



Status of Renewable Energy Pursuit in Africa

Chigozie Nweke-Eze,
Founder and Research Lead, Integrated Africa Power (IAP)

November, 2022

Cited as: Nweke-Eze C. (2022). Status of renewable energy pursuit in Africa. Integrated Africa Power (IAP). November



Table of Content

1. Background and context
2. What are the prospects and challenges for different types of renewable energy?
3. What are continental frameworks to promote renewable energy development?
4. What countries have particularly favourable national frameworks?
5. Which African and foreign-led companies successfully operate in the renewable energy sector?
6. What are the obstacles to European-African cooperation in renewable energy sector and what can be done?

Background and context

Africa is rich in all forms of renewable energy, all of which includes solar, wind, geothermal, and hydropower. This puts the continent in an advantaged position in using clean energy technologies, in the pursuit of sustainable development, energy access, energy security, and low-carbon economic growth and prosperity across the entire region.

Africa has a priority to ensure access to reliable, affordable, and clean energy. In the Sub-Saharan African (SSA) region, more than 600 million residents are still without access to electricity; while most African countries experience blackouts from using energy systems powered by fossil energy, which are expensive.

Renewable energies offer clean and affordable energies that can help inject resilience into the African energy system while also helping to catalyze economic development.

1. What are the prospects and challenges for different types of renewable energy generation in Africa?

With abundant solar, wind, geothermal, and hydropower, Africa possesses the potential to transform its current socio-economic realities into a prosperous and sustainable one. However, several technical, economic, and political challenges stall this potential.

Solar

Africa is home to 60% of the best solar resources globally and is estimated to have a solar potential of 60 million TWh annually compared to Europe's estimate of 3 million TWh.⁴ Solar PV – already the cheapest source of power in many parts of Africa – is estimated to outcompete all sources continent-wide by 2030.

Yet there has been low adoption of solar technology in the continent over the years, with only 1% of installed solar PV capacity. Access to finance for renewable energy development continues to be a massive contributing factor to this underutilization of solar potential in the continent. While there is an increasing shift towards solar technologies due to technical efficiency, uncertainties in obtaining finance remain.

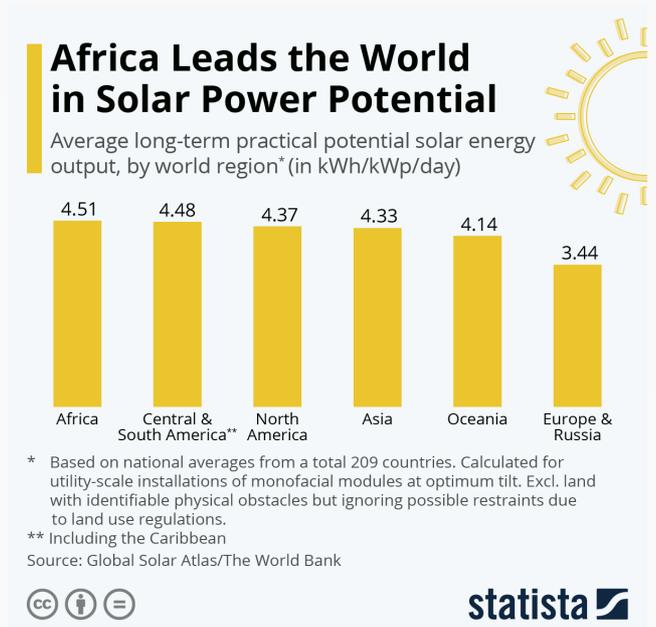


Figure 1: Africa's solar potential ⁷

Wind

Africa has a technical wind potential of 180,000 terawatts (TWh) per year, with the ability to meet Africa's electricity at 250 times over. The highest wind potential is observed mostly in coastal areas of the continent, which tend also to have both on-shore and off-shore potential.

However, the continent accounts for less than 1 percent of global installed wind capacity, due to certain challenges⁹. These challenges include lack of familiarity at the country level with wind technology, macroeconomic and sector conditions that make it difficult to access financing to develop wind initiatives, and connectivity logistics to link wind power with transmission lines.

Hydropower

Africa has an installed hydropower capacity of 38 gigawatts (GW), pumped storage installed was 3GW and electricity generated using hydro sources was 146 TWh as of 2021¹⁰.

Despite this, only 3% of global hydropower comes from Africa, and less than 10% of the potential is exploited out of the 35% of the global that the region holds¹¹. Africa has among the largest untapped potential for hydropower development in the world.

Renewable Energy	Leading African countries with capacity (MW)	Leading African countries in production (GWh)
Solar	Algeria, Egypt, Morocco, Reunion, South Africa	Algeria, Egypt, Morocco, Reunion, South Africa
Wind	Egypt, Ethiopia, Morocco, South Africa, Tunisia.	Egypt, Ethiopia, Morocco, South Africa,
Bioenergy	Eswatini, Ethiopia, South Africa, Sudan, Zimbabwe	Angola, Egypt, Eswatini, Kenya, Mauritius, Reunion, South Africa,
Geothermal	Ethiopia, Kenya	Kenya
Hydropower	Congo DR, Egypt, Ethiopia, Ghana, Morocco, Mozambique, Nigeria, South Africa, Sudan, Zambia	Angola, Cameroon, Congo DR, Cote D'Ivoire, Egypt, Ethiopia, Ghana, Kenya, Malawi, Morocco, Mozambique, Namibia, Nigeria, South Africa, Sudan, Tanzania, Uganda, Zambia, Zimbabwe.

Table 1: Leading African countries, renewable energy capacity, and production (GWh).²

Six African countries (Democratic Republic of the Congo, Namibia, Zambia, Ethiopia, Togo, and Sudan) generate more than 90% of their power from hydro sources¹². This leaves room for more exploitation of this energy source.



Figure 1: Global Hydropower Capacity ¹³

Despite the huge potential, challenges, including financial and political ones, have limited the growth of the sector in Africa. Since large hydro often requires cross-border political agreements and public support, the projects take very long periods before they are developed. Mostly, they require resettling of people located around major river lines; therefore, a strong public buy-in is often required. Other challenges include a lack of transparency in the financial dealings of projects that often involve embezzlement and, consequently, the failure of projects.

Green Hydrogen

Africa has huge potential to produce hydrogen using its rich renewable resources. A number of low-carbon hydrogen projects are underway or under discussion in Egypt, Mauritania, Morocco, Namibia and South Africa. These are focused primarily on using renewables-based power to produce ammonia for fertilizer, which would strengthen Africa’s food security. Global declines in the cost of hydrogen production could allow Africa to deliver renewables-produced hydrogen to Northern Europe at internationally competitive price points by 2030. With further cost reductions, Africa has the annual capacity to produce 5000 mega tonnes of hydrogen at less than USD 2 per kilogramme— an amount equivalent to today’s global energy supply¹⁵.

The development of hydrogen is expanding, yet some challenges are still being encountered on the continent. Some of them include the development of infrastructure necessary for leveraging the potential of hydrogen, cost of producing green hydrogen, and the question of domestic use of produced hydrogen versus export.

2. What are continental frameworks to promote renewable energy development?

The African Union, in 2021, launched the African Single Electricity Market policy¹⁷. The document was released as a guideline for an aggregated development of Africa's electricity market.

The document highlighted in its renewable energy section that the framework will enhance renewable energy frameworks by establishing new reforms, legislations, and regulations to support and promote the development of the huge African renewable energy potential for electricity generation. These will help support large-scale renewable energy systems for electricity generation projects of regional interest (mainly hydropower); allow grid extension to remote areas, as well as mini-grids using local RE resources, such as mini hydro, wind, solar, biomass and geothermal; provide an affordable and better quality of service (reduce the duration and number of interruptions and voltage drops); provide, on a small scale, electricity through off-grid, mini-grid and stand-alone systems (rural electrification); support common technical standards at regional and continental levels for the Renewable Energy Sources (RES) would be necessary and beneficial; support to ensure the development of harmonized tariffs. In addition, Sustainable Energy for All (SEforALL) has established a regional framework for developing clean energy in Africa¹⁸.

Some of the organisation's efforts have been to scale finance towards clean energy in the region. The efforts of the body have yielded some of the benefits listed below:

- BloombergPhilanthropies committed USD 242 million¹⁹ to accelerate the clean energy transition in 10 developing countries, including Kenya, Mozambique, Nigeria, and South Africa, through partnerships with SEforALL, the ClimateWorks Foundation, and other key partners to expand renewable energy capacity and access while phasing out coal use.
- Global Energy Alliance for People and Planet (GEAPP) committed USD 50 million²⁰ to further its multi-year support for SEforALL to support the scale-up of the Universal Energy Facility. The results-based financing facility managed by SEforALL also supports countries' energy access and transition plans.
- IKEA Foundation announced USD 5 million²¹ in funding also to support the scale-up of the Universal Energy Facility.

- Innovate UK's Energy Catalyst announced that up to GBP 40 million²² would be issued to help combat the climate crisis for communities in sub-Saharan Africa, South Asia and IndoPacific regions²³.

In Eastern Africa, there is the Africa Clean Energy Corridor (ACEC). The regional framework aims to accelerate the growth of renewable energy potential in the region and enhance cross-border trade of renewable energy within the Eastern Africa Power Pool (EAPP) and Southern African Power Pool (SAPP). Development of the ACEC is guided by a communiqué endorsed during the Fourth Assembly of the International Renewable Energy Agency (IRENA) in January 2014 by ministers from Angola, Botswana, Burundi, the Democratic Republic of Congo, Djibouti, Egypt, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Namibia, South Africa, Sudan, Swaziland, Uganda, the United Republic of Tanzania, Zambia and Zimbabwe. Since then, support for the initiative has expanded, with the additional engagement of more than 30 governments, regional organisations, development partners and financial institutions²⁴.

The Economic Community of West African States (ECOWAS) also has its ECOWAS Renewable Energy Policy (EREP) document aimed at mainstreaming renewable energy and energy efficiency into the national policies of the fifteen member states of the organisation²⁵. The ECOWAS Energy Efficiency Policy (EEEP) was developed. The EREP, prepared based on a comprehensive renewable energy baseline report, was adopted by the ECOWAS Ministers of Energy at the ECOWAS HighLevel Energy Forum, which took place from 29 to 31 October 2012 in Accra, Ghana. Other related frameworks that The ECOWAS energy efficiency action plan²⁶, and the Ecowas Masterplan for the Development of Regional Power Generation and Transmission Infrastructure²⁷.

3. Which countries have particularly favourable national frameworks?

The clean energy sector in Africa is experiencing some developments and is championed by some countries with the right institutional capacities alongside favourable policies for the development of the sector. The countries with the most advanced and favourable frameworks for developing their renewables include Morocco, Kenya, South Africa, Egypt, Ethiopia, and Nigeria. According to Ember²⁸, a global energy think tank, due to their advanced and favourable frameworks, Morocco and Kenya lead the ranks in terms of clean electricity in Africa.

Both countries, in 2019, surpassed the world average, generating 16% and 15% of their electricity from wind and solar, respectively. In Kenya, 74% of total energy use is already clean.²⁹ These countries already have developed robust policies to set them up for more dominance in the growth of renewable energy production and consumption in Africa. Ethiopia is looking at generating about 6GW of electricity putting the country only behind South Africa in production in Africa.

South Africa has the highest amount of wind power generated in TWh in Africa, with 8TWh generated in 2020. The country identified three hydrogen hub locations aimed at helping them become a major player in the hydrogen economy. It has also started studies for the production of hydrogen components, such as electrolyzers, following the launching of its national hydrogen strategy. Other countries leading in the African hydrogen economy include Egypt, which is preparing its national hydrogen strategy and plans to make it ready at COP27³¹.

Namibia and Morocco have established MoU with countries like Belgium, France and Germany to export locally produced hydrogen to these countries. Nigeria has also recently released its energy transition plan, the first of its kind in the continent, which is aimed at:

- Serving as a guide to Nigeria in its commitment and ambition to achieving carbon neutrality
- Reducing energy poverty among Nigerians, and ensuring reduced poverty rates among 100 million people by successfully managing the long-term job loss in the petroleum sector that will arise from decarbonization
- Driving economic growth in all commercial industries and sectors in the country
- Creating awareness of energy transition planning in other African countries to achieve a just and equitable climate future for all. The plan does lay out the strategy with which this will be done; however, bilateral agreements with neighbouring African countries are expected to be engaged
- Creating novel opportunities for solar energy companies to obtain results-based finance from the Universal Energy Facility
- Mobilizing support from international partners for the country's energy transition by showcasing existing support for data-driven energy transition planning from international partners
- Increasing electricity access for Nigerians, achieving universal power access by 2030

- Mobilizing investments and private sector involvement by creating significant market opportunities in the energy transition process

4. Which African- and foreign-led companies successfully operate in the renewable energy sector?

Currently, in the African continent, the private sector is currently the driving force behind much of renewable energy projects. Several companies have been playing successfully in African renewable energy space.

However, regulatory regimes and "ease of doing business" can make these investments difficult at times. State-owned enterprises (SOEs) lag behind the private sector and will likely continue unless more African governments reform their SOEs and their energy sectors more generally. As an example, South Africa's Renewable Energy Independent Power Producer Procurement (REIPPP) program and the World Bank and International Finance Corporation's Scaling Solar Program have driven the price of solar-generated energy to as little as US\$0.05 per kilowatt-hour.³²

Additionally, more private sector engagement can be leveraged through support for healthy competition in African energy markets to ensure that consumers get the best value for money, and promoting a level playing field for all companies to invest, no matter their nationality.

5. What are the obstacles to European-African cooperation in renewable energy sector and what can be done?

Major obstacles to EU-African cooperation in the energy sector include inadequate communication and cross-level awareness and weak legal, regulatory, and institutional framework for partnerships. Just energy transition partnerships should be partnerships that first acknowledge the need for joint actions to meet climate change targets without neglecting importance socio-economic indices in the implementing country. It is built on principles of solidarity and responsibility, and advocates for equality and fairness across board, causing a paradigm shift and transformational change. Such partnership requires effective and efficient allocation of both technology and financial support to spur the transition.

Africa: 2021 Hydropower installed capacity (MW) by country

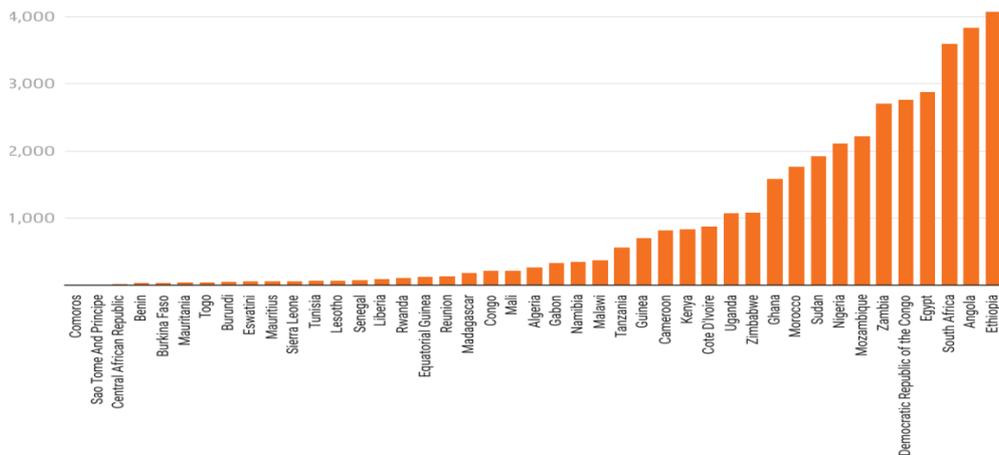


Chart: International Hydropower Association • Source: International Hydropower Association - 2022 Hydropower Status Report • Created with Datawrapper

Figure 3: Installed Hydropower capacity by African countries¹⁴

Experience shows that international private investors are willing to invest in the sector as long as a clear regulatory framework is in place and wind resources are geo-referenced to gauge feasibility. The public sector, therefore, has a vital role to play in creating a conducive environment to attract private investors while at the same time investing in upstream operations like feasibility studies that would pave the way for further sectorial development. Development Financial Institutions (DFIs) should leverage their global experience to help countries design clear procurement frameworks, adopt best practices in the sector and undertake reforms aimed at facilitating private sector engagement.

Interventions to develop the sector should be adapted to country contexts. Country experiences show that renewable energy markets face different constraints and could be developed using different paths. While Tunisia and Egypt had a public sector-led development strategy, Morocco relied heavily on private procurement of energy projects. Kenya adopted the feed-in tariff mechanism, while Egypt and Morocco used a process involving competitive bidding and direct negotiation. Moreover, the issue of carbon emissions is more relevant for South Africa than for Chad. Hence, governments should adopt solutions that are the best fit to their existing challenges instead of seeking to adopt best industry standards. In this context, DFIs should avoid the one size fits all approach when designing their interventions and should allow countries to use different approaches depending on their priorities and local constraints.

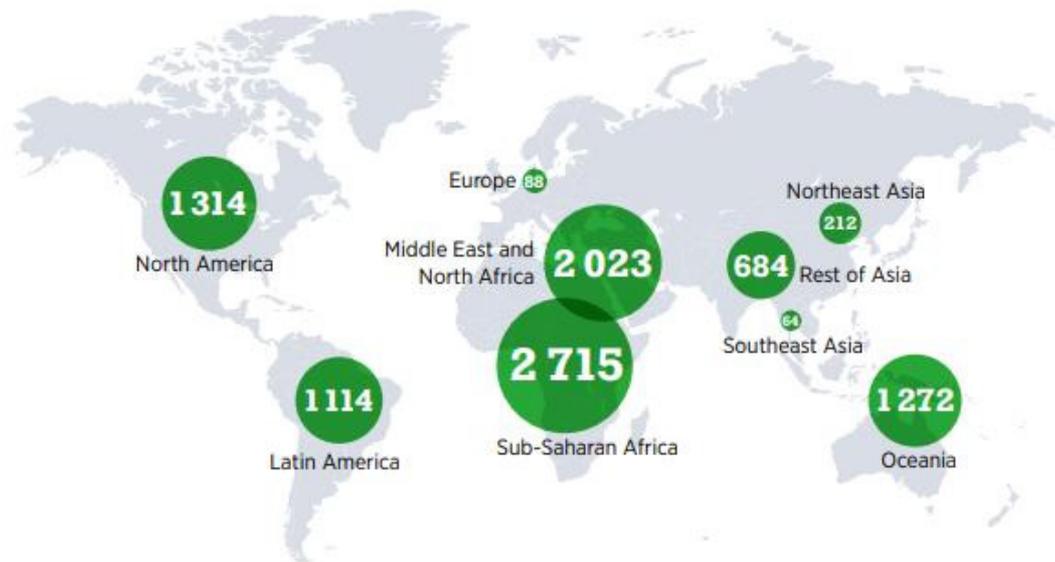


Figure 4: Technical potential for producing green hydrogen under USD 1.5/kg by 2050, in EJ¹⁶

RE Type	African (headquarter country)	Foreign (headquarter country)
Solar	Green Village Electric (GVE) (Nigeria)	Algeria, Egypt, Morocco, Reunion, South Africa
	M-Kopa Solar (Kenya)	ACWA Power (Saudi Arabia)
	Oolu (Nigeria)	Scatec (Norway)
	Daystar Power (Ghana)	LONGi Solar (China)
Wind	Nareva (Morocco)	Lekela Power (Netherlands)
	BioTherm Energy (South Africa)	Enel Green Power (Italy)
	Umoya Energy (South Africa)	General Electric (US)
Hydropower	East African Power (EAP (Rwanda)	Voith Hydro (Germany)
	Neo Themis (Morocco)	SinoHydro (China)
Green Hydrogen	Sasol (South Africa)	Hyphen Hydrogen (UK/Germany)
	Orascom (Egypt)	Scatec (Norway)
	Masen (Morocco)	CWP Global (Australia)
	Bambili Energy (South Africa)	Fertiglobe (UAE)

Table 1: Selected African- and foreign-led companies successfully operating in the renewable energy sector in the continent, and their headquarter countries.

References

- 1 World Energy Outlook 2018, Source: https://iea.blob.core.windows.net/assets/77ecf96c-5f4b-4d0d-9d93-d81b938217cb/World_Energy_Outlook_2018.pdf
- 2 Adams, S., & Asante, W. (2019). Politics of Renewable Energy in Africa: Nature, Prospects, and Challenges. In (Ed.), Innovation in Global Green Technologies 2020. IntechOpen. <https://doi.org/10.5772/intechopen.89019>
- 3 Scaling up renewable energy deployment in Africa: Impact of IRENA's engagement, Source: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/IRENA_Africa_impact_2019.pdf?la=en&hash=6B16ABE754FF6F843601E1E362F5D6B730ADF7A2
- 4 IRENA and AfDB (2022), Renewable Energy Market Analysis: Africa and Its Regions, International Renewable Energy Agency and African Development Bank, Abu Dhabi and Abidjan.
- 5 IEA 2022. Africa Energy Outlook. Source: <https://iea.blob.core.windows.net/assets/6fa5a6c0-ca73-4a7f-a243-fb5e83ecfb94/AfricaEnergyOutlook2022.pdf>
- 6 IEA 2022. Africa Energy Outlook. Source: <https://iea.blob.core.windows.net/assets/6fa5a6c0-ca73-4a7f-a243-fb5e83ecfb94/AfricaEnergyOutlook2022.pdf>
- 7 Africa has the world's most potential for solar energy | World Economic Forum (weforum.org), Source: <https://www.weforum.org/agenda/2022/09/africa-solar-power-potential/>
- 8 Powering Africa's sustainable development through wind (worldbank.org), Source: <https://blogs.worldbank.org/climatechange/powering-africas-sustainable-development-throughwind#:~:text=IFC%20commissioned%20a%20study%20ast%20year%20to%20assess,the%20entire%20continent%E2%80%99s%20electricity%20demands%20250%20times%20over.>
- 9 World Bank (2021). Source: <https://blogs.worldbank.org/climatechange/powering-africas-sustainabledevelopment-through-wind>
- 10 Africa. Source: <https://www.hydropower.org/regionprofiles/africa#:~:text=Hydropower%20potential%20exceeds%20current%20and%20mediumterm%20demand%20in,remains%20among%20the%20cheapest%20renewable%20energy%20sources%20globally>
- 11 Africa (hydropower.org). Source: <https://www.hydropower.org/regionprofiles/africa#:~:text=Hydropower%20potential%20exceeds%20current%20and%20mediumterm%20demand%20in,remains%20among%20the%20cheapest%20renewable%20energy%20sources%20globally>
- 12 Hydropower In Africa: An Overview - CleanTechnica, Source: <https://cleantechnica.com/2019/06/01/hydropower-in-africa-an-overview/>
- 13 2022 Hydropower Status Report (website-files.com), Source: https://assets-global.websitefiles.com/5f749e4b9399c80b5e421384/6344102302e73e4ccf3b851a_IHA%20Hydropower%20Status%20Report%202022%2001c.pdf
- 14 Hydropower Status Report 2022. Source: https://assets-global.websitefiles.com/5f749e4b9399c80b5e421384/6344102302e73e4ccf3b851a_IHA%20Hydropower%20Status%20Report%202022%2001c.pdf
- 15 IEA 2022. Source: <https://www.iea.org/reports/africa-energy-outlook-2022/key-findings>
- 16 IRENA 2022. Source: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2022/Jan/IRENA_Geopolitics_Hydrogen_2022.pdf
- 17 EU Technical Assistance Facility for SE4ALL 2021. Source: https://au.int/sites/default/files/documents/40438-docStrategy_HarmonisedRegulatoryFrameworkElectricityMarket.pdf
- 18 <https://www.mininfra.gov.rw/index.php?eID=dumpFile&t=f&f=44024&token=c9d8a3e4e9ad4d22aa3c3b883055c94z26760c584>
- 19 <https://www.bloomberg.org/press/bloomberg-philanthropies-intensifies-global-effort-to-turbochargeclean-energy-transition-in-10-developing-countries/>
- 20 <https://www.rockefellerfoundation.org/news/global-energy-alliance-for-people-and-planet-andsustainable-energy-for-all-announce-expanded-partnership-to-tackle-energy-poverty-worldwide/>
- 21 <https://www.seforall.org/news/ikea-foundation-deepens-commitment-with-new-funding-for-seforall>
- 22 <https://tea.carbontrust.com/updates/news/up-to-40m-available-for-innovations-delivering-clean-energyaccess-in-africa-asia-and-the-indo-pacific>
- 23 Highlights from the 2022 SEforALL Forum in Kigali | Sustainable Energy for All. Source: <https://www.seforall.org/news/highlights-from-the-2022-seforall-forum-in-kigali>
- 24 Africa Clean Energy Corridor (irena.org), Source: <https://www.irena.org/Energy-Transition/Countryengagement/Regional-Initiatives/Africa-Clean-Energy-Corridor>
- 25 ECOWAS Renewable Energy Policy (EREP) | ECREEE, Source: <http://www.ecreee.org/page/ecowasrenewable-energy-policy-erep>
- 26 ECOWAS Energy Efficiency Policy (EEEP) | ECREEE, Source: <http://www.ecreee.org/page/ecowas-energyefficiencypolicyeeep#:~:text=The%20ECOWAS%20energy%20efficiency%20action%20plan%20is%20based,them%20with%20high%20efficiency%20fluorescent%20or%20LED%20lamps.>

References

- 27 volume_0.pdf (ecowapp.org), Source: https://www.ecowapp.org/sites/default/files/volume_0.pdf
- 28 Renewables growth in Africa | Ember (ember-climate.org), Source: <https://emberclimate.org/insights/research/africa-electricity/>
- 29 We are at a crossroads in history: Africa can and must be a leader in clean energy | William Ruto | The Guardian, Source: <https://www.theguardian.com/global-development/2022/oct/04/we-are-at-a-crossroads-in-history-africa-can-and-must-be-a-leader-in-clean-energy>
- 30 Global Electricity Review 2022 | Ember (ember-climate.org), Source: <https://emberclimate.org/insights/research/global-electricity-review-2022/>
- 31 Egypt | Green Hydrogen Organisation (gh2.org), Source: <https://gh2.org/countries/egypt>
- 32 Okonjo-Iweala, N. 2020. Africa can play a leading role in the fight against climate change. In: Chapter 4 - Combatting Climate Change: An urgent call for comprehensive global and local action. In: Foresight Africa 2020 report. Brookings Institute.