



AFRICAN UNION ENERGY

African Energy Commission
Commission Africaine de l'Énergie

Africa and Just Energy Transition

Considerations for the Expansion of the African Oil & Gas Domestic Market

Executive Summary

October 2022

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Africa is endowed with considerable oil and gas reserves and undeveloped resources that can assist the continent's economic growth if they are strategically developed.

There is a need to clarify Africa's position and develop strategies for future supply adequacy, considering current uncertainties about energy supply, the key drivers of future demand, policies of consumer countries (especially alternatives to oil and gas), and expected future global economic growth and technological developments.

AFRICA'S OIL AND GAS LANDSCAPE

A wealth of oil and gas resources provides the economic foundations for the sustainable development of many African countries, while the discovery and development of new hydrocarbon fields continue to provide economic leverage through trade and investment.

CRUDE OIL

The crude oil reserves in Africa are estimated to be more than 125 billion barrels, with production reaching 6,9 million barrels per day in 2020, which represents 7,8% of global production. About 87% of the continent's oil reserves are located in five African countries: Libya (39%), Nigeria (30%), Algeria (10%), Angola (6%), and Egypt (2%). Africa is the only continent in the world that is both a net exporter of crude oil and a net importer of petroleum products. African refineries can only refine 3,3 million barrels a day, despite recording a demand of 4,1 million barrels a day by 2020. The refined petroleum products market in Africa is dominated by diesel, gasoline and LPG.

Despite significant demand across the continent of Africa, trade in crude oil and petroleum products is limited within the continent, with the majority of products being shipped to the international market. SUMED, Tazama, Chad-Cameroon, and Petrodar pipelines are the most prominent crude oil trans-border pipelines, although several other pipelines are under consideration (LAPSSET, EACOP, AZOP, Niger-Chad pipelines) or construction (Niger-Benin oil pipeline)¹.

NATURAL GAS

Natural gas reserves in Africa are estimated to be 850 tcf, with production reaching nearly 8 200 bcf in 2020, which presents 6% of global production. Gas reserves are considerable in Northern (33%), Western (28%), and Southern Africa (31%), and commercial quantities of natural gas have been found in many African countries.

Algeria (39%) and Nigeria (30%) are the two largest LNG exporters, with operational LNG export terminals in Africa having a combined capacity of 75 MTPA. A large proportion of natural gas is exported from Africa; however it is also used in industry, power generation, transport, agriculture, commercial and residential applications. In terms of global adoption, gas-to-liquids applications are not well established, however, Africa is home to two plants, both of which are located in South Africa. Africa continues to promote gas as a key fuel to meet its growing baseload power generation (e.g. Nigeria), substitute oil products (e.g. South Africa), encourage industrial development (e.g. Algeria, Egypt), monetize associated and flared gas (e.g. Nigeria), and replace coal (e.g. South Africa). Medgaz, GME, Trans-Mediterranean, AGP, EMG, Greenstream, ROMPCO, and WAGP pipelines are the most prominent natural gas trans-border pipelines, although several other pipelines are under consideration (ARP, Ghana-Côte d'Ivoire, GALSI, TSGP pipelines)².

¹ SUMED connecting the Ain Sokhna terminal in the Gulf of Suez, near the Red Sea, to the offshore Sidi Kerir port in Alexandria in the Mediterranean Sea; Tazama connecting the port of Dar-es-Salaam, Tanzania, to the Indeni Petroleum Refinery in Ndola, Zambia; Chad-Cameroon connecting the Doba Oil Field in southern Chad to a floating export facility at Kribi, Cameroon; Petrodar connecting the Upper Nile State (South Sudan) to the Red Sea (Sudan); LAPSSET connecting Kenya, Ethiopia and South Sudan; EACOP connecting Kabaale, Hoima district in Uganda to the Chongoleani Peninsula near Tanga Port in Tanzania; AZOP connecting Lobito refinery in Lobito, Angola to Lusaka, Zambia; Niger-Chad connecting the Agadem oil field in Niger to the Doba Basin in Chad, where it would be connected to the existing Chad-Cameroon Oil Pipeline, for export through the Port of Kribi in Cameroon; Niger-Benin connects Niger's Agadem oil field with Benin's Port of Seme terminal via the Southwest of Niamey, Niger.

² Medgaz connecting Algeria to Spain; GME connecting the Hassi R'Mel gas field in Algeria to Cordoba, Spain, through Morocco, where it is connected to the Spanish and Portuguese gas grids; Trans-Mediterranean connecting Algeria via Tunisia to Sicily and mainland Italy, with an extension to Slovenia; AGP connecting Egypt to Jordan, Syria and Lebanon; EMG connecting the Israeli terminal of Ashkelon to the Egyptian receiving station of Al-Arish; Greenstream connecting Mellitah in Libya to Gela, in Sicily, Italy;

REGIONAL ECONOMIC COMMUNITIES

Through regional integration, African countries have the opportunity to exploit regional value chains and expand their markets, which would otherwise be small and fragmented. In turn, regional value chains are important anchors for industrialization and broader economic transformation. Recently discovered oil and gas deposits in several African countries provide a great opportunity for African economies to undergo a rapid industrialization process.

Africa's current integration landscape contains an array of Regional Economic Communities, namely the Arab Maghreb Union (AMU), the Common Market for Eastern and Southern Africa (COMESA), the Community of Sahel-Saharan States (CEN-SAD), the East African Community (EAC), the Economic Community of Central African States (ECCAS), the Economic Community of West African States (ECOWAS), the Southern Africa Development Community (SADC) and the Intergovernmental Authority on Development (IGAD).

AFRICAN CONTINENTAL FREE TRADE AREA (AfCFTA)

AfCFTA provides a unique opportunity for African countries to integrate competitively into the global economy, reduce poverty, and promote inclusion.

In the oil and gas industry, the AfCFTA is expected to trigger substantial investment from countries overseas, such as the United States and other European countries, mainly because it provides investors with a larger market with lower risk. AfCFTA expands the market by providing a single market with fewer cross-border barriers, which allows investors to undertake larger revenue projects on a regional rather than national scale. By taking advantage of economies of scale offered by the AfCFTA to develop regional solutions, the market for exports could grow considerably. Among other things, the AfCFTA provides a protocol for the reasonable resolution of investor-state disputes, which should make investments with African countries less risky for investors.

AfCFTA currently has 54 signatories, of which 43 have deposited their instruments of ratification by May 2022.

ENERGY OUTLOOK

Recent oil and gas discoveries, as well as regulatory changes and rapidly expanding consumer markets across the continent, present significant opportunities. Business-as-Usual presents as the development pathway for the African oil and gas sector that would most benefit the continent and its people.

The short-term period of interest for this study is the period between now and 2030, the medium-term period is 2031 to 2040, and the long-term period is 2041 to 2050.

For the purpose of estimating the overall African supply opportunity over the short-, medium-, and long-term, a cumulative approach has been employed that takes into account both the supply opportunity to the international market based on the projected global demand (excluding Africa) and the supply opportunity in an isolated African market (only Africa). It is assumed that Africa's crude oil and natural gas reserves are sufficient to meet continental demand and to serve the international market, thereby maximizing revenue. Furthermore, Africa is assumed to continue to benefit from 4,2% of the global crude oil market, and 1,95% of the global natural gas market, while capturing 100% of the African market, over the outlook periods considered in this study.

ROMPCO connecting the onshore gas fields in Pande and Temane in Mozambique to Gauteng, South Africa; WAGP connecting Nigeria's Escravos region of the Niger Delta area to Benin, Togo and Ghana; ARP connecting Mozambique's gas-rich Rovuma basin to Gauteng, South Africa; Ghana-Côte d'Ivoire connecting the gas processing plant near Atuabo, in the Western region of Ghana, to the border of Cote d'Ivoire; GALSJ connecting Algeria to Italy via Sardinia; TSGP connecting Nigeria's resources to Hassi R'Mel in Algeria, linking to a wider regional network of pipelines, including GME, Medgaz, Trans-Mediterranean.

CRUDE OIL

In developing the global supply outlook scenarios for crude oil, two scenarios have been considered: one defined by OPEC in the World Oil Outlook 2021 report (BaU) and the other by the IEA in the Net Zero by 2050 report (NZE).

The total crude oil supply opportunity is comprised of Africa's growing petroleum demand (bolstered by population growth and economic activity, fuel switching from biomass to oil-based products and increased use of diesel and fuel oil for power generation), as well as the international market, and is summarised in Figure 1.

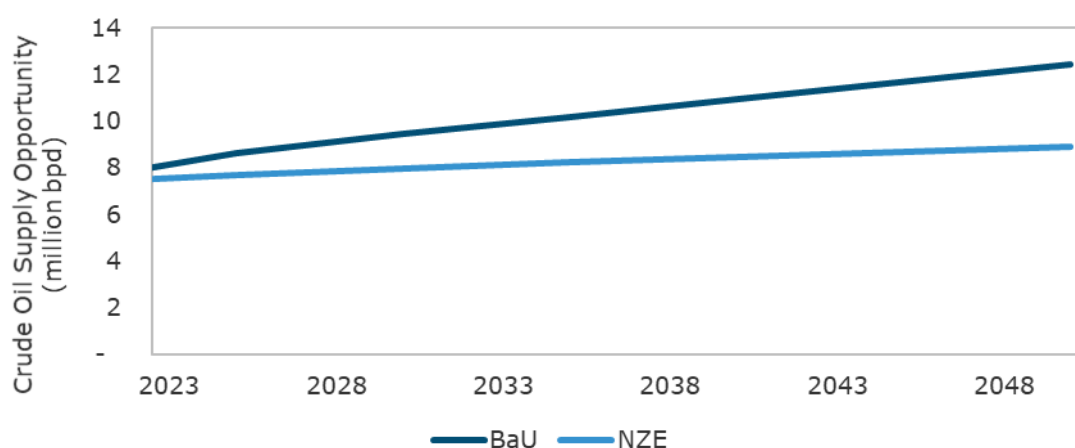


Figure 1: Potential crude oil supply opportunity for Africa (intra-African and international markets)

In the BaU scenario, the global supply opportunity gradually increases, but the overall demand shifts from export to intra-continental trade during this period, with global supply (as a portion of the total supply opportunity) decreasing from nearly 50% to 34% over time. Among the main reasons for this trend in the global market are efficiency improvements across all sectors of consumption and the substitution of oil with gas and renewable energy sources. It includes the significant penetration of electric vehicles in the road transportation sector, ongoing electrification in the residential and industrial sectors, and the penetration of alternative fuels in the marine and aviation sectors.

According to the NZE scenario, the global supply opportunity (as a percentage of the total supply opportunity) has decreased significantly from nearly 50% to 7,5%, while the African continent's demand has experienced a compound annual growth rate of 2,7% during the outlook period. Among the main reasons for this trend in the global market are decreased energy intensity and increased production of alternative fuels (advanced biofuels, hydrogen, and synthetic fuels).

The crude oil (petroleum products) market becomes increasingly local in both scenarios. Trade relationships and infrastructure must be built within Africa to facilitate trade on the continent's crude oil market, regardless of the trajectory of international decarbonization.

NATURAL GAS

In developing the global supply outlook scenarios for natural gas, two scenarios have been considered: one defined by OPEC in the World Oil Outlook 2021 report (BaU) and the other by the IEA in the Net Zero by 2050 report (NZE).

The total natural gas supply opportunity is comprised of Africa's growing natural gas demand (defined by Gas Exporting Countries Forum (GECF) in the Global Gas Outlook 2050 Synopsis report; bolstered by

rapid economic growth and a growing urban population, coupled with an unprecedented increase in electricity demand), as well as the international market, and is summarised in Figure 2.

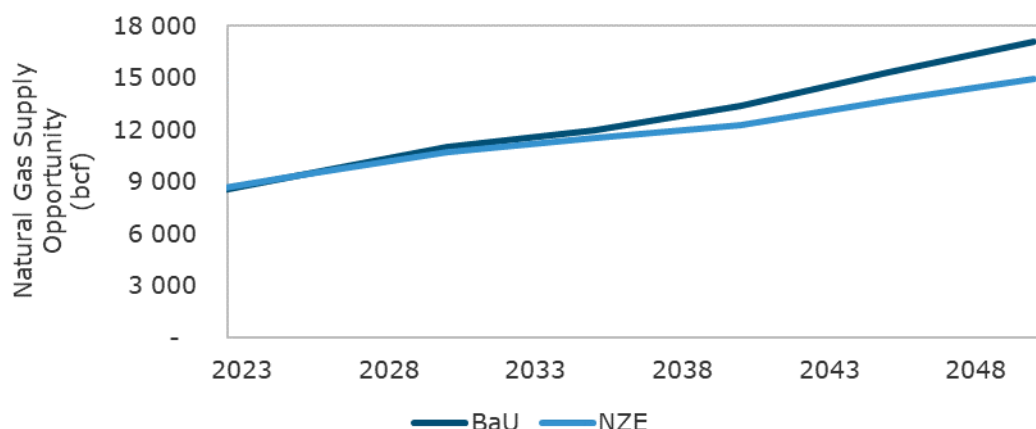


Figure 2: Potential natural gas supply opportunity for Africa (intra-African and international markets)

The BaU scenario predicts a gradual increase in global supply, but a shift in demand from exports to intra-continental trade during this period, with global supply decreasing from around 30% to just over 18% over time (as a percentage of the total supply opportunity). Energy efficiency improvements and the increasing penetration of renewable energy are two of the main reasons for this trend on the global market.

The NZE scenario indicates that the global supply opportunity (as a percentage of the total supply opportunity) has declined significantly from around 30% to just over 6%. Natural gas trade as LNG fell by 60% and pipeline trade declined by 65% between 2020 and 2050, primarily as a result of the phase-out of natural gas in the electricity sector. In the same period, African demand experienced a compound annual growth rate of 3,2%.

The natural gas market becomes increasingly localized in both scenarios, similar to crude oil (petroleum products). Regardless of the trajectory of international decarbonization, it is essential to foster intra-African trade relationships and build infrastructure to facilitate trade on Africa's natural gas market.

DEVELOPMENT ROADMAP: CRUDE OIL AND PETROLEUM PRODUCTS

The continent has enough crude oil reserves to meet its growing petroleum demand as well as an increased global market share.

Figure 3 illustrates the anticipated decline in crude oil reserves of the focus countries for this study over the outlook period. Based upon the current conditions of existing crude oil fields, Southern Africa's producing oil fields are expected to deplete in the medium-term and Central Africa's oil fields will deplete gradually over the longer-term.

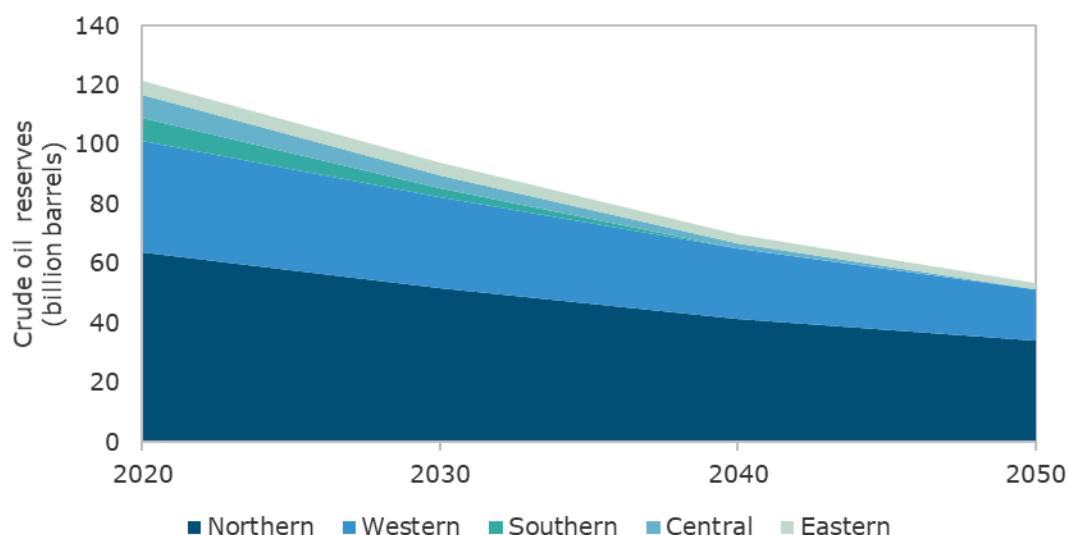


Figure 3: Crude oil reserve outlook

INVESTMENT

A few countries dominate regional oil reserves, including Libya in the north, Nigeria in the west, and Angola in the south. Oil exploration and development in other regional countries should be promoted on a short-, medium- and long-term basis as a risk mitigation strategy.

Countries with sufficient oil reserves should be encouraged to increase production, such as Libya in Northern Africa, Sudan and South Sudan in Eastern Africa, Nigeria in Western Africa and Chad in Central Africa.

Investment in oil field development and associated production facilities in countries that possess oil reserves but do not produce (including but not limited to Mauritania, Uganda, Nigeria, Senegal, Namibia) should be promoted.

Since the exploration process takes time, oil exploration should begin before the country or region's reserves have depleted. Countries with oil reserves expected to deplete in the medium-term (such as Egypt, Angola, Ghana and Equatorial Guinea) and the longer-term (such as Algeria, Gabon, Chad, and Republic of Congo) should be encouraged to shift focus from increasing production to exploration and development of new reserves in the short-term and medium-term respectively.

Investment in new trans-continental pipeline projects, such as LAPSSET, EACOP, AZOP and Niger-Chad pipelines, should be encouraged³.

TRADE

Increasing production and value addition infrastructure, storage and transmission infrastructure (domestic and international) are essential.

³ LAPSSET connecting Kenya, Ethiopia and South Sudan; EACOP connecting Kabaale, Hoima district in Uganda to the Chongoleani Peninsula near Tanga Port in Tanzania; AZOP connecting Lobito refinery in Lobito, Angola to Lusaka, Zambia; Niger-Chad connecting the Agadem oil field in Niger to the Doba Basin in Chad, where it would be connected to the existing Chad-Cameroon Oil Pipeline, for export through the Port of Kribi in Cameroon.

In order to facilitate trade, existing transborder pipelines, such as SUMED, Tazama, Chad-Cameroon and Petrodar, should be fully utilized⁴.

In order to facilitate inter- and intraregional trade between countries, countries in close proximity should be encouraged to evaluate and possibly consolidate economic groups on a regional and continental level. This will avoid the need for each country to increase production of crude oil or petroleum products, instead focusing on achieving regional self-sufficiency. It will be possible to conduct effective trade between all African countries if they are unified into a consolidated economic community (such as AfCFTA).

Countries with existing export terminals could be presented with the opportunity to increase production and expand export terminals, such as Algeria, Egypt and Libya in Northern Africa; Sudan in Eastern Africa; Angola in Southern Africa; Ghana and Nigeria in Western Africa; Chad and Republic of Congo, Equatorial Guinea and Gabon in Central Africa.

INFRASTRUCTURE

Self-sufficiency in continental refined petroleum demand would require the full utilization of existing refinery capacity as well as the construction of new refineries. The full utilization of continental refining capacity (which will require refurbishment work) has the potential to increase production by up to 1,1 million bpd, which represents 75% of the anticipated additional short-term supply requirement. Furthermore, new refineries will be required (0,35 million bpd in the short term, 1,5 million bpd in the medium term, and 1,58 million bpd in the long term). The construction of new refineries or the expansion of existing refineries should be encouraged in countries with abundant oil reserves and established associated infrastructure, with consideration given towards shared infrastructure developments between neighbouring countries.

ENERGY ACCESS

Access to modern energy is essential for the provision of clean water, sanitation and healthcare, and for the provision of reliable and efficient lighting, heating, cooking, mechanical power, transport and telecommunication services.

Refined crude oil products such as LPG, paraffin, diesel, heavy fuel oil and gasoline can be used as energy sources to assist certain regions and countries with power generation, transport, cooking, heating and lighting. Sub-Saharan Africa should be prioritised, accounting for three-quarters of the global energy access deficit.

DEVELOPMENT ROADMAP: NATURAL GAS

The continent is endowed with abundant natural gas resources that are not only sufficient to meet long-term demand, but also can be enhanced in order to cater to the needs of an expanding market.

Figure 4 illustrates the anticipated decline in natural gas reserves of the focus countries for this study over the outlook period. Due to low production volumes, significant natural gas reserves are expected to exist on the continent for the foreseeable future.

⁴ SUMED connecting the Ain Sokhna terminal in the Gulf of Suez, near the Red Sea, to the offshore Sidi Kerir port in Alexandria in the Mediterranean Sea; Tazama connecting the port of Dar-es-Salaam, Tanzania, to the Indeni Petroleum Refinery in Ndola, Zambia; Chad-Cameroon connecting the Doba Oil Field in southern Chad to a floating export facility at Kribi, Cameroon; Petrodar connecting the Upper Nile State (South Sudan) to the Red Sea (Sudan).

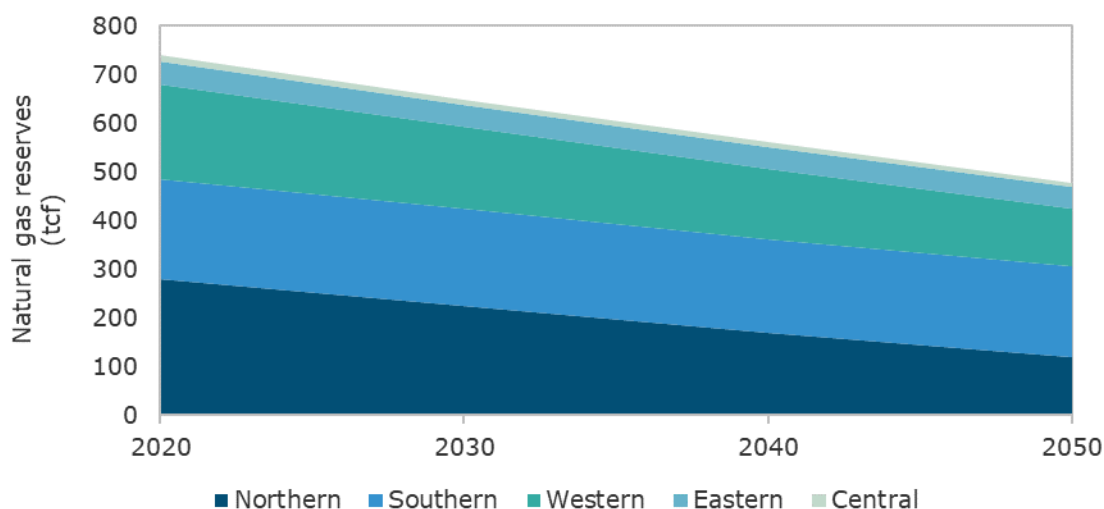


Figure 4: Natural gas reserve outlook

INVESTMENT

A few countries dominate regional natural gas reserves, such as Mozambique in the south, Nigeria in the west, Tanzania in the east and Republic of Congo in Central Africa. Natural gas exploration and development in other regional countries should be promoted on a short-, medium- and long-term basis as a risk mitigation strategy.

It is encouraged that Northern, Western, Eastern and Southern Africa should continue to increase their gas production and promote gas exports from Northern- and Western Africa to Southern-, Central-, and Eastern Africa.

Investment in various trans-regional pipeline projects, such as WAGP, ARP, ROMPCO, TSGP and Ghana-Côte d'Ivoire, should be encouraged, along with new trans-continental pipeline projects, such as the GALSI pipeline⁵.

Gas production is expected to commence in Mauritania and Mozambique in the near future and the possibility of increasing production should be explored. Recent discoveries of natural gas in South Africa should encourage the country to commence production and continue to exploit the reserves already discovered. Production in Nigeria should be promoted in order to increase regional gas production. The majority of Eastern Africa's natural gas reserves is held by Tanzania, and this country should be encouraged to increase its production as well as promote the proposed LNG export terminal on the Indian Ocean.

TRADE

The majority of Africa's natural gas reserves are located in Northern, Southern, and Western Africa. It is desirable to promote intra- and interregional gas trade, focusing on serving Eastern and Central Africa.

⁵ Medgaz connecting Algeria to Spain; GME connecting the Hassi R'Mel gas field in Algeria to Cordoba, Spain, through Morocco, where it is connected to the Spanish and Portuguese gas grids; Trans-Mediterranean connecting Algeria via Tunisia to Sicily and mainland Italy, with an extension to Slovenia; AGP connecting Egypt to Jordan, Syria and Lebanon; EMG connecting the Israeli terminal of Ashkelon to the Egyptian receiving station of Al-Arish; Greenstream connecting Mellitah in Libya to Gela, in Sicily, Italy; ROMPCO connecting the onshore gas fields in Pande and Temane in Mozambique to Gauteng, South Africa; WAGP connecting Nigeria's Escravos region of the Niger Delta area to Benin, Togo and Ghana; ARP connecting Mozambique's gas-rich Rovuma basin to Gauteng, South Africa; Ghana-Côte d'Ivoire connecting the gas processing plant near Atuabo, in the Western region of Ghana, to the border of Cote d'Ivoire; GALSI connecting Algeria to Italy via Sardinia; TSGP connecting Nigeria's resources to Hassi R'Mel in Algeria, linking to a wider regional network of pipelines, including GME, Medgaz, Trans-Mediterranean.

Mauritania, Tanzania, Libya, Mozambique and Nigeria remain best positioned to meet and sustain long-term gas demand, along with supply from Egypt, Algeria and Republic of Congo. Considering the dwindling reserves in the Western region, intra-regional trade from Nigeria or Gabon to Equatorial Guinea and Ghana should be encouraged to ensure regional security of supply.

Planned production increases are primarily destined for the international market. Thus, it is imperative that intra-regional trade with countries with little or no gas reserves be encouraged, to service existing and future domestic markets.

Medgaz, GME, Trans-Mediterranean, AGP, EMG and Greenstream pipelines capacity utilisation should be increased, if possible, to reach a greater international piped gas market⁵.

Tanzania's LNG terminal might be feasible on the Indian Ocean, which could facilitate trade with other African and international markets. Furthermore, Mauritania and Mozambique are expected to have operational LNG export facilities in the medium-term, that could potentially support increased export volumes.

In the absence of new infrastructure for the supply and transport of natural gas, reductions in flaring and venting of natural gas could make at least 350 bcf of natural gas readily available over the next few years (IEA, 2022) (ACTING, 2021).

INFRASTRUCTURE

It is imperative that future infrastructure development is directed toward serving the needs of the continental market, which accounts for 88%, 89%, and 97% of the projected growth in the BaU gas market over the short, medium, and long-term, respectively.

Countries with existing export infrastructure (such as Algeria, Angola, Nigeria) should be encouraged to increase gas production, and build new or expand existing LNG export facilities and transmission pipelines (international and domestic), to allow for additional export volumes. Shared infrastructure developments between neighbouring countries should also be encouraged (an LNG export terminal for Algeria and Libya, for example).

ENERGY ACCESS

Natural gas can be used as energy sources to assist certain regions and countries, with power generation, transport and cooking. Sub-Saharan Africa should be prioritised, accounting for three-quarters of the global energy access deficit.

ACTION PLAN

As a first step towards a strategic plan, an action plan for the expansion of continental and regional oil and gas markets in Africa is proposed, offering stakeholders with broad actions for consideration.

PUBLIC SECTOR

Regional financial frameworks, as well as joint procurement frameworks at the regional level may be developed by the public sector to facilitate the coordination of fund raising and to ensure economies of scale are achieved. Developing attractive regulatory and fiscal terms, as well as de-risking instruments will be essential to attracting and securing investment in the oil and gas sector. Furthermore, the establishment of energy banks to finance African energy projects and the promotion of investment opportunities may contribute to sustained investment in the continent.

Developing and harmonising oil and gas specifications (standards), along with regional pricing policies (currencies and tariffs) may facilitate cross-border trade.

Infrastructure agreements (general terms and conditions; including third-party access) and construction standards, as well as a public-private partnership (PPP) framework that encourages investment and participation could boost bulk infrastructure projects throughout the continent.

Energy access in Africa may be enhanced by subsidy programs and access to a portfolio of least-cost energy options.

The extension of current exploration licenses and the establishment of strategic reserves/stockpiles for petroleum products and natural gas should be considered as a means of mitigating the impact of the Covid-19 pandemic and the impact of the Russia-Ukraine conflict on global supply chains.

PRIVATE SECTOR

The African oil and gas market would require increased private sector investments in regional value chains and value additions. Engagement programs with the community are crucial for avoiding unreasonable resistance and securing a 'license to operate'. Further, the private sector can play an important role in the establishment of energy banks to finance African energy projects. It may be possible to attract future capital and customers through the decarbonization of existing oil and gas production activities.

For intra-continental trade to increase, the private sector must prioritize intra-African trade, recognizing the growing domestic demand for crude oil, natural gas, and refined petroleum products.

PPPs are essential for infrastructure projects to expedite execution and ensure project viability.

It is possible to improve energy access to the local community through the establishment of local affordable appliances.

CIVIL SOCIETY AND COMMUNITIES

Engaging public and private investors constructively (through NGO's and community forums) may ensure that oil and gas investments benefit the communities in a fair and equitable manner.

Promotional and educational campaigns promoting gas and refined product applications could contribute to the development of markets and trade.

There can be significant benefits to surrounding communities from developments in the oil and gas sector, such as access to electricity, gas, and water, as well as providing goods, services, and labour during project construction and operation.

INTERNATIONAL AND REGIONAL INSTITUTIONS

By way of pro-active information sharing and advertisement of upcoming projects (investment opportunities and associated investment sizes), provision of investment support (e.g. World Bank and International Monetary Fund), co-investment (e.g. International Finance Corporation), and provision of investment protection (e.g. Multilateral Investment Guarantee Agency), investments can be encouraged in the oil and gas sector. There may be an opportunity to pool resources and facilitate investment in the African hydrocarbon sector by establishing an African energy investment bank (similar to the African Export-Import Bank).

It is possible to boost intra-regional and inter-regional trade by developing and maintaining regional databases (production, consumption, supply, demand, prospects). Transport corridors can serve as a gateway to existing and upcoming markets by creating regional networks of trade routes (traditional as well as virtual). AfCFTA could benefit from the participation and support of international and regional institutions, as well as harmonisation of industry standards and codes.

A regional infrastructure database can be developed and maintained to improve capacity utilization (transmission, distribution, storage, refining, processing, export/import terminals, etc.). Coordination of cross-border infrastructure can ensure the least-cost development of infrastructure. It is imperative that institutional and individual skills, as well as resources, are developed in order to ensure the successful implementation and operation of local labour-based projects.

It is imperative that the development of energy services be coordinated with the development of productive uses in order to create the income base to fund the energy investments.

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The African Energy Commission (AFREC) is a specialised energy agency of the African Union (AU), mandated to develop the African energy sector through the facilitation, coordination, harmonization, protection, conservation, development, promotion of rational exploitation, commercialization, and integration of energy resources in Africa. It engages actively with a broad network of experts and partners in the 55 AU member states, ensuring that all energy initiatives align with the future development of the energy sector in Africa and the pursuit of building 'the Africa We Want'.

We welcome comments on this report and these can be addressed to:

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