Catalysing Green Rural Job Creation

with Decentralised Renewable Energies in West Africa

KONRAD ADENAUER STIFTUNG

Alliance for Rural Electrification
Shining a Light for Progress

Imprints

Cover photo: Off-Grid Europe

Date of publication: October 2023

Peer reviewed by Ian Muir, Principal, Catalyst Off-Grid Advisors; Michael Renner, Head Socioeconomics and Policy (IRENA); Celia García-Baños, Programme Officer – Policy, Gender and Socioeconomics (IRENA); Carolina Pan, Director of Research, Power for All; Sam Grant, Senior Director, Clean Energy Access, CLASP

About the Alliance for Rural Electrification (ARE)

ARE is the global association for the decentralised renewable energy (DRE) industry, catalysing private sector-driven markets for sustainable electricity services, creating jobs and powering equitable green economies in emerging economies. With more than 15 years of experience and 200+ members, ARE enables improved energy access through business development, policy and visibility support for its Membership along the whole value chain of DRE technologies.

About the Konrad-Adenauer-Stiftung (KAS)

Konrad-Adenauer-Stiftung (KAS) is a political foundation in the Federal Republic of Germany. The Regional Programme Energy Security and Climate Change in Sub-Saharan Africa, based in Nairobi, Kenya, realises activities around the nexus of energy security and climate change. Its objective is to improve the political and social framework for climate friendly sustainable development as well as fostering regional and international cooperation on energy security and on climate adaption and mitigation plans in the region.

Contents

List of abbreviations **4**

1. Executive Summary **5**

2. Direct job creation potential of DRE in Ghana **10**

- Current direct DRE jobs in Ghana 10
- Business as Usual and Forward-Leaning Policy Scenarios for DRE Jobs in Ghana 11
- Policies for DRE job creation in Ghana 11
- Case study 1: DRE job creation in Ghana. 16

3. Direct job creation potential of DRE in Senegal **18**

- Current direct DRE jobs in Senegal 18
- Business as Usual and Forward-Leaning Policy Scenarios for DRE Jobs in Senegal 19
- Policies for DRE job creation in Senegal 19
- Case study 2: DRE job creation in Senegal 23
- Case study 3: DRE job creation in Senegal 24

4. Recommendations for future rural job creation in West Africa **26**

Annex 1: Methodology **30**

- Scope of the study 30
- Data collection and analysis process 30
- Employment Factor 31
- Limitations and application of key findings 32

List of abbreviations

ADF: African Development Fund

AfDB: African Development Bank

ANER: Agence Nationale pour les Énergies Renouvelables

ARE: Alliance for Rural Electrification

ASER: Agence Sénégalaise d'Électrification Rurale

C&I: Commercial and Industrial

CEO: Chief Executive Officer

COP: United Nations Conference of Parties

CPESDP: Coordinated Programme of Economic and Social Development Policies

CSP: Communications Service Provider

DRE: Decentralised Renewable Energy

EPC: Engineering, Procurement and Construction

ESMAP: Energy Sector Management Assistance Programme

ESRP: Energy Sector Reform Programme

FER: Rural Electrification Fund

FiT: Feed-in-Tariff

FNPV: Financial Net Present Value

FTE: Full-Time Equivalent

GDP: Gross Domestic Product

GHG: Greenhouse Gas

GIP: Ghana Infrastructure Plan

Hydro: Hydroelectricity

IEA: International Energy Agency

ILO: International Labour Organisation

I-O: Input-output

IPP: Independent Power Producer

IRENA: International Renewable Energy Association

ISCO: International Standard Classification of Occupations

KAS: Konrad-Adenauer-Stiftung

km: Kilometre

kt: Kilotonne

kV: Kilovolt

kW: Kilowatt

kW hr: Kilowatt hour

kWp: Kilowatt peak

LPDSE: Lettre de politique de développement du secteur de l'énergie

LPG: Liquefied Petroleum Gas

MoE: Ministry of Energy

MoF: Ministry of Finance

MoL: Ministry of Employment and Labour Relations

MSMEs: Micro, Small and Medium Enterprises

MW: Megawatts

MWa: Average megawatt

NDC: National Determined Contribution

NDPC: National Development Planning Commission

NGO: Non-Governmental Organisation

O&M: Operations and Maintenance

PANEE: Plan d'action national d'efficacité énergétique

PANER: Plan d'action national des énergies renouvelables

PERACOD: Programme pour la promotion des énergie renouvelables, de l'électrification rurale et l'approvisionnement durable en combustibles domestiques

PPA: Power Purchase Agreement

PPP: Public-Private Partnership

PSE: Plan Sénégal Émergent

PU: Productive Use

PV: Photovoltaic

RE: Renewable Energy

REF: Renewable Energy Fund

RES4Africa: Renewable Energy Solutions for Africa

RPO: Renewable energy Purchase Obligation

SAIIA: South African Institute of International Affairs

SDG: Sustainable Development Goals

SECO: State Secretariat for Economic Affairs

SHS: Solar Home Systems

T&D: Transmission and Distribution

USD: United States dollar

VAT: Value Added Tax

W: Watt

WB: World Bank

1. Executive Summary

Renewable energies are expected to account for 45 million direct jobs worldwide by 2050.[1] Although the expansion in the renewables and the fossil fuel sectors creates jobs, **investing in renewable energy technologies creates nearly three times as many jobs as fossil fuels** per million dollars of spending.[2]

Within the renewable energies sector, **decentralised renewable energy (DRE)[3] solutions show particular promise to catalyse green employment opportunities**, already creating as many jobs in some countries as the utility-scale power sector, with a comparatively lower generation capacity installed.[4]

Additionally, DRE is poised to be the **least-cost electrification option** for **more than half of all connections** needed to provide sustainable electricity for the remaining 675 million people that are still unelectrified across the world.[5]

Jointly this means that **DRE can be a key engine to drive green job creation in emerging markets**.

Nowhere is this more pertinent than in sub-Saharan Africa, which currently has a population of 567 million of the global 675 million people without access to electricity, which is equivalent to more than 80% of the global population without access.[6]

Yet, data on DRE job creation and the methodology for calculating direct DRE jobs is not yet widespread in the industry. This study sets out to address this.

The main objectives of the study are:

- Supporting the development of a global industry standard methodology for calculating direct jobs enabled by DRE
- Identifying current and future direct job creation potential of DRE in Ghana and Senegal
- Presenting evidence to policy makers on job creation through DRE as a core element of future employment and electrification policies
- Inspiring others to conduct further research and collaborative actions to advance DRE

The study deep-dives into job creation enabled by DRE in Senegal and Ghana, where 9.9 million people are living without access to electricity, the majority of which live in rural areas where DRE solutions such as clean energy mini-grids and solar home systems (SHS) provide the most cost-effective electrification pathways.[7]

Both countries have developed national plans in favour of renewables with Senegal aiming for 2,500 MW by 2030, and Ghana aiming to increase renewable generation capacity to 1,363 MW by 2030, compared to 70 MW in 2019.[8]

The results show that **DRE companies across the clean energy mini-grid, solar home system (SHS) and commercial and industrial (C&I) space, who responded to the study employ 2,511 people in Ghana**. 34% of the people working for the contributors to the study, are women. 7%

1 IRENA, The Renewable Energy Transition in Africa: Powering Access, Resilience and Prosperity, 2021 For a definition on direct, indirect and induced jobs see annex
2 IRENA, Renewable Energy and Jobs – Annual Review, 2021
3 For a definition of DRE see Annex
4 PowerforAll, Powering Jobs Census 2019: The Energy Access Workforce, 2019
5 IEA, Africa and Covid-19: Economic recovery and electricity access go hand in hand, 2020; IEA, IRENA, UNSD, World Bank, WHO, Tracking SDG 7: The Energy Progress Report 2023, 2023
6 IEA, IRENA, UNSD, World Bank, WHO, Tracking SDG 7: The Energy Progress Report 2023, 2023
7 IRENA, The Renewable Energy Transition in Africa: Powering Access, Resilience and Prosperity, 2021
8 RES4Africa, Connecting the Dots: Accelerating renewable energy deployment with regional integration: a 10 years retrospective on West Africa, 2022

of the people employed are under 25 years old.[9]

In Senegal, around 1,500 people are directly employed by the DRE companies responding to the survey, or through their sub-contractors. 23% of those are women. 10% of the people employed are under 25 years.

Furthermore, **the study finds that with the right forward-leaning policy measures both countries could each create more than 20,000 direct jobs in their DRE sectors by 2030.**

To develop the study, ARE, in close collaboration with KAS, conducted desk research and consultations with key stakeholders to develop the methodology (see details of the methodology in Annex 1).

Based on the methodology, a survey was conducted in Ghana and Senegal to scope actual direct employment numbers and to develop the "Employment Factor" in DRE in the two countries. The employment factor is a multiplying factor showing the kW that each employee contributes to in the DRE sector. ARE then liaised with key sector stakeholders to disseminate and mobilise responses for the survey.

Three case studies showcasing DRE's ability to create green jobs on the ground were equally selected to exemplify how DRE projects contribute to employment.

The report further analyses the potential of institutional policy and the regulatory outlook for job creation in Ghana and Senegal and provides recommendations to future forward-leaning policy frameworks, which may further contribute to job creation in the sector.

As demonstrated by the case studies and data from this publication (and other similar studies), direct jobs in DRE include manufacturing, deployment, commissioning and operations & maintenance (O&M) and can be scaled further via targeted interventions, such as skills development programmes and policies measures.

DRE also enables the creation of indirect and induced jobs, particularly empowering women entrepreneurs.[10] Additionally, through productive uses of energy, small shops can store fresh produce in fridges and create or grow their business. Women can use electric sewing machines with which they can produce more products to sell. In the agricultural sector, DRE can support the use of water pumps and desalination plants to ensure access to water to grow additional or other type of crops which farmers could then sell. As a result, the expanded supply, demand and growth, will allow these farmers to hire more workers.

DRE can also create an entry point for informal workers into the formal economy. Across Africa 80% of those employed work in the informal sector. Although some employees actively seek to remain in the informal sector, governments generally see an advantage in formalising employment across all sectors for economic reasons and to ensure adequate regulation, investment opportunities and protection of the vulnerable.

In Ghana, informal employment is the norm across the country: 85% of the population are employed by micro, small and medium enterprises (MSMEs) who mainly operate in the informal sector, depriving them from accessing external markets and financing, hampering their growth.[11]

In Senegal the percentage is even higher, with 97% of companies working in the informal sector.[12]

9 For limitations of the study, see Annex

10 IEA, Africa Energy Outlook 2022, 2022; ARE, Women Entrepreneurs as Key Drivers in the Decentralised Renewable Energy Sector: Best Practices and Innovative Business Models, 2020

11 International Labour Organization, Productivity Ecosystems for Decent Work Programme Ghana, n.d.

12 Ministère de l'artisanat et de la transformation du secteur informel, Stratégie intégrée de formalisation de l'économie informelle (SNIFEI) et plan d'actions opérationnel de transformation du secteur informel (PAOTSI), 2022

Efforts to support DRE would contribute to efforts to formalise employment and provide secure jobs and higher wages.

A push to achieve universal access in sub-Saharan Africa by 2030 would require 2.8 million jobs, of which 55% would be in **O&M**. 700,000 jobs would be related to mini-grid connections and around 400,000 for the manufacturing and installation of solar home systems.[13] In Kenya and Nigeria for example, about 50,000 direct jobs were created each in 2021, outpacing the utility-scale power sector and approaching the oil and gas sector respectively.[14]

While some jobs in construction or manufacturing could disappear in the long-term due to slowing installations once universal access has been achieved, such an impact is not considered dramatic. **Job opportunities will remain to upgrade and replace smaller systems.** As rural and peri-urban African households will move up the 'energy ladder' over time, demanding larger, more capable SHS and mini-grids, which will help sustain many of these jobs, this could potentially enable additional permanent jobs, related to repairs and O&M of local DRE electricity grids.

This implies that it is **essential to have an adequate long-term skilled labour force strategy** in place, including providing relevant training and professional conversion programmes in a timely manner.

Additionally, ARE Members stated in a recent survey that finding domestic skilled labour is one of the main issues they face in deploying DRE at scale. Therefore, having **strategic and proactive labour and DRE policies in place remains essential** to ensure the further expansion of the DRE market and the creation of green jobs today and in the long-term.[15]

© Off-Grid Europe

13 IEA, Africa Energy Outlook 2022, 2022
14 PowerforAll, Powering Jobs Census 2022: The Energy Access Workforce, 2022
15 IEA, Africa Energy Outlook 2022, 2022

Ghana

86% electrification

15,465 direct jobs in **DRE**
BAU Policy Scenario 2030

23,519 direct jobs in **DRE**
Forward-Leaning Policy Scenario

4,5 M
People w/o access

32%
of capacity from renewables

34% women*

RISE

5th in Africa
RISE overall score: 63
Assesing policies & regulation for energy access, energy efficiency & renewable energy.

85% of the population are employed by micro, small and medium enterprises (MSMEs) who mainly operate in the informal sector

*According to data collected from contributors to this study

Sources: IRENA, The Renewable Energy Transition in Africa: Powering Access, Resilience and Prosperity, 2021 | IEA, IRENA, UNSD, World Bank, WHO, Tracking SDG 7: The Energy Progress Report 2023*, 2023 | RISE,* Scores*, 2021 | IRENA,* Ghana Energy Profile*, 2022 |- International Labour Organization,* Productivity Ecosystems for Decent Work Programme Ghana*, n.d.*

Senegal

68% electrification

12,269 direct jobs in **DRE**
BAU Policy Scenario 2030

20,449 direct jobs in **DRE**
Forward-Leaning Policy Scenario

5,4 M
People w/o access

30%
of capacity from renewables

23% women*

RISE

10th in Africa
RISE score: 54
Assesing policies & regulation for energy access, energy efficiency & renewable energy.

97% of companies work in the informal sector

*According to data collected from contributors to this study

Sources: IRENA, The Renewable Energy Transition in Africa: Powering Access, Resilience and Prosperity, 2021 | IEA, IRENA, UNSD, World Bank, WHO, Tracking SDG 7: The Energy Progress Report 2023*, 2023 | RISE,* Scores*, 2021 | IRENA,* Senegal Energy Profile*, 2022 | Ministère de l'artisanat et de la transformation du secteur informel*, Stratégie intégrée de formalisation de l'économie informelle (SNIFEI) et plan d'actions opérationnel de transformation du secteur informel (PAOTSI)*, 2022*

2

Direct job creation potential of DRE in Ghana

2. Direct job creation potential of DRE in Ghana

Current direct DRE jobs in Ghana

In 2022, approximately 13.4 million out of 31 million people in Ghana were employed, with about 50% in the steadily growing services sector, 30% in agriculture and 20% in industry.[16]

The survey conducted as part of this study, covers the full DRE sector value chain including academia, consulting services, sales and distribution companies, and deployment, energy, procurement and construction (EPC) and O&M companies working on SHS, clean energy mini-grids and C&I uses mainly through solar solutions, but also energy storage and productive DRE equipment such as water pumps for example. The contributors represent large international companies, NGOs and national players of all sizes.

The results represent nearly 44 MW of installed capacity across more than 22,000 installations in the country, which is nearly 1/3 of all renewable energy capacity installed in the country by 2021.[17]

Since off-grid DRE systems account for about 1.52% of the electricity generated across the board with 5,288 MW generated in 2020 across all energy sources, we can estimate the off-grid DRE capacity to be around 80 MW. [18]

Overall, penetration of renewable energy across the country increased to 144 MW in 2021.[19] Large hydro, which is considered separately in Ghana, accounts for 1,580 MW.[20]

Based on this data, the study found that **more than 2,511 people were directly employed by DRE companies who contributed to the survey or through their sub-contractors in Ghana**. 34% of those are women. 7% of the people employed are under 25.

The employment factor based on the received data is 17.39 with 0.06 employees per kWp or 57 per MW installed by the contributors on average.[21] Seen the representative sample of the responses received, this means that around 4,560 people were employed per 80 MW of DRE installed by 2020, out of which 34% (or 1,550 employed) were women and 7% (or about 320 people) were under 25.

According to the data, those working solely on SHS employ more people in direct jobs than those working only on clean energy mini-grids with a weighted average of 0.14 and 0.07 per kWp respectively. This also corresponds with other studies.[22] However, this factor does not take into consideration the indirect and induced jobs, where clean energy mini-grids typically generate more productive uses of energy and hence more induced employment.

GHANA – KEY DATA
44 MW of installed solar capacity by contributors
22,000 installations by contributors
2,511 people directly employed by contributors to the study in DRE companies or through sub-contacts
34% of employed people were women
7% of employed were youth

16 Statista, Ghana: number of people employed 2010-2022, 2023 and World Bank, Employment in services – Ghana, n.d.
17 Ghana Energy Commission, 2022 National Energy Statistics, 2022
18 Government of Ghana, The Coordinated Programme of Economic and Social Development Policies (2021-2025) Agenda for Jobs II: Creating Prosperity and Equal Opportunity for All, 2022
19 Government of Ghana, The Coordinated Programme of Economic and Social Development Policies (2021-2025) Agenda for Jobs II: Creating Prosperity and Equal Opportunity for All, 2022
20 U.S. Agency for International Development, Ghana Power Africa Fact Sheet, n.d.; See Annex for more background as to why hydro is considered separately.
21 See Annex for details on calculation methods applied for the employment factor and for the weighted average of employees per kWp.
22 PowerforAll, Powering Jobs Census 2022: The Energy Access Workforce, 2022

Employment factor: 17.39

Direct jobs created per MW installed: 57

BAU Policy Scenario 2030
15,465 direct jobs
269 MW of DRE

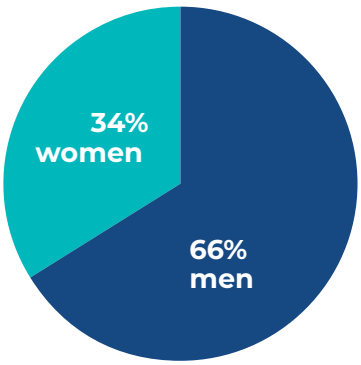
Forward-Leaning Policy Scenario 2030
23,519 direct jobs
409 MW of DRE

Business as Usual and Forward-Leaning Policy Scenarios for DRE Jobs in Ghana

If Ghana reaches its target of **10% of renewable energy** (1,363.63 MW) in 2030 of which grid-connected systems represent 1,094.63 MW[23] and therefore 269 MW of off-grid DRE electricity, this would imply that – if we use the employment factor of 17.39 – **15,465 people would be employed in the off-grid DRE sector by 2030 in the business as usual (BAU) scenario.**

A Forward-Leaning Policy Scenario of 15% renewable energy by 2030 would mean 23,519 direct DRE jobs across the country.

Employment Gender Split



Policies for DRE job creation in Ghana

The above scenarios build on a significant history of RE and job policies and plans in Ghana over the past decades. Overall, the **private sector has mainly contributed to the electricity market through energy generation, and the distribution sector is also open to private sector participation**. The Energy Commission Act 541 also anticipates its participation in brokerage, sales and exports.

Most importantly, the **private sector is limited in the sale of electricity in the DRE sector in part as a result of the government's public-led model for the development of mini-grids**.[24] On this point, the government's policies and regulations are still under development such as the uniform tariff policy which has an impact on the financial viability of such DRE projects.

The below gives a snapshot of some key policies in Ghana impacting green job creation:

23 Ghana Ministry of Energy, Renewable Energy Master Plan, 2019

24 United Nations Economic Commission for Africa, Regulatory Review of the Electricity Market in Ghana: Towards Crowding-in Private Sector Investment, 2021

RENEWABLE ENERGY AND ELECTRIFICATION POLICIES	
Energy Commission Act 541 (1997)	Establishment of the Energy Commission Establishment of an Energy Fund
National Energy Policy (2010)	Creation of fiscal and pricing incentives to enhance the development and use of renewable energy
Renewable Energy Act (2011)	Creation of an enabling regulatory environment to attract private sector involvement through a feed-in tariff (FiT) and Renewable Energy Purchase Obligation Establishment of Renewable Energy Fund (REF) focused on capacity building, provision of financial incentives, FiT, capital subsidies and equity participation for • grid interactive renewable electricity • mini-grid and off-grid renewable power systems for remote areas and islands • RE projects for non-electricity purposes
National Infrastructure Plan 2018-2047 (2017)	• Increase the share of renewable energy (solar, wind, wave & biofuel) to 18% of the national energy mix, from 88 MW to 9,000 MW by 2047 • Improve efficiency of production and use of wood fuels • Mainstream Renewable Energy into GIP • Establish a Renewable Energy Authority to implement the master plan
Renewable Energy Master Plan (2019)	DRE electrification for 1,000 off-grid communities • Increase renewable energy from 42.5 MW in 2015 to 1,364 MW (with grid connected systems totalling 1,095 MW) in 2030 • Reduce the dependence on biomass as main fuel for thermal energy applications • Provide renewable energy-based decentralised electrification options in 1,000 off-grid communities • Promote local content and local participation in the renewable energy industry[25]
Energy Sector Reform Programme (2019)	Driven by the overburdened grid with high transmission losses in part due to oversupply from Independent Power Producers who had signed take-or-pay based Power Purchase Agreements (PPAs). As a result, the government imposed a moratorium on the signing of new PPAs and gas supply arrangements and suspended all ongoing negotiations on such agreements until further notice.
Renewable Energy Act (2020)	Replaced the feed-in tariff incentive regime established in the original with a competitive procurement scheme and limited the previous renewable energy purchase obligation on distribution companies and bulk consumers to only apply to electricity distribution utilities.[26]
National Determined Contribution (2021)	With the goal to scale-up overall renewable energy penetration (excluding hydro) by 10% in 2030, the updated NDC expects to employ 18,700 people.[27]

25 Ghana Ministry of Energy, Renewable Energy Master Plan, 2019
26 Dowuona & Co, Ghana National Energy Transition Framework and What it Means for Business and Investors, 2018
27 Ghana Ministry of Energy, Updated Nationally Determined Contribution under the Paris Agreement (2020-2030), 2021

Medium-Term Development Policy Framework 2022-2025 (2022)	• Plans to restructure and strengthen the management of hydro power plants • Develop a thermal insulation market • Strengthen independent power producers (IPPs) and other private sector institutions involvement in the generation and distribution of power • Promote the production and use of renewable energy; and promote the use of solar energy for all public and private buildings • Accelerate replacement of kerosene lanterns with solar lanterns; and a safe, and sustainable nuclear power programme[28]

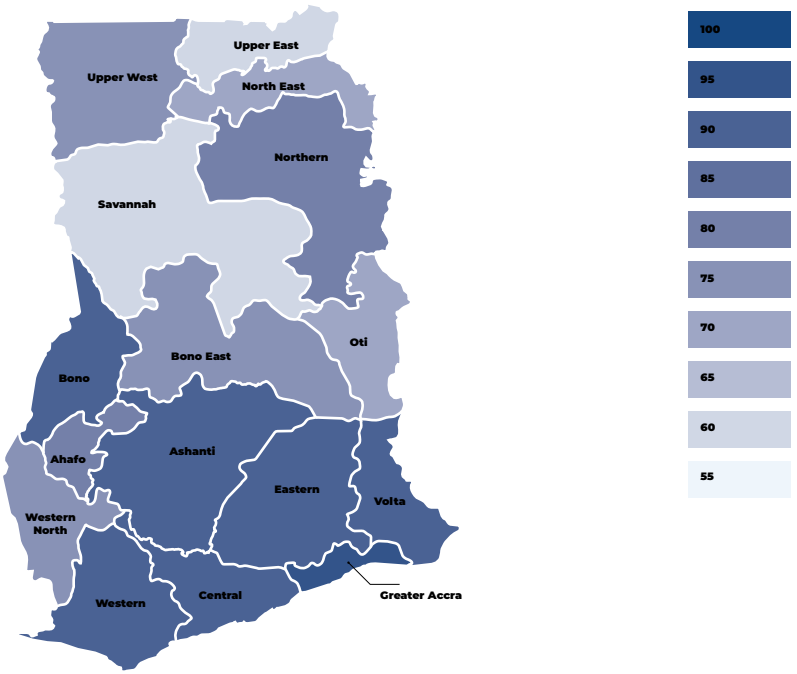
JOB AND EASE OF DOING BUSINESS POLICIES

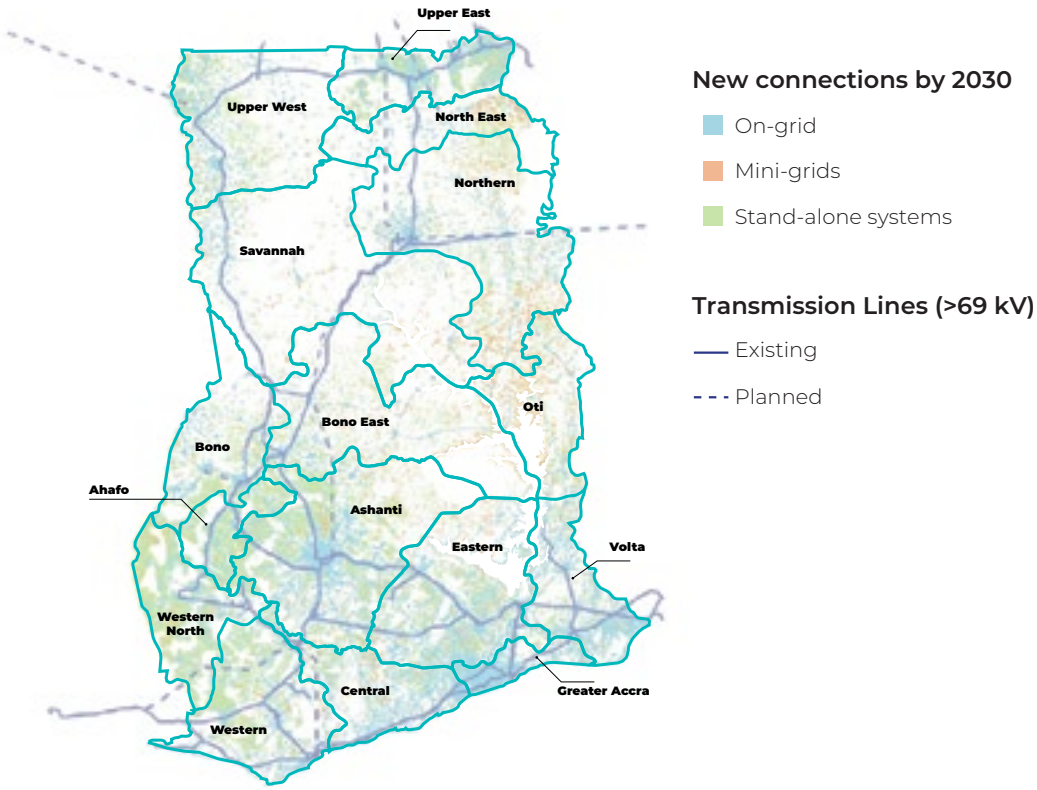
Coordinated Programme of Economic and Social Development Policies (CPESDP) - Agenda for Jobs I (2017-2024)	• Institute incentive schemes for the development of specific renewable energy projects for industrial development. Regulations for the Renewable Energy Law developed to incentivise investments in renewable technologies such as solar, wind, geothermal and tidal wave energy. • Incentivise solar parks in the northern part of the country to deploy utility-scale solar photovoltaic (PV) systems • Provide one-time tax credits to owners of commercial, industrial, and utility-scale solar PV and wind power systems for qualified installed costs, and to producers to ensure local supply of solar panels • Establish a Renewable Energy Industrial Zone; and support the private sector to build factories for the production and assembling of full components for solar power systems • Foresees solar and wind mini-grids, through the support of public-private partnerships (PPPs) and other private investment to address costly irrigation systems • Expand the provision of mini-grids to lakeside and island communities, in order to facilitate the productive use of energy[29] In terms of economic development, it foresees to: • Develop a competitive private sector by focusing on reducing the high cost of doing business, resolving the energy constraints for businesses • Lowering the overall tax burden on business, and instituting new incentive packages, targeting agro-processing, pharmaceuticals and light manufacturing, especially garments and textiles • Formalise Ghana's informal economy and focus on entrepreneurship, particularly targeting start-ups and youth businesses[30]
Public Private Partnership Act (2020)	The Act aims to facilitate the implementation of PPPs facilitated by the Ministry of Finance[31]

28 National Development Planning Commission of the Government of Ghana, Medium-Term National Development Policy Framework 2022-2025, 2021
29 Government of Ghana, The Coordinated Programme of Economic and Social Development Policies 2017-2024, 2017
30 World Bank, Ghana Rising – Accelerating Economic Transformation and Creating Jobs, 2021
31 Dowuona & Co, Ghana National Energy Transition Framework and What it Means for Business and Investors, 2018

National Green Jobs Strategy 2021-2025	Ghana's Ministry of Labour sets concrete and ambitious plans to create green jobs through the renewable energy sector amongst others. This includes: • Green Skills Development • Green Enterprise Development and Markets Project • Green Enterprise Financing Project with renewable energy activity components, for which responsibility mainly falls with the Ministry of Energy Main targets: low wattage installations and appliances such as improved cook stoves, portable solar PV, smaller appliances (2-12 W) SHS, micro hydro, pico hydro, micro wind, biogas, solar water heaters, etc.
Coordinated Programme of Economic and Social Development Policies (CPESDP) - Agenda for Jobs II 2021-2025 (2022)	Aims to continue the path set during the Agenda for Jobs I • 10% of installed power capacity to be renewables • Electrify the remaining areas in the country: largely remote rural, island and lakeside communities where grid extension may be difficult to achieve • Promote hybrid/renewable energy-based mini-grids as an integral part of the rural electrification strategy, particularly for island/peninsula communities. • Increase the penetration of non-electricity applications of renewables such as solar water heaters and crop dryers to increase the contribution of renewable energy in the overall energy consumption mix of the country. • Explore technologies such as wind and biomass It also stresses one of its flagship initiatives to complete ongoing rural electrification projects to ensure transformation of rural economies by 2025

Current rate of access vs possible DRE solutions in the country





Sources: IEA, Ghana Energy Outlook*, 2021; Ghana Energy Commission,* 2022 National Energy Statistics*, 2022*

CASE STUDY 1: DRE JOB CREATION IN GHANA

Ryse Energy – Resilient Renewable Energy Mini-Grid

Project financing: EUR 180,000 grant from the United Nations

Project implementation: Ryse Energy with the support of the project developer Trama Techno-Ambiental

DRE solution:
- Wind turbines (220 V, 5 kW)
- 1 x 40 kW PV solar array
- 6 inverters
- 250 REC PV modules
- 2 x 48 V battery banks

Project location: Village of Ada Foah, Ghana

Project period: February - May 2016

Before the project: population with no access to electricity and living in extreme poverty

Objective of the project: Develop a hybrid solar-wind mini-grid DRE system to provide energy for agricultural activity as well as for other basic energy needs of the 500 people living in the village, such as lighting and heating

Job creation:
- 20 direct jobs created within the community (primarily in O&M of the DRE system)
- 200 indirect and induced jobs / lives positively impacted

Community involvement: Today operational costs and O&M are covered by the local community

Capacity building and knowledge transfer: Trainings were conducted by Ryse Energy on how to operate and maintain the system to ensure direct green job creation in the community and promote the transfer of technical skills

Contact
Iain Munro, Strategy Director
iain@ryse.energy
ryse.energy

3

Direct job creation potential of DRE in Senegal

3. Direct job creation potential of DRE in Senegal

Current direct DRE jobs in Senegal

With a population of about 18 million, nearly 5 million Senegalese were employed at the end of 2022.[32] Of the people employed, 56% work in the services sector, only 22% in agriculture and 22% in industry.[33]

This survey conducted in the context of this study covered the entire DRE value chain including academia, consulting services, sales and distribution companies, as well as deployment, EPC and O&M companies working on SHS, minigrids and C&I. Most contributors provided solar solutions, but the study also includes energy storage companies that provide productive use equipment, such as solar water pumps.

The surveyed companies were responsible for 46 MW of the approximately 211 MW of RE capacity deployed in the country[34] (including biomass), across nearly 80,000 installations in the country. This number includes a majority of off-grid DRE connections, but also on-grid DRE.

The contributors to the study employ over 1,500 people directly or through their sub-contractors. Combined they employ 23% women and 10% of the people employed are under 25.

The employment factor based on the data is 31.00 with 0.03 employees per kWp or 33 per MW installed by the contributors on average.[35] The main reasons for the difference in employment factor between Senegal and Ghana is due to higher employment factors throughout the value chain in Senegal, showcasing that on average Senegal employs less people than Ghana per DRE solution. The reasoning behind this could be explored separately, as it falls out of the scope of this study.

In Senegal, those working solely on SHS employ significantly more people in direct jobs than those working only on clean energy minigrids with a weighted average of 0.11 and 0.03 per kWp respectively, which corresponds with other studies.[36]

As in Ghana, this excludes the indirect and induced jobs and the entire support system allowing for the sector to be in place such as people working in training facilities on RE, people employed in small business that use DRE for productive purposes, etc.

SENEGAL – KEY DATA
46 MW of installed RE capacity by contributors
80,000 installations by contributors
1,500 people directly employed by contributors
23% of employed people were women
10% of employed were youth
Employment factor: 31
Direct jobs created per MW installed: 33
BAU Policy Scenario 2030: 12,269 direct jobs 375 MW of DRE
Forward-Leaning Policy Scenario 2030: 20,449 direct jobs 625 MW of DRE

32 ANSD, Senegal Data Portal, Population du Sénégal par région, age et sexe, 2023; ANSD, Senegal Data Portal, Indicateurs du marché du travail : emploi, chômage, salaires/gain, 2023

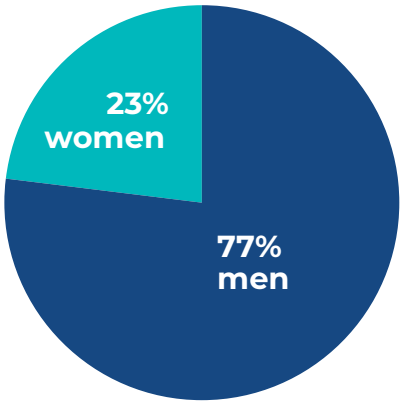
33 Statista, Number of people employed in Ghana from 2010 to 2022, 2023; World Bank, ILO modelled estimates database – Employment in Services, 2021

34 U.S. Agency for International Development, Senegal Power Africa Fact Sheet, n.d.

35 See Annex for details on calculation methods applied for the employment factor and for the weighted average of employees per kWp.

36 PowerforAll, Powering Jobs Census 2022: The Energy Access Workforce, 2022

Employment Gender Split



Business as Usual and Forward-Leaning Policy Scenarios for DRE Jobs in Senegal

If Senegal maintains a **30% renewable energy** share of expected 2,500 MW by 2030, with 15% of capacity in the country being off-grid, this would imply that – if we use the employment factor of 31 – **12,269 people would be employed directly in the DRE sector by 2030 in the business as usual (BAU) scenario.**

In a Forward-Leaning Policy Scenario of 25% DRE by 2030 this would mean **20,449 direct DRE jobs** across the country.

Policies for DRE job creation in Senegal

Although Senegal aims to reach universal access to electricity by 2025, with 95% of rural connections provided by the grid,[37] **overall SHS and mini-grids dominate DRE solutions in Senegal, a country with more mini-grid beneficiaries than its West African counterparts**.[38] Senegal has also deployed many policies in the last 20 years to enhance energy access.

Since 2008, **private RE companies can apply for large-scale concessions** under the Rural Electrification Priority Programme, while smaller, **locally-owned organisations can apply for small-scale concessions under the Local Initiative for Rural Electrification project**, with significant state and donor subsidies on offer under both systems, administered by the Senegalese Agency for Rural Electrification (ASER).[39]

Although the national utility retains a monopoly on grid transmission and distribution, **private sector generation has grown to contribute approximately 40% of the country's total installed capacity.**[40] This share is progressively expanding, indicating an increasing presence of private entities in the market. The country's *Lettre de Politique de Développement du Secteur de l'Energie* (Letter of Policy Development of the Energy Sector) actively supports private sector participation, and regulatory measures are in effect to ensure a competitive electricity market.[41]

The policy framework put in place favoured renewables and for the 2016-2019 period fossil fuels grew by 41 MW, while renewables grew by 141 MW.[42] Achieving the renewable energy objectives set by the country would lead to an increase of approximately 1,400 MW in renewable energy capacity. The latest numbers on the share of renewables show that 30% of total installed capacity comes from renewables in 2021, and almost 13% of the national installed capacity came from solar in 2018.[43]

As Senegal is moving towards universal electrification, the government anticipates a significant **rise in peak demand, reaching approximately 1,350 MW by 2025.**[44] **Concurrently, objectives are set to enhance the country's installed**

37 IEA, Africa Energy Outlook 2019, 2019
38 ESMAP, Mini-Grids for Half a Billion People - Market Outlook, 2019
39 IRENA, The Renewable Energy Transition in Africa: Powering Access, Resilience and Prosperity, 2021
40 GET.invest, Market Information: Senegal, n.d.
41 GET.invest, Market Information: Senegal, n.d.
42 IRENA, The Renewable Energy Transition in Africa: Powering Access, Resilience and Prosperity, 2021
43 GET.invest, Market Information: Senegal, n.d.
44 GET.invest, Market Information: Senegal, n.d.

capacity to 2,500 MW by 2030[45] to effectively cater to the growing energy requirements. Renewables are part of the government strategy to meet that challenge and to stimulate economic growth. In this sense, Senegal has adopted a multi-faceted approach that includes both short-term and long-term strategies.

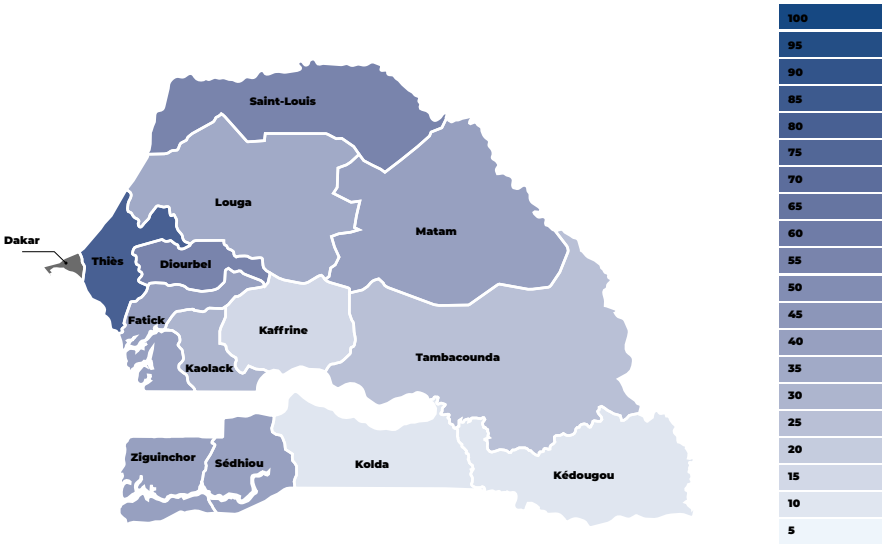
RENEWABLE ENERGY AND ELECTRIFICATION POLICIES	
Programme pour la promotion des énergie renouvelables, de l'électrification rurale et l'approvisionnement durable en combustibles domestiques (PERACOD) (2004)	Aimed at the deployment of domestic fuels and renewable energy sources. Additionally, the government introduced the Decree n° 2004-915 in July 2004, which established and defined the rules for the organisation and operation of the Senegalese Rural Electrification Agency (ASER). The government also issued the Decree n° 2006-247 in March 2006, establishing the Rural Electrification Fund (FER) and outlining its organisational and operational guidelines.
Loi no 2010-21 portant loi d'orientation sur les énergies renouvelables (2010)	• Establish a suitable legal framework for the development of renewable energy projects, reduce reliance on fossil fuels, enhance energy security, diversify the energy mix • Promote domestic energy production, encourage the adoption of renewable energy technologies, and reduce greenhouse gas emissions • Tax relief for the purchase of materials and equipment necessary for renewable energy production • Mandates grid connection for renewable energy plants • Issues certificates of origin to eligible producers for accessing incentives and lays the foundation for the implementation of a feed-in tariff scheme in the country
Plan Sénégal Émergent (PSE) (2012) – Phase I	Renewable energy penetration in the commercial sector of at least 15% in 2025, excluding traditional biomass from the mix[46] and 20% of renewables in the global installed capacity of the country for 2017. The PSE aims to achieve universal access to electricity and prioritises the development of renewable energy sources such as solar and wind power which made the country one of the front runners for grid connected renewables in the region.
Lettre de politique de développement du secteur de l'énergie (LPDSE) (2012)	• Ensure an adequate and sustainable energy supply for the country at the lowest cost • Diversify the energy sources to reduce vulnerability to external factors, particularly those related to the global oil market • Promote the development of renewable energies • Expand access to modern energy services, prioritising equitable distribution for disadvantaged regions and vulnerable populations and • Foster energy management and improve energy efficiency
Arrêté Ministériel no 9317 (2013)	Set up of the National Greenhouse Gas Reduction Programme to mitigate against climate change through energy efficiency in the building sector.[47] Senegal is also one of nine African countries to commit to end new unabated coal-fired power generation projects.

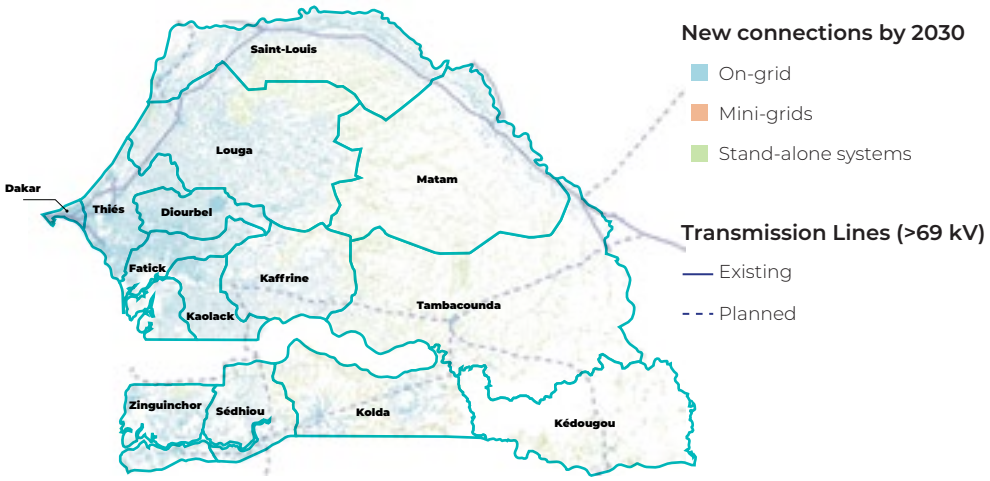
45 GET.invest, Market Information: Senegal, n.d.
46 Government of Senegal, Plan d'Action National d'Efficacité Energétique, 2015
47 Ministère de l'environnement et du Développement Durable Sénégal, Arrêté Ministériel n° 9317, 2013

Plan d'action national d'efficacité énergétique (PANEE) (2015)	• Reducing energy consumption and improving the efficiency of energy use across various sectors, including residential, commercial, industrial and transport • Initiatives to raise awareness, provide training and enhance capacity building to ensure the successful implementation of energy efficiency measures
Plan d'action national des énergies renouvelables (PANER) (2015)	Consolidates the institutional, legislative and regulatory framework around renewables and sets ambitious on-grid and off-grid targets. Objectives: Reach 31.8% of renewables in the off-grid total installed capacity and 26% of the rural population served by off-grid renewables, either mini-grids or SHS[48] by 2030.
Plan Sénégal Émergent (PSE) (2019-2023) – Phase II	Focus on the role of the private sector and to help its development through the Agence Nationale pour les Énergies Renouvelables (ANER) and the Agence Sénégalaise d'Électrification Rurale (ASER). These two agencies are responsible for coordinating electrification efforts and promoting public-private partnerships in the energy sector.
Lettre de politique de développement du secteur de l'énergie (LPDSE) (2019-2023)	Focus on promoting greater involvement of the private sector, through: • Facilitating independent power generation • Implementing institutional reforms • Enhancing competitiveness and bolstering regulatory frameworks
Contributions déterminées au niveau national (CDN) (2020)	Reduce GHG emissions by: • Increasing renewable energy to at least 30% of the country's energy mix by 2030 and to 40% by 2035 • Developing 360 MW of solar PV, 350 MW of wind, 199 MW of hydropower, 165 MW of biomass and 55 MW of CSP, as well as 5,392 solar mini-grids and 73,500 biodigesters[49] • Installing 6.18 MWp through off-grid solar electrification[50]
Arrêté Interministériel n° 010 158 (2021)	Senegal also took initiatives on other fronts to facilitate the uptake of renewables. The interministerial decree exempts 22 materials used in the production of renewable energy from solar, wind and biogas sources from value added tax (VAT)[51]

48 Government of Senegal, Plan d'Action National des Energies Renouvelables, 2015
49 IRENA, The Renewable Energy Transition in Africa: Powering Access, Resilience and Prosperity, 2021
50 Government of Senegal, Contribution Déterminée au Niveau National du Sénégal, 2020
51 Government of Senegal, Arrêté Interministériel n ° 010 158, 2021

Current rate of access vs possible DRE solutions in the country





Sources: IEA, Africa Energy Outlook 2019, 2019; Commission de Régulation du Secteur de l'Electricité, Statistiques du secteur, *n.d.*

CASE STUDY 2: DRE JOB CREATION IN SENEGAL

ASER300 – Rural Electrification Project

Project financing: by the German Development Bank KfW IPEX. Once finalised, the systems will be owned by the Senegalese government.

Project implementation: GAUFF Engineering with mini-grids built, tested and installed by Off-Grid Europe

DRE solution:
Containerised system (120 x 20') with off-grid solar PV capacities varying from 15 to 45 kWp
108 systems installed, with a total installed capacity of 2.8 MW country-wide (December 2022)

Project location: Senegal

Project period: 2020 – ongoing

Before the project: No access to electricity

Objective of the project: Electrifying 300 remote and Senegalese rural villages (120,000) with DRE.

Job creation

This project allowed the integrator to open its Dakar subsidiary: Off-Grid Africa and created 55 new jobs (equivalent to 52 FTE) directly hired in the office and in the field.

Contracts are full-time in 95% of cases, and permanent, in around 90% of cases.

99% of employees are from Senegal and surrounding countries, including the CEO.

The team is comprised of 12 women above 25-years-old and presents a wide range of levels (from the ILO classification):

- Managers – 2 FTEs
- Professionals – 2 FTEs
- Technicians and associate professionals – 7 FTEs
- Clerical support workers – 5 FTEs
- Plant and Machine operators and assemblers – 27 FTEs
- Elementary occupations – 12 FTEs

Contact
Xenia Rebsam, Communications
xenia@off-grid-europe.com
off-grid-europe.com

CASE STUDY 3: DRE JOB CREATION IN SENEGAL

Schneider Electric with Plan International – DESFER Economic and Social Development for Women

Project financing: European Union

Project implementation: Collaboration between Plan International and Schneider Electric

DRE solution:
- Solar PV: 20 kW & 12.5 kW, Schneider's Conext XW series. Total installed capacity of 64 kWp.
- Energy storage: 50 kWh, 30 kWh

Project location: Senegal
- Kaolack: 192 km South-East of Dakar by road
- Ziguinchor: 454 km South-West of Dakar by road, boat and plane

Project period: 2019 – 2022

Before the project: No access to electricity

Target of the project: Women in rural communities

Job creation

The project is comprised of 1 woman over 25-years-old and **64 women under 25-years-old**, presenting a wide range of skillsets (from the ILO classification):
- Managers – 3
- Professionals – 0
- Technicians and associate professionals – 5
- Clerical support workers – 1
- Plant and Machine operators and assemblers – 55
- Elementary occupations – 0

4,500 local entrepreneurial jobs for women created over a five-year period, by developing a favourable context, facilitating access to credit and solar energy and by strengthening the capacities of women and operators of integrated energy services.

Type of activities created:
- Crop transformation to final product (juice, cereal, etc.)
- Electricity products reseller
- Energy related (operators, system integrators, electricians)

Community involvement: The local bank supported the entrepreneurs with micro-loans so they could start their businesses

Capacity building: Over five years, 7,000 women and 2,500 students were trained on entrepreneurial skills for induced jobs and advanced electricity skills for direct jobs (solar energy installation, industrial automation, etc.)

Contact

Baba Dieye – Sales Engineer of Access to Energy for Senegal, Schneider Electric
baba.dieye@se.com
www.se.com/a2e

4

Recommendations for future rural job creation in West Africa

4. Recommendations on how to enable the creation of future jobs in rural areas and throughout the DRE value chain in West Africa

Based on the results of the study, we can conclude that the employment factor in both countries confirms **the large potential of DRE to create domestic jobs across West Africa.**

As evidenced by the BAU and Forward-Leaning scenarios for Ghana and Senegal, and data from other sources on Ethiopia, Nigeria, Kenya and India,[52] **many more direct jobs can still be enabled in the DRE sector in both countries and across West Africa** and **an exponential number of jobs can be created through access to DRE with the right policies in place**. This includes green supply chain jobs such as manufacturing, assembly, deployment, commissioning and O&M, as well as induced jobs in MSMEs empowered by DRE.

As exemplified in the case studies provided, in the example in Ghana, the indirect and induced jobs created through the enabling environment, after the village received access to energy, is tenfold. In Senegal, **rural access to energy combined with targeted training in entrepreneurship and the micro-loans facilitated by the local bank, led to a 70-fold increase in induced jobs.**

In addition, green jobs present a **long-term opportunity for governments to enable youth and women to be included in the workforce** in a growing DRE sector. The growing sector will also enable workers to be employed formally and therefore ensure quality jobs in the long run.

Therefore, **ARE and KAS call for further public-private dialogue and collaboration enabling an upscaling of DRE to drive rural development and green job creation in West Africa.**

Governments play a major role in creating an enabling environment that could support the growth of the DRE sector and contribute to achieve widespread green job creation through forward-leaning policy frameworks for DRE. In addition, government initiatives and policy frameworks can stimulate the attractiveness for private sector investments by reducing the high risks in the sector.

However, Ghana is placed 118th and Senegal 123rd out of 190 in the 2020 ratings of Doing Business from the World Bank. Although this is not directly linked to the enforcement or quality of their policies on renewable energies or the potential for green job creation, it underlines the necessity to improve the overall enabling policy environment to become more attractive for businesses in both countries.

Based on the case studies, desk research and consultations, ARE also recommends **enabling youth-centric employment policies, gender mainstreaming and de-risking opportunities for the private sector to engage more in DRE projects.**

Policies to facilitate MSMEs to focus on their core business, such as increasing digitisation, simplified administrative procedures and frameworks for employee and consumer protection, could be considered.[53] In addition, policies restricting import duties on DRE equipment such as batteries, inverters, smart meters, control software and other components of DRE systems which have been enacted in Senegal, could further support this trend in other countries. Providing access to consumer financing for rural end-users may also scale uptake of DRE projects and with that increase induced jobs in domestic MSME, such

52 PowerforAll, Powering Jobs Census 2022: The Energy Access Workforce, 2022
53 ARE, Consumer Protection Principles for Clean Energy Mini-grids, 2019; GOGLA, Principles of Consumer Protection, 2018

as shops and agriculture, empowered by DRE.

Lastly, governments with the support of international funding partners and regional centres could also consider **supporting the roll-out of quality infrastructure for renewables, developing standards for DRE products and services, and deploying certified training programmes** that maximise sustainability, skills development, job mobility across borders and domestic job creation in the DRE sector.

CHALLENGE	RECOMMENDATION FOR POLICY MAKERS TO CONSIDER	POSSIBLE SUPPORT INITIATIVES FOR GOVERNMENTS IN WEST AFRICA
Limited **youth** employment in DRE companies (below <15 %) and limited number of youth-led companies	Develop and support further tailored youth employment policies, training programmes and academies promoting digital and entrepreneurial skills in the country, and work towards matching programmes between schools and employers	ARE "Innovation 4 Electrification Hub" RES4Africa Microgrid Academy
Limited **women** employment in DRE companies (below <40 %) and limited number of women-led companies	Adopt and enforce "ECOWAS Policy for Gender Mainstreaming in Energy Access", as well as conduct technical and entrepreneurial capacity building programmes for women entrepreneurs in partnership with associations and regional centres[54]	ECREEE Programme on Gender Mainstream in ECOWAS ARE Investment Academies GET.invest Finance Readiness support
Restrictive conditions for domestic **MSME** scale-up meaning lost opportunities to grow the pool of formally employed and skilled workers	Support general ease of doing business, digitisation, simplified administrative procedures and development of frameworks for employee and consumer protection, and introduce policies that could help to accelerate affordable access of DRE equipment	World Bank B-READY GOGLA Consumer Protection Principles for SHS ARE Consumer Protection Principles for Clean Energy Mini-Grids

54 ARE, Women Entrepreneurs as Key Drivers in the DRE Sector: Best Practices and Innovative Business Models, 2020

Limited amount of **private sector** DRE companies active: lost potential of enabling skills transfer and jobs from international DRE companies	Balance out the level of government control over the DRE deployment with the financial contribution the government is willing to provide and the tariff applied to rural electricity customers. Different delivery models allow for specific combinations and degrees of achievement of the different objectives.	UNIDO, AfDB, ARE, AMDA Clean Energy Mini-Grid Policy Guide Technical assistance, for example through EU TAF, AfDB, GET.transform, IRENA and Regional Centres for Renewable Energy and Energy Efficiency, such as ECREEE ARE public-private dialogues
	Establish dedicated rural electrification agency and funding mechanism/ fund under MoE to deliver last-mile electrification (for example Rural Electrification Fund)	
	Level subsidy playing field for utility-scale vs. DRE and especially between diesel generators and clean energy alternatives (for example solar generators[55])	
	Limit import duties and provide VAT exemptions for DRE equipment (incl. batteries, inverts, smart meters and other components of DRE systems)	
	Explore additional funding streams for DRE projects and large-scale support programmes, for example via carbon financing through development of Voluntary Carbon Market (VCM) country plans to support carbon-credit production by clarifying government responsibilities, setting out market incentives and establishing transparent regulation of the sector within the context of each government's commitments under the Paris climate agreement	Africa Carbon Markets Initiative (ACMI) ARE Financier Circle
Limited **productive use** uptake from DRE projects and a massive untapped potential for induced job creation in domestic businesses (especially MSMEs) that could be empowered by DRE	Support consumer financing for DRE productive uses, enabling end-user access to DRE equipment and catalysing induced jobs from DRE	ADEME-ARE programme on Productive Use of Energy Uptake in francophone Africa

55 Access to Energy Institute, SKGS in Nigeria: Solar Generators Gather Pace, 2022

Ensuring **product and service quality** to ensure long-term market and job sustainability	Develop and enforce high-quality technical standards to ensure long-term sustainability of DRE markets	Cornerstone of Rural Electrification (CORE)
	Promote energy efficiency to improve grid T&C and limit grid losses, enabling DRE interconnections with main grid, reliable electricity and O&M jobs	Grid Efficiency and Resilience (GEAR)
Limited **domestic skilled work force** in DRE	Technical training programmes to create job force and conversion courses, including certification of DRE training curricula and exams in collaboration with ECREEE to ensure job mobility and skilled labour across countries	Cornerstone of Rural Electrification (CORE) STAR-C programme
	Promote domestic assembly and/ or manufacturing to further enhance domestic value chains and spur domestic job creation.	Renewable Energy Manufacturing Initiative

Annex 1: Methodology

Scope of the study

Why Ghana and Senegal? The two countries represent different sizes and stages of DRE market development. They also represent different market scales and levels of development. Local DRE market size determined by sales, installed capacity, geographical representation and total number of companies.

DRE systems: Decentralised Renewable Energy systems include stand-alone systems such as SHS, clean energy mini-grids and C&I installations.

What DRE companies are included? The survey covered DRE companies working in off-grid, weak-grid and on-grid market segments across clean energy mini-grids, SHS and C&I.

DRE value chain: All parts of the value chain were covered, including sales, project development and installation, service, appliances, O&M, manufacturing, wholesale imports, and other DRE services such as finance, software, and technical support. The study excludes out-of-country operations and end-of-life waste management, regardless of where it occurs.

DRE technology spectrum: The study mainly includes solar DRE technology, such as solar lanterns, SHS, solar irrigation, C&I solar systems, clean energy mini-grids, pico-solar appliances, stand-alone and grid-tied C&I solar systems, productive use systems such as solar water pumps and heaters. No clean cooking technologies are included. Other DRE technologies are also included in the study (such as bioenergy and small hydro) but represent a relatively small segments of the overall picture.

Ghana's hydro: Ghana originally relied on hydropower from two dams but had to diversify its energy mix in the 1990's due to changing rainfall patterns. The country mainly introduced thermal generation capacity using crude oil and natural gas, decreasing hydro-generated electricity from 68% to 36% in 2000. By 2021, hydro made up 5% of the country's energy supply.[56]

DRE jobs: The scope of the study is to focus on direct formal and informal jobs. Indirect and induced jobs are only addressed in the case studies, as consultations showed that these are contextual, and the employment factor depends on the domestic productive uses of energy and other local factors. The study thus did not calculate an indirect employment factor per direct job.

Throughout the study, the following definitions were taken into consideration: direct jobs occur within the DRE sector. Indirect jobs would occur within the industries that supply the inputs of production for the DRE manufacturer, like the steel industry. Finally, induced jobs are those created in businesses enabled by the newly generated DRE (e.g., in a local shop that can now freeze products) and when workers from the DRE and steel industries spend their pay checks in the local economy to purchase food, and clothing.

DRE workforce trends: The study primarily looks at gender and youth representation. Further studies could dive deeper into details on where in the value chain jobs are placed.

Skills: Skilled jobs are defined by the ILO as those involving leadership, management, professional, technical or associate professional skills generally at the International Standard Classification of Occupations (ISCO) Skill Level 3 or above.

Data collection and analysis process

A consultation on the methodology was conducted for the study. Feedback obtained from key stakeholders ensured a thorough approach.

56 Ghana Energy Commission, 2022 National Energy Statistics, 2022

16 international key actors in the DRE industry, both members and non-members, as well as partners of ARE, were part of the consultation process which took place over three months (from April to July 2022). The input was received in writing and through bilateral virtual meetings. The consultation illustrated the strong interest of DRE actors on the topic of job creation in West Africa.

There are a number of ways to calculate job creation in the renewable energy sector.[57]

One way is by using an **input-output (I-O) model of the economy** which looks into direct employment and indirect jobs induced through multiplier effects of the sector as well as the economic impacts of spending by workers in the new jobs or account for losses in other energy sectors. For example, installing wind turbines is a direct job, whereas manufacturing the steel that is used to build the wind turbine is an indirect job. Although this method shows a complete picture of the economy, it can be opaque, and a number of assumptions are needed to reach a high level of aggregation. For example, policy-based figures make it impossible to know which specific set of policies are creating how many jobs and therefore what would happen to projected employment should one or more policies be implemented in a different form as suggested in the methodology.

The other method uses spreadsheet-based analytical models, typically only looking at direct employment impacts including those jobs created in the manufacturing, delivery, construction/installation, project management and O&M of the different components of the technology. **Although this methodology is more likely to under-report overall employment impacts, it is much more transparent**. The assumptions are clear, and it is possible to conduct sensitivity analyses. In view of the large informal sector in both Ghana and Senegal, this method also allows for a clear and concrete numbers, which is why this study will take this approach.

Following data collection through the survey, the weighted average was calculated to showcase the number of people employed per kWp. Weighted average is calculated by accumulating the sum of each set of data (number of employees for example) from all contributors in the country and dividing that by the number of contributors (as opposed to calculations done per contributor and the average calculated as a second step).

$$\text{Average} = \frac{\left(\text{N° of employees per contributor} \,/\, \text{Sum of capacity installed (kWp) per contributor}\right)}{\text{N° of contributors}}$$

$$\text{Weighted average} = \frac{\text{sum of number of employees of all contributors}}{\text{sum of capacity installed (kWp) of all contributors}}$$

Employment Factor

The study calculated DRE impact on jobs through an “Employment Factor”, which estimates how many direct jobs are created for each kWp of DRE installed in West Africa. The ‘Employment Factor’ accounts for both full and part time jobs. This calculation made for direct jobs was then extrapolated to estimate the current DRE job impact in a given country based on how many kWp of DRE are installed. The calculation method for the “Employment Factor” is as follows:

Employment Factor: Ratio = Total jobs (jobs created – jobs lost) / total kWp installed

Example: ARE Members and Partners report to have created an estimated 500 direct jobs through 2,000 kWp of projects worldwide (via an

57 Daniel M. Kammen, Kamal Kapadia, Matthias Fripp: “Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate”, 2004

industry survey). The "Direct DRE Employment Factor" would be: 2,000 kWp / 500 jobs = 4.

To calculate the "Employment Factor", ARE differentiated the factor for stand-alone systems (based on sales) and mini-grids (based on kWp installed). It also conducted a **sector-wide industry survey**, including the entire value chain from manufacturing to waste companies, disseminated to **ARE's network of DRE companies from or active in West Africa**.

Limitations and application of key findings

The report encountered a number of limitations to conduct the study. These included the **desk-based approach** of the study which hindered the direct contact with contributors especially in a country where face-to-face encounters are still the dominating way of working with limited reactivity or openness to unsolicited encounters through digital means.

Another limitation faced during the survey in particular, was the **limited reactivity** to the initial more detailed survey since it required extensive dedicated time to gather the necessary data. A shortened survey was developed which did not address the same granular detail and therefore hindered a detailed analysis of the numbers on the ground.

In addition, the understanding across both countries for technical **terminology** such as FTE was not always guaranteed and may have impacted the final numbers.

In terms of the **interpretation of the data**, the figures extrapolated represent those of the contributors and their subcontractors further downstream to a certain extent. They do not cover the value chain further upstream, nor those further downstream that were not reached by the survey.

The limited answers received from contributors who only provide C&I or PU solutions made it difficult to **analyse** clear differences between those solutions, and the shortened survey did not allow for a more detailed analysis of systems from contributors who provide a variety of solutions.

A final limitation of the study is that it operates under the assumption that the **Business-As-Usual scenario, based on the current Government objectives for renewable energy penetration and electrification,** will actually be achieved, which is not a given and beyond the control of the authors.

Folow us on

www.ruralelec.org

Rue d' Arlon 63

1040 Bruxelles, Belgique

Tel : +32 2 400 10 00

E-mail : are@ruralelec.org

KONRAD ADENAUER STIFTUNG

Alliance for Rural Electrification

Shining a Light for Progress