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ENERGY LAW, POLICY AND PRACTICE

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TABLE OF CONTENTS

GLOBAL ENERGY TRANSITION IN AFRICA: THE GOOD, BAD, AND PERSPECTIVES.

ABSTRACT

The pressing need to combat climate change and the rising need for sustainable, reasonably priced, and reliable energy sources are changing the face of the global energy landscape. With the global energy transition, which is characterised by the move away from fossil fuels and towards renewable energy sources, Africa is confronted with both tremendous potential and formidable problems. The broad effects of the energy transition on the continent are examined in this research paper, with a focus on the obstacles that need to be overcome in the fields of politics, finance, infrastructure, and society, as well as the opportunities for economic growth, social progress, environmental sustainability, and technological advancement.

It also examines a number of topics related to the transition clean energy sources, the effects of renewable energy sources, the impacts on economic growth, the impact on equity and access to energy, and the legislative and policy frameworks needed to enable a fair and inclusive transition. In addition to highlighting Africa's potential for renewable energy, this paper also discusses the obstacles, and challenges that must be overcome to guarantee a successful energy transition, as well as the opportunities for better energy access, sustainable development, and climate change mitigation. This research examines historical foundations, current patterns, and potential futures to

provide a fair assessment of Africa's energy future and offer tactical recommendations for navigating the energy transition.

1. INTRODUCTION

a. Background of the Global Energy Transition

Energy transition is the move by the global energy sector away from fossil fuels such as coal, natural gas, and oil to renewable energy sources such as wind and solar energy.[1] The urgent need to slow down climate change, the depletion of fossil fuel supplies, and the rising financial and environmental consequences of extracting and using fossil fuels are some of the causes driving this shift. International agreements including the Paris Agreement, have established challenging goals for cutting greenhouse gas emissions and have accelerated the transition to renewable energy sources.[2] The world is in a constant state of flux, driven by technological advancements, political landscapes shift, economic changes, and evolving social dynamics. These global transitions impact every continent, with Africa no exception. The continent, rich in natural resources and cultural heritage, finds itself at the crossroads of numerous global trends that offer both opportunities and challenges.

Technological advancements have played a crucial role in making renewable energy sources more viable and cost-effective. Innovations in solar panel efficiency, wind

[1]TWI-Global, *"What is Energy Transition?"* < https://www.twi-global.com/technical-knowledge/faqs/energy-transition#:~:text=Energy%20transition%20is%20the%20move,as%20wind%20and%20solar%20energy > assessed on 15th June 2024

[2] International Renewable Energy Agency [IRENA], 2019, *"Renewable Energy Market Analysis: Africa and Its Regions"* < https://www.irena.org/publications/2019/Dec/Renewable-Energy-Market-Analysis-Africa-2019 > assessed on 15th June 2024

turbine design, and energy storage systems have significantly reduced the cost of renewable energy, making it increasingly competitive with traditional fossil fuels.[3] Additionally, the integration of smart grid technologies and digital solutions has improved the management and distribution of renewable energy, enhancing its reliability and accessibility.[4]

b. Importance for Africa

Africa is at a pivotal point in the global energy transition. The continent is rich in renewable energy resources, with the Sahara Desert offering enormous solar potential, coastal regions offering substantial wind resources, and numerous rivers and lakes providing ample hydroelectric potential.[5] Despite this potential, a significant portion of the population in many African nations still lacks access to reliable and reasonably priced power due to the region's continued reliance on fossil fuels and traditional biomass for energy.

Africa has an uncommon opportunity to alleviate its energy shortage, promote economic growth, and raise the standard of living for its citizens through energy transition. African countries should improve their energy security, generate new businesses and opportunities, and lessen their reliance on imported fossil fuels by utilising renewable energy.[6] Furthermore, switching to cleaner energy sources can

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[3] Ibid. IRENA, 2019

[4] World Bank. (2021). State of Access to Modern Energy Cooking Services. < https://www.worldbank.org/en/topic/energy/publication/state-of-access-to-modern-energy-cooking-services > assessed on 15th June 2024

[5] African Development Bank. (2020). *African Economic Outlook 2020: Developing Africa's Workforce for the Future.* < https://www.afdb.org/en/documents/african-economic-outlook-2020 > assessed on 17th June 2024

[6] Ibid. IRENA, 2019

support international efforts to prevent climate change and reduce the negative environmental effects of fossil fuels, such as air pollution and deforestation.[7] However, the path to a successful energy transition in Africa is fraught with challenges. Financial constraints, inadequate infrastructure, political instability, and socioeconomic disparities pose significant obstacles to the widespread adoption of renewable energy.[8] Overcoming these challenges requires coordinated efforts from governments, international organisations, and private sector stakeholders, as well as innovative solutions tailored to the unique contexts of African countries.

c. Purpose and Structure

The research examined the complexity of global energy transition and how it affect Africa. This article aims to provide a thorough knowledge of the potential and threats that these shifts present for the continent by examining historical backgrounds, economic trends, political changes, social dynamics, technology breakthroughs, environmental challenges, and their alignment with Sustainable Development Goals (SDGs). The paper also highlights Africa's renewable energy potential, highlighting the continent's vast resources and its potential for harnessing solar, wind, hydropower, geothermal, and biomass energy.

Additionally, it presents a fair-minded perspective on how African countries can strategically manage these shifts to promote growth and sustainable development. The study is divided into multiple sections, each of which focuses on a distinct facet of global shifts and how they affect Africa. This study uses case studies of particular African countries to demonstrate the range of approaches and experiences these countries have used.

2. HISTORICAL CONTEXT

The metamorphosis from pre-colonial and colonial energy systems to the present-day global energy transition is marked by wide-ranging changes in how societies exploit

[7] United Nations Development Programme (UNDP). (2020). The Africa Sustainable Development Report 2020. < https://www.undp.org/content/undp/en/home/librarypage/sustainable-development/africa-sustainable-development-report-2020.html > assessed on 17th June 2024

[8] World Bank. (2021). State of Access to Modern Energy Cooking Services. < https://www.worldbank.org/en/topic/energy/publication/state-of-access-to-modern-energy-cooking-services > assessed on 15th June 2024

or convert energy. This paper provides a brief history of pre-colonial, colonial, and global energy transitions.

a. Pre-Colonial Energy Use

Before colonialism, Africa's energy landscape was predominantly characterised by the use of local, organic energy sources. Renewable and traditional energy sources prevailed through the provision of water mills to grind cereals for food before colonial, largely domesticated in-house security apparatuses were developed for energy use. Key energy sources included:

- **Biomass (wood and charcoal)**: Most precolonial societies used wood for cooking, heating, or building materials. In some areas charcoal has also been widely used, arguably because it lasts longer.
- **Animals and Humans:** Human labour, in conjunction with animal power (oxen, horses and camels), were the primary source of energy for transportation…
- **Water and Wind Power:** Water wheels or windmills for grinding wheat and pumping access to second floor.
- **Solar Energy:** Solar energy was used by some ancient societies to heat dwellings, and for dry crops.

The pre-colonial era's energy use was largely sustainable, as societies lived within the means of their local ecosystems. However, these systems were limited in scale and could not support industrial activities.[9]

b. Colonial Energy Use

This period played a major role in the transition within African energy systems, making way for predominantly colonial powers interests in Africa. During colonial times, Africa was a major supplier of raw energy materials, including coal, oil, and natural gas. Colonial use of energy was characterised by the following :

[9] Aryee, B. N, B. K., & Atorkui, E. (2003). Trends in the small-scale mining of precious minerals in Ghana: a perspective on its environmental impact. Journal of Cleaner Production, 11(2), 131-140. https://doi.org/10.1016/s0959-6526(02)00043-4 > assessed on 19th June, 2024

- **Fossil Fuel Extortion**: Coal mining was introduced by colonial authorities to fuel industries, railways and shipping. During British colonialism, South Africa became a major coal producer and exporter of coal to Britain and other countries.
- **Widespread Deforestation**: Settlers cleared huge swaths of land to harvest wood for fuel (to power factories), build infrastructure, or sell goods abroad. This has disrupted local ecosystems and the ways indigenous peoples sourced their energy. Colonial industry across the globe exploited forests to extract fuel, including colonial ventures in regions like the Congo Basin.[10]
- **Investment in hydro-power**: The colonial government created funding for power projects to sustain their industries. The Kariba Dam (on the Zambezi River between Zambia and Zimbabwe), for example, was a colonial hydropower project constructed to supply power to nearby mining operations.[11]
- **Energy Export:** Probably the largest export was during colonial times, and lots of energy was produced in Africa and exported elsewhere. Disappointment, not necessarily to feed themselves but rather to export it back home For example, although African countries were supplying hundreds of million tonnes raw energy materials (e.g. coal, oil and natural gas), they could benefit very less from the exploitation in Europe because nearly 50% of mining sites belonged to six colonial powers: France with more than half; UK, then Belgium or Netherlands etc., and local population had practically no access to the infrastructure for utilising this announced by the above mentioned authorities.

b(i). Impact of Colonial Energy Systems on the Global Energy Transition

The energy systems built by colonial powers took on a life of their own and, have left behind legacies that still impact how Africa engages with new trends in global energy transition. These include:

- **Unequal Energy Access**: Colonial energy infrastructures were built to provide for the needs of colonial powers and local elites, with little regard to rural areas. Today it is estimated that only 43% of the African population has access to

[10] Späth, P., Castán Broto, V., Bawakyillenuo, S. *et al.* "*The governance of energy transitions in Africa: a sketch of plural perspectives*". *Energy, Sustainability Society* 12, 51 (2022). < https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-022-00380-2 > assessed on 19 June, 2024

[11] Müller, F., (2024) "Energy colonialism", *Journal of Political Ecology* 31(1), 701–717. doi: https://doi.org/10.2458/jpe.5659 > assessed on 19th June 2024

modern energy, with more than 600 million people in Sub-Saharan Africa without electricity.[12]

- **Fossil fuel dependency:** Due investments from the colonial era, many African countries came rely on producing and exporting fossil fuels. To provide power, the fossil fuel reliance imposes a great dependency on each country, which makes it difficult to transition to cleaner energy sources. One obvious example is the oil industry of Nigeria today, a product built under colonial rule.[13]
- **Environmental Degradation:** Colonial exploitation of Africa´s resources resulted in widespread environmental losses (deforestation, land degradation), which became additional environmental constraints to a successful transition into sustainable energy pathways.
- **Energy Sovereignty:** Colonial power practised by the former colonise dictated who got access to energy and how much, as they were able to survive a legacy of loose control over national assets. This demands the need for Energy Sovereignty not only in Africa but also all over the world, which has resulted into African nations advocating policies that would allow them to control their renewable resources such as solar energy developments and hydropower.

In conclusion, Africa's energy landscape is shaped by the legacy of colonial surplus exports. Although possessing immense energy resources, the continent has been historically exploited; consequently, future transitions to clean power should be rationalised with greater equity, which promotes the empowerment of local communities who will benefit from their own wealth.

c. Africa's Pre-Transition Energy Landscape

Prior to the global energy transition, Africa's energy landscape was characterised by several key factors, such as being heavily dependent on the extraction and export of fossil fuels, limited access to electricity, an underdeveloped renewable energy sector, aging and inadequate infrastructure. Countries such as Nigeria, Angola, and Algeria

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[12] Späth, P., Castán Broto, V., Bawakyillenuo, S. *et al.* "*The governance of energy transitions in Africa: a sketch of plural perspectives*". *Energy, Sustainability Society* 12, 51 (2022). https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-022-00380-2 >

[13] Simon Evans and edited by Leo Hickman, "Revealed: How colonial rule radically shifts historical responsibility for climate change", 6 November 2023 <https://www.carbonbrief.org/revealed-how-colonial-rule-radically-shifts-historical-responsibility-for-climate-change/> assessed on 19th June, 2024

derived significant revenues from fossil fuel exports.[14] In 2010, traditional biomass, including wood, charcoal, and agricultural residues, has been the primary energy source for millions of Africans, particularly in rural areas, according to the International Energy Agency (IEA).[15] This reliance on biomass has had significant health, environmental, and social implications, including deforestation, indoor air pollution, and associated health problems, such as respiratory diseases[16]. Major oil-producing countries include Ghana, Nigeria, Angola, and Algeria, but South Africa primarily relies on coal to generate electricity. However, there were major differences in access to contemporary energy services between rural and urban communities. Africa faces a significant energy access deficit, with three-quarters of the population lacking access to electricity. In 2018, approximately half of Africa's total population (548 million people) was without electricity.[17]

Many African nations have inadequately designed and maintained energy infrastructure, which frequently results in power outages and inefficiency. Finances, political unpredictability, and governance issues limit investment in energy infrastructure. Because reliable electricity is essential for industrialisation, education, healthcare, and a general quality of life, this circumstance has hindered economic progress.[18]

Despite having abundant renewable energy resources, Africa's renewable energy sector is underdeveloped compared to other regions. As of 2022, the continent had only 56 GW of installed renewable energy capacity.[19]

d. **Major Energy Transition Drivers**

Over the past few years, experts in Africa's energy future have been agreed on one point: To get their people out of poverty and to match broad-based economic growth with electricity generation that neither balloons carbon debt nor remains reliant for

[14] Osinbajo Y, "Africa: Navigating the Energy Transition" *Brookings* (June 26, 2024) < https://www.brookings.edu/articles/africa-navigating-the-energy-transition/ > assessed on 27th June 2024

[15] WEO-2014 Special Report: Africa Energy Outlook – Analysis - International Energy Agency " (*IEA*, October 1, 2014) < https://www.iea.org/reports/africa-energy-outlook-2014 > 27th JUne 2024

[16] WEO-2014 Special Report: Africa Energy Outlook – Analysis - International Energy Agency " (*IEA*, October 1, 2014) < https://www.iea.org/reports/africa-energy-outlook-2014 > 27th june 2024

[17] International Renewable Energy Agency (2021), "The Renewable Energy Transition in Africa" < https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2021/March/Renewable_Energy_Transition_Africa_2021.pdf > assessed on 27th June 2024

[18] IRENA, *" The Renewable energy transition in Africa"*, (2021) < https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2021/March/Renewable_Energy_Transition_Africa_2021.pdf > assessed on 27th June 2024

[19] IRENA, "*The energy transition in Africa : Opportunities for international collaboration with a focus on the G7"*, April 2024 < https://www.irena.org/Publications/2024/Apr/The-energy-transition-in-Africa-Opportunities-for-international-collaboration-with-a-focus-on-the-G7 > 27th June 2024

decades on dirty sources. The history of colonial extraction makes this transition a difficult process.[20] According to critics, new energy initiatives must be placed in a historical context and should consider the colonial legacies that have influenced current paradigms of access to energy on the continent. We must concentrate on ensuring that local communities gain from their energy resources rather, than just replicating the resource curse[21].

In Africa, several reasons have fueled the global energy transition. The term global energy transition refers to the shift from traditional fossil fuel systems to renewable and low-carbon energy sources :

i. Issues related to the environment and health

The urgent need to address health and environmental hazards related to traditional biomass and fossil fuel use is one of the main forces behind the energy transition. Traditional biomass is the main energy source for millions of African homes, particularly in rural areas. This includes wood, charcoal, and animal dung. However, there are many negative consequences when using these materials for heating and cooking.

In Africa, indoor air pollution poses a serious threat to public health due to the substantial contribution of traditional biomass combustion. Nearly 500,000 deaths in Sub-Saharan Africa are attributed to household air pollution from solid fuels, according to the World Health Organisation. [22] Additionally, the environmental effects of land degradation and deforestation brought on by the usage of biomass.have been sparked by the efforts to identify cleaner energy alternatives.

In addiction, potential health hazards, conventional biomass use carries significant environmental ramifications. One of the most important problems associated with biomass use is deforestation. To supply the need for firewood and charcoal, forests are being destroyed at alarming rates in many parts of Africa. According to projections from the Food and Agriculture Organisation, between 2010 and 2020, Africa lost almost 3.9 million hectares of forest annually, with biomass harvesting

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[20] Archibong, E. I., and Afolabi, A. P. (2023). From colonial exploitation to a renewable transition: A critical analysis of African's energy paradigm. European Journal of Sustainable Development Research, 7(4), em0236. https://www.ejosdr.com/download/from-colonial-exploitation-to-renewable-transition-a-critical-analysis-of-africas-energy-paradigm-13635.pdf > assessed on 27th June 2024

[21] Leo Holtz and Chris Heitzig, "*The effects of the global energy transition in Africa: Disruption and opportunity"* February 12, 2021, https://www.brookings.edu/articles/the-effects-of-the-global-energy-transition-in-africa-disruption-and-opportunity/

[22] World Health Organisation (WHO). (2016). Household Air Pollution and Health. Retrieved from https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health > assessed on 28th June 2024

playing a major role.[23] A number of environmental issues, such as soil erosion, disturbance of water cycles, and biodiversity loss, are brought about by deforestation. The soil becomes less fertile and more prone to erosion when trees are removed from the area. The deterioration of land quality may have serious consequences for agriculture, the main source of income for many African communities.

ii. Technological Improvements

The cost and accessibility of renewable energy have decreased due to advancements in technology like solar photovoltaic and wind turbines. The decreasing costs of these technologies make them more competitive with traditional energy sources, facilitating their adoption across the continent.[24] This has given Africa fresh opportunities to surpass conventional energy systems that rely on fossil fuels.[25]

Over the past decade, there have been notable advancements in solar photovoltaic (PV) technology in terms of both efficiency and cost reduction. Technological advances, such as the development of multi-junction cells and the incorporation of quartz materials, have resulted in the production of solar panels with efficiencies exceeding 20%.[26] Because these high-efficiency panels can convert more sunlight into electricity, solar power has become a more attractive and viable energy source for various applications.

In addition, since 2010, the price of solar PV modules has dropped by more than 80%, according to the International Renewable Energy Agency (IRENA)[27]. These significant cost savings result from improved production techniques, growing market competitiveness, and manufacturing economies of scale[28]. Consequently, solar energy has emerged as one of the most economical means of generating fresh power, particularly in areas like Africa which receive lot of solar energy. African nations

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[23] Food and Agriculture Organisation (FAO). (2020). Global Forest Resources Assessment 2020. Retrieved from https://www.fao.org/forest-resources-assessment/en/ > assessed on 28th june 2024

[24] Späth P and others, "The Governance of Energy Transitions in Africa: A Sketch of Plural Perspectives" (2022) 12 Energy, Sustainability and Society < https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-022-00380-2 > assessed on 28th June 2024

[25] Kidunduhu N, "Energy Transition in Africa: Context, Barriers and Strategies," *Springer eBooks* (2020) < https://www.researchgate.net/publication/346182604_Energy_Transition_in_Africa_Context_Barriers_and_Strategies > assessed from 28th june 2024

[26] National Renewable Energy Laboratory (NREL). (2020). Best Research-Cell Efficiency Chart. Retrieved from https://www.nrel.gov/pv/cell-efficiency.html > assessed on 28th June 2024

[27] International Renewable Energy Agency (IRENA). (2020). Renewable Power Generation Costs in 2019 PDF. Retrieved from https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Jun/IRENA_Costs_2019_EN.pdf%3Fla%3Den%26hash%3DBFAAB4DD2A14EDA7329946F9C3BDA9CD806C1A8A&ved=2ahUKEwi40r7C4KaHAxVRUkEAHVIbDh0QFnoECA4QAw&usg=AOvVaw3JVuNVaE0-vzrTXZ3SNHDu > assessed on 28th june, 2024

[28] IBID. 27

may now afford to invest in large-scale solar projects, which can contribute significantly more clean energy to the grid due to lower costs.[29]

iii. Global Climate Commitments

In recent years, the issue of climate change has risen to the forefront of global concerns, with an increasing number of people, governments, and organisations recognising its urgent and far-reaching impacts which has fuelled energy transition. Although Africa contributes the least to global emissions, it is particularly sensitive to the effects of climate change which include increases in the frequency and intensity of heatwaves, floods, and droughts.[30] The Paris Agreement, a landmark global commitment that aims to keep global temperatures rise to well below 2 degrees Celsius, has encouraged African countries to adopt renewable energy sources and cut greenhouse gas emissions. African nations have committed to increasing their capacity for renewable energy as part of global climate action through their Nationally Determined Contributions (NDCs), which are presented annually.[31] Africa is extremely susceptible to the effects of climate change, with agricultural, water, and coastal areas being particularly vulnerable, according to the Intergovernmental Panel on Climate Change.[32] For example, in several African countries, the increased frequency and severity of droughts have led to crop failures, food shortages, and community displacement.[33] Furthermore, the World Bank estimates that by 2040, the cost of climate change in Africa could reach up to $50 billion annually, indicating the magnitude of the economic implications associated with these effects.[34]

In response to these challenges, regional and global commitments to mitigating climate change have been critical to driving the energy transition in Africa. The African Union's Agenda 2063, for example, calls for the development of a "climate resilient and green Africa" which includes the promotion of renewable energy, energy

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[29] IBID 27

[30] Katie Auth *"How the U.S. Can Better Support Africa's Energy Transition*" PDF, 2023, https://carnegieendowment.org/research/2023/01/how-the-us-can-better-support-africas-energy-transition >assessed on 29th June 2024

[32] Intergovernmental Panel on Climate Change, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp. https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_full.pdf&ved=2ahUKEwj_yMO0v7CHAxUuVEEAHWSJD24QFnoECFUQAQ&usg=AOvVaw2vqfjjpoNJPIXJVNo3A11A > assessed on 29th June, 2024

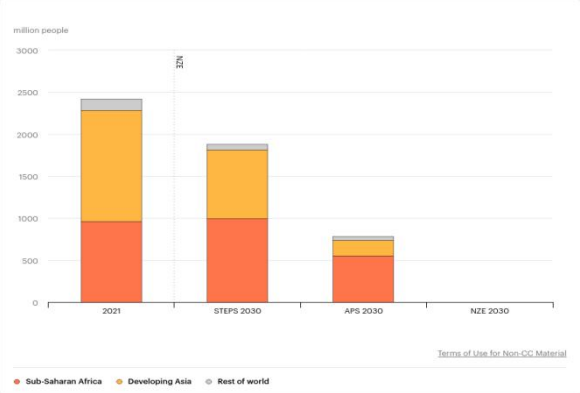
[33] What You Need to Know About Climate Change and Drought, 2023 |World Bank, retrieved from https://www.worldbank.org/en/news/feature/2023/09/11/what-you-need-to-know-about-climate-change-and-drought, assessed on 29th June 2024

[34] Africa overview: Development news, research, data |World Bank, https://www.worldbank.org/en/region/afr/overview > assessed on 29th June 2024

efficiency, and sustainable agriculture to reduce greenhouse gas emissions and build resilience against the impacts of climate change.[35] At the global level, the Paris Agreement, which entered into force in 2016, aims to limit global warming to well below 2°C above pre-industrial levels and to limit it to 1.5°C. [36] Many African countries have ratified the agreement and are taking steps to implement their Nationally Determined Contributions (NDCs) to reduce greenhouse gas emissions and increase their resilience to climate change.

iv. Sustainable Development Goals

The United Nations Sustainable Development Goals (SDGs), particularly SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action), have provided a framework for countries to pursue sustainable energy development and mitigate climate change.[37] Achieving SDG 7, which aims to ensure universal access to affordable and clean energy, is essential for promoting economic growth and poverty reduction. Access to reliable and modern energy services has enabled businesses and communities to thrive, particularly in developing countries. For instance, according to the International Energy Agency, an estimated 789 million people worldwide still lack access to electricity, with the majority living in sub-Saharan Africa and developing Asia.[38]



[35]United Nations. Economic Commission for Africa; African Union Commission (2022). African Union climate change and resilient development strategy and action plan (2022-2032). Addis Ababa :. © UN. ECA https://repository.uneca.org/handle/10855/47738 > assessed on 29th June 2024

[36] Jepsen H, Lundgren M, Monheim K, Walker H, eds. Negotiation of the Paris Agreement. In: *Negotiating the Paris Agreement: The Insider Stories*. Cambridge University Press; 2021:i-ii.> assessed on 29th June 2024

[37] Rabia Ferroukhi, Mirjam Reiner and Laura El-Katiri, *Could the Energy Transition Benefit Africa's Economies?, 2022* https://www.irena.org/News/expertinsights/2022/Nov/Could-the-Energy-Transition-Benefit-Africas-Economies > assessed on 29th June 2024.

[38] IEA (2022), *"Energy Access; Achieving Modern Energy for all by 2030 seems unlikely"* https://www.iea.org/topics/energy-access >asseesed on 30th JUne 2024

IEA (2022), Number of people without access to clean cooking by scenario, 2021-2030, IEA, Paris.[39]

By investing in sustainable energy infrastructure, such as renewable energy sources and energy-efficient technologies, countries can expand their electricity access and reduce energy poverty, which in turn can lead to increased economic opportunities and improved living standards.

v. Declining Renewable Energy Costs

Over the last decade, most renewable energy sources have also seen a large decrease in costs, or Munoz explained, which is what you would think. In 2022, the global WACC (weight average cost of capital) weighted LCOE (Levelized Cost Of Electriccity) for utility-scale solar PVs decreased by a further 3% year-on-year, and onshore wind decreased by 5%.[40] Much of this decline has been driven by technology improvements and growing deployment size, especially China. This ever-increasing trend in lowering fuel costs is where renewable energy comes into its more cost-effectiveness than fossil fuels globally, with $521 billion USD being saved by renewable energy.[41]

vi. Increasing International Cooperation

International cooperation is also critically important for ensuring successful energy transition. In addition to global agreements like the Paris Agreement, countries are being motivated towards greenhouse gas reduction and spending research dollars on clean energy technologies[42]. This underscores the necessity of cooperation and collaboration among nations interested in sharing knowledge, technology as well financial resources that will support poorer countries to transit. In these initiatives, the

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[39] IEA (2022), Number of people without access to clean cooking by scenario, 2021-2030, IEA, Paris. https://www.iea.org/data-and-statistics/charts/number-of-people-without-access-to-clean-cooking-by-scenario-2021-2030 >assessed on 30th JUne 2024

[40] Global Energy Perspective 2023: Transition bottlenecks and unlocks
January 10, 2024 | Article, https://www.mckinsey.com/industries/oil-and-gas/our-insights/global-energy-perspective-2023-transition-bottlenecks-and-unlocks >assessed on 30th June 2024

[41] IRENA (2023), Renewable power generation costs in 2022, International Renewable Energy Agency, Abu Dhabi. https://www.irena.org/Publications/2023/Aug/Renewable-power-generation-costs-in-2022 > assessed on 30th June 2024

[42] IEA 50, Tracking progress toward the Paris Agreement; Global Energy Transitions Stocktake https://www.iea.org/topics/global-energy-transitions-stocktake > assessed on 30th June 2024

G20 and G7 countries play a key role in achieving inclusiveness and benefiting from an energy transition[43].

vii. Policy and Regulatory Frameworks

Policy and regulatory frameworks must to provide a clear direction for the energy transition. More than ever, Governments are now pushing for renewable energy and energy conservation; the adoption of sustainable practises is also rising[44]. These frameworks also establish a level playing field and price signals to ensure incentives for investment in energy transition technologies. With these conclusions in mind, it is obvious that a holistic view on formulating policies should be adopted considering cross-sector socioeconomic contributions while this all points clearly at the importance of adopting with the early macro sector planning to bring about proper conditions for mass transition[45].

3. Good: Opportunities for African Energy Transition

The global energy transition presents a unique opportunity for African nations to harness their abundant renewable resources, drive economic growth, create jobs, and improve energy access. This transformation is essential not only for meeting the continent's energy demand but also for addressing climate change and fostering sustainable development. Part B of this section contains case studies from other African Countries.

Africa will benefit greatly from the worldwide transition to renewable energy. The continent is perfectly positioned for sustainable energy transition because of natural resources, especially solar and wind energy. Recent studies have shown that Africa has enormous potential for producing electricity from solar and wind power, but many obstacles prevent it from being fully utilised.

In countries like South Africa, where renewable infrastructure is being assessed for its viability and integration potential, the integration of renewable energy technologies is

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[43] McKinsey & Company, "Global Energy Perspective 2023: Transition bottlenecks and unlocks" January 10, 2024 | Article, https://www.mckinsey.com/industries/oil-and-gas/our-insights/global-energy-perspective-2023-transition-bottlenecks-and-unlocks assessed on 30th June 2024

[44] World Energy Transitions Outlook 2022 < https://www.irena.org/Digital-Report/World-Energy-Transitions-Outlook-2022 >assessed on 30th June 2024

[45] Ted Burhans & Carina Wallack ,May 7, 2024 | "Accelerating the Clean Energy Transition: Challenges, Importance & Outlook", < https://sepapower.org/knowledge/energy-transition >assessed on 30th June, 2024

essential not only for addressing environmental concerns but also for driving economic stability and growth.[46] As a result, renewable energy sources in Africa are not only essential but, also a doorway to a bright and sustainable future.
The following sections explore the key opportunities arising from this transition, focusing on economic growth, technological advancements, improved energy access, environmental benefits, and notable case studies from Ghana and other African countries.

I. Economic Growth and Job Creation

Transition to renewable energy in Africa is poised to significantly boost economic growth and job creation. The global energy transition, driven by a shift from fossil fuels to renewable energy sources, presents a significant economic opportunity for African countries. According to the International Renewable Energy Agency (IRENA), the renewable energy sector could create up to 8 million jobs by 2050, a substantial increase from 350,000 jobs in 2020.[47] This job creation will primarily stem from investments in solar, wind and renewable technologies, which are becoming increasingly cost-competitive. For instance, since its launch in 2011, South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) has generated over 52,000 employment.[48] (IRENA). The initiative has drawn billions of dollars in funding and helped diversify the nation's energy mix, lowering its reliance on coal and generating new job opportunities in the renewable energy industry.

In addition, investment in renewable energy infrastructure can stimulate local economies by creating jobs in the manufacturing, installation, maintenance, and operation of renewable energy systems. For instance, the African Energy Transition Programme emphasises the need for comprehensive policy tools to transform the energy sector, thereby fostering inclusive economic growth and wealth creation.[49] The continent's pledge to attain universal energy access by 2030 is consistent with the

[46] H. Kumba, O. Olanrewaju 2024, '"Towards Sustainable Development: Analyzing the Viability and Integration of Renewable Energy Solutions in South Africa"—A Review > assessed on 30th June 2024

[47] *AECF CEO, Victoria Sabula, 04 December 2023,African's role in global goal of tripling renewable energy capacity",* https://www.aecfafrica.org/africas-role-in-global-goal-of-tripling-renewable-energy-capacity/ >asssesed on 1st July 2024
[48] IRENA (2023), Renewable power generation costs in 2022, International Renewable Energy Agency, Abu Dhabi. https://www.irena.org/Publications/2023/Aug/Renewable-power-generation-costs-in-2022 asssesed on 1st July 2024
[49] African Union, "African Energy Transition Programme" https://au-afrec.org/energy-transition-programme

Sustainable Development Goals of the United Nations, highlighting the possibility of economic growth through renewable energy.[50]

Moreover, by lowering dependency on imported fossil fuels and stabilizing energy prices, this shift can improve energy security. African countries can lessen their economic vulnerability to changes in oil prices globally by investing in renewable resources that are locally available. As nations collaborate to develop common energy resources, this change promotes not only national economies but also regional stability and collaboration.

Countries like Kenya and Morocco have become regional leaders in renewable energy development, attracting investments from international organisations and private companies.

II. Technological Advancements and Innovations

Africa's energy conditions could change because of innovations and developments being driven by the global energy transition. African nations are finding it easier to obtain renewable energy technology like solar photovoltaics (PV), wind turbines, and battery storage as they become more economical and efficient. For example, the levelised cost of electricity from solar PVs fell by 82% between 2010 and 2019, making them a viable option for many African countries.[51]

The emergence of off-grid solar energy solutions is one of the biggest technological advances in Africa's energy revolution. In Sub-Saharan Africa, where over 600 million people lack access to electricity, off-grid solar systems present a decentralised and economical way to supply energy to underserved and isolated areas.[52] (IRENA). Innovative pay-as-you-go (PAYG) solar systems have been developed by companies such as M-KOPA Solar in Kenya and d.light in Uganda. These systems allow households to receive clean energy without the need for costly grid infrastructure.

In addition, Renewable Energy & Adaptation to Climate Change Technologies (AECF React) is a programme of the Africa Enterprise Challenge Fund that demonstrates how creative financing and business models can encourage the

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[50] GIZ, "The Renewable Energy Transition in Africa' https://www.giz.de/en/downloads/Study_Renewable%20Energy%20Transition%20Africa-EN.pdf

[51] GIZ, "The Renewable Energy Transition in Africa' https://www.giz.de/en/downloads/Study_Renewable%20Energy%20Transition%20Africa-EN.pdf

[52] IRENA (2023), Renewable power generation costs in 2022, International Renewable Energy Agency, Abu Dhabi. https://www.irena.org/Publications/2023/Aug/Renewable-power-generation-costs-in-2022

development of renewable energy solutions for small and medium-sized businesses, ultimately enhancing the lives of marginalised populations.[53]

Furthermore, Africa's energy transformation is also greatly aided by battery storage technology, which makes it possible to integrate intermittent renewable energy sources into the grid and increase energy reliability. With the increasing affordability and scalability of energy storage systems, including lithium-ion batteries, African nations can now store excess energy produced by solar and wind power for use during low-generation times.

In addition, integrating digital technology helps with energy use and administration. An example is the Internet of Things (IoT). Smart metres and energy management systems, for example, can help users in monitor their energy consumption and waste reduction, resulting in more economical energy usage patterns. These technologies will be essential to helping Africa make transition to a sustainable energy future as they develop further.

III. Improved Access to Energy and Social Advantages

One of the biggest advantages of Africa's energy revolution is better access to energy. If nothing else happens, the 600 million or so Africans who do not currently have access to power are predicted to increase to 1.2 billion by the year 2050[54]. By offering reliable and reasonably priced energy options, especially in rural and isolated locations, switching to renewable energy can help close this gap

For instance, through funding renewable energy projects, the government of Ghana has, significantly increased access to electricity[55]. By 2030, 10% of the nation's energy mix will come from renewable sources, according to the Renewable Energy Master Plan.[56] While advancing sustainability, projects like the Bui Hydroelectric

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[53] *AECF CEO, Victoria Sabula, 04 December 2023,African's role in global goal of tripling renewable energy capacity",* https://www.aecfafrica.org/africas-role-in-global-goal-of-tripling-renewable-energy-capacity/

[54] Mckinsey Sustainability, (César Augier, Hauke Engel, François Jurd de Girancourt, and Oliver Onyekweli), "Green energy in Africa presents significant investment opportunities",October 17, 2023 | Article https://www.mckinsey.com/capabilities/sustainability/our-insights/green-energy-in-africa-presents-significant-investment-opportunities assessed on 2nd july 2024

[55] Energy Commission of Ghana, "Renewable Technology Transfer Project" https://www.energycom.gov.gh/renewables/renewable-energy-technology-transfer-project >assessed on 2nd july 2024

[56] IRENA (2023), Renewable power generation costs in 2022, International Renewable Energy Agency, Abu Dhabi. https://www.irena.org/Publications/2023/Aug/Renewable-power-generation-costs-in-2022 > assessed on 2nd July 2024

Dam and solar initiatives in northern Ghana are assisting in enhancing energy availability.[57]

Access to clean energy not only improves living standards but also has profound social benefits. It enables better healthcare services, enhances educational opportunities, and promotes economic activities. For example, electrification can power schools and hospitals, facilitate small businesses, and improve agricultural productivity by using modern farming equipment.

Furthermore, by giving underprivileged communities and women the resources and tools they need to improve their lives, renewable energy initiatives can empower these groups. In order to guarantee that women will take advantage of the opportunities brought about by the change, the African Energy change Programme places a strong emphasis on the significance of gender parity in energy access[58]. African countries can promote community resilience and social cohesion by giving priority to inclusive energy solutions. In addition, the transition to renewable energy provides chances to advance gender parity by giving women more influence and opportunities for employment and business in the energy industry. The goal of many African programs, like Kenya's "Women in Renewable Energy" programme, is to assist and teach women how to work in the renewable energy industry.

IV. Environmental Benefits and Sustainability

The urgent need to address climate change and reduce greenhouse gas emissions is driving the global energy transformation. Given that Africa is particularly sensitive to the effects of climate change, such as droughts, floods, and altered weather patterns, the continent stands to gain much from the environmental sustainability associated with the adoption of renewable energy. The environmental benefits of transitioning to renewable energy are substantial. Although Africa contributes only 3-5% of global carbon dioxide emissions, it is one of the most vulnerable regions to the impacts of climate change.[59]

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[57]Mohammed Takase, Rogers Kipkoech, 18 January 2023, "An Overview of Scientific Production of Renewable Energies in Ghana" https://onlinelibrary.wiley.com/doi/10.1155/2023/7414771 >assessed on 2nd july 2024

[58] African Union, "African Energy Transition Programme" https://au-afrec.org/energy-transition-programme >assessed on 2nd July 2024

[59] IBID 58

When operating, renewable energy sources such as solar, wind, hydropower, and geothermal energy emit little or no carbon dioxide. African nations can fulfil their increasing energy needs and drastically lower their carbon footprints by switching to these sustainable energy sources[60]. This is especially crucial because many African countries, like Ghana, Nigeria, and South Africa, are trying to meet their obligations under the Paris Agreement.

Nations such as Morocco have exhibited a leading role in reducing carbon emissions through extensive renewable energy initiatives. One of the biggest solar complexes in the world, Noor Ouarzazate in Morocco, is predicted to cut carbon emissions by more than 760,000 tonnes a year.

The adoption of renewable energy not only lowers emissions but also lessens the air pollution, water use, and deforestation linked to the production of conventional energy. For instance, compared with coal or gas-fired power plants, the usage of solar and wind energy uses significantly less water, which is important for areas of Africa that are experiencing water shortage. The development of renewable energy is fundamentally based on sustainability, and African nations have the chance to match their energy policies with the Sustainable Development Goals (SDGs) of the UN, especially SDG 13 (Climate Action) and SDG 7 (Affordable and Clean Energy). Africa can guarantee sustainable development and protect its natural environment for future generations by making renewable energy a top priority[61].

3(b). Case Studies: Success Stories from Ghana and Other African Countries

Several African countries have already made significant strides in their energy transition, serving as models for others to follow.

i. Ghana

Ghana is firmly committed to sustainable development and renewable energy, positioning itself as a leader in West Africa's energy revolution. The nation has set lofty goals to attain net-zero emissions by 2060, guided by a comprehensive plan that unifies environmental stewardship with economic growth. Ghana's progress towards energy transition is examined in this case study.

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[60] A&O Shearman, 2024, Mining in Africa and its role in the global energy transition https://www.aoshearman.com/en/insights/mining-in-africa-and-its-role-in-the-global-energy-transition assessed on 2nd july 2024

[61] Salvatore Bernabei, CEO of Enel Green Power, A Global Energy Transition In Africa https://res4africa.org/news/2022/a-global-energy-transition-in-africa >assessed on 2nd july 2024

- **Context of Ghana's Energy Transition**

Fossil fuels, especially oil and gas, have long dominated Ghana's energy industry. Notwithstanding, the nation has encountered noteworthy obstacles, such as recurrent blackouts, excessive dependence on thermal energy production, and the consequences of global warming. The government has had to reconsider its energy strategy considering the ongoing energy crisis, realising that a varied and sustainable energy mix is required.

Ghana is a party to the Paris Agreement and has pledged, through its Nationally Determined Contributions (NDCs), to cut back on greenhouse gas emissions. The administration understands that reaching these climate targets and guaranteeing energy access for all residents depends on switch to renewable energy.

- **Key Initiatives Driving the Transition**

Ghana has emerged as a leader in renewable energy adoption in West Africa. The country has implemented various policies to promote solar energy, including the Solar Rooftop Programme, which incentivizes households and businesses to install solar panels. This initiative has not only increased energy access but has also created jobs in the renewable energy sector. Additionally, Ghana's commitment to the Renewable Energy Act has facilitated the development of mini-grids and off-grid solar systems, particularly in rural areas. These efforts have improved energy access for millions of Ghanaians, fostering economic growth, and enhancing their quality of life.
The Solar Rooftop Programme is a key initiative in Ghana's renewable energy landscape. It aims to encourages the adoption of solar energy by providing financial incentives and support to both residential and commercial entities. By promoting the installation of solar panels, the programme addresses the energy needs of households and businesses, particularly in urban areas where grid access may be limited or unreliable. This initiative has led to a significant increase in the adoption of solar energy contributing to the overall goal of achieving 10% of the national energy mix from renewable sources by 2030. The program not only helps reduce electricity costs

for users but also contributes to job creation through installation and maintenance of solar systems, thereby stimulating local economies[62].

In addition, Ghana's energy sector has always been significantly influenced by hydropower. The government intends to significantly boost total hydropower capacity and has identified a several small and medium-sized hydropower sites[63]. According to recent evaluations, Ghana has a potential hydropower capacity of about 2,480 MW, and there are active efforts to fully utilise this potential.[64]

As another renewable energy source, biogas is being investigated in Ghana. The nation is rich in organic materials that can be used to produce biogas, such as urban garbage and agricultural waste. However, the industry confronts obstacles like a lack of regional financial resources and technology, which the government hopes to solve via incentives and improved regulations[65].

Ghana's commitment to renewable energy is further exemplified by the Renewable Energy Act, which was enacted to create a regulatory environment conducive to the development of renewable energy projects. This legislation has been instrumental in facilitating the establishment of mini-grid and off-grid solar systems, particularly in rural areas where access to the national grid is limited[66]. Mini-grids are essential for providing reliable electricity to remote communities, enabling them to engage in economic activities that require power. These systems often use locally available renewable resources, such as solar and biomass, to generate electricity. The development of off-grid solar systems has been particularly beneficial for enhancing energy access for underserved populations, allowing them to benefit from modern energy services.[67]

The Renewable Energy law (Act 832), introduced in 2011, intends to foster a regulatory environment that is favourable to the development of renewable projects

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[62] Albert Ahenkan, Abdul-Washeru Alhassan & Emmanuel Kwesi Boon Renewable Energy for Sustainable Development: An Assessment of Solar Energy Adoption among SMEs in the City of Accra, Ghana, https://www.ajol.info/index.php/ajmr/article/download/226282/213546 > assessed on 2nd july 2024

[63] Kuamoah, C. (2020). Renewable Energy Deployment in Ghana: The Hype, Hope and Reality. *Insight on Africa*, *12*(1), 45-64. https://journals.sagepub.com/doi/full/10.1177/0975087819898581 >assessed on 2nd July 2024

[64] International Hydropower Association, 2015, Ghana: assessing the sustainability of new hydropower sites, https://www.hydropower.org/blog/ghana-assessing-the-sustainability-of-new-hydropower-sites >assessed on 2nd July 2024

[65] Ulrike Daniel, Karl-Heinz Pasch, Gloria Samira Nayina, February 2014, "BIOGAS IN GHANA: Sub-Sector Analysis of Potential and Framework Conditions, https://energypedia.info/images/2/24/Biogas_in_Ghana_Sector__Analysis_of_Potential_and_Framework_Conditions_2014.pdf >asssessed on 2nd july 2024

[66] *Leslie Mawuli Aglanu*, published by *Open Access Library , Journal*, *Vol.3 No.7, 2016,* Diffusion of Renewable Energy Policy Innovations in Ghana" https://www.scirp.org/journal/paperinformation?paperid=69514 >assessed on 2nd july 2024

[67] IBID 63

while also encouraging private sector investment in renewable energy. Ghana recently started working with stakeholders to produce a comprehensive energy transition plan that describes the steps needed to achieve net-zero emissions reduction and universal energy access.[68]

An important step forward in Ghana's commitment to sustainable energy was made in September 2023 with the announcement of the Ghana Energy Transition and Investment Plan (ETIP). [69] This proposal presents a feasible route map for reaching net-zero energy-related carbon emissions by 2060 by implementing low-carbon solutions in a number of industries, such as cooking, transportation, and power generation.[70]
It is anticipated that the ETIP will open up investment opportunities worth USD 550 billion and generate almost 400,000 net new jobs for Ghana's economy. The strategy places a strong emphasis on the necessity of involving national and international parties to guarantee the financing and successful execution of renewable energy projects[71].

Ghana's energy transition has a long-term plan called the National Energy Transition Framework, which was created in 2022. By incorporating nuclear power into the energy mix, switching thermal plants to natural gas, and expanding the use of renewable energy, this strategy seeks to decarbonise the energy industry. The plan aspires for a diversified energy mix that includes 21 GW of renewable energy by 2030 and sets specific targets for attaining universal access to electricity by 2024.[72][73]

Expansion of renewable energy sources in Ghana has significant implications for economic growth and job creation. The renewable energy sector is expected to create

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[68] SE forALL, August 2023, "Ghana energy transition plan gains momentum as consultations held with President Akufo-Addo, ministers, local stakeholders", https://www.seforall.org/news/ghana-energy-transition-plan-gains-momentum-as-consultations-held-with-president-akufo-addo >assessed on 2nd july 2024

[69] SEforALL, GHANA ENERGY TRANSITION AND INVESTMENT PLAN, 2023 https://www.seforall.org/system/files/2023-09/report-ghana-etip_WEB.pdf > asssesed on 2nd July 2024
[70] GHANA ENERGY TRANSITION AND INVESTMENT PLAN PDF. https://www.seforall.org/our-work/initiatives-projects/energy-transition-plans/ghana assessed on 2nd July 2024
[71] IBID 69
[72] Ghana's National Energy Transition Frame work, 2022-2070, PDF ,https://www.energymin.gov.gh/sites/default/files/2023-09/FINAL%20GHANA%27S%20NATIONAL%20ENERGY%20TRANSITION%20FRAMEWORK_2023_compressed%20%281%29_compressed%20%282%29.pdf assessed on 2nd July 2024
[73] Legal Resources Centre, 2022, Ghana targets major shift to clean energy over next five decades, https://lrcghana.org/ghana-targets-major-shift-to-clean-energy-over-next-five-decades/ assessed on 2nd July 2024

thousands of jobs in various fields, including manufacturing, installation, and maintenance of renewable energy technologies. The ETIP estimates that the manufacturing, installation, and maintenance of renewable energy technology are just a few of the many disciplines in which the renewable energy sector can create almost 400,000 jobs.[74]

This type of job creation is crucial for addressing high unemployment rates, particularly among the youth, and can contribute to poverty alleviation. Moreover, the increased availability of electricity can stimulate local businesses and industries, leading to enhanced productivity and economic development. Access to reliable energy enables entrepreneurs to operate efficiently, thus fostering innovation and growth in various sectors, including agriculture, trade, and services[75].

The social benefits of improved energy access through renewable initiatives are profound. Access to electricity can enhance educational opportunities, improve healthcare services, and promote overall well-being. For instance, electrification of schools can provide better learning environments, while healthcare facilities can operate essential equipment and provide improved services to communities.[76] Renewable energy projects can empower women and marginalized groups by providing them with the resources and opportunities they need to improve their livelihoods.

The integration of renewable energy solutions can also reduce reliance on traditional biomass fuels, which are often associated with health risks due to indoor air pollution. Making the switch to renewable energy sources will be very beneficial to the environment and human health.[77] Ghana wants to enhance air quality and reduce greenhouse gas emissions by lowering its dependency on fossil fuels. According to the National Energy Transition Framework, this shift could reduce emissions of 200 million tonnes of CO2 equivalent, which would reduce the indoor air pollution caused

[74] IBID 69
[75] Ghana Renewable Energy Master Plan https://www.energycom.gov.gh/files/Renewable-Energy-Masterplan-February-2019.pdf >assessed on 2nd july 2024
[76] IBID 72
[77] IBID 73

by energy and the health problems associated with it. It is estimated that better air quality could prevent approximately about 48,218 premature deaths.[78]

ii. Nigeria: Oil Dependency and Renewable Energy Projects

The leader of the renewable energy revolution is Nigeria, the most populous nation in Africa and home to one of the continent's largest economies. Nigeria is putting itself in a strategic position to take advantage of its abundant natural resources such as sunlight, wind, and biomass in order to fulfil its expanding energy needs. The numerous programmes, projects, and policies propelling Nigeria's energy transformation are examined in this case study along with their effects on the country's economy, society, and future problems.

Synopsis of Nigeria's Energy Environment

Fossil fuels, especially oil and gas, have historically dominated Nigeria's energy landscape. However, the nation has serious problems with regard to energy availability; some 85 million Nigerians do not have access to consistent electricity. Since oil was discovered in Nigeria in the late 1950s, the country has grown to become one of the continent's top producers, contributing significantly to both GDP and government revenue. Approximately 80% of Nigeria's overall government revenues and over 90% of its export earnings were from oil by the early 1980s[79]. The "resource curse," a phenomena wherein nations endowed with abundant natural resources see slower economic growth and less favourable development results in comparison to those with less resources, has been brought about by the overreliance on oil.

Due to the energy deficit, economic development and growth have been impeded, leading the government and various stakeholders to explore renewable energy solutions. [80]

- **Renewable Energy Projects**

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[78] IBID 72

[79]Emediegwu, L., & Okeke, A. (2017). Dependence on oil: What do statistics from Nigeria show? Journal of Economics and Allied Research, 2(1), 110-125. Article 10.4 https://pure.manchester.ac.uk/ws/portalfiles/portal/92683580/Dependency_on_Oil_.pdf >assesed on 2nd july 202

[80] Adzraa Shaffa Andira, Freya Harber,Colonial Legacy and Development: Reflection on Nigeria's Oil Dependency and Economic Resilience amidst the COVID-19 Pandemic, https://journal.unpar.ac.id/index.php/Sentris/article/download/6106/3886/18970 > assesed on 2nd july 20224

The Renewable Energy Plan, created in cooperation with the Energy Commission of Nigeria and the International Renewable Energy Agency (IRENA), describes tactics for boosting the deployment of renewable energy by 2050.[81] It seeks to drastically lessen Nigeria's dependency on fossil fuels by using renewable energy sources to meet roughly 60% of the country's energy needs.[82]

This effort, which was started in 2014 with funding from the UK government totalling $80.6 million, develops a market for distributed solar energy. It seeks to use Nigeria's solar potential to offer its people reliable energy.[83]

With a $750 million investment granted by the World Bank, the Nigeria Distributed Access through Renewable Energy Scale-up (DARES) initiative seeks to give over 17.5 million Nigerians access to clean energy through distributed renewable solutions. Through this project, dirty diesel generators will be replaced, improving access to energy in disadvantaged communities.[84]

To build several renewable projects, including solar parks and hydroelectric power project, the Nigerian National Petroleum Corporation (NNPC) and the Niger State government have signed a memorandum of understanding. The goal of this project is to establish a green energy economy in the state.[85]

It is anticipated that the switch to renewable energy would result in a large increase in job possibilities. By 2030, the Nigerian renewable energy industry may provide up to 340,000 employment, according to the International Renewable Energy Agency (IRENA). These positions will be in a variety of industries, such as project management, installation, manufacturing, and maintenance.[86]

Foreign investment is being made in Nigeria due to its transition to renewable energy. By 2025, for example, the goal of Shell's acquisition of Daystar Power, a generator of solar energy, is expected to greatly increase solar capacity. These investments support

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[81] IRENA, 2023, "Renewable Energy Roadmap: Nigeria" https://www.irena.org/Publications/2023/Jan/Renewable-Energy-Roadmap-Nigeria >assesed on 2nd july 2024

[82] Smruthi Nadig, May 4, 2023, High promise, high potential: the future of Nigerian renewables https://www.power-technology.com/features/nigeria-renewables-bola-tinubu/ > assessed on 5th July 2024

[83] IBID 71

[84] World Bank Group, December, 2023, "Nigeria to Expand Access to Clean Energy for 17.5 Million People" https://www.worldbank.org/en/news/press-release/2023/12/15/nigeria-to-expand-access-to-clean-energy-for-17-5-million-people > assessed on 5th July 2024

[86] *Diana Grant,* Implementing Renewable Energy in Nigeria, 2023 https://borgenproject.org/implementing-renewable-energy-in-nigeria/ > assessed on 5th July 2024

economic development and growth in addition to improving energy infrastructure.[87]

Initiatives centred on renewable energy are also committed to advancing gender parity. Programmes aimed at increasing the number of female-headed families and women's involvement in the energy industry are becoming increasingly popular. By providing women with access to education, training, and access to clean energy, these initiatives contribute to social equity and economic empowerment.[88]

Making a switch to renewable energy sources can have a huge impact on the environment and human health. Communities can benefit from lower health risks related to indoor air pollution and better air quality by reducing their reliance on diesel generators and kerosene lamps. Additionally, by reducing greenhouse gas emissions, renewable energy initiatives help mitigate the effects of climate change.

iii. South Africa's Transition from Coal

South Africa is going through a major energy transition to reduce its dependency on coal, which has long been the main source of the country's electricity. The necessity to solve urgent problems such as energy security, climate change, and socioeconomic inequality drives this shift. The management of socioeconomic effects on areas dependent on coal, investments in renewable energy, and policy reform all play intricate roles in the nation's transition to a more sustainable energy future.

- **Context of South Africa's Energy Transition**

About 80% of the electricity generated in South Africa is produced and consumed by coal, making it one of the biggest producers and consumers of coal in the worldwide. Due to its coal reliance South Africa is the continent's largest greenhouse gas emitter, greatly accelerating global warming. The nation's outdated and ineffective coal-fired power plants are causing regular power disruptions and a national energy crisis.[89]

The government of South Africa acknowledges that reforms to the energy industry are desperately needed. Due to its financial problems, poor management, and corruption,

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[87] Smruthi Nadig, May 4, 2023, High promise, high potential: the future of Nigerian renewables https://www.power-technology.com/features/nigeria-renewables-bola-tinubu/ > assessed on 5th July 2024

[88] IBID 73

[89] GIZ, South African-German Energy Programme (SAGEN),2024, Driving South Africa's Energy transition to reliable, affordable, and clean energy, https://www.giz.de/en/worldwide/153315.html > assessed on 5th July 2024

state owned Eskom has not invested in new infrastructure or in maintaining its current facilities. South Africa has started a comprehensive energy transition plan with the goal of lowering its energy mix and diversifying it to address these issues.[90]

- **Key Initiatives Driving Transition in South Africa**

In 2021, South Africa signed the historic Just Energy Transition Partnership (JETP) with a several of developed countries, including France, Germany, the United Kingdom, and the United States. Through this agreement, money totaling $8.5 billion will be raised to assist South Africa in its shift to a low-carbon economy while, making sure that the needs of communities that depend on coal are met. Investments in renewable energy, the creation of jobs in environmentally friendly industries, and assistance for people moving away from coal are all part of the JETP.[91]

Through the REIPPPP, the South African government has launched multiple rounds of renewable energy procurement (REIPPPP). The capacity for renewable energy has increased significantly because of this programme's successful attraction of large private investment in wind and solar energy projects. About 20% of the country's electricity will come from renewable sources by 2023, and efforts are in place to greatly raise this percentage in the upcoming years.[92]

The South African government is reorganising Eskom into distinct businesses for generating, transmitting, and distributing electricity to increase efficiency and accountability. The goal of this unbundling is to increase private sector involvement in power generation and foster competition in the energy market. To provide a steady supply of electricity and attract investment in renewable energy, restructuring is essential.[93]

- **Social and Economics Implications**

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[90] Nick Hedley, Climate Change News, New South African Government fuels optimism for faster energy transition, https://www.climatechangenews.com/2024/07/04/new-south-african-government-fuels-optimism-for-faster-energy-transition/ > assessed on 5th July 2024

[91] UNDP, 2024, Just Energy Transition in South Africa, https://www.undp.org/acceleratorlabs/untapped/case-studies/just-energy-transition-in-south-africa > assessed on 5th July 2024

[92] IBID 81

[93] World Bank Group, 2023, "Factsheet: Eskom Just Energy Transition Project in South Africa, https://www.worldbank.org/en/news/factsheet/2023/06/05/factsheet-eskom-just-energy-transition-project-in-afe-south-africa > assessed on 5th July 2024

For communities whose livelihoods depend on coal mining, the shift away from coal poses serious concerns. The coal industry directly supports abproximately 90,000 employment, and if coal-fired power units are shut down, many areas may experience economic instability. In order to ensure that these communities' views are heard and their needs are met, the Just Energy Transition framework highlights how crucial it is to involve them in the transition process.[94]

Although this shift might result in job losses in the coal industry, it also offers opportunities for employment growth in the renewable energy sector. By 2030, the South African government expects to generate hundreds of thousands of employment in the energy efficiency, renewable energy, and other sectors. Programmes for retraining and training are being created to provide employees with the necessary skills for employment in the green economy.[95]

In addition, the energy transition is perceived as a chance to rectify historical injustices in South Africa. The government wants to support economic development and energy access in underprivileged communities by funding renewable energy projects. Communities are becoming empowered and energy security is being improved via the exploration of initiatives like community solar projects and localised energy solutions.[96]

4. The Bad: Challenges in Energy Transition in Africa

The energy transition in Africa presents a complex array of challenges and risks that must be overcome to achieve sustainable development. This section of the paper contains section A and B, where section A discusses the challenges and section B elaborates on case studies in Africa.

a. Here are the key challenges identified:

- **Economic Costs and Investment Challenges**

[94] South Africa's just energy transition: moving from planning to action in 2023 https://www.strategyand.pwc.com/a1/en/press-release/south-africas-energy-transition-2023.html > assessed on 5th July 2024

[95] Fatih Birol, Executive Director, International Energy Agency, Africa has the most to gain from clean energy transitions https://geopolitique.eu/en/2022/06/29/africa-has-the-most-to-gain-from-clean-energy-transitions/ > assessed on 9th July 2024

[96] IBID. 95

In Africa, switching from fossil fuels to renewable energy sources comes with a high financial penalty. A large amount of government income in many African countries comes from the sale of gas and oil. For example, these resources provide over 70% of the income in nations such as Nigeria and Angola.[97] These countries must make drastic economic changes in order to prevent budgetary catastrophes as the world's demand for fossil fuels declines. Infrastructure for renewable energy must be heavily invested in, but many nations find it difficult to secure the capital needed because of perceived dangers and weak banking systems.[98]

- **Technological and Infrastructure Barriers**

The energy infrastructure in Africa is frequently inadequate and insufficient to facilitate the transition to renewable energy sources. Many areas lack the efficient grid systems needed to distribute electricity, resulting in large losses and erratic supply.[99] The adoption of greener energy alternatives is further hampered by substantial disparities in technology availability. Though the cost-effectiveness of renewable technologies has increased, one major obstacle to their advancement is the lack of local capacity to instal and maintain these systems. Examples of these include solar and wind power.[100]

- **Social and Cultural Impacts**

The social and cultural settings of African communities must be considered during the energy transition. It is critical that everyone have access to clean cooking fuels and electricity, as over 600 million people lack both.[101] If the shift is not handled inclusively, it may make worsen existing disparities. Participation of local communities in decision-making processes is necessary to guarantee that energy

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[97] AMETrade, Africa energy sector and the challenge of energy transition. https://ametrade.org/newsroom/africa-energy-sector-and-the-challenge-of-energy-transition/ > assessed on 9th July 2024
[98] Policy Center, Energy in Africa Challenges and Opportunities, https://www.policycenter.ma/opinion/energy-africa-challenges-and-opportunities > assessed on 9th July 2024
[99] GIZ, "The Renewable Energy Transition in Africa' https://www.giz.de/en/downloads/Study_Renewable%20Energy%20Transition%20Africa-EN.pdf> assessed on 9th July 2024
[100] Sops Ideriah , "Africa's unique energy future and the untold story of its transition" https://www.slb.com/resource-library/insights-articles/africas-unique-energy-future-and-transition-story> assessed on 9th July 2024

[101] UNDP, Just energy transitions as a development priority for Africa, https://www.undp.org/africa/ticad/stories/just-energy-transitions-development-priority-africa > assessed on 9th July 2024

solutions satisfy local requirements and do not interfere with customs or means of subsistence. There is a chance that people will view this shift as neo-colonialism, in which outside forces impose solutions without taking local circumstances into account.[102]

- **Environmental Risks and Unintended Consequences**

The energy shift can harm the environment although its goal is to lower carbon emissions. If renewable resource extraction is not managed effectively, it may result in biodiversity loss and land degradation.[103] Furthermore, there is fear that the haste with which renewable energy projects are developed may compromise environmental safeguards, with unexpected repercussions that could endanger nearby ecosystems and communities.[104]

- **Political and Regulatory Challenges**

Effective governance and political stability are essential for a successful energy transition. The execution of energy plans can be hindered by issues that many African countries experience, including political instability, corruption, and a lack of openness.[105] Furthermore, regulatory frameworks frequently discourage the quick adoption of renewable technology, which fosters an atmosphere that encourages investments in fossil fuels. Strong political leadership and regional collaboration are needed to establish the right environment for switching to sustainable energy sources.[106]

b. Case studies: Challenges and Failures

Several case studies illustrate the struggles of African countries in their energy transition.

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[102] Sops Ideriah , "Africa's unique energy future and the untold story of its transition" https://www.slb.com/resource-library/insights-articles/africas-unique-energy-future-and-transition-story

[103] AMETrade, Africa energy sector and the challenge of energy transition. https://ametrade.org/newsroom/africa-energy-sector-and-the-challenge-of-energy-transition/ > assessed on 9th July 2024

[104] Sops Ideriah , "Africa's unique energy future and the untold story of its transition" https://www.slb.com/resource-library/insights-articles/africas-unique-energy-future-and-transition-story> assessed on 9th July 2024

[105] GIZ, "The Renewable Energy Transition in Africa' https://www.giz.de/en/downloads/Study_Renewable%20Energy%20Transition%20Africa-EN.pdf > assessed on 9th July 2024

[106] UNDP, Just energy transitions as a development priority for Africa, https://www.undp.org/africa/ticad/stories/just-energy-transitions-development-priority-africa > assessed on 9th July 2024

i. Ghana

Ghana is at a pivotal stage in its energy transition journey, aiming to shift from reliance on fossil fuels to a more sustainable energy system. Despite its ambitious plans, including a $550 billion Energy Transition and Investment Plan targeting net-zero emissions by 2060, the country faces significant challenges. This analysis outlines the key obstacles hindering Ghana's energy transition, focusing on infrastructure deficits, financial constraints, public engagement, and the need for effective policy implementation.

Ghana still faces hurdles in its energy transition, especially with regards to infrastructure and investment, notwithstanding its advances. The current infrastructure is primarily designed for thermal generation, which accounts for approximately 60% of the energy mix.[107] Upgrades to current electrical system are necessary to integrate renewable energy sources. Integrating renewable energy sources like solar and wind energy into the grid requires substantial upgrades to ensure stability and reliability. The intermittent nature of these renewable sources necessitates advanced energy storage solutions and more robust grids capable of handling variable inputs from diverse generation sources.[108]

Furthermore, obtaining the necessary funding required for renewable energy projects remains difficult, especially considering financial constraints. According to estimates, Ghana should modernize its infrastructure for the transmission and distribution of energy by almost $76 billion. In order to accommodate more renewable energy capacity and boost overall efficiency, this expenditure is essential. Inadequate infrastructure not only makes it difficult to integrate renewable energy sources, but it also impact on energy availability, especially in rural areas where many communities live off the grid.[109]

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[107] Gas Outlook, "Ghana energy transition plan faces roadblocks: experts", https://gasoutlook.com/analysis/new-550bn-ghana-energy-transition-plan-faces-challenges-experts/ > assessed on 9th July 2024

[108] Edward Acquah, Inside Ghana's ambitious energy transition plan: Opportunuties and challenges, 2024, https://gna.org.gh/2024/05/inside-ghanas-ambitious-energy-transition-plan-opportunities-and-challenges/ > assessed on 9th July 2024

[109] n. dowuona & co, "Ghana′s National Energy Transition Framework And What It Means For Businesses And Investors" https://www.ndowuona.com/images/Ghanas_national_energy_transition_framework_and_what_it_means_for_businesses_and_investors.pdf > assessed on 9th July 2024

In addition, Ghana has set lofty goals and plans for its energy transformation, but effectively putting them into practise effectively is still a challenge. Clear goals are outlined in the Energy Transition and Investment Plan and the National Energy Transition Framework, but converting these plans into policies that can be implemented requires strong agency cooperation and control[110]. Successful execution of energy transition programmes necessitates close collaboration between different government departments and interested parties.[111] To ensure that the energy sector is aligned with national development goals and to drive framework implementation, it is imperative that the National Energy Transition Coordinating Office and the National Energy Transition Implementation Committee be established.[112]

Financing energy transformation requires private sector investment. Potential investors may be discouraged by the perceived risks associated with renewable energy projects and the requirement for robust regulatory frameworks.[113] Establishing a supportive climate by the government is necessary to lower risks and motivate private investment in renewable energy initiatives. This entails developing precise guidelines, awarding rewards, and guaranteeing openness in projects execution .[114]

Many funding sources for energy transition projects are denominated in foreign currencies, making Ghana vulnerable to fluctuations in exchange rates. This situation complicates financial planning and increases project overall cost. Addressing this issue requires innovative financing solutions and mechanisms that mitigate investors' currency risks.[115]

Continued political will is necessary for energy transition initiatives to continue under successive administrations. Long-term energy strategies may be jeopardised by

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[110] Gas Outlook, "Ghana energy transition plan faces roadblocks: experts", https://gasoutlook.com/analysis/new-550bn-ghana-energy-transition-plan-faces-challenges-experts/ > assessed on 9th July 2024

[111] Ministry of Energy, Ghana's National Energy Transition Frame work, 2022-2070 PDF, https://www.energymin.gov.gh/sites/default/files/202309/FINAL%20GHANA%27S%20NATIONAL%20ENERGY%20TRANSITION%20FRAMEWORK_2023_compressed%20%281%29_compressed%20%282%29.pdf > assessed on 15h July 2024

[112] Legal Resources Centre, 2022, Ghana targets major shift to clean energy over next five decades, https://lrcghana.org/ghana-targets-major-shift-to-clean-energy-over-next-five-decades/ > assessed on 15h July 2024

[113] Gas Outlook, "Ghana energy transition plan faces roadblocks: experts", https://gasoutlook.com/analysis/new-550bn-ghana-energy-transition-plan-faces-challenges-experts/ > assessed on 15h July 2024

[114] SEforALL, GHANA ENERGY TRANSITION AND INVESTMENT PLAN, 2023 https://www.seforall.org/system/files/2023-09/report-ghana-etip_WEB.pdf > assessed on 15h July 2024

[115] n. dowuona & co, "Ghana′s National Energy Transition Framework And What It Means For Businesses And Investors" https://www.ndowuona.com/images/Ghanas_national_energy_transition_framework_and_what_it_means_for_businesses_and_investors.pdf > assessed on 15h July 2024

changes in objectives brought about by changes in government. Encouraging cooperation between political parties and cultivating bipartisan support for renewable energy projects can help guarantee that this shift stays a national priority even in the event of a change in government.[116]

For the energy transition to succeed, public support is essential. On the other hand, the advantages of renewable energy and the need to move away from fossil fuels are often not well known.[117] Gaining support for renewable energy projects requires educating the public about the long-term benefits of renewable energy, such as increased air quality, the creation of jobs, and energy independence.[118]
The possible economic effects of lessening dependency on coal and oil worry Ghanaians, especially in areas where these sectors create jobs. To address these issues, the government needs to interact with local communities, highlighting the need to diversify the economy and the possibility of job creation in the renewable energy sector. Offering assistance and retraining to employees switching from occupations involving fossil fuels to those involving renewable energy will be vital in alleviating fears and fostering acceptance of the clean energy transition. [119]

Ghana's ambition to transition to a sustainable energy future is commendable, but the journey is fraught with challenges. Addressing infrastructure deficits, securing adequate financing, raising public awareness, and ensuring effective policy implementation are critical for overcoming these obstacles.

ii. Nigeria

Notwithstanding the encouraging advancements in Nigeria's renewable energy industry, many obstacles still need to be overcome in order to guarantee the accomplishment of plans and projects. Nigeria's renewable energy sector is still in its

[116] SEforALL, GHANA ENERGY TRANSITION AND INVESTMENT PLAN, 2023 https://www.seforall.org/system/files/2023-09/report-ghana-etip_WEB.pdf > assessed on 15h July 2024

[117] Gas Outlook, "Ghana energy transition plan faces roadblocks: experts", https://gasoutlook.com/analysis/new-550bn-ghana-energy-transition-plan-faces-challenges-experts/ > assessed on 15h July 2024

[118] Edward Acquah, Inside Ghana's ambitious energy transition plan: Opportunuties and challenges, 2024, https://gna.org.gh/2024/05/inside-ghanas-ambitious-energy-transition-plan-opportunities-and-challenges/ > assessed on 15h July 2024

[119] IBID 118

infancy, despite its potential. Through programs like the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), which attempts to attract private investment in renewable energy projects, the nation has achieved some headway. However, obstacles such as poor infrastructure, expensive startup costs, and red tape have made it difficult for the industry to expand.

Significant investments are needed in Nigeria's energy infrastructure to facilitate the grid's integration of renewable energy sources. Reliable energy delivery requires modern transmission and distribution networks, particularly in rural areas.
Nigeria has created many policies to support renewable energy, but successful implementation is still essential. The government must ensure that laws and incentives result in real results regarding renewable energy. This entails improving regulatory frameworks and expediting permitting procedures.

One of the biggest obstacles to the growth of renewable energy is still access to financing. Private investment in renewable energy projects is discouraged because high upfront costs, and many small and medium-sized enterprises do not have access to reasonable financing solutions. Novel funding methods, such as green bonds and public-private partnerships, are essential for drawing capital from the renewable energy industry.

To gain community support and involvement in energy initiatives, it is imperative to raise public understanding of the advantages of renewable energy. Outreach initiatives and educational campaigns can support the adoption of sustainable energy solutions and help cultivate a sustainable culture.

Nigeria has demonstrated its commitment to renewable energy through many programmes and a comprehensive plan that aims to improve energy availability, stimulate economic growth, and solve climate problems. The nation is well-positioned for a sustainable energy future due to its potential for renewable energy, especially in hydropower and solar energy. Nigeria can help millions of its people and contribute to global climate goals by paving the way for a cleaner, more sustainable energy environment by overcoming the obstacles in its way and making the most of its enormous resources. Not only is the transition to renewable energy necessary for the

environment, but it also presents Nigeria with a chance for social and economic advancement.

iii. South Africa

With the goal of becoming less dependent on coal and transitioning to a more diverse and sustainable energy system, South Africa is currently going through a major energy transition. However, there are some of obstacles to this change, making it more difficult. The following are the main challenges facing South Africa's energy transition:

Securing sufficient climate finace is one of the biggest obstacles to South Africa's energy transition. Developed nations pledged $8.5 billion to help the country's Just Energy Transition Partnership (JETP) during COP26, but talks surrounding this funding have been difficult. Concerned about piling up more debt, South Africa is pushing for a higher share of grants rather than loans.[120] President Cyril Ramaphosa has highlighted that industrialised countries, which have historically contributed more to climate change, should bear a larger share of the financial responsibility for the transition. The ongoing discussions on the terms and conditions of this financial support remain contentious, complicating the transition process.[121]

The coal industry in South Africa contributes significantly to the country's GDP by creating jobs and ensuring energy security. The government faces challenges in shifting away from coal, meanwhile, because many coal mines and power facilities are predominantly owned by Black people, a holdover from the post-apartheid era. Because of the potential socioeconomic effects on people who depend on coal for their livelihoods, the ruling African National Congress (ANC) is hesitant to dismantle this industry.[122] Because of this, opinions on the timing and scope of the shift are divided, with some government representatives arguing that coal should remain a part of the energy mix for some time to come. This shift is further complicated by the need

[120]Khalid Raji Africa Jun 3rd 2023, 3 Challenges to South Africa's Clean Energy Transition https://earth.org/south-africas-clean-energy-transition/ > assessed on 20h July 2024

[121] Resources, "South Africa: between power cuts and a just energy transition" https://www.energy-observer.org/resources/south-africa-energy-transition > assessed on 20h July 2024

[122] IBID 121

to strike a balance between environmental responsibilities and commercial objectives.[123]

Concerns regarding employment losses in the coal industry arise from the shift to renewable energy sources. South Africa's coal industry employs many people, and the idea of gradually closing coal-fired power facilities has worried the employees and communities that depend on them [124]The government must ensure that the transition is "just," which means it must support individuals impacted by the move away from coal and offer other employment opportunities. This involves funding investments in new industries and retraining initiatives to accommodate displaced workers. The government must actively communicate with communities about the advantages of renewable energy and the new job prospects it offers because the fear of job losses can fuel resistance to such moves.[125]

Although South Africa has created many policies to support renewable energy, these policies have not always been consistently implemented . Lack of clarity in regulatory framework can discourage investment in renewable energy projects.[126] Efficient cooperation between various government entities is essential for optimising procedures and guaranteeing the implementation of regulations. Moreover, objectives might be shifted by political unrest and leadership changes, which could affect long-term renewable energy projects commitment. [127]
Maintaining an environment of supportive policy that encourages investment and innovation in the energy industry requires ongoing engagement with stakeholders, including the business sector and civil society.[128]

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[123] The energy transition in South Africa: Shared challenges and opportunities for collaboration, https://iceds.anu.edu.au/news-events/events/energy-transition-south-africa-shared-challenges-and-opportunities-collaboration > assessed on 20h July 2024
[124] Khalid Raji Africa Jun 3rd 2023, 3 Challenges to South Africa's Clean Energy Transition https://earth.org/south-africas-clean-energy-transition/ > assessed on 20h July 2024
[125] Resources, "South Africa: between power cuts and a just energy transition" https://www.energy-observer.org/resources/south-africa-energy-transition > assessed on 20h July 2024
[126] GIZ, South African-German Energy Programme (SAGEN),2024, Driving South Africa's Energy transition to reliable, affordable, and clean energy, https://www.giz.de/en/worldwide/153315.html > assessed on 20h July 2024
[127] The energy transition in South Africa: Shared challenges and opportunities for collaboration, https://iceds.anu.edu.au/news-events/events/energy-transition-south-africa-shared-challenges-and-opportunities-collaboration > assessed on 2nd August 2024
[128] Resources, "South Africa: between power cuts and a just energy transition" https://www.energy-observer.org/resources/south-africa-energy-transition > assessed on 2nd August 2024

Energy transformation in South Africa is a complicated and, comprehensive process beset by many obstacles. Financing of climate change, reliance on the coal industry, worries about job security, infrastructure deficiencies , inconsistent policies, public opinion, and governance challenges are all factors that influence how this transition occurs. South Africa needs to embrace a comprehensive approach that first invests in renewable energy technologies, efficient policy execution, and stakeholder engagement to solve these challenges. South Africa can lead the way towards a sustainable energy future that not only satisfies its climate targets but also fosters social justice and economic progress by tackling these issues.

5. My Take: A Balanced Perspective

Africa has a complex range of opportunities and challenges because of the ongoing global energy transition. On the one hand, switching to renewable energy has enormous potential for advancing social progress, technological advancement, economic expansion, and environmental sustainability. On the other hand, there are major difficulties in achieving this potential, including those related to financial resources, technological advances, politics, and society.

i. Opportunities

Solar, wind, hydro, and geothermal energy are just a few abundant renewable energy resources available in Africa. Due to this richness, the continent is well positioned to satisfy its expanding energy needs sustainably. It may even be able to provide energy that is 30% inexpensive and emits much less emissions than fossil fuels.[129] According to IRENA's projections, Africa can produce over 10 terawatts of renewable energy, which would surpass the continent's current energy requirements. This possibility makes it possible for a sustainable energy sector to thrive, boosting both economic expansion and energy accessibility.

The continent is also rich in minerals such as copper, cobalt, and lithium which are

[129] Yemi Osinbajo, June 26, 2024, "Africa: Navigating the energy transition https://www.brookings.edu/articles/africa-navigating-the-energy-transition/ > assessed on 2nd August 2024

necessary for renewable energy technology. Creating local processing capacity for these minerals could boost employment and economic growth. [130]
For instance, the Democratic Republic of the Congo (DRC) generates more than 70% of the cobalt used in lithium-ion batteries worldwide. African countries should lessen their dependency on imports and boost economic growth by investing in domestic processing and value addition.

Africa has the chance to utilise its youthful labour force for green jobs in renewable energy industries, spurring innovation and economic growth, given its rapidly expanding population.[131] The expansion of the renewable energy industry can provide millions of employment in production, installation, maintenance, and research and development. The continent's economy can grow and poverty can be reduced because of this potential for employment creation.

Furthermore, African countries have the chance to match their energy policies with global climate goals thanks to the global push for climate action, exemplified by accords like the Paris Accord. African nations can draw funds and investments from international climate financing structures, such as the Green Climate Fund, by committing to the growth of renewable energy. This alignment places African countries as active participants in the global conversation on sustainability and climate action, while strengthening the continent's resilience against climate change.

ii. Challenges

Despite its vast potential for renewable energy, Africa faces a significant energy access deficit. Around 580 million Africans live without access to electricity, and many struggle for sporadic supplies. Energy poverty intensifies inequality and impedes economic growth.[132] Rural areas are disproportionately affected by energy scarcity, because their reliance on traditional biomass fuels for cooking and heating exacerbates health risks and degrades the environment. To fully realise the economic potential of the continent, this shortfall must be closed.

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[130] The Energy Transition In Africa: Opportunities For International Collaboration With A Focus On The G7 https://www.brookings.edu/articles/africa-navigating-the-energy-transition/ > assessed on 2nd August 2024
[131] IBID 129 & IBID 130
[132] IBID 129

Historically, less than 2% of global investments in renewable energy have been directed to Africa. Scaling up energy infrastructure is severely hindered by low funding and high upfront costs for renewable energy initiatives.[133] Moreover, many African nations lack the institutional and financial means necessary to create significant renewable energy initiatives. The continent's ability to make the shift to sustainable energy is hampered by this investment disparity.

In addition, Africa's energy projects may face financing hurdles due to political instability, corruption, and governance issues. These risks are frequently viewed by investors as entrance barriers, that restricts capital flows and project development. The financing landscape for energy projects in Africa is complicated by factors such as political instability, corruption, and the effects of international wars (like the Ukraine crisis), which impact capital flows and investor confidence.[134]

Although Africa has adopted renewable energy technology with great success, major technological obstacles remain to be addressed. Many African nations lack the technical research, development resources, and infrastructure needed to instal and sustain renewable energy systems. Moreover, grid integration, energy storage, and the scalability of renewable energy technology present hurdles for the continent. Ensuring the successful adoption of renewable energy solutions requires addressing these technological limitations.

iii. Strategic Recommendations for African Nations

To improve access to international climate funding and investment opportunities, African countries should concentrate on developing indigenous competence in renewable energy technology and project management. Investing in education and training programmes is one way to create a workforce with the necessary skills to manage and maintain renewable energy installations. Governments can also

[133] IBID 130
[134] Financing a Just Transition in Africa: Challenges and Opportunities, https://www.afdb.org/sites/default/files/2022/12/09/financing_a_just_transition_in_africa-challenges_and_opportunities_final_1_2.pdf > assessed on 2nd August 2024

collaborate with academic institutions and businesses to promote the research and development of renewable energy technologies.[135]

Creating transparent and encouraging regulatory frameworks can attract international investment and help the renewable energy industries expand. This entails guaranteeing government openness and expediting project approval procedures. Governments can encourage growth in the renewable energy sector by offering incentives to the private sector, such as tax reductions or feed-in tariffs.[136]

By working together, African countries can share resources more effectively and open up new markets for renewable energy, which will attract in more significant investments and encourage cross-border innovation. African countries should collaborate to create transnational energy initiatives that facilitate the trade of electricity and advanced energy security, like regional power pools. In the end, collaborative efforts can lower costs and improve the feasibility of renewable energy projects by resulting in joint expenditures on infrastructure, research, and development.[137]

Getting involved with international partners, especially the G7 countries, can help raise the necessary funds and transfer technologies required for Africa's energy transition. This entails adhering to the Paris Climate Agreement and obtaining pledges for greater renewable energy capability. African countries should actively engage in international discussions on climate change and look for alliances that support their objectives for renewable energy. African nations can improve their energy security

[135] UNDP, Just energy transitions as a development priority for Africa, https://www.undp.org/africa/ticad/stories/just-energy-transitions-development-priority-africa > assessed on 6th August, 2024
[136] OPEC FUND, 2021, The path to Africa's energy transition https://opecfund.org/news/the-path-to-africa-s-energy-transition > assessed on 6th August, 2024

[137] UNDP, Just energy transitions as a development priority for Africa, https://www.undp.org/africa/ticad/stories/just-energy-transitions-development-priority-africa > assessed on 6th August, 2024

and make a positive impact on global climate solutions by obtaining pledges for increased investment and capacity from renewable sources.[138]

iv. Vision for Africa's Energy Future

Achieving a fair and equitable energy transition is essential to the vision for Africa's energy future. This means:
For socioeconomic development, it is critical to guarantee that all Africans, especially those living in rural and underdeveloped areas, have reliable and reasonably priced energy access.

Furthermore, Africa can position itself as a leader in green supply chains and manufacturing while simultaneously achieving economic growth and helping to meet global climate targets by putting a priority on renewable energy and local production of energy technologies.

Creating sustainable energy systems that can also withstand the effects of climate change would safeguard communities and improve Africa's capacity to contribute to international efforts to mitigate climate change, ultimately leading to a more environmentally friendly world.

In conclusion, Africa has great potential to lead the world towards sustainable energy development, even if the region faces several obstacles in its energy transition. African countries can create the conditions for a prosperous and sustainable energy future by proactively tackling these issues through international cooperation, regulatory reforms, and the local development of institutional capacity.

Conclusion

i. Summary of the Key Findings

[138] OPEC FUND, 2021, The path to Africa's energy transition https://opecfund.org/news/the-path-to-africa-s-energy-transition > assessed on 6th August, 2024

Africa has a lot of prospects as a result of the global energy shift, especially regarding using the many renewable energy sources like solar, wind, and hydroelectric power. These resources can boost access to energy, promote sustainable economic growth, and lessen reliance on fossil fuels. Furthermore, Africa boasts an exceptional amount of unexplored renewable energy potential, with 325 days of sunshine annually and less than 7% of its hydroelectric and 2% of its geothermal capacity being utilised. Currently, barely 20% of Africa's electricity is generated by renewable sources.
To fully realise this potential, transmission and distribution infrastructure must be invested, electricity utilities must be financially and operationally sustainable, and laws and regulations must be changed to encourage private sector investment.

Even with these advantages, there many difficulties associated with this change. Africa lacks the technological know-how, finance, and infrastructure to fully realise the potential of renewable energy. Furthermore, the phase-out of fossil fuels may have harmful economic effects on oil-dependent African countries, resulting in job loss and lower tax revenues.

Strong governance structures and policies are essential for managing the energy transition. Governments of Africa need to put a high priority on energy availability, promote investments in renewable technology, and foster an innovative environment. Addressing the continent's particular difficulties would also require financial support and international cooperation.

By supplying clean, reasonably priced electricity, the transition to renewable energy sources has the potential can raise living standards. Concerns exist, though, regarding the social and environmental effects of energy projects, including the possibility of displacement and unequal benefit distribution, as well as the environmental effects of mining for renewable energy.

Africa’s energy transition is distinct because it combines sustainable development with efforts to reduce poverty. Obstacles to safeguarding Africa’s energy future, include, inadequate monitoring, education, technology access, and scalable public-

private partnerships. Taking into account local context and regional differences is crucial when establishing sustainable energy standards for Africa.

ii. Final Thoughts on the Way Forward

Africa must adopt a balanced strategy to navigate the global energy transition. Governments must concentrate on developing equitable, sustainable, and resilient energy systems. This entails making infrastructural investments in renewable energy, encouraging public-private partnerships, and ensure the transition benefits are shared fairly. By 2030, accelerating Africa's energy transformation and achieving universal access to electricity would necessitate a customised strategy that takes into account the distinct socioeconomic backgrounds and political aspirations.[139]

More so, to close the energy access gap, large-scale, highly impactful renewable energy projects and programmes are necessary, like the Desert to Power initiative. For Africa to successfully transition to a sustainable energy source, initiatives that increase access to education, research and development, and human capacity building are equally important.
In addition, Africa's strategy for resolving its energy crisis must considered the continent's unique history and the extremely difficult problems it faces.
Africa should also take advantage of international cooperation and help reduce financial and technological disparities. The continent can lead the global energy transition and ultimately contribute to a more sustainable and prosperous future for all by placing a high priority on local capacity building and innovation.

[139] GIZ, "The Renewable Energy Transition in Africa' https://www.giz.de/en/downloads/Study_Renewable%20Energy%20Transition%20Africa-EN.pdf >assessed on 3rd August, 2024

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