that the concessions are awarded to entities that can demonstrate relevant experiences and/or capacity in the operation and maintenance of the implemented technologies in accordance with best industry practices. Furthermore, the concessionaires will be expected to manage maintenance reserve accounts to allow for timely maintenance and replacement of components, when needed.*

### Selected Risk Factor 4

Category	Probability	Impact
Governance	Medium	Low
Description		

#### Monitoring risk

As per ASER's experience with the 4 awarded PPER concessionaires, different data practices pose a risk of improper, incomplete or unharmonised data collection and transmission to ASER's coordination structure (both technical, accounting and financial information).

As ASER rural electrification program signed an emissions reduction purchase agreement (ERPA) with the World Bank's Ci-Dev program in 2016, which is as of 17 May 2018 a registered programme under the CDM, there is a need for a clear demarcation between the contribution of different climate finance sources in order to prevent double-claiming of emission reductions.

#### Mitigation Measure(s)

*To mitigate the risk of double-claiming or double-counting, ASER will apply the CDM MRV framework (methodologies AMS III.BL) for GCF project activities, yet Emission reductions supported by the GCF will not be claimed elsewhere and not result in the issuance nor transfer of any carbon credits. Therefore, the project's linkage with the CDM infrastructure adds transparency to the mitigation outcomes achieved and prevents any form of double claiming or double counting.*

### Selected Risk Factor 5

Category	Probability	Impact
Prohibited practices	Low	High
Description		

#### Environmental/disposal risk

Inappropriate dismantling/recycling of mini-grids components (e.g. batteries) could lead to environmental contamination. Communities in developing regions are already struggling with contaminated sites and soil pollution from unregulated car battery recovery and recycling. Unsound end-of-life management and recycling can cause severe lead poisoning of people and negatively affect the environment. There is a risk that inappropriate battery disposal under the project will generate similar negative externalities.

**Wrong-doing and financial malversation risk**

No individuals or entities subject to United Nations Security Council Resolutions imposing financial sanctions will be involved in or benefitting from the activities of the project.

Mitigation Measure(s)

*While pollution caused by mishandling or disposal of batteries involved in mini-grids installations can be harmful, the end-of-life issues associated with the used batteries has been noted in earlier consultations and a management plan has been drafted to mitigate the risk of any spillage or inappropriate disposal of batteries. Specifically, concessionaires will be requested to a) regularly assess and maintain their entire portfolio of batteries, and b) together with ASER develop a collection and disposal scheme for expired batteries and equipment. ASER will carefully monitor the disposal process of used batteries to prevent any negative impacts to the environment. BOAD will also ensure implementation of the environmental and social measures set forth by the project.*

## G. GCF POLICIES AND STANDARDS

### G.1. Environmental and social risk assessment (max. 750 words, approximately 1.5 pages)

The project falls under Category B, according to the BOAD classification given that the project entails the installation and production of renewable energy, and given the limited scale of the proposed interventions, i.e. installation, in each concerned village, of a solar power plant (power from 15 to 45 kWp) associated with low voltage (LV) lines. In practice, for projects with multiple sites and where the exact location of the sites is unknown, an ESMF was developed (Cadre de Gestion Environnemental et Social – CGES in French) at the national PNER level<sup>43</sup>. To better optimise the management of the environmental and social aspects of the solar rural electrification project, a follow-up program and detailed recommendations concerning institutional arrangements have been proposed in the ESMF. Thus, monitoring will be carried out by the concessionaires; "internal" monitoring (or supervision) will be provided by PNER's Environmental & Social Experts; "external" monitoring (inspection) will be carried out by the CRSEs and the DREEC; mid-term and final evaluation will be carried out by independent consultants.

Locations and scope of the environmental and social impacts for each mini-grid will be determined during the project execution based on a screening process that will be undertaken according to the guidelines provided in the ESMF. For such small scale mini-grids, there is no need for a fully detailed ESIA, since the overall project is categorised as having medium risk (B), but only a simplified Strategic E&S assessment. Required studies (ESIA/analysis) for subprojects will be realized when specific sites are contracted before the installation of the mini-grids, and when the E&S documents are disclosed locally in the local administrative buildings (townhall, and local chief offices).

The sites of mini solar power plants will not affect protected areas and reserves because they will be located at the village level; and in general, protected areas and reserves are far from villages. In addition, the project sites will be set up so as not to displace populations or destroy economic assets. The beneficiary communities will provide small sites in villages for small-scale solar plants as their contribution to the project. There is no need for a resettlement plan since there will be no resettlement. Thus, PS5PS 5 will not be triggered. PS 7 does not apply for there is no indigenous population as defined by the World Bank Group's policy, on which those of BOAD and GCF are based, in the project area. Furthermore, PS 8 does not apply for activities related to the construction of such small isolated solar PV systems. Those systems will not need a great amount of excavation: thus, there will be no potential risk for cultural heritage degradation in beneficiaries' communities.

Environment and Social Management Framework (ESMF) documents are attached to this Funding Proposal.

#### Potential impacts and risks of the project

The major potential positive consequences of this type of project relate to

- job creation and increased local income during the construction phase. With the project, the construction works will have certain repercussions on the national and local economy. The employment of Small and Medium-sized Enterprises will lead to a high use of labour (especially local) whose revenues will galvanize the economic activities of the localities concerned. In addition, the sites will develop certain related activities (catering, trade, etc.) in the areas concerned, which will help increase the income of the population;
- improving the level of access to electricity in the area;
- contributing to the achievement of Senegal's electrification objectives;
- promoting economic development in polarised areas;
- promoting the development of local SMEs / SMIs by securing the electricity supply;
- extending the coverage of the electricity network;
- influencing gender and poverty reduction strategies;
- contributing to the fight against climate change – positive impact on global CO<sub>2</sub> emissions by limiting the use of fossil fuels

#### Potential negative consequences and mitigation measures for Project activities

- Solar photovoltaic systems are considered to be one of the least environmentally harmful energy options. As a result, little environmental impact is anticipated from the implementation of this system. The main potential impact is the risk of pollution in the event of poor storage or uncontrolled disposal of used batteries (leakage of

<sup>43</sup> MEDD 2016. PNER CGES

lead and acid which can pollute soil and water) and which can constitute sources of accidents, especially for children.

- During operation, the risk to the natural environment would firstly be caused by an accidental spill of sulfuric acid during maintenance operations and during the packaging of defective or end-of-life batteries. ASER, in partnership with the Concessionaires, will facilitate the establishment of a battery recovery system.
- Solar power plants are inspected by maintenance technicians. The risks incurred by the latter are those linked to the handling of the acid and the explosion of the batteries if the batteries used are with liquid electrolyte. In addition, there are risks associated with the presence of a battery in a living room (intoxication and explosion) if certain instructions are not followed.
- There are also risks of theft and other deliberate damage to the solar panels, in the absence of security

Mitigation / improvement, monitoring and institutional measures anticipated at this stage:

Construction phase	Operation phase
Social measures linked to loss of property and displacement of populations	Fire safety
Measures to reduce the effects on natural resources	Measures against the development of pests
Pollution control measures	Waste management
Dust mitigation measures	Risk management for maintenance operations
Water supply measures for construction sites	Management of noise pollution from installations
Safety measures	
Measures to avoid and settle social conflicts	
Measures to combat the risks of STI / HIV / AIDS transmission	

### Institutional arrangements

For the monitoring of the implementation of the E&S measures, it is planned, through an agreement with the Ministry of the Environment and Sustainable Development, to extend institutional support to the Department of Environment and Listed Establishments (DEEC). DEEC will in turn support the Senegalese Rural Electrification Agency (ASER) in the implementation of the environmental and social management component of the Project.

A Public Consultation Plan will aim to ensure social acceptability of projects at the community level by putting all stakeholders in a network for sharing information on the project and its interventions. The strategic planning of and the provision of information on the project should start by forums/gatherings in the form of Regional Development Committees (CRD) organized in the regions. In this context, Local Information and Monitoring Committees (CLIS) will be set up at the level of each community concerned. The role of these committees will be:

- to support ASER in the social appropriation of the project at the local level;
- to mobilize the different community actors for a peaceful implementation of the project;
- to serve as a framework for the amicable resolution of any conflicts (land or other).

An NGO or local association specializing in social mobilization could help facilitate the establishment and operations of these sectoral or socio-professional groups, but above all ensure quality and equity in representation (marginalized groups, gender, etc.).

At the national level, the PNER program already complies with national regulations, including Law 2001-01 of January 15, 2001, on the Environment Code. It was already subject to a Strategic Environmental Assessment validated by the State of Senegal with the issuance of an environmental compliance certificate N° 05 AUG.2019 / 021963 to ASER.

### G.2. Gender assessment and action plan (max. 500 words, approximately 1 page)

The State of Senegal is committed to international conventions for integrating gender issues in policies, standards and programs to facilitate its transversality at the institutional level. A Ministry of Gender was created for the first time in 2010 and during the same year, the law instituting absolute parity in totally or partially elected assemblies was adopted. It entered into force during the legislative elections of July 2012 and for the first time in the country's political history, the number of women MPs has increased from 19.2 to 42.6%. However, women are still affected by disparities at all levels and gender issues touch on poverty, health, education, access to finance, employment, access to land and the means of production, among others. Women are active in the production sectors, the small market economy and the informal sector. Any action tending to strengthen them in these sectors, reflects on their economic power, their

participation at the strategic level and the well-being of the family. Access to electricity can therefore constitute an important input, but also a bulwark against constraints that affect gender relations. However, until 2018, energy was not yet perceived by policies targeting gender equality as a factor which could improve women's participation in the national economy, but rather as a sector beyond the scope of the Implementation Plan of the National Strategy on Equity and Gender Equality (PMO-SNEEG)<sup>44</sup>.

Cooking and motive power remain the main gender issues in the energy sector. The collection of wood is the exclusive domain of women and the use of biomass leads to considerations about their health and that of children, hence there are measures aimed at modernizing cooking fuels. As for electricity, its weight in the reduction of gender inequalities is important because of the opportunities in access to modern energy services instead of motive power.

Before carrying out the diagnosis on gender accounting in the rural electrification national program, ASER has been involved in gender audits for policies and in energy programs conducted in 2005-2007. After several attempts to develop a program impact monitoring framework, a gender-sensitive manual intended to strengthen the results-based management of electrification programs was produced in 2012. In addition, it should be noted that ASER recently completed (in 2019) its Strategic Plan for Development (PSD) 2020-2023 where gender mainstreaming becomes a reality in the formulation of planned lines of intervention.

However, many factors still constitute constraints to allow ASER achieve effective gender mainstreaming. These include:

- the lack of sustained collaboration between ASER and the institutions in charge of the issues gender;
- the pricing of electricity which does not integrate preferences towards women and poor people;
- the beneficiaries' lack of resources for the initial investment necessary for starting professional, revenue-generating activities and;
- the lack of energy services for an optimized use of electricity at the productive and professional level.

Based on the constraints and challenges identified, a gender action plan for the rural electrification program using solar mini-grids was developed focusing on three main results, from which a series of actions to be implemented were identified: (i) gender is institutionalized in ASER; (ii) the energy needs of men and women are understood and met; (iii) access to finance for the development of economic and professional activities is supported. The implementation of this action plan calls for the active involvement of ASER and the synergy between all partners and development actors.

The project will confer substantial benefits on gender, due to its nature. The objective of the project is not only limited to curbing climate change by bringing renewable electricity to the rural populations, but also it greatly contributes to creating wealth and consequently reducing, even eliminating poverty. Rural women, through access to electricity, will thus find an opportunity to make their activities profitable with the possibilities offered by electric current. For example, energy-powered pumps reduce all the drudgery women endure to draw water. The socio-economic co-benefits on the lives of populations and particularly on women is very certain. The project also creates wealth. It has strong cross-sectoral links with various socio-economic sectors (agriculture, health and education). Electricity could therefore bring about a lot of positive changes at almost every level of the various business sectors. These include:

- promotion of income-generating activities;
- the acquisition of household appliances (more comfort for the populations);
- the reduction of exhausting chores of the rural woman, an increase in the schooling rate of the children, in particular the girls, and better school results;
- the development of cultural and leisure activities.

The full gender assessment and project-level gender action plan are provided as annex 8.

The Accredited Entity will validate the terms of reference for the recruitment of the consulting firm which will be in charge of the activities in close synergy with ASER, and validate the monitoring reports on the implementation of activities and the final evaluation of the project.

<sup>44</sup> At least 75% of women with access to alleviating equipment have additional human energy to devote to productive, social and leisure activities in 2011



- BOAD provided technical support for the development of the Gender Action Plan. In its implementation, it will monitor its implementation according to what is defined in the said action plan through field visits, review of reports submitted by the Senegalese side and recommendations for corrections to be made.
- BOAD has recruited a Sociologist, Gender Specialist, who ensures compliance with the implementation of gender action plans developed in the context of projects under funding of the FVC; it is not covered in the project budget.
- It was planned the training of a gender staff to ensure the implementation of the action plan. This specialist is supported in the project framework through the budget.
- In operational side, women groups and enterprises will be targeted through the project as described in the gender assessment

### **G.3. Financial management and procurement (max. 500 words, approximately 1 page)**

Financial management and procurement under this project will be guided by relevant BOAD rules and regulations, as well as relevant provisions in the Accreditation Master Agreement (AMA) signed by BOAD and the GCF as part of BOAD's accreditation to the GCF. The provision of the grant proceeds (Technical Assistance and social & gender connection coupons funds) will flow from GCF to AE based on the agreed payment schedule, subsequently to the funded activities based on the Procurement Plan. The provision of the BOAD loan will be made to ASER through the Ministry of Finance (Senegal Treasury) as per the Fund Flow Diagram (Figure 18), and subject to a reimbursement plan to be agreed. BOAD will carry out financial transfers in accordance with its own policies, procedures and rules for which it has been accredited for. Goods, and services financed from the GCF loans and the BOAD Loan will be acquired by either:

- limited consultation after expression of interest for sub-components
- international call for tenders for the components
- open consultation on a WAEMU scale of specialized design offices for the realization of the sub-components
- national call for tenders

#### **Procurement**

To ensure that financing is applied in ways that adequately secure the BOAD's mandate while maximizing development effectiveness, the Bank encourages and promotes sound, fair, transparent and well performing procurement systems.

BOAD's Guidelines for procurement of consultancy services financed by a loan or advance of funds (2016); and Guidelines for the award of works contracts, goods and services (other than consultancy services) (2016) will be applied by ASER in the project's procurement.

BOAD will conduct an analysis of the procurement files and give its no objection.

#### **AML/FT Due diligence**

As part of the prevention and fight against money laundering, BOAD has developed a Financial Security Policy (2016). This internal document constitutes the general framework of the control system covering all of BOAD's activities relating to the prevention, surveillance and management of money laundering and terrorist financing risks.

BOAD's Financial Security Policy is inspired by the international standards defined by the United Nations through its specialized structures, the Organization for Economic Cooperation and Development (OECD) whose recommendations are issued by the International Financial Action Group (FATF) and provisions of Directive 02/2015 / CM / UEMOA of 02 July 2015 on the fight against money laundering and terrorist financing in the Member States of the West African Economic and Monetary Union. ("WAEMU Directive").

The policy requires to disclose information about its clients' transactions to the relevant authorities in cases where international rules and local law require regulated financial institutions to do so, including cases of money laundering.

Under its due diligence, the Bank will assess civil / criminal and regulatory antecedents and sanctions lists. The Bank also conducts also administrative investigations into corruption, fraud, coercion, collisions and inconvenient practices, and make use of the relevant national authorities for the necessary criminal investigations.

The Bank integrates measures to combat illicit financial flows, the fight against money laundering and terrorist financing in the internal operations of the Bank Group.

In the context of this project, concerning ALM/FT, the concerned stakeholder will:

- ensure that the funds financing the Project are not of illicit origin and in particular are not related to fraud against Senegal's financial interests, corruption, organized criminal activities, terrorism or drug trafficking; and
- forward to the Bank without delay any information raising suspicions as to the unlawfulness of the sums invested in the company and in the Project;
- notify the Bank without delay if it has known at any time of any information indicating the illicit origin of all or part of the funds of the structure;
- not enter into a business relationship, directly or indirectly, with persons or entities on the lists established by the United Nations Security Council or its committees pursuant to Security Council resolutions, by the Council of the European Union in application of its Common Positions and / or by the African Union as well as on any other relative or complementary resolution and any act of implementation thereof in connection with the fight against the Laundering of Capital and the financing of terrorism.

## AUDIT

Audits will be undertaken in accordance with BOAD Guidelines for Financial Reporting and Auditing of Projects. The Financial Agreement with Senegal will require the submission of Audited Financial Statements to BOAD within four months after each year-end. An independent external auditor will be recruited based on Terms of Reference acceptable to the Bank (not later than four months after effectiveness) for the entire duration of the project. The Financial Statements will be audited in accordance with international auditing standards.

BOAD will prepare a Management Letter to provide observations, comments, and recommendations for improvements in accounting records, systems, controls and compliance with financial covenants in the Financial Agreements. The cost of the audit will be met from project resources. BOAD will ensure KYC standard-compliant due diligence process including anti-money laundering and other evaluations of sponsors is followed thoroughly.

## G.4. Disclosure of funding proposal

☒ No confidential information: The accredited entity confirms that the funding proposal, including its annexes, may be disclosed in full by the GCF, as no information is being provided in confidence.

☐ With confidential information: The accredited entity declares that the funding proposal, including its annexes, may not be disclosed in full by the GCF, as certain information is being provided in confidence. Accordingly, the accredited entity is providing to the Secretariat the following two copies of the funding proposal, including all annexes:

- ☐ full copy for internal use of the GCF in which the confidential portions are marked accordingly, together with an explanatory note regarding the said portions and the corresponding reason for confidentiality under the accredited entity's disclosure policy, and
- ☐ redacted copy for disclosure on the GCF website.

The funding proposal can only be processed upon receipt of the two copies above, if containing confidential information.

## H. ANNEXES

### H.1. Mandatory annexes

- ☒ Annex 1 NDA no-objection letter(s) [\(template provided\)](#)
- ☒ Annex 2 Feasibility study - and a market study, if applicable
- ☒ Annex 3 Economic and/or financial analyses in spreadsheet format
- ☒ Annex 4 Detailed budget plan [\(template provided\)](#)
- ☒ Annex 5 Implementation timetable including key project/programme milestones [\(template provided\)](#)
- ☒ Annex 6 E&S document corresponding to the E&S category (A, B or C; or I1, I2 or I3):  
[\(ESS disclosure form provided\)](#)
  - ☒ Environmental and Social Impact Assessment (ESIA) or
  - ☒ Environmental and Social Management Plan (ESMP) or
  - ☐ Environmental and Social Management System (ESMS)
  - ☐ Others (please specify – e.g. Resettlement Action Plan, Resettlement Policy Framework, Indigenous People's Plan, Land Acquisition Plan, etc.)
- ☒ Annex 7 Summary of consultations and stakeholder engagement plan
- ☒ Annex 8 Gender assessment and project/programme-level action plan [\(template provided\)](#)
- ☒ Annex 9 Legal due diligence (regulation, taxation and insurance)
- ☒ Annex 10 Procurement plan [\(template provided\)](#)
- ☒ Annex 11 Monitoring and evaluation plan [\(template provided\)](#)
- ☒ Annex 12 AE fee request [\(template provided\)](#)
- ☒ Annex 13 Co-financing commitment letter, if applicable [\(template provided\)](#)
- ☒ Annex 14 Term sheet including a detailed disbursement schedule and, if applicable, repayment schedule

### H.2. Other annexes as applicable

- ☒ Annex 15 Evidence of internal approval [\(template provided\)](#)
- ☒ Annex 16 Map(s) indicating the location of proposed interventions
- ☐ Annex 17 Multi-country project/programme information [\(template provided\)](#)
- ☐ Annex 18 Appraisal, due diligence or evaluation report for proposals based on up-scaling or replicating a pilot project
- ☐ Annex 19 Procedures for controlling procurement by third parties or executing entities undertaking projects financed by the entity
- ☐ Annex 20 First level AML/CFT (KYC) assessment
- ☐ Annex 21 Operations manual (Operations and maintenance)
- ☐ Annex 22 Other references

*\* Please note that a funding proposal will be considered complete only upon receipt of all the applicable supporting documents.*