Namibia

Figure 1: Energy profile of Namibia

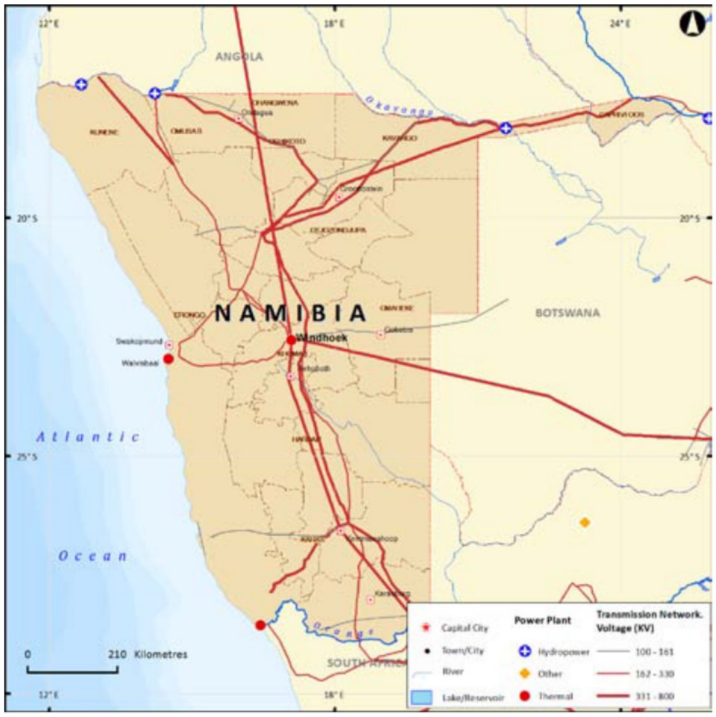
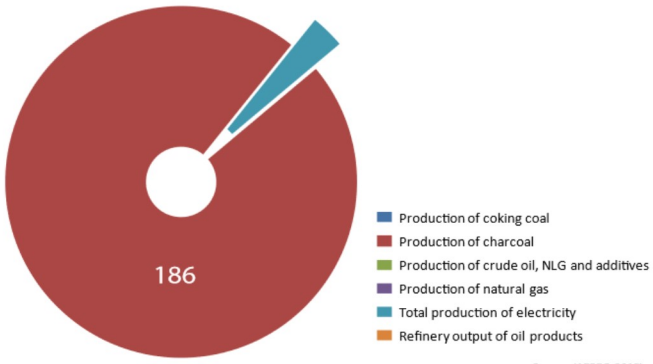
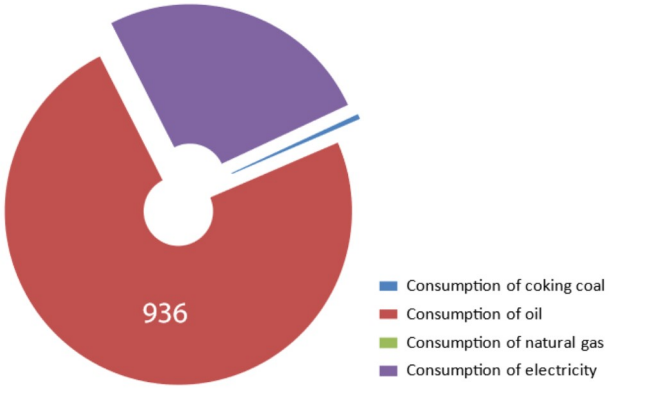


Figure 2: Total energy production, (ktoe)



Source: (AFREC, 2015)

Figure 3: Total energy consumption, (ktoe)



Source: (AFREC, 2015)

Energy Consumption and Production

In 2013, Namibia had a population of 2.3 million (Table 1). In 2014, total production of electricity was 132 ktoe of which 93.9 per cent came from hydro sources. Final electricity consumption in 2014 was 320 ktoe increasing to 323 ktoe in 2015 as shown in Table 2 (AFREC, 2015). Figures 2 and 3 show the key energy statistics for the country.

Table 1: Namibia's key indicators

Key indicators	Amount
Population (million)	2.30
GDP (billion 2005 USD)	10.52
CO_2 emission (Mt of CO_2)	3.43

Source: (World Bank, 2015)

Energy Resources

Biomass

Biomass energy is not a major part of the energy mix in Namibia (IEA, 2014). Environmental change in the Namibian landscape is providing opportunity for biomass energy generation from the so-called invader bush. Over 26 million hectares have been encroached upon by unwanted woody species effectively taking land out of cultivation and pasture and impacting livelihoods (REEEP, 2014). Utilizing the woody biomass for energy was devised as a means of upscaling the debushing of the infested land. The literature indicates that the affected land could generate about 1,100 TWh of electricity with regrowth thought to provide sustainable feedstock (REEEP, 2014). Nampower, the public utility, is exploring PPP models to finance several of these decentralised bush-to-electricity projects. Other plants that could provide biofuel include jatropha which was identified in the Namibian National Bio-Oil Energy Roadmap.

Hydropower

A vibrant hydropower sector depends on an abundant supply of running water and plentiful rainfall to sustain the resource. Namibia is very dry and has only two permanent rivers — the Kunene and Orange rivers on its northern and southern borders respectively, both draining into the Atlantic. But the fact that they are shared resources means that any efforts to develop

Table 2: Total energy statistics (ktoe)

Category	2000	2005	2010	2015 P
Production of coking coal	-	-	-	-
Production of charcoal	121	152	180	186
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	3	4	5	4
Production of nuclear electricity	-	-	-	-
Production of hydro electricity	119	143	106	126
Production of geothermal electricity	-	-	-	-
Production of electricity from solar, wind, Etc.	0	0	0	1
Total production of electricity	122	147	111	6
Refinery output of oil products	-	-	-	-
Final Consumption of coking coal	2	11	18	6
Final consumption of oil	573	837	897	936
Final consumption of natural gas	-	-	-	-
Final consumption of electricity	205	248	289	323
Consumption of oil in industry	60	76	89	95
Consumption of natural gas in industry	-	-	-	-
Consumption of electricity in industry	48	0	69	67
Consumption of coking coal in industry	0	0	0	0
Consumption of oil in transport	365	529	499	512
Consumption of electricity in transport	-	-	-	-
Net imports of coking coal	2	2	18	5
Net imports of crude oil, NGL, Etc.	-	-	-	-
Net imports of oil product	580	844	976	1 004
Net imports of natural gas	-	-	-	-
Net imports of electricity	106	128	194	205

(AFREC, 2015)

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

their hydropower potential are subject to lengthy bilateral negotiations. According to the World Energy Council (WEC, 2013), the hydropower potential of Namibia is unknown. Namibia's main source of electricity generation is the 330 MW Ruacana Hydroelectric Power Station (Leskela, 2012). In 2015, about 125 ktoe of electricity from hydro was produced (AFREC, 2015). Other projects in the pipeline include the Epupa dam, the Baynes hydro project and various small hydro (REEEP, 2014).

Oil and natural gas

The proven recoverable reserve of natural gas at the end of 2011 was 62.3 bcm (2,199.8 bcf) (WEC, 2013). It is thought that there is some offshore potential as well. Natural gas has not been well developed because of a lack of gas production and transport infrastructure, but this may change going forward (WEC, 2013).

Peat

There are 10 km^2 of peatland (WEC, 2013).

Wind

Namibia has huge wind resources with Lüderitz and Walvis Bay with wind speeds of 7 m/s or higher (REEEP, 2014). The SAPP has estimated the Namibian potential for wind at 27.201 MW and 36 TWh per year with a relative land use of 824,268 km^2. According to REEEP (2014), there is one 22 kW wind turbine feeding into the grid in Erongo Region.

Nuclear

Uranium is mined in 20 countries and half the world's production of uranium comes from just six, of which Namibia is one. In sub-Saharan Africa, Namibia, Niger and South Africa are among the ten-largest uranium resource-holders in the world (WEC, 2013). Namibia provides 8.2 per cent of global production and the government is interested in including nuclear power in its energy mix. However, this will require large investments in terms of financial resources and the building of technical, regulatory and infrastructural capacity.

Geothermal

Although hot springs are present in Windhoek, Rehoboth and in Kunene region, there is no evidence that definitely points to geothermal potential in this country. More research is needed.

Solar

Namibia has an excellent solar potential since the average high direct insolation is 2,200 $kWh/m^2/yr$ (REEEP, 2014). The areas with the highest potential are in the northern and southern parts of the country and also in the west. Solar in Namibia is primarily used for water pumping and for rural electrification to power radios, lighting, TVs and fans. IPPs are venturing into the sector. In 2015, there was no large commercial solar PV plant in Namibia (REEEP, 2014). Advances are being made in the sector, however. For instance, an Independent Power Producer (Innosun Energy Holdings) opened a 4.5 MW solar plant in Omaruru in 2015 and there are plans to build a concentrating solar thermal power plant by 2017 (Rämä, Pursiheimo, Lindroos, & Ko, 2013).

Tracking progress towards sustainable energy for all (SE4All)

Just under half of all Namibians have access to electricity. Household electrification in urban areas in 2012 was 94.1 per cent whereas for rural households it reached 14.6 per cent (Table 3 and Figure 4) (World Bank, 2016). Access to modern fuels is low with 14 per cent of rural Namibians and 83 per cent of those in urban areas using non-solid fuels (World Bank, 2015).

The energy intensity (the ratio of the quantity of energy consumption per unit of economic output) of the economy was 3.3 MJ per US dollar (2005 dollars at PPP) in 2012, down from 3.5 MJ per US dollar in 2010. The compound annual growth rate (CAGR) between 2010-2012 was -2.60 (World Bank, 2015).

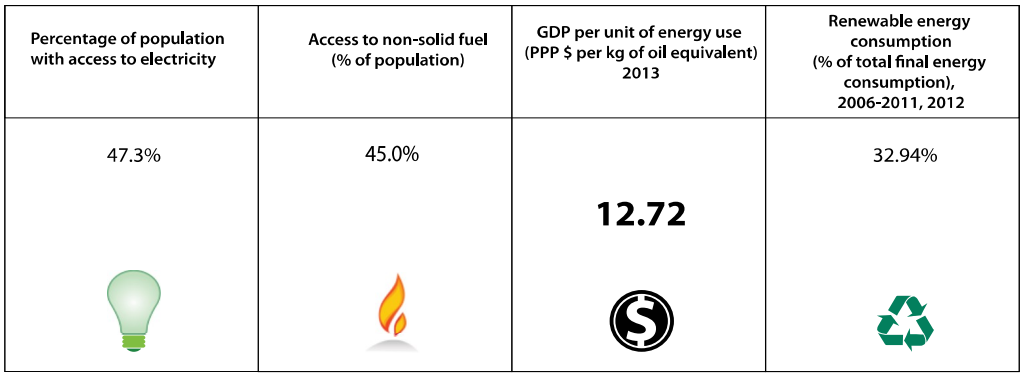
The share of renewable energy in the total final energy consumption (TFEC) increased slightly from 30.2 per cent in 2010 to 32.9 per cent in 2012. Traditional solid biofuels form the biggest share of renewable sources at 13.2 per cent of TFEC in 2012, while hydro contributed 19.6 per cent and solar only 0.1 per cent . Renewable sources contributed a 97.8 per cent share of electricity generation in 2012 (World Bank, 2015).

Table 3: Namibia'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	26	37	44	47.3		
	7.1.2 Per cent of population with primary reliance on non-solid fuels	26	37	44	45		
7.2 By 2030, increase substantially the share of renewable energy in the total final energy consumption	7.2.1 Renewable energy share in the total final energy consumption	38.9	38.2	30.2	32.94		
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)			11.8	12.2 (2011)	12.32 (2013)	
	Level of primary energy intensity(MJ/$2005 PPP)			3.5	3.3	3.32	3.27

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

Figure 4: SDG indicators



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

By 2030, Namibia aims to have reduced its GHG emissions by about 89 per cent compared to the BAU scenario (RON, 2015). Some of the activities will involve the energy sector. Table 4 highlights the energy-related Intended Nationally Determined Contributions (INDCs).

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

INDC
*Increase share of renewable energy (hydro, solar, wind and biomass) in electricity production from 33 per cent in 2010 to about 70 per cent in 2030.
*Implement an energy efficiency programme to reduce consumption by about 10 per cent in 2030.
*Commission a mass transport system in the city of Windhoek to reduce the number of cars (taxis and private) by about 40 per cent.
*Implement a car pooling system to reduce fossil fuel consumption.
*Improve freight transportation through bulking to reduce the number of light load vehicles by about 20 per cent.
These measures are expected to result in a reduction of some 1,300 Gg CO_2-eq.
*Increase share of renewables in electricity production from 33 per cent to 70 per cent. GHG amount = 740; per cent BAU scenario in 2030 = 3.3.
*Increase energy efficiency and demand side management (DSM). GHG amount = 51; per cent BAU scenario in 2030 = 0.2.
*Mass transport in Windhoek, car and freight pooling. GHG amount = 510; per cent BAU scenario in 2030 = 2.3.

Source: (MEM, 2015)

Table 5: Namibia'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	• National Petroleum Corporation of Namibia (NAMCOR) • Renewable Energy and Energy Efficiency Institute (REEEI) • National Planning Commission (NPC).
Presence of a Functional Energy Regulator	Electricity Control Board (ECB)
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	Southern Africa Power Pool
Environment for Private Sector Participation	
Whether the Power Utility(ies) is/are vertically integrated or there is unbundling (list the Companies)	NamPower, the national electricity utility, is a state-owned company with a mandate to generate, trade, transmit, import, export and distribute electricity.
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)	National Petroleum Corporation of Namibia (NAMCOR)
Extent to which Downstream services and operations are privatized or state-owned, or a mixture (extent)	
Presence of Functional (Feed in Tariffs) FIT systems	Renewable Energy Feed in Tariff (REFIT) interim program
Presence Functional IPPs and their contribution	NNOSUN-OMBURU SOLAR PV PLANT (4.5 MW)
Legal, Policy and Strategy Frameworks	
Current enabling policies (including: RE; EE; private sector participation; & PPPs facilitation) (list 5 max) most critical ones	• Energy Policy, Regulatory Framework and Energy Future of Namibia 2011 to 2013 • White Paper on Energy Policy of 1998
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	• Electricity Act 2 of 2000 • Electricity Act, 4 of 2007

This table was compiled with material from (REEEP, 2014) and (Rämä, Pursiheimo, Lindroos, & Ko, 2013)

Institutional and Legal Framework

The Ministry of Mines and Energy is in charge of the energy sector (Table 5). The energy regulator is the Electricity Control Board. Nampower has the mandate to generate, trade, transmit, import, export and distribute electricity. On a regional level, Namibia is a member of Southern Africa Power Pool. The main sector policy is the 1998 White Paper on Energy Policy. The legal framework is provided by the Electricity Act of 2002.

Taken near Ruacana-Dam, Namibia