

Figure 1: Energy profile of Liberia



Energy Consumption and Production

By 2013, Liberia had a population of 4.29 million (Table 1). In 2015, Liberia produced 41 ktce of electricity of which 53.6 per cent was from hydro, 24.3 per cent from fossil fuels and 21.4 per cent from biofuels and waste. Final consumption of electricity in the same year was 3 ktce (AFREC, 2015). Table 2 and Figures 2 and 3 shows the main energy statistics.

Table 1: Liberia's key indicator

Key indicators	Amount
Population (million)	4.29
GDP (billion 2005 USD)	975.31
CO ₂ emission (Mt of CO ₂)	0.89

Source: (World Bank, 2015)

Energy Resources

Biomass

The civil war devastated a lot of Liberia's energy infrastructure necessitating the re-establishment of energy services once peace was restored (REEEP,

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A view of Liberia's capital city, Monrovia

Figure 2: Total energy production, (ktce)

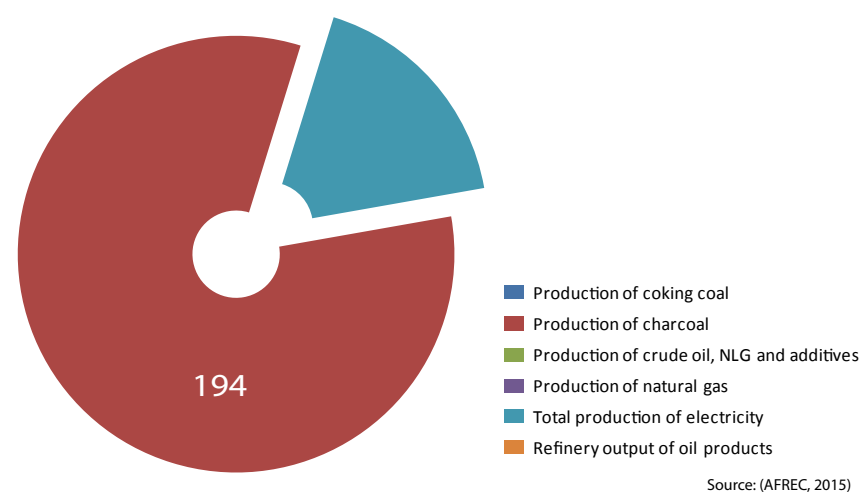


Figure 3: Total energy consumption, (ktce)

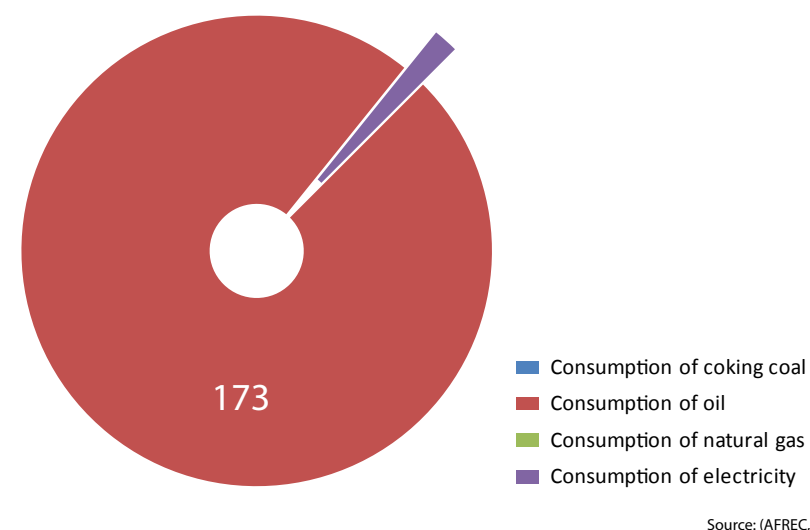


Table 2: Total energy statistics (ktoe)

Category	2000	2005	2010	2015 P
Production of coking coal	-	-	-	-
Production of charcoal	0	0	2,236	194
Production of crude oil, NLG and additives	-	-	-	-
Production of natural gas	-	-	-	-
Production of electricity from biofuels and waste	0	0	0	9
Production of electricity from fossil fuels	3	3	3	10
Production of nuclear electricity	-	-	-	-
Production of hydro electricity	-	-	-	22
Production of geothermal electricity	-	-	-	-
Production of electricity from solar, wind, Etc.	0	0	0	0
Total production of electricity	3	3	3	41
Refinery output of oil products	-	-	-	-
Final Consumption of coking coal	-	-	-	-
Final consumption of oil	147	178	183	173
Final consumption of natural gas	-	-	-	-
Final consumption of electricity	25	25	27	3
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	148	180	184	192
Net imports of natural gas	-	-	-	-
Net imports of electricity	-	-	-	-

- : Data not applicable

0 : Data not available

(P): Projected

(AFREC, 2015)

2012). Biomass energy is used for cooking and heating with the majority of the low-income population using it. The higher income households in the urban areas use electricity and liquefied petroleum gas (REEEP, 2012). Apart from the traditional wood fuels, there is also potential to use agricultural waste from coconuts, oil palm, wheat and rice. According to REEEP (2012), the energy potential from agricultural waste and future waste streams from the forest industry is 6,000 GWh/year and 15,000 GWh/year respectively.

Hydropower

Liberia has a hydroelectricity potential of 1,000 MW which could be dammed from a selection of

rivers that drain about 63 per cent of the country's water (REEEP, 2012). Of Liberia's many rivers there are six large ones from which hydroelectricity generation is a possibility – the Cavalla, Cestos, Lofa, Mano, Saint John and the Saint Paul rivers (REEEP, 2012). Developing hydropower has been particularly challenging due to financial and capacity constraints. There is potential for energy trade through the West African Power Pool.

Wind

Liberia generally lies in a low wind region so potential for wind energy exploitation may be low. However, it is likely that the highland and coastal areas may have some good prospects (REEEP, 2012).

Geothermal

This sector has not been assessed (REEEP, 2012).

Solar

In terms of solar energy assessments, Liberia is seriously lacking in data. However, interpolations suggest solar insolation of between 4.0 and 6.0 kWh/m²/day (REEEP, 2012). The solar resource is already being utilized and the country has an estimated installed capacity of about 100 kW (REEEP, 2012).

Tracking progress towards sustainable energy for all (SE4All)

The national rate of electrification in Liberia is 9.8 per cent with 1.2 per cent in rural areas and 18.9 per cent in urban areas (Table 3 and Figure 4) (World Bank, 2016). Access to non-solid fuels in 2012 was 2 per cent with 19 per cent in rural areas and 93 per cent in urban areas (World Bank, 2015).

Liberia's energy intensity increased at a compound annual growth rate (CAGR) of 2.64 over the 20 years between 1990 and 2010 and at -2.81 CAGR from 2010 to 2012. The rate of increase during the period 2000-2010 was -2.61 per cent compared to -0.22 per cent between 1990 and 2000 (World Bank, 2015b).

Between 2010 and 2012, the Liberian economy's energy intensity (the ratio of the quantity of energy consumption per unit of economic output) increased from 30.5 MJ to 27.5 MJ per US dollar (2005 dollars at PPP) (World Bank, 2015).

The share of renewable energy in total final energy consumption (TFEC) decreased from 92.5 to 84.4 per cent between 2010 and 2012. Traditional biofuels form the biggest share of renewable sources at 84.4 per cent of TFEC in 2012 (World Bank, 2015).

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

Liberia is active in global climate change initiatives and articulated its Intended Nationally Determined Contributions (INDC) in September 2015 (ROL, 2015). Those related to energy aim to place the country firmly on a carbon neutral pathway and are highlighted in Table 4.

Table 3: Liberia'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	0	1	4	10		
	7.1.2 Per cent of population with primary reliance on non-solid fuels	2	2	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	95.4	90.5	92.5	84.4		
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)	40.7		30.5	27.5	6.46	6.42

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
9.8%	2.0%	NA	89.39%

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

INDC
*Reduce GHGs by at least 10 per cent by 2030.
*Improve energy efficiency by at least 20 per cent by 2030.
*Raise share of renewable energy to at least 30 per cent of electricity production and 10 per cent of overall energy consumption by 2030.
*Replace cooking stoves with low thermal efficiency (5-10 per cent) with the higher efficiency (40 per cent) stoves.
*Strengthen the implementation and coordination mechanisms to improve climate change mitigation actions.
*Implement quantitative and qualitative research and improve systematic priority sequencing between National Energy Policy, Low Carbon Economy, and National Vision 2030 developmental goals.
*Strengthen institutional and individual capacity in renewable energy technology and management.
*Implement and strengthen policy that promotes private investment in renewable energy (hydro, biomass and solar etc.).
*Rehabilitate existing hydropower plants and build new hydropower plants to increase hydropower production capacity.
*Produce and distribute 280,543 energy saving cook stoves that use fuel wood and 308,004 energy saving cook stoves that use charcoal by 2030.
*Implement large-scale biomass projects to generate about 30 MW by 2030.
*Protect water catchments around hydropower sources such as the St. Paul River Basin.
*Strengthen the transmission and distribution infrastructure for public utilities to ensure climate resilience (i.e. flooding).

Source: (MEM, 2015)

Table 5: Liberia'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	Ministry of Lands, Mines and Energy Rural and Renewable Energy Agency (RREA)
Presence of a Functional Energy Regulator	Energy Regulatory Board (ERB) National Commission on Electricity
Ownership of sectoral resources and markets (Electricity/ power market; liquid fuels and gas market)	Liberia Electricity Company (LEC) 1973
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)	
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)	Liberia National Oil Corporation (LNOC) 2002
Extent to which Downstream services and operations are privatized or state-owned, or a mixture (extent)	Liberia National Oil Corporation (LNOC) Liberia Petroleum Refining Corporation (1978)
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 • Renewable Energy and Energy Efficiency Policy and Action Plan 2007 • Rural Energy Master Plan • Rural Energy Fund (REFUND) • Liberia National Petroleum Policy 2012
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"> • 2015 Electricity law of Liberia • Public Utilities Authority Law 1973 • National Oil Company Act 2000 • Petroleum Law 2002

This table was compiled with material from (REEEP, 2012)

Institutional and Legal Framework

The Ministry of Lands, Mines and Energy is in charge of the energy sector. The energy regulator is the Energy Regulatory Board (ERB). The Liberia Electricity Company (LEC) is in charge of generation, transmission and distribution of electricity. On a regional level, it is a member of the West African Power Pool. The legal framework is provided by the 2015 Electricity Law of Liberia. The main sector policy is the 2009 National Energy Policy (Table 5).

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Solar power panels generate energy for a newly renovated local administrative building, Liberia