National Bioenergy Action Plans (NBAPs)

Sierra Leone

Period [2020-2030]

Within the implementation of the

ECOWAS Bioenergy Policy (EBEP)

Date: March 2020

Contact:
Include the contact details of the ministry in charge of energy

Developed with technical assistance of:

ECREEE

ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE)
http://www.ecreee.org

Supported by:

AUSTRIAN DEVELOPMENT COOPERATION

Within the framework of

SUSTAINABLE ENERGY FOR ALL

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ABBREVIATIONS AND ACRONYMS

CC	Climate Change
DDO	Distillate Diesel Oil
EBEP	ECOWAS Bioenergy Policy
ECOWAS	Economic Community of West African States
ECOW-GEN	ECOWAS Programme on Gender Mainstreaming in Energy Access
ECREEE	ECOWAS Centre for Renewable Energy and Energy Efficiency
EE	Energy Efficiency
EEEP	ECOWAS Energy Efficiency Policy
EREP	ECOWAS Renewable Energy Policy
ETBE	Ethyl-tertio-butyl-ether
FIT	Feed-in-Tariff
GDP	Gross Domestic Product
GWh	Gigawatt-hour
ha	hectare
ICS	Improved Cookstoves
ktoe	kilotonne of oil equivalent
kV	kilo Volt
kVA	kilo Volt Amperes
kW	kilo Watt
LPG	Liquefied Petroleum Gas
MFP	Multi-Functional Platform
MTBE	Methyl—tertio-butyl-ether
MW	Mega Watt
MWh	Mega Watt hour
NBEAP	National Bioenergy Action Plan
NEEAP	National Energy Efficiency Action Plan
NGOs	Non-Governmental Organizations
NREAP	National Renewable Energy Action Plan
PPO	Pure Plant Oil
PV	Photovoltaic
RE	Renewable Energy
SE4AII	Sustainable Energy for All
SSHP	Small Scale Hydro Power
SVO	Straight Vegetable Oil
TGC	Tradable Green Certificates

TPES	Total Primary Energy Supply
UNIDO	United Nations Industrial Development Organization
VAT	Value Added Tax
VRA	Volta River Authority
WACCA	West African Clean Cooking Alliance
WAGP	West Africa Gas Pipeline
WAPP	West African Power Pool

1 INTRODUCTION

The ECOWAS Bioenergy Policy (EBEP) was adopted by the ECOWAS Member States in December 2016 and the ECOWAS Heads of States on 4 June 2017.

In an effort to approach the challenges of providing sustainable and efficient Bioenergy services without compromising food security, it is necessary to develop appropriate and adequate policy instruments for Bioenergy at both regional and national levels. ECREEE, together with its partners, therefore elaborated and validated a Regional Bioenergy Strategy in Bamako Mali on the 22 March 2012. The Bioenergy Strategy document was adopted by the ECOWAS Ministers of Energy in Accra, Ghana on the 31 October 2012. One of the principal components of the Strategy Framework is the development of a regional Bioenergy policy. The ECOWAS Bioenergy Policy was developed with the financial support of UNDP and involved a multi-sectoral approach with active participation of all the major stakeholders of Energy, Agriculture, Forestry and the Environment. The ECOWAS Bioenergy Policy (EBEP) was finally adopted by the Authority of the ECOWAS Heads of State and Government in Monrovia in June 2017.

This policy seeks to promote a modern, sustainable and vibrant bioenergy sector in the region by creating an enabling environment that can unlock the potential by removing the institutional, legal, financial, social, environmental and capacity gaps and barriers. It is aimed at addressing the needs and constraints of the governments, the private sector and the local communities in using existing biomass resources including household, agricultural, fish/sea food, and industrial processing wastes and residues.

The policy document was prepared with technical support of the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) and a broad range of international partners (UNDP, Austria, and Spain). The policy includes minimum targets and scenarios for bioenergy and measures, standards and incentives to be implemented at both regional and national levels.

The following targets are proposed for the modern bioenergy sector:

Table 1: ECOWAS Bioenergy Policy Targets

Main Bioenergy target by 2020 / 2030	**baseline: 2012**	**2020**	**2030**
Share of efficient charcoal production	17%	60 %	100 %
Share of population using alternative modern fuels for cooking	27%	36 %	41 %
Biodiesel and bioethanol as share of fossil fuels consumption	<1%	5%	10%
Bioelectricity	+/- 100 MW	634 MW	2008 MW
Fuelwood saved from 2012[1]	NA	700 million tons	3 billion tons

Table 2: ECOWAS Bioenergy Policy Targets (With LPG and ICS as Alternative to reduce Traditional Wood energy consumption)

Main Bioenergy target by 2020 / 2030 (for LPG & ICS)	**baseline: 2012**	**2020**	**2030**
Share of population using improved cook stoves[2]	29%	60%	100%
Share of efficient charcoal production	17%	60 %	100 %
LPG penetration household level[3]	8%	20 %	26 %

[1] Saving 700 million of fuels wood correspond to roughly 18 billion USD based on current price of wood in Burkina Faso
[2] Improved cook stoves refer here to wood and charcoal burning stoves
[3] LPG is taken here in the table because of its capacity to replace traditional biomass use

Bioenergy Policy targets by 2020:

1) Universal access to clean, safe and affordable cooking energy, including 20% of LPG users. Such a scenario represents:
   a. over 10 million of additional household users of LPG as primary fuel in comparison with the 2012 situation,
   b. about 15 million additional households using ICS as main cooking device and/or sustainable biomass fuel as primary fuel,
   c. 700 million tons of wood saved between 2012 and 2020 e.g. 18 billion USD

2) 26 % of electricity from Renewable Energy source (2,425 MW) in the region; of which 634 MW is generated from biomass residues or dedicated plantations with the deployment of sustainable and efficient technologies and application including:
   a. Biomass heat and power: systematic approach to sugar processing companies and other large-scale producer of biomass to valorise their waste stream to electricity.
   b. Waste-to-energy: connecting with cities/municipalities, agro-industries, slaughterhouses, and waste water treatment plant to convert waste into electricity, biogas, pellets/briquettes, etc.
   c. Electricity from wood plantation in countries such as Liberia, Guinea and Sierra Leon
   d. Biogas production, gasification of agricultural residues for energy (electricity, heating and cooking) in association with NGOs and local communities, including women in the rural areas.

Bioenergy Policy target by 2030:

1) Universal access to clean, safe and affordable cooking energy, including 26% of LPG users and 100% of improved cookstoves (ICS) and/or sustainable biomass fuels users. Such a scenario represents almost 3 billion tons of wood saved between 2012 and 2030. The graph below represents the expected situation by 2020 and 2030 with regards to improved solid biomass fuels, the dissemination of improved stoves and the sustainable production of biomass.
2) Electricity from biomass will account for 5 % of the total installed capacity in the region, which corresponds respectively to 686 MW by 2020 (28% of RE capacity) and 2008 MW (13% of RE Capacity) by 2030.

For domestic applications, transportation and financing:

- Ensure universal access to improved cook-stoves to 100% by 2020;
- Increase the share of the population served with modern fuel alternatives for cooking to 36% by 2020 and 41% by 2030;
- Increase the penetration of LPG for cooking to 20% by 2020 and 26% by 2030;
- Increase the share of efficient charcoal production to 60% by 2020 and 100% by 2030;
- Introduce blending ratios for Ethanol/bio-diesel in transport fuels of 5% by 2020 and 10% by 2030;
- Conduct research on the use of ethanol and other fuels as domestic cooking fuels;
- Reduce fuelwood consumption, as a result of the Policy implementation, by 700 million tons by 2020 and 3 billion tons by 2030;
- Create instruments for financing sustainable energy, including carbon finance in the longer term, establish a regional fund for the development and implementation of sustainable energy projects.

For minimizing health risks, gender imbalance and improve socio-economic wellbeing

- Reduce health risks associated with smoke inhalation and long distances travelled by women and children by introducing very efficient burners for cooking and heating that consumes less woodfuels and reduce travel time;
- improve livelihoods through involving small-scale farmers as direct producers or out-growers enabling them to generate new income, opening up employment opportunities, and thereby alleviating poverty and boosting rural incomes;
- Use of agricultural residues can lead to more investments and modernization of the agricultural sector by increasing mechanization, but taking measures to minimize the impact on biodiversity, land use, soils, and water resources.

For enhancing Agricultural productivity

- reduce the poor practices of “slash and burn” as a way to clear land, as such practices negatively impact on biodiversity (insects, plants, etc) and contribute to soil erosion;
- The use of slurry (residue of biogas production) and nutritive ash (residue of controlled combustion processes or biochar) can greatly improve the soil and increase agriculture yields.

For enhancing the Environment:

- Stimulating farmers to collect and/or use agricultural waste, rather than burning it as an additional source of income and/or increase energy access and reduce dependence on the natural forest;
- Use of agro-industrial waste coupled with use of efficient devices and systems will help save 700 million tons of wood by 2020 and 3 billion tons by 2030

Part A: BASELINE REPORT

The EBEAP foresees the development of Bioenergy Action Plans (NBEAPs) by the end of 2020 by all fifteen ECOWAS Member States. The five-year rolling NBEAPs will contribute to the achievement of the regional EBEP targets by 2020; 2025 and 2030. The NBEAPs have been prepared by the ECOWAS Member States in accordance with a template provided by ECREEE. The NBEAPs include baseline data on the status of bioenergy development, and propose attainable bioenergy targets, incl. gender, based on national potentials and socio-economic assessments. Moreover, an overview on concrete laws, incentives and measures to be implemented by the country to achieve the targets will be included. The implementation of the NBEAPs will be monitored by the Ministry of … (insert your Ministry) and ECREEE on behalf of the ECOWAS Commission during a continued consultative process. The NBEAP template was prepared with technical assistance of ECREEE. The NBEAP development process has been supported by our partner, the Governments of Austria.

2 SOCIO-ECONOMIC SITUATION

Please provide a general description of the country. Include the map showing the location of the country in Africa. Provide figures on indicators such as GDP, GDP per capita, population (urban and rural), poverty,

Table 3: socio-economic situation

	population			*GDP*	*GDP per capita*	*Poverty Rate*	Population growth rate
	Total	*urban*	*rural*				
2018							
2017							
2016							
2015							

3 PRIMARY ENERGY SUPPLY AND CONSUMPTION

Please describe briefly the country's energy sector, and analyze what are the main sources of energy in the country, demand and current energy trends, etc. fill in the tables below.

Table 4 : Total primary energy supply

Year	Total Primary Energy Supply (Mtoe)
2018	
2017	
2016	
2015	

Total Primary Energy Supply (TPES) is composed of: National production + imports - exports - international maritime bunkers - international aviation bunkers +/- stock changes.

Please indicate the quantity of energy consumed per end use in table form such as:

Table 5: Energy Consumption by sector in Mtoe for 2018 (or the most recent year for which data are available)

2018 (or most recent year)	Oil Products	Électricity	Firewood	Charcoal	Coal	Others	Total
Transport sector							
Industrial sector							
Tertiary sector (commercial and service)							

Agriculture and fisheries sector							
Residential sector							
Other sectors							
No energy use							
Total							

Oil Products include all petroleum products, including LPG

- **Fuel consumption for domestic applications**

Please indicate the fuels (including biofuels) consumed in households for energy applications. If applicable, provide figures on the number of households and the quantity of fuel they use, in pie chart format, such as:

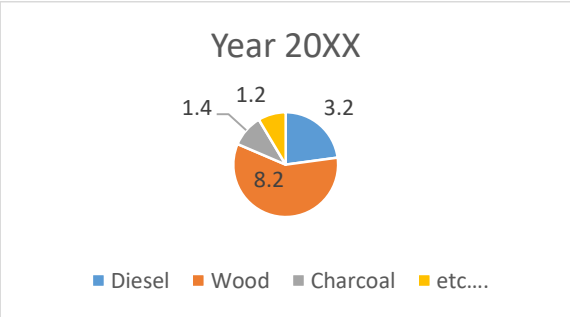

Figure xx : (put the legend of figure)

(Repeat a similar chart for other sectors like transport, commercial, etc)

Analyses of the energy situation showing the energy balance of the country (include narrative with graphics. Max 3 pages)

4 SUMMARY OF THE CURRENT BIONERGY SITUATION

4.1 Institutional arrangement

Describe briefly and analyse institutional situation of the bioenergy sector including clean cooking, institutional framework and fill in Institutions dealing with Bioenergy Programs and Projects; the interaction between these different institutions and fill in the tables below

4.1.1 Public institutions and research centres

4.1.2 Private sector (individuals included here)

4.1.3 NGO/Civil Society or other association

4.2 Legal and Regulatory Framework

Describe and analyse existing policies and measures for enabling sustainable Bioenergy service delivery (including biomass conservation, clean cooking, forestry, environment, agriculture, transport, etc). (Attach the measure/policy or regulatory mechanism as Annex)

Table 6: Overview of policies and measures

Name of the measure	Type of measure*	Expected results**	Target group***	Sector or activity	Start and end dates of the measure

1.					
2.					
3.					
…					

** Indicate if the measure is (predominantly) regulatory, financial or soft (i.e. information campaign).*

***Is the expected result behavioural change, installed capacity (MW; t/year), energy generated (MWh/year)?*

****Who are the targeted persons: investors, end users, public administration, installers, urban or rural population, health centres etc.?*

Please add lines as required.

4.3 Overview of Bioenergy Technologies and Services *(For each table below in each of the sections, complete it and analyse the situation with graphs and provide a narrative of the situation)*

4.3.1 Cooking Fuels

Table 7: Cooking fuels consumption over the past 3 decades

Quantity of domestic fuels and stoves	1990	199..				2000	2010	2018
Firewood (Metric tons)								
Charcoal (Metric tons)								
Briquettes/pellets (Metric tons)								
Bioethanol (Litres)								
Biodiesel (litres)								
Biogas (CUM)								
Agro-industrial waste (Metric tons)*								

* Provide estimates where possible

Table 8: Price of cooking fuels (USD/kg)

Prices of domestic fuels and stoves	1990	199..				2000	2010	2018
Firewood (Metric tons)								
Charcoal (Metric tons)								
Briquettes/pellets (Metric tons)								

4.3.2 Bioenergy Devices

Table 9: ICS and others cookers

Quantity produced	1990	199..				2000	2010	2018
Solar cookers								
Improved cookstoves								
ethanol cooker								

Table 10: Price of devices

Prices	1990	199..				2000	2010	2018
Solar cookers								
Improved cookstoves								
ethanol cooker								

Table 11: number of Installed Bio-digesters per capacity (complete the table with existing volumes)

Capacity	1990	199..		2000		2010	20..	2018
10 m^3								
20 m^3								
30 m^3								
…..								
…..								
Total number								

Table 12: Price of installing Biogas Digesters

Capacity/Prices	1990	199..		2000		2010	20..	2018
10 m^3								
20 m^3								
30 m^3								
…..								
…..								

Table 13: LPG cylinders data (fill in the table with existing capacities in the country)

Cylinder	1990	199..		2000		2010	20..	2018
3kg								
6kgl								
9kg								
12.5kg								
28kg								
38 kg								
…….								

Total								

Table 14: LPG Cylinder prices (USD equivalent)

Cylinder	1990	199..		2000		2010	20..	2018
3kg								
6kgl								
9kg								
12.5kg								
28kg								
38 kg								
…….								

4.3.3 Heating Fuels

Table 15: Indicate the quantity of fuel used for boilers/hotel, laundry, bakery and fishing industry

Quantity fuels	1990	199..		2000		2010	20..	2018
***Agro industrial waste (metric tons)**								
Biogas (M^3)								
LPG (metric tons)								
Ethanol (Kilo litres)								

* disaggregate by type of used biomass (bagasse or molasses of sugar cane, coconut husks, oil palm residues, sawdust from sawmills; etc.)

4.3.4 Electricity production

Electricity generation from various biomass resources. Include quantity of waste/resource, electricity produced. Name and location of the plant, capacity installed. Include here also mechanical power generation (multi-functional platform - MFP)

Table 16: installed capacities (grid connected)

Capacity installed (MW)	1990	199..				2000	2010	2018
Total installed capacity								
RE (including medium and large Hydro)								
Total Bioenergy								
Biogas								
Biodiesel								
Bioethanol								

Capacity installed (MW)	1990	199..				2000	2010	2018
Agro-industrial waste (Bagasse, sawdust, etc)								
Pellets/briquettes								
Municipal solid waste								

Table 17: Energy production (grid connected)

Production (GWh)	1990	199..				2000	2010	2018
Total Production								
RE (including medium and large Hydro)								
Total Bioenergy								
Biogas								
Biodiesel								
Bioethanol								
Agro-industrial waste (Bagasse, sawdust, etc)								
Pellets/briquettes								
Municipal solid waste								

Table 18: installed capacities (off grid)

Capacity installed (MW)	1990	199..				2000	2010	2018
Total capacity								
RE (including medium and large Hydro)								
Total Bioenergy								
Biogas								
Biodiesel								
Bioethanol								
Agro-industrial waste (Bagasse, sawdust, etc)								
Pellets/briquettes								
Municipal solid waste								

Table 19: Energy production (off-grid)

Production (GWh)	1990	199..				2000	2010	2018
Total Production								
RE (including medium and large Hydro)								
Total Bioenergy								

Production (GWh)	1990	199..				2000	2010	2018
Biogas								
Biodiesel								
Bioethanol								
Agro-industrial waste (Bagasse, sawdust, etc)								
Pellets/briquettes								
Municipal solid waste								

Table 20: Existing plant for electricity or mechanical generation

Name of the plant	*location of the plant,*	*installed capacity*	Type of Biofuel used	Grid connected / Off-grid/self-generation	Status (operating/not operating

4.3.5 Transportation

Table 21: Production/import

Quantity	1990	199..				2000	2010	2018
Gasoline (Litres)								
Diesel (Litres)								
Bioethanol (Litres)								
Biodiesel (litres)								

Table 22: Import

Quantity	1990	199..				2000	2010	2018
Gasoline (Litres)								
Diesel (Litres)								
Bioethanol (Litres)								
Biodiesel (litres)								

Table 23: Export

Quantity	1990	199..				2000	2010	2018
Gasoline (Litres)								
Diesel (Litres)								

Quantity	1990	199..				2000	2010	2018
Bioethanol (Litres)								
Biodiesel (litres)								

Table 24: National consumption

Quantity	1990	199..				2000	2010	2018
Gasoline (Litres)								
Diesel (Litres)								
Bioethanol (Litres)								
Biodiesel (litres)								

Table 25: Prices of biofuels per litre (USD)

Price/litre	1990	199..				2000	2010	2018
gasoline								
Diesel								
Bioethanol								
Biodiesel								

Table 26: existing biofuels producing companies

Name of the plant	*location of the plant,*	*capacity of production*	Type of biomass used	Type of biofuel produced (biodiesel, bioethanol, PPO/SVO	Status (operating/not operating	Area (hectares) used for biomass production

4.4 Biomass waste Resources

4.4.1 Biomass from forestry residues:

a) Please indicate how much land is degraded.

(b) Please indicate how much arable land is not used.

(e) Is there a specific policy to promote reforestation?

4.4.2 Biomass from Municipal Waste

(a) Please specify the number of municipal waste dump sites

(b) Are there waste dump sites for power generation, biogas, or landfills? Please specify the waste-to-energy projects and specify the location and capacities

(c) Is there any policy or mandate for municipalities to improve municipal waste transformation into energy?

4.4.3 Biomass from agricultural-industrial waste

(a) Please specify the number of agro-industrial waste sites

(b) Is there any policy or mandate to reuse the wastes from agro-industrial processes?

(b) Please specify the type and number facilities that generate waste from agro-industrial activities?

4.4.4 Biomass from animal/abattoir waste

a) Please specify the number of animal/abattoir waste sites (include here the number of agricultural farms with animals, poultry, etc that generate animal/abattoir waste)

(b) Is there any policy or mandate to reuse the wastes from animal/abattoir waste?

(c) Are there waste resources used for power generation, cooking or heating (domestic/institutional)? Please specify the waste-to-energy projects and specify the location and capacities from animal/abattoir activities

4.5 Overall summary of the national Bioenergy Situation (narrative with the analysed data) *(conclude here the outcome of the Bioenergy situation following your analyses of data)*

4.6 Main Challenges

4.7 Opportunities

Part B: NATIONAL ACTION PLAN

5 SUMMARY OF TARGETS

Please include the status of bioenergy penetration in 2018 and specify the targets your country intends to achieve by 2020, 2025 and 2030 as contribution to the attainment of the targets of the ECOWAS bioenergy Policy (see targets in the EBEP above). The indicated targets in this section should undergo approval of the respective institutions in the ECOWAS Member State.

Table 27: National Bioenergy Targets (With LPG and ICS as Alternative to reduce Traditional Wood energy consumption)

Main Bioenergy target by 2020 / 2030	baseline: 2018	2020	2025	2030
Share of efficient charcoal production in %				
Share of population using bioethanol (liquid/gel) for cooking in %				
Share of population using biogas for cooking in %				
Share of population using briquettes/pellets for cooking in %				
Biodiesel as share of diesel fuels consumption in %				
Bioethanol as share of gasoline fuels consumption in %				
Bioelectricity				
Share of population using improved cook stoves[4]				
LPG penetration at household level[5] in %				
Fuelwood saved from 2018 in tons				

6 BIOENERGY TARGETS AND TRAJECTORIES

6.1 Domestic cooking Targets

Table 28: Targets for domestic cooking energy

Quantity of domestic fuels and stoves	2018	2020	2025	2030
Firewood (Metric tons)				
Efficient Charcoal (Metric tons)				
Briquettes/pellets (Metric tons)				
Bioethanol (Litres)				
Biodiesel (litres)				
Biogas (m^3)				
Agro-industrial waste (Metric tons)				
Municipal solid waste (Metric tons)				

[4] Improved cook stoves refer here to wood and charcoal burning stoves

[5] LPG is taken here in the table because of its capacity to replace traditional biomass use

Table 29: ICS and other cookstoves

Quantity of domestic fuels and stoves	2018	2020	2025	2030
Quantity				
Solar cookers				
Improved cookstoves				
ethanol cooker				

Table 30: Projection of # of Bio digesters Installations

Capacity	2018	2020	2025	2030
10 m^3				
20 m^3				
30 m^3				
…..				
Total				

Table 31: LPG cylinders trajectory (fill in the table planned capacities in the country)

Capacity	2018	2020	2025	2030
3kg				
6kgl				
9kg				
12.5kg				
28kg				
38 kg				
…….				
Total				

6.2 Bioelectricity Targets

Indicate here the total electricity produced in the country from biomass resources for the base year 2018 and also indicate the targets for 2020, 2025 and 2030. Please refer to the NREAP and NEEAP for the targets already provided for both the electricity and energy targets.

Table 32: Targets for the share of grid-connected Bioelectricity for 2018, 2020, 2025 and 2030 (Note: Energy produced for mechanical power can be classified under Bioelectricity)

Installation Capacity (MW)	2018	2020	2025	2030
Biogas				

Biodiesel				
Bioethanol				
Agro-industrial waste (Bagasse, sawdust, etc)				
Pellets/briquettes				
Municipal solid waste				
Others (specify)				
Total				

Table 33: Targets for the share of off-grid-connected Bioelectricity for 2018, 2020, 2025 and 2030 (Note: Energy produced for mechanical power can be classified under Bioelectricity)

Installation Capacity (MW)	2018	2020	2025	2030
Biogas				
Biodiesel				
Bioethanol				
Agro-industrial waste (Bagasse, sawdust, etc)				
Pellets/briquettes				
Municipal waste				
Others (specify)				
Total				
Others (specify)				
Total				

Electricity production in GWh	2018	2020	2025	2030
Biogas				
Biodiesel				
Bioethanol				
Agro-industrial waste (Bagasse, sawdust, etc)				
Pellets/briquettes				
Municipal waste				
Others (specify)				
Total				

Table 34 : National 2020 and 2030 targets and estimated trajectory for rural population served by Bioelectricity

	2018	2020	2025	2030
Total Rural Population (number of inhabitants)				
Rural population served with electricity services (number of inhabitants)				
Rural population served with electricity services (% of total)				
Rural population served with bioelectricity services (bioenergy only and hybrid) (number of inhabitants)				
Rural population served with renewable electricity services (bioenergy only and hybrid) (%)				

6.3 Bioenergy applications for domestic uses

In this section, Member States are required to set their targets regarding bioenergy applications for domestic uses in 2020 and 2030 as well as its trajectory.

Table 35: National 2020 and 2030 targets and estimated trajectory for domestic cooking energy

	2018	2020	2025	2030
Population served with improved cookstoves (number of inhabitants)				
Share of population using improved cookstoves in %				
Total charcoal production in tons				
Charcoal production with efficient technologies (yield superior to 25%) in tons				
Share of charcoal produced with efficient technologies in %				
Population using modern cooking fuel alternatives (LPG, biogas, solar cookers,) (number of inhabitants)				
Population using LPG (number of inhabitants)				
Population using biogas (number of inhabitants)				
Population using solar cookers (number of inhabitants)				
Population using ethanol cookers (number of inhabitants)				
Others				

Share of population using modern fuel alternatives for cooking (e.g. LPG, biogas, solar cookers,) (% of the total population)				
Share of Population using LPG (% of the total population)				
Share of Population using biogas (% of the total population)				
Share of Population using solar cookers (% of the total population)				
Share of Population using ethanol cookers (% of the total population)				
Others				

** or the most recent year for which statistics are available*

6.4 Biofuel for transportation

In this section, Member States are required to set their biofuel usage targets by 2020, 2025 and 2030

Table 36: National targets and estimated trajectory of biofuel usage for 2020, 2025 and 2030

	2018	2020	2025	2030
National gasoline consumption (Kilo litres)				
National diesel consumption (Kilo litres)				
Production of biodiesel and straight vegetable oil (SVO) or pure plant oil (PPO (litres)).				
Production of ethanol (litres)				
Bioethanol consumption (kilo litres)				
Biodiesel consumption (Kilo litres)				
Bioethanol as share of national gasoline consumption (%)				
Biodiesel as a share of national Diesel consumption (%)				

7 MEASURES FOR ACHIEVING THE TARGETS

In the following chapter, the ECOWAS Member States are asked to include measures and activities how they intend to achieve the set targets in the previous chapter. The implementation of the activities will be monitored by ECREEE at regional level.

7.1 Summary tables of all policies and measures to promote the use of Bioenergy resources for grid connected and off-grid electricity generation, cooking/heating energy, and transportation.

Table 37: Overview of policies and measures

Name of the measure	Type of measure*	Expected results**	Target group And/or activity***	Existing or planned	Start and end dates of the measure
1.					
2.					
3.					
…					

** Indicate if the measure is (predominantly) regulatory, financial or soft (i.e. information campaign).*

***Is the expected result behavioural change, installed capacity (MW; t/year), energy generated (MWh/year)?*

****Who are the targeted persons: investors, end users, public administration, planners, architects, installers, urban or rural population, health centres etc.? or what is the targeted activity / sector: biofuel production, energetic use of animal manure, etc.)?*

Please add lines as required.

7.2 Specific measures for the promotion of efficient cookstoves

How efficient cookstoves are being promoted? Please provide details regarding the awareness raising and other information campaigns being implemented or planned, including how messages are developed to target the differentiated needs, interests and literacy levels of women and men in the country

7.3 Specific measures for the promotion of efficient charcoal production

How efficient charcoal production technologies are being promoted? Please provide details regarding the awareness raising and other information campaigns being implemented or planned, including how messages are developed to target the differentiated needs, interests and literacy levels of women and men in the country.

7.4 Specific measures for the promotion of modern fuel alternatives for cooking

How modern fuel alternatives for cooking (LPG, biogas, ethanol, solar cookers,) are being promoted? Please provide details regarding the awareness raising and other information campaigns being implemented or planned, including how messages are developed to target the differentiated needs, interests and literacy levels of women and men in the country.

7.5 Support schemes to promote the use of biofuels

What are the concrete obligations / targets per year (per fuel or technology)?

7.6 Specific measures for the promotion of the sustainable use of energy from biomass

Biomass has an important role as primary energy in rural and peri-urban areas. National biomass strategy is crucial to promote the use of biomass sustainably. Therefore Member States are required to assess their current level of consumption and domestic potential and, implement measures to promote the rational use of biomass.

7.6.1 Biomass supply

Under this section, Member States should assess the supply of domestically available biomass and the need for imports and exports. There should be a focus in the identification of the sustainable level of biomass supply.

7.6.2 Measures to increase biomass availability: Mobilisation of new biomass sources:

7.6.2.1 Biomass from forestry residues:

(a) Are any measures planned to encourage unused arable land, degraded land, etc. to be used for energy purposes?

(b) What measures are planned to improve forest management techniques in order to maximise the extraction of biomass from the forest in a sustainable way? How will forest management be improved in order to increase future growth? What measures are planned to maximise the extraction of existing biomass that can already be put into practice?

7.6.2.2 Biomass from Municipal Waste

What measures are planned to improve the municipal waste management in order to minimise the environmental impact and maximise the extraction of bioenergy (biogas, landfill or electricity)? How will the management of municipal waste be improved in order to plan for future growth?

7.6.2.3 Biomass from agricultural-industrial waste

What measures are planned to improve the reuse of waste in order to minimise the environmental impact and maximise their reutilisation?

7.6.2.4 Biomass from animal/abattoir waste

What measures are planned to improve the reuse of waste in order to minimise the environmental impact and maximise their reutilisation?

8 PREPARATION OF THE NATIONAL BIOENERGY ACTION P.LAN

(a) How were regional and/or local authorities and/or cities involved in the preparation of this Action Plan? Were other stakeholders involved?

(b) Are there plans to develop regional/local bioenergy strategies in the country? If so, could you please explain? In case relevant competences are delegated to regional/local levels, what mechanism will ensure national target compliance?

(c) Please explain the public consultation process carried out for the preparation of this Action Plan.

8.1 Actions plan (aligned with Regional Policy)

Indicate actions. Activities required to achieve bioenergy targets. The national priority have to be align with EBEP pillars and identify actions at national level.

1. **Policy guideline 1:**

General Objective 1

Expected outcome 1

Action 1.1 :

Objective	
Justification	
Description	
Expected Outcome	
Target Population	
Entity responsible for execution	
Cost of the action	~USD
Execution time	

Action 1.2 :

Objective	
Justification	
Description	
Expected Outcome	
Target Population	
Entity responsible for execution	
Cost of the action	~USD
Execution time	

(For each Policy guideline, complete the action to be implemented in the tables)

2. **Policy guideline 2:**
3. **Policy guideline 3:**
4. **Policy guideline 4:**

8.2 Monitoring and follow-up on implementation

(a) Please indicate your national contact point / the national authority or body responsible for the follow-up of the Bioenergy Action Plan?

(b) Do you have a monitoring system, including indicators for individual measures and instruments, to follow-up the implementation of the Bioenergy Action Plan? If so, could you please give more details on it? If not define the monitoring system to put in place.

Indicate below actions required for monitoring the implementation of the national action plan

Action 6.1* **:**

Objective	
Justification	
Description	
Expected Outcome	
Target Population	
Entity responsible for execution	
Cost of the action	~USD
Execution time	

Action 6.2 :

Objective	
Justification	
Description	
Expected Outcome	
Target Population	
Entity responsible for execution	
Cost of the action	~USD
Execution time	

**Numbering of actions depend on the number of actions and policy guidelines*

9 ARTICULATION WITH REGIONAL INITIATIVES

The ECOWAS region has a series of on-going regional initiatives in the field of renewable energy:

- The ECOWAS White Paper on a Regional Policy for Increasing Access to Energy Services in Peri-Urban and Rural Areas by 2015;
- Establishment of ECREEE;
- ECOWAS Renewable Energy Policy (EREP) with targets for 2020 and 2030; Link: http://www.ecreee.org/sites/default/files/documents/ecowas_energy_efficiency_policy.pdf
- ECOWAS Energy Efficiency Policy (EEEP) with targets for 2020 and 2030; Link: http://www.ecreee.org/sites/default/files/documents/ecowas_renewable_energy_policy.pdf
- The ECOWAS Bioenergy Strategy
- ECOWAS Bioenergy Policy and Implementation Plan (EBEP) with targets for 2020 and 2030; Link: http://www.ecreee.org/sites/default/files/ecowas_bioenergy_policy.pdf
- WACCA (West Africa Clean Cooking Energy) Concept Note
- ECOWAS Policy on Gender Mainstreaming in Energy Services
- WACCA Regional Action Plan; Link: http://www.ecreee.org/sites/default/files/documents/basic_page/wacca_action_plan_v2_english.pdf
- Consolidated National Renewable Action Plan (NREAP)
- Consolidated National Energy Efficiency Action Plan (NEEAP)
- SEforAll Action Agenda; Link: http://se4all.ecreee.org/sites/default/files/final_report_on_se4all_consolidation.pdf
- Country National Action Plan for Clean Cooking
- Study Report on Novel Bioenergy Crop Potential in the ECOWAS Region; Link: http://www.ecowrex.org/sites/default/files/documents/news/biocrop_assesment_study_report_en_final.pdf

Besides the activities in renewable energy, the ECOWAS region has also a series of on-going activities in energy access:

- West Africa Power Pool (WAPP) and the ECOWAS Revised Generation and Transmission Master Plan ;
- The West Africa Gas Pipeline (WAGP);

- ECOWAS Rural Electrification projects.

Synergies between these regional initiatives and the proposed measures in this Plan will be created.

ANNEX I: ACTION PLAN

TOTAL BUDGET: xx USD

Policy Guideline 1 : **Objective1 :** **Outcome 1:** **Total 1 : xx USD**																		
Action	**Indicator**	**Calendar (Year, Quarter)**																**Budget USD**
		year				**year 2**				**Year 3**				**Year 4**				
		1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	
1.1 Action 1																		
1.2 Action 2																		
1.3 Action 3																		
1.4 Action 4																		
1.5 Action 5																		

Policy Guideline 2 : **Objective 2 :** **Outcome 2** **Total 2 : xx USD**																		
Action	**Indicator**	**Calendar (Year, Quarter)**																**Budget USD**
		year				**year 2**				**Year 3**				**Year 4**				
		1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	
2.1 Action 1																		
2.2 Action 2																		
2.3 Action 3																		
2.4 Action 4																		
2.5 Action 5																		

Policy Guideline 3 : **Objective 3 :** **Outcome 3** **Total 3 : xx USD**																		
Action	**Indicator**	**Calendar (Year, Quarter)**																**Budget USD**
		year				**year 2**				**Year 3**				**Year 4**				
		1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	
3.1 Action 1																		
3.2 Action 2																		
3.3 Action 3																		
3.4 Action 4																		

3.5 Action 5																	

Policy Guideline 4 : **Objective 4 :** **Outcome 4** **Total 4 : xx USD**																	
Action	**Indicator**	**Calendar (Year, Quarter)**															**Budget USD**
		year				**year 2**				**Year 3**				**Year 4**			
		1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	
4.1 Action 1																	
4.2 Action 2																	
4.3 Action 3																	
4.4 Action 4																	
4.5 Action 5																	

Policy Guideline 5 : **Objective 2 :** **Outcome 2** **Total 5 : xx USD**																	
Action	**Indicator**	**Calendar (Year, Quarter)**															**Budget USD**
		year				**year 2**				**Year 3**				**Year 4**			
		1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	
5.1 Action 1																	
5.2 Action 2																	
5.3 Action 3																	
5.4 Action 4																	
5.5 Action 5																	

Monitoring and implementation of bioenergy action plan **Total 6 : xx USD**																	
Action	**Indicator**	**Calendar (Year, Quarter)**															**Budget USD**
		year				**year 2**				**Year 3**				**Year 4**			
		1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	
6.1 Action 1																	
6.2 Action 2																	
6.3 Action 3																	
6.4 Action 4																	
6.5 Action 5																	

ANNEX 2 - DEFINITION OF TERMS USED IN THE ACTION PLAN

Agro-fuels: Solid biofuels obtained from crops, and residues from crops and other agricultural products. Residues from agricultural production include animal solid excreta, meat and fish residues. Agro-fuel is subdivided into bagasse, animal wastes and other biomass materials and residues (check definitions for bagasse, animal wastes and other agricultural residues).

Animal waste: Excreta of animals which, when dry, are used directly as a fuel. This excludes waste used in anaerobic fermentation plants. Fuel gases from these plants are under biogases (see biogas).

Bagasse: the fuel obtained from the fibre which remains after juice extraction in sugar processing

Biofuels: liquid or gaseous fuel for transport produced from biomass.

Other vegetable material and residues: biofuels not specified elsewhere and including straw, vegetable husks, ground nut shells, pruning brushwood, olive pomace and other wastes arising from maintenance, cropping and processing plants.

Solid biofuels: solid fuels derived from biomass.

Liquid biofuels: Liquids derived from biomass and generally used as fuels. Liquids biofuels comprise bio-gasoline, biodiesel and other liquid fuels (definitions of biogasoline, biodiesel and other liquid fuels are provided below).

Bio-gasoline: Liquid fuels derived from biomass and used in spark-ignition internal combustion engines. Common examples are: bioethanol; biomethanol; bio ETBE (ethyl-tertio-butyl-ether); and bio MTBE (methyl-tertio-butyl-ether).

Biodiesel: Liquid biofuels which are usually modified chemically so that they can be used as fuel in engines either directly or after blending with petroleum diesel. Biological sources of biodiesel include, but are not limited to, vegetable oils made from canola (rapeseed), soybeans, corn, oil palm, peanut, or sunflower. Some liquid biofuels (straight vegetable oils) may be used without chemical modification their use usually requires modification of the engine.

Biodiesel as a share of diesel and fuel-oil consumption (in %): The EREP sets conventional biofuels targets (1st Generation Biofuels) for the ECOWAS region as a whole, one of which is the biodiesel as a share of diesel and fuel oil consumption. In this template this is calculated by dividing the production of raw vegetal oil/biodiesel by the diesel oil/DDO/fuel oil consumption in the country.

Straight vegetable oil: When vegetable oil is used directly as a fuel, in either modified or unmodified equipment, it is referred to as straight vegetable oil (SVO) or pure plant oil (PPO).

Other liquid biofuels: liquid biofuels not elsewhere specified.

Biogas: gases arising from anaerobic fermentation of biomass. These gases are composed principally of methane and carbon dioxide and comprise landfill gas, sewage sludge gas and other biogases (check definitions for landfill gas, sewage sludge gas and other biogases). They are used mainly as a fuel but can be used as a chemical feedstock. . It is particularly relevante for cooking purposes or in the context of industrial uses (e.g. breweries, slaughter houses).

Landfill gas: biogas from anaerobic fermentation of organic matter in landfills.

Sewage sludge gas: biogas from anaerobic fermentation of waste matter in sewage plants.

Other biogases: biogases not elsewhere specified including synthesis gas produced from biomass.

Biomass: biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste. The uses of biomass for energy are very diverse: from the traditional, low-efficiency burning of wood in open fires for cooking purposes to the more modern use of wood pellets for the production of power and heat, and the use of biodiesel and bioethanol as a substitute for oil-based products in transport.

Large hydro power is an important renewable energy source for the provision of base load in the ECOWAS region. The

significance will grow with the implementation of the WAPP hydropower project pipeline.

Charcoal: The solid residue from the carbonisation of wood or other vegetal matter through pyrolysis. The amount of biomass (usually fuelwood) necessary to yield a given quantity of charcoal depends mostly on three factors:

- *parent wood density – the principal factor in determining the yield of charcoal from fuelwood is parent wood density, since the weight of charcoal can vary by a factor of 2 for equal volumes*
- *moisture content - moisture content of the wood also has an appreciable effect on yields - the drier the wood, the greater is the yield - ; and*
- *the means of charcoal production: charcoal is produced in earth-covered pits, in oil drums, in brick or steel kilns and in retorts. The less sophisticated means of production generally involve loss of powdered charcoal (fines), incomplete carbonization of the fuelwood and combustion of part of the charcoal product, resulting in lower yields.*

Traditional non-efficient charcoal production methods: traditional charcoal production methods include open pits, oil drums and kilns with lower efficiencies. In the ECOWAS charcoal is mainly produced by traditional methods in the informal sector (e.g. open pits and kilns) which are inefficient (60-80% of the energy in the wood is lost) and has impacts on the health and on the environment.

Efficient charcoal production: efficient charcoal is the terminology used on this template for the charcoal produced by modern methods that are more efficient than traditional ones. The modern methods use sealed containers and have higher efficiencies and thus higher yields. Within the EREP, under the targets for domestic cooking, a target for efficient charcoal production is set: 60%/100% of the charcoal production should be by improved carbonisation techniques (yield >25% in 2020 and 2030, respectively. In this template the MS is asked to set out its target and trajectory for efficient charcoal production. This is calculated by dividing the quantity of charcoal produced by improved carbonisation techniques with yield superior to 25% in tonnes by the total charcoal production in tonnes.

Conservation: The reduction of energy usage through increased efficiency and/or reduced waste.

DDO: stands for Distillate Diesel Oil

Distributed and Microgeneration: This is when electricity is generated for local distribution and is not connected directly to the national grid. Microgeneration is typically used to describe smaller scale generating technology.

Energy Efficiency appliances: Electrical devices or appliances that perform their task, and use less electricity than lower-efficient devices. Electrical inefficiency in many devices is directly related to the heat they produce. For example, energy efficient light bulbs use most of the incoming electrical energy to produce light, not heat. Inefficient air conditioning is a major cause of peak hours in the ECOWAS region.

Electricity: The transfer of energy through the physical phenomena involving electric charges and their effects when at rest and in motion. Electricity can be generated through different processes: e.g. by the conversion of energy contained in falling or streaming water, wind or waves or by the direct conversion of solar radiation through photovoltaic processes in semiconductor devices (solar cells); or by the combustion of fuels.

Electricity demand: The total electricity consumption in GWh or MWh consumed by a country annually. This includes the demand of the complete system including the in circuital consumption and the losses.

Electricity mix: The range of energy sources of a region/country (either renewable or non-renewable) that is used to produce electricity,

Energy access: A universal and affordable access to modern means of energy. It implies access to modern cooking solutions defined as relying primarily on non-solid fuels for cooking. It also implies access to electricity, defined as availability of an electricity connection at home or the use of electricity as the primary source of lighting that can provide non-served communities and households with a modern life and economic development.

Energy Efficiency: the ratio of performance or output of performance of services, goods or energy to input of energy. The energy efficiency of a process is improved if it produces the same service using less energy. Energy-efficient light bulbs produce the same amount of light but use up to 75% less energy to do so. Improving energy efficiency helps reducing energy use or bringing more energy services with the same amount of energy consumed.

Ethanol: also called ethyl alcohol, pure alcohol, grain alcohol or drinking alcohol, is a volatile, flammable, colourless liquid that

can be used for several different purposes, being one of them as fuel. As fuel, ethanol is used as a motor fuel and fuel additive (e.g. Brazil relies in Ethanol as a motor fuel). Ethanol is also used for household heating as a relatively safe fuels.

Ethanol as share of gasoline consumption: The EREP sets first generation biofuels targets for the ECOWAS region as a whole, one of which is the ethanol as a share of the gasoline consumption. This is calculated by diving the quantity of ethanol produced by the quantity of gasoline consumed in the country and it is show in %.

Fossil Fuel: An energy source formed in the Earth's crust from decayed organic material. The common fossil fuels are oil, diesel, coal, and natural gas. Some ECOWAS countries are highly dependent on diesel electricity generation.

Fuelwood, wood residues and by-products: fuelwood or firewood obtained from natural or managed forests or isolated trees. Also included are wood residues used as fuel and in which the original composition of wood is retained. In the ECOWAS region fuelwood is the principal source of energy for cooking and heating, however statistics on fuelwood are generally poor as it is mainly produced and traded in the informal sector.

Grid-connected: a system (photovoltaic, hydro, diesel, etc.) that is connected to a centralised electrical power network (power grid).

Generation (electricity): This covers the production of electricity at power stations.

Heat: Heat is an energy carrier primarily used for warming spaces and industrial processes

Hybrid System: a power system consisting of two or more power generating subsystems (e.g. combination of a wind turbine or diesel generator and a photovoltaic system)

Improved cookstoves (also called clean/efficient cookstoves): is a device that is designed to consume less fuel and save cooking time, convenient in cooking process and creates smokeless environment in the kitchen or reduction in the volume of smoke produced during cooking against the traditional stove; and thus addressing he health and environmental impacts associated with traditional cookstoves. Traditional cookstoves (open fires and rudimentary cookstoves using solid fuels like wood, coal, crop residues and animal dung) are inefficient, unhealthy, and unsafe, and inhaling the acrid smoke and fine particles they emit leads lead to severe health problems and death. Traditional cookstoves also place pressure on ecosystems and forests and contribute to climate change through emissions of greenhouse gases and clack carbon. Within the EREP targets are set for improved cookstoves, as the pressure on the ECOWAS woodland will grow exponentially. Thus the policy includes the banning of inefficient stoves after 2020, enabling 100% of the population of the urban areas to use high efficient wood and charcoal stoves (with efficiencies higher than 35%) from 2020 onwards and 100% of the rural population to use high efficient charcoal stoves from the same date on. In this template the MS is asked to set a target for improved cookstoves measured in terms of the % of the population that uses efficient cookstoves. This is estimated by dividing the number of inhabitants that use improved cookstoves by the total number of inhabitants of the country.

Installed capacity: is the rated continuous load-carrying ability of a given electricity generation plant expressed in megawatts (MW) for active power

Kilowatt (kW): 1,000 watts

Kilowatt-hour (kWh): 1,000 watt-hours.

Load: In an electrical circuit, any device or appliance that uses power (such as light bulb or water pump)

Megawatt (MW): 1,000,000 watts

Megawatt-hour (MWh): 1,000,000 watt-hours

Mini-grids: set of electricity generators and, possibly, energy storage systems interconnected to a distribution network that supplies the entire electricity demand of a localized group of customers. This power delivery architecture can be contrasted with single customer systems (e.g. solar home systems) where there is no distribution network interconnecting customers, and with centralized grid systems, where electrical energy is transmitted over large distances from large central generators and local generators are generally not capable of meeting local demand. Mini-grids are particularly relevant in the rural context of ECOWAS where renewable energy powered hybrids can be the more cost-effective alternative. The EREP includes mini-grid targets.

Modern fuel alternatives (for cooking): known as non-conventional or advanced fuels, these are any materials or substances that can be used as fuels for cooking, other than conventional solid fuels such as coal, fuelwood and charcoal. These alternatives cover Liquefied petroleum gas (LPG), biogas, ethanol, and solar power (e.g. solar cookers). In this template improved cookstoves are not considered within the modern fuel alternatives, as they are object of a separate analysis in this template.

Off-grid applications: is a designation for facilities that produce all their own energy and are not connected to any external source, such as the electrical power grid.

Power grid: a system of high-tension cables by which electrical power is distributed throughout a region

Renewable Energy (RE): 'Renewable energy' is used to describe the energy produced using naturally replenishing resources. This includes solar power, wind, geothermal, bioenergy, wave and tide and hydropower.

Renewable energy sources – in this template the renewable energy sources refer to the following renewable energy technologies:

- *Hydropower which includes:*
    - *Small scale hydropower (small-hydro or SSHP) up to a maximum installed capacity of 30 MW;*
    - *Medium (capacity between 30MW and 100MW) and large hydropower (capacity higher than 100MW);*

  In the EREP hydropower is defined as follows: up to 30 MW small-scale, 30 to 100 MW medium-scale, more than 100 MW large-scale.
- *Bio-energy covering three different fields:*
    - *Woodfuels (firewood and charcoal) used for domestic cooking purposes and commercial applications (restaurants, breweries, potteries, blacksmiths, brick makers). Excess woodfuels resources could be used for power generation with other biomass.*
    - *By-products from crops production for power generation (stalks, straw, husks, shells, kernels, etc.). These can serve as fuel for power generation when gathered together on an agro-industry site. Power can also be generated through biogas production using industrial or urban waste, manure and dung (resource concentration at dairies or slaughter houses or cattle and vegetable markets).*
    - *Energy crops for power generation or sustainable biofuels (e.g. sugar processing waste) offer some interesting perspectives.*

Bioelectricity share in the electricity mix: - is the share of bioelectricity generation in the total electricity generation for a given year, measured in %. This is calculated in the template by dividing the electricity production from renewable energy sources (in MWh/year) by the total electricity production (in MWh/year) – renewable and non-renewable for the same year.

Rural Electrification: Provides a regular supply of electricity to rural residents. It implies the extension of power lines to rural areas, or the use of stand-alone, mini-grids or isolated power systems. The EREP includes targets for rural electrification.

Share of rural population served with off-grid (mini-grids) bioelectricity services: this is the percentage (%) of the rural population as defined above that is served with bioelectricity mini-grids. This is calculated by dividing the number of inhabitants served by bioelectricity off-grid applications by the number of rural inhabitants (as defined above).

Rural communities: These includes population living in rural centres and villages with population between 200 and 2,500 inhabitants and some larger cities that due to its peripheral geographical location are away from the national grid. The EREP refers as well that some of the off-grid rural localities supplied before 2020 might be included in the grid extension as they will potentially grow up.

Solar cookers: or solar oven, is a device which uses the energy of direct sun rays (which is the heat from the sun) to heat, cook or pasteurize food or drink.

Support scheme: means any instrument, scheme or mechanism applied by a Country or group of Countries, that promotes the use of energy from renewable sources by reducing the cost of that energy, increasing the price at which it can be sold, or increasing, by means of a renewable energy obligation or otherwise, the volume of such energy purchased. This includes, but is not restricted to, investment aid, tax exemptions or reductions, tax refunds, renewable energy obligation support schemes including those using green certificates, and direct price support schemes including feed-in tariffs and premium payments.

Some support schemes for renewable energy:

- *Production based incentives:*
    - *Feed-in-Tariff ("FIT"): is an energy supply policy that promotes the deployment of renewable energy*

resources. A FIT offers a guarantee of payments to renewable energy producers for the actual electricity produced ($/kWh). These payments are generally awarded as long-term contracts.

- *Quota system: is an energy supply policy that awards the generator with certificates that can be sold into a market (with no price guarantee)*
- *Quota systems with competitive bidding: is the fixation of mandatory production quotas for green electricity supply. These quotas are imposed on power generating utilities and / or electricity distribution utilities (calculated as a percentage of production/sales). Operators can meet these obligations in three ways: (i) by producing their own green electricity, (ii) by buying the electricity under long term contracts, and (iii) by acquiring on the financial market the "Green Certificates" corresponding to the amount of electricity required.*
- *Decentralized quota system with green certificate market also called tradable green certificates (TGC): is the fixation of mandatory production quotas for green electricity supply. These quotas are imposed on power generating utilities and / or electricity distribution utilities (calculated as a percentage of production/sales). Operators can meet these obligations in three ways: (i) by producing their own green electricity, (ii) by buying the electricity under long term contracts, and (iii) by acquiring on the financial market the "Green Certificates" corresponding to the amount of electricity required.*

- *Investment based incentives*
  - *Capital grants and loans: investment instruments in which government provide grants or loans for the development of renewable energy projects. Grants do not have to be repaid, while loans have to be repaid.*
  - *Microcredits: is the extension of very small loans (microloans) to impoverished borrowers who typically lack collateral, steady employment and a verifiable credit history.*
  - *VAT Exemptions: allows households or investors not to have to pay VAT on renewable energy or energy efficiency equipment*

Watt-hour (Wh): a measure of electric energy equal to the electrical power multiplied by the length of time (hours) the power is applied.

Waste: in energy statistics waste refers to the part of the waste that is incinerated with heat recovery at installations designed for mixed wastes or co-fired with other fuels. The heat may be used for heating or electricity generation. Certain wastes are mixtures of materials of fossil and biomass origin.

Industrial waste: non-renewable waste which is combusted with heat recovery in plants other than those used for the incineration of municipal waste. Examples are used tires, specific residues from the chemical industry and hazardous wastes from health care. Combustion includes co-firing with other fuels. The renewable portions of industrial waste combusted with heat recovery are classified according to the biofuels which best describe them.

Municipal waste: Household waste and waste from companies and public services that resembles household waste and which is collected at installations specifically designed for the disposal of mixed wastes with recovery of combustible liquids, gases or heat. Municipal wastes can be divided into renewable and non-renewable fractions.