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## **Africa: the green solution to energy poverty**

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### **Executive Summary**

Modern societies have highlighted the importance of the environment and the consequences of climate change to every domain of our everyday lives.

Energy is the foundation of development and data show that a society without energy and especially without electricity is doomed to poverty, dependency and low living standards. One of Africa's main problems is its inadequacy to provide access to electricity, which is produced by clean fuels, friendly to the environment. The majority of the continent's population lives without electricity and relies on fossil fuels (oil, gas, coal etc.) and biomass, mostly wood, to meet their energy needs. The extravagant use of these fuels harms the environment.

The dependance on these harmful for the environment fuels for the production of electricity, render energy poverty as a fundamental issue of the continent.

As population and the African economy grows, measures to achieve sustainable development for all African people and countries must be taken with a view to avoid the increase of CO<sub>2</sub> emissions to the environment. Green hydrogen, Solar PV panels and hydropower technology is the decisive step to green transition, ensuring access to electricity for all, while respecting the environment.



## Introduction

Modern states have realized the importance and the impacts of human's activities on the environment. Therefore, the environment has a central position to the 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, which prioritize the access to affordable, reliable, sustainable and modern energy for all, according to Goal 7, while Goal 13 pushes the nations to take urgent action to combat climate change and its impacts.

There is no shadow of a doubt that Goal 7 defines as crucial the efforts to resolve the energy crisis along with the problem of energy poverty and aspires to accomplish 100% electricity access and clean cooking facilities for all, worldwide, by 2030. In any case, energy is the vital source of life and it is indissolubly linked to the development of a country and to improved living standards. The aim is to ensure energy access for all, while protecting the environment and combating climate change, by using renewable energy sources.

At this point, it would be essential to clarify that electricity is not the only source of energy. On the contrary, it is one of the three components, including transport and heating, that constitutes the total energy production. Nevertheless, this policy brief focuses on electricity, because, principally, in the electricity sector, we have many more alternatives (nuclear power, hydropower, wind, and solar) to non-renewable sources, which have greater potential concerning the progress on decarbonization.

Africa, as a continent, should be in the spotlight of these attempts. Africa has great unexploited potential to renewable sources of electricity. However, in 2019, 580 million people in Africa didn't have access to electricity, while the continent still doesn't exploit its "green potential", and depends to a mix of fossil fuels and biomass, which is harmful for the environment and incapable to satisfy the needs of the population.



## The two aspects of the energy problem

**The international energy problem is not one-sided. On the first hand, we observe the developed countries where people have access to energy, but the emissions of CO<sub>2</sub> are high. On the other hand, poor countries are tormented by energy poverty, being unable to provide to their people access to energy, but, at the same time, the percentage of CO<sub>2</sub> emissions is estimated to be near to zero.**

At the same time, as the world evolves and the economies grow, underdeveloped countries will reportedly catch up with the richer part of the world. African Development Bank estimates that both Africa's Gross Domestic Product and GDP per capita will increase steadily during the period 2010 to 2060 (African Development Bank, 2011). The biggest challenge, now, is to avoid reaching the high

percentages of greenhouse emissions of the more developed countries, which would result to the augmentation of the energy problem.

## Non-renewable Dependency

Firstly, it is important to understand the "electrical reality" of the African continent.

The continent's current energy needs are satisfied through a mix of fossil fuels and biomass. The five African power pools produce electricity using different energy sources. The table below shows the percentage of each energy source used in the production of electricity by the five power pools in Africa:

Power Pools	Fossil fuels	Hydroelectricity	Solar, wind, etc.	Biofuels and waste
CAPP	21.9	77.4	0.4	0.3
EAPP	77.2	18.5	2.6	0.03
COMELEC	98.2	0.8	1	-
SAPP	76.8	18.5	0.2	0.5
WAPP	77.4	21.9	0.4	0.3

**Data retrieved from AFREC, 2019**

It is evident that, in the electricity sector, the dominant energy source is fossil fuels.



## Oil

Africa has a profusion of proven petroleum or crude oil reserves. Libya and Nigeria have the largest share, which is estimated to 63% of African's total, followed by Algeria and Angola, with a collective 20% of oil reserves. (BP, 2016) These countries mostly use oil reserves to meet their electricity needs.

However, the downsides of oil exploitation are several and damage irreparably the environment. Oil fuel combustion emit CO<sub>2</sub> and methane pollutants, while drilling and transporting it harms the local ecosystems. Oil spills, occurring mainly in the region of Niger Delta, is the biggest environmental hazard, worldwide.

It is important to mention, as well, that a big part of electricity production is associated with diesel generators, which burn oil to construct electrical power. The incomplete combustion of diesel, which occurs mostly due to technologically ineffective diesel gensets, produce emissions of black carbon, which is responsible for climate change and respiratory and cardiopulmonary disease increasing the risk of premature death.

## Gas

Furthermore, the continent has, also, an abundance of proven natural gas reserves, mainly in the northern parts and in Western Africa (Atlas of Africa Energy Resource, 2017). Natural gas consists primarily of methane, a very clean and safe fossil fuel, although its combustion produces pollutants, such as carbon dioxide, carbon monoxide and nitrogen oxides.

The positive element of natural gas in electricity production is that it is often mixed with other fuels, aspiring to reduce pollution. Nevertheless, gas flaring is a method used in many African countries, especially in Nigeria, in the electricity sector, and it is a process resulting to pollutants including oxides of nitrogen, carbon and sulphur, hydrocarbons and ash, photochemical oxidants and hydrogen sulphide (H<sub>2</sub>S), which contribute to global climate change (AAAS, 2010).



## Coal

Charcoal is used widely in the poorer parts of Africa for cooking (alongside with wood), because its power plants are considered the cheapest way to produce electricity. Unfortunately, its combustion emits methane and short-lived pollutants.

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The environmental consequences of the combustion of fossil fuels are well known and does not concern only the African Continent. The reduction of their use will undeniably benefit the whole world and those who do business in Africa.

## Carbon Budget

The Paris Agreement on climate change, adopted by 196 Parties, aims to ensure that the global average temperature rise this century is kept well below 2°C above pre-industrial levels. Article 2, also, declares that states must pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change (Paris Agreement, 2015). That requires as well that 21% of Africa's proven oil reserves, 33% of its proven gas reserves and 85% of its coal reserves remain untouched, a project widely known as 'unburnable carbon' (Atlas of Africa Energy Resource, 2017). It is an obligation of all contracting parts to reassure the achievement of these goals.

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## Biomass- a green capacity turned black.

Africa depends on biomass. Although it is considered as a renewable source of energy, this alters in relation to the combustion technology, the way it was harvested, the regrowing efforts and the type of biomass. Fuelwood or wood fuels is the most important primary energy source in the African continent. In East, Central, and West Africa, it is calculated that fuelwood provides more than half of the total energy (Atlas of Africa Energy Resource, 2017). African people use wood primarily for cooking. However, the overuse of wood as a source of energy has a negative influence on the environment, which leads poverty to be linked to deforestation.



The FAO reports that on the African continent the reliance on wood as fuel is the single most important driver of forest degradation (FAO, 2018). This link underlines why deforestation diminishes with economic growth. We can claim that energy poverty -and not only economical- results to deforestation. Africa can be offered as a proof of this statement. People do not have other sources of energy to exploit and as a result they take advantage of the abundance of timber in Africa leading to deforestation. Easy access to other renewable electricity sources would give a solution to this problem. African forests are important for climate change mitigation, due to the capacity of trees to ‘trap’- absorb-greenhouse emissions. (Brack, 2019)

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The current energy sources in Africa could be judged as inefficient to achieve Sustainable Goal 7.

As above mentioned, nearly 620 million people in Africa do not have access to electricity. In 2016, only 14% of households had access to clean fuels, which leaves an 86% of households using fuels harmful for the environment (WHO, 2016). According to IEA, almost 780 million people depend on traditional solid biomass for cooking (IEA,2020). Energy poverty provokes not only environmental issues but creates many problems to African societies, harming indirectly Europe as well.

The achievement of the Sustainable Agenda 2030 requires the cooperation of the European Union with the African Union. Under the consultations for the new EU-AU strategy, environment needs to be in the center of policymakers’ concerns. All the other aspects of the EU-AU strategy will be undermined if we do not focus on energy poverty and its environmental and social consequences. It is evident that sustainable development will diminish poverty, inequalities, migration, and credit risk, opening the road for safe European investments and will unquestionably solve environmental issues.

Africa has the capacities for a green transition. Specifically, the African Development Bank, in 2017, estimated the power generation capacities for the continent, which are 350 GW for hydroelectric, 110 GW for wind, 15 GW for geothermal and an astounding 1000GW for solar (Akinwumi, 2019).





Africa's renewable energy sources have been used before to produce electricity. The Benban Solar Park in Egypt and the dam of lake Turkana are two examples of the exploitation of Africa's green capacities.

But, keeping in mind the number of people without access to electricity, it is easy to say that these initiatives are not enough.

## **Recommendations**

Many ways to achieve green transition can be proposed, but the future of developed green economies is, without a doubt, green hydrogen.

Green hydrogen is the only known clean energy molecule that can be constructed at any scale and in almost any place, worldwide, a potential that cannot be compared to any other environmentally-friendly fuel. Consequently, green hydrogen could offer almost any individual or society, the possibility to get their own fuels, with the pliability for multiple purposes, including applications in any domain (industry, transport, etc.) [ESMAP,2020].

Hydrogen can be produced in many ways. If the sources used are renewable and clean fuels, hydrogen is considered as green, because its production is "carbon-free".

As mentioned above, Africa has plenty renewable energy resources in order to produce green hydrogen. So as to produce green hydrogen, the first step is to exploit these sources by constructing Solar PV parks across Africa in locations that meet the criteria, and installing MHK (Marine and Hydrokinetic) technology for the production of electricity. Africa has so far only used approximately 11% of its hydropower capacity, with 906 megawatts (MW) placed into operation in 2019 (IHA, 2020). MHK power plants generate more than 538 terawatt-hours of electricity per year, enough to provide electricity to millions of homes (Nichols, 2020).

Furthermore, large scale power-to-gas (P2G) renewable energy facilities need to be constructed, to transmit the green energy and power all the cities of both rural and urban regions, with green hydrogen. This technology aims to ensure the storage of electricity through the conversion of green hydrogen and CO<sub>2</sub> into methane, contributing to the combat against energy poverty and climate change.



The European Union, in cooperation with the African Union, can provide the means and the funds to achieve the green hydrogen transition. The European Investment Bank has provided again, in the past, funds to Africa. The current fund should focus on the construction of Solar PV parks, hydropower and green hydrogen technology.

Before taking the big step to green hydrogen-transition, with a view to diminish African's dependency on oil and biomass, a transitional phase must be adopted, continuing, in the short term, the use of fossil fuels and biomass, but adding carbon removal technologies to the electricity production.

## Conclusion

For the developed and wealthy part of the world, the challenge towards decarbonization is electrifying the energy system using clean renewable power. For Africa, the most challenging part is to electrify society with the relentless clean energy wealth, avoiding the adoption of the carbonized energy habits of the developed world. The EU, respecting its obligations as a global actor, can contribute to the accomplishment of this ambition.

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