Expert Commentary

Energy Access and Development in Africa: Strategic Role of Natural Gas

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1- Introduction

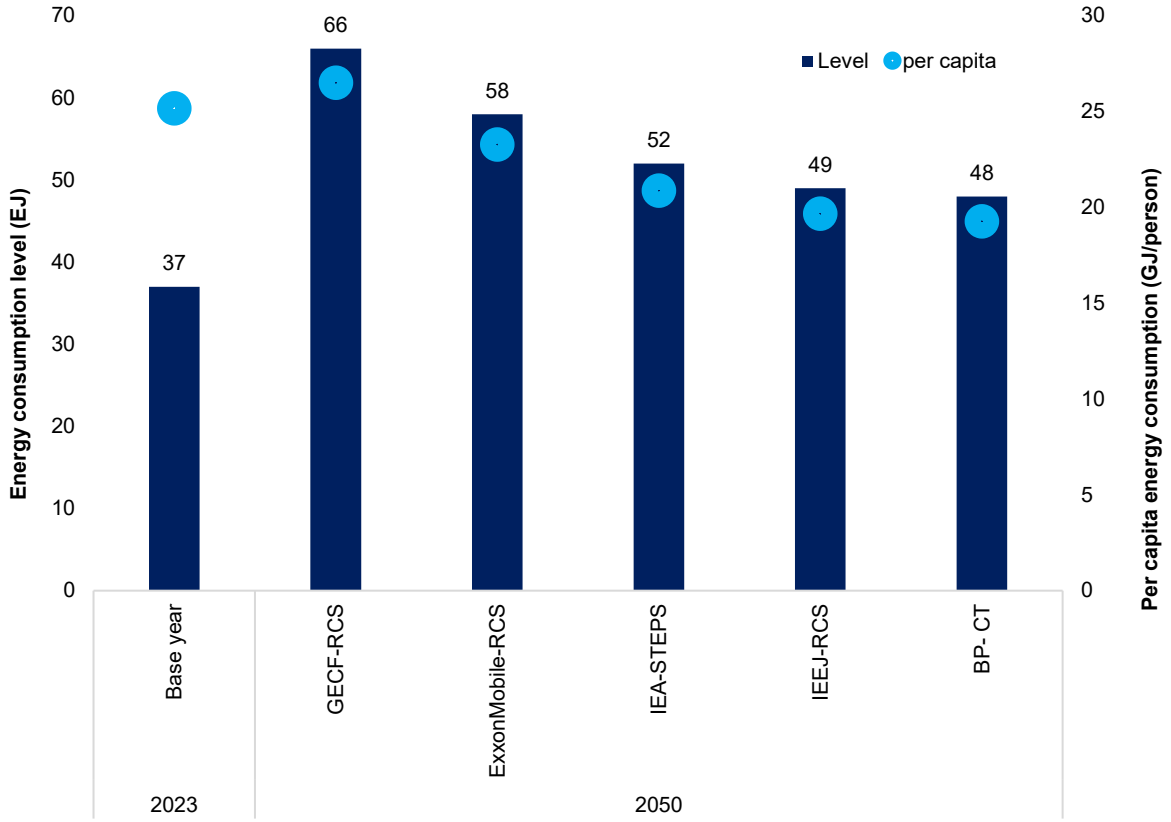
Despite a threefold increase in Africa's primary energy demand since 1982, per capita energy consumption has remained essentially stagnant. This stagnation is largely a demographic result of population growth, which has seen the continent's population expand by nearly one billion people over the same period. As demographic pressures intensified, energy supply struggled to keep pace, resulting in a widening structural imbalance between available energy and societal demand. Today, Africa's average per capita energy consumption stands at just one-third of the global average, reinforcing the continent's persistent energy access deficit and highlighting the growing divergence in global energy equity.

This imbalance is mirrored in poverty trends. According to World Bank estimates using the international poverty line of USD 2.15 per day (2017 PPP), Africa's poverty headcount ratio was around 41% in 1982 and remained stubbornly high at a similar level by 2019. In stark contrast, China provides a compelling illustration of how expanding energy access can catalyse poverty reduction: from 1982 to 2015, China's poverty headcount fell dramatically from 88% to 0.7%, driven in part by a sixfold increase in per capita energy consumption.

Looking ahead, Africa is poised to experience one of the most profound demographic shifts globally, with its population projected to grow by nearly one billion people by 2050. As shown in Figure 1, reputable forecasts from leading energy institutions anticipate a sharp rise in energy demand across the continent. However, given current trajectories and systemic constraints, energy supply growth is unlikely to keep pace with population expansion. As a result, per capita energy consumption is commonly used as a proxy for energy access[1]It is not predicted to experience any meaningful increase by mid-century, and the absolute number of people living in energy poverty may rise further under these scenarios, exacerbating socioeconomic vulnerabilities of the continent and beyond.

[1] Energy consumption per capita is a useful but imperfect proxy for energy access. It works reasonably well at low levels of development in Sub-Saharan Africa, where increases reflect genuine improvements in basic access. However, as efficiency improves and economies advance, the link between per capita consumption and welfare weakens such as in Europe.

Figure 1. Energy consumption in Africa (level and per capita)



These concerning scenarios raise a fundamental question: What level of energy demand is necessary to address energy poverty and support human development in Africa effectively? Two complementary approaches help frame this question. First, examining international best practices, such as China's integration of energy expansion with rapid industrialisation, job creation and poverty eradication, offers important lessons. Second, from a human development needs and economic empowerment perspective, multiple studies converge around a minimum per capita energy threshold of 50 to 100 GJ/year, below which human development is severely constrained. A widely cited benchmark is 70 GJ/person/year, which is aligned with an HDI greater than 0.8, deemed sufficient to meet essential needs such as nutrition, housing, mobility, education, and health.[2]. Applying this threshold to Africa's projected 2050 population indicates that final energy consumption would need to increase by at least fourfold, and potentially up to eightfold, compared to

[2] Cross-country studies (e.g. by Steinberger, Rao, Smil, UNDP) show that energy consumption and HDI are strongly correlated at low energy levels, but the curve flattens once countries cross ~70 GJ/person/year.

current levels, in order to eradicate poverty and achieve the minimum energy requirements for sustainable human development.

While Africa possesses a diverse endowment of energy and mineral resources, including natural gas and renewable energy, achieving this scale of supply expansion constitutes a monumental undertaking, one that will require massive infrastructure investment, scaled-up access to innovative and affordable finance, adoption of context-specific technological solutions, and predictable, efficient and coherent policy and regulatory frameworks. It is worth noting that the continent has already embarked on significant initiatives to address persistent energy access challenges. The African Union's Agenda 2063, Africa's "blueprint and master plan for transforming the continent into a global powerhouse of the future", sets out a vision of inclusive and sustainable development, fostering unity, self-determination, and collective prosperity (African Union, 2023). Similarly, Mission 300, spearheaded by the World Bank Group and the African Development Bank (AfDB), commits to providing electricity access to 300 million people in Sub-Saharan Africa by 2030, a transformative step towards achieving universal energy access. The importance of regional and international coordination, particularly in advancing inter-regional energy cooperation and fostering a unified energy market, cannot be overstated in this context.

The remainder of this commentary explores these issues in more detail. It begins with an overview of the structural characteristics of Africa's energy system, followed by an estimation of the total energy demand required to achieve high human development levels, including income per capita, health and education, along with life expectancy by 2050. It then discusses the strategic role of natural gas in Africa's energy transformation journey, concluding with a discussion of the enabling policy, financial, and technological levers needed to achieve universal access to affordable, reliable, and modern energy services.

2- Structural Characteristics of Africa's Current Energy Landscape

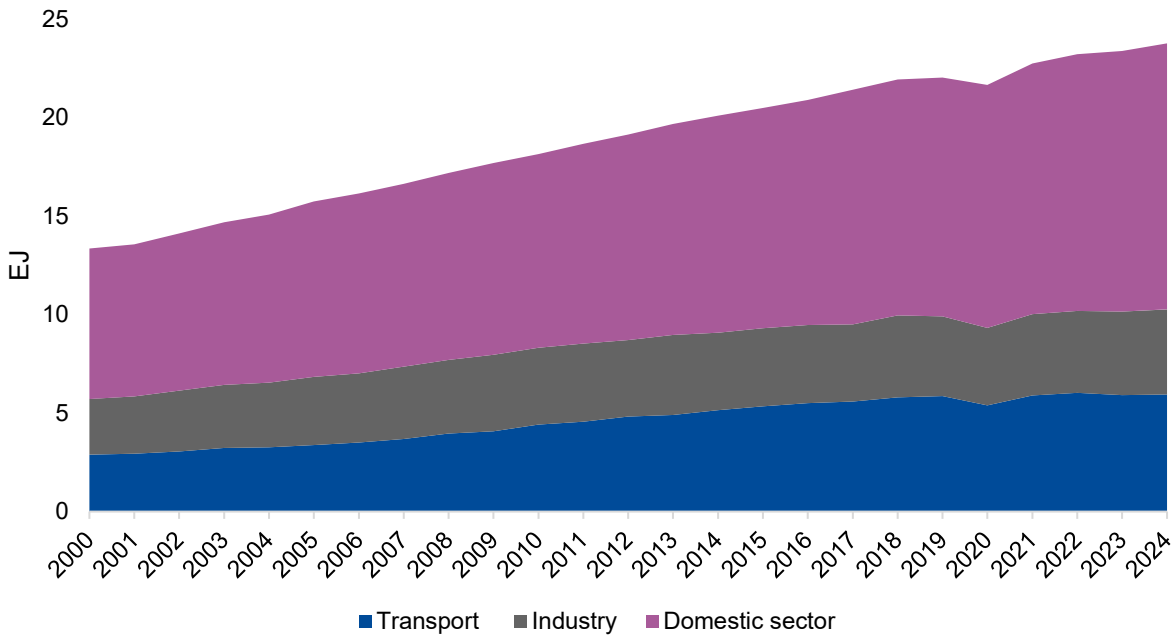
Africa's final energy consumption has nearly doubled over the past two decades, rising from approximately 14 exajoules (EJ) in 2000 to 24 EJ in 2024, according to data from the GECF Global Gas Model. This growth is attributed to both rapid population expansion and notable economic performance. Between 2000 and 2019, seven of the world's ten fastest-

growing economies were in Africa, as highlighted in the World Bank's 2025 Governance and Growth Report. However, despite this rapid increase in overall consumption, the structural composition of Africa's energy demand has remained essentially unchanged, continuing to diverge from global patterns.

The domestic sector, mainly the residential sector, still accounts for an outsized share of final energy consumption, approximately 57%, a figure that has remained stable for over two decades (Figure 2). In contrast, the industrial and transport sectors, which are typically central to productive economic transformation, remain comparatively underdeveloped and underrepresented in the continent's energy profile, implying that energy is more used for rudimentary consumption purposes such as heat for cooking and space heating in the residential sector, as compared with productive purposes where energy serves as a factor of production and creates value added. Crucially, this dominance of the residential sector should not be mistaken for an indicator of improved living standards. While residential energy encompasses critical uses such as cooking, lighting, and heating, much of the consumption in Africa is derived from cheap, traditional, polluting, and inefficient energy sources, particularly biomass, leading to negative externalities for public health, economic productivity, and environmental protection. The high share reflects the prevalence of low-quality energy use rather than expanded access to modern, reliable and efficient energy services. Africa's energy system remains predominantly traditional, small in scale, oriented mainly toward basic consumption, and constrained in both quality and reliability.

The structural imbalance features of Africa's energy system raise a pressing question for Africa's development trajectory: Do other world regions at a comparable development stage to Africa exhibit a similarly dominant share of residential energy use in their final consumption patterns, or is this uniquely an African challenge? It is worth noting that advanced economies have historically used traditional biomass before the industrial revolution, but have since gradually transitioned away from it, particularly by using more coal and oil.

Figure 2. Final energy demand in Africa by sector (2000-2024)



Source: GECF Global Gas Model

While residential energy consumption accounts for nearly one-third of global energy consumption in 2024, Africa presents a striking deviation. Over the past two decades, the continent has consistently recorded a residential energy share of almost 60%, nearly double the global average. This contrasts sharply with other regions such as Eurasia (28%), Europe (24%), and below 20% in many parts of the world, as illustrated in Figure 3. Such a disproportionate allocation reveals a structural imbalance in Africa's energy use, with demand heavily concentrated in households rather than in productive sectors like industry and transport, which implies that Africa is lagging in transitioning from its traditional biomass-oriented energy system to a combustion-based fossil fuel, mainly due to economic challenges related to access and affordability.

Despite ongoing regional initiatives, access to clean cooking energy remains critically low across much of Africa, especially Sub-Saharan Africa (SSA). In the ECOWAS region, ten out of fifteen countries report modern cooking energy access rates below 10% as of 2022 (AFREC, 2024), reflecting a heavy reliance on traditional biomass. Amid a large residential share, much of the continent, especially SSA, continues to face acute energy poverty. Nearly one billion people, predominantly in SSA, still depend on traditional, polluting and inefficient energy sources for basic needs such as cooking, heating and lighting.

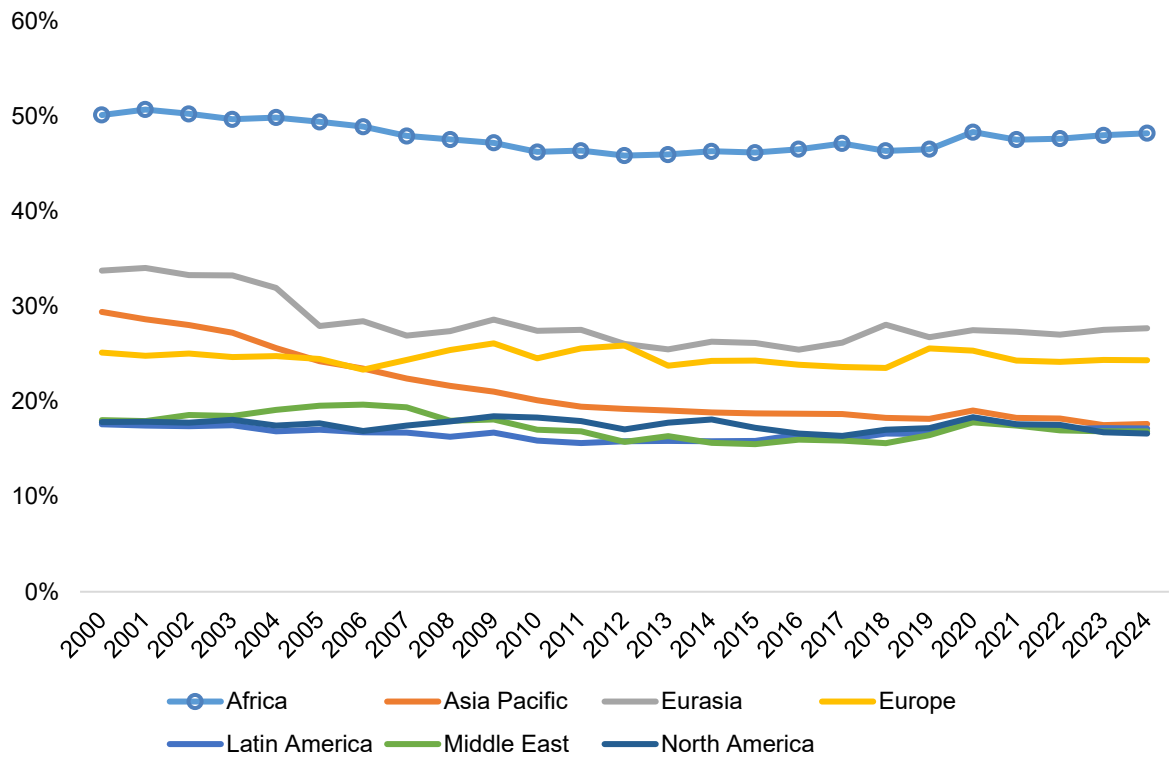
Furthermore, around 630 million people remain without access to electricity. With only half of the African population having access to electricity and more suffering from unreliable electricity, compared to the global average surpassing 90%, according to the World Bank, the gap is both alarming and persistent, particularly with the anticipated rapid population rise and urbanisation.

This consumption pattern in Africa, where energy use is primarily confined to meeting basic household needs and falls short of delivering modern energy services, underscores a fundamental disconnect between the quantity of energy consumed and the quality of that energy. The dominance of household energy use has not translated into improved living standards, access to clean cooking solutions, or reliable electrification for the majority of the population. Instead, it often reflects a large quantity of consumption from cheap but inefficient and polluting sources, such as biomass and kerosene. According to the ECOWAS Energy Efficiency Report (2018–2022), LPG and kerosene are primarily used in the residential sector for cooking (84%) and water heating (11%), with only 5% allocated to other uses. For nearly seventeen centuries before the Industrial Revolution, humankind remained trapped in this vicious cycle until the Revolution in Europe transformed economies and societies, breaking the cycle once and for all. The unfortunate reality is that much of Africa has yet to make this fundamental transition from a pre-industrial, traditional mode of living to modern, integrated energy systems capable of powering sustainable growth. However, the resources are abundant and available.

Over the past decades, significant advances in healthcare, medicine, and sanitation have significantly increased life expectancy and reduced infant mortality across the continent. Combined with historically high fertility rates, these improvements have driven one of the fastest population growth rates in the world. This demographic surge is now a major driver of rising energy demand. However, the development of Africa’s energy supply systems has lagged far behind these demographic shifts, creating a massive gap between energy demand and supply. In its many regions, access to clean, reliable, and affordable energy remains limited, constraining industrialisation, technological innovation, economic diversification, and improvements in quality of life. Without an implementable industrial strategy tailored to the regional circumstances of the continent and a decisive leap toward modern energy infrastructure, this growing energy imbalance will continue to hinder Africa’s socioeconomic development.

This impending gap prompts a deeper question about the nature and composition of residential energy consumption in Africa. If more than half of the continent's energy is consumed by households, yet so many remain without access to modern, clean, and reliable energy, then what forms of energy are being used? And more critically, what kind of residential energy system has emerged in Sub-Saharan Africa, one that consumes so much, yet delivers so little in terms of development outcomes?

Figure 3. Share of residential energy sector in final energy demand by region (2000-2024)



Source: GECF Global Gas Model

Amid a high share of residential energy consumption, Africa, particularly SSA, continues to face a profound energy crisis. The majority of households rely on inexpensive yet low-quality, low-efficiency, and harmful energy sources, particularly traditional biomass such as firewood and charcoal. For decades, traditional biomass has remained the dominant source of residential energy in SSA, reflecting a persistent trap of stagnant and inefficient energy use. This overdependence not only impedes progress in energy transitions to a modern and reliable energy system but also poses serious socio-economic and health challenges across the region.

The widespread use of biomass leads to indoor air pollution, with devastating consequences. According to WHO data, up to 400,000 souls, primarily women and

children, die annually from respiratory and cardiovascular diseases caused by indoor pollution, often without realising the source of their illnesses. Beyond the health toll, these practices also impose a harsh physical burden, particularly on women and girls, who spend significant time and effort gathering firewood and cooking with open stoves in dangerous conditions. These tasks limit educational access, economic participation, and upward mobility for the region's rapidly growing working-age population.

What is even more concerning is that Africa's energy consumption is not channelled into value-added sectors such as manufacturing or industry, which are essential for economic transformation, particularly job creation. Instead, a large share is spent merely on survival, cooking and heating for basic energy needs such as food, health and shelter, using inefficient and polluting fuels, simply because they are the only accessible and affordable option for low-income individuals living in SSA. This reflects a usual development stage: while Africa consumes a large share of its small energy volume in households, this does little to create jobs, generate income, or build the productive base needed for long-term prosperity, which stems from the hierarchy of essential human needs, with food and nutrition taking precedence for survival. Consequently, available energy sources are initially directed toward basic functions such as heating and cooking for subsistence, before societies progress to meeting higher-level needs such as healthcare, education, and economic development.

This brings us to a crucial question: Has Africa's final energy demand expanded beyond the residential sector to the industry? Does it have the capacity to support sustained economic growth and job creation for the continent’s growing population?
While economic growth and higher GDP per capita are strongly linked to industrial development, Africa’s progress in trade and investment remains uneven. On the one hand, there have been notable gains: Africa’s exports to the world increased from about US$136 billion in 2002 to nearly US$662 billion in 2022, according to the World Bank’s 2025 Governance and Growth Report, marking significant growth. However, these gains are undermined by the continent’s structural dependence on raw material exports. The bulk of Africa’s exports consist of unprocessed commodities, while the value addition happens elsewhere. Consequently, much of the revenue generated is used to import finished products at higher prices, perpetuating trade imbalances and limiting industrial growth alongside a surging external debt burden.

A telling example lies in the case of fertilisers. Despite Africa's abundance of natural gas, a critical feedstock for nitrogen-based fertiliser production, the continent still heavily depends on imports to meet its agricultural needs. This underscores the continent's underdeveloped industrial base and highlights missed opportunities to leverage local resources for value-added production.

Ultimately, while trade volumes have increased, Africa's economic competitiveness and resilience remain constrained without significant investment in domestic processing, manufacturing, and infrastructure development. Unlocking these opportunities will be critical for job creation, sustainable and inclusive growth and reducing dependence on imported finished goods. However, to translate these macroeconomic gains into broad-based and sustained economic transformation, it is essential to examine the structure and composition of energy use within the industrial sector. Without sufficient energy directed toward value-added production in sectors where Africa holds a comparative advantage, the continent's large and growing population will continue to be underserved by the prevailing economic model, especially given that 83% of employment remains informal, with limited productivity or structural impact.

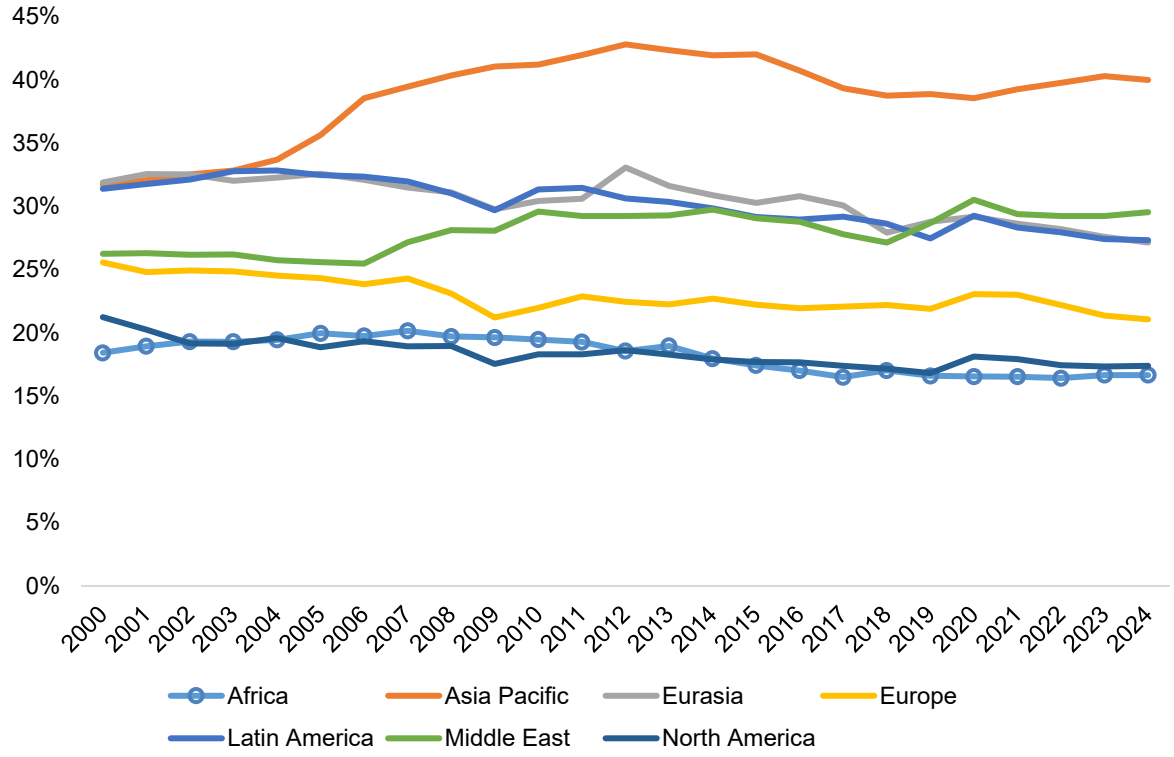
In this context, merely expanding energy access is not enough. What matters is how much of that energy reaches the industrial sector and how effectively and efficiently it is used to drive formal employment, productivity, and competitive manufacturing. Globally, the industrial sector typically accounts for 28–35% of final energy consumption. In Africa, however, the industrial sector has consistently represented less than 20% of final energy consumption over the past two decades (see Figure 4), with the bulk of this consumption concentrated in North Africa. This persistent underrepresentation highlights a structural disconnect between energy use and productive economic activity. In contrast, regions like Europe and North America also had low industrial energy shares, below 10%, during their pre-industrial periods. However, they experienced significant increases during their industrialisation phases, with shares rising substantially before gradually declining to around 20% today as their economies matured and transitioned toward services. Meanwhile, other regions such as the Middle East increased their industrial share from 26% in 2000 to nearly 30% in 2024, and Asia-Pacific from 31% to almost 40%, illustrating how shifts in energy allocation can drive industrial growth and broader economic development.

Advanced economies have followed a markedly different trajectory. Europe, for example, has reached an energy consumption maturity stage, driven by low population growth and moderate economic expansion. In this context, the focus has shifted from expanding energy supply to improving the quality of energy use, with an emphasis on environmental sustainability and energy security. This shift is evident in the decoupling of energy use from economic growth: primary energy consumption is declining in several European countries even as their economies continue to grow, mainly due to significant gains in energy efficiency.

One notable trend is the decline in the industrial sector's share of energy consumption, from 26% to 21% in Europe, as economies pivot toward service-oriented models and relocate energy-intensive manufacturing to lower-cost regions. A similar pattern is observed in North America, where the industrial share has fallen from 21% to 17%. These transitions underscore how structural changes in energy use can support new forms of competitiveness and sustainable growth. At the same time, they highlight a critical message for developing regions, particularly Africa: the path to long-term sustainability begins with building broad energy access and industrial capacity. Only after reaching such maturity can economies shift their focus toward substitution, efficiency, and decarbonisation.

In Africa’s case, the persistently low and stagnant share of industrial energy consumption highlights a critical barrier to industrialisation. This brings into focus the specific role of electricity within industrial energy use. Many modern industrial processes are non-substitutable and heavily dependent on consistent, high-quality electric power. If electricity use within the African industry remains limited or unreliable, the continent will find it difficult to develop a high-efficiency, technologically advanced manufacturing base. This leads to a vital question: what is the current share and reliability of electricity in Africa’s industrial sector, and is it sufficient to drive the level of industrial transformation required to lift incomes, create jobs, and sustain long-term growth?

Figure 4. Share of industry sector in final energy demand by region (2000-2024)



Source: GECF Global Gas Model

The share of electricity in final energy consumption is a critical indicator of a region's progress toward modern and sustainable energy systems. Electricity, as an energy carrier, plays a non-substitutable role in powering essential services such as lighting, cooling, computation, telecommunication, digital infrastructure, healthcare, education, and various productive industries. Its versatility, cleanliness at the point of use, and potential for decarbonisation make it a cornerstone of modern energy transitions. Globally, electricity currently accounts for approximately 20–21% of final energy use and is projected to reach nearly 30% by midcentury, an indicator of an anticipated increase in electrification across economies.

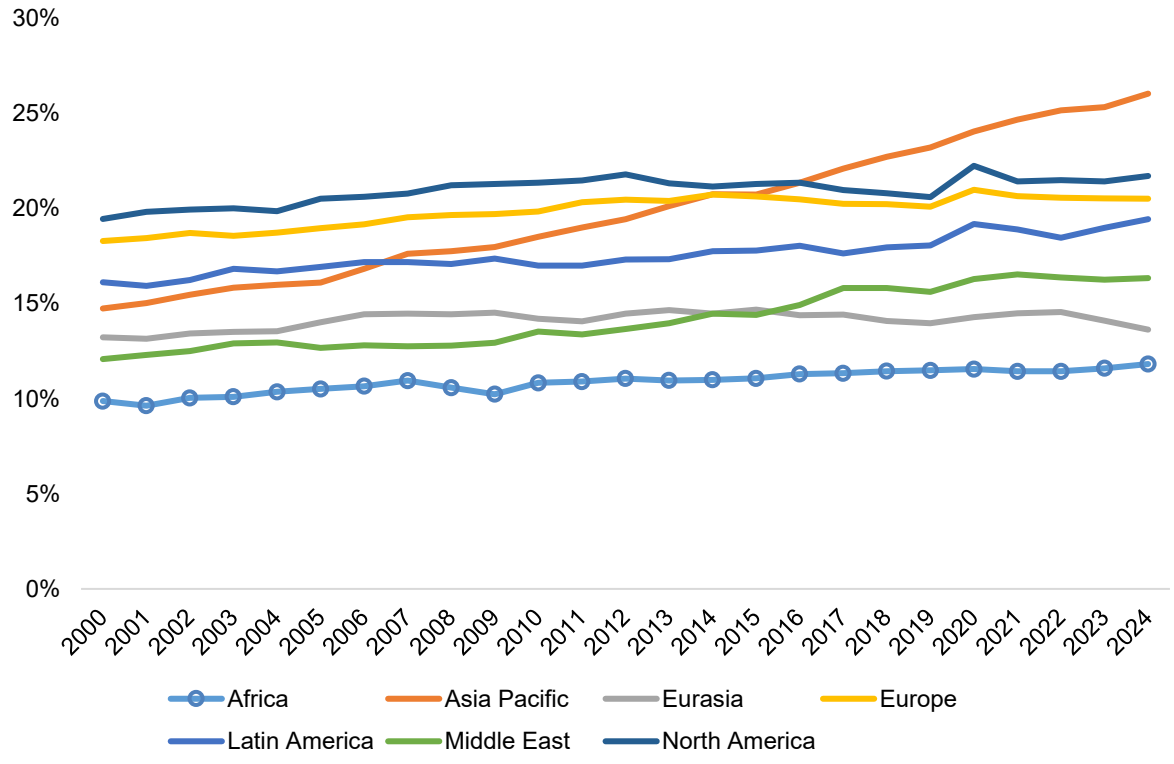
However, Africa significantly lags in this key metric. Over the past two decades, the average share of electricity in final energy consumption across the continent has remained stubbornly low, around 10%, roughly half the global average, with frequent blackouts and alternating voltages sometimes. This figure places Africa at the bottom among world regions, as shown in Figure 5. While incremental improvements have been made in recent

years, the pace of electrification remains insufficient to meet the growing demand for clean, reliable, and productive energy across residential, industrial, and service sectors.

The persistently low electricity share reflects deeper structural issues within Africa's energy systems. Significant populations remain disconnected from national grids, and electricity supply, where available, is often unreliable, expensive, or limited to urban centres. In rural and peri-urban areas, traditional biomass and other inefficient fuels continue to dominate energy use in heating and cooking, mainly. This not only hampers human development but also restricts the expansion of energy-intensive, value-added sectors like manufacturing and digital services, which are crucial for economic diversification and job creation.

To unlock Africa's development potential and align with sustainable development goals, a significant scale-up of electrification is imperative. This includes investing in grid infrastructure, distributed energy systems, and generation capacity, while also making electricity affordable and accessible. Increasing the share of electricity in final energy use will be central to improving quality of life, enhancing productivity, and industrialisation across the continent.

Figure 5. Share of electricity in final energy demand by region (2000-2024)



Source: GECF Global Gas Model

Another defining characteristic of Africa's energy system is its extremely low energy efficiency, which stems from a combination of outdated infrastructure, inefficient appliances, poorly insulated buildings, and limited regulatory enforcement. This inefficiency significantly undermines the continent's ability to maximise the benefits of its already limited energy supply. For example, in many urban areas, power is delivered through ageing grid systems that suffer from high technical losses, sometimes exceeding 20% of generated electricity, compared to less than 10% in advanced economies.

In the residential sector, the widespread use of inefficient lighting, refrigeration, and cooking appliances leads to unnecessary energy waste. For instance, traditional incandescent bulbs and older cooling units consume far more electricity than modern LED lighting and energy-efficient air conditioners. In rural and peri-urban areas, the situation is compounded by poorly insulated homes and substandard building materials, which increase energy demand for heating or cooling, even in moderate climates.

Yet, this challenge also presents a powerful opportunity. By investing in modern appliances, adopting energy-efficient building codes, and upgrading transmission and distribution networks, African countries can significantly expand access to energy even at the current generation capacity.

Together, these structural insights make clear that Africa's energy challenge is not simply one of volume, but of distribution, quality, efficiency and functionality. Addressing it requires a holistic approach that rebalances energy use across sectors, accelerates the shift to modern and clean energy sources, and ensures that energy supports both livelihoods and industrial development in a just, inclusive and equitable manner. Hence, the key prospects begin with estimating how much energy can be generated.

3- Estimating Africa's Energy Demand to End Energy Poverty

Understanding the scale of energy required to eliminate poverty and reach higher human development levels in Africa is essential for designing a realistic and transformative energy system for the continent. To support this, the methodology employs two complementary approaches, with the first drawing from historical lessons in development, notably from China's remarkable progress. In the early 1980s, China was grappling with extreme poverty, including severe energy deprivation, with over 900 million people, nearly 88% of its population, living below the poverty line. Through a combination of targeted

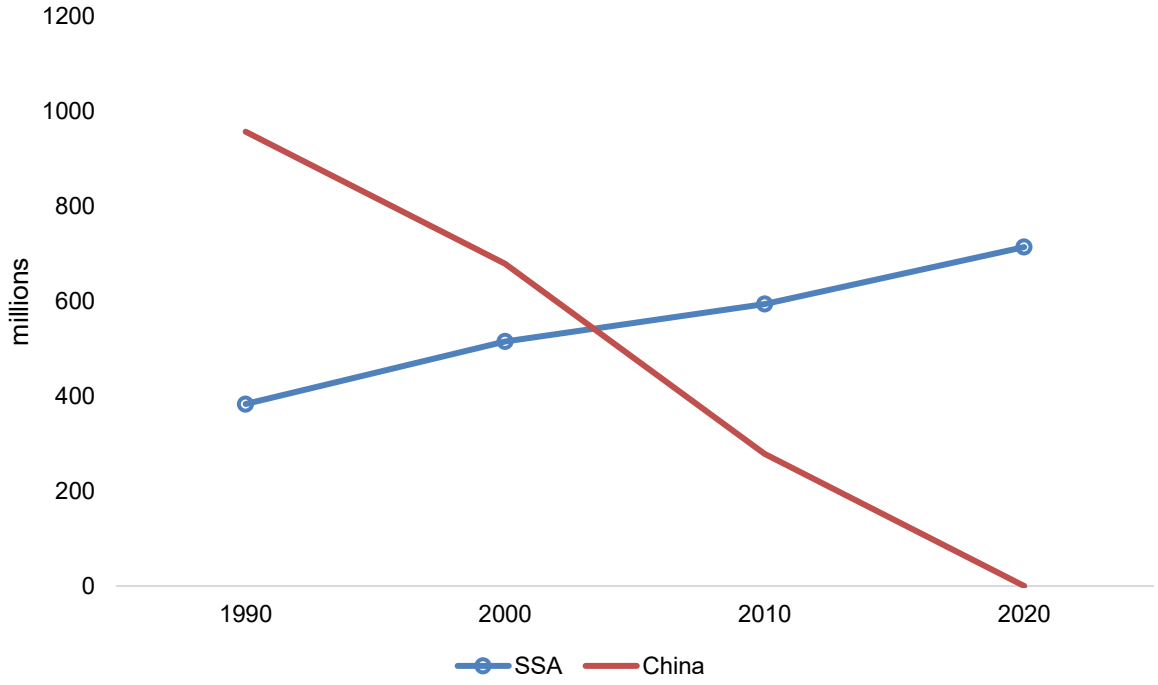
policy reforms, large-scale infrastructure investment, and strategic industrialisation, China almost eradicated poverty by 2020, as depicted in Figure 6.

In contrast, Africa, especially SSA, failed to move in a similar trajectory. Despite decades of international development efforts, the continent's poverty headcount has continued to rise, growing from approximately 500 million in 1990 to over 700 million in 2020. This trend is also depicted in Figure 6, drawing on World Bank data to compare the divergent paths of the two regions. Unlike China, Africa's poverty reduction has been slow and inconsistent, revealing systemic gaps in the structural foundations required to drive inclusive development.

A key differentiator in these trajectories is the role of energy access. While China's economic transformation was underpinned by the rapid expansion of modern energy infrastructure, enabling rapid industrialisation, export-oriented economic growth and productivity gains across sectors, Africa remains hindered by widespread energy poverty. Modern energy access, particularly electricity and clean cooking, is central to unlocking improvements in education, health, industrial output, and employment. Africa's lag in this area underscores the urgency for a more ambitious and coordinated energy strategy that supports economic empowerment and social development at scale.

This historical comparison underscores a pressing need: if Africa is to chart a new course in eradicating poverty and driving inclusive growth through industrialisation, how much energy will it need, and how should it be structured to empower its people and economies sustainably?

Figure 6. Poverty headcount in China versus Sub-Saharan Africa (1990 – 2000)

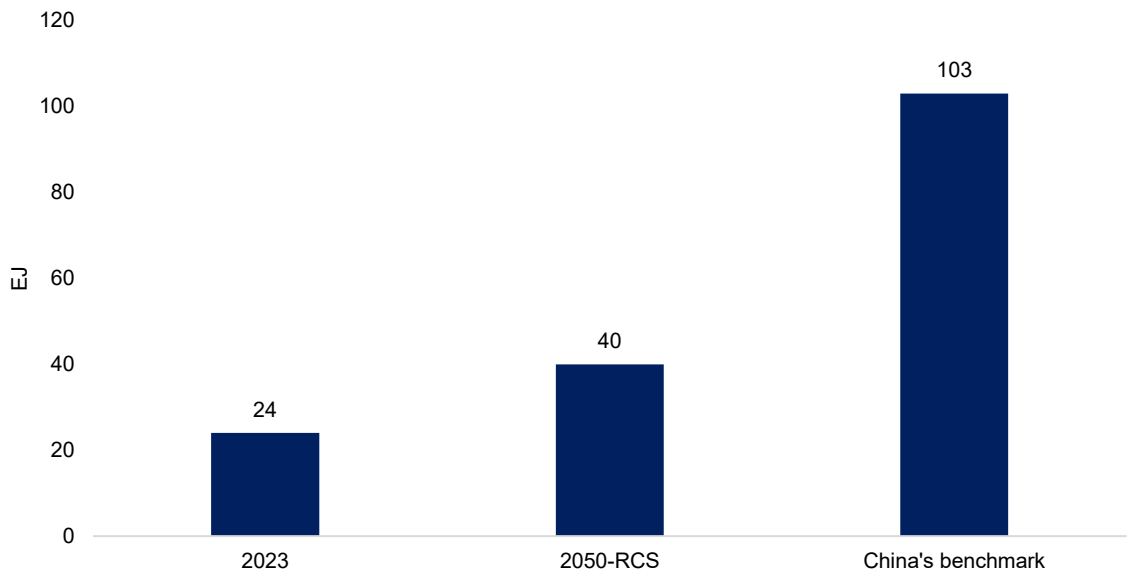


Source: World Bank

To estimate the scale of energy required for Africa to embark on a transformative development trajectory, we draw on China's historical energy transition as a reference point. At the beginning of the 1980s and the outset of the Chinese economic rise, China's per capita energy consumption was approximately 9 GJ per person, a level broadly comparable to Africa's current consumption. Over the following three decades, as China systematically addressed poverty and accelerated industrialisation, it increased its per capita energy consumption nearly fourfold to reach around 41 GJ per person.

Applying a similar energy scaling trajectory to Africa implies that, to achieve a comparable transformation in poverty eradication, economic development, and human wellbeing, the continent would need to raise its energy consumption to approximately 103 EJ by 2050, as illustrated in Figure 7. This figure, although immense, reflects the scale of energy access and infrastructure expansion required to uplift over 600 million people currently living without electricity and around 1 billion without reliable, modern, clean cooking fuels.

Figure 7. Africa's energy requirement to eradicate poverty based on China's historical experience



Source: Author calculation

It is essential to recognise that China's energy expansion was primarily driven by the utilisation of vast and inexpensive domestic coal resources, an approach that, while effective in achieving rapid development, came at the cost of high carbon emissions and environmental degradation. In contrast, Africa's pathway must be both *development-driven* and low-carbon. Although the estimated 103 EJ may seem unrealistic, Africa is endowed with abundant and diverse energy and mineral resources, which, if harnessed strategically, can provide the foundation for a cleaner, scalable, and more inclusive energy system.

Although the estimated scale of energy demand for the African region appears vast and challenging to meet, it reflects the region's significant lag in basic energy access and human development. However, a second methodological approach will provide a more balanced estimation of energy needs, based on global benchmarks required to achieve adequate levels of human development.

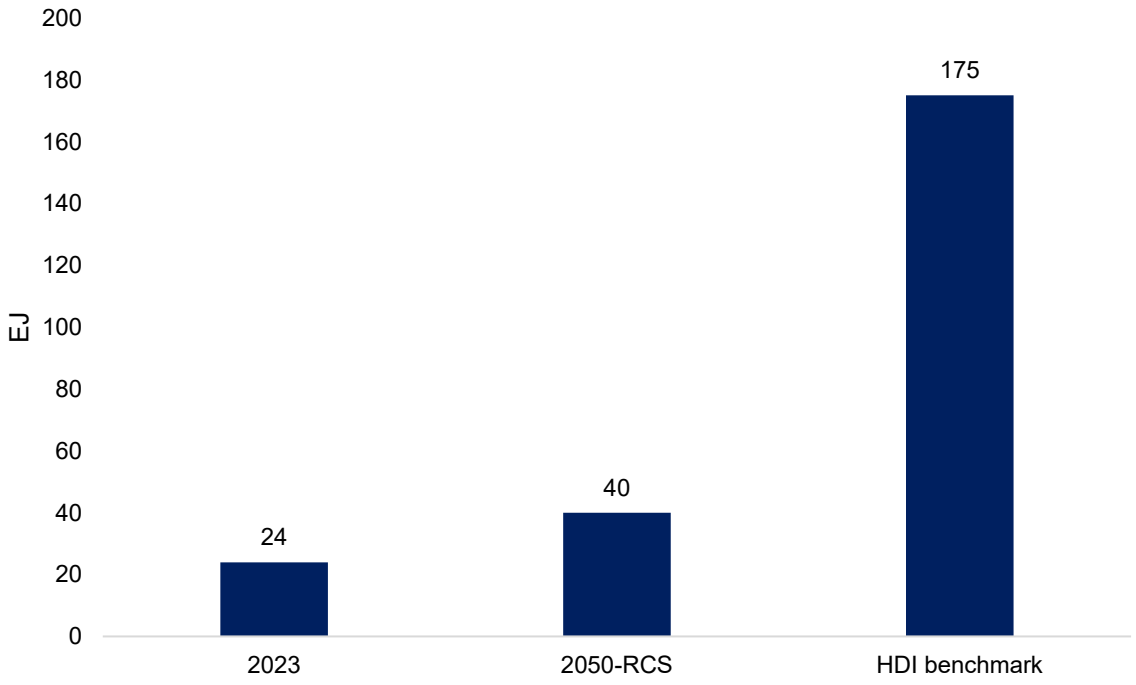
Despite an expected fourfold increase in final energy consumption by 2050, it is important to note that this projected level for Africa still falls short of the minimum per capita energy requirement needed to achieve sustainable human development and economic empowerment. To address this gap, a second methodological approach has been

adopted to estimate Africa's future energy demand, aligning it with standard thresholds of human development by using the Human Development Index (HDI) as a benchmark. Numerous global studies indicate a strong correlation between minimum energy consumption levels and achieving medium to high HDI status, which reflects improvements in health, education, and overall living standards.

According to this approach, individuals in societies with acceptable levels of human development typically consume between 50 and 100 GJ of final energy per person annually. Within this range, an average threshold of 70 GJ per person per year is widely considered sufficient to meet the energy needs associated with improved well-being, such as access to modern healthcare, education, clean cooking, and mobility.

Using this benchmark, Africa's minimum energy requirement by mid-century can be calculated by multiplying the continent's projected population by 2050, estimated at 2.5 billion people, by the average energy threshold of 70 GJ per person. This yields a projected minimum energy demand of approximately 175 EJ by 2050 (Figure 8). This estimate serves as a upper bound for the scale of energy needed to achieve substantial socio-economic transformation across the continent.

Figure 8. Africa's final energy requirement based on the human development index



Source: Author calculation

In this context, the HDI-based estimation offers a powerful and policy-relevant insight: energy is not merely a byproduct of development but a prerequisite. It highlights the urgent need for integrated planning and large-scale investments in energy infrastructure, technology deployment, and institutional capacity to ensure that energy systems are aligned with Africa's demographic realities and development aspirations.

Meeting this huge gap is monumental undertaking that requires a mix of energy sources, including natural gas, renewables and other low-carbon options, tailored to national contexts and supported by enabling policies, financing mechanisms, and international cooperation.

4- Strategic Role of Natural Gas in Africa's Energy Expansion

Following the estimation of the energy required for Africa to reach a threshold consistent with the HDI, a critical question emerges: Does Africa possess the energy potential to meet this surging demand, and what strategies are needed to unlock and deliver it effectively to a growing population? The answer begins with Africa's resource endowment, which is both vast and diverse. The continent holds approximately 8% of global natural gas reserves, 60% of the world's best solar resources, and around 30% of the critical minerals, such as cobalt, lithium, and rare earth elements, required for clean energy technologies. These figures reflect a continent rich in natural wealth and positioned strategically for the energy transitions.

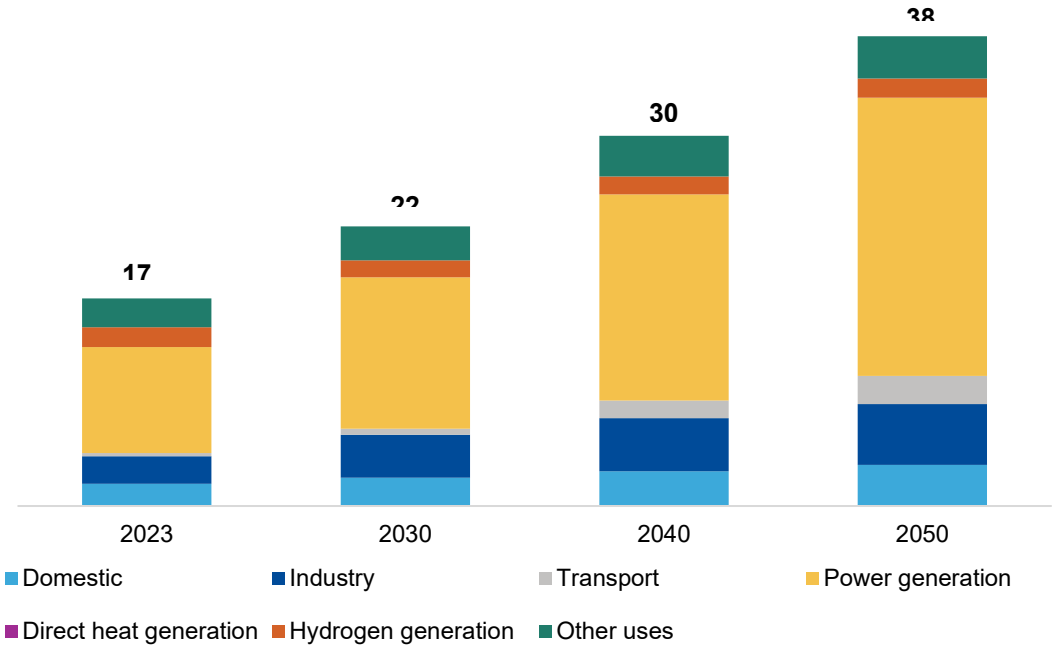
However, resources alone are not sufficient. Turning this potential into scalable, reliable, and accessible energy requires a deliberate combination of enabling, efficient and predictable policies, scalable innovations and technologies, low-cost sources of finance and well-functioning markets. Without a coherent and integrated framework, Africa risks remaining a supplier of raw materials while continuing to suffer from energy poverty at home. To close the persistent access gap and meet rising energy demand, Africa must prioritise energy solutions that are abundant, affordable, and capable of delivering stable power at scale. This includes renewables like solar and hydro, but also critically, natural gas, which offers a flexible, dispatchable, and rapidly scalable option to address the continent's immediate development needs.

In this context, natural gas emerges as a pivotal destination fuel, uniquely positioned to power Africa's industrialisation, urbanisation, and energy transitions. Its role is not confined to electricity generation alone; gas enables integration of variable renewables by

providing reliable baseload and peaking capacity, while also offering an immediate pathway away from traditional biomass in household cooking. More importantly, natural gas serves as a critical feedstock for fertiliser production, which is essential to ensuring food security for the continent's rapidly expanding population. While Africa's long-term energy future will require a diversified mix, natural gas provides the immediacy, scalability, versatility and infrastructure compatibility to serve as the backbone of national energy systems during this critical transition period and beyond. Recognising this, many African countries have begun adopting gas-inclusive energy strategies that simultaneously support development goals.

According to the GECF Global Gas Outlook (9th Edition), Africa is projected to experience the fastest growth in natural gas demand globally, with consumption more than doubling by 2050, reaching nearly 400bcm (Figure 9). SSA alone will account for almost 90% of this growth, underscoring the region's central role in shaping the continent's energy future. Gas is set to meet 43% of Africa's incremental power generation needs, with its share in the electricity mix rising from current levels to 42% by 2050. To meet this demand, gas-fired power capacity in Africa must more than double, reaching approximately 275 GW by mid-century.

Figure 9. Africa's natural gas demand by sectors



On the supply side, Africa's natural gas production is also projected to double by 2050, led increasingly by offshore developments and untapped reserves. The continent is expected to register the highest annual growth rate in global gas supply, adding 250 bcm by 2050. Consequently, Africa's share in global gas production will rise from 6% in 2023 to 9% by 2050, reinforcing its emergence as a key global supplier. Liquefied Natural Gas (LNG) will play a dominant role in this transformation, with net African LNG exports more than doubling by 2050. To realise this vision, however, nearly USD 1 trillion in investment will be required, of which 90% will be needed in the upstream sector alone.

Moreover, Africa is projected to capture 16% of global midstream investment, with 85% directed toward LNG liquefaction, positioning the continent as a strategic player in the evolving global LNG trade. These trajectories highlight the continent's immense natural gas potential and the critical need to mobilise investment, technology, and partnerships to ensure gas fuels inclusive development and energy access across Africa.

5- Means of Implementation: Policy, Finance, and Technology

To fully realise the transformative potential of natural gas in Africa's energy transition, a foundation of transparent, coherent, predictable, and forward-looking policy and regulatory frameworks is indispensable. Encouragingly, recent reforms across the continent increasingly reflect this imperative, reducing investor uncertainty, strengthening institutional capacity, promoting infrastructure investment, and embedding sustainability criteria into project development.

A key milestone in this direction is the African Common Position on Energy Access and Just Transition, adopted by the African Union Executive Council in July 2022. This landmark policy underscores a unified continental vision anchored on four strategic pillars:

- **Universal Energy Access**: Recognising that access to electricity and clean cooking fuels is a prerequisite for achieving the Sustainable Development Goals (especially SDG 7), the Common Position calls for a significant scale-up in reliable and affordable energy services for all Africans.
- **Balanced Energy Mix**: The policy supports harnessing Africa's full range of energy resources—including natural gas, nuclear, renewables, and low-carbon hydrogen—in a technology-neutral manner that meets growing demand while maintaining flexibility and resilience.

- **Economic and Social Transformation**: By linking energy policies with inclusive industrialisation, job creation, and poverty reduction, the Common Position integrates energy development with Africa's broader socio-economic objectives.
- **Climate Compatibility**: Africa reaffirms its commitment to the Paris Agreement, while advocating for a just energy transitions, that reflects the continent's right to development, resilience building, and differentiated responsibilities.

Within this balanced framework, **natural gas stands out as a strategic enabler**—a dispatchable, scalable, and cleaner-burning fuel that can accelerate electrification, unlock industrial development, and enable the rollout of renewables. For many African economies, natural gas is not only a development imperative but also the bridge to a low-carbon, resilient future that prioritises people, prosperity, and planetary stewardship.

The case for natural gas in Africa is also grounded in the principle of climate justice. As emphasised in Article 6.2 of the Paris Agreement, countries are entitled to pursue sustainable development pathways in line with their "common but differentiated responsibilities and respective capabilities." Africa's developmental needs are urgent, and its capacity to invest in expensive alternatives remains limited. According to the IEA, even if all discovered gas reserves in Africa were developed and consumed, the continent's cumulative emissions would account for less than 3.5% of global totals, underscoring Africa's marginal historical responsibility for climate change, despite its resource wealth. Although supplying natural gas comes with key requirements, the following section highlights the most suitable pathway for Africa.

Across the African continent, recent policy reforms are increasingly geared toward enabling a gas-inclusive energy transition that is both sustainable and investment-friendly. Governments are taking deliberate steps to expand infrastructure, strengthen institutions, and establish regulatory frameworks that not only guide sectoral growth but also improve the bankability of natural gas projects. These efforts are deeply aligned with broader development goals, including energy access, economic diversification, and environmental sustainability.

Several countries have begun to articulate National Gas Strategies, providing clear roadmaps that define the role of gas in national energy mixes while balancing domestic consumption with export priorities. In tandem, fiscal reforms have introduced competitive tax regimes, including reduced royalties and grace periods, designed to attract long-term

capital investment in upstream and midstream projects. Complementing these, pricing reforms are being rolled out to ensure greater transparency and cost-reflectivity—essential for incentivising efficient gas use in industry and expanding infrastructure access for residential and commercial users.

Regulatory streamlining is also evident in areas such as land acquisition and environmental permitting, where simplified processes now aim to reduce delays and bureaucratic risk. In support of fair competition, many countries are introducing open access frameworks that allow third-party use of pipelines and related infrastructure at regulated tariffs. Moreover, the establishment of gas transportation codes is helping to harmonise technical and commercial standards across jurisdictions, facilitating interoperability among operators. Regional bodies like ECOWAS, SADC, and the AfCFTA are advancing cross-border harmonisation, creating standard rules to enable transnational pipelines, LNG trade, and market integration.

At least seven major gas projects across Africa have adopted clear pathways, demonstrating how policy initiatives are now addressing the entire gas value chain, upstream, midstream, and downstream. In the upstream segment, policies are driving the development of gas feedstocks with low-carbon intensity and the monetisation of associated gas that would otherwise be flared. A prominent example is Eni's Baleine offshore field in Côte d'Ivoire, Africa's first net-zero upstream development. Eni has integrated high-efficiency plant designs and energy recovery systems into a project. Similarly, Algeria's Sonatrach is working with Eni, Sinopec, ExxonMobil, and TotalEnergies to expand LNG storage capacity and deploy upstream gas separation and boosting units equipped with modern technologies.

In Mozambique, the Coral Sul FLNG project marks a milestone as Africa's first ultra-deepwater FLNG facility, made possible through advanced engineering and partnership among Area 4 stakeholders. The project not only strengthens Mozambique's role as a global LNG exporter but also integrates low-carbon practices. Additional examples include the Rovuma LNG project in Mozambique, which implements sustainable low-carbon management programmes led by ExxonMobil and Eni; Tanzania's Likong'o–Mchinga LNG project, supported by Shell, ExxonMobil, and Equinor, which features plans for electrified liquefaction; and Congo LNG, which incorporates zero-flaring technologies, allowing the Republic of the Congo to enter global LNG markets.

In the midstream sector, African policies are increasingly focused on developing a pan-African, integrated gas infrastructure. The vision is to foster a unified market through cross-border pipelines and regional interconnectors, enhancing trade and supply reliability across national boundaries. These efforts are being coupled with efficiency improvement strategies, integrating solar power for electrified processes, and exploring hydrogen blending. Such measures are crucial for positioning Africa at the forefront of clean gas innovation while facilitating regional economic integration.

Realising these ambitious infrastructure plans requires substantial capital investment and long-term financial commitment. Africa's natural gas infrastructure must therefore be financed through a combination of international public financing and private-sector engagement. Multilateral Development Banks (MDBs)—including the African Development Bank, the World Bank, and the Islamic Development Bank—have played a crucial role in this space. For instance, the African Development Bank's $400 million support for Mozambique's Coral Sul FLNG project highlights the catalytic role of Multilateral Development Banks (MDBs). In parallel, climate finance instruments such as the Green Climate Fund and the Adaptation Fund are beginning to support gas-related projects that are tailored to improving energy access while reducing carbon emissions.

Public-Private Partnerships (PPPs) are crucial, as demonstrated by the $2.8 billion AKK pipeline in Nigeria, which was developed in collaboration with NNPC and Chinese financiers. Sovereign and infrastructure funds, such as Nigeria's Sovereign Investment Authority (NSIA), have also played a key role, allocating $250 million to gas industrial park developments. Export Credit Agencies (ECAs) are supporting import-heavy projects, with the UK Export Finance (UKEF) providing $300 million for Mozambique's Temane gas-to-power project. Commercial banks have been instrumental in major ventures, including Standard Bank's financing of Ghana's $7.7 billion Sankofa gas project.

In addition, green bonds and ESG instruments are helping unlock sustainable finance, exemplified by South Africa's Nedbank, which issued over $200 million in ESG bonds for energy projects. Blended finance and carbon markets also support distributed gas infrastructure, such as Kenya's LPG expansion, which is backed by a $47 million Results-Based Finance (RBF) programme involving GIZ and the World Bank. These instruments must be complemented by risk guarantees, currency hedging mechanisms, and clear regulatory guidance to attract sustainable investment into Africa's gas sector.

Technology remains central to scaling up natural gas use in Africa while meeting global environmental protection and environmental responsibilities, in pursuit of expanding energy access to end energy poverty. Across the upstream, midstream, and downstream value chains, African gas projects are increasingly integrating advanced solutions to reduce lifecycle emissions, enhance operational efficiency, and expand market reach. Zero-flaring technologies, such as those deployed in the Congo LNG project, are helping to promote sustainable practices in many upstream and LNG facilities. Combined Cycle Gas Turbines (CCGT) are being used for power generation due to their high efficiency and low emissions profile, while blue hydrogen—produced through Steam Methane Reforming (SMR) with integrated Carbon Capture, Utilisation, and Storage (CCUS)—presents a scalable decarbonisation pathway for hard-to-abate sectors. CCUS is also gaining traction in LNG processing and other high-emission applications, contributing to a broader strategy of emissions mitigation.

In the midstream segment, innovative technologies such as small-scale LNG, virtual pipelines, and cross-border gas pipelines are playing a crucial role in expanding gas access and building a more inclusive and resilient gas infrastructure. Small-scale LNG facilities, such as Nigeria’s Mini-LNG projects by Axxela and Tanzania’s LNG distribution hubs, are providing decentralised energy solutions for off-grid industries and communities where large-scale infrastructure is not viable. Virtual pipelines, including CNG transport systems in Côte d'Ivoire and Kenya, provide a flexible alternative to fixed pipelines, enabling timely gas delivery to areas that are awaiting infrastructure development. Meanwhile, cross-border projects like the West African Gas Pipeline and the proposed Trans-Saharan Gas Pipeline are advancing regional energy integration, linking gas-rich producers with neighbouring demand centres and international markets. These technologies support Africa’s ambition to become a dynamic, interconnected gas market, while enabling cleaner fuel substitution for industries that rely on diesel or biomass.

In downstream segments, business models centred on mini-grids, LPG networks, and digital metering are becoming increasingly vital. To support these developments, policies must focus on market liquidity, pricing transparency, consumer protection, and the integration of gas projects into evolving carbon markets. Together, coordinated policy efforts, innovative finance, and technological deployment provide Africa with a viable path to leverage its abundant natural gas resources for inclusive economic growth while making meaningful contributions to global decarbonisation efforts.

6- Conclusions

Africa stands at a pivotal juncture in its socio-economic trajectory, where demographic dynamics, structural transformation, and energy system development must converge to define the continent's future. With one of the fastest-growing populations globally, driven by improved healthcare, sanitation, and public health, the urgency of achieving rapid and sustained economic growth cannot be overstated. Two interrelated imperatives sharpen this urgency. First, Africa must "become rich before becoming old," securing broad-based prosperity well before demographic ageing sets in during the second half of the century. Second, the accelerating global diffusion of labour-saving technologies, notably automation and artificial intelligence, reduces the historical advantage of abundant labour. In this context, Africa's capacity to harness its demographic dividend depends on its ability to generate labour-intensive yet productivity-enhancing growth, anchored in a resilient and modern energy system.

Inclusive and sustainable development on the continent will be impossible without a quantum leap in the supply of reliable, affordable, and modern energy. The demographic transition is already generating new demand for food, housing, healthcare, education, and industrial production. Yet, Africa's prevailing energy system remains antiquated, characterised by low levels of per capita consumption, heavy reliance on traditional biomass for basic household needs, and minimal penetration of modern energy services. Sub-Saharan Africa, in particular, is locked in a structural energy poverty trap, where the majority of households meet their needs through inefficient and harmful fuels such as firewood and charcoal. This pattern not only constrains productivity growth but also imposes severe negative externalities on public health, environmental integrity, and economic competitiveness. In the absence of timely modernisation of the energy system, population growth will exacerbate the gap between rising demand and the quality of energy services provided, deepening socio-economic vulnerabilities. It is worth highlighting the immense and coordinated efforts of the African Union (AU), particularly through the African Energy Commission (AFREC), in driving initiatives aimed at expanding energy access and promoting industrialisation across the continent. Under the AU's strategic frameworks, including Agenda 2063, AFREC plays a pivotal role in harmonising energy policies, developing regional infrastructure, and facilitating cross-border energy trade to unlock Africa's economic potential.

Through initiatives such as the African Energy Information System (AEIS), clean cooking access programs, and the promotion of natural gas and renewable integration, AFREC has positioned energy as a catalyst for industrial growth and socio-economic transformation. By supporting the development of pipelines, LNG infrastructure, and regional power pools, these coordinated efforts are laying the groundwork for sustainable industrialisation, enhancing energy security, and enabling Africa to harness its abundant resources to achieve inclusive and resilient growth.

The continent's immense resource base underscores this paradox. Africa possesses some of the world's largest reserves of natural gas, vast renewable potential in solar, hydro, and wind, and abundant critical minerals required for the energy transition. Yet these resources remain vastly underutilised due to infrastructural deficits, fragmented markets, regulatory uncertainty, and financing constraints. Addressing these bottlenecks requires coherent and predictable policy frameworks, strong regional cooperation to promote cross-border energy integration, and innovative financing models that leverage both concessional and private capital. Without these, Africa risks remaining energy-poor despite its resource wealth.

Within this spectrum of resources, natural gas occupies a unique strategic position. Technically versatile and geographically widespread, it is one of the few fuels capable of simultaneously meeting Africa's short-term needs and long-term objectives. Gas-fired power generation offers a scalable and dispatchable complement to variable renewables, enhancing energy security and grid reliability. As a feedstock for fertiliser production, natural gas is indispensable for strengthening agricultural productivity and ensuring food security for a rapidly expanding population. Industrially, gas can drive the expansion of energy-intensive sectors such as cement, steel, and petrochemicals required for rapid urbanisation, while also enabling coal-to-gas switching to reduce the carbon intensity of production.

At the same time, achieving universal access to clean cooking remains one of Africa's most urgent development challenges, with nearly one billion people still reliant on traditional biomass. LPG represents the most practical and scalable near-term solution, not only because of its affordability and established supply chains, but also due to its direct linkage to Africa's natural gas resources. Globally, around 60% of LPG production comes from natural gas processing, and this share rises to nearly 85% in Sub-Saharan Africa, underscoring its dependence on the development of the gas value chain. Expanding LPG

supply and infrastructure, supported by targeted affordability measures, can quickly reduce indoor air pollution, improve health outcomes, ease the disproportionate burden on women and children, and deliver significant welfare gains. In this sense, natural gas and LPG form an integrated continuum: natural gas underpins power generation, food security, and industrial growth, while LPG, as a byproduct of gas processing, directly tackles the pressing challenge of household energy poverty and clean cooking access.

However, resources alone will not guarantee transformation. Africa's success depends on deploying innovative technological solutions and new business models capable of bypassing the limitations of centralised infrastructure. Off-grid and decentralised approaches, from virtual LNG pipelines and modular small-scale LNG terminals to hybrid gas systems, can accelerate the rollout of modern energy services in underserved areas. Coupled with regional market integration and harmonised regulatory frameworks, these solutions can create economies of scale, attract foreign investment, and unlock Africa's comparative advantages.

The stakes are clear. Without decisive action to expand and modernise its energy system, Africa risks perpetuating a vicious cycle where population growth outpaces economic progress, leaving the continent increasingly marginalised in a rapidly evolving global economy. Conversely, by leveraging its abundant natural gas and LPG resources, fostering innovative financing and regulatory mechanisms, and prioritising inclusive access to modern energy, Africa can unlock a virtuous circle of industrialisation, human development, and sustainable growth.

Ultimately, the continent's energy choices today will determine whether its demographic expansion translates into prosperity or vulnerability. A strategy that places natural gas and LPG at the heart of Africa's energy transition, while complementing them with renewables, regional integration, and technological innovation, provides the most pragmatic pathway to ensure that Africa not only meets the needs of its current population but also secures the prosperity of generations to come.

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