

Bringing renewable energy-powered electricity to a Liberian coastal community

A team of experts investigated the feasibility of establishing a small, EU-funded hydropower plant in Sinoe Rapids, an hour or so inland from Greenville City.



The Sinoe river has good hydrology due to its forested catchment and high rainfall, giving the proposed 2 MW project a capacity factor of 70% and ability to generate almost 3 times the demand of the proposed local grid benefiting about 1,700 households.



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More than a decade of civil war - which ended in 2003 - destroyed Liberia's power infrastructure. Almost all public generators installed following the conflict have been destroyed, forcing much of the country's 4.7 million population to use costly private diesel generators.

With support from the EU, the Government of Liberia aims to boost the rural electrification supply to southeast Liberia that will include electricity expansion to Grand Kru, Sinoe, Maryland and other counties. The overall aim is to stimulate economic development and reduce poverty.

One of several planned projects includes the development of a small hydropower project (1 MW) in Sinoe County to provide captive supply of electricity to Greenville, a town of approximately 17 000 residents. Over the course of nine months, NIRAS conducted a feasibility study on the development of the plant, delivering a detailed design as well as tender documents to enable the EU to publish the tender.

Poor infrastructure holds back development

Sinoe County is one of 15 counties in Liberia. The county capital, Greenville City, has about 20 000 inhabitants, about 1.5% of whom reside and trade along the road to the planned site of the Sinoe Rapids hydropower plant. Prior to the 1990s civil war, the city was a prominent exporter of rubber, lumber, finished wood products and agricultural produce. It was partially destroyed during the first civil war and has been rebuilt but remains under-developed. Despite having old and debilitated infrastructure with a mixture of concrete and dirt roads, Greenville is a busy business town with plenty of retail stores, and it benefits from

having a reasonable port, the third largest in Liberia. In addition to the dearth of proper roads connecting Greenville to the nation's capital, Monrovia, and Buchanan further north, the lack of centralised electrification is a major issue for people and an obstacle to development on a wide range of fronts. If the community were to gain access to a reliable source of electricity, it would be a tremendous boost for many local businesses and sectors including fisheries, cold storage, food processing, agricultural development, tourism, woodworking, traders, stores and SMEs.

2%

of Liberians have access to electricity

Project deliverables

Over the course of the project, the NIRAS-led team produced several topographical studies and hydrological surveys to understand the site as well as geological investigations to assess local materials. In addition to an economic and financial analysis and an assessment of the cost of upgrading the road to the project site, local construction capabilities and specifications for required electro-mechanical equipment were evaluated, and public procurement plans drawn up. Potential environmental and social impacts were examined and plans drafted for their mitigation.

As part of the assignment, several community meetings were conducted with Greenville residents as well as members of the Wedjah and Numopoh tribal groups to assess the impact on local livelihoods, understand perceptions among the local population and learning about the river users' different needs. In

Donor
European Commission

Client
EU Delegation to Liberia

Location
Greenville City and environs, Liberia

Contract value
€406,358

Duration
October 2018 - July 2019



Conducting any type of field work in rural Liberia is challenging, primarily due to lack of access to remote project sites. Particularly during the rainy season when the dirt roads become little more than mud baths, trucks can end up being stuck on the road for days. These were only some of the challenges faced by the team in conducting the feasibility study of establishing a small hydropower plant along Sinoe River.



the final report, the team recommended continual engagement with locals to update them on the project plan and to undertake further social outreach to rural beneficiaries who have a much lower ability to pay for electrical services than in Greenville City.

An unintended capacity development aspect was included in the project when the team recruited locals to help with conducting household questionnaires. The EU Delegation appreciated the approach as it went beyond the original scope of the study, giving the team valuable insights and making locals feel included in the project.

One conclusion that was reached early in the process was that due to both technical difficulties and how the local population use the river, a so called “run-of-river” solution was preferred over the original intention of a dam. This will allow the fish to migrate upstream and ensure the livelihoods of the people dependent on fishing.

Challenges in completing the assignment

Conducting any type of field work in rural Liberia is challenging, primarily due to lack of access to remote sites, and this project was no exception. As the 200km road from Buchanen to Greenville is in serious disrepair, the team faced numerous difficulties in completing and reporting on the technical, field-based tasks. Other obstacles the team had to overcome included dense forest upstream from the rapids, which was problematic even for a drone when conducting the topographical surveys; lack of historic climatic data to assist with the hydrological

modelling; incomplete hydrological data; delays to the geological investigations as a result of the river running too full, and lack of capacity to test soil and rock samples locally. Despite these challenges, the project timetable was met.

+10K

Number of people who will benefit from with proper lighting, water supply, health services, and other key infrastructures once the plant is built

Green light given

In their final report, the project team concluded that construction of the hydropower plant is viable, even at a relatively high cost of USD 6,648 per kW developed compared to international standards for cost of small hydro of less than USD 5,000 per kW.

The project could significantly improve the developmental potential of Greenville and the areas along the road to the project site where the transmission line will run and benefit over 10,000 people with proper lighting, water supply, health services, and other key infrastructures, providing a huge opportunity for increased business and higher local incomes. If the whole project was to cost USD 15-16 million with the transmission lines, the cost of the project per capita seems reasonable at USD 1,500-1,600.