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# CONNECTING THE DOTS

## Accelerating renewable energy deployment with regional integration: a 10 years retrospective on West Africa

# Acknowledgements

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The study was developed
in collaboration with
Enel Green Power

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# Introduction

RES4Africa Foundation, in collaboration with Enel Green Power, presents an overarching analysis to look at what happened in the renewable energy sector in the last 10 years in the West Africa region, what limited its growth, and what is needed to accelerate investment and deployment of renewable energy solutions.

The analysis focuses on the main features of the West Africa region, its socio-economic context, strengths, and vulnerabilities, which greatly vary from one country to the other. Taking into account the wide range of differences that characterize the region and building on facts and figures, the publication presents what would be needed to achieve access to affordable, reliable, sustainable energy for all.

Why West Africa? The region accounts for about a third of the continent's population, with almost half of it with no access to electricity; this, despite many crucial building blocks for sustainable development has already been put in place: an established economic community, a regional power pool, and a monetary union. The countries within the region are differentiated by demographic and socio-economic conditions but most of the basis for regional integration is in place. What is missing is connecting the dots.

# Preface

This decade will be crucial to understand if we will be able to achieve the ambitious goals in our fight against climate change set by the international agenda, that urged a global effort for the 1.5°C target.

West Africa is endowed with enormous renewable energy potential that could help its countries to cope with rapid urbanization and population growth, both contributing to the continuous increase of energy demand. But the share of renewables in the generation capacity is just at 21%, with large hydro representing the vast majority of it and solar and wind growing at a slow pace in the last decade.

Nevertheless, the area faces a situation where some countries have deficits in energy production and other have a surplus of power generation, an outline that clearly positions West Africa as a strong candidate for regional energy integration. Achieving integration would mean saving between 5 and 8 billion dollars a year  on Countries' energy bill. Despite that, cross-border energy trade remains very limited.

# Preface

To fully develop the immense renewable energy potential of the region it will be paramount to act on different streams of action by i) adopting a clear regulatory framework to ease Foreign Direct Investments barriers to allow the implementation of bankable PPAs and ensure balance between local content and market competitiveness, ii) enhancing financial de-risking instruments with the provision of innovative solutions; iii) supporting monetary cooperation among countries and iv) and promoting regional integration to attract investments and support economic development and prosperity.

The 2022 publication aims at shedding light on the opportunities for renewable energy development and regional integration in West Africa, as a mean to foster socio economic benefits for a fast-growing population. This publication is intended to be used as a tool for exchanging ideas and views, a building block to stimulate further analysis and spread knowledge around the enormous potential laying within the region.

It is not an easy task, but the time to act is now.



**Salvatore Bernabei**
President at RES4Africa Foundation
CEO of Enel Green Power
Head of Enel Global Power Generation

# Abbreviations and acronyms

ACBF – The African Capacity Building Foundation
AfDB – African Development Bank
BNEF – Bloomberg New Energy Finance
ECOWAS – Economic Community of West African States
ESMAP – Energy Sector Management Assistance Program
FDI – Foreign Direct Investments
GDP – Gross Domestic Product
GW – Giga Watt
JRC – Joint Research Center
IEA – International Energy Agency
IFC – International Finance Corporation
ILO – International Labour Organization
IPCC – Interngovernmental Panel on Climate Change
IPP – Indpendent Power Producer
IRENA – International Renewable Energy Agency
MWh – Megawatt per hour
OECD – Organization for Economic Co-operation and Development
PPA – Power Purchase Agreement
PV – Photovoltaic
RE – Renewable Energy
RES – Renewable Energy Sources
RISE – Renewable Indicator for Sustainable Energy
QFD – Quasi Fiscal Deficit
SHS – Solar Home Systems
TES – Transformative Energy Scenario
TWh – Terawatt per hour
UAE – United Arab Emirates
USAID – United States Agency for International Development
WAEMU – West Africa Economic and Monetary Community
WAPP – West Africa Power Pool
WB – World Bank
WGI – Worldwide Governance Indicators

# Geographic scope of work

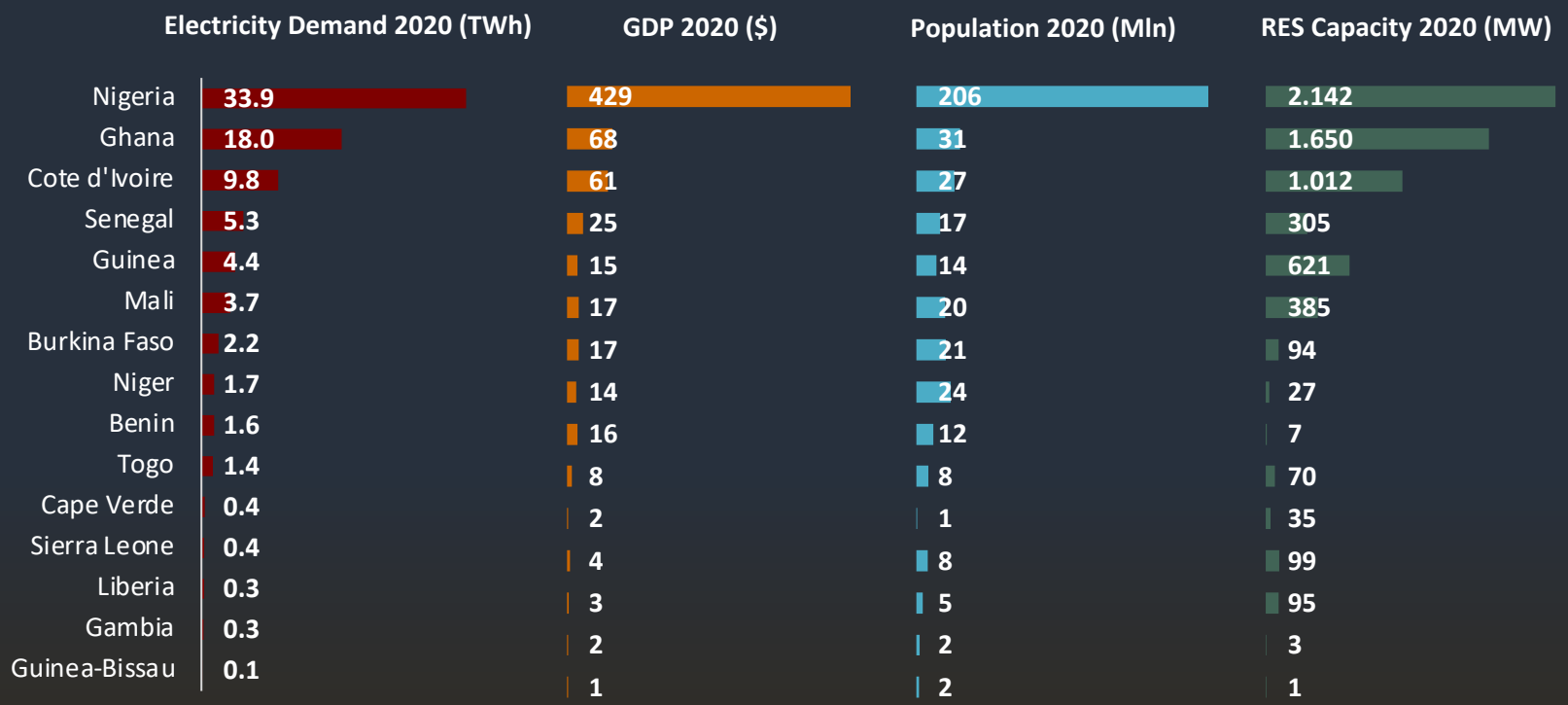
The study includes 15 countries of the Economic Community of West African States (ECOWAS):
Benin, Burkina Faso, Cabo Verde, Ivory Coast, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo.

Any deviation from this country grouping in the data provided is further specified within the study in the “notes” section.



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# West Africa in numbers




| | | | | |
|---|---|---|---|---|
| Total 15 West Africa's countries | 83.6 TWh | 683 B$ | 398 Mln | 6546 MW |
| **West Africa's share of the World** | **0,3%** | **0,8%** | **5,1%** | **0,2%** |

ECOWAS is home to **5% of the world's population**, but accounts for **ony 0,3% of global power demand**
More than 70% of the region's total electricity demand comes from just three countries.
The region is home of **only 0,2 % of the total RES installed capacity.**

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# To understand West Africa's economy and vision it is necessary to understand the common ground upon which its countries are founded

Born with the treaty of Lagos in May 1975, The Economic Community of West African States (ECOWAS/ [fr] CEDEAO) is a 15 members organization (Benin, Burkina Faso, Cabo Verde, Ivory Coast, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo) whose aim is to promote economic integration in the region at all levels. It is also meant to work as a trading union with the ambition to create a single, large trading entity through economic cooperation among countries.
ECOWAS' vision is "the creation of a borderless region where the population has access to its abundant resources and can exploit same through the creation of opportunities under a sustainable environment."

The West African Economic and Monetary Union (WAEMU / [fr] UEMOA) was created under the Treaty of Dakar in January 1994 by the Heads of State and governments of seven West African Countries (Benin, Burkina Faso, Ivory Coast, Mali, Niger, Senegal, and Togo while Guinea Bissau joined in 1997), under the common choice of adopting the CFA Franc.
The union was established with the shared vision of strengthening the economic and financial competitiveness of the Member States and harmonizing policies, legal frameworks, and actions on vital economic sectors such as energy, agriculture, industry, mining, etc.

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## Chapter 1
## What happened in the last 10 years

- Socio-economic progress in the region is not uniform
- The opportunity of regional energy market integration isn't fully exploited
- Renewable energy potential remains largely untapped
- The off-grid segment is gaining momentum
- The Region holds a pivotal position in the transition era

## Chapter 2
## What limited the RE growth

- Regulatory barriers hinders the achievement of ambitious RES targets
- The power sector faces a wide range of challenges
- Investments are insufficient and concentrated in a few countries

## Chapter 3
## The time to act is now

- Adopt a clear regulatory framework and ensure its implementation as a starting point for positive, long-term development of RES
- Financial de-risking instruments are crucial to unlock the full potential of cost-effective RE solutions
- Promote regional integration to attract investments and support economic development and prosperity

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# **1.** What happened in the last 10 years

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# 1. What happened in the last 10 years

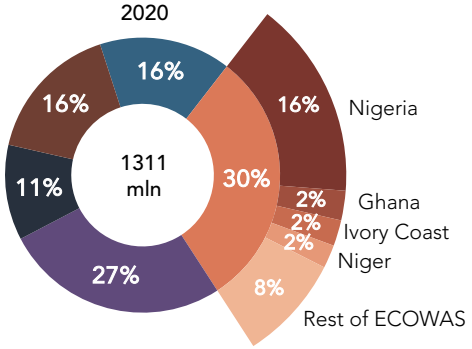
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SOCIO-ECONOMIC PROGRESS IN THE REGION IS NOT UNIFORM

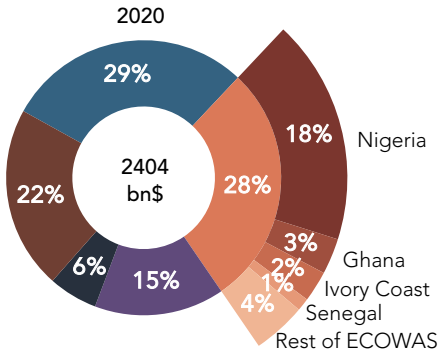
# Western Africa is the most populous region of the Continent while Nigeria, Ghana and Ivory Coast represent 80% of the region's GDP

Western Africa accounts for 30% of the African population and has the second highest GDP compared to the other regions. With 206 million inhabitants in 2020, Nigeria is the most populated country of all the Continent, and together with Ghana and Ivory Coast, they account for more than 80% of Western African GDP.

AFRICAN POPULATION (MLN) BY AREA (2010-2020)




AFRICAN GDP (BN$) BY AREA (2010-2020)






| 2010-2020 | | | | | | TOT Africa |
|---|---|---|---|---|---|---|
| Δ (mln): | 94 | 36 | 89 | 38 | 46 | 303 |
| CAGR (%) | 2,7 % | 2,0% | 3,0% | 3,0% | 2,4% | 2,7% |

| 2010-2020 | | | | | | TOT Africa |
|---|---|---|---|---|---|---|
| Δ (bn$): | 162 | 91 | 161 | 33 | -88 | 359 |
| CAGR (%) | 2,7 % | 1,4% | 5,9% | 2,7% | -1,6% | 1,6 % |

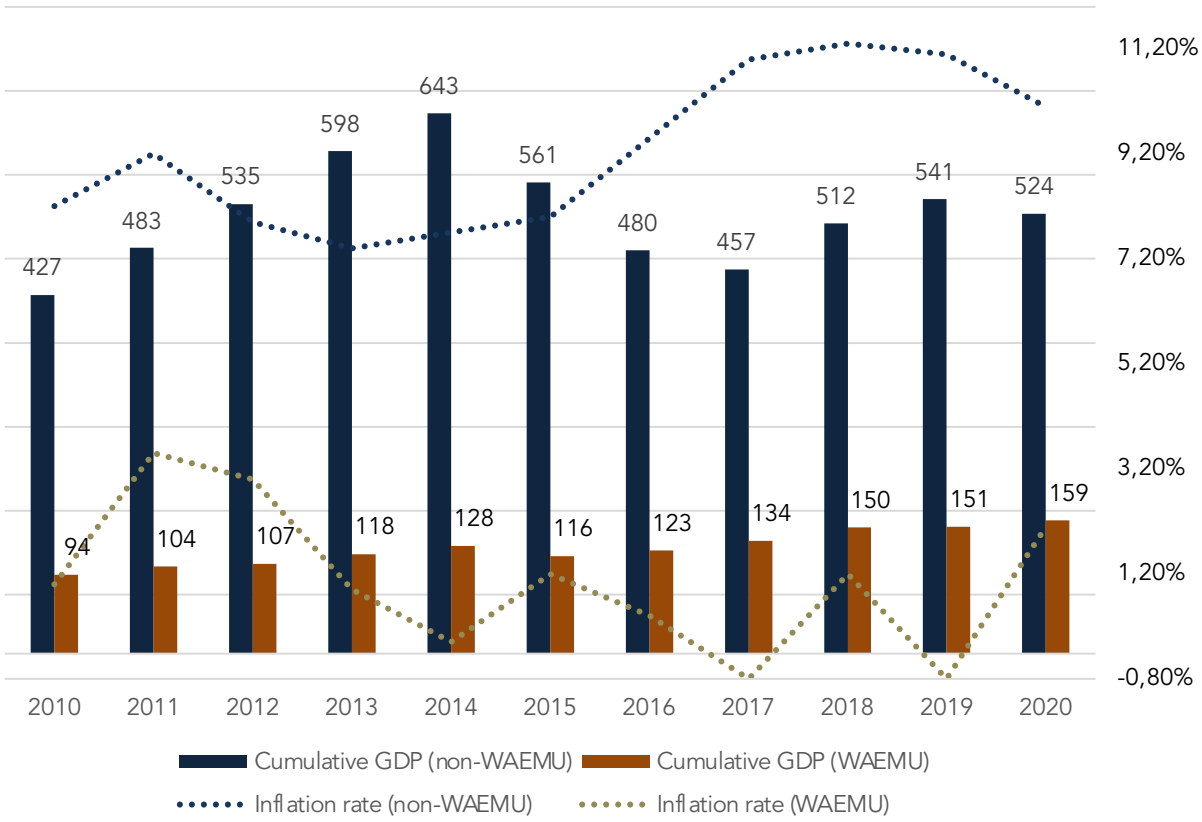
Western Africa
Northern Africa
Eastern Africa
Central Africa
Southern Africa

Source: IMF – World Economic Outlook 2022.
Notes: GDP values are converted from national currency to U.S. dollars using market exchange rates (yearly average).

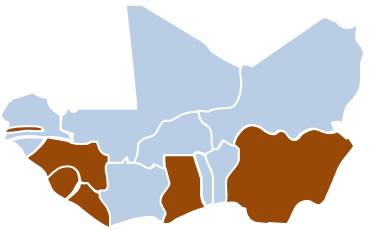
SOCIO-ECONOMIC PROGRESS IN THE REGION IS NOT UNIFORM

# Inflation and GDP growth are influenced by the West African Economic and Monetary Union (WAEMU)

INFLATION EVOLUTION (%) AND CUMULATIVE GDP (Bln $), 2010-2020




Non-WAEMU countries have higher inflation rates than WAEMU countries. This difference can be attributed to the monetary independence of various central banks. WAEMU countries benefit from lower inflation imported from the Euro Zone but don't have complete control over their monetary policies contrary to the non-WAEMU countries



CPI avg. CAGR: 0,9%
GDP avg. CAGR: 5,4%

CPI avg. CAGR: 10,3%
GDP avg. CAGR: 2,1%

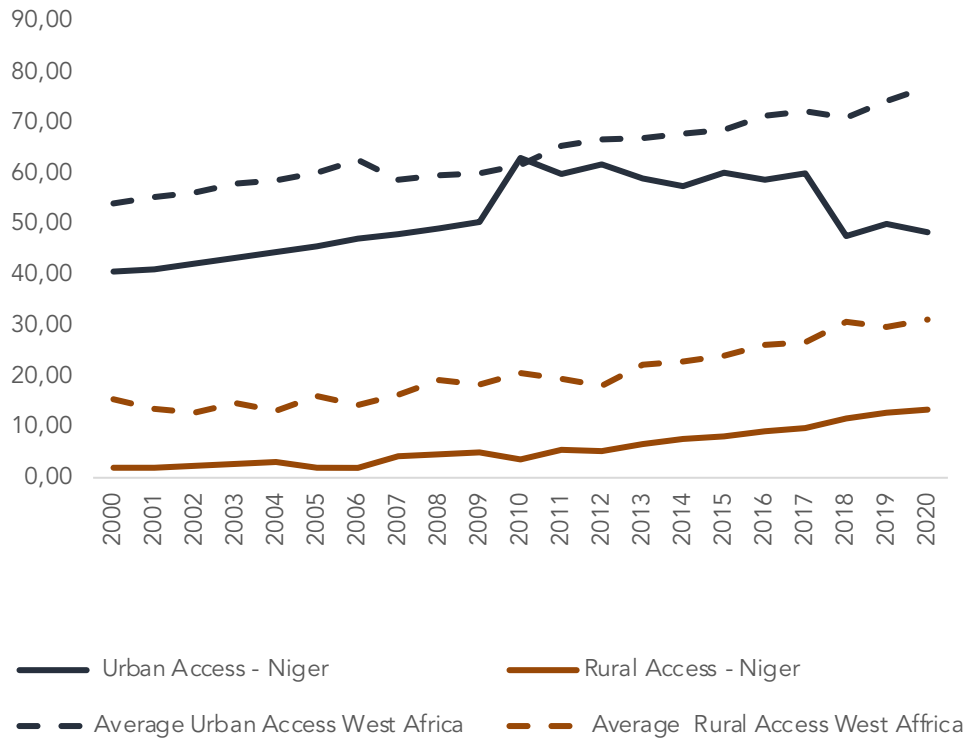
Source: IMF – World Economic Outlook 2022.
*AFDB – West Africa Economic Outlook 2019*
*Notes: 1.* WAEMU = West African Economic and Monetary Union
2. Inflation is measured as year-on-year change of average consumer price index (not end of the year).

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SOCIO-ECONOMIC PROGRESS IN THE REGION IS NOT UNIFORM

# Rural electrification programmes and decentralized solutions have boosted access to electricity in rural areas

ELECTRICITY ACCESS RATE (% POPULATION), 2020




West Africa has one of the lowest rates of electricity access in the world; **only about 42% of the total population, and 8% of rural residents, have access to electricity**, with Niger among the countries experiencing higher lack of electricity.

In the last decade, the World Bank has poured over $2.3 billion of investments to support the WAPP; just in the previous three years, it has doubled its investments to expand electricity access in the Region.

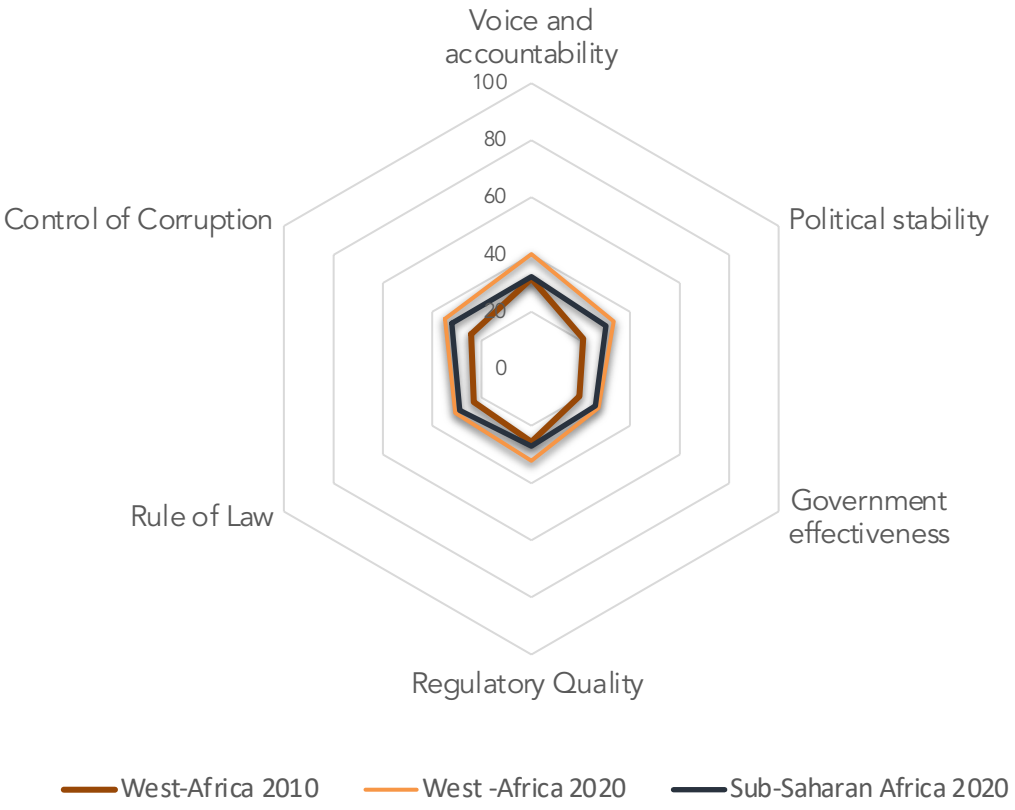
The 338 Mln$ Regional Off-Grid Electricity Access Project (ROGEAP), announced in August 2022, aims to increase access to sustainable solar energy services in the 15 ECOWAS Member States and four other African countries for households, businesses, public hospitals, and schools.

Source: World Bank, 2020
Notes: 1. Mauritania, Central African Republic, Chad, and Cameroon

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# Quality of governance at regional and national levels has increased

WORLD GOVERNANCE INDICATORS, 2010-2020




**Governance in the region has improved over the last decade**: West Africa's performance has an opposite trend compared to the Sub-Saharan Africa area, where all indicators are worsening.

The country that stood out the most was Ivory Coast with significant developments in four of the six indicators detailed on the graph. On the other hand, some countries have faced a deterioration of their status, although relative to only one area.

Political stability is generally the area with the biggest improvement (+59%). Despite the recent uncertainties in internal affairs, efforts to prevent conflicts have also improved, contributing to **overall stability**.

Source: World Bank, Worldwide Governance Indicators, 2019

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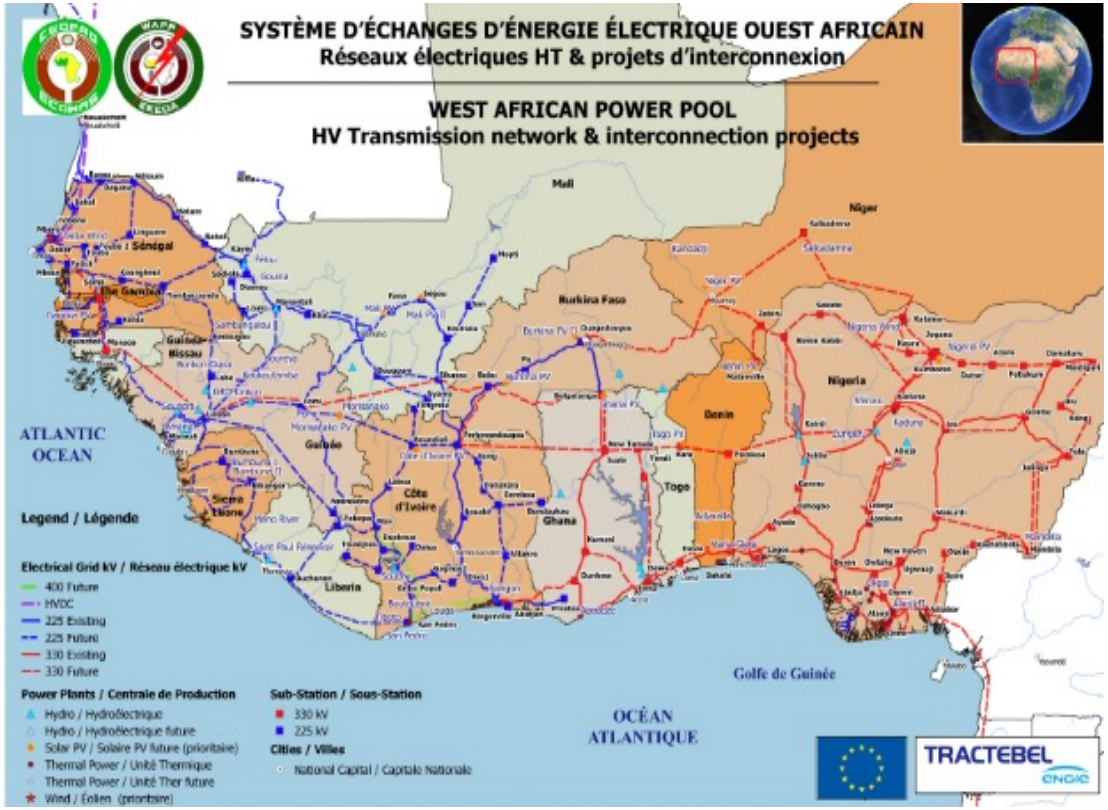

# 1. What happened in the last 10 years

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THE OPPORTUNITY OF REGIONAL ENERGY MARKET INTEGRATION ISN'T FULLY EXPLOITED

# West Africa is the continent's second largest energy market and a number of milestones have been reached to promote its full integration




The effort of the **ECOWAS** to structure a legal framework that could **promote cooperation among countries** in the Region began in the early 2000. It led to the creation of the West Africa Power Pool (**WAPP**) and the ECOWAS Regional Regulatory Authority (**ERERA**).

WAPP has 39 active members, including national and local utilities (27) and member states (14). Nigeria is the leading actor in the power pool, accounting for around 46% of the total installed capacity (2020). Ghana, Ivory Coast, and Senegal together account for about 40%.

Despite being a great opportunity to improve regional trade, **WAPP is not expected to become "operational" soon**, due to non fully developed regional interconnections.

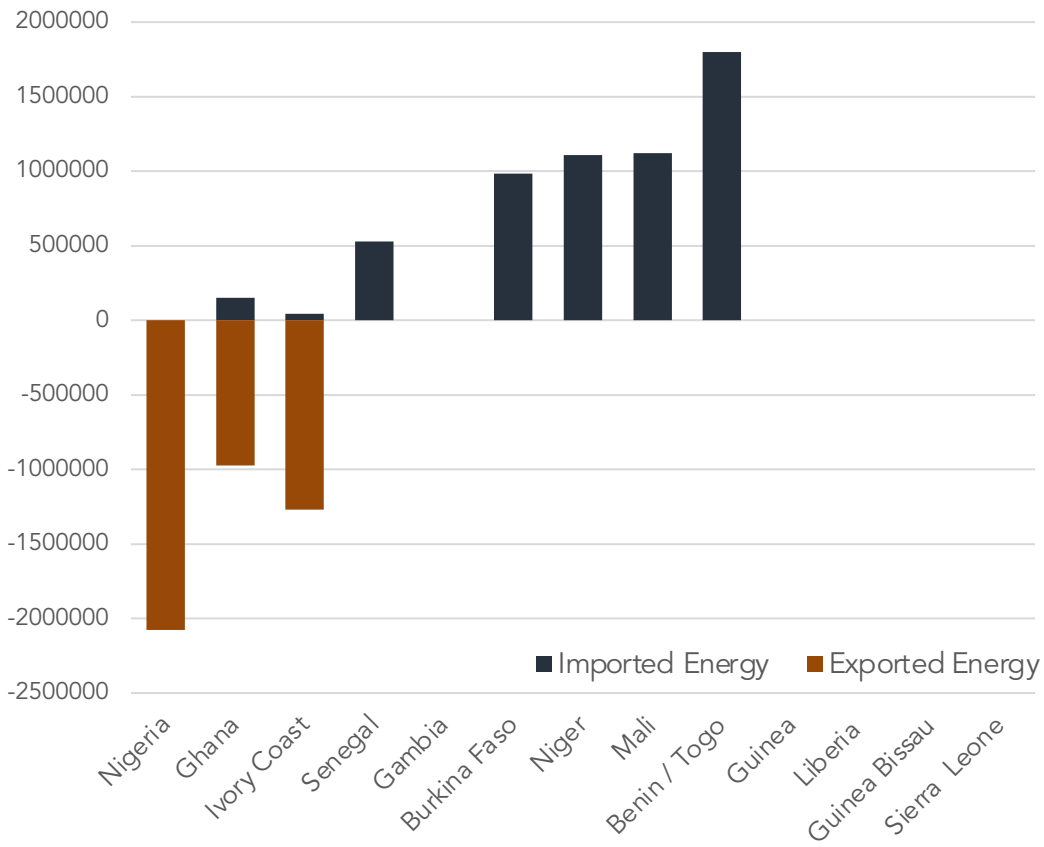
Source: WAPP

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THE OPPORTUNITY OF REGIONAL ENERGY MARKET INTEGRATION ISN'T FULLY EXPLOITED

# However, trading within the WAPP tends to occur on an occasional basis rather than on structured agreements among its countries

TOTAL IMPORTED / EXPORTED ENERGY (W), 2022




Energy trade is essential to develop affordable, reliable and sustainable energy; despite this, only 8.5% of total regional electricity is traded among WAPP countries.

The World Bank estimated power **trading could save about 5-8 billion USD per year**, making electricity more affordable by allowing every country in West Africa to benefit from the least expensive electricity from the region.

Nigeria, Ghana and Ivory Coast are the main exporters of electricity in the WAPP. However, small countries are those who would benefit the most from regional integration: increased reliability on imported energy could result in 1% to 3.5% of GDP worth financial savings.

Source: WAPP
WORLD BANK Blogs, Regional electricity trade, key to unleashing West Africa's power, 2020
World Bank Group, ECOWAS- Battery Energy Storage Systems and Synchronization, 2019

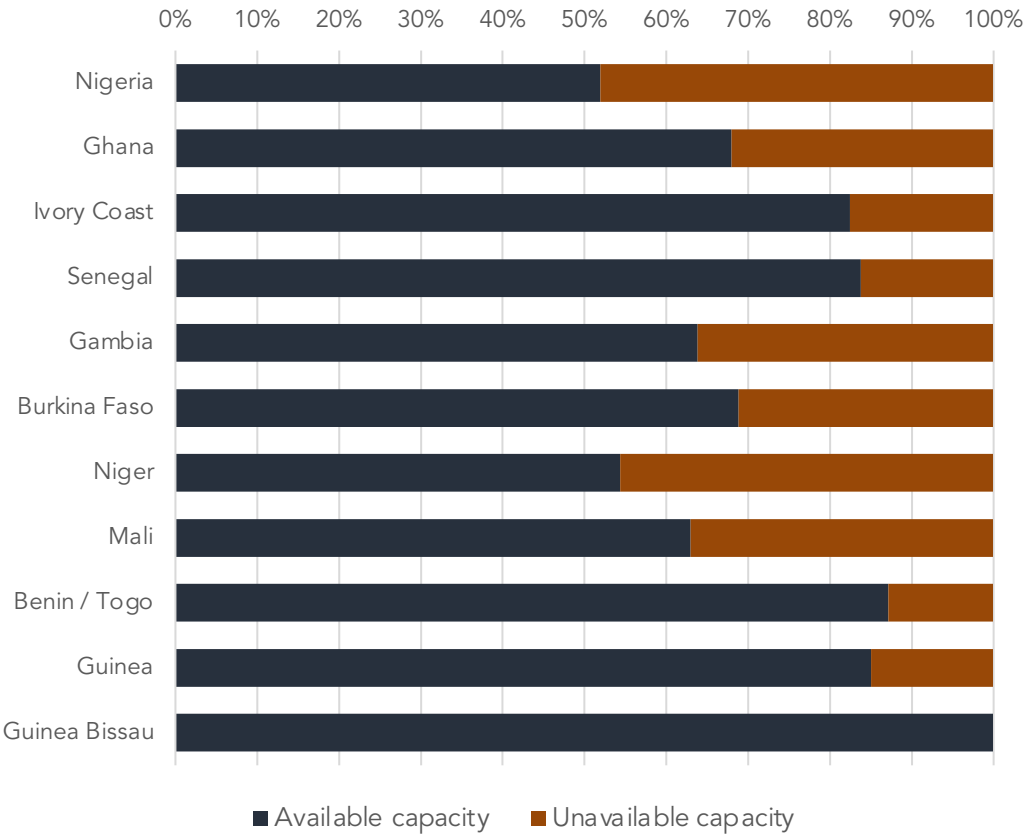
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THE OPPORTUNITY OF REGIONAL ENERGY MARKET INTEGRATION ISN'T FULLY EXPLOITED

# Quality and efficiency of infrastructures can still be improved for a sustainable power pool development

AVAILABLE CAPACITY VS UNAVAILABLE CAPACITY (%), 2022




**Total losses** (technical, non-technical such as fraud and collection losses) in ECOWAS countries were almost constant between 2017 and 2020; **about 26% on average**. However they greatly vary among distributors (between 8,9% to 62,8%).

Interconnections exist, and others are planned, but domestic systems still need to be improved compared to the installed capacity potential.

The operationalization of power pools requires proper and functioning generation and transmission infrastructure. It is crucial to improve energy infrastructure to ripe the benefits of regional integration and have a performing power pool

Source: WAPP, Reduction of Technical and non-Technical Electricity Losses in the Distribution Companies in the ECOWAS Region, 2021

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# 1. What happened in the last 10 years

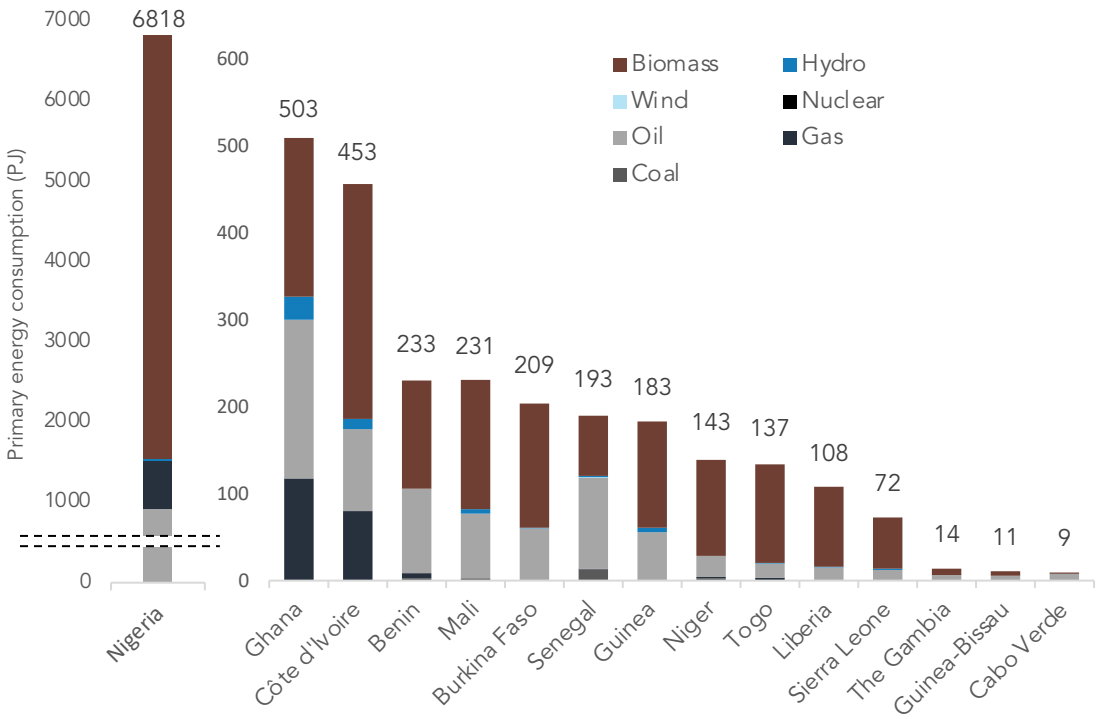
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RENEWABLE ENERGY POTENTIAL REMAINS LARGELY UNTAPPED

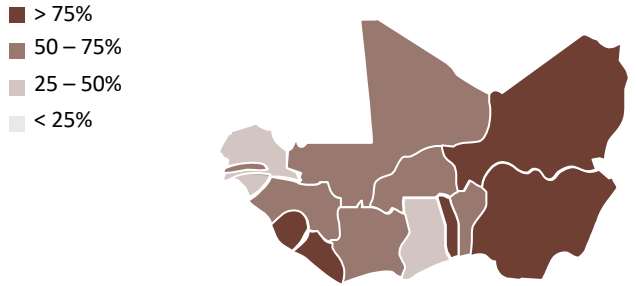
# Biofuels and waste constitute the largest component of the energy mix

PRIMARY ENERGY CONSUMPTION (PJ), 2021




Biomass and waste account for more than 70% of the region's primary energy consumption. **Biomass is the largest source of energy today**, primarly used for heating and cooking, but it brings environmental (emission and uncontrolled deforestation) and health issues

BIOMASS & WASTE SHARE IN THE COUNTRY ENERGY MIX



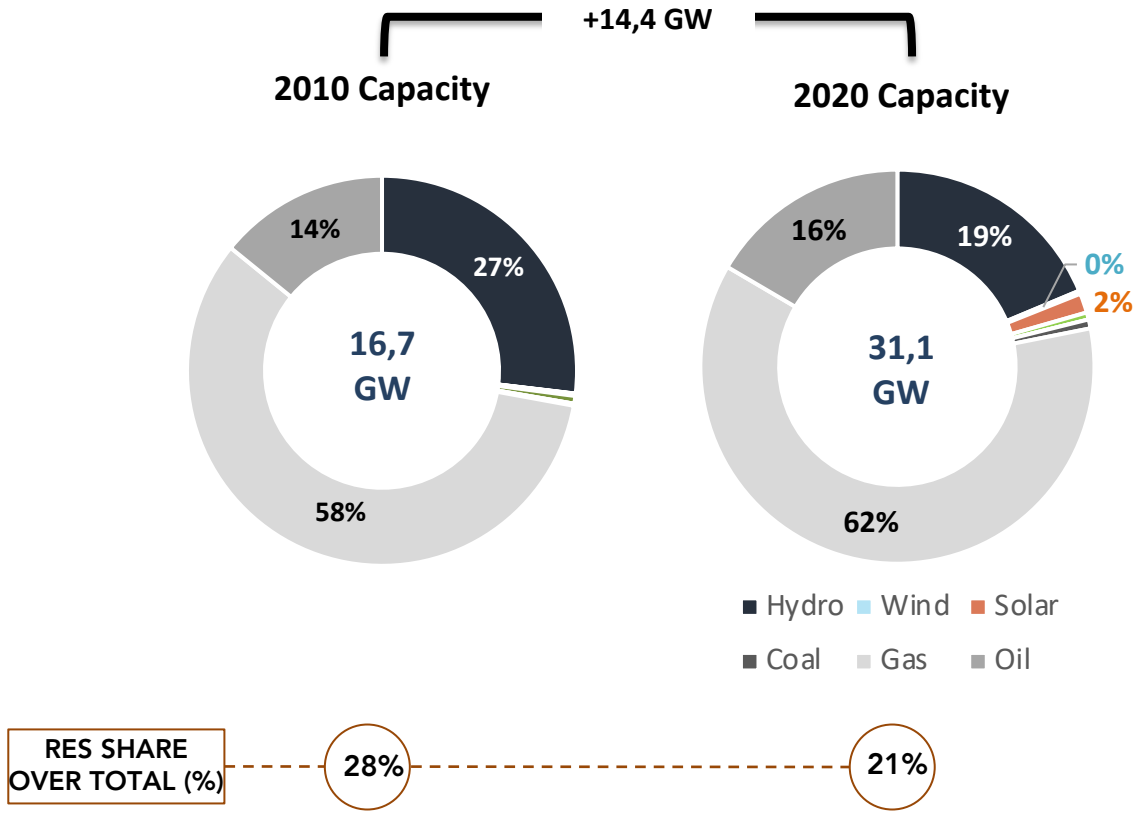

Source: Enerdata, 2022; IEA 2019

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RENEWABLE ENERGY POTENTIAL REMAINS LARGELY UNTAPPED

# The West Africa region is still highly relying on fossil fuels to satisfy its electricity demand

ANNUAL INSTALLED CAPACITY BY TECHNOLOGY (GW)




West Africa is the second largest energy market of the continent, with a total of 31.1 GW installed, with fossil fuels accounting for the most significant share in terms of generation.

Burkina Faso, Cabo Verde, Gambia, Guinea-Bissau, and Niger rely on oil power generation for more than 80% of their generation.

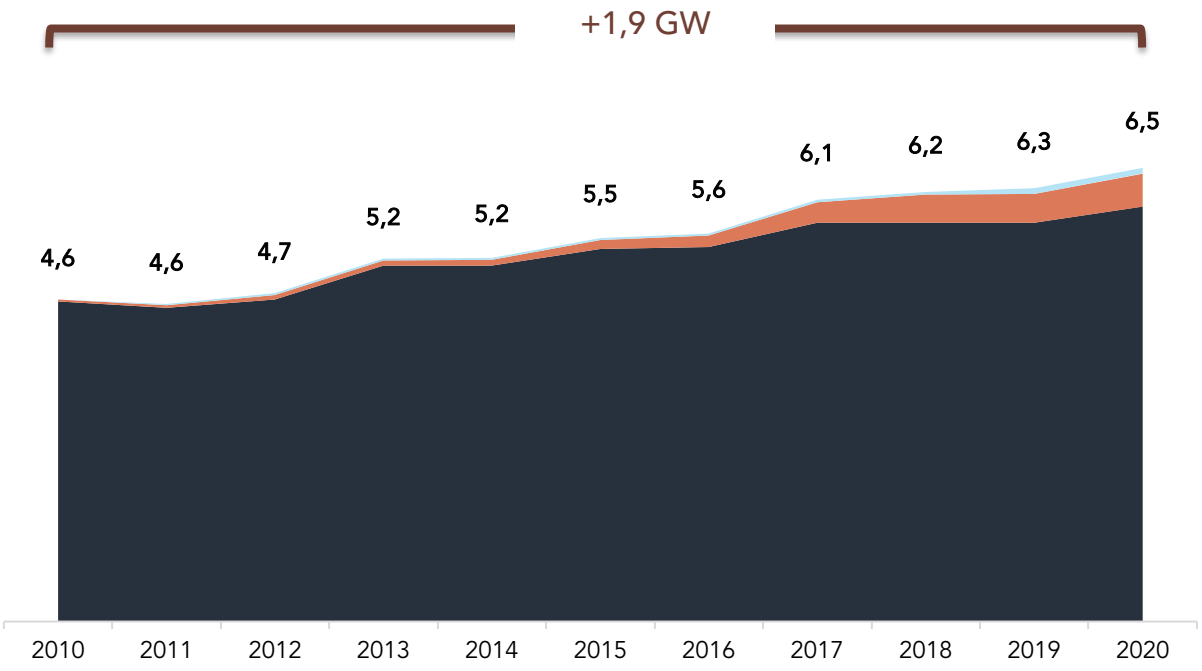
Source: Enerdata, 2022
IRENA, Renewable Energy Market Analysis- Africa and its regions, 2022

RENEWABLE ENERGY POTENTIAL REMAINS LARGELY UNTAPPED

# The total installed capacity in the last decade was 14.4 GW, but only 1.9 GW in renewable energy

Solar PV and wind capacities started slowly increasing in the last 5 years, reaching only 2% of total capacity in 2020. The total share of RES within the installed capacity decreased from 28% to 21% in ten years.

CUMULATIVE RES INSTALLED CAPACITY (GW), 2020




Solar 8%

Wind 2%

Large hydro 90%

Source: Enerdata, 2022

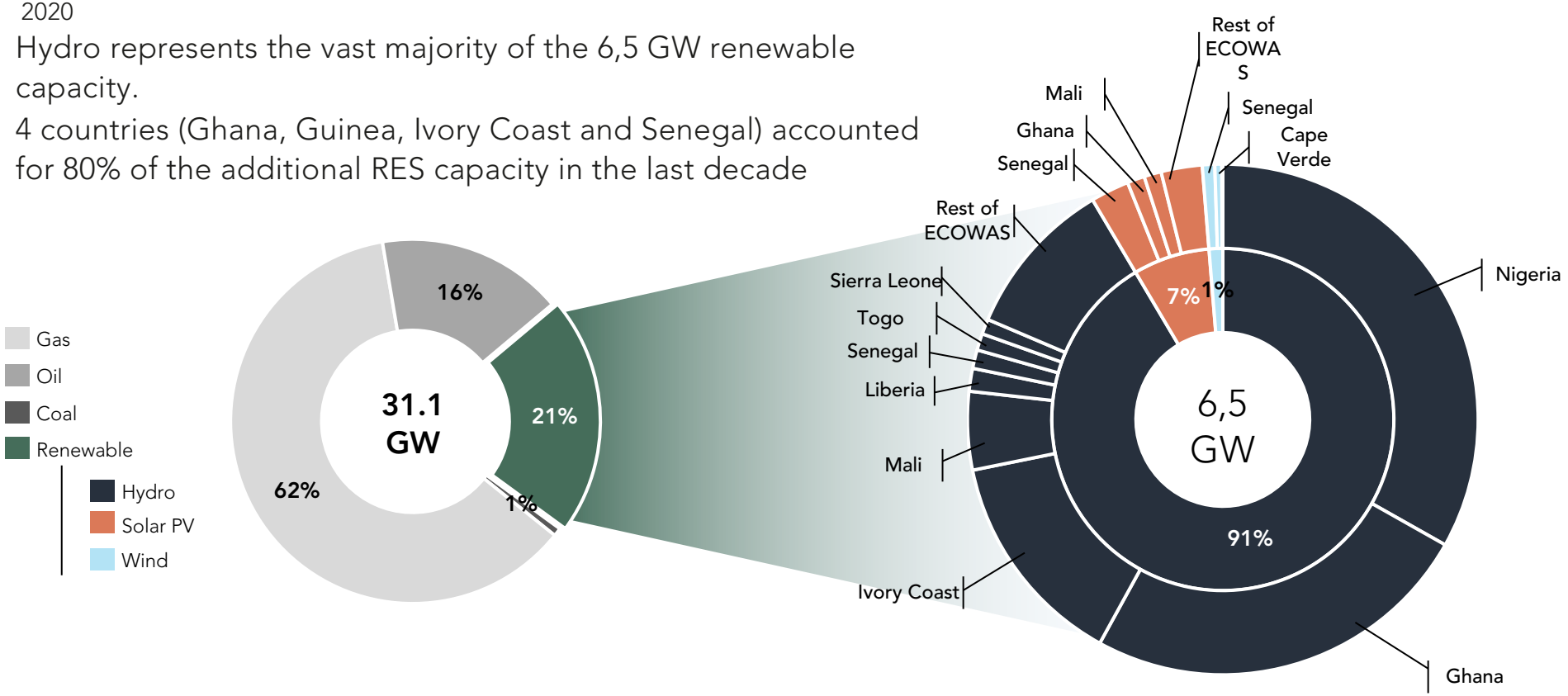
RENEWABLE ENERGY POTENTIAL REMAINS LARGELY UNTAPPED

# RES growth has been unbalanced and concentrated in a handful of countries

ECOOWAS INSTALLED CAPACITY (GW), 2020

Hydro represents the vast majority of the 6,5 GW renewable capacity.

4 countries (Ghana, Guinea, Ivory Coast and Senegal) accounted for 80% of the additional RES capacity in the last decade




Source: Enerdata, 2022

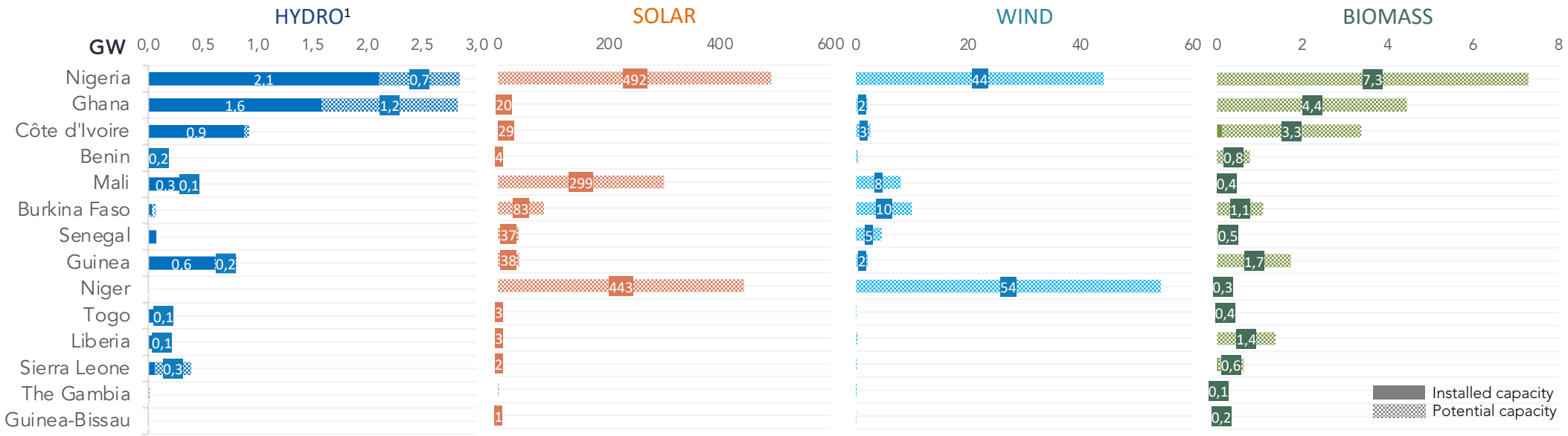
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RENEWABLE ENERGY POTENTIAL REMAINS LARGELY UNTAPPED

# Renewable energy could greatly contribute to the Region's development if natural resources available were properly exploited

**West Africa is rich in solar, wind and hydropower resources**. It has a high annual average solar irradiation of 2100 kWh/m$^2$ and wind speeds averaging 6 m/s. IRENA estimates a renewable potential of around **37 times** the current generation (= 82.5 TWh incl. non-renewable production).

## INSTALLED AND POTENTIAL CAPACITY PER TECHNOLOGY (GW), 2022




| | HYDRO¹ | SOLAR | WIND | BIOMASS |
|---|---|---|---|---|
| Current: | 84,3 TWh (21,1 TWh) | 2603 TWh (0,5 TWh) | 295 TWh (0,2 TWh) | 67,2 TWh (0,3 TWh) |

Source: Enerdata 2022
IRENA, Planning and prospects for renewable power: West Africa, 2018
UNIDO , World Small Hydropower Development Report, 2019
**Notes:** Hydro includes small (<10MW) and large hydro. For large hydro, the potential is relative to the sites identified in the WAPP Master Plan (2011) with updates from IRENA 2015–2016 analyses.

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# 1. What happened in the last 10 years

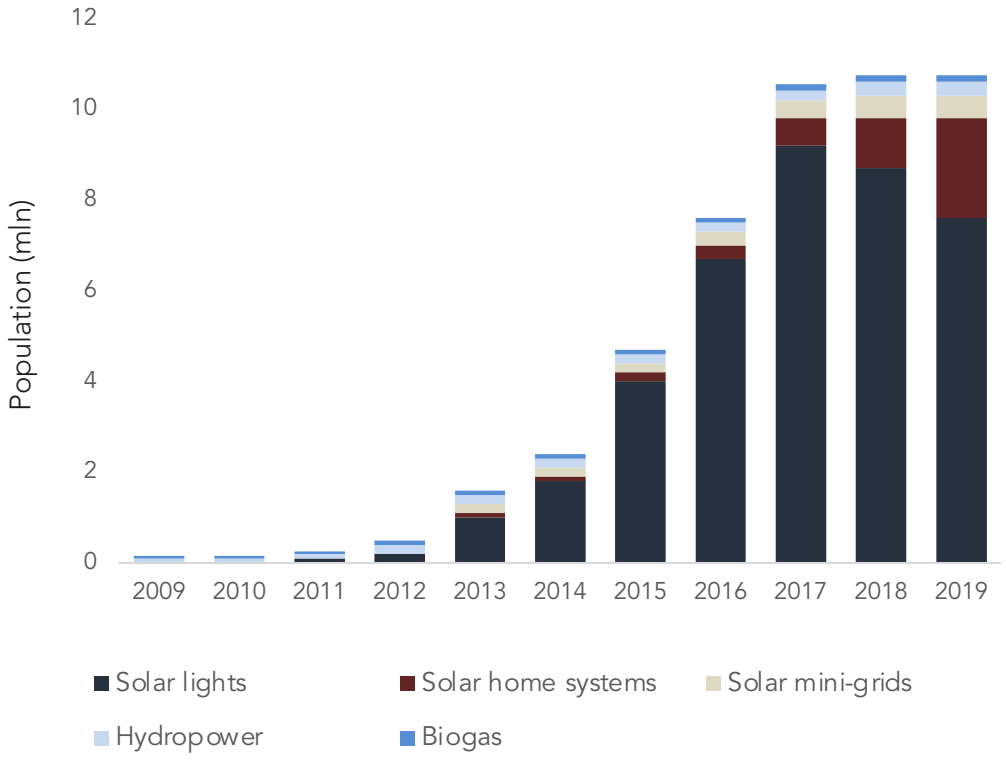
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THE OFF-GRID SEGMENT IS GAINING MOMENTUM

# Off-grid systems are relevant for rural access to electricity and have gained momentum in the last ten years

POPULATION THAT GAINED ACCESS TO ELECTRICITY VIA OFF-GRID, 2019




Rural electrification rates in the area experience **common disruptions of service and losses** linked to the national grid at about 39%.

With the decrease of PV systems' costs and innovative financing models[1], the number of people with access to electricity in Sub-Saharan Africa rose consistently thanks to decentralized solutions.

In West Africa, there are **385 mini grids operating**, with a power of around 30MW (95% PV). In 2019, more than **10 million people in the area had access to electricity thanks to off-grid technologies**. It has to be noted that most of the mini-grids in place were funded by development programmes and cooperation agencies[2].

Source: IRENA, Renewable Energy Market Analysis – Africa and its Regions, 2022
Antonanzas-Torres / Antonanzas / Blanco-Fernandez, State of the art of mini-grids for rural electrification in Africa, 2021
Notes: 1. such as the pay-as-you-go model

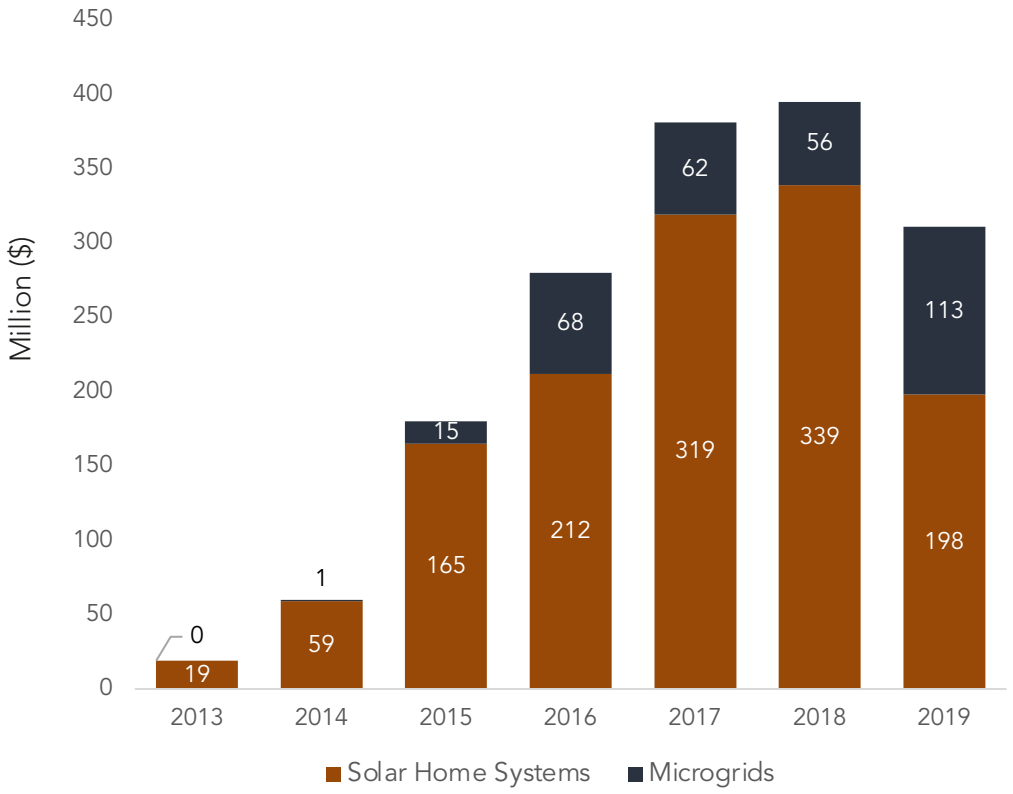
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THE OFF-GRID SEGMENT IS GAINING MOMENTUM

# The market for start-ups operating in the solar home system and mini-grid sectors grew consistently

FINANCING ANNOUNCEMENTS FOR STARTUPS (2019)




As most of the times grid extension to remote areas constitute an economic and technical barrier for governments, there has been space for hybrid ventures[1] to invest in mini-grids.

**The market for start-ups operating in the mini-grid sector grew** from $19 million (2013) to $395 million (2018), even though a decrease followed in 2019.

The Energy Sector Management Assistance Program (ESMAP) estimates that globally almost $220 billion will be needed to connect 490 million people to 210.000 mini-grids by 2030.

The biggest challenges for mini-grids development are i) **access to finance**, ii) **unreliable regulations** and iii) **lack of viable business models**.

Source: Climatescope - Bloomberg: Off-grid and mini-grid market oulook, 2019
World Bank, Mini Grids for Half a Billion People : Market Outlook and Handbook for Decision Makers - Executive Summary, 2019
Notes: 1. involving private actors, non-governmental organizations, communities and governments

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FOCUS ON

# Encouraging examples exist on off-grid development

Fiscal incentives, such as exemptions from import duties, have been introduced for stand-alone systems: 26 African countries have adopted some sort of incentive scheme, 12 in West Africa.

Mini-grids have seen a large expansion especially in Mali and Senegal, thanks to programmes offering 10-15 years concessions contracts to mini-grid developers and operators.

In Sierra Leone, the Rural Renewable Energy Project boosted the development of mini-grids across the region, thanks to guidance on licensing procedures, consumer services, grid interconnection and tariff setting; it led to the installation of 54 solar systems to power 54 community health centers, plus the installation of more than 90 mini-grids through the adoption of PPPs.

Nigeria has quite an advanced regulatory framework for mini-grid development, whose implementation started in 2016. By 2019 an estimated mini-grid capacity of 2.8 MW was installed, distributed across 59 projects to serve rural communities.

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# 1. What happened in the last 10 years

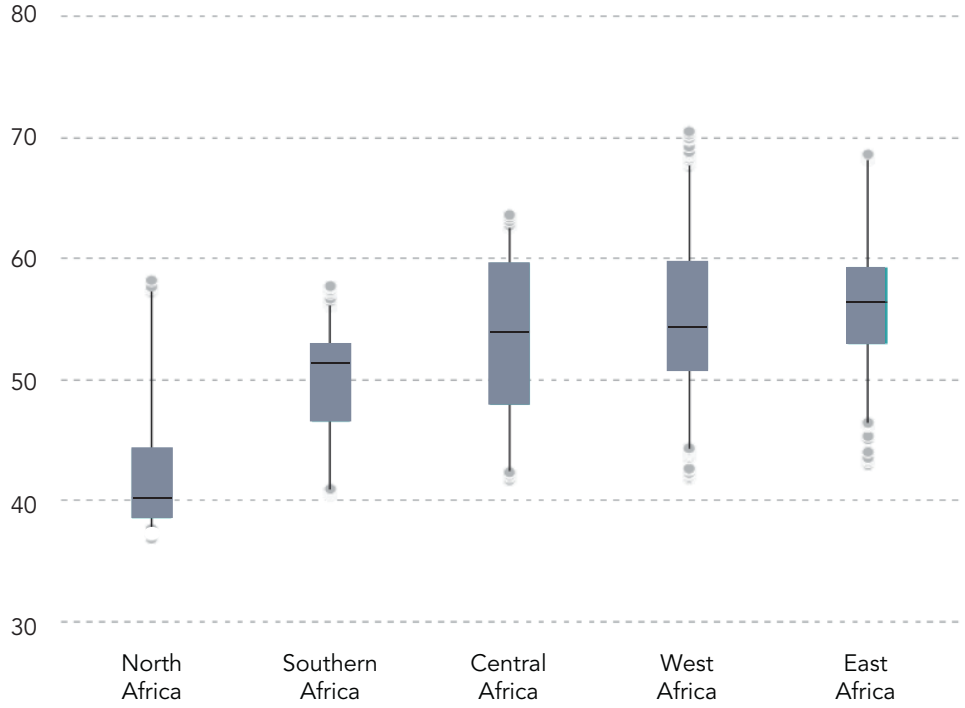
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THE REGION HOLDS A PIVOTAL POSITION IN THE TRANSITION ERA

# West Africa is among the most climate-vulnerable regions of the world

CLIMATE VULNERABILITY INDEX SCORE, 2021




From 2010 to 2020, Africa has been the second-most climate vulnerable region of the world after South Asia and displays the lowest climate readiness. Within the continent, **West Africa has been the second-most vulnerable region with lower climate readiness**. Niger and Guinea-Bissau have been the most vulnerable countries of the region and the continent.

In the future, associated with a 2°C temperature rise, the warm spell duration is expected to increase by 56 days compared with current levels, and West Africa would experience a 40% increase in the frequency of rainfall extremes and a 9-day increase of droughts.

Source: AfDB, African Economic Outlook, 2022 – WMO, State of the Climate in Africa, 2021
Notes: calculations based on the Notre Dame Global Adaptation Initiative Database. In 2021 temperatures in West Africa were 0.91° C above the 1981-2010 period and 1.39°C above the 1961-1990 average; in the last decade the regions has seen longer and hotter heatwaves, rising see level between 3.5 and 4 mm/year as well as fewer but more intense precipitations.

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THE REGION HOLDS A PIVOTAL POSITION IN THE TRANSITION ERA

# The effects of climate change could endanger the livelihoods of millions

**Food insecurity**

Crop yealds → **-11%**

**Economic losses**

Impact on GDP → **-10%**

**Coommunity displacement**

Internal migrants → **32 mln**

Higher temperatures, increased evaporation and decreasing precipitation are projected to accentuate the risk of water stress, while the system relies extensively on rainfed crop production (that could decrease up to 11% if no action is taken), leading to enormous consequences for people's food security.

**West Africa is projected to be one of the most affected regions in terms of loss in GDP** per capita due to climate change, with more than 10% median reduction in GDP per capita growth in the high warming scenario by 2050.

**Up to 32 million people in West Africa could be forced to move by 2050** due to the climate crisis unless action is taken today (compared to 4.3 million in 2020 at continent level).

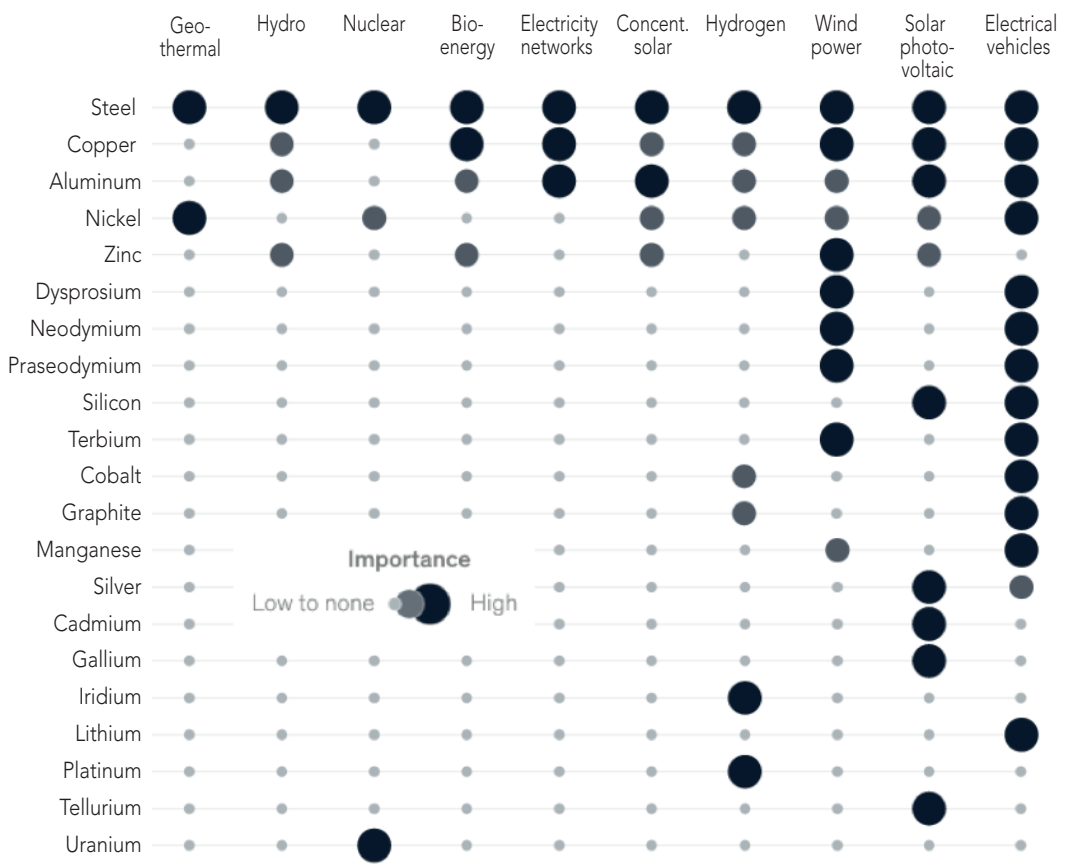
Source: IPCC, Assessment Report (AR5), 2014
World Bank/EBRD, High and Dry: Climate Change, Water, and the Economy, 2016
Notes: The estimates are based on a 2°C Scenario

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THE REGION HOLDS A PIVOTAL POSITION IN THE TRANSITION ERA

# The transition to a net-zero emissions world is going to be a metal-intensive one




The decarbonization path towards an electricity-based economy and the emissions reduction commitments made in the last years will require increasing amounts of raw materials and stress global supply chains.

In West Africa most of the countries are rich in metals functional to the transition: for example, Burkina Faso is rich in zinc, fundamental for the wind industry.

Excluding diamonds, Nigeria is the second biggest mineral producer after South Africa.

Source: IRENA, Renewable energy market analysis – Africa and its regions, 2022
McKinsey, The raw-materials challenge: How the metals and mining sector will be at the core of enabling the energy transition, 2022

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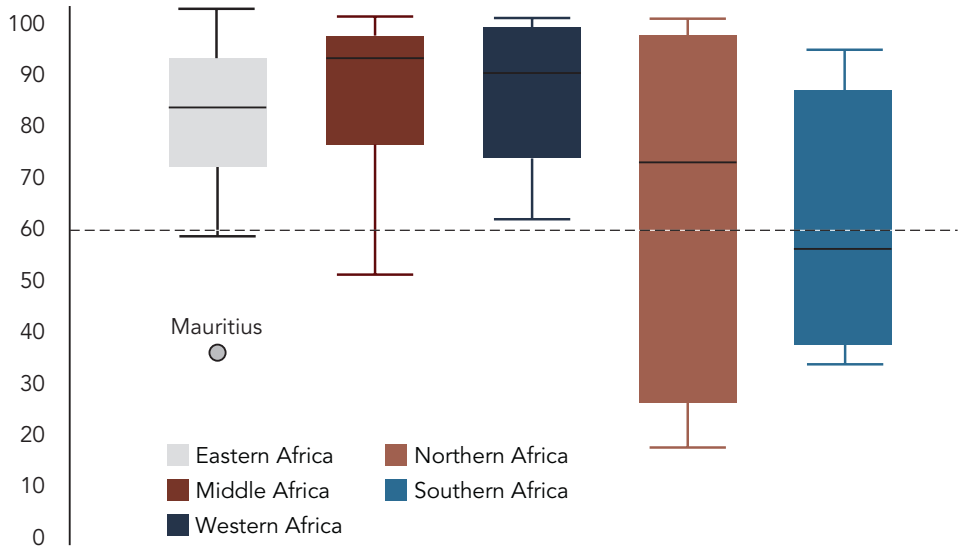
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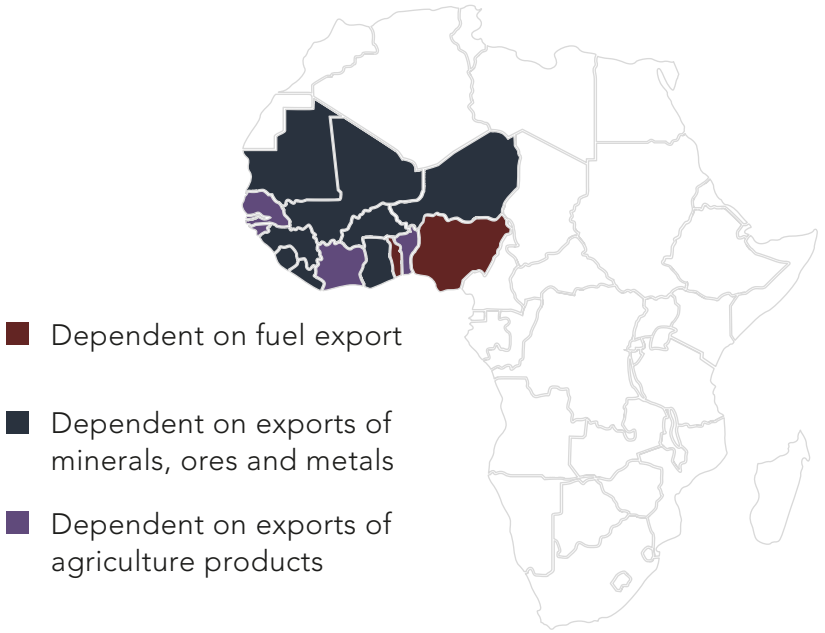
THE REGION HOLDS A PIVOTAL POSITION IN THE TRANSITION ERA

# West Africa is endowed with natural resources ranging from fossil fuels to minerals and agriculture products

The region is endowed with enormous quantities of minerals, ores and metals, most of which are **strategic for the global energy transition**. Nevertheless, all countries in the Region are considered to be **commodity dependent**, with local differences in terms of merchandise.

**West Africa** (together with Central Africa) **displays the highest dependence on commodities**, with their share representing about 95% of the total merchandise exports.




Source: McKinsey, The raw-materials challenge: How the metals and mining sector will be at the core of enabling the energy transition, 2022
UNCTAD, The state of commodity dependance, 2022

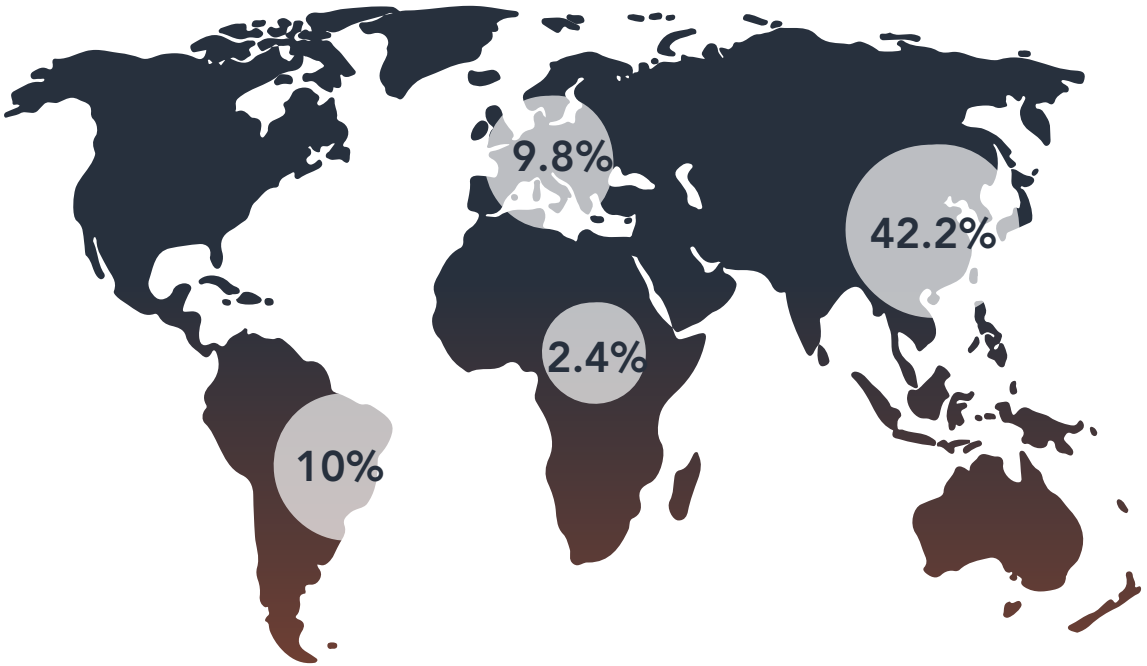
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THE REGION HOLDS A PIVOTAL POSITION IN THE TRANSITION ERA

# The Renewable Energy sector employs 12 million people worldwide, but less than 3% are located in Africa

DISTRIBUTION OF RES JOBS WORLDWIDE (%), 2021




Worldwide, the RES sector employed 12,7 million people in 2021, a 64% increase compared to 7.3 million in 2012.

Of those 12,7 million people, 42,2% were located in China, 9,8% in Europe, 10% in Brazil and only **2.4% in Africa**.

Despite its tremendous potential, the region of **West Africa employed approximately 66.000 people, or 0.55% of the worldwide workforce**.

Source: Renewable energy and Jobs: Annual review 2022

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# 2. What limited the RE growth

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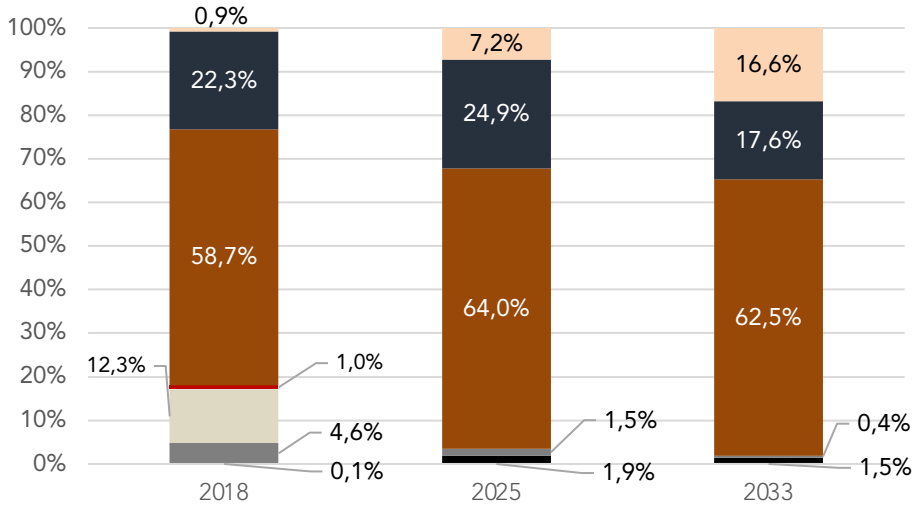

# 2. What limited the RE growth

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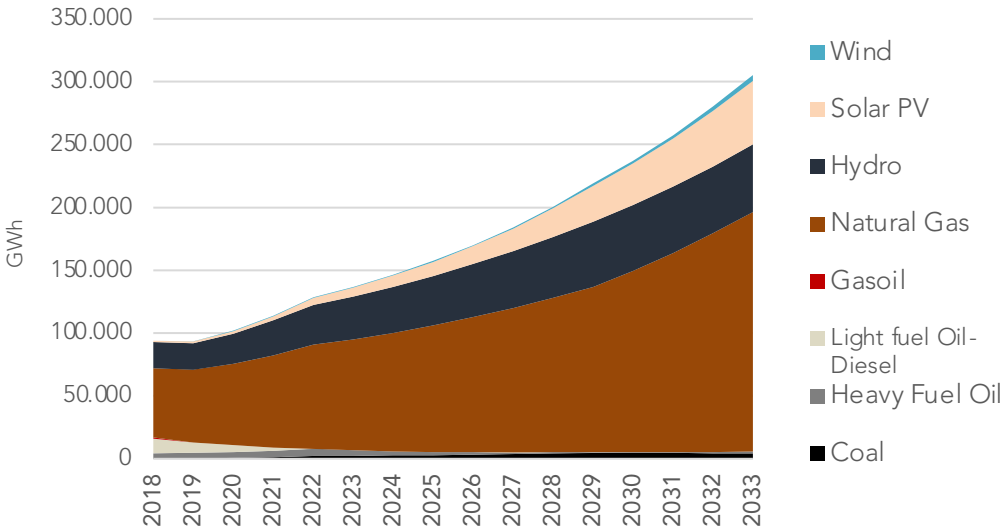
# West Africa has integrated RE targets in both national and regional plans

**West African countries have developed national plans** (Ivory Coast – 42% by 2030, Senegal – 23% by 2030, Ghana aims to increase variable renewable generation capacity to 1.360 MW by 2030, compared to 70 MW in 2019) with different shares of RE planned in the next 10 years, but relevant regulatory barriers still remain.
From a regional perspective, **in 2019 ECOWAS published a comprehensive power development plan** that combines generation and transmission requirements with a target of 17% of solar and wind in the energy mix by 2033.

WEST AFRICA ENERGY MIX IN INSTALLED CAPACITY (SELECTED YEARS (%)




WEST AFRICA ELECTRICITY DEMAND FORECAST BY TECHNOLOGY (GWh)




Source: RISE, ESMAP, 2010 - 2019
ECOWAS - Master Plan for the Development of Regional Power Generation and Transmission Infrastructure 2019-2033
RES4Africa / PwC, Investors Survey, 2021

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REGULATORY BARRIERS HINDERS THE ACHIEVEMENT OF AMBITIOUS RES TARGETS

# However regulatory barriers are holding back the deployment of renewables compromising the sustainable development of the region

| | |
|---|---|
| Slow regional integration process | Unclear political will to support regional integration and to strengthen WAPP authority |
| Unclear routes to market | Feed in tariff poorly implemented<br>Auction programmes not finalized<br>Direct PPAs not implemented |
| Non cost-reflective tariff | No cost reflective tariffs that would allow the system to achieve financial sustainability |
| Unefficiency of infrastructures | Infrastructure investment gap in transmission and distribution sector and missing regulation to engage private sector investment |

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REGULATORY BARRIERS HINDERS THE ACHIEVEMENT OF AMBITIOUS RES TARGETS

# A overview of the existing regulatory framework for renewables in selected West African economies

| Market | RES Share | RES Share Excl Hydro | RES Target | Supporting Scheme | Routes to market | More info |
|---|---|---|---|---|---|---|
| Nigeria | 12% | 0% | 30% of RE by 2030 | No | PPA with local utilities | 14 PPA signed in 2016, still stalled |
| Ivory Coast | 43% | 6% | 42% of RE production by 2035 | Auctions (Scaling Solar) | PPA with Single Buyer (CIE) | Scaling Solar tender in delay |
| Ghana | 31% | 1% | 10% of solar and wind by 2030 | FiT<br>RPO | PPA with Distribution company + DPPA* | Moratorium ongoing** |
| Senegal | 21% | 15% | 30% of RE by 2030 | Auctions (Scaling Solar) | PPA with National Utility (SENELEC) | 60 MW solar installed with Scaling Solar |

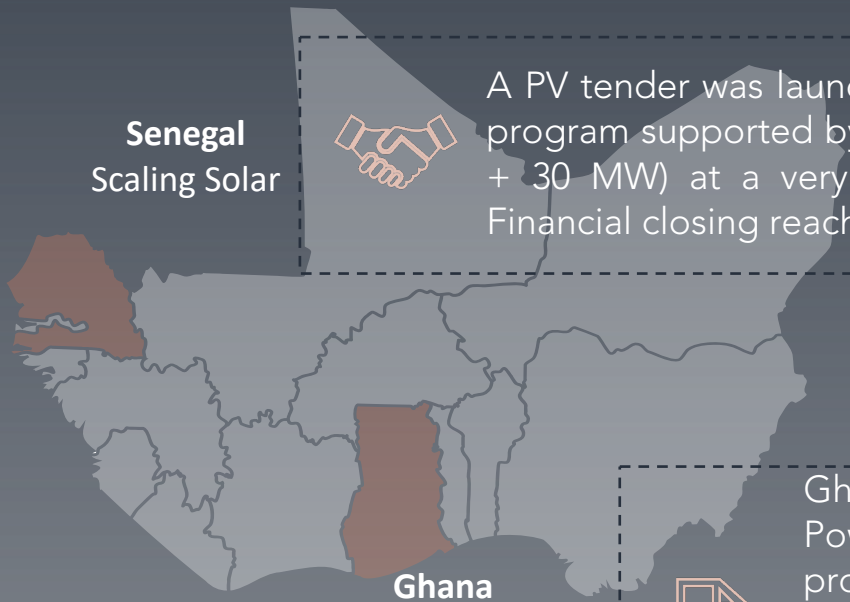
Source: enerdata, 2022.
Various national plans.
Notes: Data might slightly differ from one source to another
*DPPA is an agreement between IPP and an end user in which electricity produced is physically delivered to power the corporate buyer's operations at a fixed price plus transmission related fee.
** Moratorium RE Deal: In 2020, Government suspends renewable energy signing deal due to overcapacity and to many non-competitive past deals signed by previous administration

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FOCUS ON

# Despite the slow development of renewables, examples of good practices exist



**Senegal**
Scaling Solar

A PV tender was launched in August 2016 as part of Scaling Solar program supported by IFC. Senegal assigned 60 MW solar PV (30 + 30 MW) at a very competitive price (around 47 USD/MWh). Financial closing reached in July 2019.

**Ghana**
Put and Call Option Agreement (PCOA)

Ghana signed a PCOA in 2016 for a 400 MW Combined Cycle Power Plant. The PCOA allowed the private investor to exit a project and to recover its investment if the PPA terminates early; if the termination event is due to the default of off-taker, the private investor may exercise its Put Option by requiring the Government to purchase its shares in the project company or the project assets.

Notes: Uncertainties remain on the actual ability of the PCOA to attract investments in the future, however it can be still considered as a good practice for the country.

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# 2. What limited the RE growth

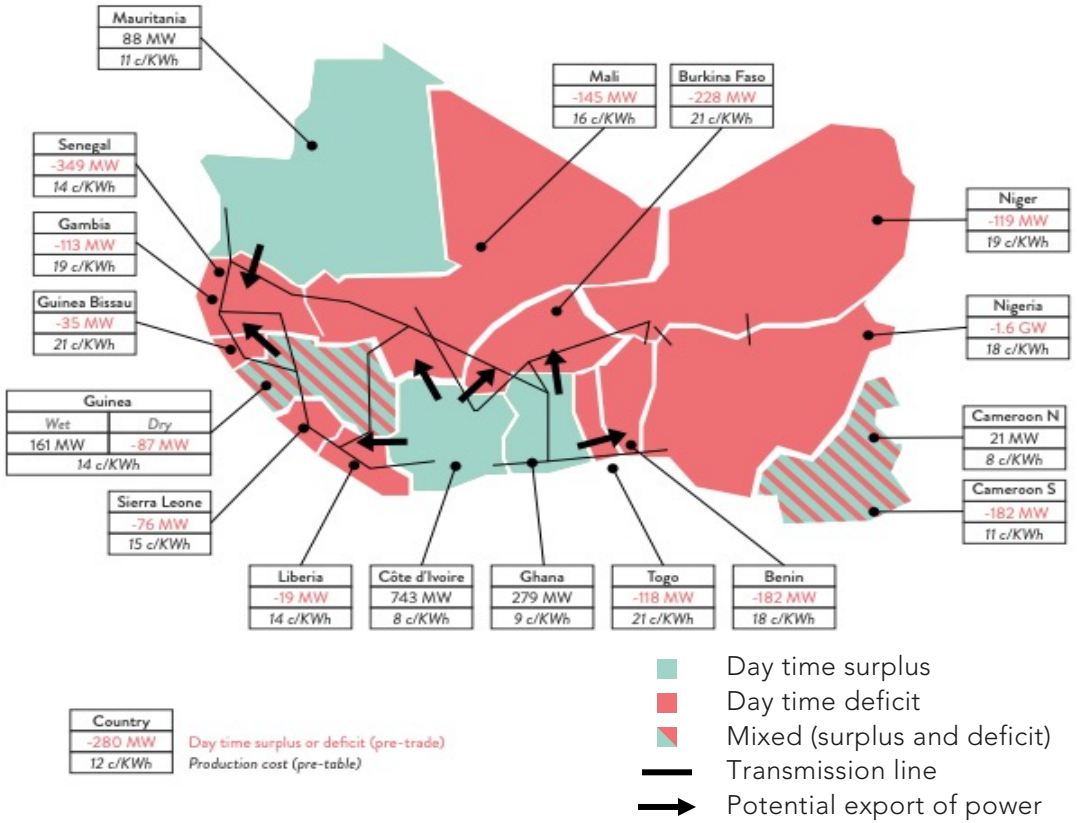
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THE POWER SECTOR FACES A WIDE RANGE OF CHALLENGES

# Some countries have to deal with an excess of (costly) unused generation capacity, while others have a deficit of production

ANTICIPATED OFF PEAK / SURPLUSES, DEFICITS AND LONG RUN PRODUCTION COSTS, 2022




West African countries have experienced **difficulties in planning the evolution of** their **energy markets**, resulting in relatively low levels of regional trade: only about 8.5% of electricity production is traded on average every year In West Africa.

One of the major challenges in the area is to synchronize all domestic networks into a single grid, even though some countries have been successfully connected (Ivory Coast, Ghana, Burkina Faso, Togo and Benin).

In the region, only Nigeria has been exploiting its connection with considerable exchanges, mostly because of the attractiveness of exports compared to domestic demand.

Source: USAID, Power Africa, West Africa Power Trade Outlook, 2018
Notes: The WAPP grid serves two distinct geographic areas:
Zone A: Nigeria, Niger, Benin, Togo, Burkina Faso, Ghana, Ivory Coast – where interconnections exist
Zone B: Mali, Liberia, Guinea, Sierra Leone, Guinea Bissau, Senegal, Gambia – where only Senegal and Mali are interconnected

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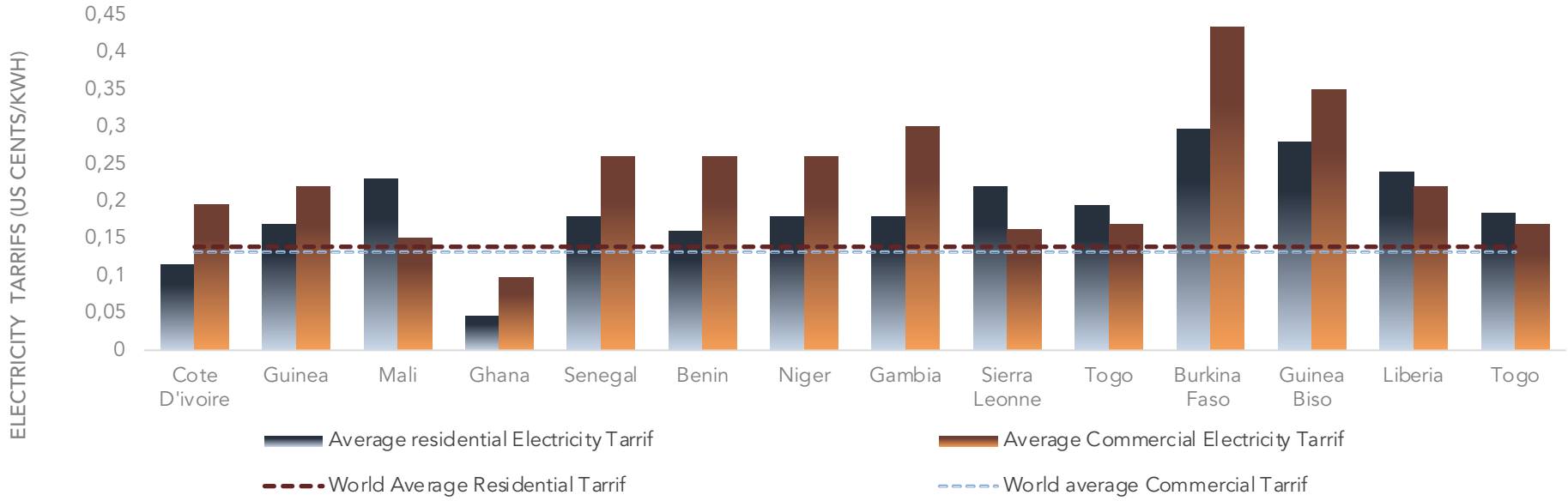
THE POWER SECTOR FACES A WIDE RANGE OF CHALLENGES

# The electricity market is characterized by some inefficiencies, with utilities struggling to implement cost-reflective tariffs

**Prices are among the most expensive in the world**, averaging about $0.20/KWh and sometimes as high as $0.40/KWh. More than twice the global average.

Part of this cost stems from the fact that nations in the region have so far dealt with energy problems independently, trying to match national demand with domestic generation.

**Public utilities in West Africa struggle to recover the cost of producing electricity** due to reliance on small-scale expensive oil-fired power generation, expensive imported fuel and rampant operational inefficiencies

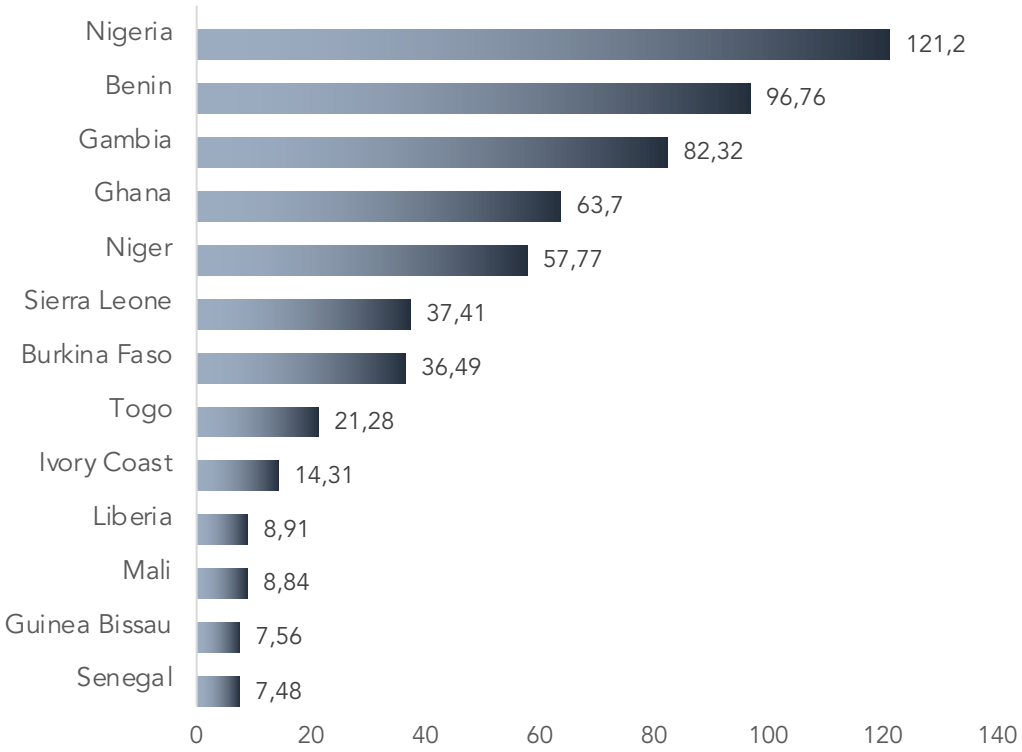



Source: AEP, Comparative Analysis of Electricity Tariffs in ECOWAS Member Countries, 2019

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# The effects of inefficiencies consistently impact the private sector, forced to operate under unreliable electricity supply

OUTAGES PER MONTH (hours), 2020




Shortage of supply is a common issue in the region, with **outages averaging 44 hours per month** and in some extreme cases (like Nigeria) more than 120 hours.

Enterprises report that an average of 5-10% of annual revenues are lost due to power supply shortages.

Power loss reduces direct exports by 6% to 12% as well as slowing down expansion in the industrial and service sectors with dire consequences on labor demand and employment.

Source: World Bank, Entreprise Survey, 2020

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# Bolgatanga-Ouagadougou Interconnector: 188 km of transmission line to diversify the Burkina Faso electricity supply

This interconnection, inaugurated in 2018, has contributed overall to power local economic activities and improve the standard of living for the local population by:

**24%**
**Electricity cost reduction**

Reducing the average weighted annual cost of electricity supply in Burkina Faso from $0.26 to $0.20 / kWh

**16 times less**
**Outages**

Reducing the annual duration of outages in Burkina Faso due to generation capacity deficit/load-shedding from 130.00 to 8.00 hours

**200 MW**
**New energy exports**

Increasing Ghana's ability to export electricity by 200 MW

**21.000**
**People connected to the grid**

Enabling the electrification of 25 villages along the line, powering an additional 21.000 people




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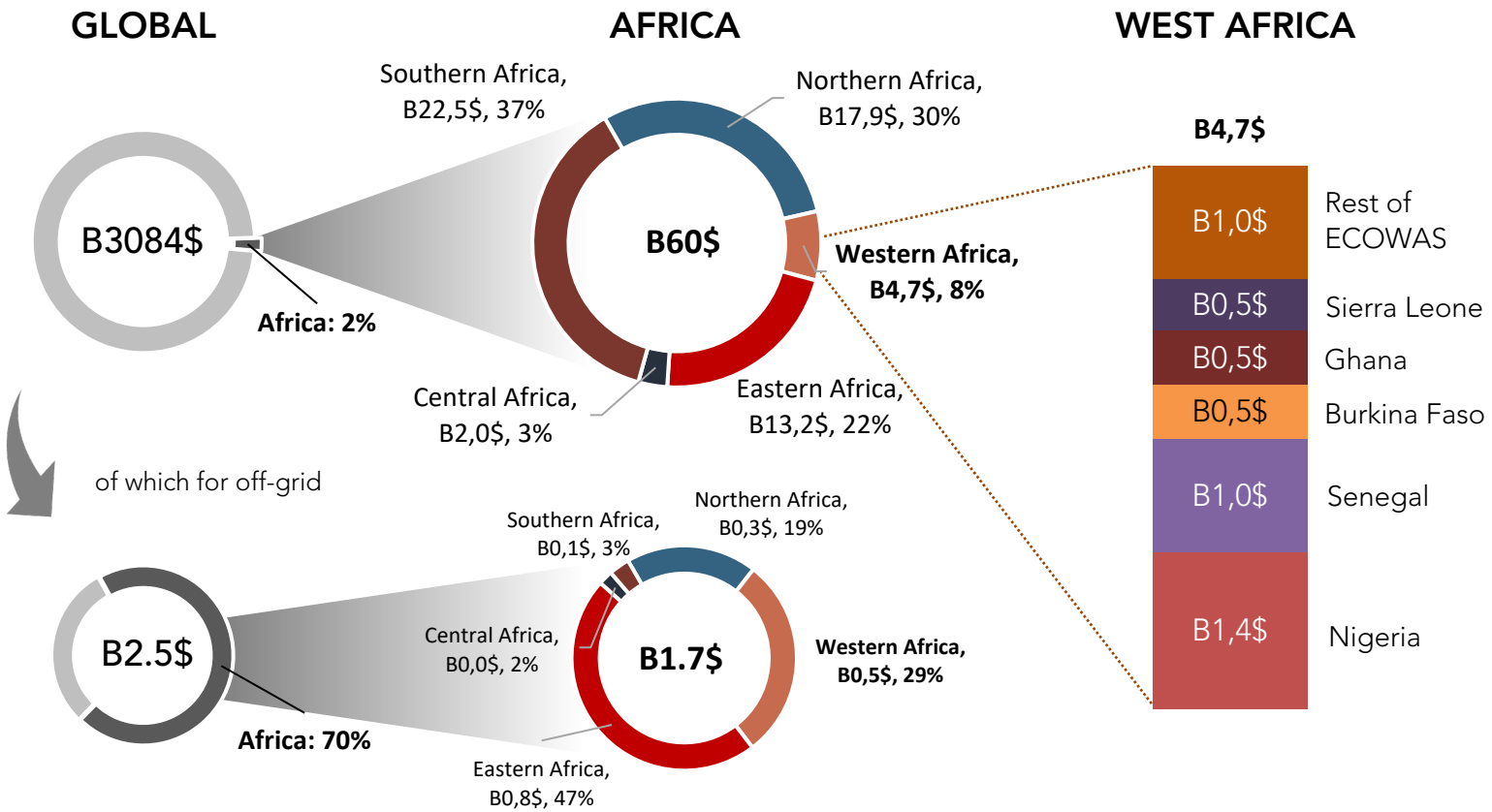

# 2. What limited the RE growth

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INVESTMENTS ARE INSUFFICIENT AND CONCENTRATED IN A FEW COUNTRIES

# Only 2% of the global RES investments are directed to the African continent, but only 8% of this share goes to West Africa

RENEWABLE ENERGY AND STORAGE INVESTMENTS 2010-2020 (B$)




Source: BNEF (2022)
IRENA Renewable Energy Market Analysis – Africa and its regions (2022)
Notes: Data exclude investments in large Hydro (>50MW). Technologies inccluded: solar, wind, small hydro, biofuel, biomass and waste.

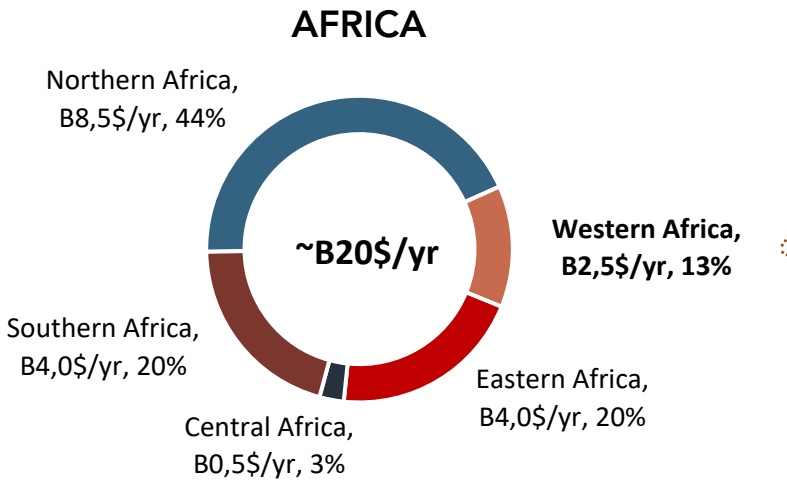
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INVESTMENTS ARE INSUFFICIENT AND CONCENTRATED IN A FEW COUNTRIES

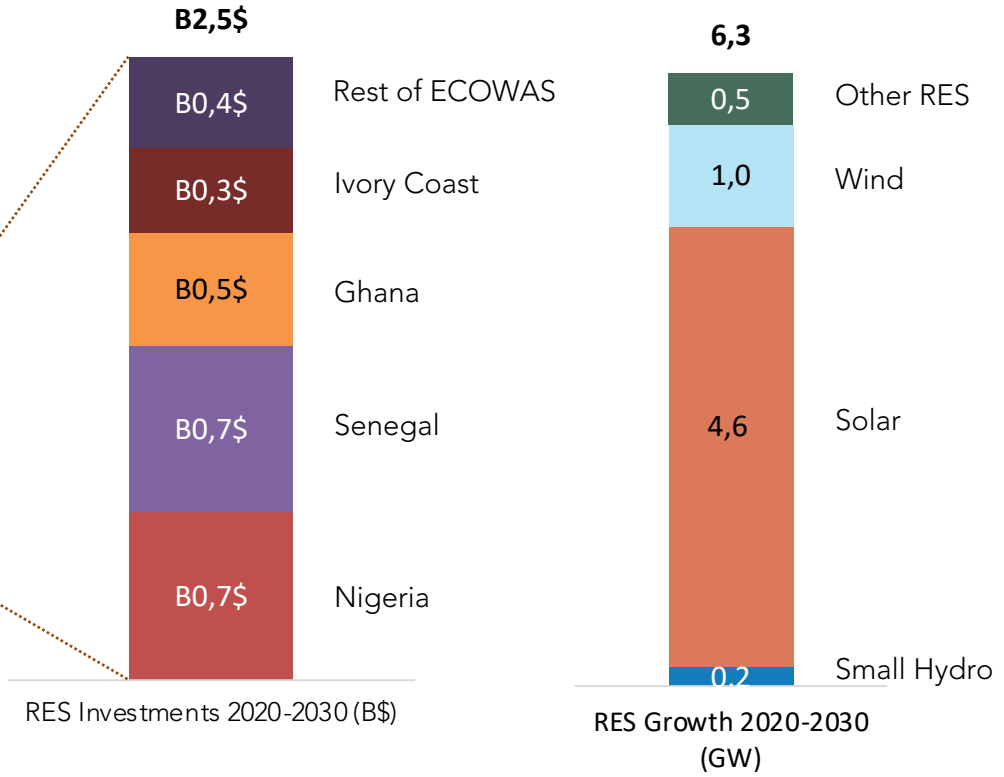
# Investments in RES must increase by 5 times in Western Africa in the next decade to reach national targets

Despite the necessary increase of investment, **single national markets in Western Africa are too small to attract investment** and regional synergy should improve. The expected increase in RES capacity in West Africa is **+6,3 GW**.

FORECASTED YEARLY AVERAGE RENEWABLE ENEGY INVESTMENT 2020-2030 (B$/YEAR)




RES FORECASTED INVESTMENTS (B$) PER COUNTRY AND GROWTH 2020-2030 (GW) BY TECHNOLOGY




Source: Enerdata, EGP analysis based on National Targets and forecasts from infoproviders (IHS, BNEF, WoodMcKenzie) *Other RES excluding Large Hydro
Note: Data exclude investments in Large Hydro. Expected 2010-2020 investments in West Africa is: +0.1 B$ in Small Hydro, 1.85 B$ in Solar, 0.4 B$ in Wind, 0.2 B$ in Other RES.

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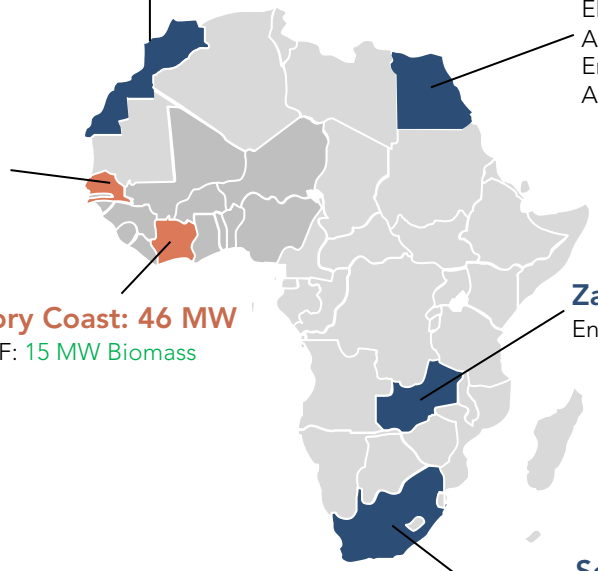
INVESTMENTS ARE INSUFFICIENT AND CONCENTRATED IN A FEW COUNTRIES

# IPP Investments in Africa are mainly concentrated in Morocco, Egypt and South Africa

In West Africa, a few countries (including **Senegal**) **succeeded to attract IPPs** due to its formal regulatory framework, showing how decisive clear and sound policies could be to attract private investment in the region.

MAIN PLAYERS IN AFRICA

| | | | |
|---|---|---|---|
| Utilities | enel | Headquarters: Rome<br>Installed capacity in Africa: **945 MW** | Employees: 66.000 |
| | ACWA POWER | Headquarters: Riyad<br>Installed capacity in Africa: **759 MW** | Employees: 3.900 |
| | ENGIE | Headquarters: Paris<br>Installed capacity in Africa: **454 MW** (47 MW in Senegal) | Employees: 171.000 |
| | EDF | Headquarters: Paris<br>Installed capacity in Africa: **218 MW** | Employees: 163.000 |
| Private Equity | actis | Headquarters: London<br>Installed capacity in Africa: **804 MW** (158 MW in Senegal) | Employees: 350 |
| | OLDMUTUAL | Headquarters: Cape Town<br>Installed capacity in Africa: **580 MW** | Employees: 31.000 |



**Morocco: 1.159 MW**
Acwa Power: 65 MW Solar, 61 MW Wind
Enel: 70 MW Wind + 99 MW Wind
EDF: 67 MW Wind + 266 MW Solar + 80 MW Wind
Engie: 151 MW Wind

**Egypt: 612 MW**
EDF: 66 MW Solar + 33 MW Solar
Actis: 250 MW Wind
Engie: 105 MW Wind
Acwa Power 25 MW Solar + 133 MW Solar

**Senegal: 205 MW**
Actis: 158 MW Solar
Engie: 47 MW Solar

**Ivory Coast: 46 MW**
EDF: 15 MW Biomass

**Zambia: 27 MW**
Enel: 27 MW Solar

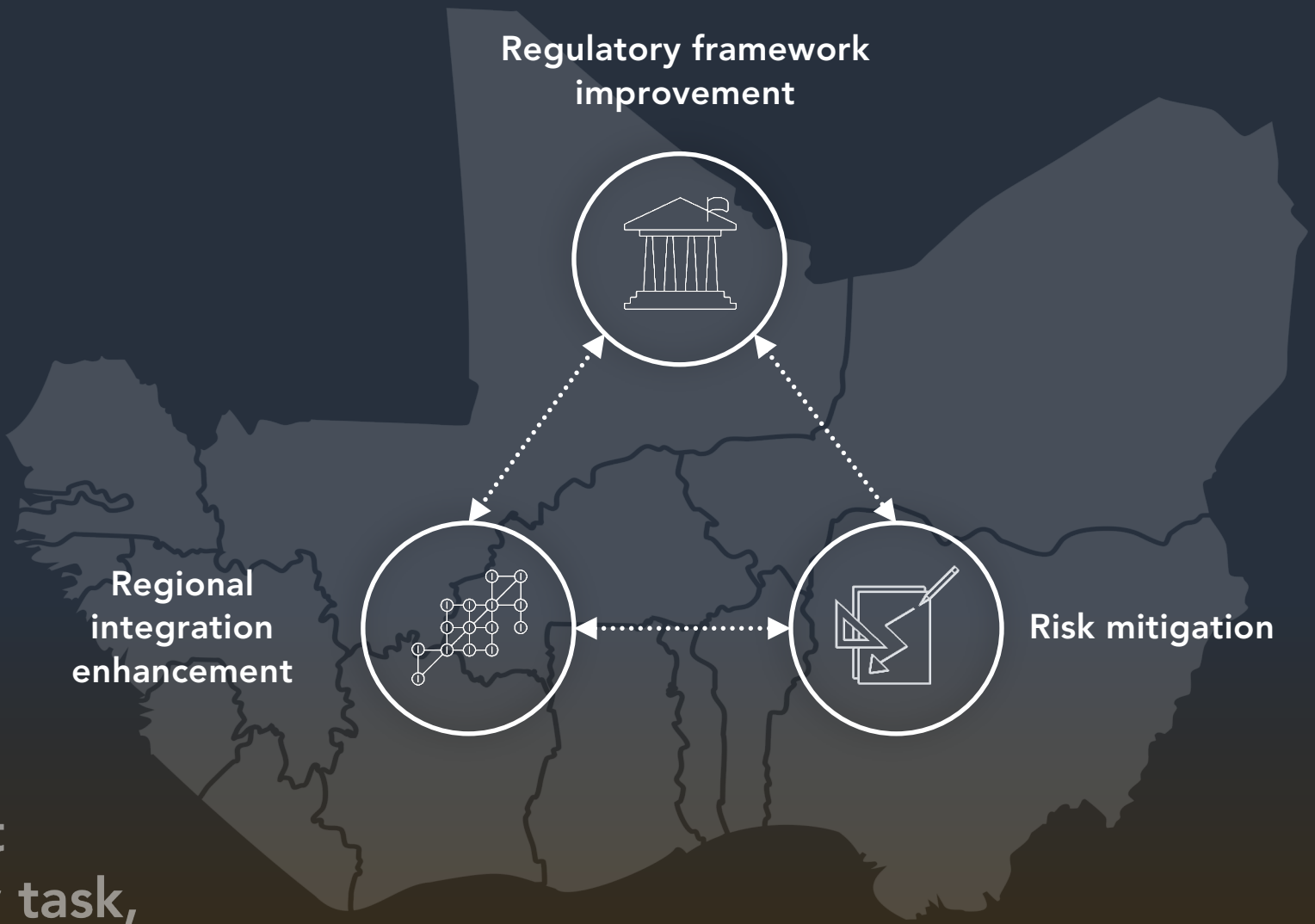
**South Africa: 2.000 MW**
Enel: 546 MW Wind, 302 MW Solar
Oldmutual: 298 MW Solar, 282 MW Wind
EDF: 150 MW Wind, 20 MW Solar
Engie: 302 MW Solar, 40 MW Wind
Actis: 00 MW Wind, 105 MW Solar
Acwa Power: 20 MW Solar

**MW Commissioned/Partially commissioned**
**MW Under Construction/Financial Secure**

Source: BNEF, Oct 2022

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It is not an easy task, but...

# 3. The time to act is now

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THE TIME TO ACT IS NOW

# Adopt a clear regulatory framework and ensure its implementation as a starting point for positive, long-term development of RES

**Ease FDI barriers** – where they exist – that impede foreign IPP participation.

**Establish multiple routes-to-market** to allow IPPs to choose from a portfolio of opportunities.



**Implement standard and bankable PPAs** to reduce the cost of capital and the cost of debt.

**Ensure a balance between local content rules and market competitiveness** to stimulate both international and local engagement.

**Organize competitive procurement schemes** to attract international companies and improve sector competitiveness.

**Apply cost-reflective tariffs** to guarantee affordable energy while ensuring the sustainability of electricity production.

National regulators, Ministries and local governments must work together to publish a national framework that addresses key regulatory barriers such as: FDI rules, local content requirements, pathways to market and procurement processes. Considering the huge sources of RE in West Africa, a clear regulatory framework is the missing element to attract international investors

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THE TIME TO ACT IS NOW

# Financial de-risking instruments are crucial to unlock the full potential of cost-effective RE solutions

Engage and **support monetary cooperation** with non-WAEMU countries (Cabo Verde, Gambia, Ghana, Guinea, Liberia, Nigeria, Sierra Leone).



**Mitigate the risk of non-payment** of a trade transaction caused by currency depreciations, transfer issues or foreign exchange shortages, e.g. through specialized institutions.

Ensure a clear and **transparent process** for the approval of offshore accounts within local governments and ministries.

Provide **alternative solutions** such as partial guarantees and blending facilities.

The high level of perceived business risks by investors is one of the main challenges slowing down the development of RE. Private investors' perception of risk is particularly high when it comes to financing projects; therefore, transparent policies on currency risk mitigation, convertibility and transferability are a crucial aspect in the decision process of international investors.

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THE TIME TO ACT IS NOW

# Promoting regional integration is essential to attract investments and support economic development and prosperity



**Confirm and strengthen political will** – at the national level and through regional organisations – to support decarbonised and sustainable development within a realistic roadmap.

- Support ECOWAS and WAPP actions.
- Update energy development plans
- Reinforce strategic and results-oriented partnerships with various African and International organizations



Leverage international cooperation and **attract international investments** for regional and continental interconnection

- Channel investments into strategic projects in line with national and regional plans
- Strengthen coordination and cooperation between national and local governments, IFIs and international cooperation agencies
- Make progress in unbundling state-owned utilities
- Improve knowledge sharing



**Support the further development of a power trading market**, with appropriate structures and rules, **to accelerate regional energy integration** and maximise the value of the WAPP

- Confirm the political will to strengthen ECOWAS/WAPP responsibilities.
- Establish policies and a regulatory framework that clearly address key barriers

ECOWAS and WAPP are the ideal political and technical arenas to support the integration process and to indicate to the international community the direction that the countries of West Africa are willing to take.

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Looking back at the past
to face the present and plan
for a sustainable and prosperous
energy future for all

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