



Figure 1: Energy profile of Sierra Leone



Energy Consumption and Production

In 2013, Sierra Leone had a population of 6.17 million as shown in Table 1. In 2015, total production of electricity was 28 ktoe of which 46.4 came from fossil fuels and 42.8 per cent from hydro sources. Final electricity consumption was 27 ktoe (Table 2) (AFREC, 2015). Key energy indicators are shown in Figures 2 and 3.

Table 1: Sierra Leone's key indicators

Key indicators	Amount
Population (million)	6.17
GDP (billion 2005 USD)	3.12
CO ₂ emission (Mt of CO ₂)	0.89

Source: (World Bank, 2015)

Energy Resources

Biomass

In common with many African countries, biomass plays a big role in the energy mix representing over 80 per cent of the total energy consumed in Sierra Leone (UNDP, 2012). Biomass potential is high and includes fuelwood from forests, crop waste and agricultural residue with an estimated total generation potential of 2,706 GWh (REEEP, 2012). There is also potential for about 32 MW of biofuels from sugarcane ethanol some of which could be supplied to the national grid (REEEP, 2012).

Hydropower

According to (REEEP, 2012) the hydropower potential in the country is just over 1,500 MW. Located on the Seli River, the Bumbuna is the largest hydropower plant generating up to 50 MW of electricity. In 2015, almost half (28 ktoe) of the electricity generated was from hydro sources and this placed the country at the mercy of changes in the climate regime (AFREC, 2015). For instance, the generating capacity of the Bumbuna hydroelectricity station typically decreases by 64 per cent during the dry season from its normal 50 MW during the rains (REEEP, 2012). There are plans to expand the Bumbuna Plant to 275 MW (REEEP, 2012). The government is considering investing in hydro at the following sites: Betmai III, Bekongor III, Kambatibo and Yiben I and II (REEEP, 2012). There are also many sites for the development of small and mini hydro.

Figure 2: Total energy production, (ktoe)

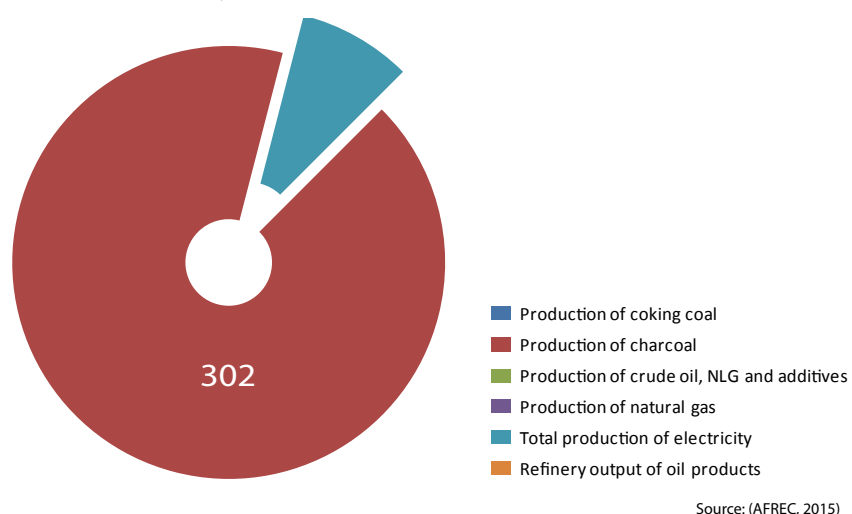


Figure 3: Total energy consumption, (ktoe)

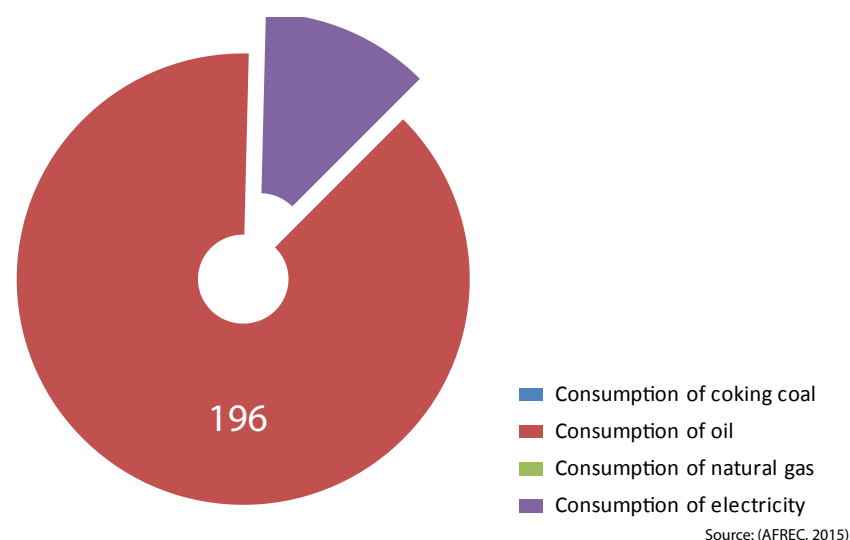


Table 2: Total energy statistics (ktoe)

Category	2000	2005	2010	2015 P
Production of coking coal	-	-	-	-
Production of charcoal	0	0	281	302
Production of crude oil, NLG and additives	-	-	-	-
Production of natural gas	-	-	-	-
Production of electricity from biofuels and waste	0	0	0	1
Production of electricity from fossil fuels	6	5	4	13
Production of nuclear electricity	-	-	-	-
Production of hydro electricity	1	2	22	12
Production of geothermal electricity	-	-	-	-
Production of electricity from solar, wind, Etc.	0	0	0	2
Total production of electricity	8	7	26	28
Refinery output of oil products	247	326	0	0
Final Consumption of coking coal	-	-	-	-
Final consumption of oil	125	281	200	196
Final consumption of natural gas	-	-	-	-
Final consumption of electricity	7	6	12	27
Consumption of oil in industry	0	0	0	0
Consumption of natural gas in industry	-	-	-	-
Consumption of electricity in industry	0	0	0	0
Consumption of coking coal in industry	-	-	-	-
Consumption of oil in transport	0	0	0	0
Consumption of electricity in transport	-	-	-	-
Net imports of coking coal	-	-	-	-
Net imports of crude oil, NGL, Etc.	-	-	-	-
Net imports of oil product	125	285	218	305
Net imports of natural gas	-	-	-	-
Net imports of electricity	-	-	-	-

- : Data not applicable
0 : Data not available
(P): Projected

(AFREC, 2015)

Oil and natural gas

After biomass, oil is the next biggest energy source at 13 per cent (UNDP, 2012). Petroleum products are mainly used for electricity power generation and transport. In 2015, 13 ktoe of fossil fuels was used in the production of electricity a three-fold increase from 10 years previously (AFREC, 2015). Although some offshore discoveries were made in 2009 and 2010, the sector is still in the exploratory phase (UNDP, 2012). Domestic needs are met through importation of refined petroleum products. Importation of oil products has doubled over the last decade. For instance, in 2000, 125 ktoe of oil products were imported compared to 305 ktoe in 2015 (AFREC, 2015). Final consumption of oil in 2015 was 196 ktoe, down from a high of 281 ktoe in 2005 (AFREC, 2015).

Wind

Wind energy has not really been exploited in this country as there is a dearth of data on wind speeds and. The existing data indicates means of between 3 and 5 m/s and it is thought that speeds of 12 m/s are also likely in some places (UNDP, 2012, REEEP 2012). However, investments in wind energy systems can only be done on the back of scientific studies in this area. These are urgently called for as it might also be possible to invest in new technology options that may allow for the generation of electricity in low wind areas (REEEP, 2012).

Geothermal

There appears to be no potential for geothermal energy in this country (REEEP, 2012).

Solar

Solar is a potential growth industry in Sierra Leone with the installed capacity currently estimated at 25 MW (REEEP, 2012). There are also some upcoming investments such as the US \$28.9 million street lighting project that is ongoing in Freetown and other major towns across the country (UNDP, 2012); and a US \$18 million Solar Park Freetown Project that will generate about 6 MW of power. These are possible because solar radiation in the country averages between 1,460-2,200 kWh/m which is deemed suitable for exploitation (UNDP, 2012) (REEEP, 2012).

Tracking progress towards sustainable energy for all (SE4All)

The national electrification rate for Sierra Leone was 14.2 per cent in 2012 (Table 3 and Figure 4). Access to electricity in rural areas is 1.2 per cent and in urban areas is 46.5 per cent (World Bank, 2016). The electricity sector is hindered by inadequate and aging transmission and distribution networks and damage suffered during the war, although much is being done to rehabilitate it. The current electricity system covers mainly the western region of the country with most consumption happening in the capital city of Freetown (UNDP, 2012).

Access to modern fuels is low. In 2012, only 2 per cent of the population was using non-solid fuels down from 6 per cent in 1990. In the rural and urban areas, and the percentage is the same for both rural and urban areas (World Bank, 2015).

The energy intensity (the ratio of the quantity of energy consumption per unit of economic output) was 8.0 MJ per US dollar (2005 dollars at PPP) in 2012, down from 11.7 MJ per US dollar in 1990. The compound annual growth rate (CAGR) between 2010 and 2012 was -6.94 (World Bank, 2015).

The share of renewable energy in the total final energy consumption was 80.4 per cent in 2012. Traditional solid biofuels form the biggest share of renewable sources at 56.3 per cent of TFEC in 2012, while the modern solid biofuels contributed 22.9 per cent and hydro 1.2 per cent only. Renewable sources contributed 36.0 per cent share of electricity generation in 2012) (World Bank, 2015).

Table 3: Sierra Leone's progress towards achieving SDG7 – Ensure access to affordable, reliable, sustainable and modern energy for all

Target	Indicators	Year					
		1990	2000	2010	2012	2000-2010	2011-2015
7.1 By 2030, ensure universal access to affordable, reliable and modern energy services	7.1.1 Per cent of population with access to electricity	6	9	12	14.2		
	7.1.2 Per cent of population with primary reliance on non-solid fuels	6	6	2	2		
7.2 By 2030, increase substantially the share of renewable energy in the global energy mix	7.2.1 Renewable energy share in the total final energy consumption	95.6	90.6	71.2	80.4		
7.3 By 2030, Double the rate of improvement of energy efficiency	7.3.1 GDP per unit of energy use (constant 2011 PPP \$ per kg of oil equivalent)						
	Level of primary energy intensity(MJ/\$2005 PPP)	11.7		9.2	8.0	9.06	7.98

Sources: (World Bank, 2015); (World Bank, 2016)

Figure 4: SDG indicators



Percentage of population with access to electricity	Access to non-solid fuel (% of population)	GDP per unit of energy use (PPP \$ per kg of oil equivalent) 2013	Renewable energy consumption (% of total final energy consumption), 2006-2011, 2012
14.2% 	2.0%	NA	80.35% 

Table 4: Sierra Leone's key aspects/key mitigation measures to meet its energy Intended Nationally Determined Contributions (INDCs)

INDC
*Expand clean energy utilization (e.g. solar, mini-hydroelectric power, LPG, biomass stoves etc.).
*Develop energy efficiency programmes through sensitization and awareness raising campaigns, promote sustainable production of charcoal and reduce dependence on firewood.
*Develop alternative energy sources such as bio-fuels from sugarcane, corn, rice husk, etc.
*Develop agricultural and urban waste incineration programmes for energy production.
*Promote energy efficiency, enhanced management and expansion of the energy mix through uptake of renewable energy sources (Solar, Wind, Hydro, and Biomass) particularly in the rural areas of Sierra Leone.

Source: (MEM, 2015)

Table 5: Sierra Leone's institutional and legal framework

Basic Elements	Response
Presence of an Enabling Institutional Framework for sustainable energy development and services (Max 5 institutions) most critical ones	<ul style="list-style-type: none"> • Ministry of Energy • National Power Authority • Petroleum Directorate
Presence of a Functional Energy Regulator	Electricity and Water Regulatory Commission
Ownership of sectoral resources and markets (Electricity/power market; liquid fuels and gas market)	
Level of participation in regional energy infrastructure (Power Pools) and institutional arrangements	West African Power Pool
Environment for Private Sector Participation	
Whether the Power Utility(ies) is/are vertically integrated or there is unbundling (list the Companies)	Sector unbundled: <ul style="list-style-type: none"> • Electricity Generation and Transmission Company • Electricity Distribution and Supply Authority • Energy Asset Unit
Where oil and gas production exists, whether upstream services and operations are privatized or state-owned, or a mixture (extent) e.g., licensed private exploration and development companies)	
Extent to which Downstream services and operations are privatized or state-owned, or a mixture (extent)	
Presence of Functional (Feed in Tariffs) FIT systems	
Presence Functional IPPs and their contribution	
Legal, Policy and Strategy Frameworks	
Current enabling policies (including: RE; EE; private sector participation; & PPPs facilitation) (list 5 max) most critical ones	<ul style="list-style-type: none"> • National Energy Policy 2009 • National energy strategic plan 2010-2025 • Petroleum Policy 2010
Current enabling laws/pieces of legislation (including: RE; EE; private sector participation; & PPPs facilitation) – including electricity/grid codes & oil codes (5 max or yes/no) most critical ones	<ul style="list-style-type: none"> • Electricity and Water Regulatory Commission Act 2011 • National Electricity Act of 2011 • National Power Authority Act of 1982 Petroleum (Exploration and Production) Act 2011

This table was compiled with material from (REEEP, 2012), (AJME, 2011) and (UNDP, 2012))

Intended Nationally Determined Contributions (INDC) within the framework of the Paris climate Agreement

Sierra Leone is the third most vulnerable country after Bangladesh and Guinea Bissau to the negative impacts of climate change (GOSL, 2015). Over dependence on rain-fed agriculture and natural resource-based livelihoods places the population at high risk. The government articulated its Intended Nationally Determined

Institutional and Legal Framework

The Ministry of Energy is in charge of the energy sector (Table 5). The energy regulator is Electricity and Water Regulatory Commission. The electricity sector is unbundled with three companies as follows: the Electricity Generation and Transmission Company, the Electricity Distribution and Supply Authority, and the Energy Asset Unit. On a regional level, the country is a member of West African Power Pool. The legal framework is provided by the National Electricity

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