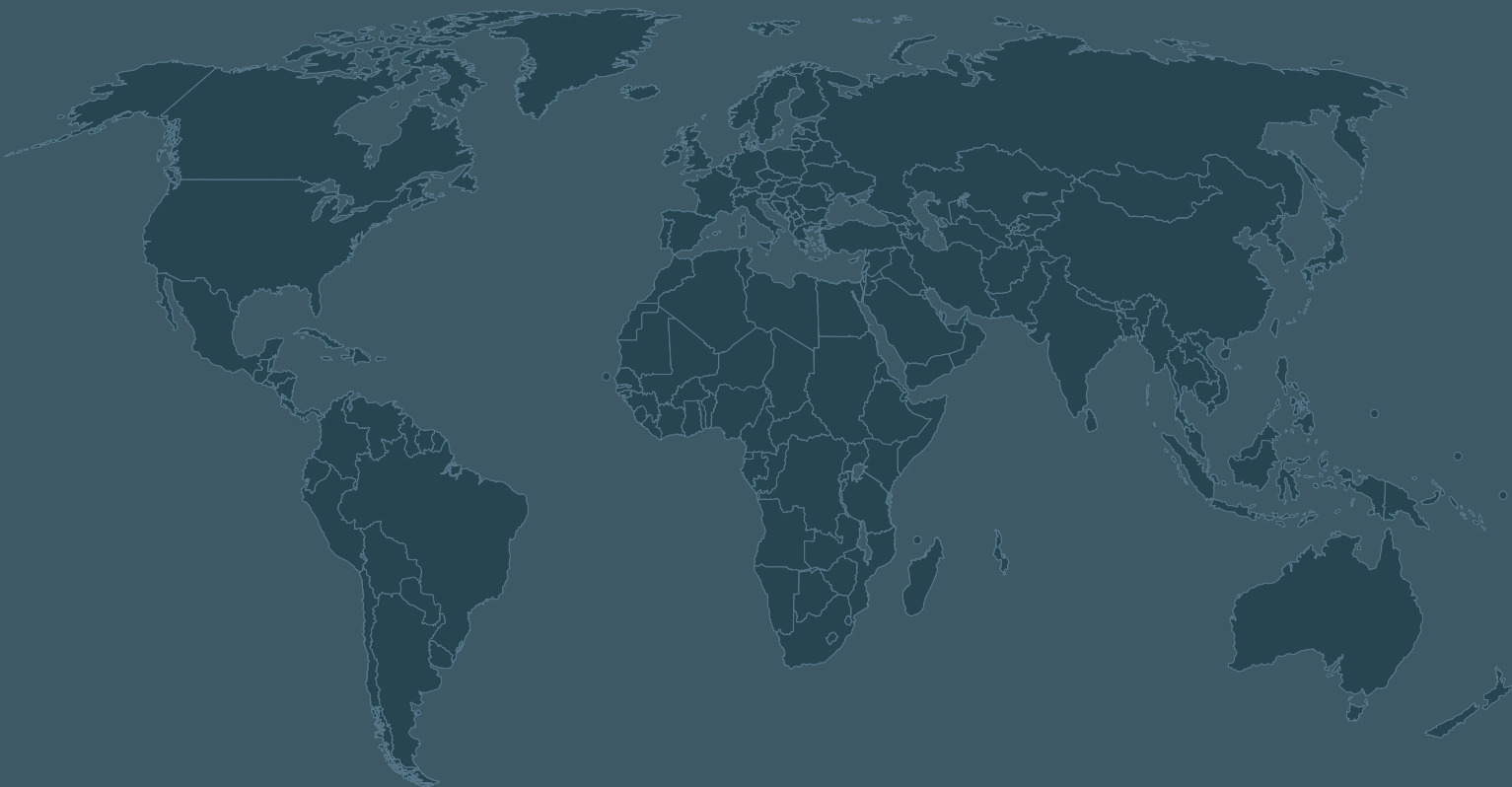


WORLD SMALL HYDROPOWER DEVELOPMENT REPORT 2013

www.smallhydroworld.org

SIERRA LEONE



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1 Africa

1.5 Western Africa

1.5.9 Sierra Leone

Lara Esser and Kai Whiting, International Center on Small Hydro Power

Key Facts

Population	5,485,998 ¹
Area	71,740 km ²
Climate	Tropical climate with two seasons: rainy season (May to October), and dry season (November to April). Humidity is high, about 85 per cent.
Topography	Mountainous range in the north-east which slopes down to the coastal swamps through an undulating grassland plain. The relief is drained by a system of rivers flowing through cataracts and waterfalls ideal for hydropower development, and providing water for the rural communities.
Rain Pattern	Average annual rainfall: 2,746 mm. ² Three climatic belts: coast to 80 km inland (rainfall greater than 3,300 mm per annum), 80 to 190 km inland (average annual rainfall between 2,500 mm and 3,300 mm), 190 km to border areas (average annual rainfall between 1,900 mm and 2,500 mm). ³

Electricity sector overview

Sierra Leone is endowed with abundant energy resources, these include hydropower (estimated at 1,200 MW), solar, biomass, biogas/bagasse. However, these are not sufficiently developed yet to meet energy needs in the country. Most of the energy needs are met by petroleum products (e.g. petrol, diesel, kerosene), and traditional sources such as firewood, charcoal and other agricultural products. Only about 4.7 per cent of the hydropower potential in the country has been tapped so far.⁴ Until the Bumbuna I hydropower station (50 MW) came on stream in 2010, generation relied mainly on costly fuel-based thermal generation (figure 1).⁵

The nation is still recovering from war and the electricity generation, transmission and distribution infrastructure is still poor. There is currently no national grid.

The national electrification rate is 10 per cent.⁵ While Freetown has a relatively acceptable degree of

electricity access, the rest of the towns are virtually in perpetual darkness, with only 1 per cent having access to an electric grid supply. In order to restore power to these areas, the Government has in principle repealed the act of parliament that empowers the National Power Authority (NPA) as the sole monopolist of electricity supply and now encourages private participation in electricity generation.⁴ With the completion of the Bumbuna I hydropower facility in 2010, the country jumped from 13 MW to 63 MW of installed electricity generation capacity.⁵

The estimated hydropower potential in Sierra Leone is more than enough to supply Freetown and to export excess electricity to the neighbouring countries.⁵

Sierra Leone is part of the West African Power Pool (WAPP), a regional organization dedicated to fostering greater co-operation in the region's power sectors and interconnection between countries to enhance energy security. Currently Sierra Leone does not import electricity. By joining the WAPP, Sierra Leone has the potential to become both an importer and exporter of electricity and to compensate for seasonal variations in hydropower generation.⁶

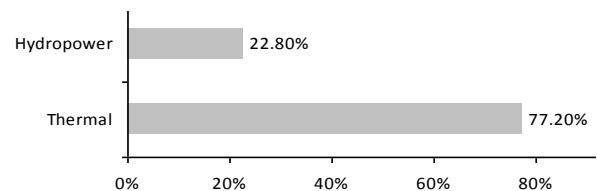


Figure 1 Electricity generation in Sierra Leone

Source: African Development Bank⁷

Note: Data from 2010.

Small hydropower sector overview and potential

Sierra Leone has a very high potential for small- and medium-hydropower generation. The new vision of the Sierra Leone Government is to develop all of its hydropower potentials, and to install thermal generation to complement the envisaged hydropower stations.⁸ Nearly all the districts have one or more waterfalls which could be developed to generate small and/or medium hydropower.

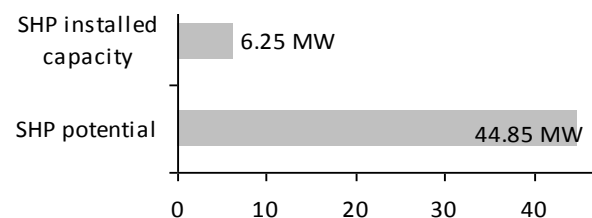


Figure 2 Small hydropower capacities in Sierra Leone

Source: ECOWAS Centre for Renewable Energy and Energy Efficiency⁹

The *Baseline Report on Small-Scale Hydropower in the ECOWAS Region* identified six potential small hydropower sites with a potential capacity of 38 MW.⁹ The only small hydropower station in the country is Dodo, with 6 MW capacity following a refurbishment.⁴ A mini hydropower plant exists in Yele/Makali, with a total operating capacity of 250 kW in the northern part of Sierra Leone (figure 2).⁹

Since 2012, UNIDO has been working on a feasibility study for a 10-MW hydropower project linked to Njala University at the Moyamba district. Following an initial feasibility study, there are also further developments for a 1-MW mini hydropower scheme on River Banaksoka.¹⁰

Studies have been carried out in Charlotte, Freetown, with the aim to develop a 2.2-MW small hydropower plant. There has been limited information on the project, however the project is set to commence according to Kamara.¹¹

Further possible development at Moyamba in the south of Sierra Leone (10 MW) still awaits contractual confirmation.⁹⁹ The project is proposed to receive Global Environmental Facility financing.⁹

Renewable energy policy

The main target of 2010 Energy Policy on electricity is to provide access to 35 per cent of the Sierra Leone population by 2015. There is no proposed contribution from renewable energy under the policy.⁸

The main objective of the national energy policy is to develop energy supply infrastructure countrywide, judiciously developing alternative sources of energy without adverse effect to the five pillars of the 25-year Development Plan, i.e. an environment for economic and social development, good governance, improvement of national security, employment creation, and poverty alleviation.

For the second and third stages of the energy expansion plan (by 2020 and 2025, respectively), two per cent renewable energy (non-hydro) is planned. For example, the target for 2020 is to reach a total installed capacity of 800 MW and an electricity production of 7,000 GWh per year.⁸ Part of future renewable energy plans is grid-connected solar PV, solar thermal electricity production, generation from urban wastes and crop residues as well as low speed off-shore wind parks. However, feasibility studies are still required. Sierra Leone also aims to develop a rural electrification policy and strategy. The dominant institutional solutions considered are the establishment of a Rural Electrification Agency and the active deployment of off-grid technologies that make

use of small-scale renewable energy sources, such as mini- or pico-hydro schemes, or solar technology.⁵

Barriers to small hydropower development

Eleven years of war has caused enormous damage to the national economy and severe destruction to the infrastructure. The country's electricity industry lags behind and needs upgrading. Barriers specific to small hydropower development are:

- Lack of local production of turbines and spare parts;⁹
- Lack of local consultancy capacity;⁹
- Lack of hydrology departments at universities and/or training institutes. However, a network of gauging stations for regular water level and runoff measurements and hydrological data collection is available at hydrological stations;⁹
- Lack of funding, which hinders the implementation of small hydropower projects.

There are also specific challenges in the electricity sector which hinder development. According to AfDB (2011) the country has one of the highest electricity tariffs in West Africa. There is also a lack of utility infrastructure and equipment. Capacity building for strategic planning, operation and maintenance of facilities is lacking, as are the financial means.⁵

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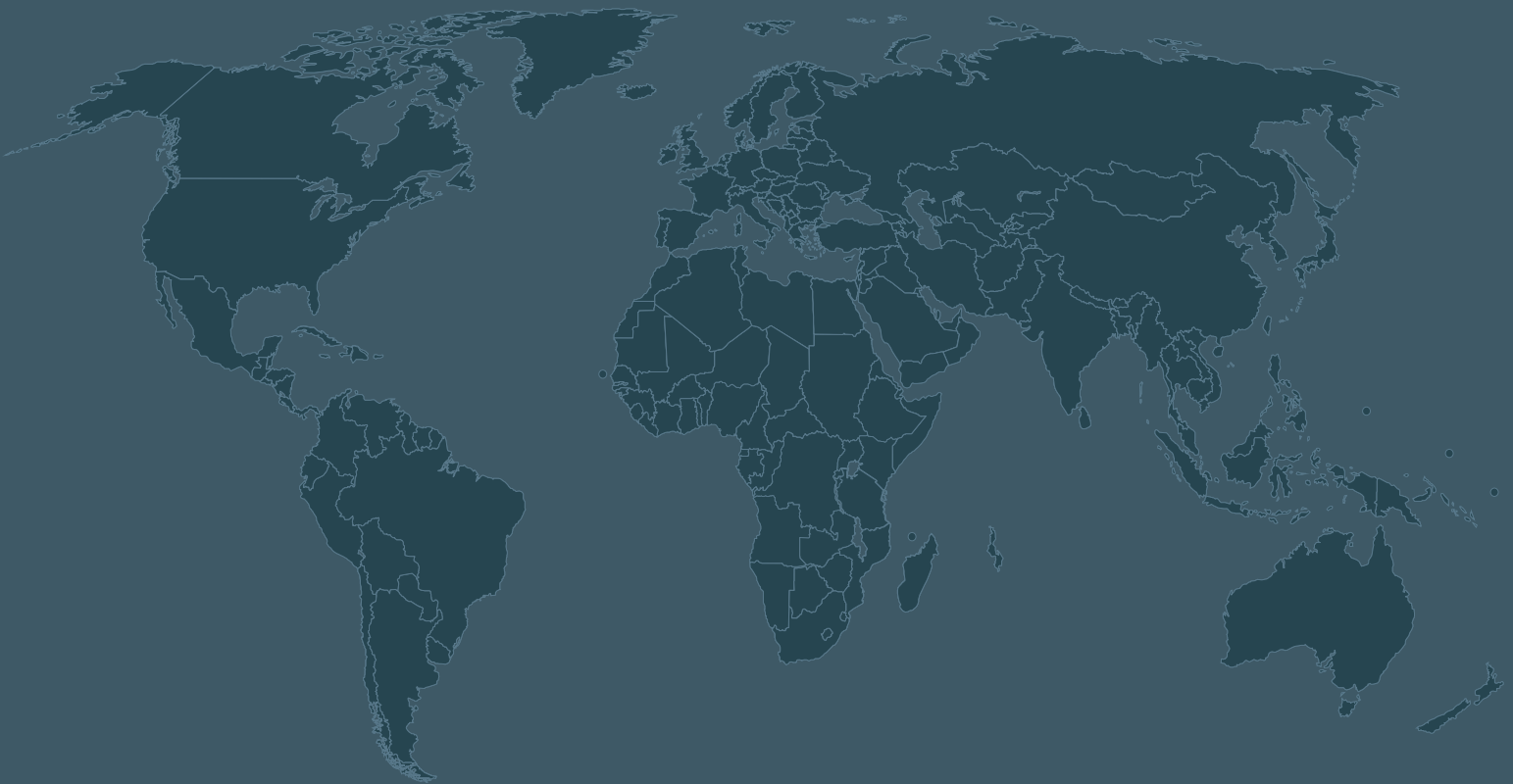
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