

Alternative Finance

// in Emerging Markets //

Clean Energy in West Africa
November 2019

Executive Summary

Word from the Editor

Thanks for viewing the latest report on **Alternative Finance in Emerging Markets!** It's been a busy time at AlliedCrowds, as we have been working on improving our Capital Finder database and building products for our clients. We're excited to relaunch the reports with new and better data – and a much-needed design update!



We have a number of exciting projects and announcements in the works, and we'll be releasing these reports on a monthly basis from now on. If you haven't already, make sure to **sign up to our newsletter** so you don't miss the latest data and insights.

This month, we're excited to announce the launch of a product we created for the Ghana Climate Innovation Centre (GCIC), a prominent accelerator based just north of Accra. The **GCIC Capital Finder** is a unique database of all alternative (non-bank and non-microfinance) funders active in Ghana's green tech space. The database is highly searchable, allowing entrepreneurs to filter investors by type of capital, funding need, and the five GCIC sectors: energy efficiency, domestic waste management, water management and purification, solar energy, and climate-smart agriculture.

The database also contains information on past deals. This is a big deal – entrepreneurs are now able to see who is in an investor's portfolio, and get an idea on how much these investors are investing in firms. We also added information on investor team members, allowing entrepreneurs to identify who exactly to

reach out to at each funder.

In order to create the most comprehensive overview of investors active in Ghana's green tech space, we collected a lot of unique data – not only on Ghanaian investors, but also those in the wider region. Now, we'd like to make it open to the public.

Green tech companies, including those focused on renewable energy in particular, have a lot of promise in the region. West African nations receive a lot of sunshine and have a clear need to push for electrification. **In Ghana, the regional leader, almost 80% of the population have access to electricity. In Liberia, the laggard, that number is only 21%.** Even the resource-rich Nigeria has only a 54% electrification rate; anyone who's been in the country is familiar with the constant power failures. In order to promote electricity access, renewables must become a priority – and, accordingly, receive a growing share of funding.

Our analysis shows that Nigeria and Ghana are the leaders when it comes to the number of funders actively funding green tech startups and SMEs. Given their large populations and fast-growing economies,

that's not much of a surprise. What is quite surprising is the relative lack of investor activity in other countries in the region (see chart on page __). This may be due to our data collection – after all, we focused specifically on Ghana. But we would expect at least some of the funders we identified to be more active across the region, rather than in just one or two countries.

We also had the privilege of getting insights from Wale Shonibare, Acting Vice-President of Power, Energy, Climate Change & Green Growth at AfDB as part of the research for this report. You can see our questions to him and his responses at the end of this document.

We hope you enjoy the analysis and the unique data in the report. Stay tuned for more such information on other sectors and geographies next month. And if you'd like us to conduct unique data analysis, or build a custom database of investors based on your needs, please reach out to **capital.finder@alliedcrowds.com**.

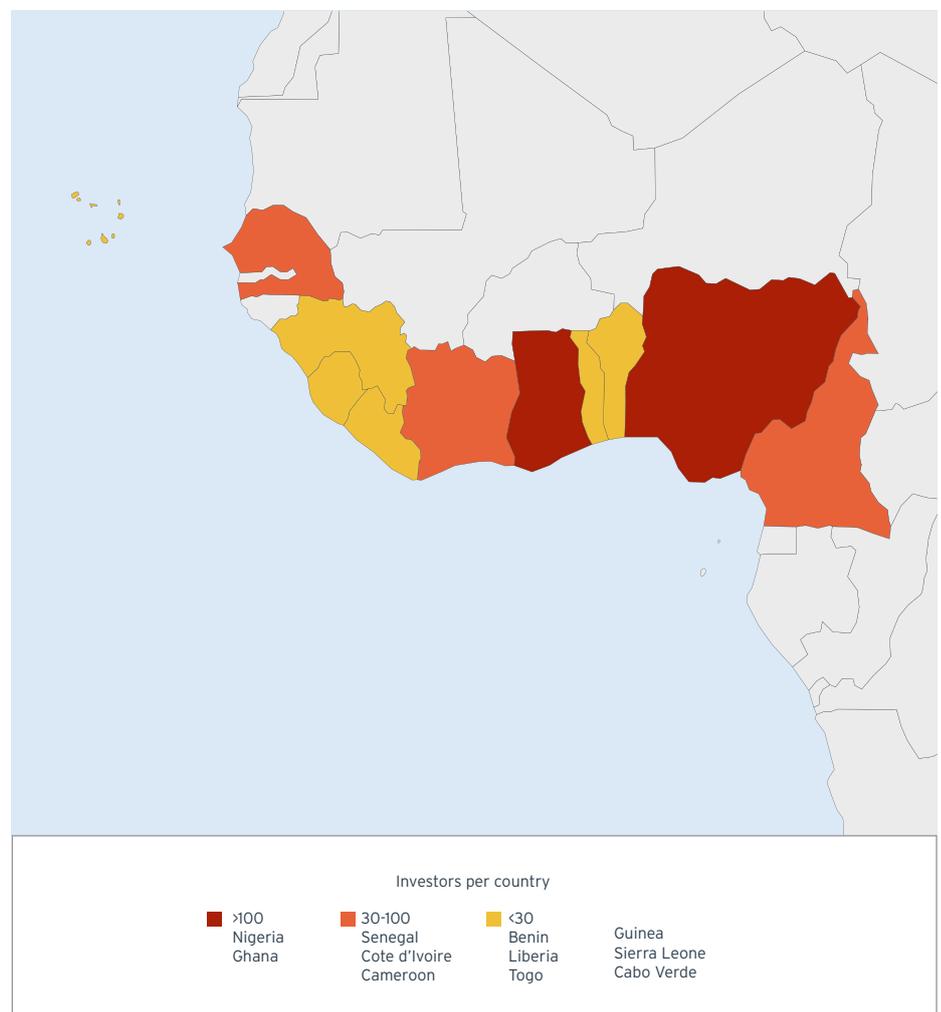
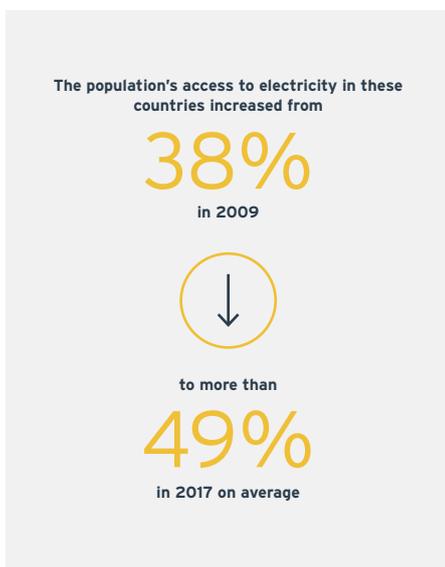
Anton Root
Head of Research

Introduction

With over 360 million people, West Africa represents nearly a third of the African population; it also has one of the lowest **consumption rates of modern energy sources** globally.

Mass urbanisation and demographic trends are set to boost energy demand in the coming years, and the declining cost of cleaner energy sources, coupled with the growing imperative for climate action, have led to unprecedented investment in

renewable energy over the last decade. Total renewable energy capacity of the 10 West African countries included in our analysis (Benin, Cameroon, Côte d'Ivoire, Ghana, Guinea, Liberia, Nigeria, Senegal, Sierra Leone, and Togo) increased from **4 927 MW in 2009 to 6 437 MW in 2018**, with wide growth variations across these countries. In this report, we'll look at some of the challenges and opportunities facing renewable energy growth in West Africa, focusing specifically on funding.



Challenges

In 2017, developing economies accounted for **63% of global investment in renewable energy**, but this includes China, India, and Brazil – who account for over 50% of the total. Most developing countries, particularly in Africa, have yet to attract consistent volumes of capital to scale their local clean energy sectors.

“Energy security in the region is threatened by poor system reliability and limited infrastructure.”

They also still face structural issues that impede such levels of investment. These include unreliable supply networks, restrictive institutional frameworks, and high distribution costs that keep significant population shares secluded from electricity access.

There have been inconsistent improvements in the past decade. While less than 2% of **Liberia's** population had access to electricity in 2009, more than 20% do today. In **Nigeria**, on the other hand, the access rate was relatively high (50%) in 2009, but progress stalled and coverage has yet to reach 60%. Rural areas remain least connected, with **access rates for rural populations** as low as 5.4% in Sierra Leone.

Energy security in the region is threatened by poor system reliability and limited infrastructure. This is characterised by recurrent power shortages in urban areas and limited access to reliable and affordable energy services in rural areas. In Nigeria alone, unreliable electricity access costs an estimated **\$29 billion** annually. **Dependence on refined fuel imports** and a reliance on large hydropower plants leaves countries vulnerable to variations in volatile international prices and seasonal output. Traditional biomass (wood and charcoal) still represent up to **85%** of total energy consumption in some countries, exposing populations to health and safety risks – and resulting in significant deforestation.

“In Nigeria alone, unreliable electricity access costs an estimated \$29 billion annually.”



Electricity costs in West Africa as a whole are still high, due to **aging infrastructure and the inability to serve consumers in a reliable manner**. Some countries have opted for subsidies like feed-in tariffs, whereby regulators offer guaranteed prices for a given number of years to support the sale of electricity generated from renewable sources. Although considered a vital pillar to control renewables deployment and attract investors, these have given way to fierce competition. An abundance of Senegalese applicants for feed-in tariffs meant that **it took several years to identify the best ones** – leaving many projects without any government-backed support.

Rapid urbanisation and demographic growth have boosted demand for energy, with a **projected fourfold increase in regional demand** from 2013 to 2030 – for which ECOWAS heads of state have committed to increase the share of renewable energy to 31% of the overall electricity generation mix. Despite recent efforts to promote investment, West African countries still have a long way to go to reach this goal.

Opportunities

Despite these challenges, the outlook remains positive. The region's rapidly growing demand for energy has led to ambitious regional and national strategies. The pressing need to support development in remote communities has already driven policy commitments, expanded innovative solutions to capitalise on the region's renewable energy potential, and generated business opportunities in the off-grid power sector.

At the regional level, ECOWAS heads of state committed to adopt the **ECOWAS Renewable Energy Policy** in 2013, which aims to increase the share of renewable energy in the region's overall electricity generation mix to 31% in 2030. At the national level, most governments have developed National Renewable Energy Action Plans, created rural electrification agencies, and some, like **Senegal**, have created new ministerial departments to oversee renewable energy development.

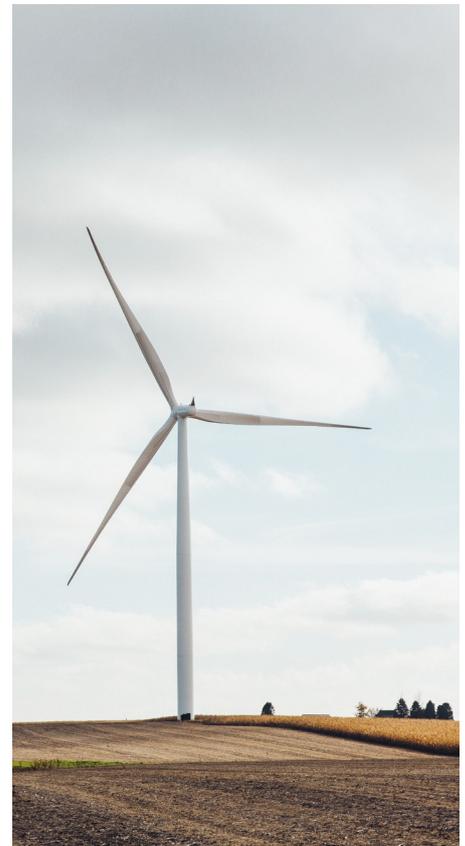
West Africa has tremendous renewable energy potential across a diverse set of resources (modern biomass, hydropower, solar, and wind). This potential has been harnessed to a certain extent, with total renewable energy capacity growing on average **9.27%** each year since 2009 in the 10 selected countries. The most established and widely used renewable energy technology is hydropower, yet only **19% of the region's estimated 25 GW of hydropower potential** has been tapped to date. The potential for solar energy is particularly abundant, **averaging 4-6.5 kW per square-metre across West Africa** – making solar energy generation a salient candidate for meeting the region's growing power demand.

AfDB has estimated that nearly 40% of the continent's new connections will have to be from off-grid solutions to achieve electrification goals. Investments across the continent have been growing to match this need; according to venture capital firm Partech, off-grid technology was the **third highest-funded startup sector in Africa** in 2018. Importantly, off-grid solutions play a pivotal role in enabling rural populations

to access electricity, as they are often more cost-competitive than extending national grid networks, and can be adaptable to local needs and conditions.

Although investment remains insufficient, interest in clean energy projects has been growing. Chart 2 on page 6 shows a breakdown of funders investing in clean energy ventures, according to five sub-sectors: Solar Energy, Water Management and Purification, Domestic Waste Management, Energy Efficiency, and Climate Smart Agriculture.

In light of global reductions in renewable energy costs, the International Renewable Energy Agency (IRENA) **estimates** that both onshore wind and solar PV will have lower generation costs than fossil fuels by 2020, accelerating investment and technology adoption. Wind and solar projects also have a different expenditure model compared to coal, gas, oil, and biomass generation projects; renewable energy technologies incur an overwhelming majority of lifetime costs at the initial construction stage since the input (sunshine/wind) is free, while operations and maintenance expenses are relatively low.



COUNTRY SPOTLIGHT: GHANA

Ghana, along with Nigeria, has a relatively developed renewable energy market in terms of funders willing to invest in clean energy projects (see chart 1 on page 6). Solar has experienced a meteoric rise, with national generation capacity increasing by **66.5%** year-on-year from 2013 to 2018. While renewable energy in the form of large hydropower accounts for **43.2%** of the country's total installed capacity, its solar and biogas initiatives still only account for 0.6% – revealing significant potential for the clean energy sector to grow in coming years.

In February this year, the government's Energy Commission set out its blueprint for developing alternative power production in its **Renewable Energy Master Plan**. This includes goals to increase installed renewable capacity to 1,364 MW by 2030 (excluding large hydropower projects), of which 1,095 would be linked to the national grid network. A total of \$5.6 billion is needed to achieve this, representing \$460 million each year; 80% of this is expected to come from private investors.

Other policy efforts include replacing kerosene lanterns in rural areas with solar-powered equivalents; in 2017 more than 52,000 portable solar lanterns with phone-charging functionality were sold with 70% price subsidy to low-income, rural households.

Data Breakdown

Clean Energy Funders vs. Avg. Annual Public Flows

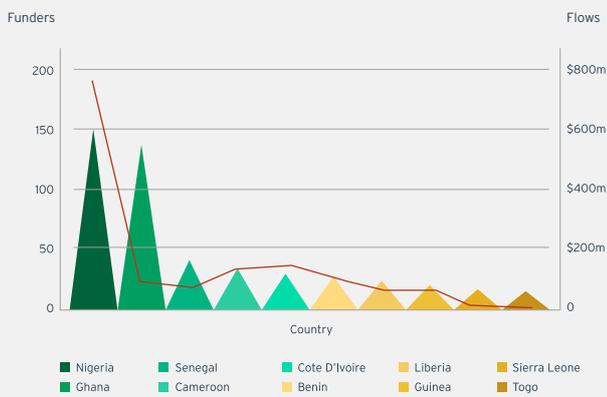


Chart 1: Number of capital providers that invest in the renewable energy and clean-tech sectors, and public flows to renewable energy projects (2009 to 2017 average) for each country (IRENA).

Proportion of Funders per Country

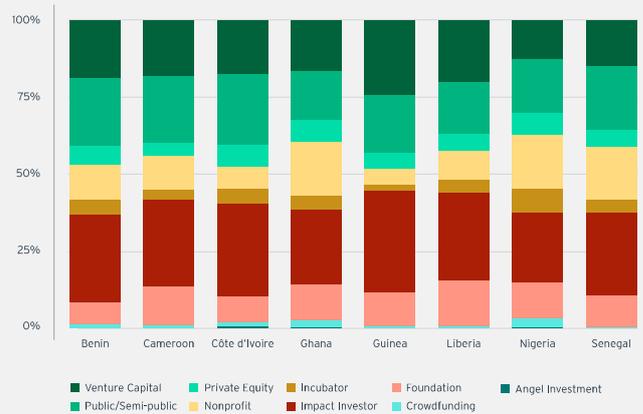


Chart 2: Breakdown by type of investor for each country.

Capital Providers by Sector, Nigeria

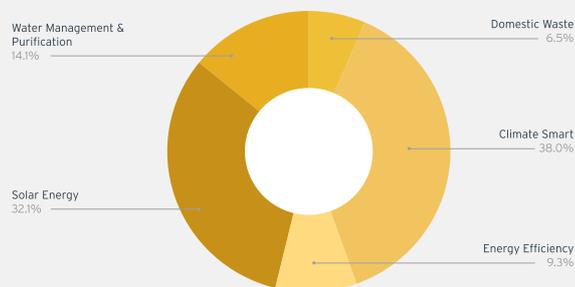


Chart 3: Breakdown of investors active in Nigeria by sector.

Rural population with access to electricity (%)

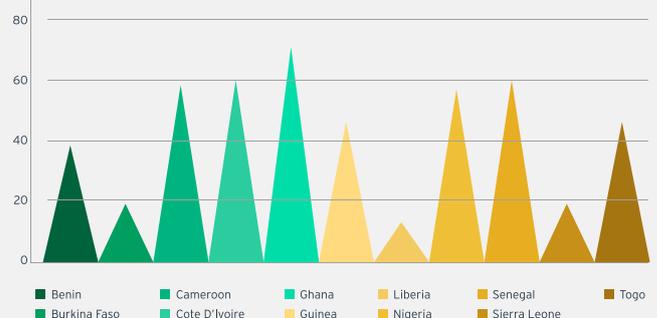


Chart 4: Rural electricity access rates by country, 2017 (IRENA).

Financing Trends

According to a report by BloombergNEF, UN Environment, and the Frankfurt School, global renewable energy investments in 2018 alone reached almost **\$273 billion**. This represents three times the estimated expenditure on gas- and coal-powered electricity generation. Still, access to funding in Sub-Saharan Africa lags behind the rest of the world, and current levels of financing are far below what is needed to reach the 2030 clean energy access goals.

Public finance

Data from IRENA shows that public financial flows to renewable energy in the 10 selected West African countries averaged \$1.23 billion each year from 2009 to 2017 (see chart 1 on page 6). Our data indicates that, on average, public and semi-public investors back the largest amounts in clean energy projects compared to other types of capital providers. These volumes are unevenly distributed across the region, however, with Nigeria alone accounting for 70% of the \$7.2 billion public investment flows to renewable energy from 2016 to 2017. In terms of cross-country public flows, **Senegal, Sierra Leone, and Liberia have been the largest recipients** of clean energy investment with \$330 million, \$190 million, and \$110 million accumulated flows respectively from 2008 to 2017.

At the national level, governments have implemented different types of financing mechanisms to promote clean energy development. Nearly all countries in the region have implemented some type of fiscal incentive to promote renewable energy development. **Senegal**, for instance, has exempted solar-powered devices including lighting, water pumps, and water heating kits from customs and value-added taxes. **Burkina Faso** provides tax credits and energy production payments (per unit of renewable energy produced) to encourage more investment in the sector.

Average minimum and maximum clean energy funding amounts by type of capital in the 10 countries

	Average Min Investment Size	Average Max Investment Size
Equity	\$2,940,080	\$33,139,286
Lending	\$324,235	\$16,099,406
Grant	\$66,669	\$2,555,425

Policy efforts have promoted the use of green debt instruments to finance clean energy developments, such as the partnership between the African Development Bank (AfDB) and West African Development Bank (BOAD) to launch a **co-guarantee platform** for renewable energy projects that require support to attract private finance, as well as the BOAD Green Bond programme. Countries also benefit from multilateral support; this year, the World Bank with the Nigerian government committed **\$350 million** to finance electrification for rural populations, with a focus on facilitating licensing and registration for mini-grid developers to accelerate the development of off-grid solutions.

Private finance

Given that 43% of multilateral development bank finance to energy projects in Africa between 2014 and 2016 **went directly toward fossil fuel infrastructure**, meeting clean energy targets means that a large share of investments will need to be funded from the private sector. While international public finance is, in general, still dominant across Africa, an **SEforALL report** finds that in the 20 most “high impact” countries, of which 13 are in Sub-Saharan Africa, the private sector accounts for the vast majority of trackable domestic financing for energy access. Still, a lack of private domestic investment raises operational and fundraising costs for businesses in the clean-tech sector.

According to Audrey S-Darko, CEO of Sabon Sake and winner of the 2019 Ghana Climate Launchpad competition, “the financial sector has not embraced the idea of startups being the solution to problems such as climate change, and being strong assets to economic development. It’s near impossible for me to walk into a bank, pitch a proposal for Sabon Sake, and actually get a loan”. She explains that while these are expensive markets for entrepreneurs to enter, they remain attractive because of their potential to thrive. As traditional financial institutions are reluctant to fund such ventures, the effective transition to a sustainable resource economy “will take a lot of tenacious, ambitious entrepreneurs to be aggressive in finding funders that are willing to match this capital-intensive sector’s investment needs”.

“The financial sector has not embraced the idea of startups being the solution to problems such as climate change.”

Audrey S-Darko

Equity, Grant and Lending Funders per Country

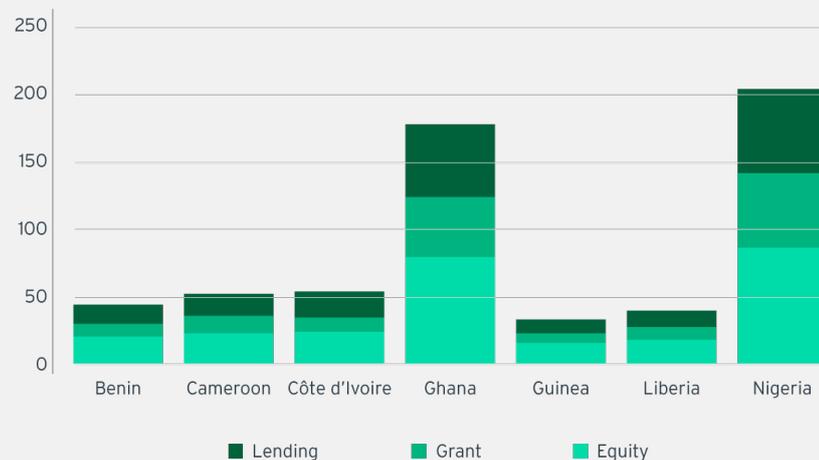


Chart 5: Breakdown of funders per country by type of capital provided.

Nigeria boasts the largest number of capital providers among the 10 countries, with Ghana not far behind. This is not surprising considering that these are the most financially developed countries in the West African region. We estimate that there are 150 clean-tech funders in Nigeria, against 20 in Togo - the smallest amount in our analysis.

When asked about the effectiveness of different funding providers, Audrey considers that “for early-stage ventures, grants are the most attractive because at that stage entrepreneurs don’t want to be indebted and are still nurturing their model. The daring ones tend to go for debt, whether it is banks, angel investors, or venture capitalists. For me, incubators and other seed-funding are most attractive as they give you that push which enables you to keep going.”

Our data indicates that impact investors are the most prevalent funders for the sector among private investors in each of the countries included in our analysis (see chart 2 on page 6). Impact investors also back the largest deals among non-bank capital providers in the region, the upper end of which average \$8.7 million, surpassing even private equity and venture capital investors.

Given the increasing attractiveness of the sector, it is somewhat surprising that financial institutions have not been as proactive as they should; as Audrey puts it, “there are immense opportunities in this sector, and entrepreneurs can and should carry out their activities without support from traditional financial institutions. When the financial sector realises that communities are being powered and that the sector is being populated, they will come running. Once they do, investment should definitely be tailored to the sector, for example by breaking down support for each type of renewable in order to guarantee that financing is inclusive over time.”



**\$8.7
Million**

Average maximum
investment size for impact
investors in the region

Technology Trends

West Africa and beyond

The majority of households across Sub-Saharan Africa continue to rely on traditional biomass for cooking. **This costs an estimated \$36.9 billion each year**, from time lost gathering fuel and cooking to health expenses due to exposure to biomass smoke. Many African cookstove ventures have started to reach scale, with new technologies ranging from slightly more efficient biomass cookstoves to cleaner solutions like that developed by **Sistema.bio**, which converts waste into renewable natural gas to create fuel for cooking and heating.

Solar PV remains the most popular renewables technology in emerging markets, attracting **\$10.5 billion more investment than wind in 2017**. In Benin, the non-profit SNV has partnered with MTN, Africa's biggest mobile network operator, to support micro-entrepreneurs in this sector. MTN agents operate **pico solar carts** that sell basic power services such as phone charging. At the household level, innovations range from pay-as-you-go solar power kits geared towards low-income, rural households, to solar PV switching units that power water heaters without the need for batteries or inverters. The rapid market growth of distributed energy systems has been enabled by the widespread uptake of mobile money across Sub-Saharan Africa, which reached a **transaction value of \$200.5 billion 2018**.

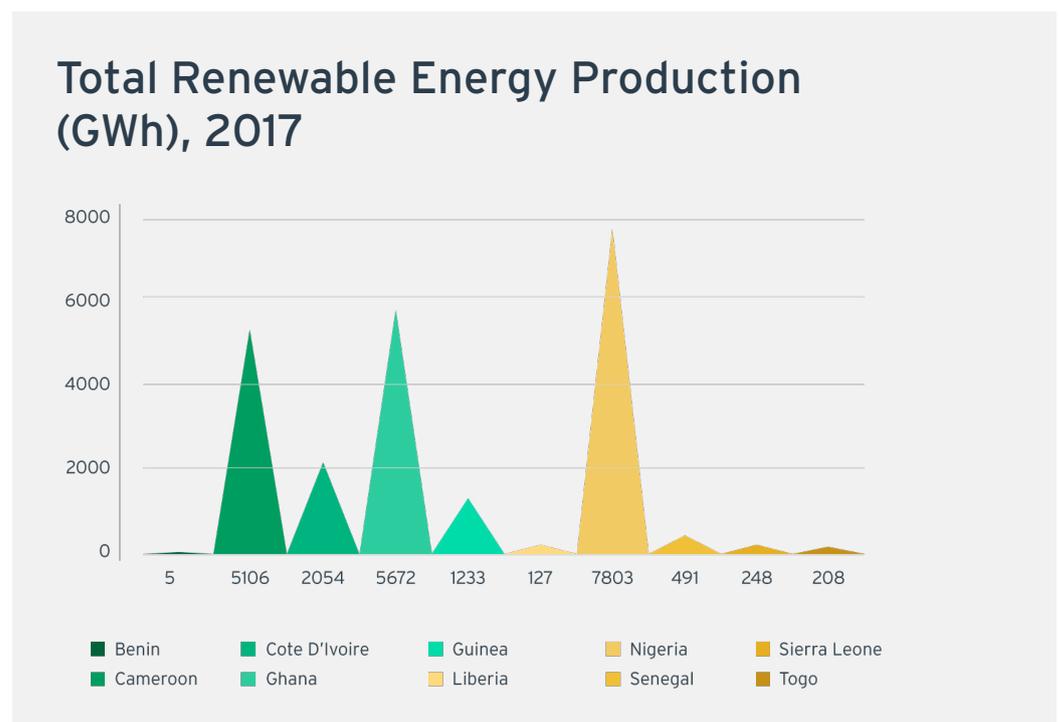


Chart 6: Total renewable energy production in 2017 for each country, including large hydropower (IRENA).

With its strategic location and large coastline, West Africa possesses enormous potential for wind power production. While some countries have built large wind farms, the continent is slowly capitalising on the prospect of small wind turbines, primarily used for microgeneration. South Africa-based Estrel Renewable Energy manufactures distributed small wind turbines combined in hybrid systems with solar PV, that have been installed to power lights, computers, and projectors at a **school in the coastal village of Haga Haga**.

The scaling up of distributed generation technologies are turning consumers into active players in the electricity system. This is affecting the role of system operators, whose responsibilities are expanding to include the integration of variable renewable energy into the grid, as well as the optimisation of existing grids to improve demand-side management and promote energy efficiency.

Expert Perspective

Interview with **Wale Shonibare**, Acting Vice-President of Power, Energy, Climate Change & Green Growth at the African Development Bank

Can you give a bit of background on the Energy Financial Solutions, Policy and Regulation work in the PEVP Vice-Presidency at the African Development Bank?

PEVP works to scale up investments by mobilizing and structuring innovative financing into Africa's energy sector; and to strengthen energy policy, institutional performance, regional cooperation, legal and regulatory reforms, and access to reliable data to support decision making. These interventions are key in our efforts to provide energy access to the 600 million African who lack access to electricity by enhancing project bankability, and attracting private sector investments to fill the energy financing gap.

How has the clean energy sector in West Africa developed since ECOWAS committed to adopting the Renewable Energy Policy goals in 2013?

The renewable energy sector in West Africa shows sustained development since 2013. However, this has not happened at the pace envisaged by the ECOWAS Energy Renewable Policy (EREP). The current estimated share of renewables in the region's generation mix is below the 35% and 10% targets for large, and medium scale hydro respectively. These are currently estimated at 20% and 5% respectively. Despite the continuous decline in the cost of renewables, especially solar, there is still a high dependency on fossil fuels for power generation. The region is endowed with enormous renewable energy resource potential, but high financing and investment gaps still persist across the entire electricity value chain.

What are the main barriers to renewable energy development and electrification in the region, and how can they be overcome?

Common challenges that hamper the development of the energy sector in the region include insufficient government buy-in and support, low electricity access rates, saturated power networks due to lacking infrastructure, and a high reliance on fossil fuels. West African countries created the West African Power Pool (WAPP) to coordinate power trade but less than 10% of energy produced is traded today in the pool. Options to overcome these challenges include increasing electricity access through the deployment of grid and decentralized energy solutions, improving



utility performance and capacity, developing appropriate financial, commercial, and regulatory frameworks and risk mitigation strategies, and developing technical and financial feasibility studies to develop bankable solar projects.

Why are financial institutions reluctant to invest in the clean energy sector, given the regional growth in demand for energy?

Commercial banks are less active because of their more conservative risk appetite that translates to higher interest rates and shorter tenors. They are also unable to extend loans with adequate tenors due to the short-term maturity profile of their deposit and the absence of deep capital markets to source long-term financing. Yet, in order to reduce energy tariffs, long loan tenors are required, interest rate margins have to be minimized, and very often the use of higher interest rates on local currencies mean that financing in foreign currencies (USD/EUR) are used to keep tariffs low. In addition, there is a lack of effective regulation to support a workable financial framework encouraging investments.

Given recent improvements in legislature and public efforts to boost clean energy, why do you think growth in investments has been slow?

Investment growth rates in renewable energy across West African countries have been positive and progressive. Going forward, we expect these positive trends to further accelerate. Electricity demand in West Africa is expected to increase by as much as fivefold in West Africa by 2030; meeting this demand will require West Africa to reach 63 GW of installed capacity by 2030, of which renewable energy sources

will be an important component. The total cumulative investment needs for large hydro and other renewables projects between 2015 and 2030 is estimated at USD 67 billion. Yet, project development and financing, anywhere in the world, generally requires long and sometimes very complicated processes.

How does the AfDB choose which projects to support?

Public projects are demand driven. The project selection process is undertaken in close consultation with governments and with the development partners involved in the sector. Selected projects are in line with the government priorities and plans; and are also aligned with the Bank's corporate priorities, including the **High Five Priorities**.

For private projects, the key criteria are development impact and credit risk; the project must provide positive economic value to a country.

How does the Bank's Energy Financial Solutions practice interact with intermediaries such as private equity and venture capital funds?

The Bank can invest in projects using a number of different financial products: equity, debt, guarantees, but has some restrictions on the minimum size of projects which it can invest in directly. To ensure smaller companies also get access to funding, the Bank invests in funds which can then invest in smaller projects. Because of the variety of financing instruments available, there can sometimes be conflicts of interest e.g. between an equity and debt investment in the same project. One way to avoid these conflicts is to channel equity investments through funds which operate independently of the Bank.

Conclusion

Weak institutional settings and lagging infrastructure investments have meant that West Africa has fallen behind in the deployment of clean energy, but the implementation of ambitious policy goals coupled with the costs of renewable energy represent a tremendous opportunity for the development of clean technologies.

Next Steps

Both entrepreneurs and capital providers are stepping up to the challenge and providing innovative commercial responses, in particular off-grid and decentralised solutions, to expand electricity access in the region. Still, as the West African clean energy sector grows at an increasingly rapid pace, more funding is needed from investors to stimulate local entrepreneurial ecosystems and further drive the transition to a clean, regenerative economy.



Author: Celine Zins

Editor: Anton Root

Data Collection: Malcolm Kapuza and Alex Athorne

Design: Elisabet Bassa

Special thanks to Audrey S-Darko (Sabon Sake), Kathambi Kaaria (AfDB), and Wale Shonibare (AfDB) for their contributions.