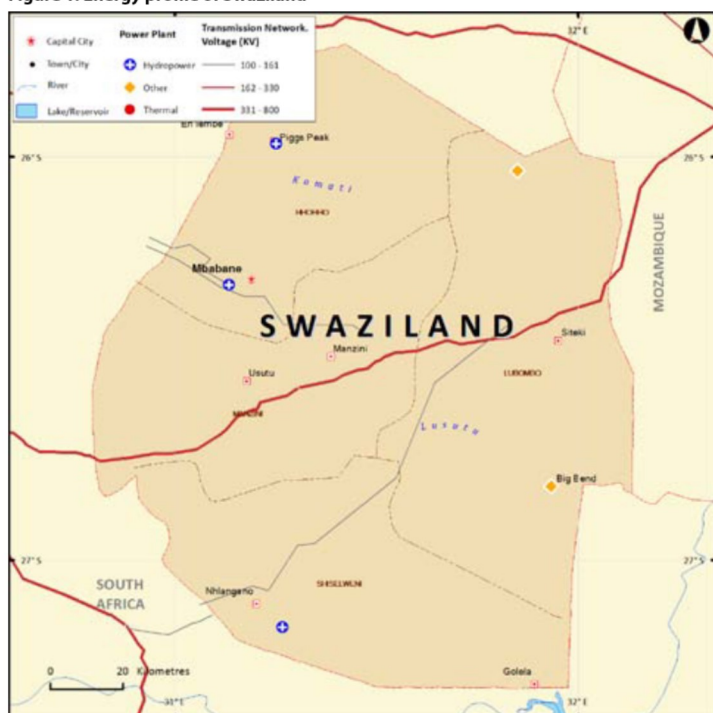




Figure 1: Energy profile of Swaziland



Energy Consumption and Production

In 2013, Swaziland had a population of 1.25 million (Table 1). Electricity production in 2015 was 50 ktoe while final consumption of electricity was 99 ktoe, as shown in Table 2.

Table 1: Swaziland's key indicators

Key indicators	Amount
Population (million)	1.25
GDP (billion 2005 USD)	3.12
CO ₂ emission (Mt of CO ₂)	1.04

Source: (World Bank, 2015)

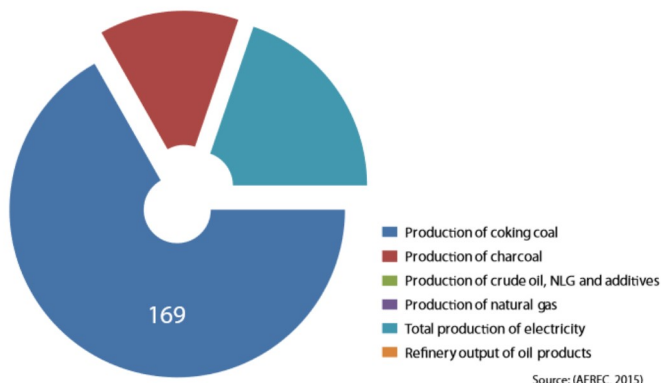
Energy Resources

Biomass

Swaziland has high levels of poverty, and biomass meets 90 per cent of domestic energy needs (IRENA, 2014). It is also an important energy source for industry through cogeneration. For instance sugar industry uses bagasse as feedstock to produce electricity and they have an installed capacity of 105 MW (IRENA, 2014) (REEEP, 2012). In 2010, traditional woody biomass contributed approximately 66 per cent of the national energy demand (IRENA, 2014). Wood-fuel production and charcoal production increased by 25 per cent and 50 per cent respectively between 2002 and 2012 (IRENA, 2014). In 2015, charcoal production amounted to 34 ktoe (AFREC, 2015). This has put the forests under severe pressure. Forests and woodlands cover about 625,400 ha, with 74 per cent being indigenous species (REEEP, 2012).

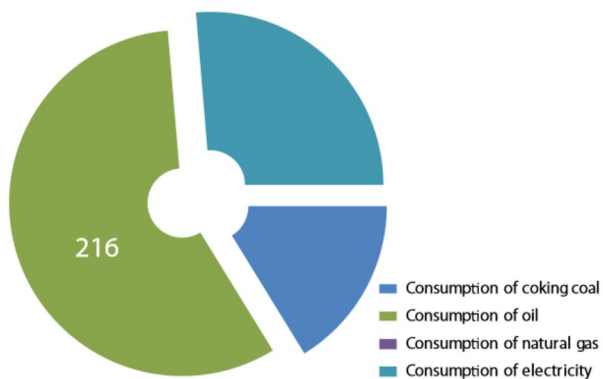
Increased efficiency in biomass usage, such as fuel-efficient cookstoves, is needed to protect the forests. With electricity imports from South Africa becoming increasingly difficult cogeneration is an option that should be exploited.

Figure 2: Total energy production, (ktoe)



Source: (AFREC, 2015)

Figure 3: Total energy consumption, (ktoe)



Source: (AFREC, 2015)

Table 2: Total energy statistics (ktoe)

Category / Catégorie	2000	2005	2010	2015 P
Production of coking coal	183	135	179	169
Production of charcoal	0	0	721	34
Production of crude oil, NLG and additives	-	-	-	-
Production of natural gas	-	-	-	-
Production of electricity from biofuels and waste	0	0	9	4
Production of electricity from fossil fuels	22	20	22	27
Production of nuclear electricity	-	-	-	-
Production of hydro electricity	17	14	25	18
Production of geothermal electricity	-	-	-	-
Production of electricity from solar, wind, Etc.	0	0	0	0
Total production of electricity	39	34	56	50
Refinery output of oil products	-	-	-	-
Final Consumption of coking coal	103	54	128	61
Final consumption of oil	177	177	239	216
Final consumption of natural gas	-	-	-	-
Final consumption of electricity	90	106	113	99
Consumption of oil in industry	0	0	1	1
Consumption of natural gas in industry	-	-	-	-
Consumption of electricity in industry	0	0	113	115
Consumption of coking coal in industry	0	0	17	16
Consumption of oil in transport	0	0	137	143
Consumption of electricity in transport	0	0	34	34
Net imports of coking coal	-178	-230	-246	-187
Net imports of crude oil, NGL, Etc.	-	-	-	-
Net imports of oil product	177	177	202	297
Net imports of natural gas	-	-	-	-
Net imports of electricity	53	75	78	41

- : Data not applicable

0 : Data not available

(P): Projected

(AFREC, 2015)

Hydropower

Electricity produced from hydropower in 2015 was 18 ktoe in 2015; and although this was down from 25 ktoe in 2010, hydro is still an important part of the energy mix in Swaziland (AFREC, 2015). The hydroelectricity power stations operated by the Swaziland Electricity Company (SEC) have an installed capacity of 61 MW equivalent to about 15 per cent of the total energy demand (WEC, 2013). The actual generation in 2011 was 69 GWh per annum (WEC, 2013).

Swaziland has 60.4 MW of small hydro in operation and the government is looking to develop more sites to augment supply. These include a total of 945 kW on the Mpuluzi, Lusushwana and Usutu Rivers (IRENA, 2014). Independent Power Producer are also engaged in the Swaziland energy sector.

Oil and natural gas

There are no known reserves of oil so all petroleum products are imported. Net imports have increased over the years from 177 ktoe in 2000 to 297 ktoe in 2015 (AFREC, 2015). In addition 54 per cent of electricity produced in 2015 was from fossil fuels (AFREC, 2015).

Coal

Coal is mainly used in the sugar industry for cogeneration.

Wind

The government has been looking into the possibility of exploiting wind to for rural electrification as part of its efforts to increase the share of renewables in the energy mix (REEEP, 2012). Average wind speeds of 4 m/s have been measured (REEEP, 2012).

Geothermal

The presence of hot springs could be an indicator of geothermal energy, but research is needed to study this further (REEEP, 2012).

Solar

More research is needed in this area, but the data indicates Global Horizontal Irradiance figures of between 4 to 6 kWh/m²/ day (REEEP, 2012). There are variations in solar intensity between the summer and winter months (IRENA, 2014). Solar is currently being used on a small-scale level in the country side. Efforts to upscale solar might not be feasible due to the large land requirement to host the solar panels. About 149 kW of solar PV has been installed in Bulembu, the Mbabane blood bank, the Luyengo campus of the University of Swaziland among others (IRENA, 2014).

Tracking progress towards sustainable energy for all (SE4All)

Swaziland had a national electrification rate of 42 per cent in 2012 (Table 3 and Figure 4). All the urban areas are fully electrified (100 per cent access) while only 24.5 per cent of rural areas have access to electricity (World Bank, 2016). The approach to rural electrification has mainly been through grid extension. Currently the electricity grid covers 70 per cent of the country (IRENA, 2014). Nationally, access to modern energy services is low, with only 24.5 per cent of the population using non-solid fuels; 20 per cent are in rural areas and 87 per cent in urban areas (World Bank, 2015).

In 2010, Swaziland had one of the highest energy intensities (the ratio of the quantity of energy consumption per unit of economic output) globally. In 2012, the energy intensity was 7.8 MJ per US dollar (2005 dollars at PPP). The compound annual growth rate (CAGR) between 2010 and 2012 was 1.10 (World Bank, 2015).

The share of renewable energy in the total final energy consumption (TFEC) in 2012 was 39.9 per cent. Traditional solid biofuels form the biggest share of renewable sources at 24.4 per cent of TFEC in 2012, while modern solid biofuels contributed 8.5 per cent and hydro 7.0 per cent. Renewable sources contributed a 40.3 per cent share of electricity capacity in 2012 (World Bank, 2015).

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

Climate change is a national development priority and the country has published its Intended Nationally Determined Contributions as required by global obligations. The energy-related INDCs reiterate many of the country's policy objectives and are listed in Table 4.

Table 3: Swaziland'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	29	32	35	42		
	7.1.2 Per cent of population with primary reliance on non-solid fuels	26	34	38	38.37		
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	84.3	46.8	35.7	39.9		
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)	13.5		20.45 (2007)			
	Level of primary energy intensity(MJ/\$2005 PPP)	4.7		7.7	7.8	7.91	7.83

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
42%	38.37%	19.27	39.47%
			

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

INDC
*Double the share of renewable energy in the national energy mix by 2030, relative to 2010 levels
*Implement small scale, decentralized renewable energy technologies to improve energy access in rural areas. This will also reduce the unsustainable wood harvesting practices that are currently undertaken
*Increase the use of grid-connected renewable technologies with fuel sources such as waste, solar, bagasse (from the sugar industry) and wood chips.

Source: (MEM, 2015)

Table 5: Swaziland'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 Natural Resources and Energy
Presence of a Functional Energy Regulator	Energy Regulatory Authority
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	
Environment for Private Sector Participation	
Whether the Power Utility(ies) is/are vertically integrated or there is unbundling (list the Companies)	Swaziland Electricity Company
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"> • Energy Policy 2003 • National Energy Policy Implementation Strategy 2009 • Swaziland Utilization of Renewable Energy Action Plan, 1997 • National Biofuels Development Strategy and Action Plan • Public Private Partnership policy 2013 • Renewable Energy Independent Power Producers Policy (REIPPP) (under development)
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 Act 2007 • Energy Regulatory Authority Act, 2007 • Petroleum Bill • IRENA Statute, 2011

This table was compiled with material from (REEEP, 2012) and (IRENA, 2014)

Institutional and Legal Framework

The Ministry of Natural Resources and Energy sets the policy framework for the country (Table 5). The sector regulator is the Energy Regulatory

Authority. Swaziland Electricity Company handles generation, transmission and distribution. The Electricity Act 2007 is the main law regulating the electricity supply sector. Swaziland is a member of the Southern Africa Power Pool (SAPP). The

Energy Policy was developed in 2003 to address energy issues in light of the national development plan, with renewable and energy from alternative sources a cornerstone of the policy.

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Komati River Maguga Dam, Swaziland