THINK NAMIBIA

FACT SHEET ON:

Renewable Energy

SHIFTING ENERGY SYSTEMS IN NAMIBIA TOWARDS A MORE SUSTAINABLE PATH

The purpose of this Factsheet is to showcase selected sustainable energy systems in Namibia.

Introduction

The coal, oil, and natural gas that power the majority of electricity generation produce more than one-third of global greenhouse gas emissions. More than 1.3 billion people worldwide still lack access to the electricity they need to raise their standard of living, and experts predict that climate change will worsen the situation. In Namibia, most of the energy is consumed in the transport sector and most of the Carbon dioxide (CO_2) emissions produced by Namibia's energy sector comes from transportation. The second largest CO_2 emission source is fishing, followed by industry, electricity generation and others. According to energy statistics the total CO_2 emissions from Namibia's energy use were 2800 $ktCO_2$ in 2011 *(Rämä et al., 2013)*. The amount of CO_2 emissions from the energy sector has been increasing by approximately 4 % per year, on a world scale.

According to the Regional power status of Africa 2010 report, Namibia generates about 1,305 GWh, while it consumes more than 3000 GWh per annum. Namibia imports power from South Africa, Zambia, Zimbabwe and Mozambique to cover the supply gap of electricity between what is generated locally and what is required for the country's economic activities. *(National Planning Commission, 2013)*.

SOMETHING TO REFLECT ON ...

MAJOR SOURCES OF COMMERCIAL ENERGY IN NAMIBIA ARE:

81 %

OF ENERGY USED IN NAMIBIA IS IMPORTED

AND

54 %

OF ELECTRICITY IS IMPORTED IN 2009.

34 %

OF THE POPULATION HAD ACCESS TO ELECTRICITY IN 2009.

Source: VO Consulting, 2012

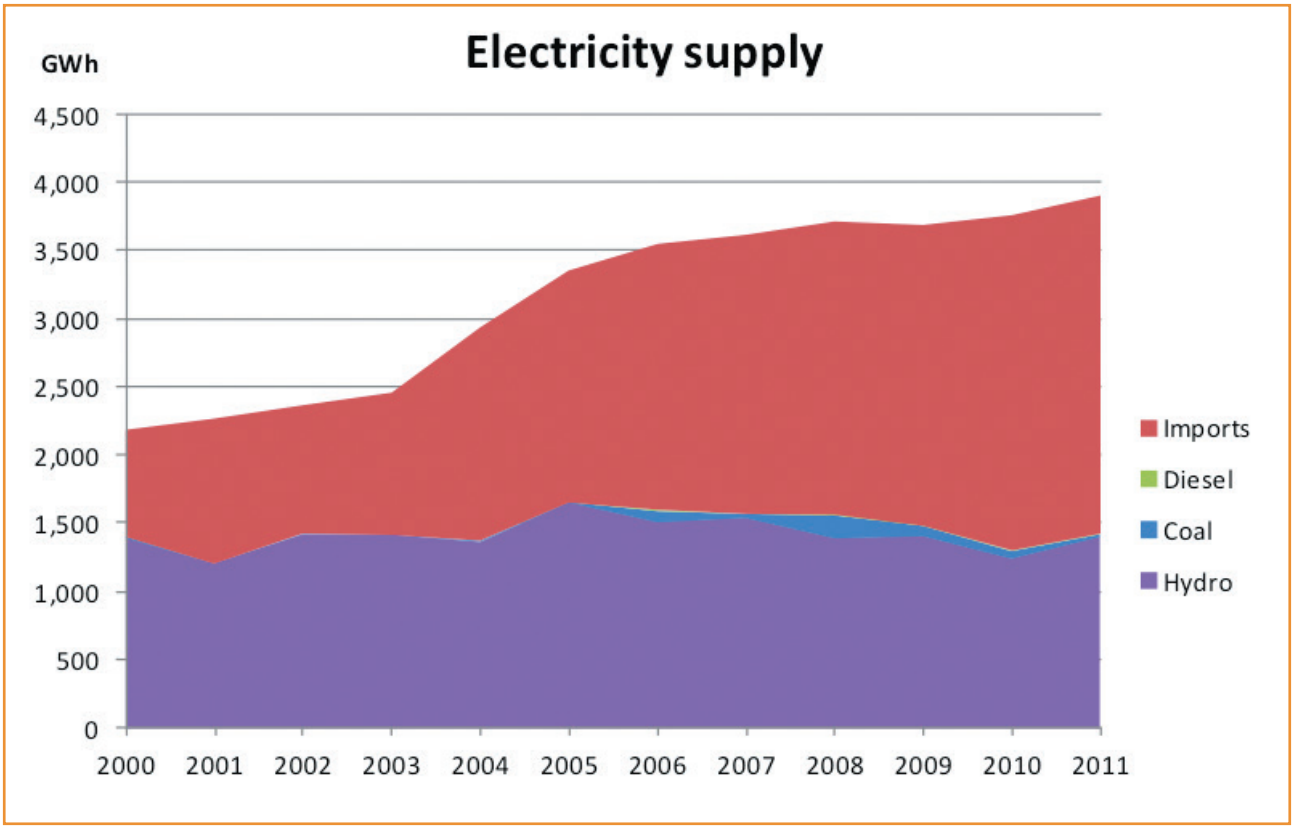

FIGURE 1:
Electricity supply in Namibia between 2000 to 2011 in GWh
(Source: Rämä et al., 2013)

Renewable Power Production

Renewable power production will play a significant role in energy systems in years to come. The shift to clean energy offers an opportunity to prevent the worst impacts of climate change, while lessening the toll that fossil fuels have on communities and vital ecosystems.

Namibia is well placed to lead the clean energy development pathway. The country is endowed with natural resources required for (renewable) energy supplies from the sun, wind and biomass from invader bush. These renewable energy resources provide the country with a comparative advantage in terms of supporting clean energy and socio-economic development. The current productive use of these resources is limited, but there is a growing pool of knowledgethat has been developed since Independence in 1990 to inform scaling-up the use of renewable energy and energy efficient technologies.

Clean Energy Sources in Namibia

Measures to develop clean energy in Namibia, which reduce greenhouse gas emissions, while also stimulating innovation and promoting growth and jobs, include the following:

Hydropower

Ruacana is a hydroelectric power station on the Kunene River, which has a generation capacity of 332 MW. It is a run-of-river power station, meaning that its ability to generate electricity remains dependent on continuous water flows from Angola. In the absence of sufficient water flow, Ruacana cannot generate and feed electrical energy into Namibia's national electricity grid. Plans are underway to develop the 600MW Baynes hydropower plant of which 300 MW will be for Namibia, and the 100MW Orange River project *(Rämä et al., 2013)*.

FIGURE 2:
Ruacana hydropower station

FIGURE 3:
220 kW Wind Energy turbine at Walvis Bay

Wind Energy

Wind turbines transform the wind's kinetic energy into electrical energy. Namibia has very favourable wind conditions with long coastlines measuring 1,572 km. Wind energy in the country is sufficient to be harvested and put to good use, however in Namibia the wind energy industry has not been fully developed.

To date, the country has about 30,000 wind water pumps installed throughout the country – ranking second on the African continent. There is currently one wind turbine (220 kW) installed which feeds the electricity distribution grid in Erongo Region. Other areas with excellent wind energy potential are the Lüderitz and Hantiesbay areas.

Even though there is potential for wind energy growth in Namibia, there is still the concern of wind fluctuations, which may disrupt electricity generation. Thus, further research and investment is required to ensure efficient generation of wind energy in the country.

Solar Energy

Namibia has one of the best solar regimes in the world with an average high direct insolation of 2,200 kWh/m2/a and minimal cloud cover. The southern parts of the country easily experience up to 11 hours of sunshine per day and recorded direct solar radiation of 3,000 kWh/m2/year *(IET 1999; cited by Willemse 2004)*. Solar water heaters, solar photovoltaic technologies, and concentrated solar power plants can contribute to reduce the country's electricity supply gap.

FIGURE 4:
An aerial view of the Omburu solar power plant and the Omburu sub station.

FIGURE 5:
Solar PV array of Namibia's largest solar-diesel hybrid system at Tsumkwe

One of the major solar PV applications in Namibia is solar water pumping (PVP) that takes place on cattle farms. Solar PV is also used for rural access to modern energy.

It consists of a small system equipped with an inverter and a storage system (batteries) that provide enough electricity for lighting, radio, TV or fans. Households with substantial electricity consumption can utilise larger solar home systems.

NAMIBIA'S FIRST INDEPENDENT POWER PRODUCER (IPP)

In May 2015, a 4.5 MWp Photovoltaic solar power plant was inaugurated in Omaruru. The 'Omburu solar power plant', owned by Franco-Namibian company InnoSun, is the country's first local Independent Power Producer (IPP). It is projected to generate about 13 500 000 kWh of electricity per year, which represents 1% of the electricity generation in Namibia, and caters for the basic domestic consumption of 20 000 Namibian households (NamPower, 2015).

Bush-to-electricity

Significant areas in northern Namibia are infested by invader bush *(de Klerk, 2004)*. Thorny bush and shrub species grow in such abundance that they have a significant effect on the growth of grasses and less prevalent species of bushes and shrubs *(Bester, 1998)*. Such vegetation also dramatically reduces the essential recharge of underground water resources. However, the bush encroachment problem creates possibilities

FIGURE 6:
Bush to electricity demonstration plant

for larger scale bioenergy production in Namibia (NEI, unpublished). Power plants fuelled by biomass from invader bush would have electricity generation characteristics similar to traditional coal-fired power plants *(VO Consulting, 2012)*.

The Desert Research Foundation of Namibia piloted the use of invader bush for larger scale energy production, with support from the Europe Union, in a project titled 'Combating Bush Encroachment for Namibia's Development' (CBEND). The project installed the first bush to electricity demonstration plant (250 kW). The technology uses wood gasification and is fuelled by a variety of encroacher bush species.

Conclusion

The renewable energy sector in Namibia is in a critical development stage. Currently the focus is mostly on eliminating barriers to making the usage of renewable energy technologies more universal in everyday life. In order to successfully shift Namibia's energy systems to a sustainable development path, more investment should be made in the renewable energy sector in order to improve the economic viability of renewable energy technologies.

POWER CONSUMPTION OF SOME ELECTRICAL APPLIANCES

LCD TV:
30 - 300 W

DESKTOP PC:
300 - 400 W

LAPTOP:
40 - 60 W

REFRIGERATOR:
150 - 300 W

MICROWAVE:
150 - 300 W

AIR CONDITIONER:
1 - 2 KW

Simplified definitions and conversion units

- Watt is the unit of power (symbol: W).
- One watt is defined as the energy consumption rate of one joule per second.
- The kilowatt hour (symbol kWh, kW·h, or kW h) is a unit of energy equal to 1,000 watt-hours, or 3.6 megajoules.
- An electric heater rated at 1000 watts (1 kilowatt), operating for one hour uses one kilowatt-hour (equivalent to 3.6 megajoules) of energy.
- A television rated at 100 watts operating for 10 hours continuously uses one kilowatt-hour. A 40-watt light bulb operating continuously for 25 hours uses one kilowatt-hour.

Glossary:

Renewable energy
Renewable energy is energy from a source that is not depleted when used, such as wind or solar power.

Energy efficiency
Energy efficiency is a way of managing and restraining the growth in energy consumption.

Biomass
Biomass is biological material derived from living, or recently living organisms. In the context of biomass for energy this is often used to mean plant based material, but biomass can equally apply to both animal and vegetable derived material.

Solar photovoltaic technology
Solar cells, also called photovoltaic (PV) cells by scientists, convert sunlight directly into electricity.

Concentrated solar power
Concentrated solar power systems electricity by using mirrors or lenses to concentrate a large area of sunlight, or solar thermal energy, onto a small area. Electricity is generated when the concentrated light is converted to heat, which drives a heat engine (usually a steam turbine) connected to an electrical power generator or powers a thermochemical reaction.

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Enhancing decision making for sustainable development

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