African Energy Chamber

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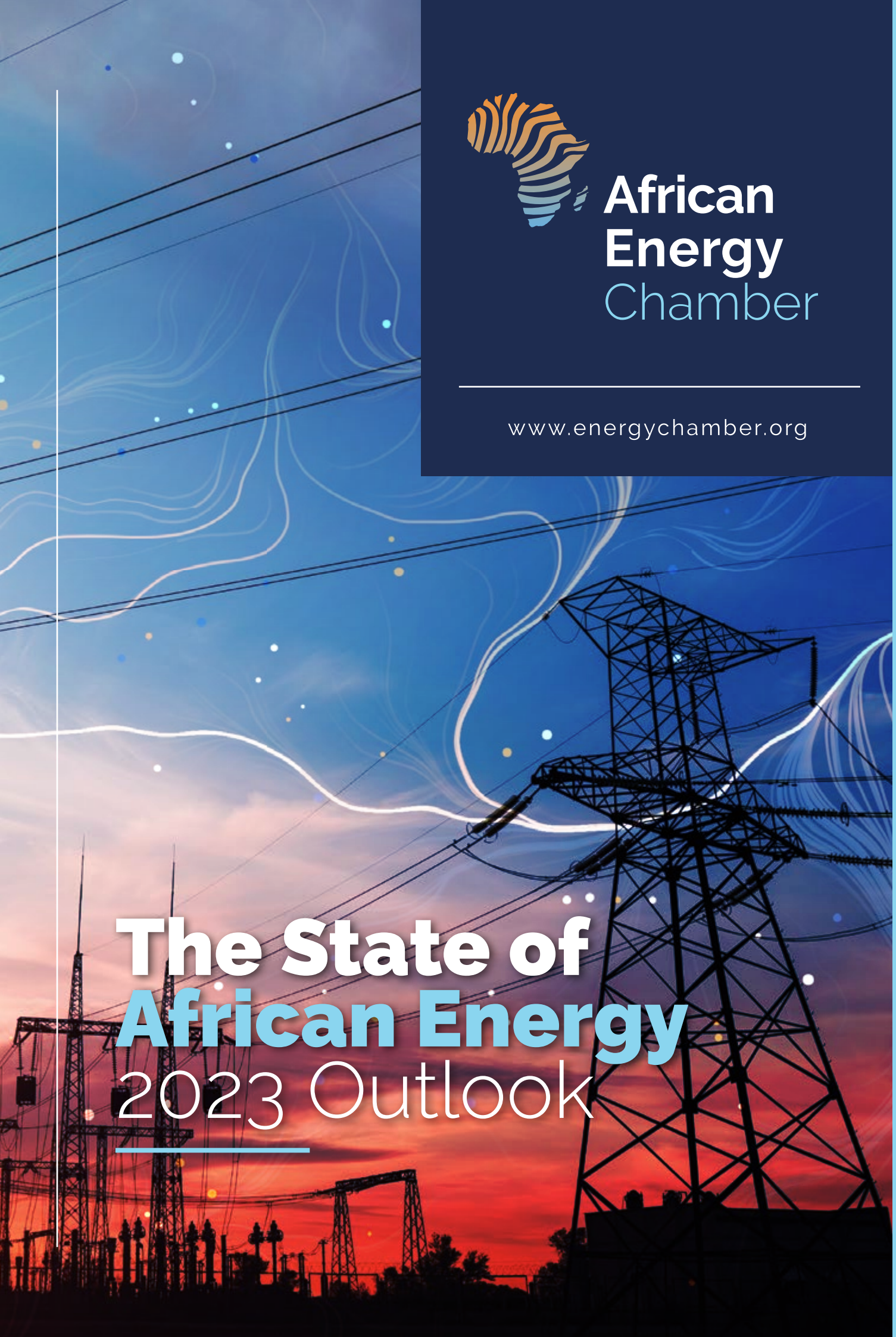

The State of African Energy 2023 Outlook

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The State of African Energy 2023 Outlook

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Key Highlights

- The announcement of European Union (EU) ban on Russian oil starting 5th December 2022 is set to remove 1.3 million bpd of Russian oil from European market and oil product imports ban starting February 5th will take out 1 million bpd of refined products
- In the longer term, an average drop of 1.65 million bpd of Russian oil expected over the period 2022 – 2030 as compared to the previous annual outlook
- While the Russian output takes a beating, global oil supply expected at the same level as the previous annual outlook, thanks to supply growth from the US and Middle East
- In the short term, this ban on Russian oil is expected to result in a tight market and Brent in 2022 running high despite some supply growth from the United States, Saudi Arabia and Iran (in the case of a nuclear deal)
- While initial total liquids demand vs supply was expected to stay balanced through the remainder of 2022, recession-fears and lower GDP expectations hit oil demand and raise inventory levels
- Short-term (2022 – 2023) month-on-month global oil + condensates output is expected to see a steady marginal growth due to increased flows from the North American shale and Middle East
- 2022 global production is estimated at 81.16 million bpd and 2023 flows are estimated at a higher 85.3 million bpd
- Libya outages drew down African liquids output in 1H 2022 but supply expected to be stable at 7 – 7.1 million bpd through the remainder of 2022 and 2023
- Western sanctions and operator exits post-Russia's invasion of Ukraine result in drastic drop in Russian natural gas output and overall global natural gas production in the short- to medium-term
- Europe is expected to depend on large LNG imports to meet the demand and this is expected to result in high European gas prices, higher than East Asia LNG in the short-term
- As Russian imports decrease and Europe relies on LNG imports, the current LNG supply in development pipeline is expected to fall short of the demand and requires new developments
- Nigeria, Algeria and Egypt are expected to lead African gas and LNG flows in the short-term
- Brent runs high as net impact of EU embargo on Russian oil and demand strength continue the market turbulence started by COVID-19 almost three years back
- Production through the decade supported by increasing oil flows from North America and Middle East while natural gas flows are expected to be driven by the same two regions and Africa
- An increase of about US$130 billion in cumulative capital expenditure (CAPEX) spending over the period 2022 – 2025 expected as global spending uptick overrides the drop in Russian CAPEX
- Half the near-term CAPEX spending to come from North American and Asian projects
- No substantial growth in near-term African CAPEX spending compared to the previous forecast, as most major project sanctions are expected to happen post-2025
- African crude oil supplies resilient to post Russia – Ukraine conflict markets as forecast remains same as pre-war and marginally raised compared to 2022 outlook
- Nigeria, Libya, Algeria and Angola – the main drivers of liquids supply through the decade
- Libya expected to see the maximum growth in the Medium-term compared to 2022 liquids supply outlook provided internal conflicts subside, whereas, natural declines taking down Nigeria and Algeria
- Natural gas supply expected to be unchanged from previous forecast as well as pre-war forecast
- Natural decline from producing gas fields expected to be irreversible with any growth expected only from new developments
- Ample opportunity to grow natural gas exports to under-supplied Europe and global LNG markets but possible at the cost of large greenfield spending as most of the potential in pre-FEED stage
- An uptick in near-term CAPEX forecast compared to previous outlook as recent, new and upcoming Final Investment Decisions (FIDs) in countries like Mauritania – Senegal, Uganda, the Republic of the Congo,

Mozambique, Ghana, Angola and Cote d'Ivoire drive the greenfield spending

- While 2022 is expected to see upstream investment totaling just over US$33 billion in Africa, the estimated growth in African upstream expenditure over the years 2023 – 2025 is close to US$15 billion when compared to the estimates from year-end 2021
- Increased greenfield spending in the near-term leading to an increased overall spending forecast with sub-Saharan Africa driving the bulk of the greenfield and brownfield spending
- Close to 17 billion boe of recoverable reserves transiting from contingent to greenfield phase in the near-term
- Drilling activity expected to increase marginally from about 895 wells in 2022 to 915 wells in 2023 and further to just over 1000 wells in 2025
- 2022 rig demand sees a 20% growth versus 2020, and 2023 demand estimated to increase further by 30% over 2022 levels, indicating a busy market for drilling service providers
- Namibia's mega discoveries drive 2022 bumper discovered volumes and inspire more wildcats in the Southern African region, with 10 more high impact wells (HIWs) scattered across Africa expected to be drilled in the coming 18 months
- As many as 18 exploration licensing rounds offering frontier as well as explored acreage in the MSGBC basin, other regions of West Africa and across North and East Africa expected to award blocks by the end of 2023
- International oil majors and National Oil Companies (NOCs) in collaboration with these majors continue to be the largest producers in Africa with about 75% of the 2022 – 2023 African hydrocarbon output coming from these operators
- Sonatrach (Algeria), Nigerian National Petroleum Corporation (NNPC – Nigeria) and NOC Libya constitute the majority of the flows from NOCs in Africa
- Eni, TotalEnergies and BP round off the top three majors in Africa in terms of production
- Independents growing in size with acquisitions from majors in West Africa
- As projects offshore and onshore in countries like Mauritania – Senegal, Namibia, South Africa, Mozambique, Tanzania and other upcoming oil and/or gas economies come online, these countries are expected to produce about 8% of Africa's oil and gas output over 2026 – 2030, increasing to about 20% over the period 2031 – 2040
- Cumulative volumes from these countries/projects are expected to average almost 1 million boepd over 2026 – 2030 and almost 2.5 million boepd over the next decade
- Africa's current access to electricity status requires tremendous improvement barring a few countries
- Rural access to electricity is low even in countries with high overall electricity access, thus pointing at the necessity to improve universal electricity access
- High dependance on fossil fuels for power generation expected to remain in the near-term
- Natural gas expected to constitute about 40% of the power mix over 2023 – 2030 but lot of space for improvement as existing upstream gas potential is over 450 Tcf with about 65% of it still in pre-FEED state of development
- Solar photovoltaic (PV), onshore wind and hydrogen expected to be the main sources driving the renewable energy capacity in Africa through 2030s
- Africa's contribution to global solar PV, onshore wind and hydrogen in 2022 – 2%, 1% and <0.5% with capacity volumes of 12.6GW, 10GW and sub-0.5GW, respectively
- Africa still a [minnow?], even in the medium-term, contributing to a cumulative 4% of solar PV, 3% of onshore wind and a fifth of hydrogen generated capacity through 2023 – 2035
- African Solar PV, onshore wind and hydrogen capacity to reach 70GW, 51GW and 50GW, respsectively
- Mauritania, Morocco and Egypt expected to be the leaders in renewables in the medium-term
- Asian financial institutions continue to be the leaders in funding fossil fuel projects but European institutions are also expected to fund gas developments as EU rules gas investments as "green" to meet the demand post-Russia – Ukraine conflict

Oil Markets Turbulence Continues As The Russia – Ukraine Conflict Takes Over From Covid

The announcement of the European Union (EU) ban on Russian oil starting 5th December 2022 is set to remove 1.3 million bpd of Russian oil from European markets and oil product imports ban starting February 5th will take out 1 million bpd of refined products

In the longer term, an average drop of 1.65 million bpd of Russian oil expected over the period 2022 – 2030 as compared to the previous annual outlook

While the Russian output takes a beating, global oil supply expected at the same level as the previous annual outlook, thanks to supply growth from the US and Middle East

In the short-term, this ban on Russian oil is expected to result in a tight market and Brent in 2022 running high despite some supply growth from the US, Saudi Arabia and Iran (in the case of a nuclear deal)

While initial total liquids demand vs supply was expected to stay balanced through the remainder of 2022, recession-fears and lower GDP expectations hit oil demand and raise inventory levels

Short-term (2022 – 2023) month-on-month global oil and condensates output is expected to see a steady marginal growth due to increased flows from the North American shale and Middle East

2022 global production is estimated at 81.16 million bpd and 2023 flows are estimated at a higher 85.3 million bpd

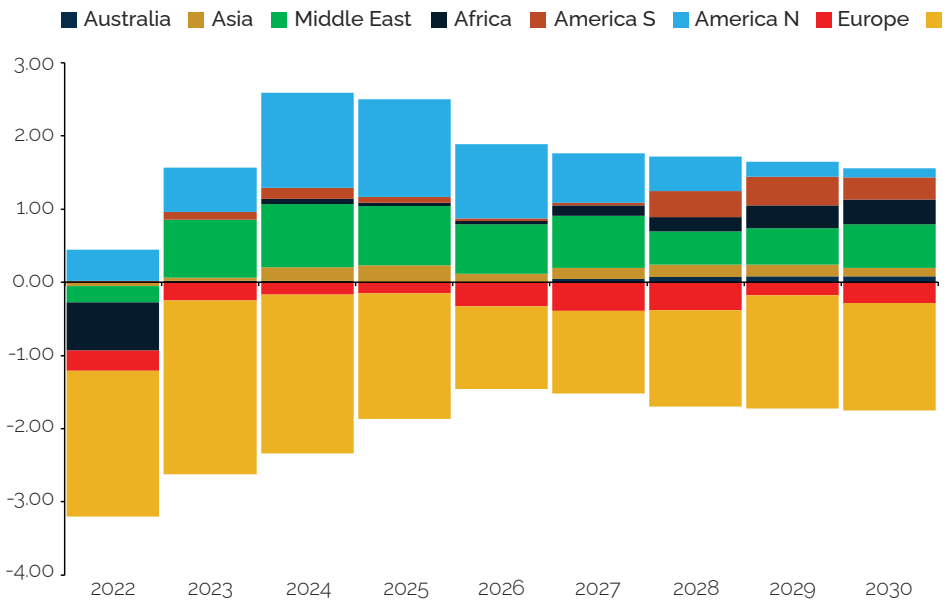
Libya outages drew down African liquids output in 1H 2022 but supply expected to be stable at 7 – 7.1 million bpd through the remainder of 2022 and 2023

1.1 Russia's invasion of Ukraine resulting in adverse impact on Russian oil flows

Russia's crude production looks set to slump by an average 1.65 million barrels per day (bpd) over the period 2022 – 2030 according to the latest forecast as against the 2021 average forecast, in the wake of conflict in Ukraine and resultant Western sanctions and oil company exits. The flight of foreign players from the country's upstream sector is expected to result in shortages in equipment and technology, which could have a detrimental impact on output. The exodus of foreign majors from Russia will affect both producing and future projects. Apart from projects in Russia where foreign players are present, other developments may experience postponements due to financial sanctions and consequent disruptions to the supply of equipment and technology. The latest implemented

1.1 Russia's invasion of Ukraine resulting in adverse impact on Russian oil flows

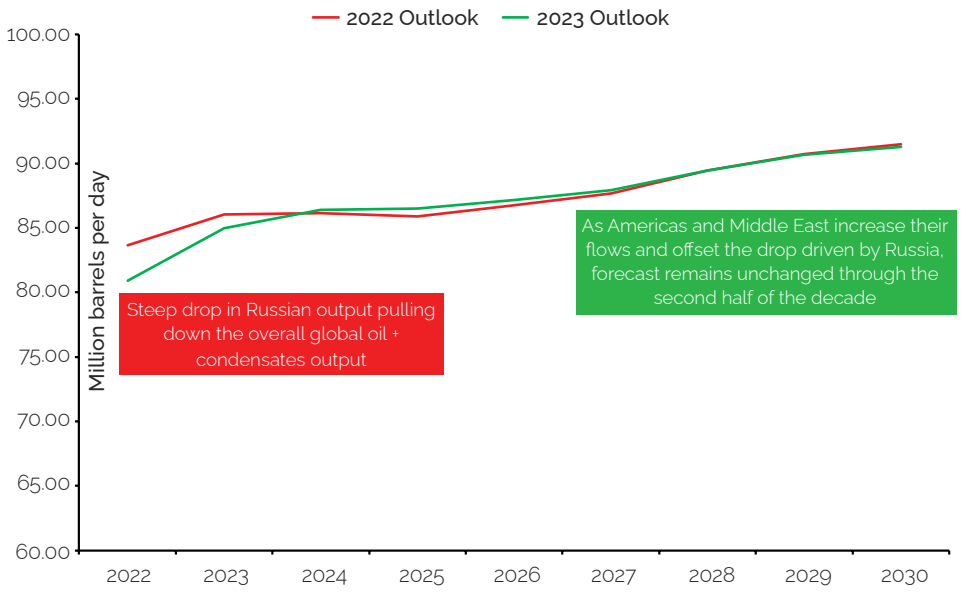
An average ~1.65 million bpd of 2022 – 2030 Russian oil and condensates output expected to be taken out compared to forecasts from 2022 outlook



Source: Rystad Energy UCube

ban of 2.3 million bpd of Russian oil by the EU puts the forecast in further risk. 2022 oil output from Russia is expected to see a contraction of almost 2 million bpd compared to the outlook last year. Any chances of recovery are impacted by the possible delays in start-ups and reduced greenfield schemes combined with the production decline on giant mature fields. To maintain production at higher levels, Russian operators will need to significantly increase investments, exploration and development drilling. Russian oil output can be expected to enter a chronic decline phase if the conflict does not de-escalate sooner than later.

Additional flows from the Americas and Middle East expected to offset the drop in Russian volumes



However, long-term global oil and condensates output is expected to stay at 2021 forecasted levels as the drop in Russian volumes is offset by the growth in supply from the Americas and Middle East. The average impact of the reduced Russian flows over the period 2022 – 2030 as well as on a year-on-year basis over the same period are expected to be offset by the increased flows from the US and Middle East. While 2022 – 2023 are expected to see marginally lower flows of about 81.45 million bpd and 85 million bpd respectively as opposed to the 2021 forecast of 83.7 million bpd and 86 million bpd, global oil and condensates flows going forward seem to stay at levels similar to forecast from the 2022 outlook. The total global supply is expected to increase gradually from about 86.4 million bpd in 2024 to close to 91.3 million bpd by the end of the decade.

1.2 Ban on Russian crude set to result in tight market and high Brent price

2022 began with the pandemic still prevalent but at a much lower level compared to the 2020 – 2021 period. The Omicron impact on Western countries was limited and the oil market started growing more and more bullish with each Covid-19 mutation breakout. Most oil watchers were betting on the fact that we were closer to the end of the pandemic than we were at any point in the past two years and Brent broke the US$80 per barrel barrier. As the pandemic impact kept lessening, demand kept growing and supply turned short, Brent surpassed the US$90 per barrel mark leading to an increased 2022 average price assumption of US$70 per barrel. In March 2022, Brent was expected to glide north of US$100 per barrel this year due to a tightly supplied market and demand recovery spurred by the lifting of Omicron restrictions.

However, armed conflict in the heart of Europe threw oil prices into an exuberant upward cycle with Brent reaching US$139 per barrel in intraday trading, echoing oil shocks experienced in the 1970s oil embargo and during the first Gulf War in the 1990s. After two years of the global pandemic defined by negative oil prices, a demand shock like no other, and record upstream production shut-ins of wells, the oil market was again broken, but this time skewing to the ultra bullish. But soon, a downward price pressure came from China lockdowns and the US announcement to release 180 million barrels of Strategic Petroleum Reserve (SPR) volumes over the next six months.

While this shifted down the front-end of the Brent curve, Brent was expected to stay above US$100 per barrel throughout 2022 as Russian supply remained impacted, OPEC+ kept output tight, and robust oil demand stayed on track. The latest announcement of EU ban on Russian oil and products' imports reaffirms this and Brent is expected to stay at this high average of US$105 per barrel for 2022 with some respite in supply coming eventually from the US and Middle East.

While initial total liquids demand vs supply was expected to stay balanced through the remainder of 2022 as Russian supplies were estimated to remain resilient despite the EU embargo, with the banned barrels expected to be absorbed by other markets in the physically tight market, It now appears Q3 – 2022 will be a turning point when oil inventories start building after a mostly bullish marathon since May 2020 with global liquids supply outpacing demand already by August 2022 and products implied builds surging towards 2 million bpd. Crude demand (refinery intake and direct crude burn) is expected to remain more resilient, only being surpassed by crude and condensate supply by October 2022. Crude balances are set to remain much tighter as supplying crude to refineries will remain challenging amid the reshuffle of Russian crude and imminent EU embargo, but weakening margins in Asia and potential virus lockdowns may curb refiner intake. Refinery runs are set to continue growth through Sep-22, after which we expect seasonal weakness and then a slight recovery towards 83.7 million bpd by Dec-22. Weakness in China due to lockdowns and quota exports hasbeen counter-balanced

Brent running high on net impact of EU embargo and demand strength

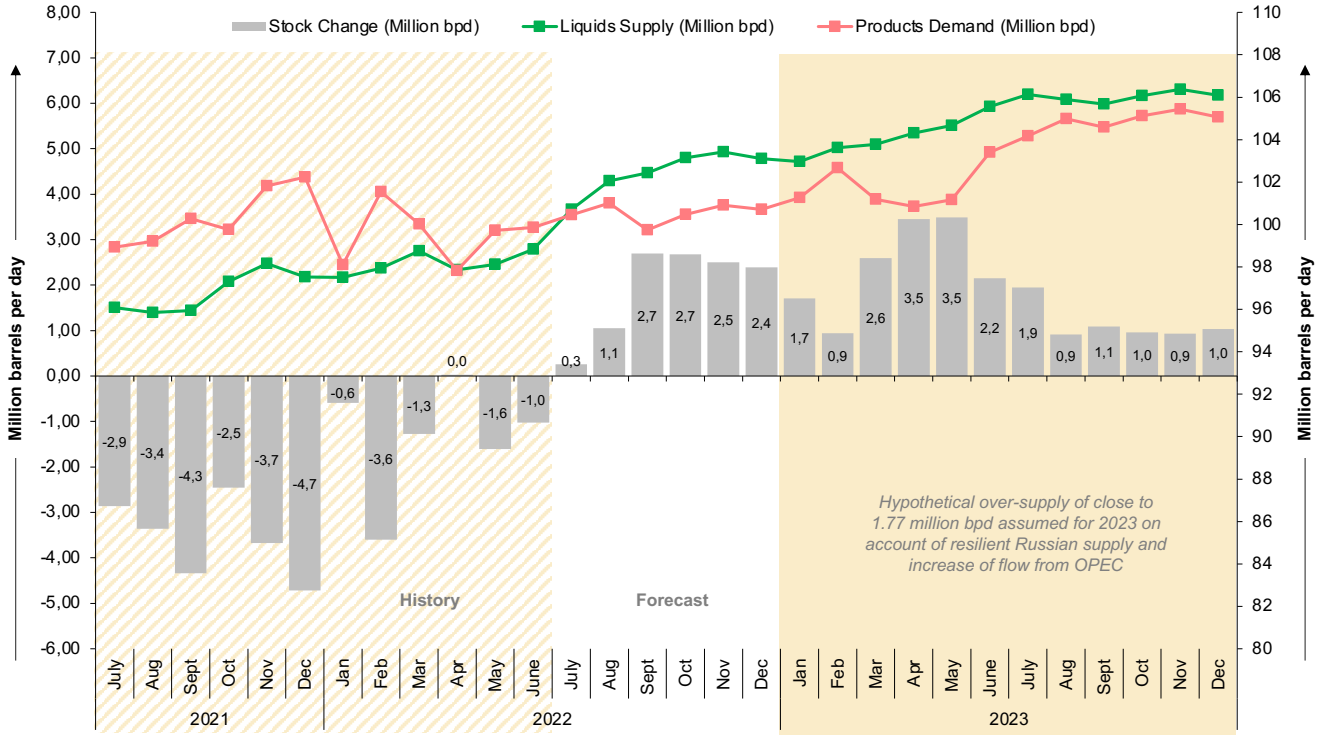
Source: Rystad Energy UCube

by relative robust utilization in the US. We see downside risk in the US due to softer than expected summer gasoline demand, but this could be offset by a heavy hurricane season that could tighten products markets. A challenged economic backdrop will hit oil demand directly, first materializing in the products market, and eventually in refinery intake. The slowdown will impact all regions, but on varying scales and time periods. Europe will be the first to be hit and will bear the biggest consequences, with a negative year-on-year growth in the 6 months ahead. Unlike Europe, other regions will only experience a severe slowdown. Global demand growth will then strengthen again in 2H23, but aviation will still lag its pre-pandemic peak.

Supply growth is also materializing, and total liquids are expected to reach an average of 100 million bpd in 2022, and crude and condensate between now and year end is estimated to grow by 2.3 million bpd, driven mostly by robust US oil growth set to surpass 13 million bpd by year-end as well as anticipated increases from core Middle East OPEC+ countries as the current supply management program is currently set to wrap up in Sep-22. Prices could find support in lower than expected supply due to OPEC+ underperformance, continued geopolitical, unrest, and sabotage-related outages in Libya, Nigeria, and Ecuador, as well as Russia using oil as a political weapon. The SPR release of an additional 20 million bbls, if live on the market before Oct-22, will widen the WTI discount versus Brent, which will initially be an isolated US event but eventually will have global impact as exports swell further. Any possible return of Covid-19 lockdowns in autumn and Russia supply as EU embargo nears continue to be the main signposts to lookout.

2023 market situation is expected to be looser compared to 2022 as supply exceeds demand on account of Russian flows remaining resilient and also increase in flows from OPEC, mainly the Middle East. The current estimates indicate a maginal over-supply of close to 1.77 million bpd for 2023 as a result. However, in a dynamic market such as now, it remains to be seen which direction the market driving factors – the current Russia – Ukraine situation, Russian supplies, Chinese lockdown possibilities and resultant demand going forward take.

Recession-fears and lower GDP expectations to hit oil demand and raise inventory levels



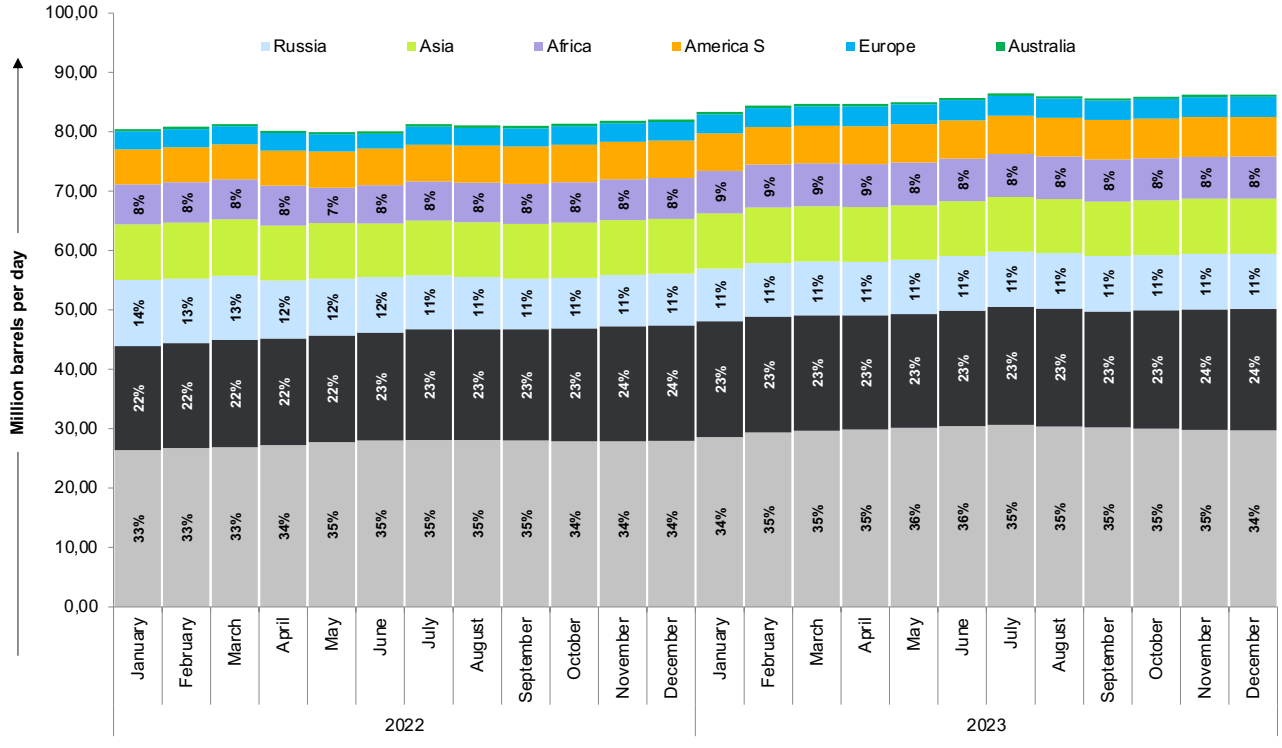
Source: Rystad Energy OilMarketsCube

1.3 Middle East drives short-term liquids supply growth while OPEC countries dominate the flows in Africa as always

Global short-term oil and condensates production is expected to be see a stable marginal month-on-month growth through to the end of 2023 despite the current Russia – Ukraine conflict and the Russian oil embargo imposed by the EU. While the total output from Russia is expected to drop from an average 10.25 million bpd in 1H 2022 to 8.72 million bpd in 2H 2022 and settle at a marginally higher 2023 average of 9.18 million bpd.

The 2H 2022 drop in Russian output is offset by Middle East and North American shale flows. The cumulative oil and condensates output from Middle East is expected to increase from an average 27.2 million bpd in 1H 2022 to about 28 million bpd in 2H 2022 and further to a higher 2023 average of 29.93 million bpd. The North American shale volumes are also expected to grow from 17.87 million bpd to 18.97 million bpd to 19.67 million bpd from 1H 2022 to 2H 2022 to 2023 respectively. As a result, the overall global average production is expected to grow from about 80.6

Middle East expected to lead growth in oil + condensates output in the short term and Africa 2023 production stable at an average 7.07 million bpd growing from 6.4 million bpd in 2022



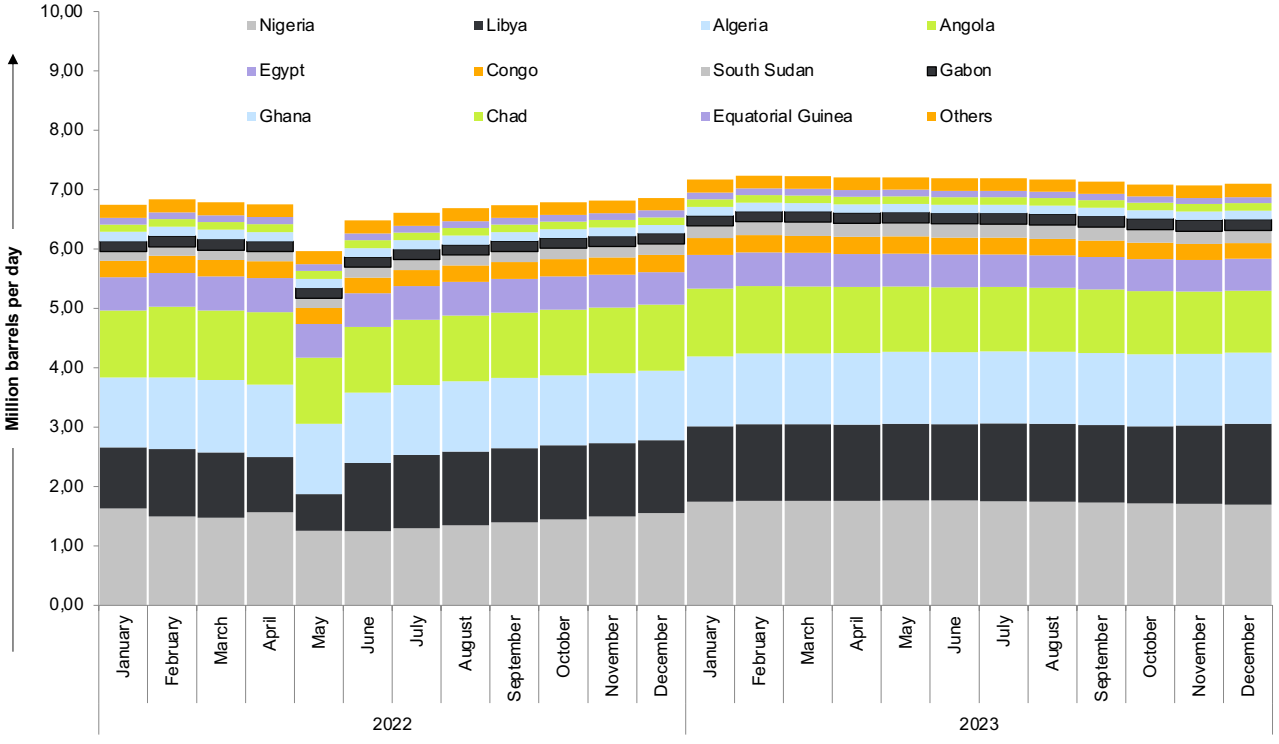
Source: Rystad Energy OilMarketCube

million bpd in 1H 2022 to 81.71 million bpd in 2H 2022 and further to 85.3 million bpd average for the full year 2023.

Meanwhile, African crude oil and condensates output is expected to stay at a flat 8% of the global volumes hovering at 7 – 7.1 million bpd over the next 18 months. The first half of 2022 saw the outages in Libya and Nigeria driving down the output. Angola has become Africa's top oil producer Nigeria's production is expected to grow from 1.65 million bpd in 2022 to about 1.75 million bpd in 2023 and Libya's output is expected to raise to 1.3 million bpd in 2023 from 1.12 million bpd in 2022. Algeria is expected to stay flat at about 1.2 million bpd over the period while Angola is expected to marginally decline from 1.13 million bpd in 2022 to about 1.1 million bpd in 2023.

OPEC producers continue to drive the output but Africa's wait to produce at capacity levels continues as the mega projects are yet to be realised for various reasons.

Outages in Nigeria and Libya resulted in 1H – 2022 drop but African crude and condensates volumes expected to be around 6.5 – 7 million bpd levels for the next 18 months



Source: Rystad Energy OilMarketCube

Gas Markets Outlook – undersupplied lng market and soaring europe gas price strips as russian volumes are taken out

Western sanctions and operator exits post-Russia's invasion of Ukraine result in drastic drop in Russian natural gas output and overall global natural gas production in the short- to medium-term

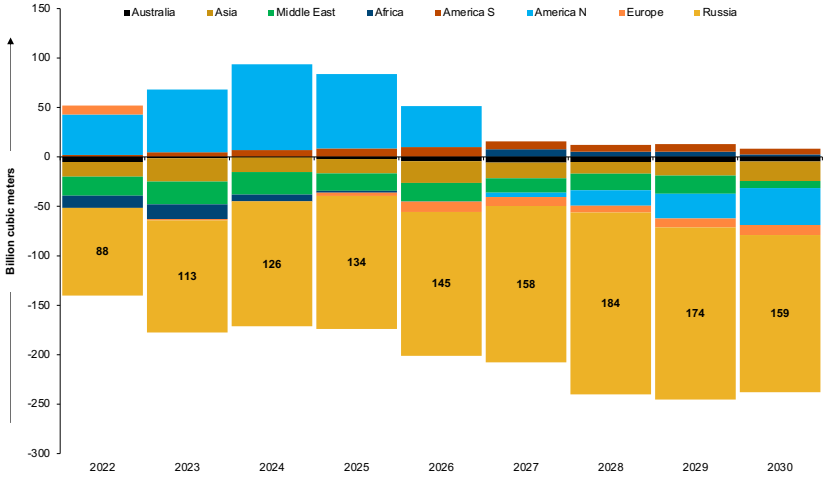
Europe is expected to depend on large LNG imports to meet the demand and this is expected to result in high European gas prices, higher than East Asia LNG in the short-term

As Russian imports decrease and Europe relies on LNG imports, the current LNG supply in development pipeline is expected to fall short of the demand and requires new developments

Nigeria, Algeria and Egypt are expected to lead African gas and LNG flows in the short-term

2.1 Russia set to lose 140 Bcm per annum of average output over the years 2022 – 2030 and global volumes suffer

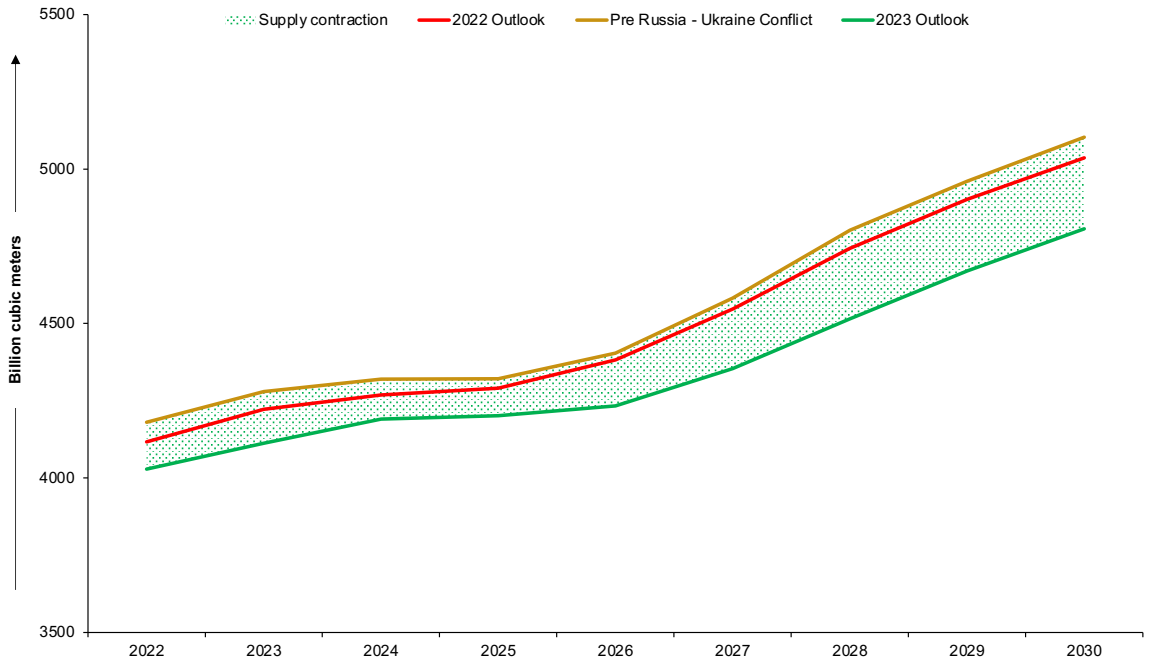
As operators exit and projects get delayed, Russia expected to see an average 140 Bcm per annum output drop over the years 2022 – 2030 as opposed to previous forecast



Source: Rystad Energy UCube

Russia was originally planning to increase its gas production in excess of 800 billion cubic meters (Bcm) by 2030. It was largely focused on expanding its footprint in China and maintaining its market share in Europe. Following Russia's invasion of Ukraine, the prospect for its export volumes to Europe appears bleak, as many European countries have expressed reservations about continuing to rely on Russia for energy security. This will have an impact on Gazprom's ambitions to develop its massive gas condensate resources in the Yamal Peninsula and in East Siberia, which will necessitate enormous expenditure due to their remote locations and lack of proximity to gas pipeline infrastructure. Due to decreasing demand from Europe, some of them are projected to be delayed by at least three to four years. The latest

Drop in Russian output dragging down the global natural gas output



Source: Rystad Energy UCube

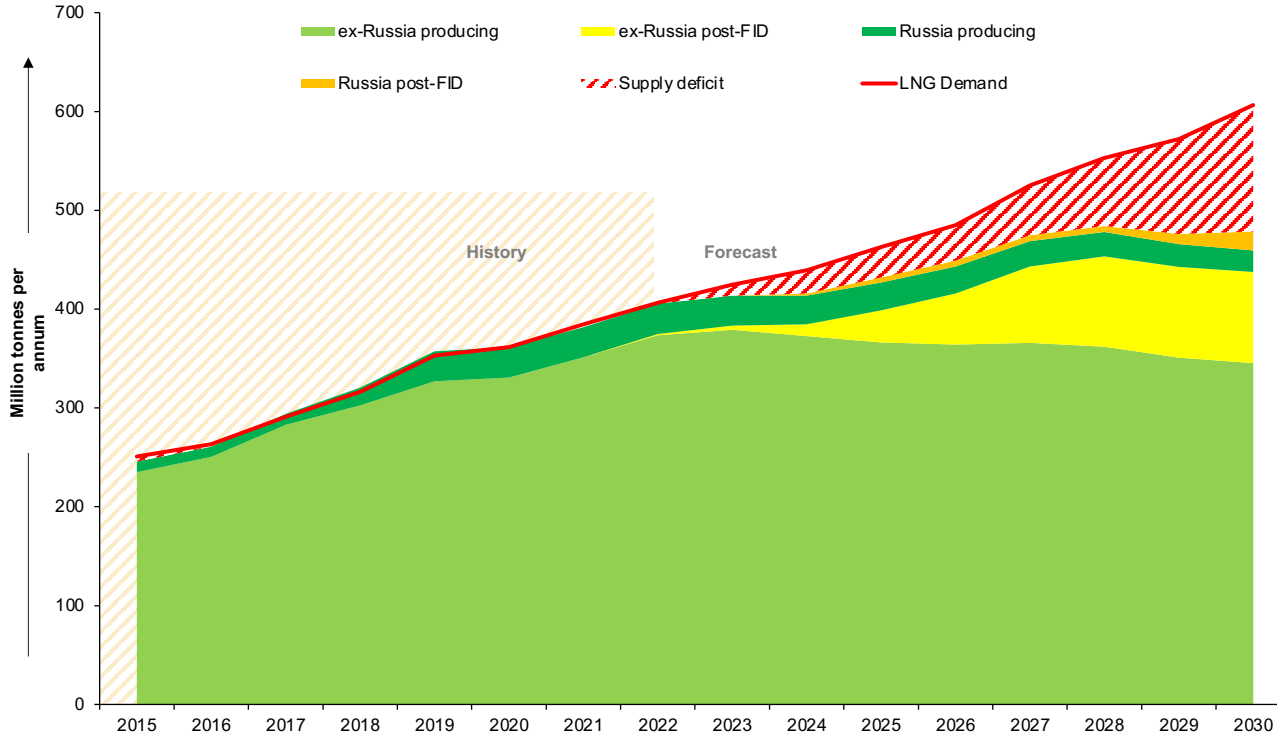
estimates put Russia's short-term gas production at much lower levels than the target as well as the previous forecast. The 2022 drop in natural gas output from Russia is close to 90 Bcm and the 2023 drop is close to 115 Bcm as opposed to the forecast in the 2022 outlook. The overall average production loss over the period 2022 – 2030 is estimated to be about 140 Bcm per annum.

As a result of this drop in Russian output, global volumes are also expected to take a hit despite some additional volumes coming from North America in the short-term. It is to be noted here that, compared to the previous forecast, the global natural gas flows were expected to rise marginally higher. But the current situation, post the invasion of Ukraine by Russia, shows a drop of about 150 Bcm in 2022 and 165 Bcm

in 2023. The average drop in global output over the period 2022 – 2030 is estimated to surpass 200 Bcm per annum.

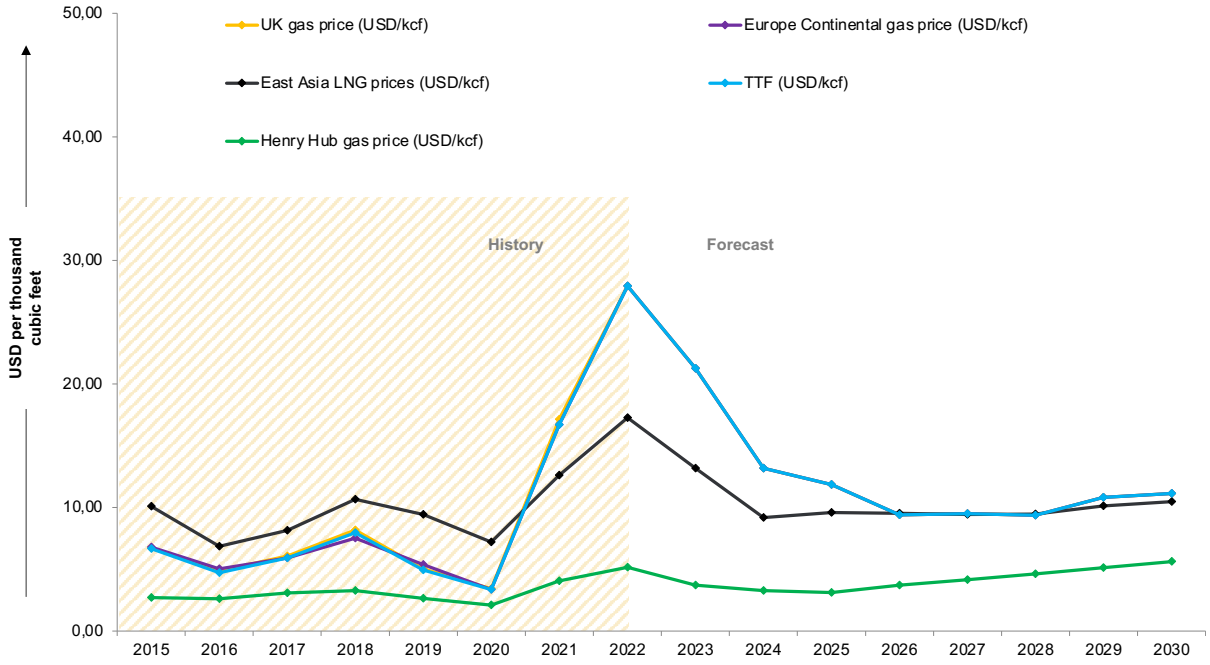
Russia's war on Ukraine has resulted in a downward revision of total Russian gas production and pipeline exports to Europe. Large volumes of LNG imports to Europe are expected to be required to substitute the Russian gas and meet Europe's gas demand. As such, the LNG market is expected to be more Eurocentric as opposed to being East Asia-centric historically. Northwestern Europe is currently seeing LNG import terminals, as well as pipeline capacity to bring gas from the United Kingdom and Spain, running at 100% of capacity driving up Europe's Title Transfer Facility (TTF) price. A structural shift in European LNG demand in the long-term to replace Russia pipeline gas is expected over the next three years. During this period, there is limited new LNG export capacity coming into the market, which will cause a global LNG market tightness. The volumes of LNG imports that Europe will need now to meet the demand put the gas prices at higher levels than East Asia LNG prices.

Close to 125 million tpa LNG global supply deficit by 2030 to be fulfilled by new developments currently in pre-FEED phase



Source: Rystad Energy UCube; Rystad Energy GasMarketCube

European gas prices soar high and expected to stay above East Asia LNG in the medium term as ban on Russian imports creates an energy void



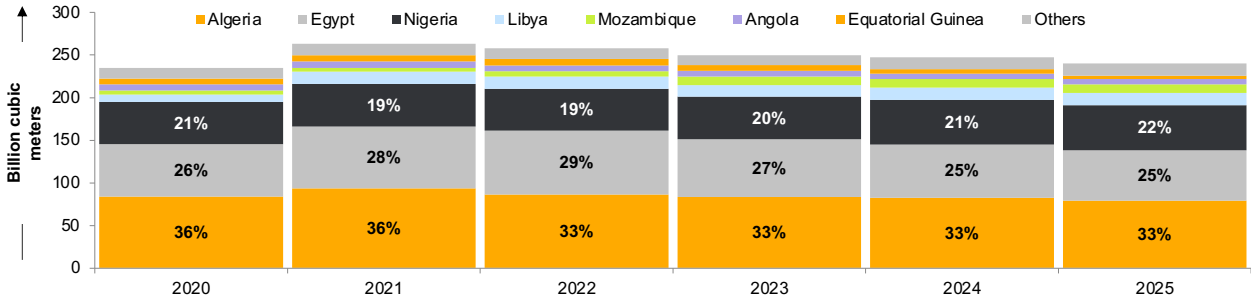
Source: Rystad Energy UCube

Russia's invasion of Ukraine and Europe's subsequent decision to wean itself off Russian gas dependence has resulted in a tectonic shift in LNG demand expectations: from Asia-centric previously to Eurocentric now. In a scramble to reduce Russian gas imports, Europe will have to consider multiple levers such as raising domestic gas production, accelerating the rollout of renewables and demand-side responses such as efficiency measures and the installation of heat pumps. However, in any scenario in which those levers are considered, the volume of Russian gas exports (around 140 Bcm in 2021) is so high that only LNG can meaningfully displace this in the medium term while minimizing the impact to the economy. Therefore, LNG demand in Europe is expected to grow from around 70 Million tpa (MMtpa) in 2021 to over 100 MMtpa in 2022, where it is likely to remain through 2030, representing an incremental 20 – 40 MMtpa of demand each year compared to previous forecasts. For the 2022 – 2026 timeframe, when the LNG market is expected to be in deficit , incremental demand in Europe is likely to be met by paring demand growth in Asia, as high prices and volatility from Europe's energy security-based demand may raise affordability concerns in the more price sensitive countries. As a result, this region may depend on coal and fuel oil longer than previously expected, resulting in a delayed energy transition even as Europe's is accelerated. Based on currently producing and sanctioned projects, a likely 125 MMtpa supply gap by 2030 can be expected, which may expand to over 150 MMtpa if the extreme downside risk of losing all Russian production (over 50 MMtpa from four projects) materializes.

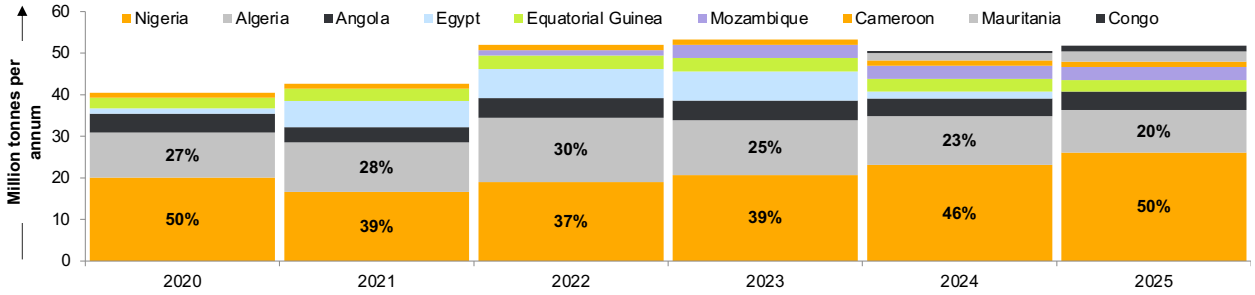
2.2 Nigeria, Algeria and Egypt remain the top three African gas producers in the short-term

Algeria responsible for a third of Africa's natural gas output over the years 2020 – 2025 and a quarter of the LNG exports

A good three quarters of the continent's natural gas supply coming from Algeria, Egypt and Nigeria in the short term



Nigeria and Algeria spearhead the African LNG exports in the short term



Source: Rystad Energy UCube

Africa is in a prime position to increase its natural gas output and benefit from an undersupplied LNG market and demand from Europe. In the near-term, however, not many large volumes are expected to come online and overall Africa natural gas output is expected to experience a marginal decline from 2022 through 2025. Ramp up is expected through the second half of this decade as Mozambique ramps up its LNG output and new gas start-ups across the continent come online and take the output on an increasing trend. But an increased focus on LNG exports is apparent with an expected uptick in near-term LNG flows from the continent. Nigeria and Algeria are expected to drive the majority of these export volumes with additional flows coming from Egypt, Equatorial Guinea, Mozambique and waters off Senegal – Mauritania. Africa stands at a point where it can benefit from historical gas trade relations with Europe, existing infrastructure to export gas to Europe, geographical vicinity to the demand centres and, most importantly, abundant natural gas potential. It is very important that both the upstream operators and policy-makers grasp this opportunity with both hands and solidify Africa's role as a global natural gas exporter before the opportunity diminishes or even worse, expires.

Global Upstream Industry Review

capital expenditure increase in the near-term as spending taken out in russia is substituted by other regions

Brent runs high as net impact of EU embargo on Russian oil and demand strength continue the market turbulence started by COVID-19 almost three years back

Production through the decade supported by increasing oil flows from North America and Middle East while natural gas flows are expected to be driven by the same two regions and Africa

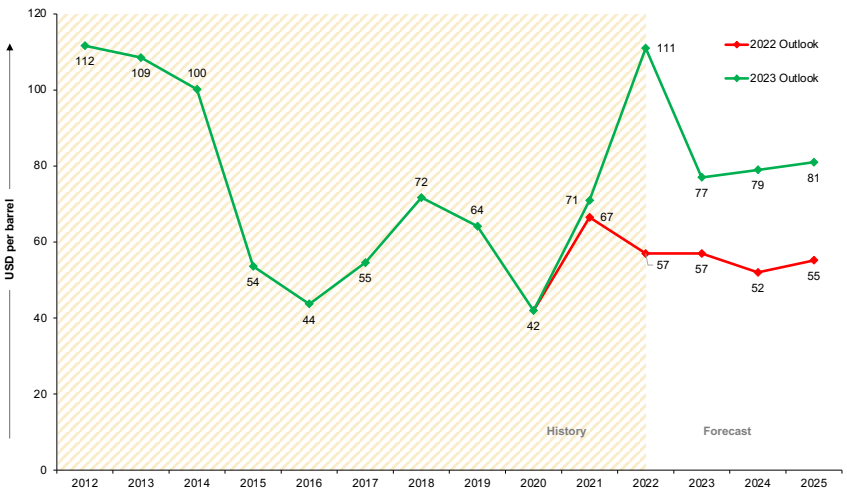
An increase of about US$130 billion in cumulative capital expenditure (CAPEX) spending over the period 2022 – 2025 expected as global spending uptick overrides the drop in Russian CAPEX

Half the near-term CAPEX spending to come from North American and Asian projects

No substantial growth in near-term African CAPEX spending compared to the previous forecast, as most major project sanctions are expected to happen post 2025

3.1 As COVID-19 subsides, the Russia – Ukraine conflict leads to Brent shot up!

Brent running high on net impact of EU embargo and demand strength

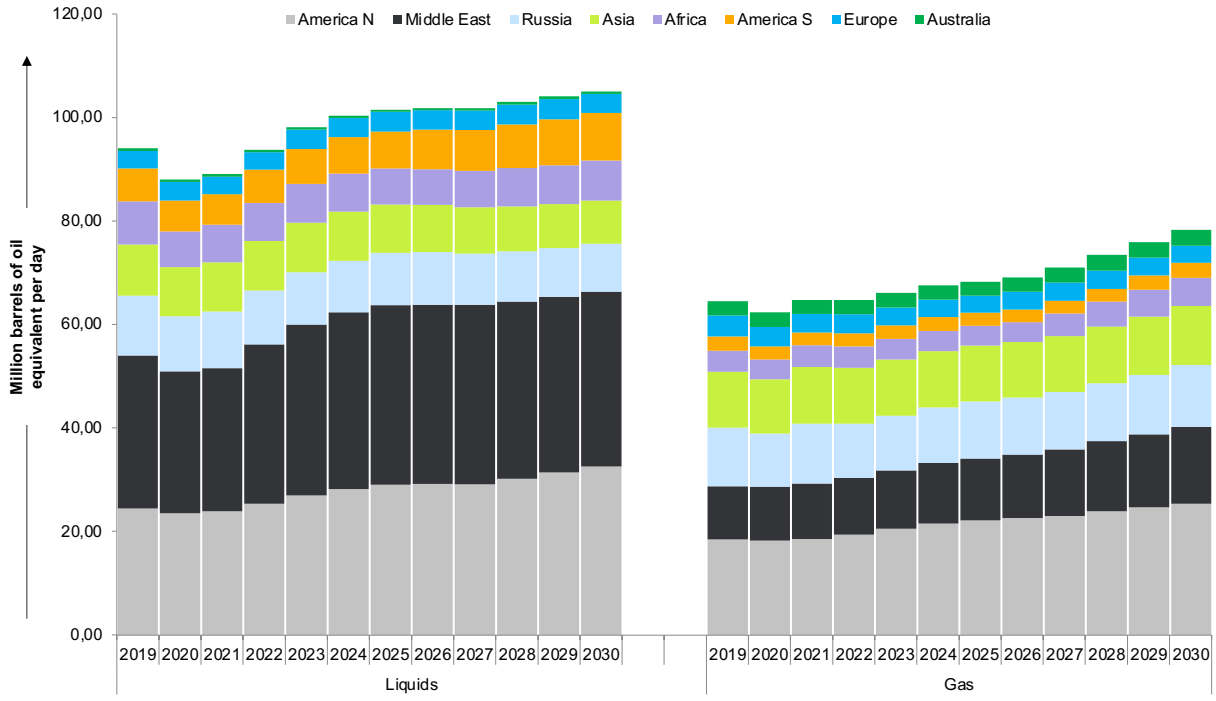


Source: Rystad Energy UCube

Brent forecast through 2022 – 2025 was expected to stay relatively flat at around US$55/barrel as COVID-19 driven lockdows eased, demand picked up and supply was stabilized. However, another global event kicked off in February 2022 as Russia picked up arms against Ukraine and threw the oil markets into a tizzy. As a result, many upstream operators and OFS providers announced their exits from Russia voicing their opinions against the attack on Ukraine. The EU also announced and solidified its embargo on Russian oil and oil products. As supply weakened, day-to-day crude prices rose up to almost US$140/barrel and the latest average Brent forecast for 2022 is expected to hit US$111/barrel compared to the previous forecast of US$57/barrel. As this is expected to have a long-term impact on oil prices, the forecast through 2025 is now expected at a much higher levels of US$77/barrel, US$79/barrel and US$81/barrel respectively for the years 2023, 2024 and 2025 compared to a much lower levels of US$57/barrel, US$52/barrel and US$55/barrel expected previously.

3.2 Global liquids supply expected to be driven by North America and Middle East while Africa expected to play a part in long-term natural gas supply

Middle East and North America expected to drive the growth in long-term liquids supply while Africa joining hands with Middle East and North America in increasing the global natural gas supply through the end of the decade



Source: Rystad Energy UCube

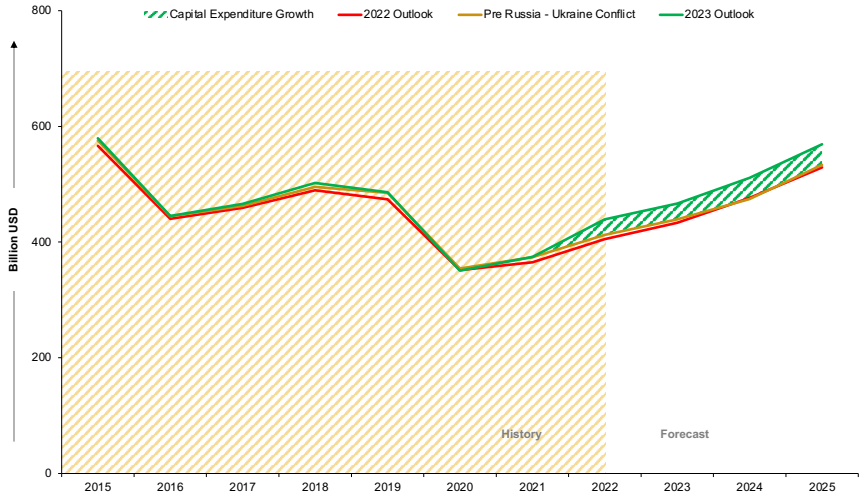
Middle East and North America are expected to be the global drivers for both liquids and natural gas supply contributing to over 60% of the global liquids output over the period 2022 – 2030 and half the global natural gas supply over the same period. While North America is expected to see a steady growth in both liquids and natural gas flows through the decade from 2022, the Middle East region is expected to see a steady growth in natural gas supply driven mainly by the growth from Qatar and Iran. The liquids flow from Middle East, however, are expected to see an increase to about 34.5 million bpd by 2025 from expected 2022 levels of 30.75 million bpd and then stabilize at 34 – 34.5 million bpd for the remainder of 2020s. Global liquids and gas supply is also expected to reach pre-COVID levels of 2019 hitting 94 million bpd and 65 million barrels of oil equivalent per day (boepd) respectively in 2022; and grow to 105 million bpd and 78 million boepd by 2030. Africa liquids production, despite not being able to make a turnaround to 2019 levels, is expected to see steady flows of about 7 – 7.5 million bpd over the years 2022 – 2030 provided no accidental- or attack-caused outages disrupt the flows. Natural gas flows are expected to marginally decline to about 3.8 million boepd in 2025 from 2022 levels of 4.1 million boepd but a trend reversal is expected post-2025 with production increasing to an estimated 5.5 million boepd by 2030.

3.3 Slight uptick in CAPEX spending over 2022 – 2025 as ex-Russia spending offsets the drop in Russia CAPEX in the near-term

The increased flows from regions elsewhere than Russia also demand and drive an uptick in global CAPEX in the near-term. Compared to the CAPEX outlook from the previous forecast as well as the pre-war situation, the total global upstream CAPEX is expected to see a growth of close to US$130 billion over the years 2022 – 2025. A year-on-year comparison suggests that 2022 has seen a CAPEX growth of about US$27 billion compared to the previous forecast, whereas, 2023 is expected to see a growth of US$28 billion and 2025 CAPEX is estimated to be over US$35 billion compared to the previous forecast. It is also to be noted that the pre-war forecast was very close to the 2022 outlook suggesting the withdrawing impact of the pandemic on the upstream spending globally and how the repeated announcements of cutting down spending on fossil fuels was yet to translate to actual effect in the near-term.

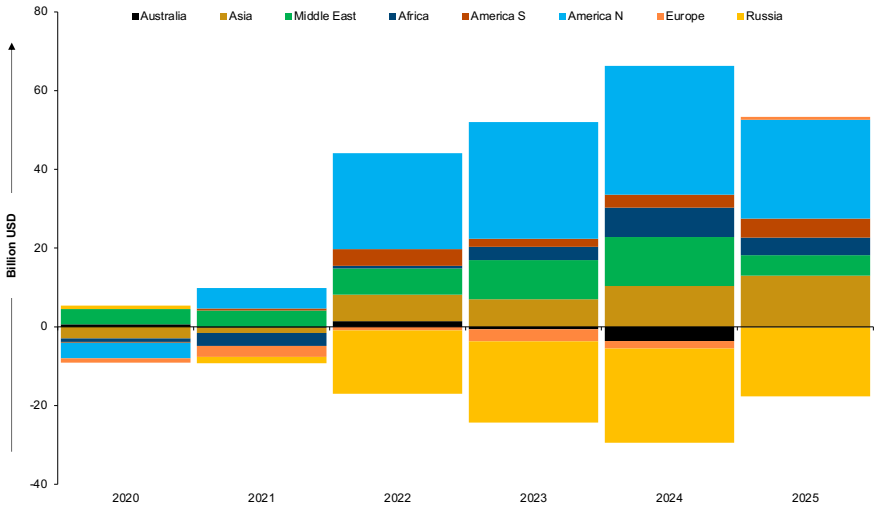
While Russia has seen an obvious drop in CAPEX, almost all the other regions are expected to see an increase in CAPEX over the period 2022 – 2025 compared to the 2022 outlook. The biggest driver of the growth is North America where a cumulative CAPEX of growth of US$670 billion is expected over the period. Asia is also expected to see a cumulative CAPEX growth of US$320 billion. Together these two regions are estimated to see 50% of the overall global CAPEX spending over the same period.

While short term pre Russia – Ukraine conflict global capital expenditure forecast was in line with the 2022 outlook, the latest forecast shows an increased spending



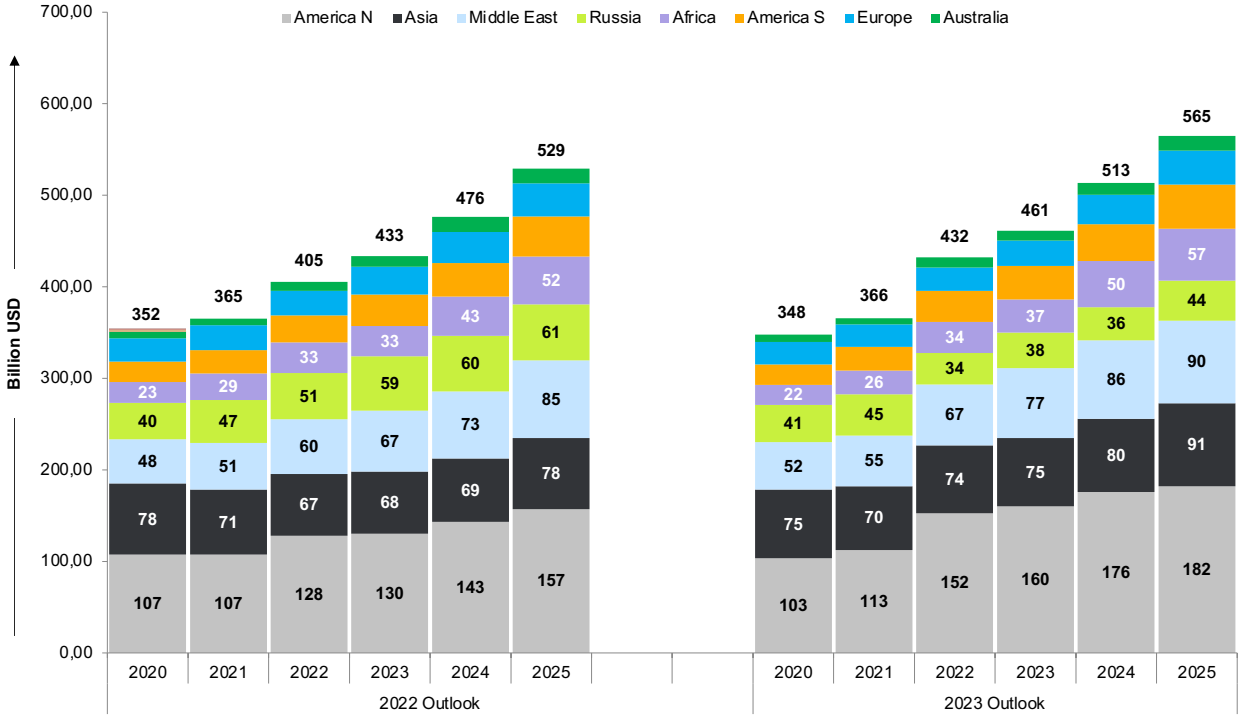
Source: Rystad Energy UCube

Capital expenditure drop in Russia driven by operators' exits and project delays is offset by increased spending in the Americas, Asia, Middle East and Africa



Source: Rystad Energy UCube

Close to US$130 billion capital expenditure spending increase over the years 2022 – 2025 driven by the Americas, Asia, Middle East and Africa



Source: Rystad Energy UCube

Year-on-year global upstream CAPEX spending is now expected to hit about US$432 billion compared to an estimated US$405 billion in the 2022 outlook, with over a third of the spending coming from North America. Latest 2023 CAPEX forecast is about US$461 billion vs a previously expected US$433 billion and 2025 CAPEX is expected to grow to US$565 billion compared to the 2022 outlook of about US$530 billion. The common theme is that North American CAPEX spending is over a third of the global year-on-year spending. Africa CAPEX spending, however, has remained largely unchanged with a cumulative 2022 – 2025 growth of about US$16 billion compared to the 2022 outlook, again suggesting that the vast greenfield activity is only expected to begin in the second half of the decade.

Africa Upstream Industry Review

Supply Resilient to the new market situation; marginal capex uptick driven by new fid's and region on the forefront of a gas export opportunity

Africa crude oil supplies resilient to post-Russia – Ukraine conflict markets as forecast remains same as pre-war and marginally raised compared to 2022 outlook

Nigeria, Libya, Algeria and Angola – the main drivers of liquids supply through the decade

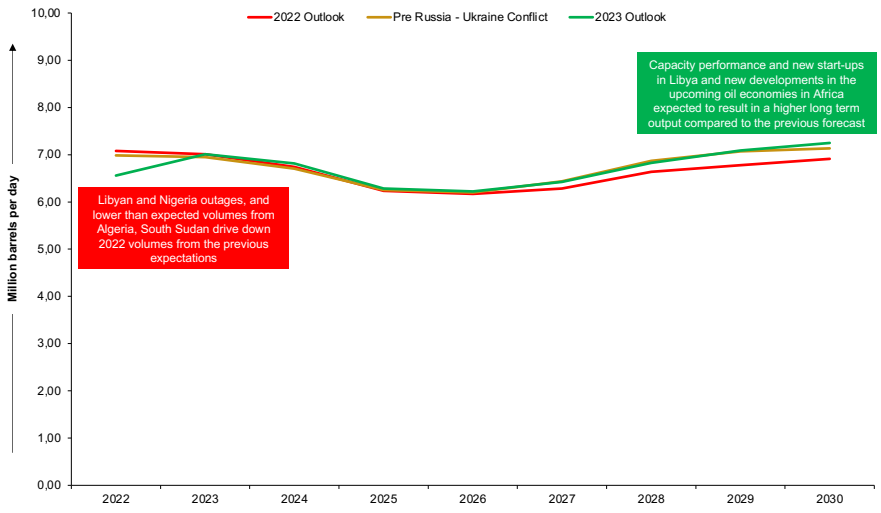
Libya expected to see the maximum growth in the medium-term compared to 2022 liquids supply outlook provided internal conflicts subside, whereas, natural declines taking down Nigeria and Algeria

Natural gas supply expected to be unchanged from previous forecast as well as pre-war forecast

Natural decline from producing gas fields expected to be irreversible with any growth expected only from new developments

4.1 African oil and gas supply "resilient" to Russia – Ukraine conflict as pre and post war forecast shows little to no change

African liquids output resilient to Russia – Ukraine war but internal issues result in changes in forecast



Source: Rystad Energy UCube

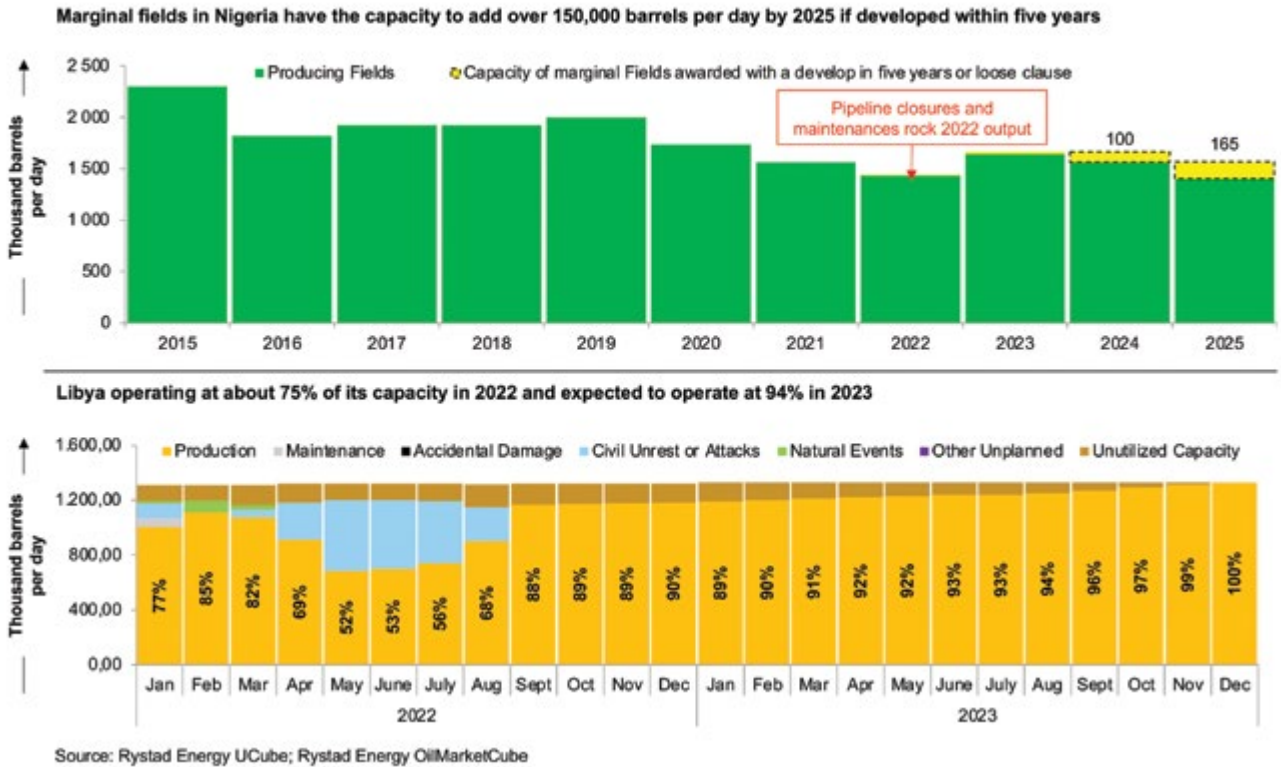
Ample opportunity to grow natural gas exports to under supplied Europe and global LNG markets but possible at the cost of large greenfield spending as most of the potential in pre-FEED stage

Africa oil + condensates output forecast through the decade is expected to stay unchanged in the near-term and see a marginal upward revision in the second half of the decade compared to the forecast from the 2022 outlook. Although a slight downward revision is expected in overall 2022 volumes mainly caused by the outages caused due to the civil unrest in Libya and pipeline outages in Nigeria, the forecast going forward is expected to be stable and in line with the pre-war forecast. 2022 annual average is expected at about 6.95 million bpd and 2023 is expected to see a small increase to just over 7 million bpd. Provided the civil unrest in Libya subsides and new fields elsewhere in the continent come online, Africa is expected to see gradual growth in output through the second half of this decade and be able to reach an average crude oil + condensate production of close to 7.25 million bpd by 2030. It is to be noted that pre-war estimates suggested African output for the years 2022, 2023, 2025 and 2030 at 6.98 million bpd, 6.95 million bpd, 6.25 million bpd and 7.15 million bpd, respectively. As such, there are no drastic revisions in the forecast due to the current conflict between Russia and Ukraine and its impact on the global markets.

Nigeria, Libya, Algeria and Angola round off the top 4 oil and condensates producers in Africa for the years 2022 and 2023 and the only 4 countries in Africa to surpass a cumulative annual average of 2 million bpd. Each of these countries have their own industry dynamics and issues to deal with.

The second-top producer, Nigeria, has historically been plagued with issues like lack of fiscal reforms eventually leading to lack of deep water developments, disagreements between International Oil Companies (IOCs) operating in the Niger Delta and local administrations, and pipeline vandalism and crude oil spills and pollution have been caused due to this. The second-largest oil producing nation in Africa has been aspiring to reach its historical highs of 2 million bpd+ annual oil production for a few years now but this has remained a dream for the past few years and is expected to remain a dream for the foreseeable future as the above mentioned issues now coupled with exits of IOCs like Shell Plc (from onshore operations) and ExxonMobil (from shelf water depth) lead to further voids in CAPEX that is required to boost the country's output. The recently passed Petroleum Industry Act (PIA) seems to be having little impact on resolving the deepwater operators' issues and no new developments have kicked off since the bill was passed. Breakeven oil price analysis suggests that the PIA has a net positive

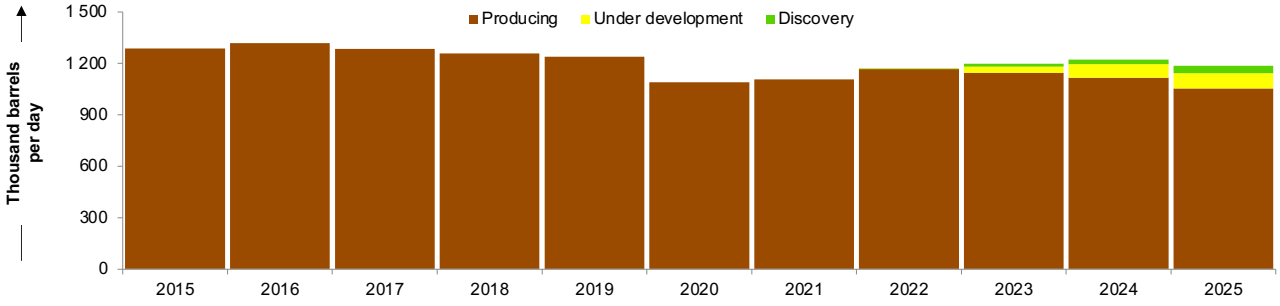
Top liquids producers Nigeria and Libya suffering from lack of new developments and under utilization of capacity issues respectively



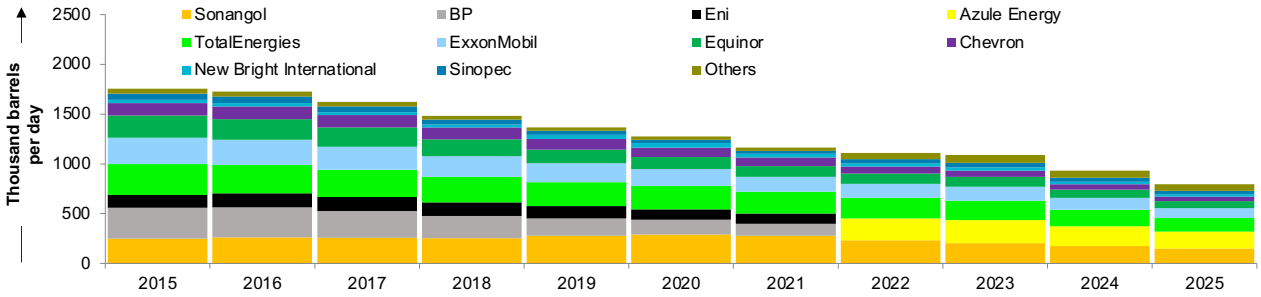
Source: Rystad Energy UCube; Rystad Energy OilMarketCube

Algeria looks to new start-ups and Angola seeks new developments from the BP – Eni JV, Azule Energy, to reverse and/or stabilize their production decline

Algeria – New start-ups expected to temporarily stabilize the declining but previous highs seem impossible



BP – Eni JV Azule Energy becomes the second largest producer in Angola after the state-owned Sonangol



Source: Rystad Energy UCube

impact on the onshore projects compared to the previous regime(s) but the onshore operators largely dominated by indigenous and/or relatively smaller operators than the IOCs are struggling with funding issues and are unable to scale the operations to as high as previously aspired. The country recently completed a "successful" marginal field award round, awarding 57 onshore and swamp fields with a "develop-in-five-years-or-lose" clause. These fields have the potential to add additional flows of surplus of 150,000 bpd by 2025 if developed within the five year timeline. However, industry signals are pointing towards little to no optimism that this is likely to happen. Recent pipeline closures and maintenance activities have dented the 2022 oil + condensates output from Nigeria and it is expected to be 1.435 million bpd. Gradual resumption of flows is expected through 2022 and 2023 average annual output is expected to increase to 1.645 million bpd.

Libya, on the other hand, is struggling with the instability due to the continued existence of two parallel governments. This instability has in the past led to numerous production halts in the past and the current scenario is no different. Since the start of this year, there has been a wave of port closures and production halts. The country has a capacity of 1.2 million bpd and has designs on hitting 2 million bpd by 2024, while interim Prime Minister Abdul Hamid Dbeibah recently announced plans to reach 1.4 million bpd by the end of this year and an ambitious 3 million bpd by 2024. But with such repeated instances of civil unrest and the lack of a decision-making body, the base case scenario estimates the 2022 oil production to be around 985,000 bpd which could gradually raise to around 1.25 million bpd in 2023, provided no major outages take place. If elections take place and political stability prevails, Libya is estimated to have the maximum capacity to reach 1.8 million bpd by 2024, which is still shy of its 2 million bpd ambition.

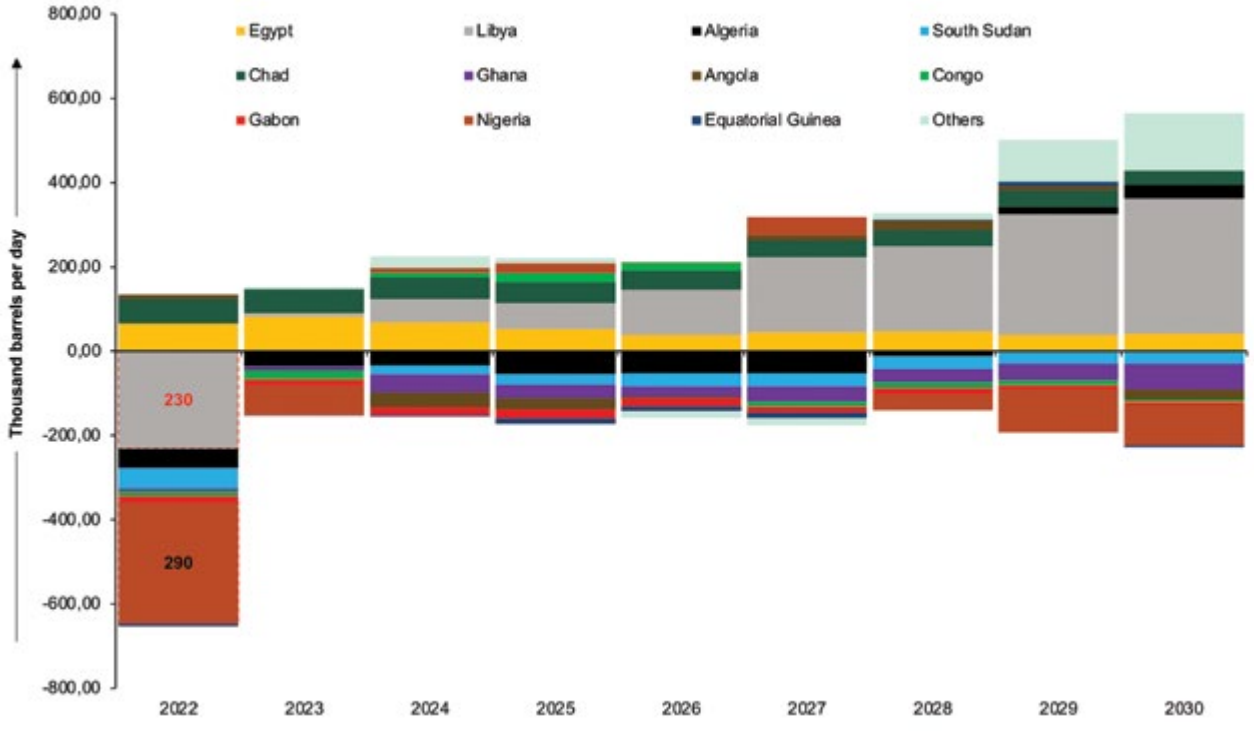
On the other hand, the other two main liquids producers in Africa – Algeria and Angola have their future supplies highly dependant on new start-ups as the legacy fields in both the countries are in decline and only new developments can reverse this trend. Algeria, similar to all its OPEC counterparts saw its 2020 – 2021 output cut down driven by OPEC regulated production quotas but the 2022 output saw an increase as these regulations loosened. Owing to a couple of new start-ups, the North African country is expected to maintain its liquids production similar to 2022 levels

for 2023 and 2024. 2022 production is expected at about 1.422 million bpd, while 2023 and 2024 output is expected to reach 1.435 and 1.45 million bpd respectively. However, as existing producing fields decline, the flows from new start-ups are expected to fall short of offsetting this decline and as a result, Algeria is looking at declines in liquids production going forward. The country is in need of additional exploration or brownfield drilling to replenish the depleting reservoirs and also more and/or accelerated start-ups to stabilize the decline.

Angola is in a similar situation. The multiple deepwater FPSOs that came online in a cluster during the 2008 – 2015 period are now looking at an ireversable decline. These FPSOs operated by various majors have seen their respective outputs fall off peak production and the country is looking at sub-1 million bpd flows post-2023 until the new fields come online later in the decade. The administration is fighting to control this decline by implementing various new policies like marginal field incentives that allows an operator 50% reduction in royalties and taxes provided the field satifies a few set conditions. Angola has also announced multiple exploration licensing rounds in an attempt to upgrade its depleting reservoirs by increasing exploration. While the marginal field incentives have resulted in certain projects like Palas – Astraea – Juno (PAJ), Alho – Cominhos – Comninhos Este (ACCE), Agogo and Golfinho are looking at preponed timelines than expected previously, the licensing rounds have also resulted in block awards to IOCs. The West African nation is doing everything in its control to encourage participation and investments especially from majors to keep the production above 1 million bpd and hopefully move closer to the previous highs.

A comparison between the 2022 outlook and the latest outlook suggests that Libya, despite the current political turmoil resulting in a 230,000 bpd drop compared to 2022 outlook, can be the biggest gainer if political stability returns and field shut downs are avoided. While 2022 outlook put the country's 2022 liquids (oil + condensates) production at an estimated 1.27 million bpd, the latest outlook suggests the production is expected to be just over 1 million bpd. But 2023, 2025 and 2030 comparisons show a revised and improved outlook. 2022 outlook put the country's 2023, 2025 and 2030 liquids production at 1.3 million bpd, 1.27 million bpd and 1.22 million bpd respectively, the latest forecast estimates the annual output for these three years at 1.31 million bpd, 1.33 million bpd and 1.54 million bpd, making Libya the biggest "improver" compared to the previous outlook. On the other end of the spectrum, Nigeria's forecast has seen the most negative revisions.

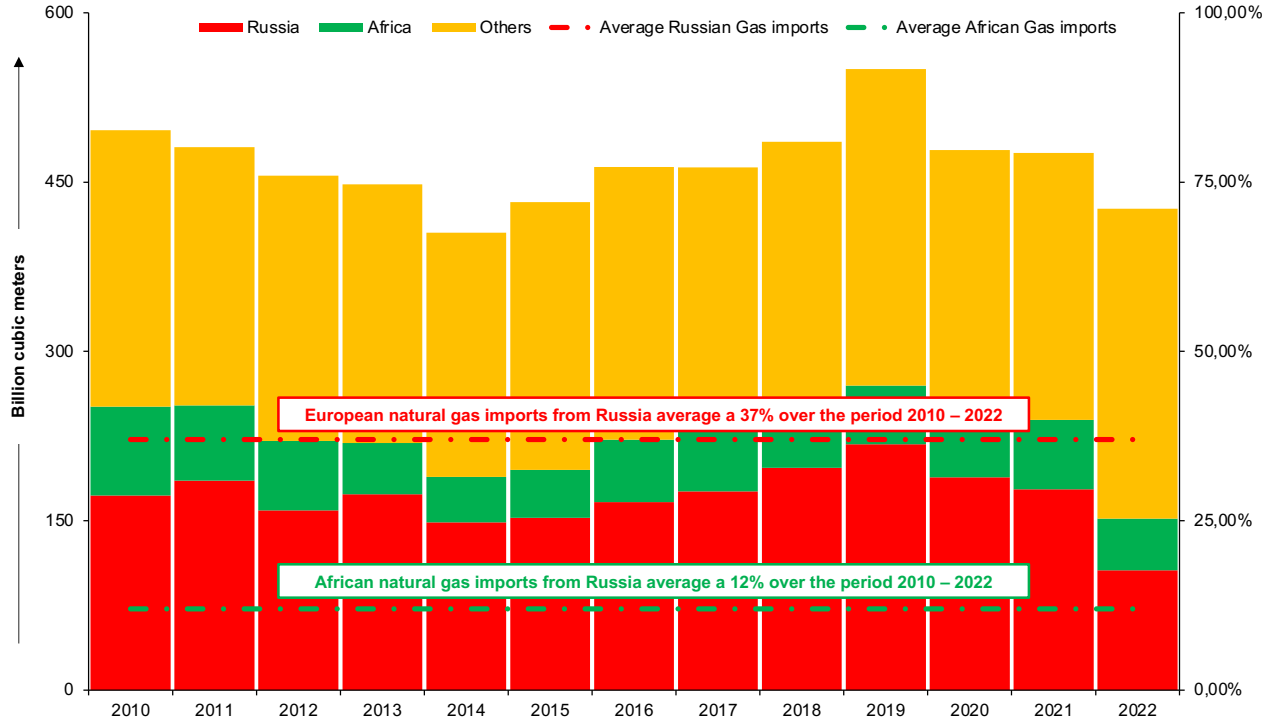
Libya, Chad and Egypt expected to be the biggest gainers in 2022 – 2030 volumes while Nigeria, Ghana, Algeria and South Sudan see a reduction in forecast from the 2022 outlook



Source: Rystad Energy UCube

4.2 Ample gas export opportunity but it all comes down to realising the undeveloped potential which requires a multi billion dollar spending

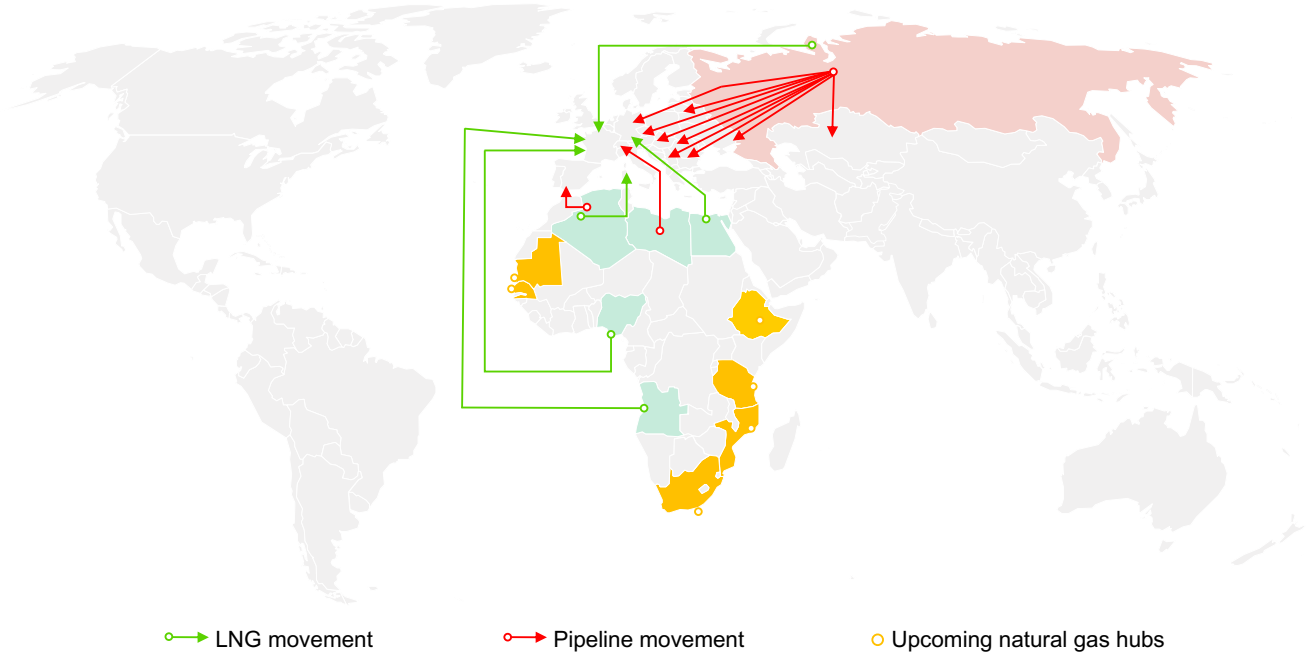
Historical European natural gas import volumes suggest Russia will be tough to substitute



Source: Rystad Energy GasMarketsCube

Russia has historically been the dominant natural gas supplier to Europe. Considering European gas imports in the past decade, Russia is the clear top supplier, driving an average of about 37% of overall gas imports to Europe during the years 2010 – 2022. Africa, on the other hand, has been a consistent gas exporter to Europe. On average 12% of European gas imports over the last decade have come from Africa. The majority of Russian supplies to Europe are driven by pipeline exports to the likes of Germany, Italy, France and the UK, while numerous other European nations get the bulk of their natural gas supplies from Russia. While Russian supplies are primarily via pipelines, African supplies include a mix of pipeline and LNG exports. Pipeline exports from the continent to Europe are from Algeria and Libya, and LNG exports have predominantly been from Nigeria and Algeria, with smaller volumes from Egypt, Angola and a fraction from Equatorial Guinea.

Geographical location, existing trade relations and large potential put Africa in a good position to upscale its gas export to Europe



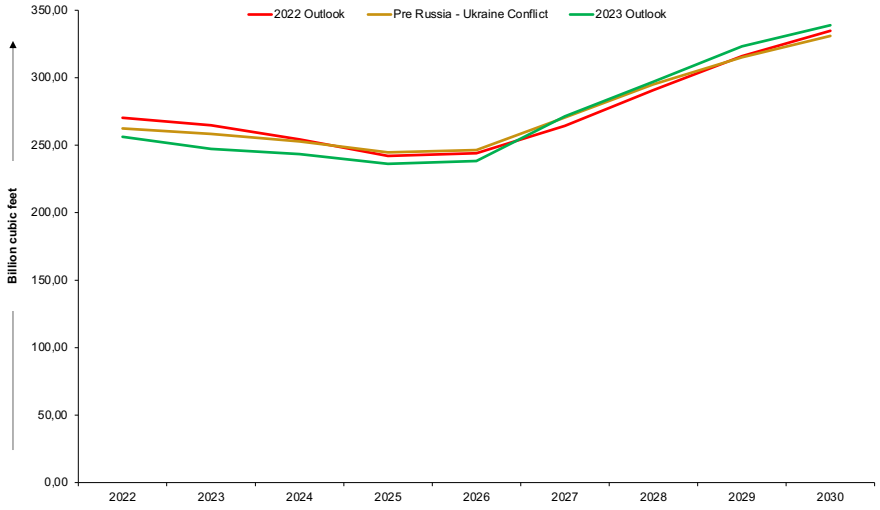
Source: BP Statistical Review of World Energy 2011–2021; Rystad Energy UCube; Rystad Energy research and analysis

African nations that have historical been gas suppliers to Europe continue to be well-placed to continue their exports. In addition to this, large-scale discoveries offshore the likes of Mozambique, Tanzania, Senegal, Mauritania and South Africa could yield additional natural gas export hubs in the future. The current geopolitical climate coupled with Africa's abundance of gas resources places Africa in a very good position to find market for its gas. Certain operators had already begun looking at their African projects targeting European markets. UK major BP and Italian major Eni are currently taking steps to export their North African and sub-Saharan African gas volumes to Europe. IOC exits from Russia can lead to certain stalled projects operated by them Africa now take a more significant role in their respective strategies going forward. A major breakthrough on the long-delayed $30 billion Tanzania LNG scheme was achieved in mid-June this year when Shell and Equinor — both operators who had previously announced their exit from Russia — signed a framework deal with the government for the Tanzania LNG project. The project aims at 10 million tpa LNG exports from the plant at Lindi.

These studies and agrrements, however, are yet to be put to action as medium-term Africa natural gas output has not changed much compared to what the forecast was pre war. Most of the significant projects that are currently under study are still in pre-FEED stage and conservative estimates suggest these developments are expected to come online only after the turn of the decade. The current forecast puts Africa's 2022, 2023, 2025 and 2030 natural gas output at around 255Bcm, 245Bcm, 235Bcm and 340Bcm, respectively. There is not much difference between this and the pre-war forecast which put the 2022, 2023, 2025 and 2030 natural gas output at around 260Bcm, 260Bcm, 245Bcm and 330Bcm, respectively.

Also, in stark contrast to the current market situation, Africa's near-term natural gas forecast is actually expected to see a marginal decline from an estimated 255Bcm output in 2022 to 235Bcm in 2025. However, the bright side is expected to kick in during the second half of the decade when a few of the current developing and pre-FEED projects come online and result in an increasing production trend taking the output to 340Bcm by 2030. Several natural gas developments across Africa are expected to come to fruition in many countries like Nigeria, Mozambique, Algeria, Egypt, Angola, Libya, Senegal, Mauritania, Equatorial Guinea, the Repubic of the Congo and South Africa, resulting in trend reversal of the continent's natural gas output.

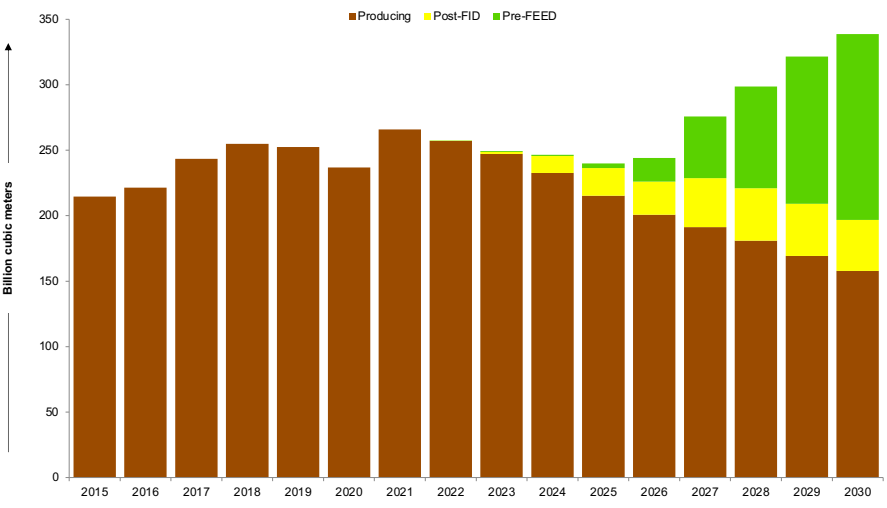
Similar to liquids, African natural gas flows resilient to Russia – Ukraine war



Source: Rystad Energy UCube

Africa has further potential to extend the run beyond 2030. Current recoverable natural gas reserves volume in the continent is estimated at close to 80 billion boe. As such, there is no dearth of under-the-ground potential if Africa is looking to take a more significant role as a global natural gas producer and exporter in the future. In the longer term, as more natural gas projects come online on both east and western regions of the continent, peak production can be expected to soar as high as 475Bcm by late 2030s. However, a large portion of close to 65% of the overall recoverable natural gas reserve potential is currently in pre-FEED stage across the continent.

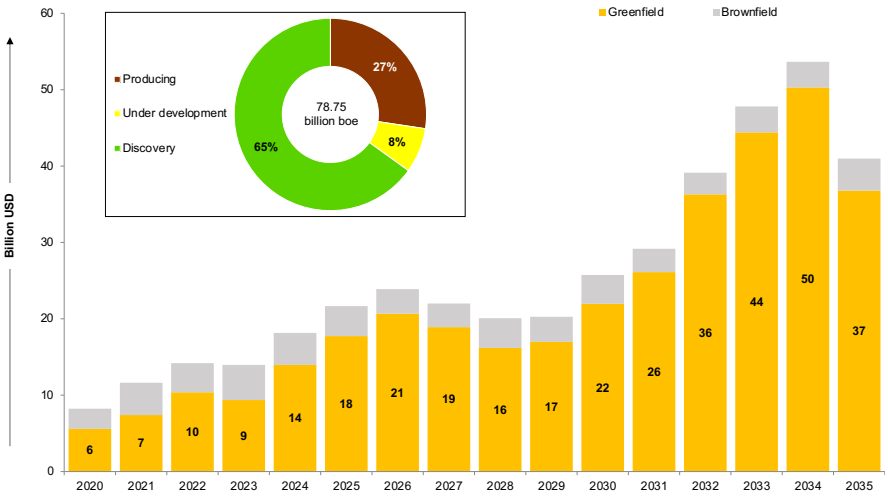
Producing fields in decline in the medium to long term and trend reversal expected to happen only via new developments



Source: Rystad Energy UCube

This large undeveloped volumes requires massive greenfield investment for both – development of upstream fields to supply gas and LNG/pipeline export infrastructure to take the produced gas to domestic and international markets. An estimated greenfield – brownfield expenditure of about US$375 billion over the next ten to twelve years is required to maintain the production from the existing producing fields, bring online the new fields that currently hold undeveloped potential and also construct the required midstream infrastructure to take the gas from the well head and process it for the destination markets. Additional expenditure can be expected if the exports happen via pipelines from the processing plants to end destination. Pipelines like the Trans Saharan Gas Pipeline (TSGP) and Nigeria – Morocco Gas Pipeline (NMGP) are currently being looked at US$13 billion and US$25 billion, respectively.

Large natural gas potential but majority undeveloped – Africa needs a lot of greenfield spending to realize its potential and cater to under supplied market



Source: Rystad Energy UCube

While the current Nigerian Minister of State for Petroleum Resources, H.E. Timipre Sylva, has been rallying behind the TSGP, the President of Nigeria, H.E. Muhammadu Buhari, has been very vocal about making the more ambitious NMGP a success. More recently, "a number of majors" including Equinor and Shell Plc were in talks with Nigeria's government about the creation of bespoke fiscal terms for their offshore gas projects. Equinor and Shell Plc are among a number of majors in talks with Nigeria's government about the creation of bespoke fiscal terms for their offshore gas projects, according to a senior government official. Timipre Sylva said that these projects were being considered "outliers", that they could not be legislated for in the Petroleum Industry Act (PIA) and that these would be treated on a case-by-case basis, ring fence them accordingly and give them fiscal incentives to make them viable. He also pointed out that Equinor would be granted very generous tax terms if Equinor progressed with plans to develop offshore gas projects. Equinor and Shell Plc also signed a framework deal with the Tanzanian government, taking a vital step towards the development of Tanzania LNG. The country's President, H.E. Samia Hassan, had announced that this long-delayed US$30 billion project was going to be a priority for her government.

Mozambique presents a large opportunity with multiple majors involved but problems persist in the form of the security situation in the Cabo Delgado province. French major TotalEnergies is reportedly waiting for situation to improve before it can restart its operations in the area, and that this wait can extend by a few months. However, the quantity and the quality of the gas present along with the stakes that the operator holds, marks this project as a priority for Total Energies despite the security situation. US major ExxonMobil is said to be looking at an alternative construction solution for its stalled LNG development in the country. The main focus seems to be developing the project in an accelerated timeline and increasing the capacity, while keeping in mind the responsibility of minimising the security risk to staff on the ground. Italian major Eni is in the market to award a giant logistics contract in Mozambique that could run for up to 20 years, starting next year, to handle all upstream activities in Area 4 that will feed gas to the delayed Rovuma LNG project and the Coral FLNG vessel. Reports have also emerged that Eni is now considering the possibility of deploying a second FLNG vessel, similar to the already in place Coral Sul FLNG vessel, to tap additional gas resources in Area 4 offshore Mozambique. Further south, TotalEnergies is also looking to develop its phase one of Luiperd – Brulpadda project offshore South Africa and bring it online by 2027 with a price tag of US$3 billion.

In Ghana, Tullow Oil started studies to determine the best scheme to develop about 2Tcf of untapped non-associated gas, distributed among its Jubilee and Tweneboa – Enyenra – Ntomme (TEN) projects, with the aim of sanctioning the project in 2023. These recent developments clearly suggest that both – governments and operators are mindful of the potential and demand for African gas and are taking steps towards developing this potential. Africa currently presents a great opportunity, not only to position itself as a major LNG exporter to an under supplied market, but also to cater to its own domestic needs and move towards ending energy poverty. But a massive investment requirement seems to be the main obstacle to overcome.

Increased Investment And Drilling Outlook, and Mega Discoveries Offshore Namibia – All positive signals for Upstream Activity in Africa

An uptick in near-term CAPEX forecast compared to previous outlook as recent, new and upcoming Final Investment Decisions (FIDs) in countries like Mauritania – Senegal, Uganda, Congo, Mozambique, Ghana, Angola and Cote d'Ivoire drive the greenfield spending

While 2022 is expected to see upstream investment totaling just over US$33 billion in Africa, the estimated growth in African upstream expenditure over the years 2023 – 2025 is close to US$15 billion when compared to the estimates from year-end 2021

Increased greenfield spending in the near-term leading to an increased overall spending forecast with sub-Saharan Africa driving the bulk of the greenfield and brownfield spending

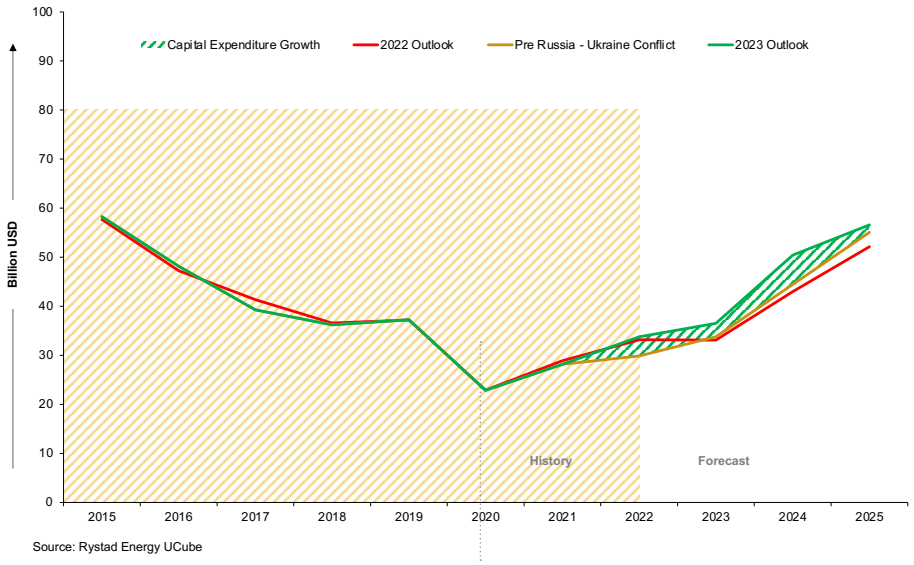
Close to 17 billion boe of recoverable reserves transiting from contingent to greenfield phase in the near-term

2022 rig demand sees a 20% growth versus 2020,and 2023 demand estimated to increase further by 30% over 2022 levels, indicating a busy market for drilling service providers

Drilling activity expected to increase marginally from about 895 wells in 2022 to 915 wells in 2023 and further to just over 1000 wells in 2025

5.1 New developments driving a marginal uptick in near-term CAPEX spending forecast

Similar to global trend, Africa spending forecast is higher post Russia – Ukraine conflict as compared to the pre-conflict and 2022 outlook



Source: Rystad Energy UCube

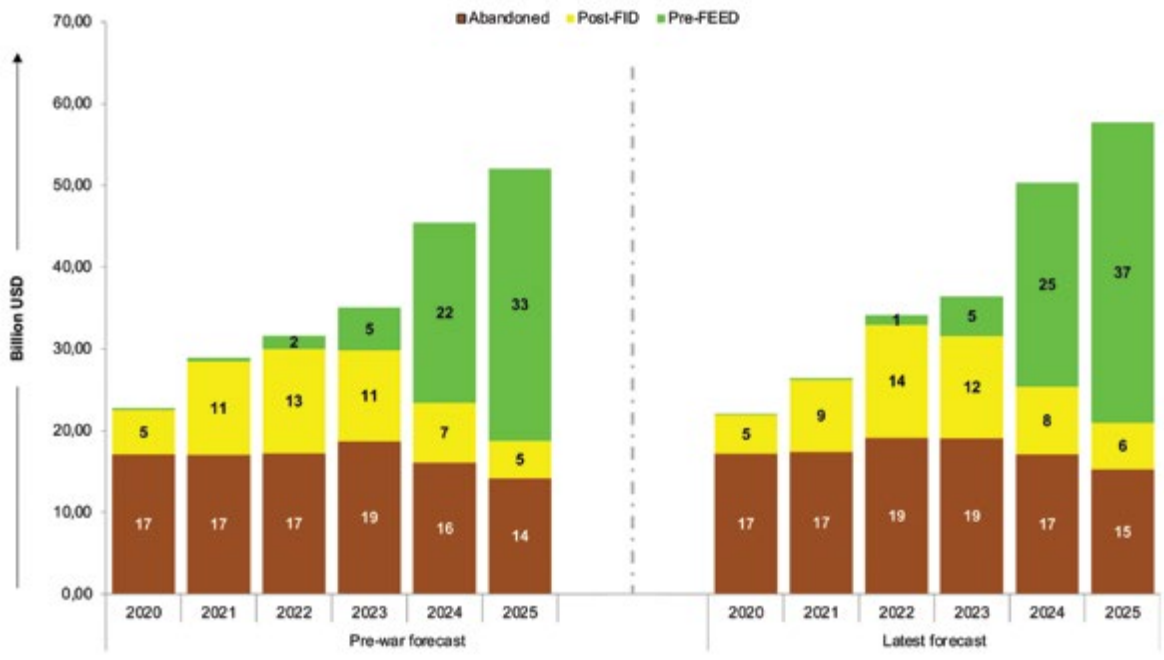
From the pandemic hit lows of 2020, African CAPEX spending has been on the revival. The 2022 outlook indicated an estimated US$33 billion CAPEX spending each for the years 2022 and 2023, and an increased US$52 billion spending in 2025. The latest forecast, while showing no difference in 2022 spending, suggests a cumulative growth in 2023 – 2025 CAPEX spending of just over US$15 billion with 2023 and 2025 spending now estimated at US$36.5 billion and US$56.5 billion respectively. The previous spending forecast was highly dependant on projects with low breakevens as Brent forecast was not at all investment friendly for projects with breakeven oil price of over US$60 per barrel. But the after-effects of Russia declaring war on Ukraine earlier this year have led to Brent trading at US$140 per barrel on day-to-day trade. As EU bans on Russian hydrocarbons tighten, Brent forecast is now expected higher, LNG market is expected to be undersupplied and fossil fuels from ex-Russia? are expected to be dearer. All these factors present a good opportunity for Africa to increase its upstream activity and find markets for its supplies. The CAPEX spending pattern also is indicating the same. While post war production scenario in Africa has not changed by compared to what it was before the invasion, Africa, similar to its global outlook, is expected to see a marginal increase in CAPEX spending in the near-term.

2022 post-FID spending is now estimated at US$14 billion compared to a pre-war estimate of US$13 billion. 2023 – 2025 cumulative post-FID spending is also estimated to increase from US$23 billion in a pre-Russia – Ukraine war Africa to US$26 billion according to the latest forecast.

A few projects like the China National Offshore Oil Corporation (CNOOC) operated Kingfisher South and TotalEnergies' Tilenga in Uganda; Eni's Marine XII Floation LNG (FLNG) and LNG schemes offshore Republic of the Congo and Baleine in Côte d'Ivoire; have kicked off development in the past few months. Several other projects are expected to see their FID happen in the near-term and this is expected to result in cumulative 2023 – 2025 spending from expected near-term FID increases from US$60 billion to US$67 billion according to the latest forecast.

Africa holds more gas potential in the medium-term than oil, with vast gas discoveries planned to be developed as LNG projects, as can be seen in the list of major projects driving the 2022 – 2025 CAPEX spending. From Mozambique and Tanzania in the East to Republic of the Congo, Nigeria, Angola, Mauritania and Senegal in the West, the emphasis clearly seems to be on LNG, in line with the market requirement.

Africa seeing an increased greenfield spending in the near-term post Russia – Ukraine war



Source: Rystad Energy UCube

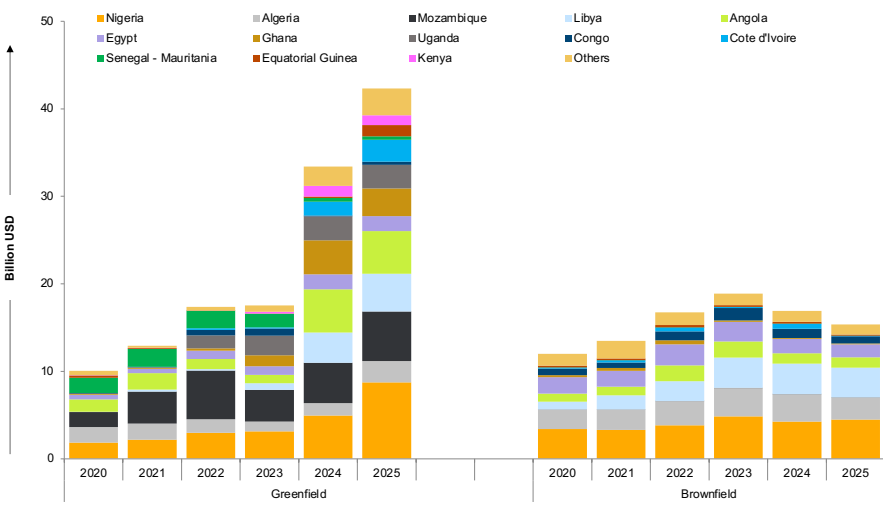
LNG and natural gas projects driving the near-term development volumes

Project	Operator	Country	FID*	Start-up*	Resources* (MMboe) Liquids Gas
Area 1 LNG (T1 – T2)	TotalEnergies	Mozambique	2019	2026	3150
NLNG T7	NNPC	Nigeria	2019	2024	2500
Tilenga	TotalEnergies	Uganda	2022	2026 – 2027	1055
Area 4 LNG (T1 – T2)	ExxonMobil	Mozambique	2024	2029	925
Greater Tortue Ahmeyim FLNG Phase 1	BP	Mauritania	2018	2023	915
Waha	Waha	Libya	2024	2027	775
A&E Structures	Mellitah	Libya	2023	2025 – 2026	705
Quiluma/ Maboqueiro	Eni	Angola	2023	2026	425
Cameia – Golfinho	TotalEnergies	Angola	2023	2027	420
South Lokichar Phase 1	Tullow Oil	Kenya	2023	2026	365
Calub/Hilala (Domestic supply)	Poly GCL	Ethiopia	2023	2027	335
OML 18 Redevelopment	Eroton E&P	Nigeria	2024	2025	330
Marine XII Fast LNG	Eni	Congo	2022	2024	325
Greater Tortue Ahmeyim FLNG	BP	Mauritania	2022	2027	320
Fortuna FLNG	Golar – New Fortress – Kosmos	Equatorial Guinea	2024	2028	265
HI – 1	Shell	Nigeria	2023	2027	265
Kingfisher South	CNOOC	Uganda	2022	2026	240
Coral FLNG	Eni	Mozambique	2017	2022	235
SNE Phase 1	Woodside	Senegal	2020	2023	230
HA	Shell	Nigeria	2024	2027	210
Agogo FFD	Eni	Angola	2023	2026	210
Eban – Akoma (OCTP)	Eni	Ghana	2023	2024 – 2025	170
Marine XII FLNG	Eni	Congo	2022	2025	150
Uzu	Shell	Nigeria	2023	2026	140
UTM Offshore FLNG	UTM Offshore Limited	Nigeria	2024	2027	135
Ndungu FFD	Eni	Angola	2024	2025	125
Sanha Lean Gas	Chevron	Angola	2021	2023	115
PAJ	BP	Angola	2023	2026	115
Luiperd EPS	TotalEnergies	South Africa	2024	2026	105
ACCE	TotalEnergies	Angola	2023	2027	85
Pecan Phase 1A	Aker Energy	Ghana	2023	2026	75
CLOV 3	TotalEnergies	Angola	2023	2025	60
Baleine Phase 1	Eni	Cote d'Ivoire	2022	2023	30

Source: Rystad Energy UCube; *Rystad Energy conservative estimates

As seen from the above list, barring a couple of projects in Libya, most of the projects are in sub-Saharan African countries ranging from the giant LNG developments in Mozambique, Nigeria, Senegal – Mauritania to the oil projects Uganda, Kenya, Angola, Senegal and Ghana. As such, 80% of the 2022 – 2025 cumulative greenfield spending from Africa is expected to come from sub-Saharan African projects. Cumulative brownfield spending over the period 2022 – 2025, however, is uniformly split between sub-Saharan African region and rest of Africa, as substantial brownfield spending is expected to come from North African countries of Algeria, Egypt and Libya.

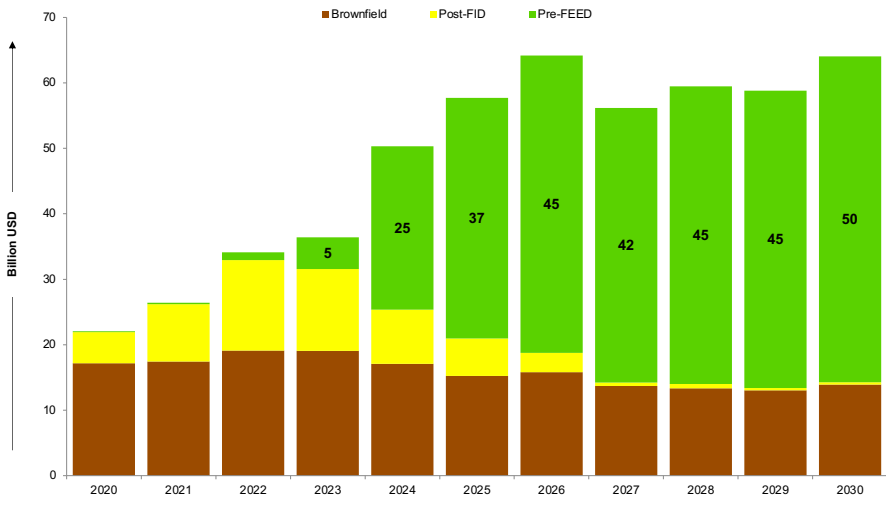
Bulk of the near-term capital expenditure coming from Sub-Saharan Africa



Source: Rystad Energy UCube

Greenfield spending in Africa, while on an uptick from 2022 to 2025, is expected to be at stable but high levels through the second half of this decade. As more and more developments are expected to happen through mid- and late-2020s, CAPEX spending on currently post-FID and pre-FEED projects is estimated to stay at US$40 – US$50 billion per annum levels with the 2026 – 2030 cumulative greenfield spending estimated at about US$235 billion. As such, current forecasts suggest an optimistic picture for Africa with many upstream investments happening through the decade.

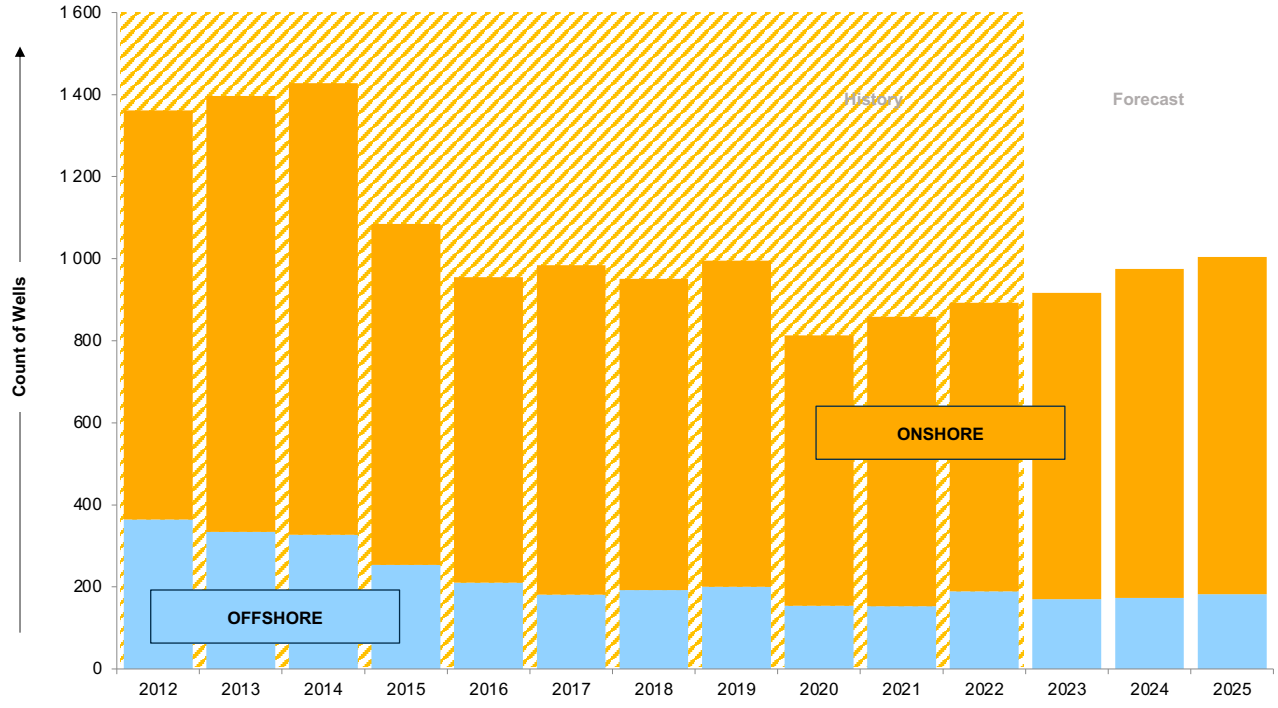
Greenfield spending expected to pick up in the second half of the decade as many projects see final investment decision



Source: Rystad Energy UCube

Wells drilled in Africa and associated continental shelves ultimately represent the activity that ensures hydrocarbon recovery from its underground deposits. The continent has seen an estimated 1360 wells drilled during 2012 with 73% drilled onshore and the remaining 27% drilled offshore. From 2012 – 2014 there was a slight increase in the overall number of wells drilled, but the oil price drop in 2014 led to a sharp decline in drilling activity, falling from approximately 1430 wells in 2014 to close to 1085 in 2015. In 2016, further declines ensued with around 955 wells drilled and the trend remained flat till 2019, overall representing about a 30% drop-in activity versus 2012. Reduced drilling activity onshore Libya and Egypt are the main drivers behind this decline. Covid-19 then did what years of civil war could not – it brought a complete halt to offshore drilling in Angola and the overall wells drilled in 2020 fell further down to an estimated 815 wells, a mere 60% of 2012 levels and about 57% of 2014 activity levels. 2021 saw a marginal growth to an estimated 860 wells and 2022 is expected to end at a further increased count of 895 wells with about 80% of these wells being drilled onshore. Over the period 2023 – 2025 offshore drilling is expected to stay relatively flat at about 175 wells drilled per annum. However, as onshore drilling in countries like Uganda and Kenya driven by greenfield projects and, Algeria, Libya and Chad, driven majorly by brownfield projects, the onshore well count is expected to increase from an estimated 745 wells in 2023 to about 820 wells in 2025.

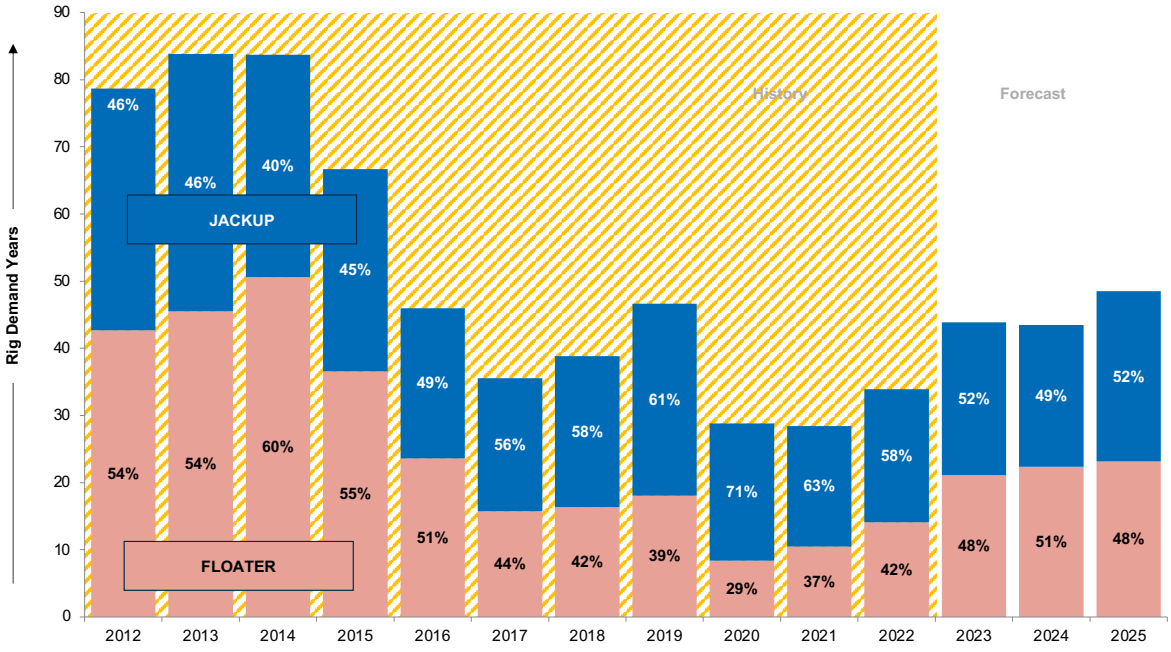
Onshore wells expected to continue driving majority of the drilling activity in Africa



Source: Rystad Energy WellsCube

The number and type of wells can be translated into rig demand expectations. In other words, how many drilling rigs have to be operational for a year in order to drill the wells? Jackups are typically used in shallow water with water depth up to 125 meters while floaters serve drilling demand in deeper waters. The rig demand pattern is similar to what was observed in the estimated number of wells drilled per year. From a high level of demand in 2012 to 2014 of about 80 – 85 rig years, the late 2014 oil price collapse reduced drilling demand significantly. By 2018 demand was down to 40 rig years implying a reduction of 50% from 2012 and 54% from the highs of 2014. In that respect, 2019 was a more promising year as demand increased towards 50 rig years representing an increase of about 20%. At the start of 2020, demand was not expected to decline towards and below 2018 levels again, however the unprecedented impact of COVID-19 meant that 2020 levels fell as low as 28 rig years, a year-on-year decline of about 40% and 2021 stayed at similar levels. However, a rebound is expected from the pandemic lows as significant drilling associated with projects currently under development is expected to return to Africa from 2022. 2022 is expected to see a year-on-year increase of about 20%, with rig demand increasing to 34 years. As more projects enter the pipeline of development, rig demand over the years 2023 – 2025 is expected to further increase from 2022 levels reaching an average rig demand per annum of 45 years.

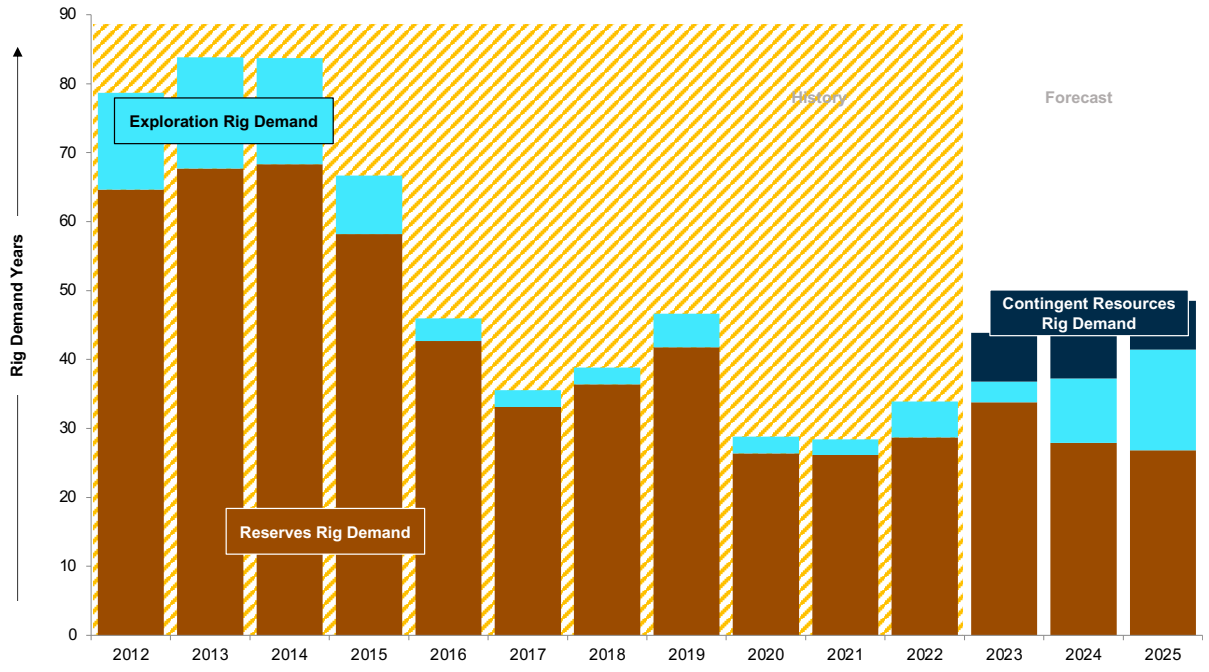
Increased rig demand expected in the near-term as drilling returns to Africa post the pandemic lows



Source: Rystad Energy RigCube

It is, however, to be noted that the rig demand expansion to an average 45 rig years over the year 2023 – 2025 is contingent on new projects being sanctioned. The current oil market outlook, greenfield and brownfield investment forecast suggests the combined potential of these new projects and further exploration activity will be able to propel rig demand in Africa towards pre-Covid-19 levels. It is to be noted that the rig demand from the existing projects in-pipeline / in the pipeline is expected to decline through 2023 to 2025 and it is the combined impact of rig demand driven by projects contingent on FIDs and exploration is the driving factor for increase. Any delays in these expected FIDs and/or exploration drilling can lead to trend reversal and thus, an obvious blow to production going forward.

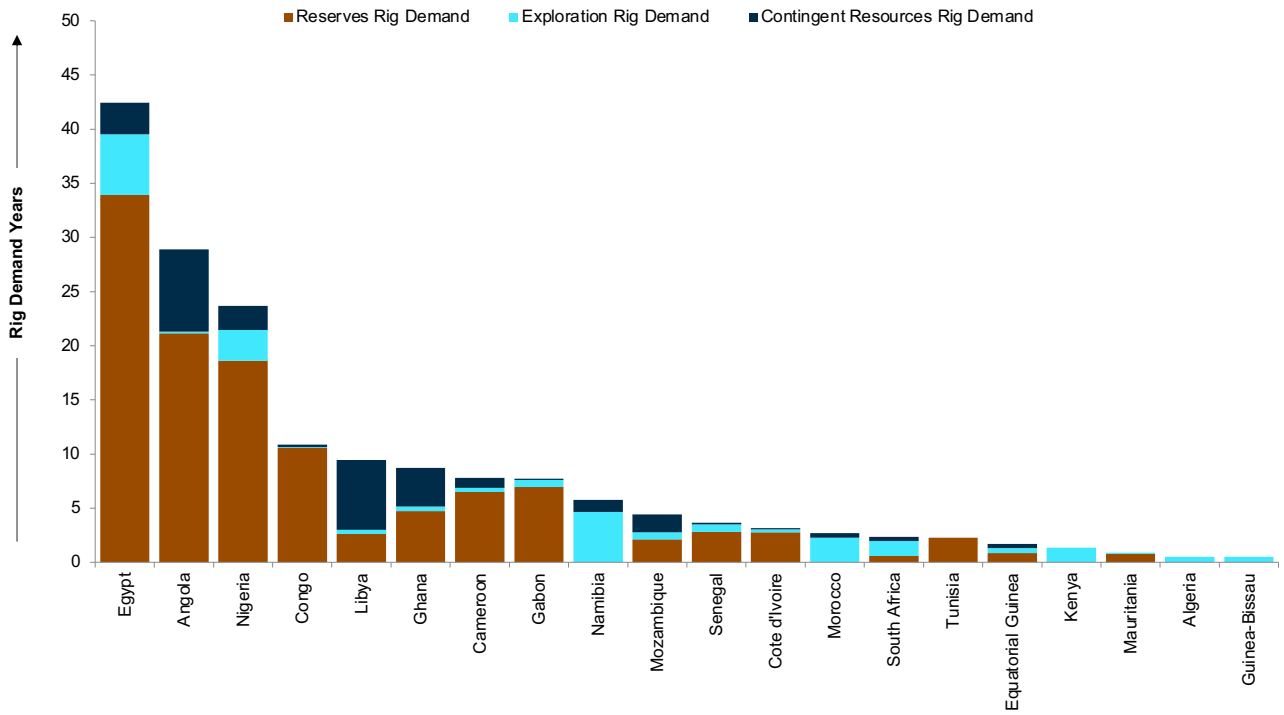
Increasing rig demand sensitivity to final investment decisions to be expected in the near-term



Source: Rystad Energy RigCube

Breaking down cumulative offshore rig demand from 2022 to 2025 per country reveals Egypt as the most active country with about 42 rig years followed by Angola and Nigeria. The breakdown of the top 20 countries by rig demand with associated split on what resource class is supporting the rig demand suggests majority of the rig demand is robust with only about 30% related to contingent resources and exploration. Libya and Ghana show high percentage of rig demand is related to contingent resources implying that rig demand in this particular area is sensitive to investment decisions expected over the period. Most other producing countries show very little dependence on upcoming project sanctions to drive their rig demand.

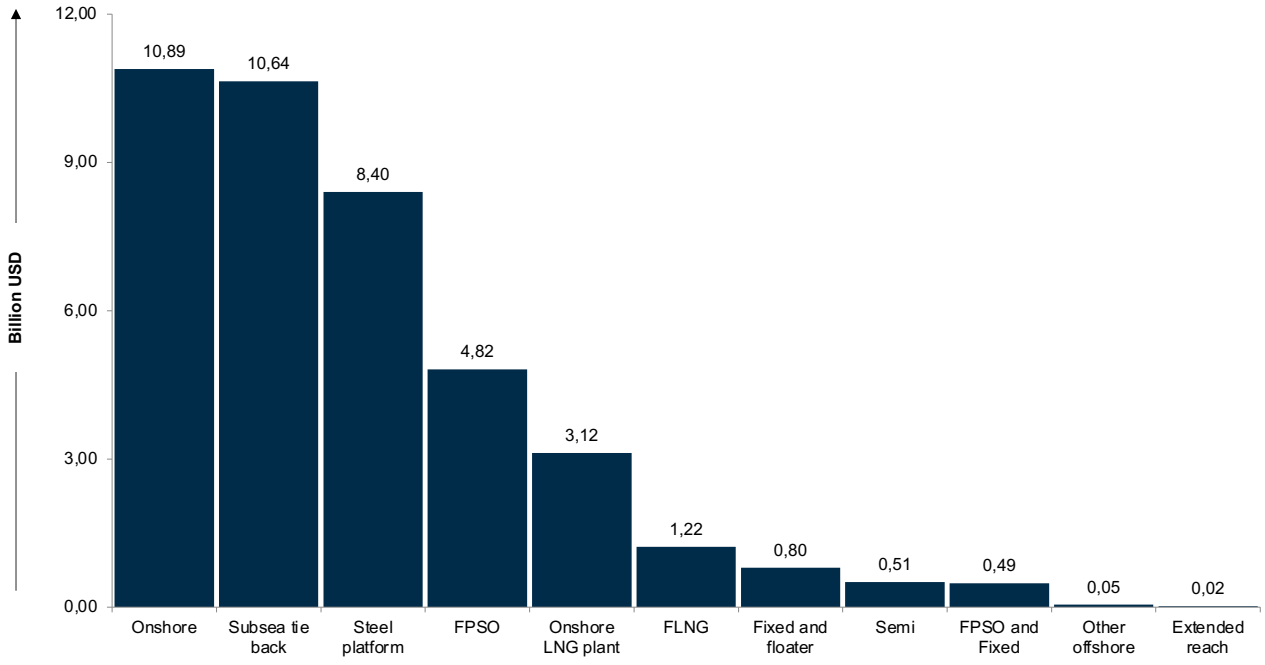
Major producers driving the rig demand and majority rig demand driven by greenfield/brownfield projects



Source: Rystad Energy RigCube

The expected break down of the estimated investments towards 2025 derived from contingent projects, or in other words projects yet to make an investment decision per development concept, suggests that onshore investments constitute the single greatest category with investments reaching almost US$11 billion across the period 2022 – 2025. Subsea tiebacks are likely to be as common as the onshore developments, with a cumulative 2022 – 2025 expected investment of about US$10.65 billion, because of the commercial benefit it makes to piggyback smaller hydrocarbon accumulations on existing infrastructure, wherein using such a development solution results in a very competitive breakeven. The category also includes the offshore related part of LNG developments which further boosts this category, considering the mega-projects expected in both eastern and western sides of the continent. Investments related to offshore platforms take the third biggest spot as the investments in these categories are expected to be about US$8.4 billion. Continued drilling of new wells and other improvements are needed to arrest production decline in the mature areas of African onshore production. Contingent investments in many sub-Saharan African countries and Algeria, Libya and Egypt are the main drivers behind this spending.

Projects with low breakevens expected to lead the contingent 2022 – 2025 cumulative spending as onshore projects and subsea piggy backs take the top two spots



Source: Rystad Energy UCube

Namibia's mega discoveries drive 2022 bumper discovered volumes and inspire more wildcats in the Southern African region, with 10 more high impact wells (HIWs) scattered across Africa expected to be drilled in the coming 18 months

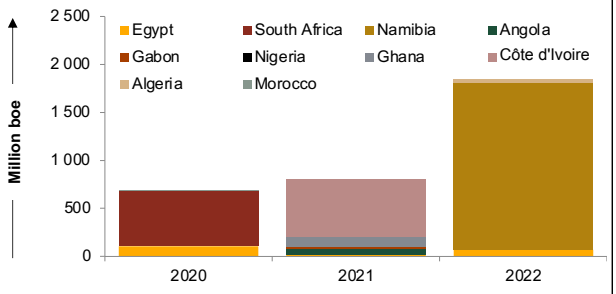
As many as 18 exploration licensing rounds offering frontier as well as explored acreage in the MSGBC basin, other regions of West Africa and across North and East Africa expected to award blocks by the end of 2023

5.2 Namibia all the way for 2022 and the giant finds expected to inspire more drilling

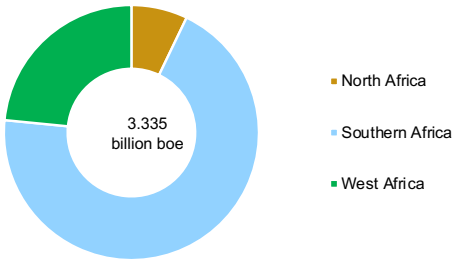
Africa oil and gas exploration activity took a major hit due to the pandemic with 2020 seeing the ssecond-lowest volume of discovered resources per annum in the past decade. While 2021 saw a 15 – 20% year-on-year increase over 2020 in terms of overall discovered hydrocarbons, it was the Baleine discovery offshore Côte d'Ivoire that drove about 75% of the these volumes. 2022, so far, has been a bumper year with a year-on-year increase of about 130%. The pattern has been similar to 2021, with Venus and Graff discoveries offshore Namibia, operated by TotalEnergies and Shell Plc respectively, driving about 95% of the volumes. While the Baleine wildcat was successful, it could not lead to more exploration drilling in the region. However, these mega discoveries offshore Namibia along with the gas discoveries offshore South Africa seem to be driving more exploration interest from operators in the Southern African region.

2022 discovered volumes in Africa – Namibia's Venus all the way!

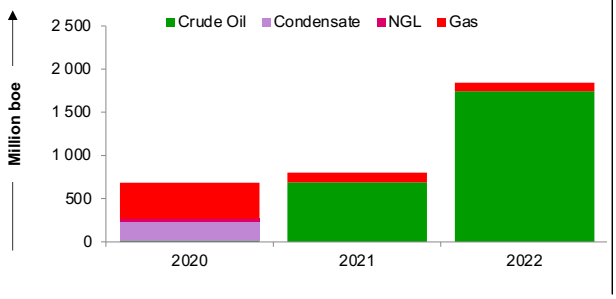
2022 – A bumper year of discovered volumes so far!



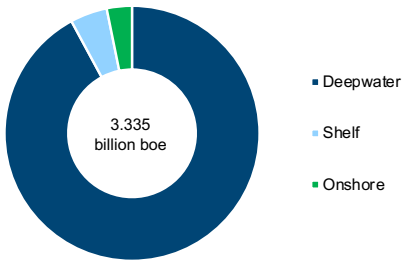
South African region leads the way with Namibian finds



Venus liquids driving the 2022 discovered volumes

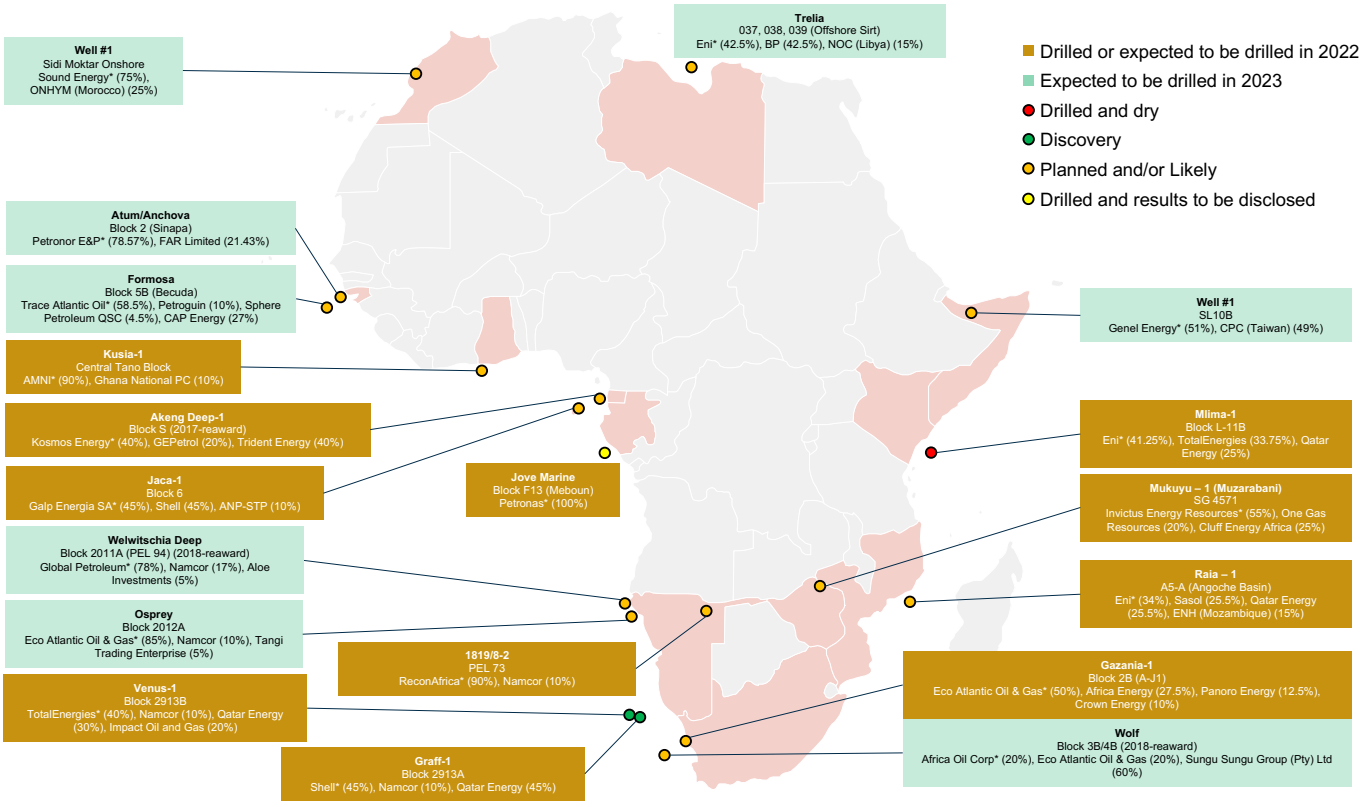


Massive Deepwater find in the form of Venus in 2022



Source: Rystad Energy UCube

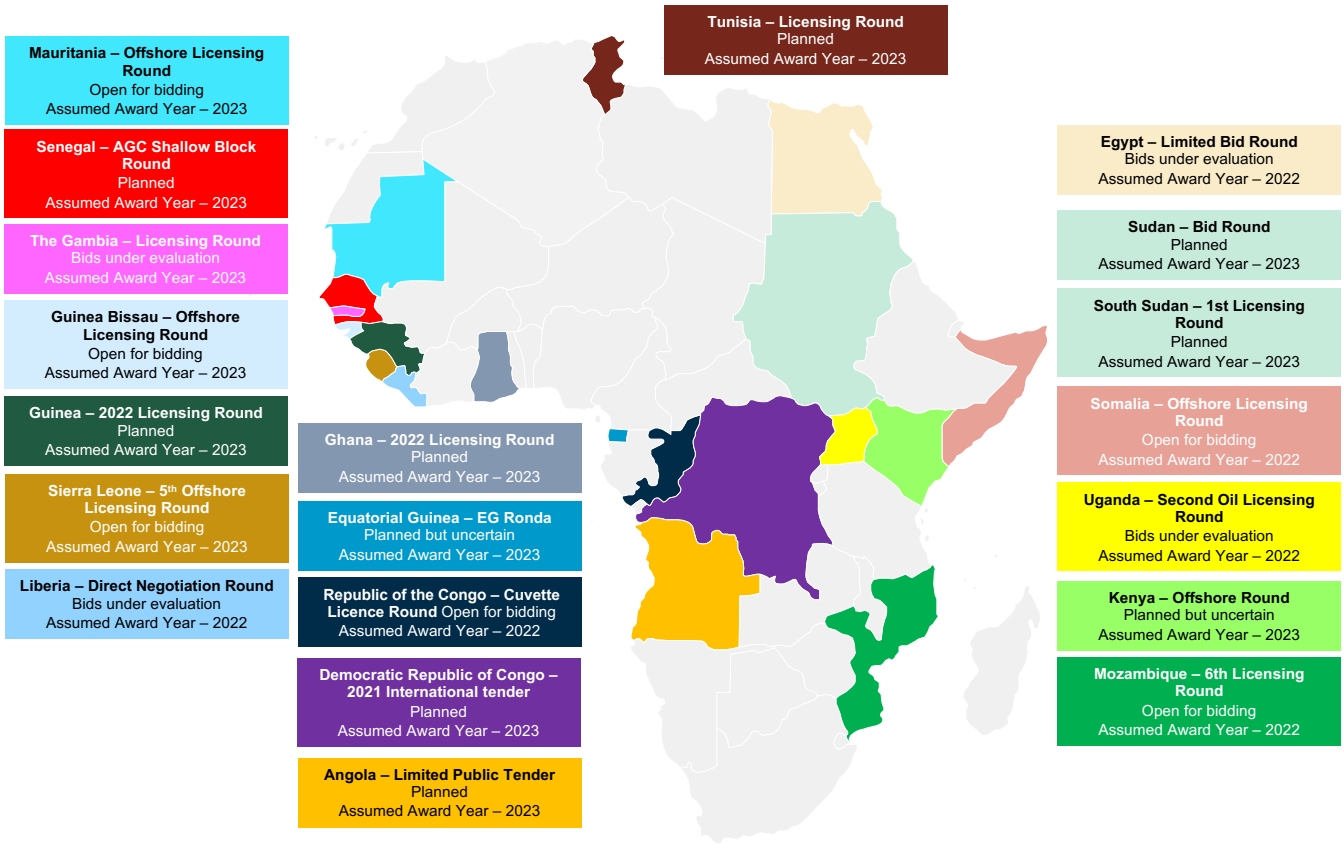
Venus, Graff, Brulpadda and Luiperd inspire more wildcats in South African region while the rest of Africa sees scattered high impact well drilling



Source: Rystad Energy ECube

Namibia has already seen one high impact onshore well spud recently by Canadian oil company, ReconAfrica as the company kicked off its planned four well program with the 8-2 well on onshore Block 1819. The 8-2 well is planned to be drilled to a depth of approximately 2,800 meters (9,184 feet) and is designed to test potential conventional oil and associated natural gas reservoirs in clastic rocks (sandstones) in the Karoo Rift Fill. The operator announced this well will also be drilled deeper into the Pre-Karoo Mulden and Otavi formations. It is anticipated the well will reach total depth within 60 days from the initial spud. Eco Atlantic Oil & Gas is looking for another partner to help fund the drill ready Osprey prospect's drilling programme, in the waters off Namibia. Global Petroleum's Welwitschia Deep prospect with an estimated P50 prospective resource volume of about 670 million barrels of oil is also expected to be drilled in the next 15 – 18 months. On the western coast of South Africa, in waters where the Venus and Graff discoveries were made, Eco Atlantic Oil & Gas plans to spud the Gazania-1 well on its 50% owned and operated block 2B, in September 2022. The well is expected to take about 25 days to drill. Eco Atlantic Oil & Gas is also expected to partner another Canadian oil company Africa Oil Corp., in the drilling of Wolf prospect on Block 3B/4B offshore South Africa. This well is expected to spud / expected to be spudded in 2023. 11 more of such high-impact exploration wells, 6 in 2022 and 5 in 2023, are expected to be drilled in different countries of the continent. Two of these wells are onshore – in Zimbabwe and Somalia. Australian operator Invictus Energy had started mobilizing the Exalo Rig 202, back in June 2022, to drill the Mukuyu-1 well on its SG 4571 block in Zimbabwe. Mukuyu-1 well will test multiple stacked objectives within the greater Mukuyu structure. The prospect was initially expected to hold 8.2 trillion cf (Tcf) of gas and 247 million barrels of liquids, but has been recently reported to be a much bigger 20 Tcf of gas and 845 million barrels of liquids prospect. In the MSGBC basin in West Africa, 2 high impact wells – Atum well on Petronor operated Block 2 (Sinapa) and Formosa well on Trace Atlantic Oil operated 5B (Becuda) block, are expected to be drilled offshore Guinea-Bissau. As such, high impact well drilling for the remainder of 2022 and 2023 is expected to happen in all regions of Africa and mostly offshore.

Lots of explored and frontier acreage on offer in the MSGBC basin, rest of West Africa and across the eastern coast of the continent



Source: Rystad Energy ECube

Licensing activity also is showing positive signs with as many as 12 licensing rounds expected to close in the next 15 – 18 months in West Africa and four on the eastern side of the continent with a round each in Tunisia, Egypt, Sudan and South Sudan. While the volume of these prospective licensing activity might seem encouraging, it remains to be seen on what level of interest will be shown by the IOCs that can bring the kind of investment that is required to indulge in both exploration and subsequent development activity required to uplift the future potential of Africa. It is on the respective administrations to conduct these rounds in a highly structured manner utilizing digital solutions wherever required. Release of data rooms can also drive operators to have better clarity on the blocks and this can lead to increased interest. While integration of digital solutions into existing processes and acquiring extensive geological data does require an upfront investment, the potential rewards could far outweigh the costs and represent the catalyst required to ignite the much required exploration activity on the continent.

While Majors And Nocs Drive Large Volumes Together, Independents Picking Up Pace With Acquisitions Especially In West Africa

International oil majors and National Oil Companies (NOCs) in collaboration with these majors continue to be the largest producers in Africa with about 75% of the 2022 – 2023 African hydrocarbon output coming from these operators

Sonatrach (Algeria), Nigerian National Petroleum Corporation (NNPC – Nigeria) and NOC Libya are constitute the majority of the flows from NOCs in Africa

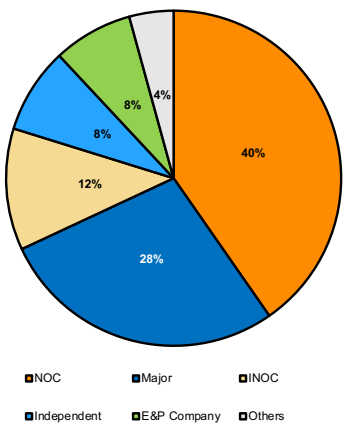
Eni, TotalEnergies and BP round off the top three majors in Africa in terms of production

Independents growing in size with acquisitions from majors in West Africa

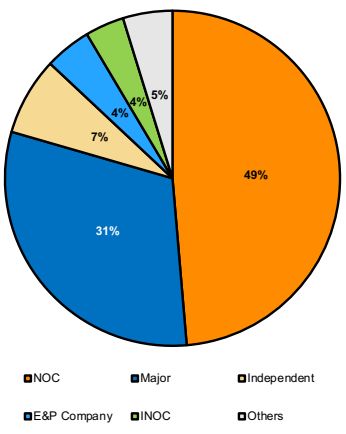
International oil majors have always played a significant role in African upstream industry. Close to a third of the continent's output over the last decade has come from this handful of majors. Also, these same majors have been operating in joint ventures (JVs) or partnering with NOCs in different countries, hence playing a part in driving the volumes that show up as owned and/or operated by the NOCs, especially in countries like Nigeria. Overall, close to 75% of the overall hydrocarbon output from Africa over the past decade has been driven by these two segments – majors and NOCs. The trend is expected to be the same over the years 2022 – 2023 also, with about 73% of the cumulative production over the two years coming from majors and NOCs.

Majors and NOCs driving 70 – 80% of the 2022 – 2023 annual production in Africa

2022 – 2023 Africa liquids production split by company segment



2022 – 2023 Africa gas production split by company segment



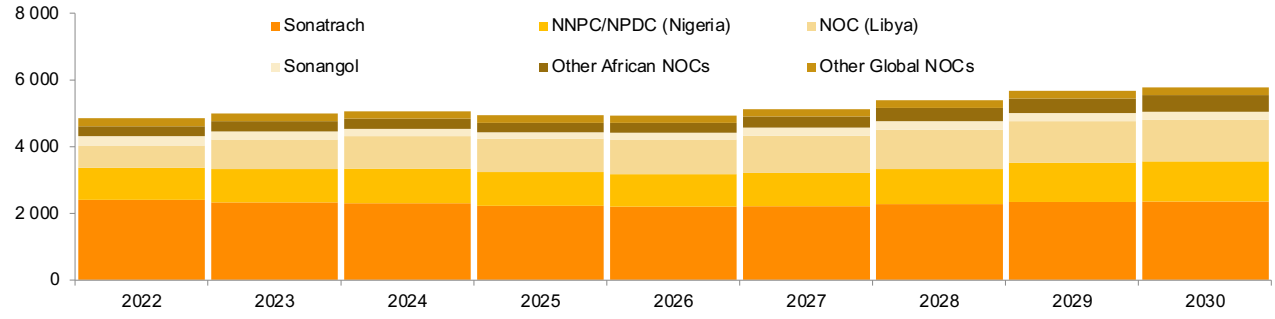
Source: Rystad Energy UCube

International NOCs like Chinese Sinopec, CNPC, CNOOC and Norway's Equinor constitue the third largest group contributing to about 9% of the overall 2022 – 2023 output. Independents like Perenco, Marathon, Tullow oil, Kosmos, Seplat and so on, and exploration and production (E&P) companies like Capricorn Energy, Savannah Energy, Maurel & Prom, First E&P, Seven Energy, Dana Gas and so on, round off the top five with about 8% and 7% of the overall volumes, respectively.

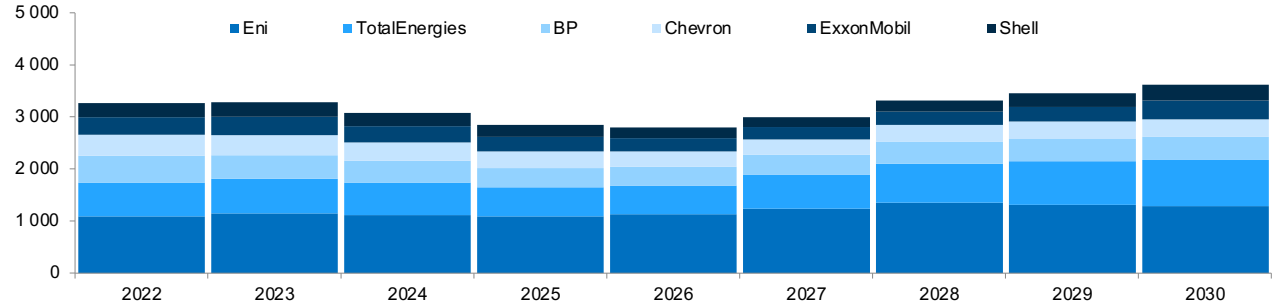
Algerian NOC Sonatrach, Nigeria's NNPC and Libya's NOC are the top three NOCs in Africa in terms of overall output. While Sonatrach is the largest, it is also in decline as legacy fields are in a state of depletion and new start-ups are required to reverse the trend. Sonatrach's hydrocarbon output is expected to decrease from about 2.4 milion boepd in 2022 to close to 2.33 million boepd in 2023. Nigeria's NNPC, which recently underwent rebranding and has pledged to end energy poverty in Africa's largest populated country, is expected to reach output levels of 1 million boepd for the years 2022 – 2023. As projects where it holds stakes see some redevelopments and reach the start-up milestone, NNPC is expected to see a production increase to 1.2 million boepd by the end of this decade. The long running armed struggle has crippled the oil and gas production from Libya and the country's NOC's gross production for 2022 is estimated at 675,000 – 700,000 boepd, increasing slightly to 875,000 – 900,000 boepd in 2023. If stability is restored and flows run uninterrupted, Libya has the capacity to increase its output and as such, the NOC can also see increase in its own production. If all goes well, NOC Libya's owned production can be expected to gradually increase to 1.25 million boepd by 2030. Angola's Sonangol, which recently partially divested its portfolio offshore Angola to decrease its investment exposure, is the fourth-largest NOC in Africa. Overall, the cumulative gross production contribution from all the NOCs in Africa is estimated at million boepd in 2022 and million boepd in 2023.

Cumulative production of both NOCs and Majors in Africa looking at decline in the near term but reversing the trend in medium-term

Libyan NOC expected to be the highest growing producer in the medium term among NOCs operating in Africa
Thousand barrels of oil equivalent per day



Eni – the major among the majors with respect to overall production from Africa and near-term growth
Thousand barrels of oil equivalent per day



Source: Rystad Energy UCube

Among the majors, Italian major Eni is the clear leader in terms of overall annual production. With associations with NOCs in countries like Egypt, Libya, Congo, Nigeria or standalone operations as a working interest partner in various projects in many African nations, Eni's 2022 output is expected close to 1.1 million boepd, increasing to 1.15 million boepd in 2023. The percentage of natural gas in Eni's total output is slightly higher compared to liquids and is expected to increase further as the company focuses on gas more going forward. The second biggest major in terms of production in Africa – TotalEnergies, has a slightly more skewed split of hydrocarbons in its production with 75% – 80% of the total output being liquids. Majority of TotalEnergies' Africa production comes from OPEC nations – Nigeria, Angola and Congo, with future growth expected from recently FID'ed Ugandan and Kenyan projects, giant gas developments off Mozambique and the recent "world beater" Venus discovery offshore Namibia. The French major's 2022 Africa output is estimated at just over 650,000 boepd and 2023 is expected to see a marginal increase to about 670,000 boepd. British major BP finishes the top three with 2022 output estimated at about 515,000 boepd and 2023 output at a decreased 455,000 boepd. Prominent BP operated producing projects include Zohr and Atoll in Egypt and offshore FPSOs in Angola. BP is expected to benefit from future start-ups in Angola which were granted the marginal field status and LNG projects in the Mauritania – Senegal region. US majors Chevron and ExxonMobil, and London stock exchange listed Shell Plc have majority of their production coming from Nigeria and Angola. These three companies together are estimated to produce just over 1 million boepd for the years 2022 – 2023.

The announced and currently in-play upstream asset sales activity is transitioning the African upstream industry where majors are exiting and independents are acquiring the portfolio up for grabs from majors.

While majors are looking to decrease their oil and gas exposure in West Africa, independents pick up the portfolio being divested

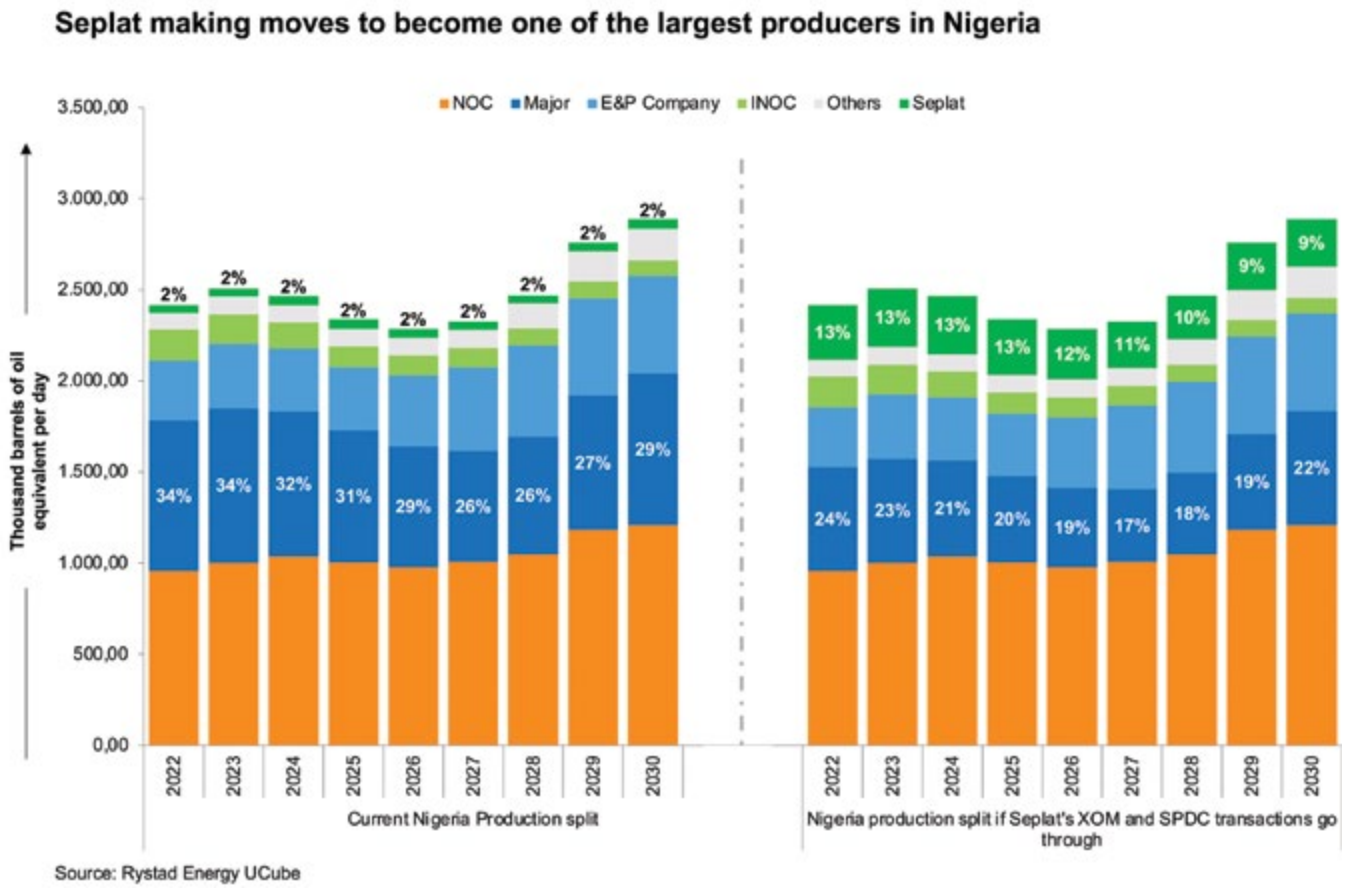
Country	Seller(s)	Buyer(s)	Deal Insight(s)
	Sonangol	Sequa Petroleum, Afentra	*Sonangol divesting stakes in its offshore assets to decrease its upstream exposure and accumulate funds to enable smoother operations*
	bp, eni	bp, eni	*British major BP and Italian major Eni merge their operations in Angola, to benefit from synergies in nearby blocks to improve cash flows from existing production and cost optimization efforts for newer, smaller developments, also mitigating current production declines*
		Seplat Energy	*Shell Petroleum Development Company (SPDC) (Shell Plc – 30%, TotalEnergies – 10%, Eni – 5%) looking to exit its onshore and swamp operations in Nigeria, and focus only on deepwater assets in the country*
	ExxonMobil	Seplat Energy	*US major ExxonMobil exiting its shelf water depth portfolio in Nigeria to decrease its high emissions oil and gas portfolio and move towards energy transition*
	ExxonMobil, PETRONAS	SAVANNAH ENERGY	*Strained relationship with the Chadian government as well as the local oil union and plans to divest its oil and gas portfolio in Europe, Asia, and Africa to focus on its mega projects at home and elsewhere lead to ExxonMobil's exit from Chad. Petronas follows suit*
	Impact Oil & Gas		*Impact Oil & Gas considering selling its 20% stake in the block 2913B (PEL 56) offshore Namibia where the Venus discovery was made earlier this year. Impact reported to be in talks with investors to raise up to US$100 million to fund Venus' appraisal, but said to be in early discussions with several potential buyers at the same time*
			Tullow and Capricorn have agreed for an all-share combination of the two entities, creating a combined group set to be one of the largest listed independent African focused energy companies. Both the companies to benefit from high combined liquidity and high estimated free cash flows
			VAALCO and TransGlobe Energy signed a US$307 million merger agreement that will see them form a major Africa-focused E&P company. Following the merger, VAALCO stockholders will own approximately 54.5% and TransGlobe shareholders will hold the remaining 45.5% of the combined company. VAALCO said that this merger brings together two complementary businesses, with assets located in Egypt, Gabon and Equatorial Guinea in Africa, with significant future growth potential.

Source: Rystad Energy Research and Analysis

Sonangol successfully concluded the divestment of its stakes in a number of offshore blocks in Angola. The sale which was targeted at bolstering the state-owned company's financial position saw strong interest with seven of the eight blocks attracting bids. While the majors elected to stay away, Sonangol received a total of 35 bids from 19 companies, comprising a mix of players with experience and ones looking to make a maiden splash in Angola's oil and gas sector. The Namibian NOC Namcor, London-based Sequa Petroleu and local player Petrolog joint venture took the 10% stake in Block 15/06, 40% stake in Block 23 and also a 35% stake in Block 27. The Somoil – Sirius consortium won the 8.5% and 10% stakes in BP-operated blocks 18 and 31, respectively. The consortium also secured a 25% stake in Block 27. Afentra secured a 20% stake in producing shallow water Block 3/05 and also a 40% interest in Block 23. Two blocks in the Congo basin — 4/05 and 6/05 — were not awarded.

Angola also saw a major merger where, in an attempt to mitigate the declining output in Angola, Eni replicated its Vaar Energi joint venture in Norway with a similar tie-up with BP in Angola. As part of the new joint venture, the assets of both companies in the major West African producer are merged under a new entity named Azule Energy. The combined portfolio is expected to benefit from synergies in nearby blocks to improve cash flows from existing production and cost optimization efforts for newer, smaller developments, also mitigating current production declines in the country. This new entity is expected to be the second largest producer in Angola, only second to the Angolan NOC, Sonangol. The Eni – BP joint venture in Angola could seek to acquire similar opportunities in Angola to further build on its portfolio.

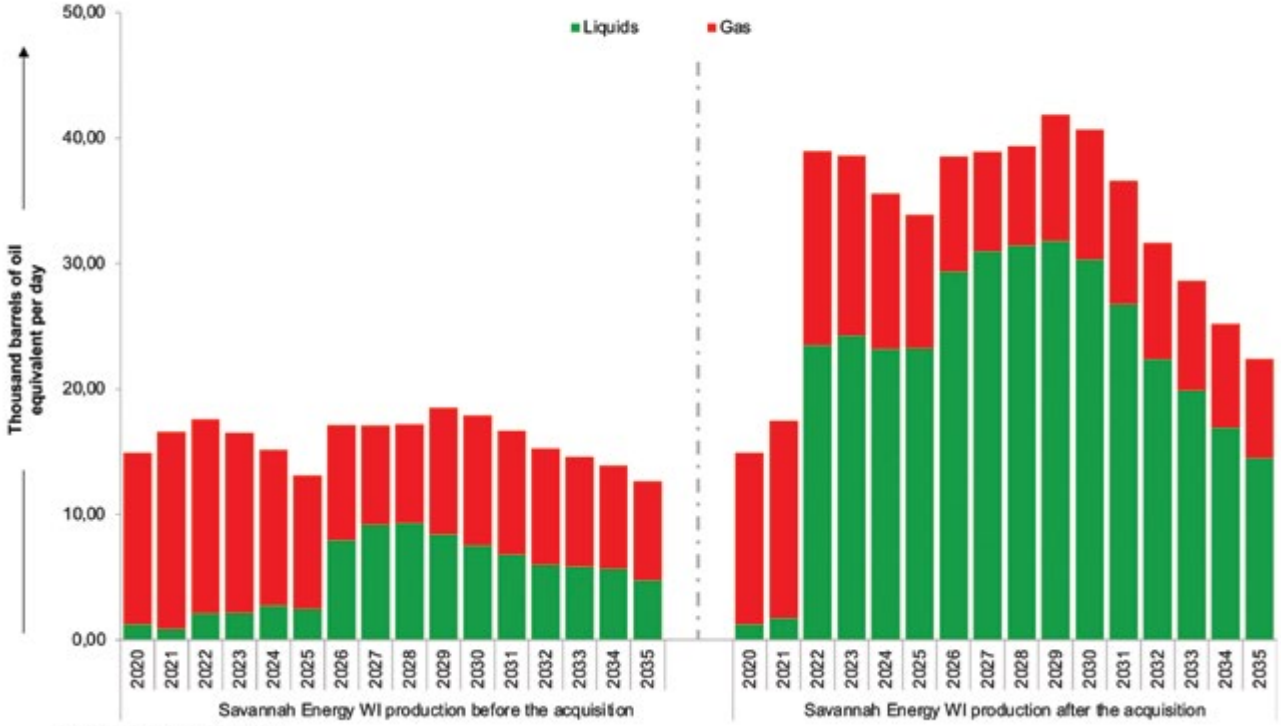
The Shell Petroleum Devleopment Company's (SPDC) JV in Nigeria has been offloading onshore oil mining leases (OMLs) since 2014. Operators like Aiteo Eastern E&P, San Leon and NewCross E&P have farmed into these blocks in transactions whose cumulative value was in the billions. SPDC is currently looking to exit from its onshore and swamp portfolio in the country. Shell Plc, the operator of the portfolio that the JV holds, has seen losses in production driven by pipeline theft and sabotage, oil spills as a result of this pipeline damages as well as other operational issues. Along with spending required to repair these damages, the Dutch major has also been facing legal actions in relation to these issues. Last year, a Dutch court held Shell responsible for oil spills in the Niger Delta, ordering the company to pay damages to the farmers, leading CEO van Beurden to call these assets as a "headache". Reduction of carbon emissions is another driving factor for this exit from an emission intensive portfolio. SPDC consists of Shell Plc, TotalEnergies and Eni with stakes of 30%, 10% and 5% respectively in the fields they hold, with Nigerian NOC NNPC holding the remaining 55%. Hsitorically, SPDC exits have been joint exits from all the three majors and it can be expected that the same would happen with this transaction as well. The sale was reported to fetch anywhere between US$2 – US$3 billion for Shell Plc's 30% stake in the 19 OMLs operated by the SPDC venture, with more recent valuation estimates increasing further to US$4 billion. However, required investments to bring new fields online and maintain output from the existing producing fields, and above-the-surface risks associated with the region can result in a much lower valuation. The sale drew interest from independent Nigerian firms Seplat Energy, Sahara Group, Famfa Oil, Troilus Investments Limited and Nigeria Delta Exploration and Production (NDEP), with Seplat reportedly leading the pack.



Seplat was also recently involved in a transaction with ExxonMobil to acquire the US major's stakes in 4 OMLs – 67, 68, 70 and 104 for US$1.3 billion. The reported valuations estimates for this transaction were over US$3 billion initially, reducing down by more than 50% by the time the transaction materialized. This transaction is currently going through a legal tussle with NNPC claiming pre-emption rights and winning a court decision to temporarily block ExxonMobil from selling these assets to Seplat. If Seplat successfully completes both the above transactions – with SPDC and ExxonMobil, it can potentially become the largest independent producer and one of the largest producers in Nigeria, producing an average of over a tenth of Nigeria's total output through the remainder of this decade. Seplat's 2023 working interest production levels can increase from an estimated 46,000 boepd pre-transactions to a potential 325,000 boepd.

It is to be noted a successful transaction with ExxonMobil has already resulted in an independent operator in Africa increase its gross output by a significant level. ExxonMobil and Petronas exited Chad signing deals worth a combined $626 million with Savannah Energy to sell their entire upstream portfolios in the West African nation. After a difficult few years for the sellers, which at one time saw Chad fine an ExxonMobil-led consortium $76 billion and a more recent worker unrest and insecurity at the Doba Basin fields, the US major – Asian NOC duo stepped out of the country. Savannah acquired these assets in what appeared to be a couple of undervalued deals and thereby more than doubling its gross output. Savannah's production, before the transaction, came from a couple of marginal fields in Nigeria and further flows were expected from the block it holds in Niger. With this transaction, the independent made an entry into Chad and increased its producing portfolio and also became one of the largest producers in Chad. Savannah was looking at a flat production of average 17,000 boepd through 2021 – 2023 before the transaction was completed. The new portfolio has injected significant oil flows and Savannah's overall average 2022 – 2023 oil output increased from an estimated average of just over 2,000 boepd to almost 24000 boepd. Savannah's overall average 2022 – 2023 output increased from an estimated average of 17,000 boepd to close to 38,500 boepd.

Savannah doubled its output through acquisition of fields in Chad from ExxonMobil & Petronas



Source: Rystad Energy UCube

While the recent and upcoming major transactions involved independents taking over majors' assets in West Africa, a potential significant deal involves privately owned Impact Oil and Gas considering sale of its 20% stake in Block 2913B, offshore Namibia, where drilling of the Venus 1-X exploration well resulted in a significant discovery. Block 2913B is operated by TotalEnergies with a 40% interest. Other partners include QatarEnergy (30%), and Namibian NOC NAMCOR (10%). Impact has reportedly hired investment bank Jefferies for the sale. Impact hopes the sale would fetch between US$500 million and US$1 billion. The company is currently in deliberation with potential investors to secure funding of up to US$100 million for the appraisal programme, expected to begin in August 2022.

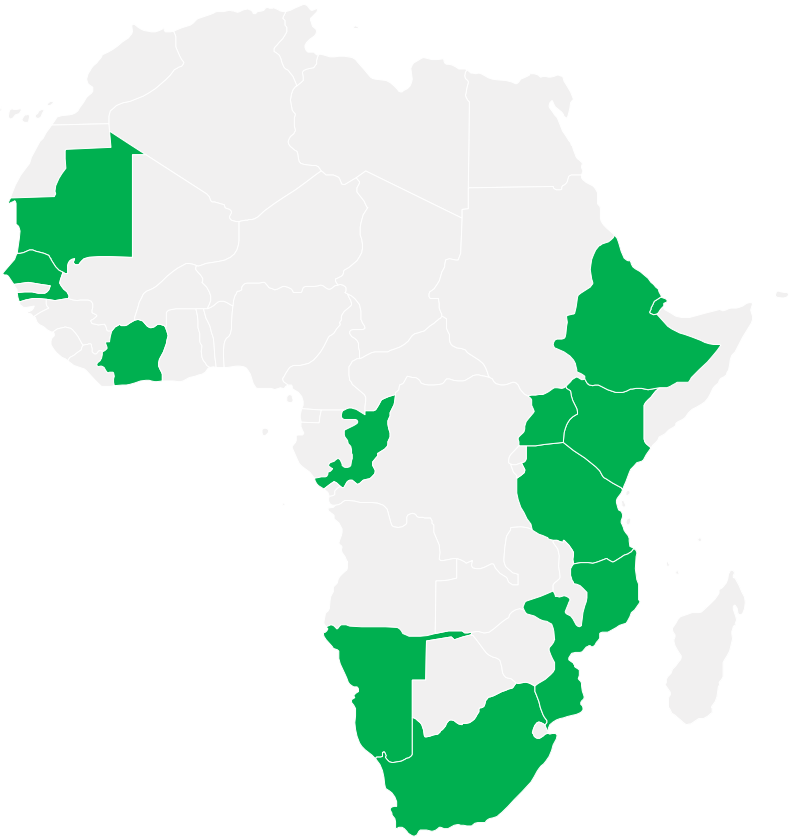
Impact Of New Oil And Gas Economies In Africa
Expected To Be Much Higher Following This Decade

As projects offshore and onshore in countries like Mauritania – Senegal, Namibia, South Africa, Mozambique, Tanzania and other upcoming oil and/or gas economies come online, these countries are expected to produce about 8% of Africa's oil and gas output over 2026 – 2030, increasing to about 20% over the period 2031 – 2040

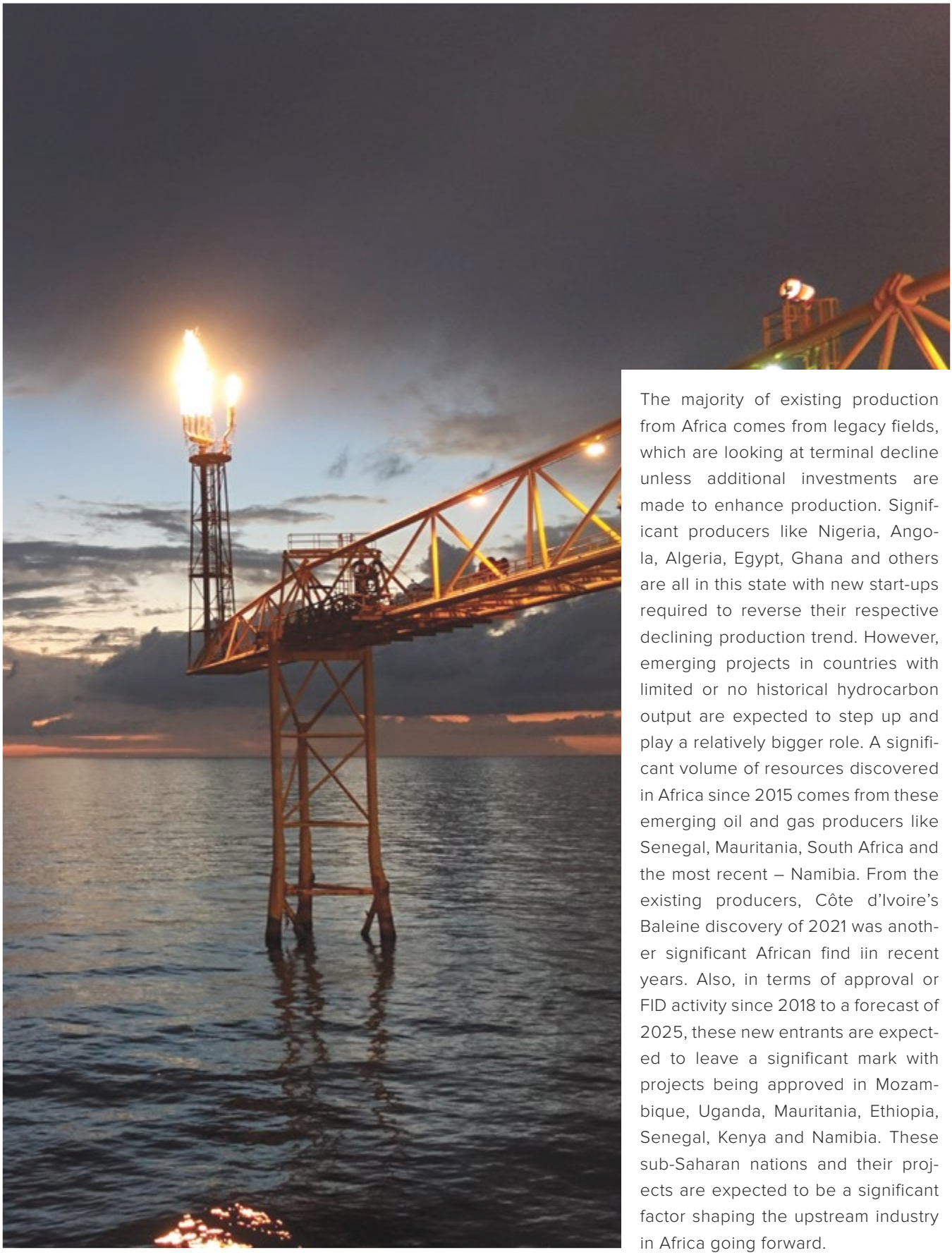
Cumulative volumes from these countries/projects are expected to average almost 1 million boepd over 2026 – 2030 and almost 2.5 million boepd over the next decade

the Majority of existing production from Africa comes from legacy fields, which are looking at terminal decline unless additional investments are made to enhance production. Significant producers like Nigeria, Angola, Algeria, Egypt, Ghana and others are all in this state with new start-ups required to reverse their respective declining production trend. However, emerging projects in countries with limited or no historical hydrocarbon output are expected to step up and play a relatively bigger role. A significant volume of resources discovered in Africa since 2015 comes from these emerging oil and gas producers like Senegal, Mauritania, South Africa and the most recent – Namibia. From the existing producers, Côte d'Ivoire's Baleine discovery of 2021 was another significant African find in recent years. Also, in terms of approval or FID activity since 2018 to a forecast of 2025, these new entrants are expected to leave a significant mark with projects being approved in Mozambique, Uganda, Mauritania, Ethiopia, Senegal, Kenya and Namibia. These sub-Saharan nations and their projects are expected to be a significant factor shaping the upstream industry in Africa going forward.

New entrants and innovative developments/mega discoveries from old timers shaping the new Africa oil and gas scene



- **Mauritania – Senegal**
  - Major LNG projects – GTA, Yakaar – Teranga, BirAllah
  - Oil developments – SNE
- **Côte d'Ivoire**
  - Baleine discovery
- **Congo**
  - Marine XII Fast LNG and FLNG
- **Namibia**
  - Mega discoveries of Venus and Graff
- **South Africa**
  - Brulpadda and Luiperd gas finds
- **Mozambique**
  - Coral FLNG, Area 1 LNG, Area 4 LNG
- **Tanzania**
  - Long delayed LNG developments of Blocks 1, 2 & 4
- **Kenya**
  - South Lokichar oil project
- **Uganda**
  - Recently FID'ed Tilenga oil project
- **Ethiopia**
  - Calub and Hilala gas projects



The majority of existing production from Africa comes from legacy fields, which are looking at terminal decline unless additional investments are made to enhance production. Significant producers like Nigeria, Angola, Algeria, Egypt, Ghana and others are all in this state with new start-ups required to reverse their respective declining production trend. However, emerging projects in countries with limited or no historical hydrocarbon output are expected to step up and play a relatively bigger role. A significant volume of resources discovered in Africa since 2015 comes from these emerging oil and gas producers like Senegal, Mauritania, South Africa and the most recent – Namibia. From the existing producers, Côte d'Ivoire's Baleine discovery of 2021 was another significant African find iin recent years. Also, in terms of approval or FID activity since 2018 to a forecast of 2025, these new entrants are expected to leave a significant mark with projects being approved in Mozambique, Uganda, Mauritania, Ethiopia, Senegal, Kenya and Namibia. These sub-Saharan nations and their projects are expected to be a significant factor shaping the upstream industry in Africa going forward.

Major currently FID'ed upcoming sub-Saharan African start-ups

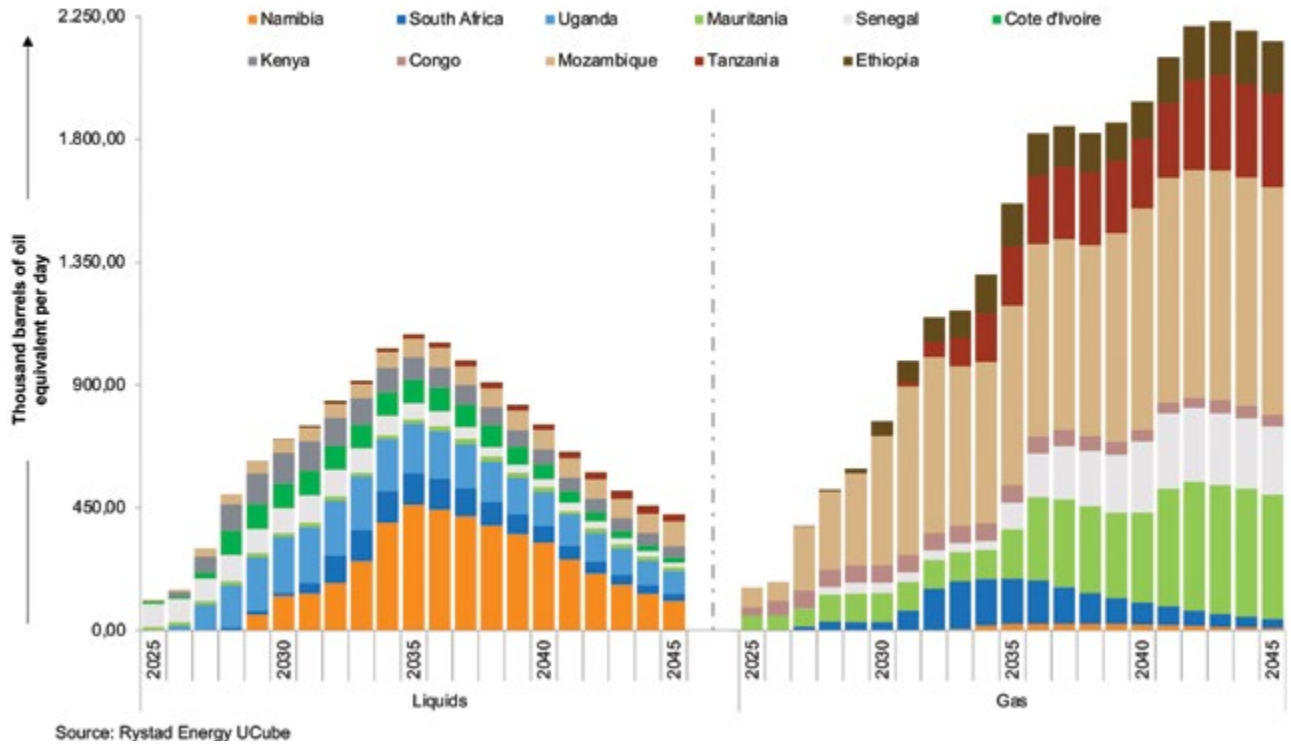
Operator	Country	Project	FID*	Start-up*	Resources* (MMboe) Liquids Gas
TotalEnergies	Mozambique	Area 1 LNG (T1 – T2)	2019	2026	3590
TotalEnergies	Uganda	Tilenga	2022	2026	1055
bp	Mauritania / Senegal	Greater Tortue Ahmeyim Phase 1	2018	2023	920
eni	Congo (Brazzaville)	Marine XII Fast LNG	2022	2024	325
cnooc	Uganda	Kingfisher South	2022	2026	240
woodside	Senegal	Sangomar (Ex-SNE)	2020	2023	230
eni	Mozambique	Coral FLNG**	2017	2022	225
eni	Congo (Brazzaville)	Marine XII FLNG	2022	2025	150
TotalEnergies	Mozambique	Area 1 LNG (T3 – T4)	2030	2034	2815
ExxonMobil	Mozambique	Area 4 LNG (T3 – T4)	2033	2038	2285
bp	Mauritania	Bir Allah LNG	2030	2035	2180
bp	Senegal	Yakaar LNG	2030 (Phase I) 2033 (Phase II)	2034 (Phase I) 2039 (Phase II)	2145
TotalEnergies	Namibia	Venus	2025 (Phase 1) 2028 (Phase II)	2028 (Phase 1) 2033 (Phase II)	1440
bp	Mauritania / Senegal	Greater Tortue Ahmeyim Phase 3	2035	2040	1160
TotalEnergies	Tanzania	Brulpadda – Luiperd	2024 (EPS) 2027 (FFD)	2027 (EPS) 2031 (FFD)	1140
ExxonMobil	Mozambique	Area 4 LNG (T1 – T2)	2024	2029	925
Shell	Tanzania	Tanzania LNG T2 (Block 1 and 4)	2034	2041	925
equinor	Tanzania	Tanzania LNG T1 (Block 2)	2028	2033	910
Shell	Tanzania	Tanzania LNG T1 (Block 1 and 4)	2026	2031	780
Tullow Oil	Kenya	South Lokichar	2023 (Phase I) 2025 - 2026 (Phase II) 2028 - 2032 (Phase III)	2026 (Phase I) 2027 - 2029 (Phase II) 2031 - 2036 (Phase III)	575
eni	Ivory Coast	Baleine Phase 2	2024	2027	565
eni	Mozambique	Coral (Phase 2)	2028	2030	400
woodside	Senegal	Sangomar (Ex-SNE) Further Phases	2024 (Phase II) 2027 (Phase III) 2032 (Gas)	2027 (Phase II) 2030 (Phase III) 2036 (Gas)	365
Shell	Namibia	Graff	2027	2032	340
bp	Mauritania / Senegal	Greater Tortue Ahmeyim FLNG	2022	2027	320
bp	Senegal	Yakaar (domestic)	2025	2028	220
Shell	Tanzania	Tanzania Block 1 and 4 (Domestic Supply)	2032	2035	165

Source: Rystad Energy UCube; *conservative estimates

These projects involve a number of majors and are spread across both sides of the continent. Some of the past FIDs include BP's GTA Phase 1 in the Senegal – Mauritania maritime region, Woodside-operated Sangomar scheme offshore Senegal, Eni's Coral FLNG offshore Mozambique, which will soon start exporting LNG cargoes, and TotalEnergies' Area 1 LNG trains 1 and 2 also in Mozambique. The list gets longer with the recent FID for the Tilenga development operated by TotalEnergies and CNOOC's Kingfisher South project in Uganda, and Eni's Marine XII gas export schemes offshore Republic of the Congo. Large gas schemes in Mozambique, Tanzania, Senegal, Mauritania, South Africa and recent mega oil finds offshore Namibia and Côte d'Ivoire round off this very significant list.

In terms of the overall cumulative production, these upcoming projects are estimated to drive significant volumes, both oil and gas, from Africa. Flows from these projects kick off with Mozamique's Coral FLNG in 2022 and ramp up gradually through all of next decade and the following as some of these project are looking at a delayed timeline of development. Cumulative peak liquids production is estimated to surpass 1 million bpd by mid-2030s at the current conservative timeline and estimated build-up. As more and more gas projects, in line with Africa's tremendous gas potential, come online, cumulative gas output is expected to stay in the path of inreasing through the remainder of this decade, into the next decade and extend the ramp up through 2040s as well. Peak volumes of gas volumes are expected to exceed 2 million boepd, but at a delayed timeline of late-2030s or early-2040s. Average hydrocarbon output from these projects can be expected to reach 1 million boepd through the years 2026 – 2030 , and increase further to an average of close to 2.5 million boepd through the 2030s. The respective timelines and schemes of development for these projects remain the key factor but the potential is tremendous.

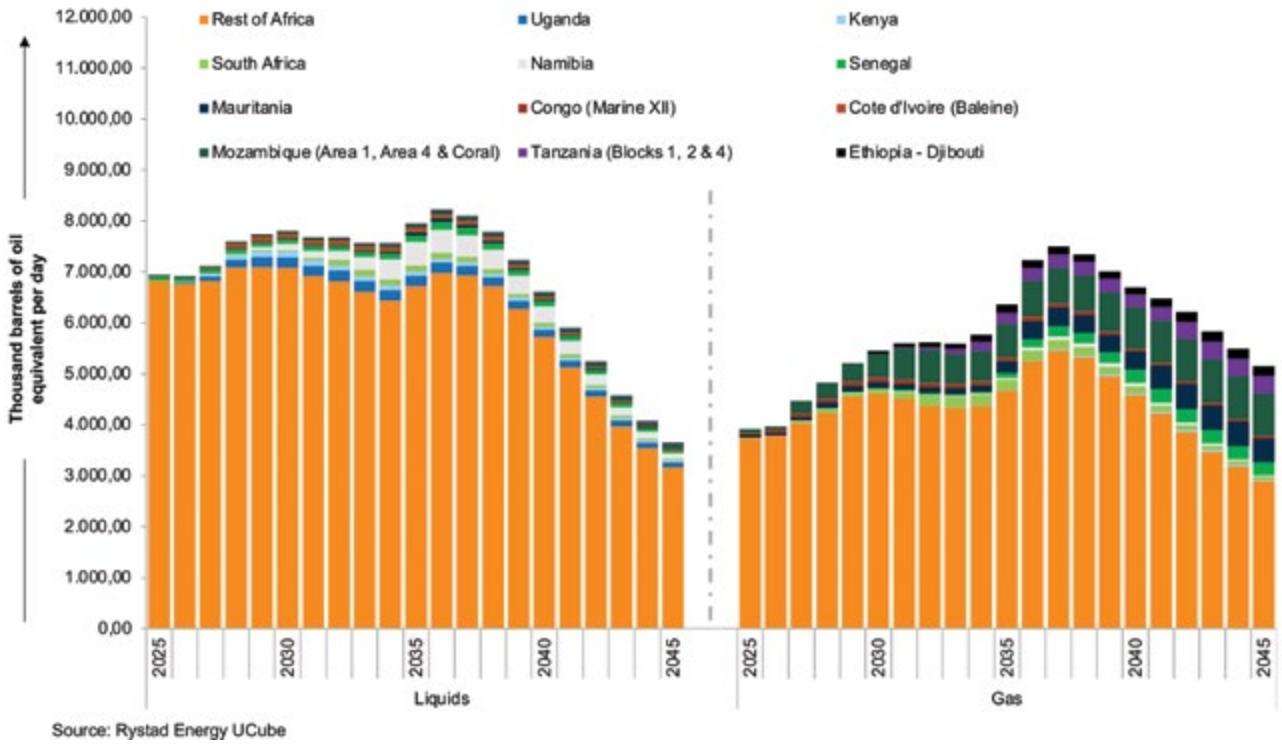
Handful of upcoming projects in sub-Saharan Africa expected to drive an average of almost 1 million boepd through the second half of this decade and increasing to an average 2.5 million boepd production through the next decade



Source: Rystad Energy UCube

These large flows are expected to have a significant impact on the overall production from Africa in the coming years. As production from the legacy countries declines and production ramp-up from the projects kick-off, the liquid's production share from these new projects is expected to be over 5% of the overall Africa liquids during the second half of this decade and increase further to close to 15% average during the period 2031 – 2040. The impact on the gas output is expected to be much bigger. Natural gas production share over the period 2026 – 2030 is expected to be over 10% and increase to as high as over a quarter of the overall output during the next decade. As a result, these new and upcoming economies are estimated to drive almost 10% of the total oil and gas flows from Africa through 2026 to 2030 and a much higher average of 20% over the next decade.

Upcoming oil and gas economies expected to drive a tenth of Africa's hydrocarbon output over 2026 – 2030, doubling to a fifth over the next decade!



Source: Rystad Energy UCube

Gas–To–Power: Upstream and power generation infrastructure development important to meet universal electricity access

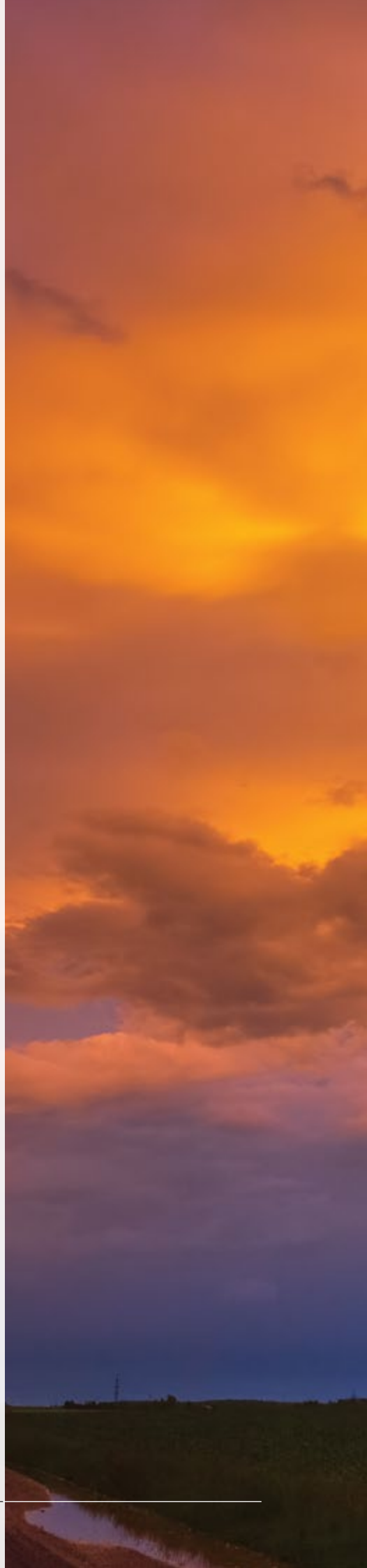
Africa's current access to electricity status requires tremendous improvement barring a few countries

Rural access to electricity is low even in countries with high overall electricity access, thus pointing at the necessity to improve universal electricity access

High dependance on fossil fuels for power generation expected to remain in the near-term

Natural gas expected to constitute about 40% of the power mix over 2023 – 2030 but lot of space for improvement as existing upstream gas potential is over 450 Tcf with about 65% of it still in pre-FEED state of development

While the world is pushing towards the energy transition and net zero emission targets. Africa stands in a position where no new development of fossil fuel projects will mean a massive hit to many African economies. On top of this, the dependance on conventional sources to generate electricity combined with the existing low access to electricity across the continent is a key indicator towards the fact that energy poverty in Africa needs fossil fuels before the big switch to more "modern sources" of energy can be made. Only four of the top 10 most populous nations in Africa – Egypt, South Africa, Kenya and Algeria have an electricity access rate of over 70%. While Egypt's hydro and thermal powered plants and increasing exposure to renewable sources of energy give the state a 100% access to electricity, Algeria and Tunisia are dependant on gas for power, and South Africa generates most of its electricity using coal.



Electricity access at low levels barring a few

High Population low access to Electricity

Low Population but high

Algeria
- Population – 9th largest
- Access to electricity – 99.8% (99.6% for rural areas and 99.9% for urban areas)
- Main sources – Natural gas (96%), Combination of oil, solar, hydropower and wind (4%)

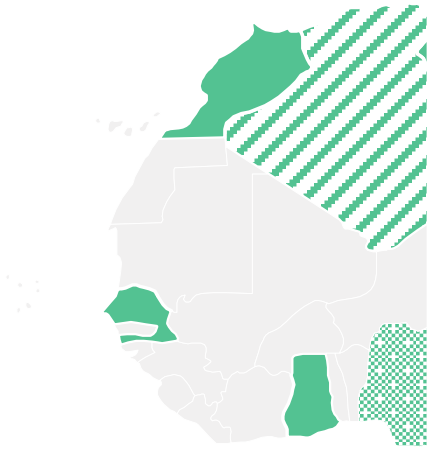
Morocco
- Population – 11th largest
- Access to electricity – 100%
- Plans to increase the share of renewables in the energy mix to 52% for wind and solar by 2030

Senegal
- Population – 23rd largest
- Access to electricity – 70.4% (47.4% for rural areas and 95.2% for urban areas)
- Main sources – Natural gas, Solar, Wind and Biomass
- Targeting complete access by 2025 driven by new gas-to-power developments and renewable investments

Ghana
- Population – 14th largest
- Access to electricity – 85.9% (74% for rural areas and 94% for urban areas)
- Main sources – Natural gas, Hydro and Thermal

Nigeria
- Population – LARGEST
- Access to electricity – 60%

Tunisia
- Population – 32nd largest
- Access to electricity – 100%
- Main source – Natural gas
- Targeting 30% renewables powered



Gabon
- Population – 44th largest
- Access to electricity – 91.6% (27.8% for rural areas and 98.6% for urban areas)
- Under the Gabon Emergent Policy, the country aims to introduce a sustainable energy mix including biomass, natural gas and hydropower

Democratic Republic of Congo
- Population – 4th largest
- Access to electricity – 40%

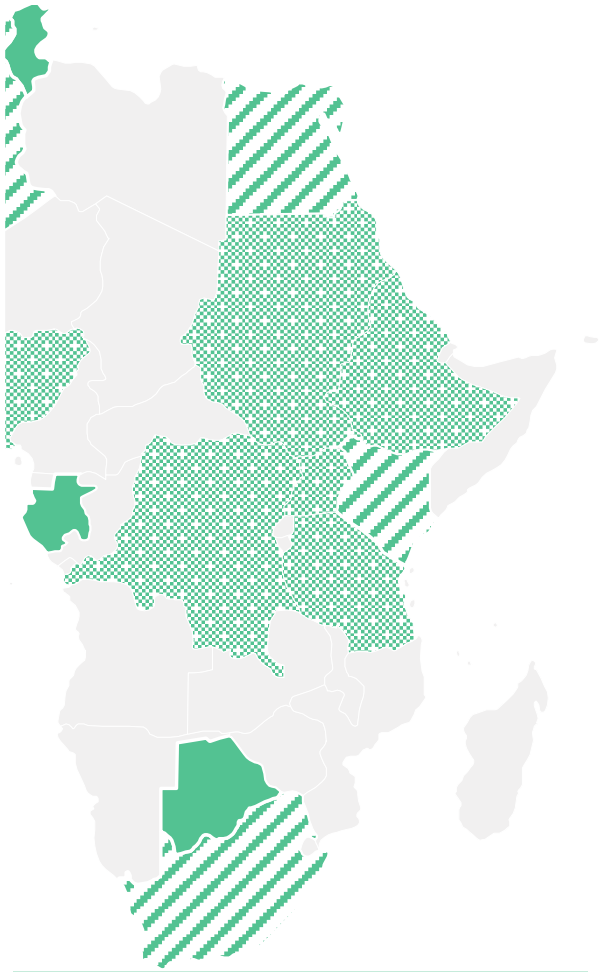
Sources:
Energy Capital & Power – "The Ten Most Electrified Countries in Africa" June 2022;
Rystad Energy Research and Analysis

exceptions and rural access even lower

access to Electricity

High Population and high access to Electricity

energy by 2023



South Africa
- Population – 6th largest
- Access to electricity – 84.4% (75.3% for rural areas and 88.8% for urban areas)
- Main source – Coal
- Targeting reduction of coal usage to 60% and increasing renewables to 25% by 2030

Egypt
- Population – 3rd largest
- Access to electricity – 100%
- Main sources – Hydro and Thermal power stations
- Increasing Renewables investments

Sudan & South Sudan
- Population – 7th largest
- Access to electricity – 50%

Ethiopia
- Population – 2nd largest
- Access to electricity – 50%

Kenya
- Population – 8th largest
- Access to electricity – 71.4% (62.7% for rural areas and 94% for urban areas)
- Energy mix – Hydro, Geothermal, Wind, Solar and Biomass
- Bulk of electricity from renewables

Uganda
- Population – 10th largest
- Access to electricity – 50%

Tanzania
- Population – 5th largest
- Access to electricity – 50%

Botswana
- Population – 43rd largest
- Access to electricity – 72% (26.4% for rural areas and 90.7% for urban areas)
- Main source – Coal & Petroleum imports and Wood
- Targeting 100% access by 2030 by utilizing its abundant wind and solar resources

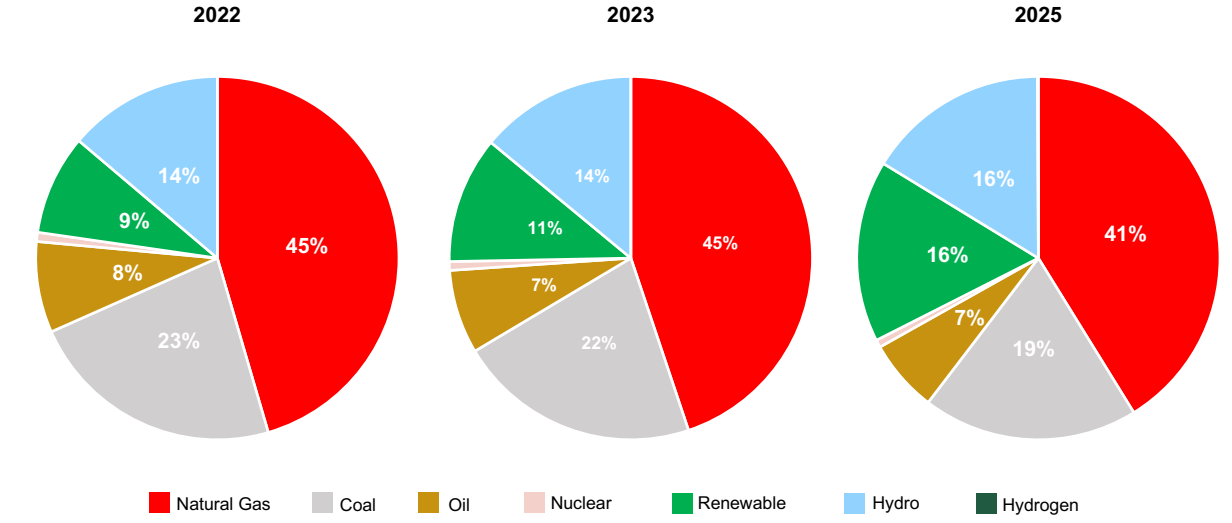
The average access to electricity between the remaining six most populous nations in Africa – Nigeria, Ethiopia, Democratic Republic of Congo, Tanzania, Sudan and Uganda is about 50%. It is to be noted that, of these countries, Nigeria and Tanzania have massive natural gas resources and are targeting LNG markets. However, half of their population is currently in the dark, with no access to electricity. Six other countries – Morocco, Ghana, Tunisia, Senegal, Botswana and Gabon, that boast of universal electricity access rate of over 70% show an average 63% access to rural population compared to a high 96% access to urban population. This suggests in countries where universal access is already low, rural access rate can be even marginal at the best.

Egypt announced during last year's COP26 new targets for renewables which shorten the timeline for its transition to clean energy. The target to achieve 42% renewables by 2035 has been brought forward to 2030, with the 2035 target revised to 55% renewables. By 2040, Egypt is aiming to have 61% renewables in its power mix, of which 45% will be solar, and 13% wind. To support its ambitious targets – and the high-level of installed renewable energy capacity required to hit these goals – the country needs to develop a smart grid infrastructure that can integrate traditional (fossil fuels) and renewable energy sources. A smart power grid could help reduce the environmental impact and the cost of producing electricity from renewable energy sources and storing it. The country's moves seem set to support a strong and smart grid that will be able to back the development of planned renewable energy projects, and Egypt's Ministry of Electricity and Renewable Energy is paying special attention to transmission infrastructure projects, which are key to implementing the government's strategy of transforming the country into a global energy hub.

South Africa – faced with 1,130 hours (highest ever) of planned power outages in 2021 – needed 6,000 megawatts (MW) of additional electricity generation to overcome the year's supply shortfall. Earlier this year in July, this crisis worsened further with Stage 6 rolling blackouts implemented after 18,000MW of generation capacity was lost. This led to eight hours per day of no access to electricity. This led to a devastating effect on South Africa's struggling economy. Currently, South Africa has installed generation capacity of 45,000MW and, at peak times, approximately 32,000MW is consumed. However, only 60% of the country's installed capacity is available at any given time due to scheduled maintenance and unplanned outages caused by inadequate maintenance, theft, corruption and mismanagement. This year, the country is calling for proposals from private producers to supply an additional 2,600 MW of renewable energy capacity, including 1,600 MW of onshore wind and 1,000 MW of solar PV, under its Renewable Energy Independent Power Producer Procurement Program (REIPPPP) bid window 6. However, the REIPPP programme has experienced significant delays due to uncertainty over, amongst other things, tariff structures and local content requirements and, in this context, the energy crisis has only worsened. Hence this REIPPP programme was announced to increase the generation capacity of wind and solar projects to be procured through this round to double from 2,600MW to 5,200MW. Round 6 bid submissions closed on 11 August 2022. The Government further plans to release a request for proposals for battery storage solutions by September of this year, with a RfP for gas power following soon after.

On the other hand, many African nations are currently dependent on and are expected to remain dependent on their fossil fuel output to maintain as well as garner any hopes of increasing their respective universal electricity access rates. Algeria, which currently enjoys high electricity access is dependent on its declining natural gas potential and is looking at investments to improve the situation. Among other initiatives like gas focused "Decade of gas", Nigeria is constructing the Ajaokuta – Kaduna – Kano (AKK) pipeline, aiming to generate 3.6 gigawatts (GW) of power and support gas-based industries along the route. South Africa is dependent on coal currently for power. Although it is working on programs like the REIPPP, the recent offshore discoveries of Brulpadda and Luiperd can play a vital role in domestic supply. Ghana derives its electricity with gas as one of the main sources. Gabon is aiming to introduce a sustainable energy mix including biomass, natural gas and hydropower under its Gabon Emergent Policy. One of the main sources of electricity in Senegal is natural gas and the upcoming Yakaar development is aimed at diverting some gas flows to the domestic market. Namibia and Zambia are working on an agreement to assess the viability of constructing natural gas and oil product pipelines between the two countries. Zambia aims to import gas from Namibia using the natural gas pipeline and use it for power generation. Zambia is also in talks with gas-rich Tanzania to discuss the possibility of gas imports for power. The landlocked country is in talks with other neighbours Angola and potentially, Zimbabwe also for gas imports. As such, gas can be expected to play an important role for power generation and elimination of energy poverty in Africa in the near- to medium-term, before renewables pick up and become a viable solution.

Natural gas, Coal and Oil expected to continue to be the main sources of power in the near-term



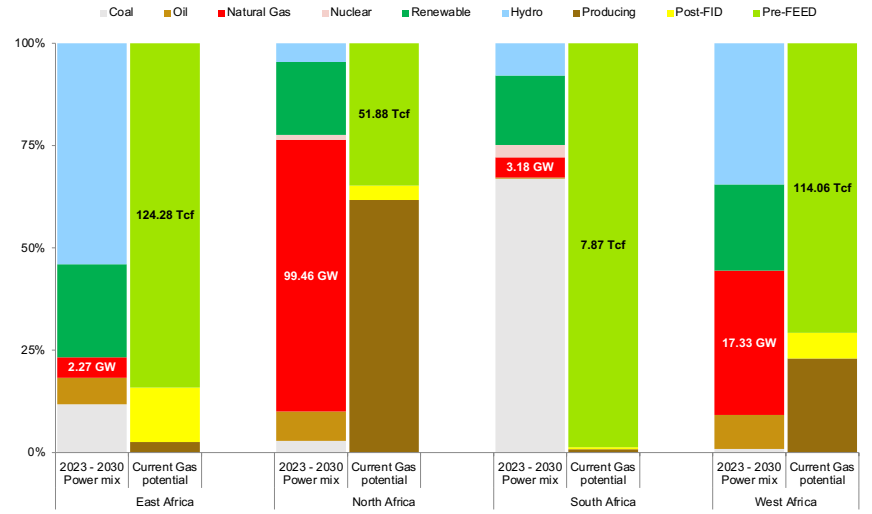
Source: Rystad Energy PowerCube

The near-term expected power mix forecast for Africa also suggests the same. Natural gas and coal are expected to be the main sources driving 68% of the overall capacity in 2022, staying flat at 67% in 2023 and decreasing marginally down to 60% of the capacity by 2025. Hydropower maintains its status at an average 15% of the capacity over the period. As Africa, especially the northern states, slowly inceases its exposure to renewable sources of energy and generating electricity from them, power generation capacity increases from 9% in 2022 to 11% in 2023 and further to 16% by 2025. However, natural gas retains its role as the major source.

To meet the climate targets set out in the Paris Agreement Africa must radically change its energy landscape, moving away from coal, which together make up close to 25% of primary energy demand in 2022, towards cleaner solutions. Even though renewables are integral to reduce greenhouse emissions, other energy sources must be considered to ensure the security of supply across the continent and to meet the additional energy demand, which is set to triple in the next 20 years. For underdeveloped power grids the intermittency of renewables can put the stability of the systems at risk. Better system management and upgraded infrastructure is necessary, but for now, without a long-term power storage technology, complimentary fuels such as natural gas are crucial to satisfy the growing demand for electricity.

Over 25 countries have proven natural gas reserves on the African continent. This represents strong potential for an increasing role of natural gas in the African energy mix. There are 13 countries in sub-Saharan Africa currently consuming gas for power generation. Ten of those countries generate power from their own domestic gas production, two rely on pipeline imports (Togo and Benin) and one uses a combination of domestic supply and pipeline imports (Ghana). As of 2022, an estimated 82% of gas-to-power production is concentrated in Northern Africa, 15% in Western Africa and the remaining 3% split between other regions. About 50% of 2022 power generation in Africa is from North Africa. Egypt, Algeria, Morocco, Libya and Tunisia round off the top 5 in North Africa in terms of 2022 power generation. Although the outlook for these countries is different, 2022 situation suggests these countries largely rely on the output of their hydrocarbon resources, which are utilized both for domestic supply and also to bring in export revenue, with high volumes flowing to Europe. Gas discoveries in sub-Saharan countries such as Senegal – Mauritania, Tanzania and Mozambique put the region in a favourable position to start developing their own gas-to-power infrastructure as well as benefit from under supplied LNG market.

Current gas potential vs 2023 – 2030 power mix suggests the issue is a mix of gas potential an gas-to-power infrastructure



Source: Rystad Energy PowerCube, Rystad Energy UCube

Considering the gas utilization plans from many African administrations and also the increasing demand for power, it seems that power generation should be the primary objective behind utilization of the energy sources and that the transition towards cleaner sources of energy will begin with better utilization of natural gas produced and improvement of gas-to-power facilities. A comparison of the cumulative 2023 – 2030 power mix in the four regions of Africa vs the current recoverable gas reserves estimates suggests that better resource management and upgraded infrastructure is necessary to progress towards eliminating energy poverty as well as towards cleaner sources of energy. East Africa, owing to the giant gas finds off Mozambique and Tanzania has tremendous yet-to-be-developed gas potential. The power mix also shows majority of the generation capacity draws resources from hydropower and other renewable sources of energy. However, the situation is different in northern and southern African regions where dependance on coal and natural gas is heavy but relative gas potential is low because of either depleting feedgas fields or lack of new discoveries. As such, while these regions pick up the pace on either making the switch to renewable sources or improve their gas supply, intra-African gas exports from East Africa can prove helpful. The fact that the northern and southern African regions are home to few of the largest populations across Africa suggests that the demand for power and the necessity for universal electricity access are issues that need to be sorted out. Meanwhile, western Africa seems more balanced in terms of the energy mix – natural gas potential comparison, but the largest population and the biggest producer – Nigeria is very vocal about heavy gas export plans, whether it is in the form of LNG using its NLNG plant or via pipelines using the proposed TSGP or NMGP intra-Africa to Europe pipeline projects. It is to be noted that despite being a major producer of hydrocarbons, Nigeria's electricity access rate is low, and barring Gabon and Ghana, other West African nations are also facing the same issue or even worse. Hence, maintaining the balance between European export plans, meeting domestic demand, helping intra-African exports and most importantly, investing in gas-to-power infrastructure is the key for Nigeria as well as West Africa. Africa, as a whole, needs to look inwards first and consider African priorities while developing export projects.

Although solar PV and other clean renewable sources are very important to meet the climate requirements, it remains only one facet of a more diversified and multi-discipined solution to the situation that Africa is facing. The access to electricity is low and hence, the demand is high but the infrastructure or majority of the development plans to achieve this via renewable sources is still in the concept phase. The gas potential is high and is a relatively more viable approach to step towards improving electricity access and ending energy poverty in Africa. As such, in the case of Africa, the energy transition is not a switch, but a real transition with natural gas as the first step, going hand-in-hand with development of renewable energy projects. This needs time and monumental effort from all the administrations – first to eliminate energy poverty across the state irrespective of rural or urban geography, second to restrict the emissions by eliminating natural gas flaring and use this resource to generate electricity and finally, progressing towards cleaner sources of energy which is essential for the planet.

Energy transition – Africa capacity minimal in comparison to global volumes but six times growth expected by 2035

Solar PV, onshore wind and Hydrogen expected to be the main sources driving the renewable energy capacity in Africa through 2030s

Africa's contribution to global solar PV, onshore wind and hydrogen in 2022 – 2%, 1% and <0.5% with capacity volumes of 12.6GW, 10GW and sub-0.5GW respectively

Africa still a, even in the medium-term, contributing to a cumulative 4% of solar PV, 3% of onshore wind and a fifth of hydrogen generated capacity through 2023 – 2035

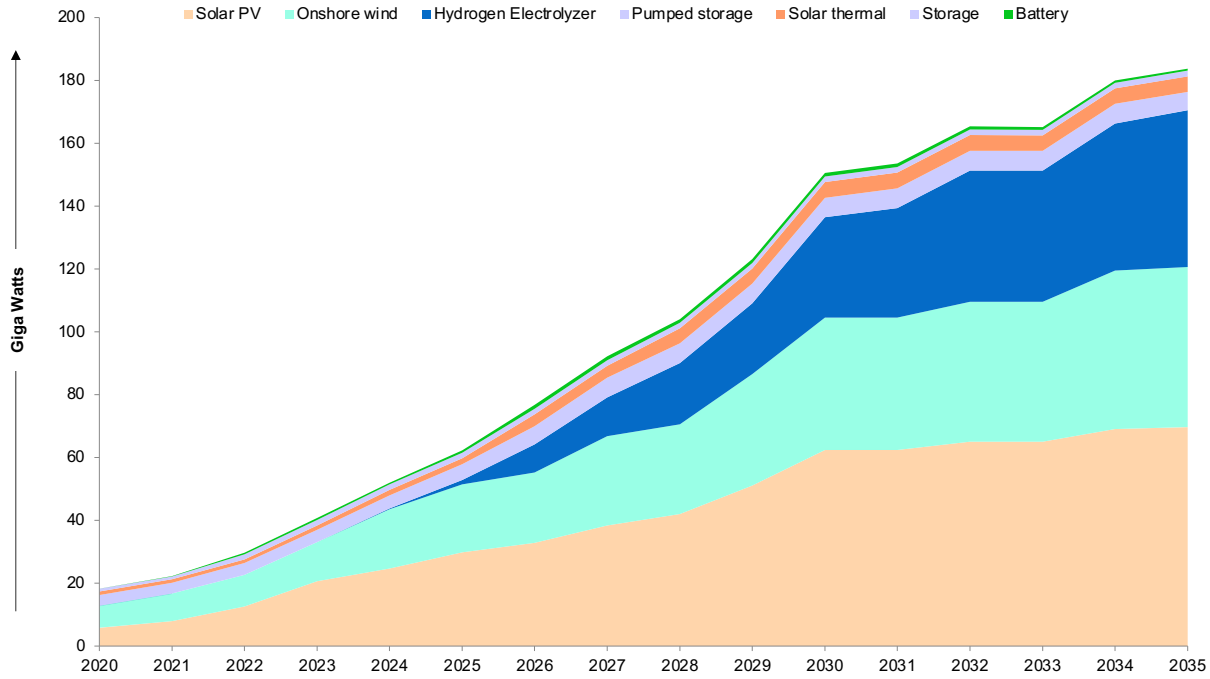
African solar PV, onshore wind and hydrogen capacity to reach 70GW, 51GW and 50GW, respectively by 2035

Mauritania, Morocco and Egypt expected to be the leaders in renewables in the medium-term

Asian financial institutions continue to be the leaders in funding fossil fuel projects but European institutions are also expected to fund gas developments as EU rules gas investments as "green" to meet the demand post Russia – Ukraine conflict

As discussed in the previous section, Africa's transition from fossil fuels or investments in renewable sources of energy is expected to be relatively on a much smaller scale as opposed to high exposure to these "modern" sources of energy being observed in Asia, Europe or the United States. While global 2022 hydrogen powered capacities are minimal, solar PV and onshore wind capacities are about 575GW and 900GW respectively. Asia, Europe and the United States take the top three spots as leading producers adding about 90% of the overall volumes with estimated solar PV and onshore wind capacities of 342GW, 75GW and 98GW respectively, and 432GW, 212GW and 176GW, respectively. The impact on capacities for 2023 is no different with these three regions again expected to drive 90% of the total. Asia, Europe and the United States 2023 solar PV and onshore wind capacities are estimated at 431GW, 91GW and 137GW, respectively and 513GW, 225GW and 191GW, respectively. Compared to this, Africa's 2021 solar PV and onshore wind capacity is 12.6GW and 10GW respectively, and 2023 capacities are expected to show increases to 20.5GW and 12.5GW of solar PV and onshore wind capacity respectively. These volumes are a mere 1% – 2% of the total and are a reflection of Africa's exposure to renewables compared to other regions like Asia, Europe and North America.

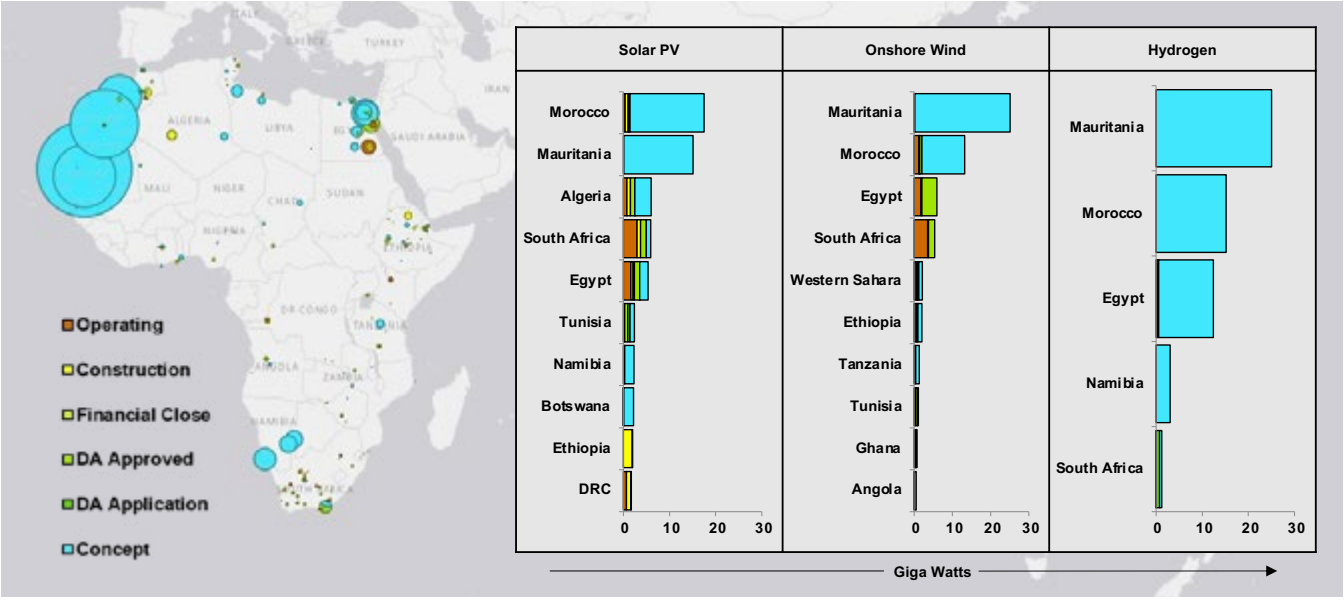
Photovoltaic, wind and hydrogen sources driving majority of Africa's renewable energy



Source: Rystad Energy RenewablesCube

Africa, however, is expected to see a growth in its renewables capacity even at the current estimated conservative timeline and scale of projects. While three-fourths of the 2022 overall capacity of about 30GW is driven by solar PV and onshore wind projects mainly in Egypt and South Africa, the capacity is estimated to gradually increase, spread across the continent and also venture into hydrogen. 2023 total capacity is expected to increase to 80GW with solar PV and onshore wind projects mainly in Egypt, South Africa, Morocco, Algeria and Ethiopia driving 80% of the total. Solar PV and onshore wind capacities are expected to gradually increase going into the next decade and considerable hydrogen capacity is expected to kick-off by 2025 – 2026 with projects in South Africa, Egypt, Mauritania, Morocco and Namibia. By the end of the decade, Africa renewables capacity is estimated to increase to 150GW, five times of 2022 capacity. Solar PV is estimated to continue to be the largest renewables source driving about 41% of the total capacity, followed by onshore wind driving close to 28%. Hydrogen sector is estimated to grow exponentially by 2030, driving over a fifth of the overall volumes with projects in Egypt, Mauritania, Morocco, South Africa and Namibia. The total capacity, as per the projects in concept phase and in pipeline, is currently estimated to peak around 2035 – 2036 at a level of over 180GW with solar PV, onshore wind and hydrogen as the main sources. The contribution percentage of these three sources is expected to be about 38%, 28% and 27%, respectively.

Mauritania, Morocco and Egypt lead the way for Africa renewables



Source: Rystad Energy RenewablesCube, Rystad Energy GIS services

Renewable energy investors like CWP Global, developers like Scatec, renewable energy players like Masdar and Hassan Allam, renewable energy focused wings of E&P players like TotalEren in association with various governments are in pipeline to develop and operate the upcoming revewable developments across Africa.

Solar PV potential strong across Africa

Country	Project	Operator/Developer	Start-up**	Capacity (MW)
Mauritania	Aman Project	CWP Global	2030 - 2034 - 2036	12000
Morocco	Amun Project	CWP Global	2027 - 2030 - 2032	7500
Morocco	Morocco – UK Export Project	Xlinks*	2029	7000
Mauritania	Project Nour	Chariot*	2028	3000
Botswana	Botswana – Namibia Solar Project		2029 - 2030	2000
Namibia	Botswana – Namibia Solar Project		2029 - 2030	2000
Tunisia	Remada Solar PV Plant	STEG (Tunisia)	2023 - 2025 - 2030	1700
Morocco	Noor Tata	MASEN (Morocco)	2030	800
Morocco	Noor Midelt I	EDF	2023	600
Egypt	Kom Ombo ANI Solar Project	ASPC	2023	500
Morocco	Foum Al-Oued	MASEN (Morocco)	2025	500
Libya	As-Saddah Solar Farm	TotalEnergies	2030	500
Egypt	West Nile Solar	EETC (Egypt)	2025 - 2026	490
Egypt	BP Solar	Lightsource BP	2024	400
Sudan	Sudan Solar Power Plants	Government of Sudan	2025	400
Western Sahara	Noor PV II Ph – II	MASEN (Morocco)*	2026	400
Togo	Arise Integrated Industrial Solar	Arise*	2026	315
Djibouti	Grand Bara Solar Project	ENGIE	2023 - 2024	300
Uganda	CEEC_Uganda Ph – I	China Energy Group*	2022	250

Source: Rystad Energy RenewablesCube; **conservative estimates; *Developer

North Africa heavy on onshore wind activity

Country	Project	Operator/Developer	Start-up**	Capacity (MW)
Mauritania	Aman Project	CWP Global	2030 - 2034 - 2036	18000
Morocco	Amun Project	CWP Global	2027 - 2030 - 2032	7500
Mauritania	Project Nour	Chariot*	2029	7000
Morocco	Morocco – UK Export Project	Xlinks*	2027	3500
Egypt	Gulf of Suez – Red Sea	Siemens Gamesa	2024	2000
Egypt	Masdar – 800MW	EDF	2024	1600
Western Sahara	Dakhla Wind Project	Soluna	2025	864
Tanzania	Sany Singida	Sany Group	2035	600
Morocco	Jbel Lahdid – Pei	Nareva	2024	540
Egypt	Kom Ombo ANI	AlNowais Investments	2023	500
Egypt	Ras Ghareb – 500 MW Wind farm	Siemens Gamesa	2023 - 2024	500
Morocco	Koudiat Baida	ONEE	2023 - 2026	320
Tanzania	Miombo Hewani Phase	Windlab	2024	300
Ethiopia	Iteya II Wind farm		2025	300

Source: Rystad Energy RenewablesCube; **conservative estimates; *Developer

Renewable energy developers and Chariot expected to drive majority hydrogen volumes

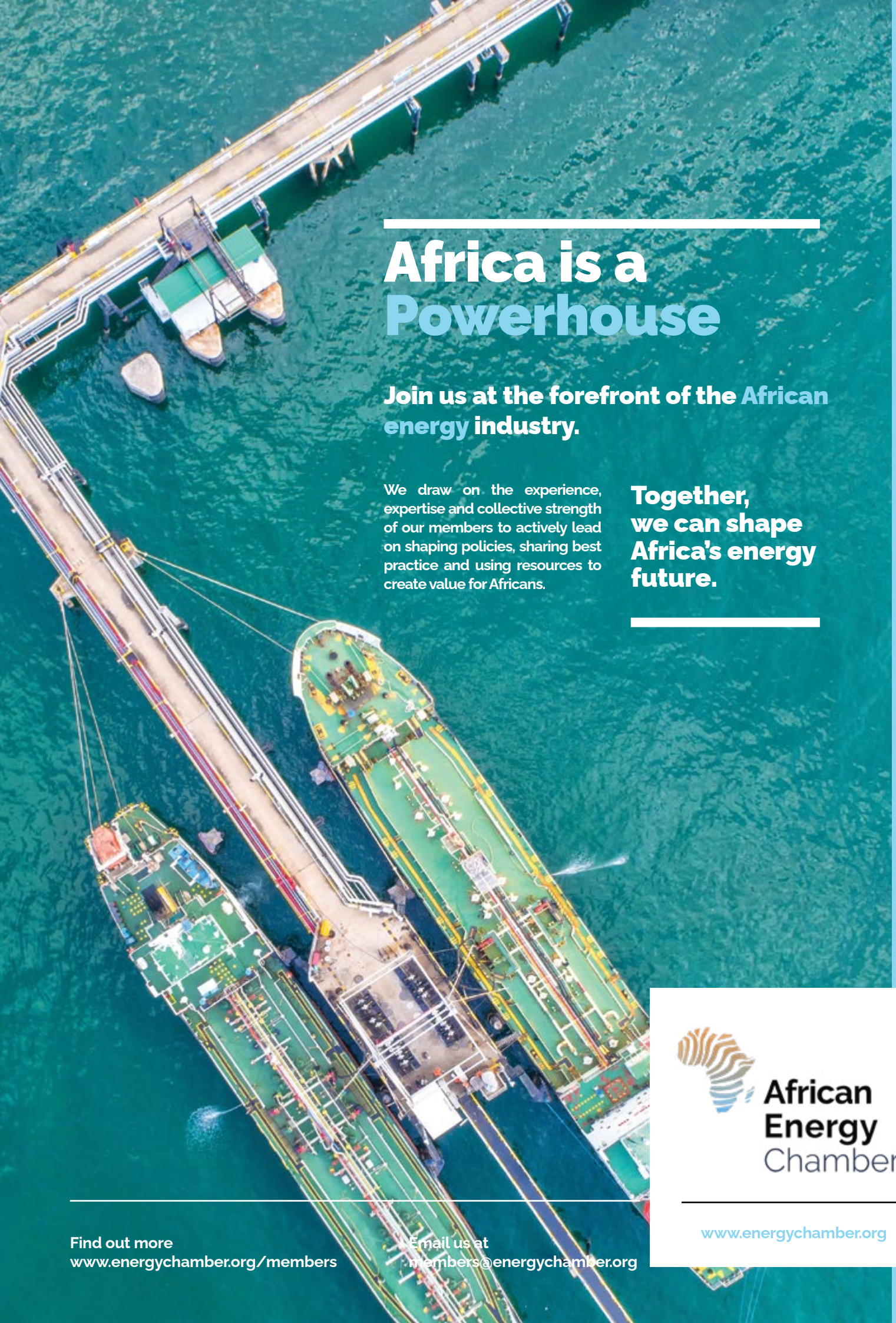
Country	Project	Operator	Start-up*	Capacity (MW)
	Aman Project	CWP Global	Phase I – 2030 Phase II – 2034 Phase III – 2036	15000
	Project Nour	Chariot Ltd	Phase I – 2026 Phase II – 2029 Phase III – 2032	10000
	Amun Project	CWP Global	Phase I – 2028 Phase II – 2032 Phase III – 2035	9000
	Guelmim-Oued Nour Plant	Total Eren	Phase I – 2027 Phase II – 2031	6000
	Scatec Green ammonia Ain Sokhna	Scatec	Phase I – 2026 Phase II – 2030	4329
	Masdar Ain-Sokhna	Hassan Allam Holding	Ph I – 2026 Ph II – 2026 Ph III – 2030 Ph IV – 2030	3450
	Tsau Khaeb	Nicholas Holdings	Ph I – 2026 Ph II – 2026 Ph III – 2028 Ph IV – 2028	3000
	Hive Energy Green Ammonia Plant		Phase I – 2025 Phase II – 2035	1200

Source: Rystad Energy RenewablesCube; *conservative estimates

Despite the international community including the G20 nations committing to limit average global temperature increases to 1.5°C above the pre-industrial levels, the governments of these nations have allocated multi-billion dollar funds in public sector financing to fossil fuel projects in the Middle East – North Africa (MENA) region over the past decade. Even in the era of increased focus on energy transition, the relative funding granted to clean energy projects has been a quarter of the sum allocated to hydrocarbons. Historically, Asian nations, especially China, has been a large investor in oil and gas industry in Africa. The Asian financial institutions, too, have been observed to show a year-on-year growth in fossil fuel financing, European banks have shown a relatively flat funding level. Also, "policy scoring" based on the extent of exclusion imposed across the different fossil fuels within the policies of the various banks concludes that the European banks scored the highest in terms of overall policy, mirroring the public funding analysis that says European institutions are the least likely to be involved in future fossil fuel projects. While the Asian banks were rated the lowest in policy scoring indicating high participation in fossil fuel funding.

However, the Russia – Ukraine conflict led to an under-supplied LNG market. Europe, which was largely dependant on Russia's gas is now looking for new avenues to replace the gas volumes and solutions to meet its energy demands. Europe is now considering how gas-rich African nations can be helped to scale up production and exports in the years to come. The EU's decision earlier this year that all natural gas investments are equivalent to investments in "green" energy signal that African gas is considered sustainable. The supply crisis driven by security interests may push Europe to fund projects that will also help with energy affordability back home. For instance, Europe could be a key financer of the proposed $13-billion TSGP project. These policy changes may push European banks to ease their regulations on fossil fuel funding and Africa will be hoping to have more doors open for investments in its oil and gas industry.

About 23% of the overall power generation in Africa for the year 2022, is estimated to be driven by hydropower and other renewable sources. This percentage is expected to increase marginally to 25% in 2023 and further to 32% by 2025 as dependence on coal decreases. With the focus on energy transition and renewables on the rise, many high emitting and largely hydrocarbon dependent African nations become vulnerable due to the carbon neutral goals of the world's major companies. Demand for oil and gas may still be growing, however investment in fossil fuels projects can eventually be seen as a risk in the future. The energy transition is observed in the projections of the renewables energy sectors, as each one observed growth in the coming decades. Similar to the issues with hydrocarbon industry, there are capacity issues in Africa due to weak sector planning and management. Regulatory and legal frameworks are often missing, making investments in renewables more expensive. Above all else, the electricity grids present challenges, often suffering from high loss rates, and limited capacity in addition to being financially unsustainable with limited opportunities for expansion or required maintenance. It is important to note that each country has different socio-economic starting points and political ambitions, which will take them down different paths in the energy transition. The transitional pace is dictated by each country's current dependence on fossil fuels, existing industrial productivity, future technology choices and depth/diversity of domestic supply chains. And Africa is currently in a state to put its interests and its people's interest first, and take necessary steps towards eliminating energy poverty!



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African Energy Outlook:
Africa's Power and Minerals Market in 2023 and Beyond

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Index

SUMMARY AND KEY MESSAGES

This section of the Africa Energy Outlook 2023 deals with power and minerals sector developments on the African continent. We review the market dynamics on the continent in 2021 and 2022, especially how COP26 and the ongoing Russian-Ukraine war have affected the continent's power and minerals sector and its overall impact on equitable growth prospects. Thematic areas covered in this section include:

Russia-Ukraine war and Africa's power and minerals sector

A just and inclusive clean energy transition for Africa

Investment climate and projects pipeline

Electricity demand-supply outlook

Resource-based industrialisation in Africa using critical minerals

Our key highlights of the 2023 power section of the Africa Energy Outlook (AEO) are summarised as follows:

- **1. The ongoing Russian–Ukraine conflict sharply increased the costs of energy and food imports for most of the region's economies.** These sustained price pressures are impacting government stability, with citizens staging anti-government demonstrations and protest marches over the rising cost of living. However, in some cases, these cost increases are counterbalanced by higher commodity and oil prices, benefiting the trade and fiscal balances of commodity-exporting countries such as Angola and the Republic of the Congo
- **2. The ongoing war has also exposed Africa's fragile energy systems and deepened prevailing energy poverty on the continent. However, it brings to the fore the critical need for finances to revamp the continent's energy systems.** As the Africa Energy Chamber poignantly highlighted in last year's report, Africa's rapid economic development is directly linked to providing reliable modern energy services, especially electricity. At the heart of this is ensuring a just and equitable energy transition for the continent. It is estimated that Africa needs US$250 billion annually between 2020 and 2030 to implement its nationally determined contributions (NDCs) under the Paris Climate Agreement.
- **3. Going into the UN COP27 Summit in Egypt, Africa must present a unified strategy that should detail the continent's unique circumstances and highlight that oil and gas is a crucial fuel choice for any decarbonisation pathway towards 2050 for the continent.** Also, African leaders must push

for more climate financing flows to the continent, especially for adaptation and "loss and damage". As it currently stands, Africa is the poorest in energy use and access and the greenest in terms of its emissions. Acknowledging Africa's "special circumstances" must reflect in financing from global financial systems, including multilateral development banks.

- **4. The Chamber strongly asserts that African governments and other stakeholders must prioritise addressing energy poverty and accessibility on the continent using all energy resources at their disposal, including oil and gas and renewables.** African governments must strongly prevent global attempts to force them down the rabbit hole of making a binary choice on the direction of their energy transition, as portrayed by certain interest groups and some financiers. Interestingly, the primacy of energy security has again become one of the dominant geopolitical themes in the aftermath of Russia's war in Ukraine. As a result of the conflict, countries, especially in Europe, are shifting their energy policies toward energy security and affordability and less on climate concerns (at least in the short- to medium-term) despite the big promises made at COP26.
- **5. Despite the prevailing "energy apartheid" that some commentators have christened the current geopolitical landscape, the quest by many nations to source alternative gas supplies means that more investments/financing in gas and LNG infrastructure is likely in Africa in the short- to medium-term (3-4 years).** This, of course, crucially depends on how quickly EU-member states find cost-parity alternatives outside of Africa to bolster their energy security.
- **6. Total electricity generation in Africa stood at 898 terawatt hours (TWh) in 2021, of which North Africa accounted for about 44%.** This is a 5% increase from the 2020 estimate of 855 TWh and average annual growth of 2.8% since 2012. Natural gas remains the foremost fuel in the mix, accounting for about 40% of total electricity generation, followed by coal and hydro, contributing 28% and 17%, respectively. Oil made up the next 8%; the share of nuclear was reduced to almost 1%, whilst renewables and others, mainly solar, wind and geothermal, accounted for the remaining 6%.
- **7. To make energy poverty history by 2030, the Chamber estimates that Africa's electricity generation needs to reach 2,586 TWh in 2040.** This translates to a 5.8% annual expansion in generation capacity. The results in this scenario underscore the need for concerted effort and massive investment in fossil-based generation (principally natural gas) alongside RE technologies to meet Africa's rising electricity requirement for rapid economic growth, population expansion, industrialisation, and urbanisation.
- **8. African countries must also seek to proactively participate in the global critical minerals value chain, leveraging the power of the** Africa continental free trade agreement (AfCFTA). Countries can focus on this part of the value chain to develop an electric vehicle value chain, ultimately creating the need for local batteries and, subsequently, local demand for battery metals. Policy will be the key driver in creating this market for Africa. The war may be temporary, but it will likely have long-lasting impacts that will reform automakers' supply chain dynamics, particularly in the electric vehicles sector. AfCFTA creates unique and significant market opportunities for African countries to leverage each other's resources to create a common market. The agreement can make Africa an electric vehicle powerhouse in the long-term.

INTRODUCTION

2022 has been an extraordinary year for the global economy and livelihoods, especially in Africa. While the continent was just about recovering from the coronavirus (COVID-19) pandemic and accompanying economic downturn – one of the biggest since the great depression of the 1920s-30s —, it has been hit again and left to address the ripple effects of a war it did not instigate.

The spillovers from Russia's invasion of Ukraine since February 2022 have been through commodity markets, trade, and financial channels. These have led to a rise in inflation, pressure on the fiscal balances of many countries, and lower economic growth. The United Nations Food and Agriculture Organisation's food price index , which measures the monthly change in international prices of a basket of food commodities, soared to its highest level (since its inception in 1990) in March 2022. The sub-indices for the prices of cereals, vegetable oils, dairy, and sugar all saw significant increases. While some of these global price pressures have receded, they nonetheless could damper global recovery especially in Africa. Russia's invasion of Ukraine in February 2022 has severely exacerbated Africa's vulnerabilities, initially affecting food, fertiliser and fuel (energy) prices and financial flows.

In Africa, the ongoing Russian–Ukraine conflict sharply increased the costs of energy and food imports for most of the region's economies. As measured by the consumer price index (CPI), yearly inflation has increased to astronomical levels in several countries, including Ghana, Ethiopia, South Africa, Nigeria, and Kenya, among others. For example, Ghana's inflation reached a 20-year high of 31.7% in July 2022 from 9% a year earlier - driven by transport, energy and food prices . Likewise, inflation in Nigeria reached a 17-year high of 19.64% in July 2022, driven by food and transport prices. Also, South Africa's inflation surged to a 13-year high in June 2022 to 7.4% year-on-year, again driven by fuel and food prices. These sustained price pressures are impacting government stability with labour unions, civic groups and main opposition parties staging anti-government demonstrations and protest marches over the rising cost of living. Violent protests have occurred in Ghana, Sierra Leone, Uganda and Sudan, among others.

The COVID-19 pandemic and Russia's ongoing war in Ukraine indicate that Africa is increasingly becoming a part of the global economy through financial and trade channels. This leaves the continent heavily exposed to the ripple effects of such global shocks with disastrous local consequences for livelihoods.

The deteriorating economic conditions have forced several central banks to increase their key monetary policy rates in an attempt to stem inflation. For example, Ghana's central bank has increased its policy rate by a cumulative 750 basis points since November 2021, with the most extensive 300 basis point hike taking place on 17 August 2022. Also, in June 2022, South Africa's Reserve Bank increased its benchmark repurchase rate by 100 basis points. In Egypt, the country's monetary policy committee hiked interest rates by 200 basis points in May but has kept them steady for the foreseeable future. Furthermore, in May, Uganda and Kenya increased their policy rates by 100 and 50 basis points, respectively.

However, in some cases, these cost increases are counterbalanced by higher commodity and oil prices, benefiting the trade and fiscal balances of commodity-exporting countries such as Angola and the Republic of the Congo. For example, Angola's gross oil revenues reportedly increased by 75% to US$11.8 billion in Q2 2022 compared to a year earlier in 2022, at an average production of 1.1 million barrels per day (mmbpd). The country's 2022 budget is based on a USD59-per-barrel benchmark oil price; prices have averaged US$100 per barrel for most of 2022 due to the ongoing war in Ukraine. Similarly, Nigeria's 2022 benchmark oil price was initially set at US$62 per barrel. However, the price upside has been dwarfed by reduced production of 1.22 mmbpd compared to a budget of 1.88 mmbpd, sizeable subsidies and refined petroleum products import bill. Other economies on the continent heavily dependent on refined fuel imports, such as Senegal, Mozambique and Togo, have also seen their fiscal bill rise due to the lack of pre-existing hedging arraignments under their liberalised downstream petroleum sector.

Africa has been hit heavily by the twin crises of the COVID-19 pandemic and the ongoing Russian-Ukraine

war, which are eroding livelihoods amidst limited government support

Economic growth in several African countries is expected to trail lower as upward momentum from fewer COVID-19 restrictions fades, and higher non-oil and food prices take centre stage. According to IMF estimates, overall GDP growth on the continent is expected to average 3.8% real GDP in 2022, rising to 4% in 2023. Countries expected to enjoy more robust growth prospects of 5% or more real GDP include DRC,, Kenya, South Sudan, Côte d'Ivoire, Senegal and Ghana, among others. However, Africa Energy Chamber remains concerned about the macro-micro disconnect in many African countries. These improved macro-economic growth prospects are not trickling down enough at the sectoral and micro levels to reduce poverty and inequality, including energy poverty. While some African countries have shifted their policy priorities to helping the most vulnerable households cope with high food and energy costs and sharp exchange rate depreciation in 2022, these have also come at the expense of adding to existing debt vulnerabilities.

To mitigate the effect of the ongoing war, various African governments have begun sourcing alternative supplies of staples such as wheat and fertilisers from other markets. For example, data indicates that South Africa, Senegal and Nigeria are sourcing wheat from Argentina. Others have sought to increase the domestic production of some staples as part of broader import substitution policies. However, the short-term impacts are likely to be reduced due to worsening climatic conditions – especially drought in Eastern and Southern Africa.

Additionally, most countries received emergency financing from multilaterals such as the IMF, World Bank, African Export-Import Bank (Afreximbank), and Africa Development Bank (AfDB) and ongoing debt relief through schemes such as the G20 Common Framework for Debt Treatments beyond the DSSI. Some of the concessional financing which is helping or expected to help bridge near-term fiscal needs on the continent include the USD4-billion Afreximbank Ukraine Crisis Adjustment Trade Financing Programme for Africa (UKAFPA) facility and IMF's recently established US$45 billion Resilience and Sustainability Trust (RST) facility, which uses the Fund's US$650 billion allocation of special drawing rights (SDRs) made in August 2021 to channel resources from economically stronger member countries to low-income countries. For example, under the UKAPA facility, the Nigerian National Petroleum Corporation Limited (NNPC) is reported to have borrowed US$1 billion for petroleum product imports from May to July. Other interventions include €1.79 billion of pledges coordinated by the FAO to address food insecurity in the Sahel and Lake Chad regions.

The ongoing war has not only shocked the region but again exposed its fragile energy systems, deepening energy poverty on the continent. As the Chamber poignantly highlighted in last year's report, Africa's rapid economic development is directly linked to the provision of reliable modern energy services, especially electricity. While the ongoing Russian invasion of Ukraine has led to rising demand for oil (and for Europe especially, looking for alternative supplies amidst a Russian oil embargo), for the continent, access to reliable power is one of the most significant constraints to doing business. Unfortunately, Africa's access to modern energy services remains limited despite the continent's vast energy resources. About 730 million of the continent's population lack access to clean fuels and facilities for cooking – out of this, about 600 million (almost 43%) of the continent's population lack access to electricity. This lack of access to clean fuels and facilities became more pronounced during the COVID-19 pandemic and now the ongoing war in Ukraine, where the pace of new grid and off-grid connections has slowed. As a result, some studies show that multidimensional energy poverty has increased across the continent.

About 730 million of the continent's population lack access to clean fuels and facilities for cooking – out of this about 600 million (almost 43%) of the continent's population lack access to electricity.

A just and equitable energy transition is another topical issue that Africa has begun to champion collectively. The 26th United Nations Climate Change Conference of the Parties (COP26) took place in November 2021 in Glasgow with multiple outcomes that will affect

the continent. At a global level, countries agreed to phase down fossil fuels while developed economies committed to increasing climate change adaptation while deepening transparency and reporting measures. Furthermore, Article 6 rules under the 2015 Paris Agreement were concluded. This allows countries to use market mechanisms (international carbon markets) and non-market approaches to reduce their carbon emissions in line with their nationally determined contributions (NDCs) under the UNFCCC framework. As of July 2022, 53 African countries had submitted their intended nationally determined contributions (INDCs) or updated them under the UNFCCC framework. African countries seek to leverage their NDCs to pursue greener industrialisation (using mitigation financing) and support climate resilience (adaptation financing).

However, the requirement for developed countries to provide mitigation and adaptation financial resources to assist developing countries has not been made to date, especially for Africa. Data from the Organisation of Economic Co-operation and Development (OECD) shows that 43% of climate finance from 2016-2019 went to Asia, with Africa only getting 26%. Furthermore, the data also shows that nearly 80% of the funding provided has been interest-bearing non-concessional loans. A November 2021 report commissioned by the UN High-Level Climate Action Champions shows that US$125 trillion of climate investment is needed by 2050 to meet net-zero goals. Africa is estimated to require USD$200 billion annually by 2025 and about US$400 billion annually by 2030 onwards to transform its economy and avoid the worst physical impacts of climate change. That is, Africa needs US$250 billion annually between 2020 and 2030 to implement its NDCs. These issues will be topical at COP27 later this year in Egypt as African leaders increasingly push for increased climate financing flows to the continent.

43% of global climate finance from 2016-2019 went to Asia, with Africa only getting 26%. Furthermore, the data also shows that nearly 80% of the funding provided has been interest-bearing non-concessional loans.

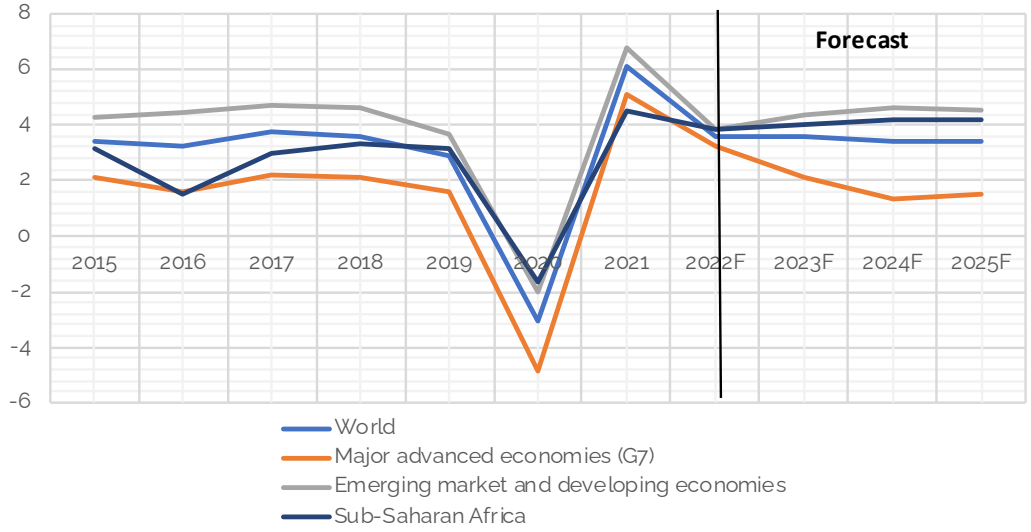
The remainder of this section of the Outlook outlines the Chamber's views on these issues, especially those relating to a just and equitable energy transition for Africa. The Chamber strongly asserts that African governments and other stakeholders must prioritise addressing energy poverty and accessibility on the continent using all energy resources at their disposal, including oil and gas and renewables. African governments must strongly prevent global attempts to force them down the rabbit hole of making a binary choice on the direction of their energy transition, as portrayed by certain interest groups and some financiers. Energy poverty remains one of the continent's biggest impediments to inclusive economic growth. To that extent, Africa must leverage all its available energy resources to safeguard energy security and affordability and aggressively fight poverty.

Interestingly, the primacy of energy security has again become one of the dominant geopolitical themes in the aftermath of Russia's war in Ukraine. Major western nations (primarily Europe) have underscored the primacy of security of supply in the energy trilemma — the trilemma underscores a balance between energy security, energy affordability, and environmental sustainability. **As a result of the ongoing conflict, countries are shifting their energy policies toward energy security and affordability and less on climate concerns (at least in short to medium term) despite the big promises made at COP26.** For example, newly-elected German Chancellor, Olaf Scholz, changed course on years of German national energy policy due to the Russia-Ukraine war by saying Germany would build two new LNG import terminals, gradually shifting energy purchases away from Russia Also, the UK unveiled its new energy security strategy to accelerate homegrown power for greater "energy independence" which includes new oil and gas licensing activities in the North Sea.

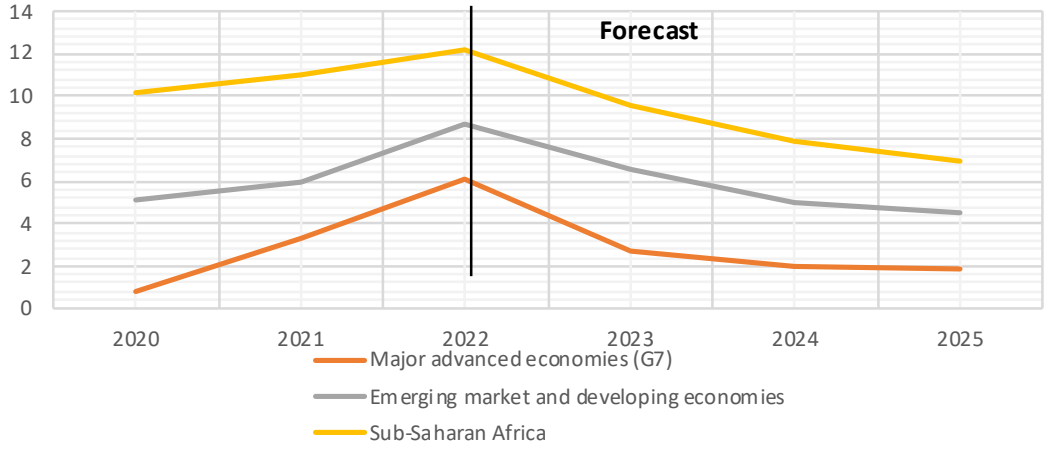
Africa must leverage all its available energy resources to safeguard energy security and affordability and aggressively fight poverty

African governments must strongly prevent global attempts to force them down the rabbit hole of making a binary choice on the direction of their energy transition

Real GDP Growth (2015-2021 actuals, and 2022-2025 forecast)



Inflation, average consumer prices (percent change)



MARKET DEVELOPMENTS

2.1 Post-COP26 Africa's Electricity Sector in 2022 and beyond

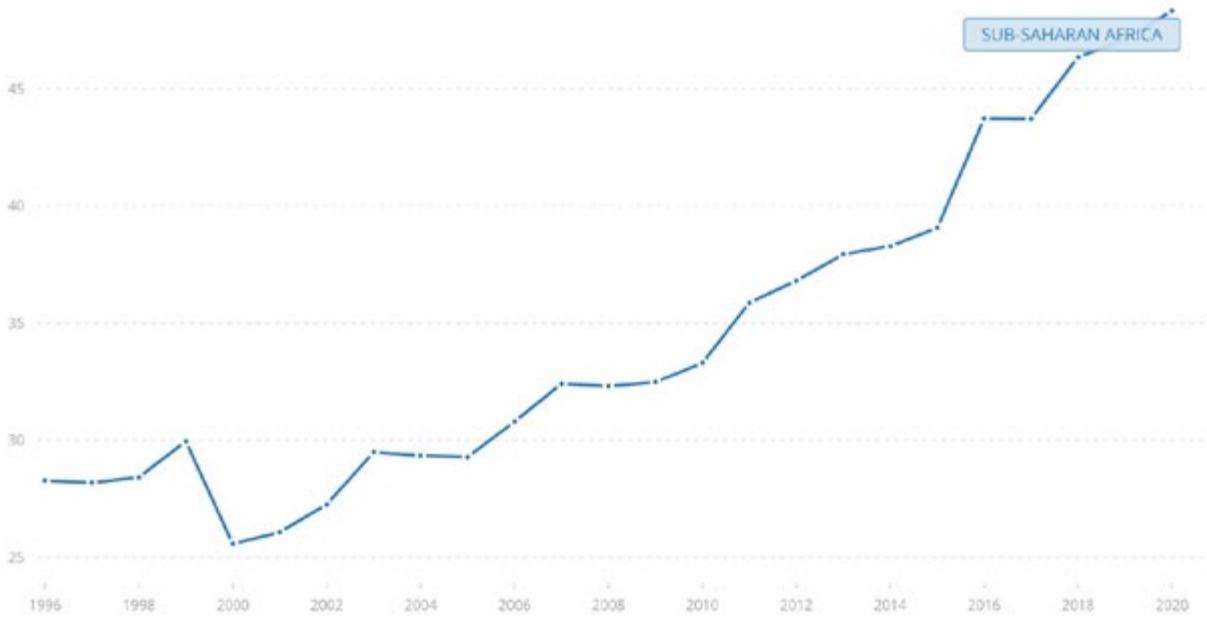
COP26, which concluded in Glasgow on 13 November 2021, underscored the need to accelerate climate action and keep 1.5OC alive. For the electricity/power sector, there was an initial heavy focus to "resign coal to history", but this ended with the change in wording from "phase out" to "phase down" for coal use following extensive lobbying by India and China. With the ongoing conversations and push to have a faster pace of a green transition, Africa's key transition to universal access keeps losing its relevance to the big green transition.

Achieving universal access to affordable, reliable, sustainable, and modern energy by 2030 remains one of Africa's critical challenges tied to its economic and sustainable development on all fronts. Presently, estimates suggest that about 600 million people are without access to electricity – representing 77% of the global population without access. The COVID-19 pandemic undoubtedly slowed the progress, affecting already fragile economies and livelihoods, resulting in affordability challenges for millions. According to the IEA, about 90 million people in Africa and Asia lost the ability to afford certain energy services due to COVID-19 in 2020 alone. Moreover, the sharp increases in energy prices due to the ongoing Russian-Ukraine war is highly likely to constrain energy access further and deepen poverty on the continent.

With the ongoing conversations and push to have a faster pace of a green transition, Africa's key transition to universal access keeps losing its relevance to the big green transition.

Across the continent, electricity access rates differ with certain countries home to the largest unserved populations: notably Nigeria (92 million people), the Democratic Republic of Congo (72 million), and Ethiopia (56 million). The chart below shows the electricity access rate for countries in Sub-Saharan Africa. Key performers in terms of annual progress (greater than three percentage points between 2010 and 2020) in electrification are Kenya and Uganda.

Access to electricity (% of population) - Sub-Saharan Africa



Access to electricity (% of population) - Sub-Saharan Africa

Country	2010	2015	2020	% change (2010 vs 2020)	% change (2015 vs 2020)
Kenya	19,2	41,6	71,4	52,2	29,8
Rwanda	9,7	22,8	46,6	36,9	23,8
Eswatini	45,6	64	79,7	34,1	15,7
Lesotho	17	31,7	47,4	30,4	15,7
Uganda	12,1	18,5	42,1	30	23,6
Guinea-Bissau	6	20,1	33,3	27,3	13,2
Ethiopia	25,4	29	51,1	25,7	22,1
Tanzania	14,8	26,2	39,9	25,1	13,7
Mali	26,9	37,6	50,6	23,7	13
Togo	30,8	44,6	54	23,2	9,4
Zambia	22	31,1	44,5	22,5	13,4
Liberia	5,2	15,2	27,5	22,3	12,3
Ghana	64,2	74,1	85,9	21,7	11,8
Madagascar	12,3	23	33,7	21,4	10,7
Botswana	52	62,1	72	20	9,9
Sudan	38	46,9	55,4	17,4	8,5
Comoros	69,8	74,6	86,7	16,9	12,1
Guinea	28	34,7	44,7	16,7	10
Gambia	46,7	54,6	62,3	15,6	7,7
Sao Tome and Principe	61,4	67,2	76,6	15,2	9,4
Sierra Leone	11,5	19,5	26,2	14,7	6,7
Senegal	56,5	60,5	70,4	13,9	9,9
Zimbabwe	38,8	33,7	52,7	13,9	19
Mauritania	34	39,5	47,3	13,3	7,8
Cabo Verde	81,1	86,4	94,2	13,1	7,8
Angola	34,9	42	46,9	12	4,9
Eritrea	40,2	46	52,2	12	6,2
Cameroon	52,8	58,6	64,7	11,9	6,1
Mozambique	18,8	24	30,6	11,8	6,6
Namibia	44,6	51,6	56,3	11,7	4,7
Côte d'Ivoire	58,3	62,6	69,7	11,4	7,1
Congo, Rep.	39,8	44,4	49,5	9,7	5,1
Nigeria	48	52,5	55,4	7,4	2,9
Benin	34,2	29,6	41,4	7,2	11,8
Congo, Dem. Rep.	12,7	16,1	19,1	6,4	3
Burundi	5,3	8,4	11,7	6,4	3,3
Malawi	8,7	10,8	14,9	6,2	4,1
Niger	13,3	16,6	19,3	6	2,7
Burkina Faso	13,1	16,1	19	5,9	2,9
South Sudan	1,5	4,6	7,2	5,7	2,6
Central African Republic	9,8	12,7	15,5	5,7	2,8
Chad	6,4	7,7	11,1	4,7	3,4
Seychelles	97	100	100	3	0
Gabon	89,5	87,4	91,6	2,1	4,2
South Africa	82,9	85,3	84,4	1,5	-0,9
Equatorial Guinea	66,2	66	66,7	0,5	0,7
Mauritius	99,7	99,4	99,7	0	0,3
Somalia	52,2	51,1	49,7	-2,5	-1,4

2.2 Impact of the Russian-Ukraine on Africa's power sector

The Russian-Ukraine war continues to send ripples through the global energy industry. Since the invasion, energy prices have shown an upward trend benefiting many oil and gas producers, including Russia. On the flip side, households have had to endure sharp rises in energy bills, with many governments and regulators exploring several measures to reduce the worsening cost of living. With the ongoing uncertainty regarding when the war will end and the brewing geopolitical tensions over sanctions, among others, the winter outlook for power and gas supplies in Europe appears grim. Russian supplies to Europe via Nord Stream 1 continue to be unreliable. For example, there have been cuts to European supply under "routine maintenance" reasons on several occasions, raising the risk of rationing and recession in many European countries; the latest being the announcement by Gazprom to shut for three days from 31 August to 2 September 2022. As detailed in a Press statement by President von der Leyen, the EU response to previous cuts is to significantly reduce dependence on Russian fossil fuels by sourcing for alternative providers and bringing in additional LNG imports.

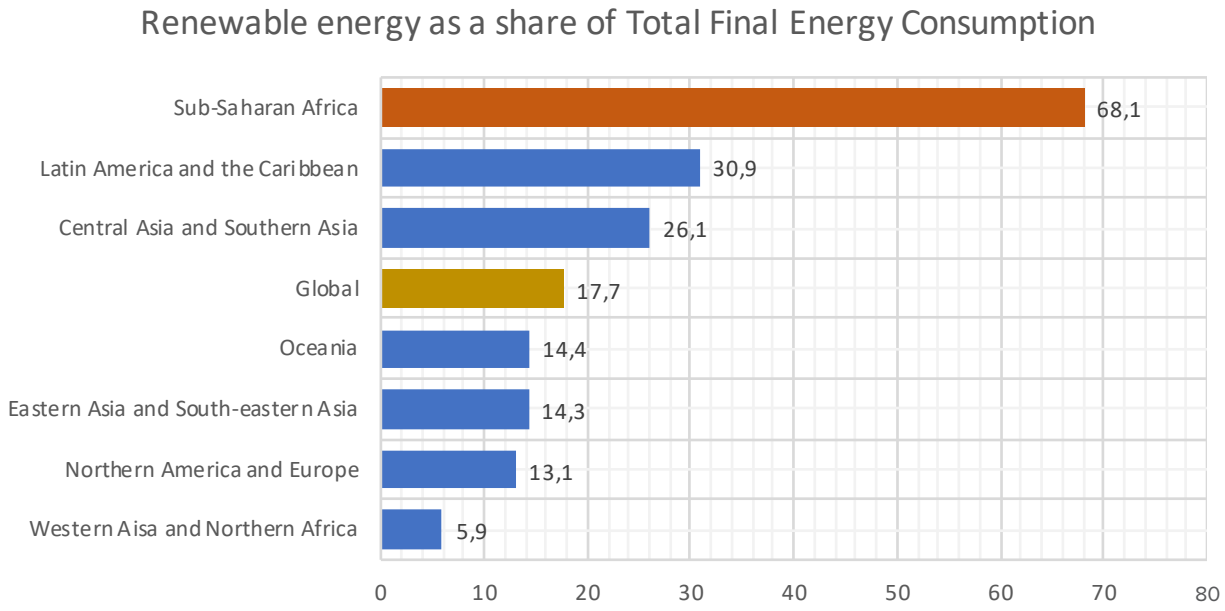
This quest has softened the stance of Europe and its allies to stop financing fossil fuel projects, including gas on the continent. This softening or reversal amplifies one key lesson from this war: **that energy security is paramount and wealthy and high-income countries will seek to safeguard it at any cost.** For example, moves to ensure the security of supply for Europe has culminated in the visit of German Chancellor Olaf Scholz to Senegal for talks with President Macky Sall over gas supply from the country's BP-backed offshore fields. Additionally, news reports highlight EU plans to significantly ramp up security assistance for Mozambique's troubled Cabo Delgado gas project bedevilled by an ongoing Islamist insurgency. Last but not least, the IEA reports that coal use in the European Union is set to rise by 7% on top of last year's 14% jump due to gas-to-coal switching in many countries.

This development means that **more investments/financing in gas and LNG infrastructure is likely over the short- to medium-term (3-4 years),** depending on how the war affects EU gas supplies and how quickly EU member states find alternatives to strengthen their energy security. Already, Eni SpA is reported to be planning a second liquefied natural gas production vessel offshore Mozambique that could be built in less than four years as part of efforts to diversify EU supply.

The key message here is that Africa must spearhead its own energy strategy based on its needs (almost 50% of the population without access) with or without international partners. With the state of energy access across sub-Saharan Africa being a single unifying challenge; poised to derail the attainment of goals such as ending poverty (SDG1), good health and wellbeing (SDG3), quality education (SDG4), and industrialisation efforts (SDG9), collaboration among African nations in joint strategy formulation, financing and communication is paramount.

Africa must spearhead its energy strategy based on its needs (almost 50% of population without access)... collaboration among African nations in joint strategy formulation, financing and communication is paramount.

Going into the UN COP27 Summit in Egypt, a unified strategy should be presented detailing Africa's unique circumstances and highlighting that oil and gas is a crucial fuel choice for any decarbonisation pathway towards 2050 for the continent. Undoubtedly, the vast renewable energy resources on the continent will also be used to pursue energy independence and environmental sustainability in pursuit of global climate goals. However, this must not be presented as a binary option for the continent. Renewable energy as a share of Total Final Energy Consumption for the year 2019, as shown in the chart below, shows that Africa's 68% share is already higher than the global average and other regions, including Northern America and Europe.



Renewables will undeniably form a substantial part of future electrification efforts across the continent, as demonstrated in national energy plans and targets, including the Nationally Determined Contributions (NDCs). Findings from the gap analysis of NDCs cite "mobilisation of finance, access to technology and requisite capacity as the three top needs by African countries to successfully deliver on their NDCs.

Financing for renewable energy remains one of the key challenges developing economies face as the US$100 billion pledged to developing countries annually for climate finance has fallen short. Although this was acknowledged at COP26 in Glasgow, this must be designed so they do not add to the rising debt levels on the continent. The investment of US$25 - 27 billion per year to provide access to modern energy for all Africans is a goal that is within reach of the global community and must be prioritised to ensure the goal of universal access.

Regarding technology, cost reductions in solar and wind technologies combined with well-designed incentives/mechanisms like auctions hold much promise in increasing the share of renewable energy in electricity generation. For example, Portugal's floating solar energy auction won by EDPR recorded one negative bid at -€4.13/MWh, a negative price, currently the lowest tariff in the world after the 2020 solar auction low of €11.14/MWh. Integrating solar and wind on a substantial scale is planned by many countries (renewable energy targets and NDCs) will require the availability of modern transmission systems. Improving the policy and regulatory environment will be critical in attracting the necessary investments across the continent.

2.3 Ensuring Fair and Inclusive Clean Energy Transitions for Africa

Globally, there is a gradual move from utilising fossil fuels to satisfy our energy needs to an energy system that is more environmentally friendly and sustainable. The energy transition, as it is referred to, is changing facets of living with massive positive and negative consequences to economies and society. The injustice inherent in transitions has initiated conversations and discussions on ensuring justice and equity in the global decarbonisation process embedded in the UN principle of Leave No-One-Behind.

Africa faces a quandary as it looks to lift millions out of poverty at a time when a known pathway that developed countries exploited for centuries is making way for another in an already inequitable world where the "have-nots" have less access to resources, opportunities and power. A just and inclusive transition at its heart must "recognise and address in a meaningful way the impact on economies, communities and industries" at both international and national levels.

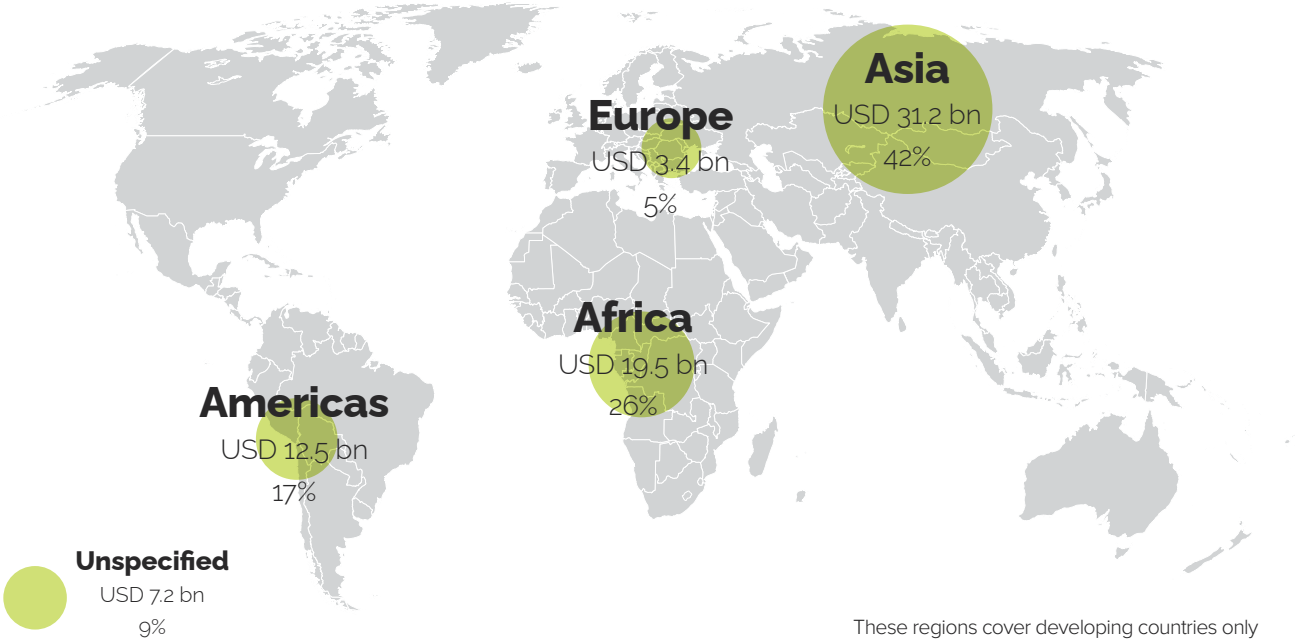
2.3.1 Access to financial and technology resources

The availability and access to financial resources remain a sticking point for a fair and inclusive African transition. Ensuring adequate financing for adaptation and mitigation, as highlighted by developing countries at COP26, is still relevant. Notably, efforts to reduce financing to fossil fuel projects must be fair, bearing in mind energy history and needs assessment. As it currently stands, Africa is the poorest in energy use and access and the greenest in terms of its emissions. **Acknowledging Africa's "special circumstances" must reflect in financing from global financial systems, including multilateral development banks.** The multi-resource approach, which upholds the well–known principle of diversification, must be considered as Africa seeks to eradicate energy poverty. The design and structuring of the financial instruments should also centre on fairness as the heavy use of debt adds to the balance sheet of already struggling developing economies. In that vein, tailored investment vehicles that open and broaden access to green projects in different countries will be paramount.

The 2009 initial target to mobilise US$100 billion of global climate finance annually by 2020 to support developing countries with adaptation and mitigation ha never been met. The data shows that an average of US$64 billion was recorded in global climate finance flows between 2013 and 2019; this increased to US$83.3 billion in 2020. However, it is still far short of the pledged total, especially for adaptation finance and given that most of these are still loans. A recent Climate Policy Initiative study shows that African governments can only finance 10% of the total estimated US$2.8 trillion needed between 2020 and 2030 to implement Africa's NDCs. In other words, the majority of the remaining 90% or US$2.5 trillion (US$250 million) must come from international public sources, and the domestic and international private sectors. Actual climate finance flows to Africa for 2020 was only US$30 billion or just 12% of the amount needed, indicating a huge financing gap.

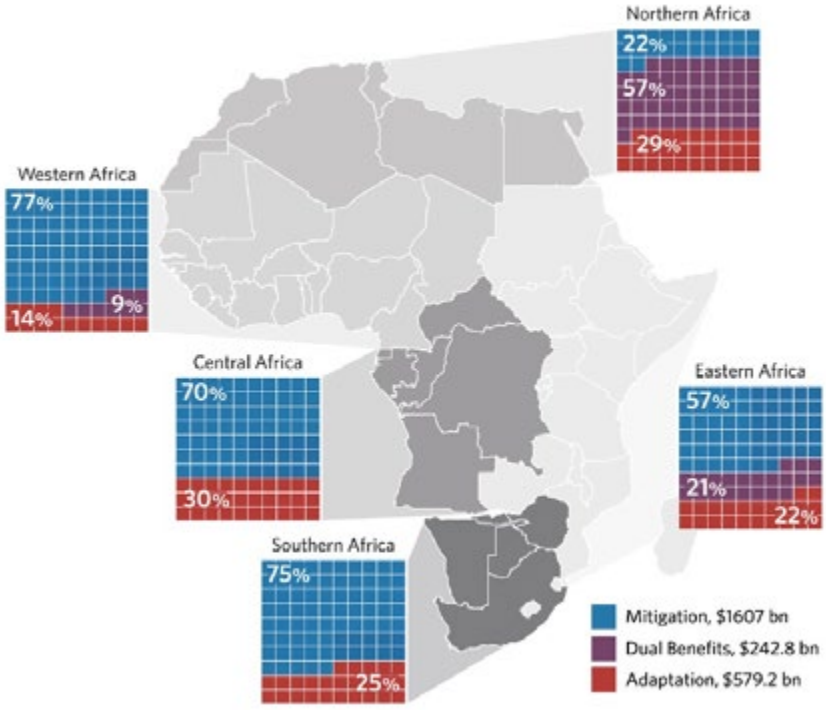
Climate finance provided and mobilised by developing country regions

Distribution of climate finance across developing country regions (annual average)



These regions cover developing countries only

Africa-Sub-regional climate finance needs 2020-2030 (USD billion)



Source: Climate Policy Initiative

Technology and innovation are resources necessary for meeting long-term global policy goals. Access to research funding and collaboration will ensure that research and technological outputs are relevant in multiple contexts (culturally relevant) and have a better chance of success. Additionally, collaboration and capacity-building support from local and international will be crucial in disseminating lessons learnt and best practices.

Recommendation: African governments and policymakers must address the concerns of companies and investors over long delays in planning consent and the lack of certainty in consenting criteria. This will ultimately reduce market risk and incentivise investments.

2.3.2 Access to new economic diversification opportunities

The green transition will create new economies while some become obsolete. Demand for critical minerals, high capacity batteries and semiconductors is expected to increase drastically over the next two decades. For example, critical minerals are key inputs for the manufacture of electric cars and renewable energy plants like onshore wind power which typically require six to nine times more critical minerals than their conventional alternative (i.e., conventional car or gas-fired plant). Additionally semi-conductors will be critical components of almost every technology making it indispensable for green industrialisation.

For Africa to partake to any significant degree in the new economies created by the transition, adequate/ surplus affordable power is critical. The state of Africa's power sector already create huge challenges in the access to the global export market for low carbon products estimated to be worth £1.8 trillion by 2030. With little time to pursue electricity access and industrialisation independently, the development of critical minerals on the continent must prioritise the development of domestic value chains coupled to green energy hubs among African countries. The lack of substantial value addition through forward and backward linkages and the economic losses that characterised the past and existing extractive industry in Africa is a failing that should not be repeated.

Trade policies and agreements between Africa and its international partners have long been skewed in favour of the latter due to the lack of a united economic bloc and capacity among others. The use of non-tariff-barriers including behind the border measures such as competition, trade related investment measures restrict the access of African nations to the opportunities the transition could bring.

Recommendation: African governments must harness the power of the AfCFTA to negotiate on a united front and develop capacity to understand trade policies and agreements.

2.3.3 Geopolitical Rebalancing

The transition is political and well as is technological/ social and efforts to reduce the imbalance of power between developing and developed countries will be crucial to ensuring a just transition. Essentially, the political framing of what is "just" in terms of what fuel/technology choices are financed for whom and which countries should do more in light of historic emissions must be fair.

Recommendation: African governments must examine the framing of issues regarding the transition and should build on the use of data and evidence in advancing their arguments.

INVESTMENT CLIMATE AND PROJECTS PIPELINE

This section of the outlook covers

- **Country level and cross-border power projects and project financing in Africa in 2022-23**
- **Special focus on climate financing in Africa:** highlighting the disconnect between the rhetoric and reality

3.1 Investment Climate in Africa in 2021

Sub-Saharan Africa has faced many difficulties in its strive for universal access to affordable, reliable, sustainable and modern energy, especially in the area of investments. In 2019 (before the pandemic), Africa accounted for just 4% of global power supply investments. Out of US$100 billion in investments in the energy sector in Africa between 2014 and 2018, US$70 billion was invested in fossil fuels and US$13 billion in renewables, while US$13 billion was invested in grid networks, according to the IEA.

Many energy utilities within the continent are riddled with high debt burdens and insufficient funding support. These challenges have been further exacerbated by the COVID-19 pandemic in terms of disruption to the construction of energy infrastructure and planned project negotiations. The COVID-19 crisis affected several parts of Africa's energy systems, including reversing positive trends in improving access to modern energy. For example, 4% more people living without electricity in 2021 than in 2019, according to the IEA. The pandemic also impeded financial investment in the energy sector. For example, licenses for oil blocks in South Sudan and Angola were deferred indefinitely. The shocks from the pandemic pushed African government attention towards facilitating more private sector investments in renewable energy, especially in solar photovoltaic technology, to build resilience. On the other hand, plans in some cases remained unaffected. For example, the Great Ethiopia Renaissance Dam (GERD) completed its early phase of filling on schedule in July 2020 amid the pandemic. In addition, the Democratic Republic of Congo (DRC) announced a reinforced commitment to the Inga 3 Hydropower project.

Large investments in energy infrastructure across Africa remain vulnerable due to declining private sector enthusiasm and major donors pulling out of investing in Africa. At COP26, 39 countries and development agencies, including twelve EU countries, the UK, the US, the European Investment Bank, and the French and Dutch development agencies, pledged to stop direct international public financing of fossil fuel projects – including natural gas - by the end of 2022. The World Bank also stemmed financing, providing no funding for any fossil fuel projects, including natural gas in 2021. However, there seems to be change in tone only a year down the line on fossil financing, especially for natural gas – this is driven by the aftershocks of the Russia-Ukraine war in which many western nations are prioritising energy security in the short- to medium-term over climate concerns.

1. Africa has contributed the least to global climate change, yet the continent faces the biggest energy challenge - an energy apartheid. In light of this and the various transitionary strategies being adopted by countries worldwide, Africa has the right to develop its abundant gas resources to meet SDG7 by providing affordable and accessible energy for all. Withdrawing investments into the sub-region will definitely leave Africa behind.
2. Several countries that were signatories to Glasgow COP26 are still developing fossil fuel for use at home.

a. The US issued the largest ever auction of oil and gas drilling leases in the Gulf of Mexico

b. The UK continues to explore the North Sea oil fields.

c. Belgium, Denmark, Germany, Ireland, Italy, the Netherlands, Portugal, Slovenia, and Spain, who were EU signatories have new fossil fuel pipelines in development.

3. Despite access, affordability, transmission network, and COVID challenges, the African region is also facing severe investment challenges. Most countries within the continent suffered from the drop in investments, especially in key energy projects. Foreign direct investments (FDI) declined by 16% in 2020 to US$39 billion, from US$47 billion in 2019. There has been some rebound FDI in 2021 to an estimated US$97 billion. However, this is still insufficient to address the scale of the significant need.
4. In addition to the continent's investment needs in power generation, it also requires considerable investments in transmission and distribution (T&D). Currently, only US$1 in every US$10 is invested in distribution and transmission, according to the Mo Ibrahim Forum report, leaving a huge investment gap in T&D.
5. Despite these challenges, renewables are set to lead the global electricity sector, according to the IEA and other reports. Only 2% of global investments in renewable energy in the last two decades were made in Africa, with significant regional disparities. However, while FDIs in sectors related to the Sustainable Development Goals (SDGs) fell considerably in 2020, renewable energy was an outlier, with international project finance deals increasing by 28% to US$11 billion, from US$9.1 billion in 2019. The number of international projects in renewables in Africa climbed to 71; this is nearly double the 36 recorded in 2011.

Scaling up Africa's capacity to achieve universal access to energy by 2030 would require over US$100 billion per year.

The International Renewable Energy Agency (IRENA) estimates that with the right policies, regulations and investments secured, sub-Saharan Africa could meet up to 67% of its energy needs by 2030. Moreover, nearly a quarter of those energy needs could be met through renewable energy. According to International Energy Agency data, scaling up Africa's capacity to achieve universal access to energy by 2030 would require over $100 billion per year, of which 40% would be dedicated to solar, wind, and other low-carbon power generation projects. However, the big question for energy projects in Africa is whether they can attract the required investment, given the competition elsewhere.

3.2 Country Level and Cross-Border Renewable Energy Projects in Africa

Below, we spotlight a few country-level and cross-border renewable energy projects which are taking in Africa from 2022 and beyond.

Table 1 Country level and cross-border renewable energy projects in Africa

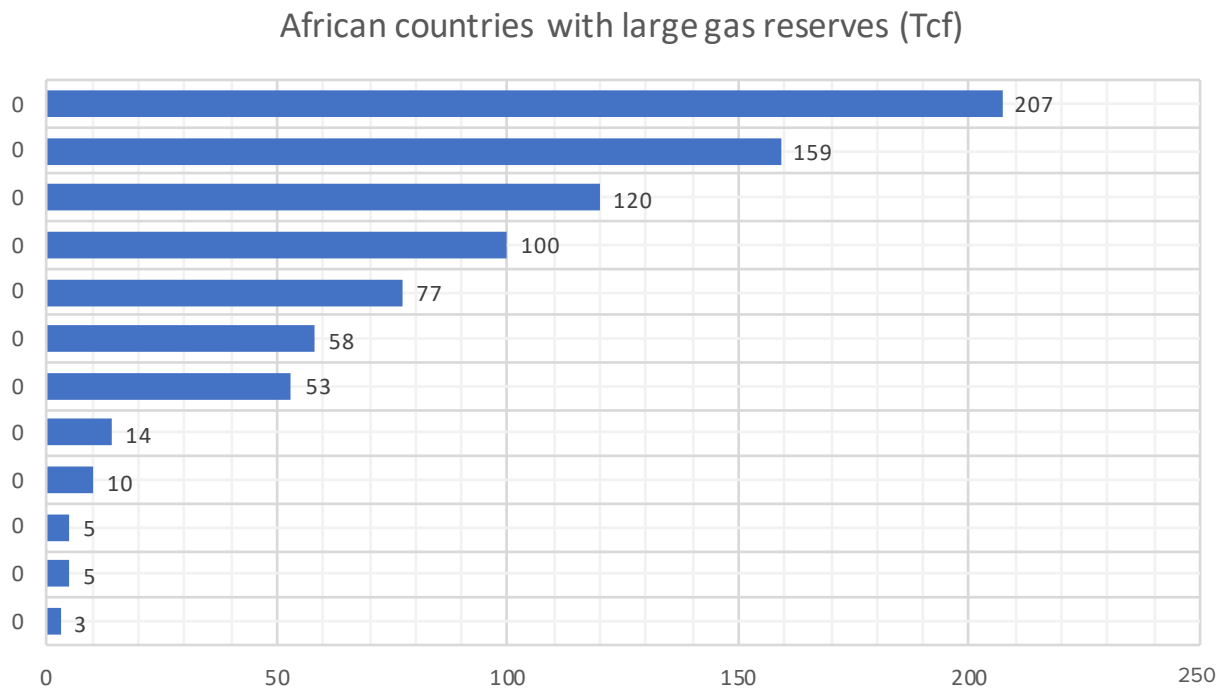
No.	Project Mix	Company	Project	Expected Production Level	Period	Country	Sub-region
1	Renewable (Hydroelectric)	China Gezhouba Group Company (CGGC)	Chollet hydroelectric dam & plant	600MW	2022-2025	Cameroon & Congo	West & Central Africa
2	Renewable (large-scale solar pipeline)	Africa Solar Industry	Angola-Namibia green hydrogen project	5GW		Angola & Namibia	Southern Africa
3	Renewable (solar)	Africa Solar Industry Association (AFSIA),	Solar project	1GW	2021-2022	Algeria	North Africa
4	Renewable (solar)		Mogalakwena Mine Solar PV Park	100MW	2022-2023	South Africa	Southern Africa
5	Renewable (solar)	EDF Renewables (South Africa); Pele Green Energy	Shumba Tati Solar PV Park	100MW	2023-2025	Botswana	Southern Africa
6	Renewable (solar)	Shumba Energy; Solarcentury Africa	Construction of two 100 megawatt (MW) solar power plants in the copper and cobalt-rich south-east	200MW	2022-2023	Democratic Republic of Congo	Central Africa
7	Renewable (solar)	SNEL	Construction of eight solar power plants	259MW	2022	Ghana	West Africa
8	Hydroelectricity	Bui Power Authority	Commissioning of the Grand Ethiopian Renaissance Dam	Contribute 6.45 GW of installed capacity to Ethiopia's national grid	2022	Ethiopia	North-East Africa
9	Renewable (solar)	Pele Green Energy, and independent power producer, EDF Renewables South Africa	Construction of a 100 MW solar photovoltaic plant at the Mogalakwena mine	100 MW of electricity	2022		
10		Developed by Saudi Arabia-based power generation company, ACWA Power, under S. Africa's Renewable Energy Independent Power Producer Procurement program	Redstone concentrated solar power (CSP) project	Approximately 480,000 MW of electricity annually. It is expected to supply over 200,000 households with clean, reliable electricity.	2023	South Africa	Southern Africa

3.3 Investment in Gas

The continent's industrialisation goals are heavily reliant on expanding natural gas use. More than 5,000 billion cubic metres (bcm) (700 trillion cubic feet: Tcf) of natural gas resources have been discovered in Africa but are yet to be approved for development. These resources could provide an additional 90 bcm (3 TcF) of gas annually by 2030, which will be vital for Africa's domestic industries. **Prospects for gas exports from African producers remain bright, considering that Europe is trying to wean itself off Russian gas.** Research from Rystad Energy suggests African production is likely to increase from about 260 bcm in 2022 to as much as 335 bcm by the end of this decade and then to 470 bcm by the late 2030s.

Gas is the primary transition fuel across Africa given its abundant supply. This must be used to address energy poverty. Africa should not be energy poor!

Gas reserves across the continent increased from 455 trillion cubic feet in 2020 to current proven reserves of over 620 trillion cubic feet in 2021. BP predicts that natural gas production in the continent will expand by 80% by 2035. The continent saw FDI rebounding strongly in 2021, with inflows in Nigeria, for instance, doubling to US$4.8 billion, mainly because of a resurgence in investments in the oil and gas sectors. The chart below highlights African countries with large gas reserves:



Reports indicate that an estimated 428 oil and gas projects are expected to start operations on the continent between 2021 and 2025. However, the current reality of low investments in fossil fuels on the back of COP26 has led to delays and possible suspension of fossil-fuel projects. As a result, upcoming oil and gas projects such as Nsiko offshore deepwater project, Uge deepwater project, Satellite Field Development Phase 2 project, Bosi crude oil offshore deepwater, Bonga South-West and Aparo, among others, are pending due to a lack of investments. Below is a table of crude oil and natural gas projects in Africa.

Table 2 Oil and gas projects in Africa

Project Mix	Company	Project	Expected Production Level	Cost	Time Period	Country	Sub-region
Liquefied natural gas (LNG)	British Petroleum (BP)	Drilling operations at its Greater Tortue Ahmeyim LNG gas project offshore Mauritania-Senegal	Up to a combined 10 million tons of LNG per year.	$4.6 billion	2022	MSGBC (Mauritania, Senegal, The Gambia, Guinea-Bissau, and Guinea-Conakry) Basin	
Liquefied natural gas (LNG)	Woodside Energy (Australian petroleum exploration and production company)	Drilling operations at the Sangomar oilfield			Begin commissioning by 2023		West Africa
Crude Oil, LPG	Sinohydro	Upgrading Units 7 and 8 (each with a 300 MW capacity) of the Hwange Thermal Power Station	Add 600MW to the existing 920MW Hwange Power Station	$1.5 billion	2023	Zimbabwe	South East Africa
Liquefied natural gas (LNG)	Shell	Tanzania LNG Liquefaction Project also known as the Likong'o-Mchinga LNG Project	The facility will comprise up to five trains, each with a capacity of producing five million tons of LNG per year.	$30 billion	Commence construction in 2023 and start production in 2028	Tanzania	East Africa
Crude Oil	Total	Zinia Phase 2 development project	To reach a production capacity of 40,000 barrels of oil per day (bpd).		2023	Angola	South West Africa
Lean gas	Chevron's Angolan subsidiary, Cabinda Gulf Oil Company	The Sanha Lean Gas Connection (SLGC) project seeks to deliver lean gas to Angola's LNG onshore facilities	Targeting the delivery of up to 480 million standard cubic feet of lean gas per day		2023		
Crude Oil	Dangote Group	650,000 bpd Dangote Oil Refinery to complete Phase I and II of its operation	An annual refining capacity of 10.4 million tons of gasoline and other petrochemicals.	$19 billion	2022	Nigeria	
Natural Gas	Nigerian National Petroleum Corporation	The 614 km Ajaokuta-Kaduna-Kano (AKK) gas pipeline which represents phase one of the broader 1,300 km Trans-Nigerian Gas Pipeline mega-project	The pipeline has capacity to transport up to 3,500 million cubic feet of gas per day.	$2.8 billion	2023		
Natural Gas	Nigerian National Petroleum Corporation	Ogidigben Gas Revolution Industrial Park	The project aims to tap into 18 trillion cubic feet of proven natural gas reserves	$20 billion	Unveiled in 2015 but is still Pending.	Nigeria	West Africa
Crude Oil	Shell Nigeria Exploration and Production Company, Eni and Nigerian Agip Exploration (operator)	Zabazaba and Etan Integrated Development	Capacity of 120,000 barrels of oil per day	$13.5-billion	Expected to start production in 2020 but is Pending		
Liquefied natural gas (LNG)	Eni	Coral South Floating Liquefied Natural Gas (FLNG) facility	3.4 million tons of LNG per year.	$7 billion	2022		
Liquefied natural gas (LNG)	Total Energies	Mozambique LNG facility	12.9 million tons per year	$20 billion FID	Production to start in 2027 due to instability instead of 2024	Mozambique	South East Africa
Liquefied natural gas (LNG)	ExxonMobil	Rovuma LNG Project in the Afungi Peninsula	15.2 million tonnes per annum (Mtpa)	$30 billion FID	FID expected in 2023, and production is expected to start in 2025		
Liquefied natural gas (LNG)	Eni in partnership with Belgium's maritime company, Exmar, and engineering	Marine XII Fast LNG Project	The project is targeting production levels of 1.4 mtpa utilising gas from the associated			The Republic of the Congo	Central Africa

Table 2 Oil and gas projects in Africa

Project Mix	Company	Project	Expected Production Level	Cost	Time Period	Country	Sub-region
	firm, New Fortress Energy		gas field of Nene Marine in Block Marine XII				
Crude Oil	China National Offshore Oil Corporation Ltd (CNOOC Ltd) & Total S.A	East African Crude Oil Pipeline (EACOP)	Proposed 1,443-kilometer pipeline that will transport oil from Hoima, Uganda to the port of Tanga in Tanzania.	$10 billion	Pending (due to resistance from local communities on environmental & social risks)	Uganda, Tanzania	Eastern Africa
	Chevron Corporation	Nsiko offshore deepwater project	100,000 barrels per day (bpd)		Pending (Lack of FIDs)		
Crude Oil	ExxonMobil	Uge deepwater project	110,000 bpd			Nigeria	West Africa
	ExxonMobil	Satellite Field Development Phase 2 project	80,000 bpd				
	ExxonMobil	Bosi crude oil offshore deepwater	140,000 bpd				
Crude Oil	Shell	Bonga South-West and Aparo. ii. Bonga North	225,000 bpd ii. 100,000 bpd				
Natural Gas		Trans-Saharan Gas Pipeline / NIGAL	The 4,128 km Trans-Saharan Gas Pipeline (TSGP) will carry 30 billion cubic meters (bcm) of natural gas annually	$21 billion	Pending (Lacking political will)	Link Warri in Nigeria to Hassi R'Mel in Algeria via Niger	West Africa – North Africa
Crude Oil	Woodside	Sangomar 1 oil field project	100,00 bpd	$4.6 billion	2023	Senegal	West Africa
Crude Oil	Tullow Oil	South Lokichar Development (Phase 1)	120,000 bpd	$3.4 billion	Pending	Kenya	East Africa
Natural Gas	Joint venture between Mozambican oil and gas company Empresa Nacional de Hidrocarbonetos, Profin Consulting Sociedade Anónima, South Africa's SacOil Holdings and China Petroleum Pipeline Bureau	2,600 km African Renaissance Pipeline project (ARP)	Annual capacity of 18 billion cubic meters (bcm)	$7.98 billion	Pending (application to build, own & operate was still under consideration as at 2021)	Mozambique, South Africa	South East & Southern Africa

AFRICA'S ELECTRICITY SUPPLY OUTLOOK

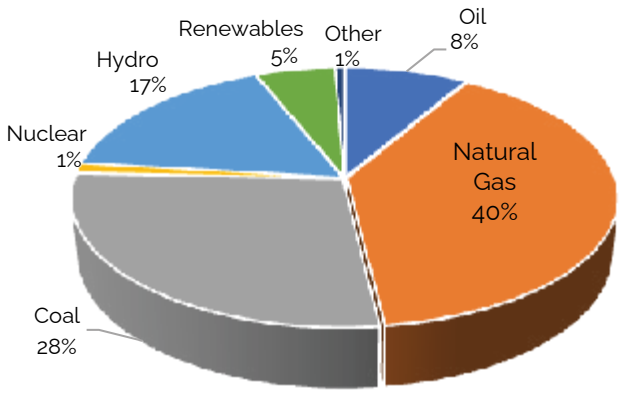
This section of the Outlook covers scenarios-based modelling of electricity supply on the continent up to 2040

- **Scenario 1:** Business-as-Usual (BAU) Scenario – normal investment flows
- **Scenario 2:** Making energy poverty history by 2030
- **Scenario 3:** A more 'cleaner' mix

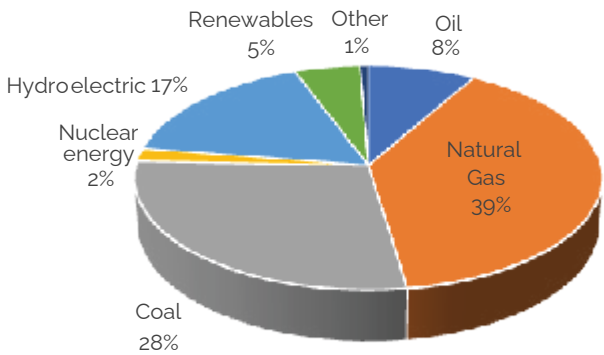
Electricity supply is critical to the socio-economic and industrial development of Africa. Nevertheless, while the continent is rich in energy resources, the electricity access rate averaged at just below 50%, the lowest in the world. Crucially, there exist wide disparities in electricity access rates across the region, ranging from below 40% in Central and East Africa to about 50% in Southern and West Africa and about 99% in North Africa. The access deficit is most acute in Sub-Saharan Africa (SSA), with more than 600 million people living without electricity and nearly 730 million still using hazardous and inefficient cooking fuels and technologies.

The remaining one-third who even have some access frequently experience blackouts, brownouts, load shedding, and high transmission and distribution (T&D) losses, among several structural problems affecting the continent's power system. The IEA's 2021 World Energy Outlook indicated that out of 48% of sub-Saharan Africa's population with electricity access, 6% will lose their ability to afford basic electricity services before 2025, with noticeable impacts to be felt amongst countries such as Nigeria, DR Congo, and Niger, among others. Electricity access rate remains very low in South Sudan (7.2%), Chad (11.1%), Burundi (11.7%), Malawi (14.9%) and DR Congo (19.1%), making them the top five least electrified countries in the region

Africa's Electricity Generation Mix by Fuel, 2021



Africa's Electricity Generation Mix by Fuel, 2020



Source: BP Statistical Review 2022

Total electricity generation in Africa stood at 898 terawatt hours (TWh) in 2021, of which North Africa accounted for about 44%. This is a 5% increase from the 2020 estimate of 855 TWh and average annual growth of 2.8% since 2012. Africa's electricity generation mix is dominated by fossil fuels which accounted for more than three-quarters (76%) of electric power generated in 2021, down from 80% five years ago. Crucially, natural gas (NG) remains the foremost fuel in the mix, accounting for about 40% of total electricity generation, followed by coal and hydro, contributing 28% and 17%, respectively. Oil made up the next 8%; the share of nuclear was reduced to almost 1%, whilst renewables and others, mainly solar, wind and geothermal, accounted for the remaining 6%.

With recovery from COVID-19 impact, hydro power generation grew by 5.1% to reach 153 TWh, from 146 TWh in the previous year. While the hydro contribution (on the continental level) now stands at 17.1% (with huge untapped potentials), it remains a dominant source supplying over 70% of electricity generated in most countries such as Ethiopia, Congo DR, Ethiopia, Malawi, Mozambique, Namibia, and Zambia. Relatedly, power generation from other renewable sources (excluding hydro) witnessed a significant leap, with a total installed capacity of wind and solar reaching 7,334 MW and 10,302 MW, respectively. This is a 13.4% and 6.5% growth from the previous year's estimates. As the role of renewables (including hydro) climax at 23%, there is an urgent need for significant expansion for the continent to achieve the UN's universal access goal and full implementation of its climate pledges by 2030.

On the consumption side, Africa's electricity demand grew by roughly 5.2% in 2021, from 700TWh in the previous year, due to restrictions lifting and economic recovery from the COVID-19 pandemic. Electricity consumption occurred mainly amongst North African and South African economies, which jointly accounted for about 70% of the continental's total in 2022. In sum, Africa's electricity demand is projected to grow at an average annual rate of 2.5% over the next decade, occasioned by rising population growth, economic recovery, industrialisation, and accelerated RE development, especially hydropower, wind, solar PV and geothermal. Despite ongoing (and planned efforts) to improve modern energy access in several African countries, including Ethiopia, Ghana, Kenya, Senegal and Rwanda, **Sub-Saharan Africa still has the lowest electricity consumption per capita globally, estimated below 500 kWh per capita** (which has even fallen by over 5% since COVID-19 started). Per capita energy consumption is about six times lower than the global average. This must change if the continent is to become an industrial powerhouse. This estimate is much lower in some African countries, such as Niger, Ethiopia, and Benin, with below 100 kWh per capita threshold.

Africa's electricity demand is projected to grow at a baseline average annual rate of 2.5% over the next decade. However, per capita energy consumption is about six times lower than the global average. This must change if the continent is to become an industrial powerhouse and lift millions out of poverty.

The significant proportion (43%) of Africa's population without electricity underlines the long-held fact that electricity access and rural electrification require radical investment in key areas. This includes generation capacity addition (through mini-grids and stand-alone systems), T&D infrastructure extension and modernisation, and metering over the next few decades. According to the African Development Bank, achieving universal electricity access requires providing 160 GW of new generation capacity, suggesting that the current growth rates would result in the addition of almost half that amount. Sub-Saharan Africa's power sector would need a significant investment of between US$60 billion and US$90 billion per year over the next decade.

4.1 Scenario Development and Analysis

Given Africa Energy Chamber's focus on electricity access improvement in Africa, this section underpins the possible scenario-based analysis of various electricity generation and investment pathways. It considers factors such as available energy resources, technologies, cost, and generation prospects, from 2022 to 2040. As with our 2022 Outlook, three main scenarios are developed, namely:

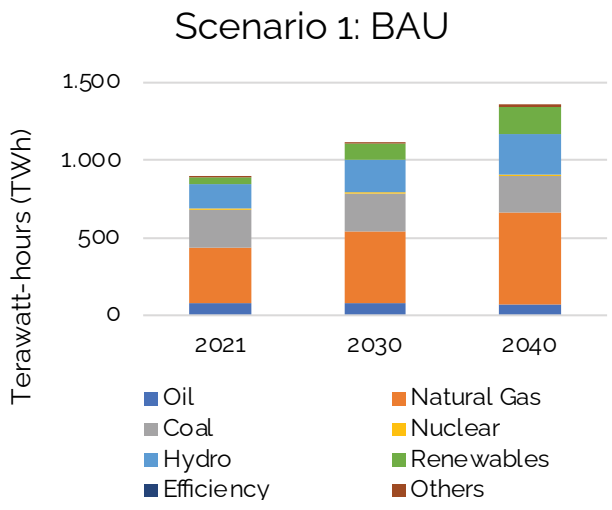
- **Business as Usual (BAU) scenario,**
- **Making energy poverty history by 2030** (MEPH 2030) scenario, and
- **A more 'cleaner' mix (CleanMix) scenario.**

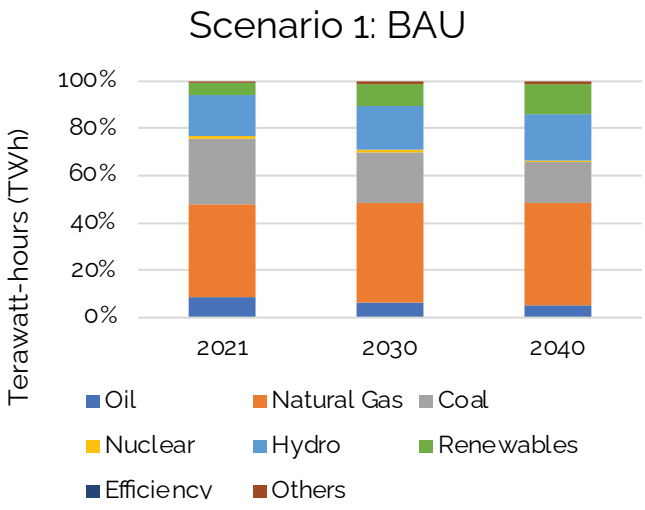
The **BAU scenario** examines how the present electricity generation outlook unfolds if the current trends continue. **MEPH 2030** investigates the possibility of eradicating energy poverty in Africa by 2040 using various energy sources (including fossil fuels that remain an integral part of the overall electricity mix in most developed and developing economies). Finally, the CleanMix scenario examines the potential role of renewables, including hydropower, solar, wind, and geothermal, plus efficiency in improving the electricity supply system in Africa.

Scenario 1: BAU Scenario

Projections under the BAU approximate Africa's electricity generation to reach 1,362 TWh in 2040, implying an average annual growth of approximately 2.2%. The generation from NG power plants (CCGT and GT) is anticipated to increase by 2.7% a year, reaching 594 TWh in 2040 due to new (ongoing) investments in this so-called cleanest fossil energy source. Also, with rising capacity addition in countries such as Ethiopia, Angola and Mozambique, the contribution of hydro powerplants to the generation mix is estimated to increase substantially from 153TWh in 2021 to 262TWh in 2040. Unlike NG and hydro, coal witnessed a different trend due to rising clamour for decarbonisation, with its share envisaged to plunge by 7.1%, from 247TWh to 230TWh from 2021-2040. Therefore, NG, coal and hydropower remain the leading sources of electricity generation in Africa under BAU Scenario and will continue to do so for many years to come.

While renewable energy (excluding hydro) makes up a small proportion of the total electricity generation mix as of 2021. Its contribution, alongside other technologies, is expected to expand considerably from 55 TWh in 2021 to 193 TWh in 2040. The dramatic rise by 2040 attributes to rising utilisation of high-quality solar, wind and geothermal potentials in several African countries, including Kenya, Senegal, Algeria, Egypt, Morocco, South Africa, amongst others, with most of them already at the forefront of RE deployment. Moreover, within renewable energy technologies, Solar PV dominates the generation mix followed by wind and geothermal with insignificant shares from other emerging RE technologies.



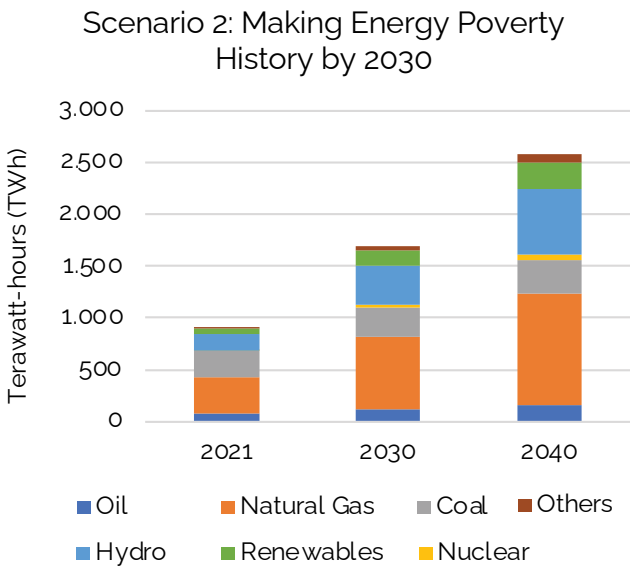


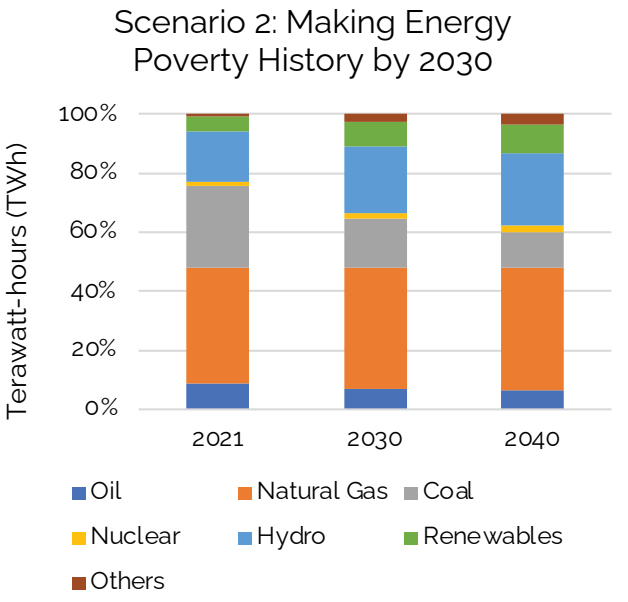
Scenario 2: making energy poverty history by 2030

In making energy poverty history by the 2030 scenario, Africa's electricity generation reaches 2,586 TWh in 2040, indicating about 5.8% annual expansion in generation capacity to support socio-economic activities and spur industrial modernisation. The scenario is targeted at achieving drastic poverty decline in Africa through productive utilisation of all its local energy resources (without any climate constraints) to ensure the creation and improvement of income-generating activities. Estimates by the Chamber suggest that the continent's electricity generation capacity needs to be almost tripled, rising by 188% from 897 TWh in 2021 to 2,586 TWh in 2040 to foster economic growth and improve the overall wellbeing of its teeming citizenry. That conventional fuels account for roughly 60% of the total generation under this scenario underlines their integral role in enabling energy poverty escape in Africa, thereby strengthening energy access for diverse applications.

Estimates by the Chamber suggest that the continent's electricity generation capacity needs to be almost tripled, rising by 188% from 897 TWh in 2021 to 2,586 TWh in 2040 to foster economic growth and improve the overall wellbeing of its teeming citizenry.

The composition of conventional fuels surges from 679 TWh in 2021 to 1,555 TWh in 2040. Moreover, the contribution of hydro to the supply mix, which remains about a quarter (25%), surpasses coal by 2040. The combined share of modern renewable energy (including PV, wind, and geothermal plants) matched with other sustainable energy sources and technologies such as carbon capture utilisation and storage (CCUS) and hydrogen fuel cells grow to reach 13% by 2040, thus compensating for the drastic decline in coal power generation. Nuclear power is seen to continue playing a meagre role in addressing African poverty, rising gradually from 10TWh to 58TWh in 2040 owing to high capital costs, weak institutional quality coupled with low human capital and technical know-how in most African countries. **The results in this scenario underscore the need for concerted effort and massive investment in fossil-based generation (principally natural gas) alongside RE technologies to meet Africa's rising electricity requirement for rapid economic growth, population expansion, industrialisation, and urbanisation.**

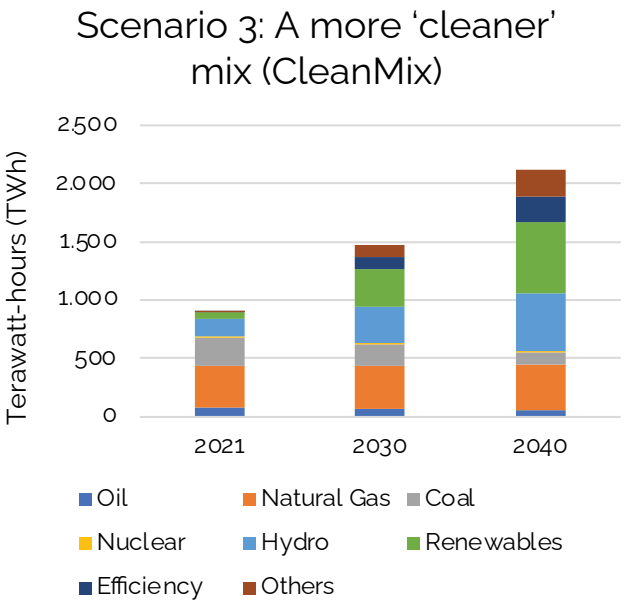


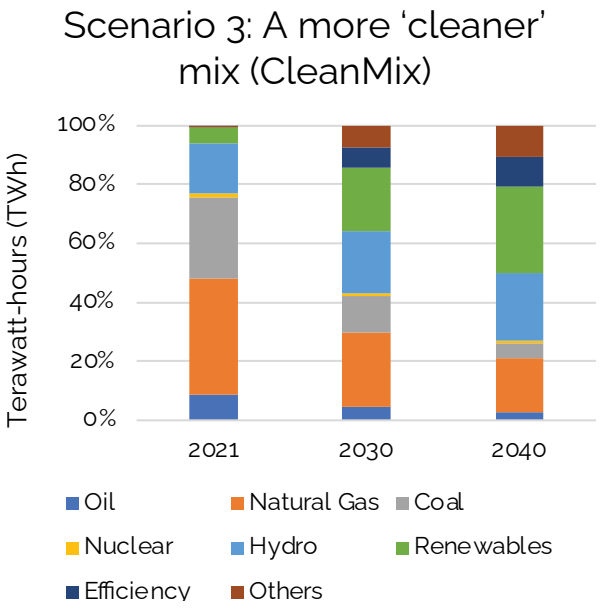


Scenario 3: A More 'cleaner' mix (CleanMix)

In this scenario, the RE proportion in Africa's generation mix, including hydro, wind, solar and other emerging greener technologies, is expected to surge exponentially due to their falling costs, growing public support, escalating deployment and huge RE resource potential in Africa. Results describe the general dominance of cleaner fuels in the generation mix, outstripping oil, coal and NG power plants that continue to expand beyond 2040. RE electricity supply (excluding hydro) in this scenario will grow from 69 TWh in 2021 to 616 TWh in 2040. Considering Africa's rich solar, wind, geothermal and biomass potentials, this projection appears feasible with significant deployment already taking place in South Africa, Morocco, and a catalogue of East African countries with intensifying RE deals and projects ongoing throughout the continent.

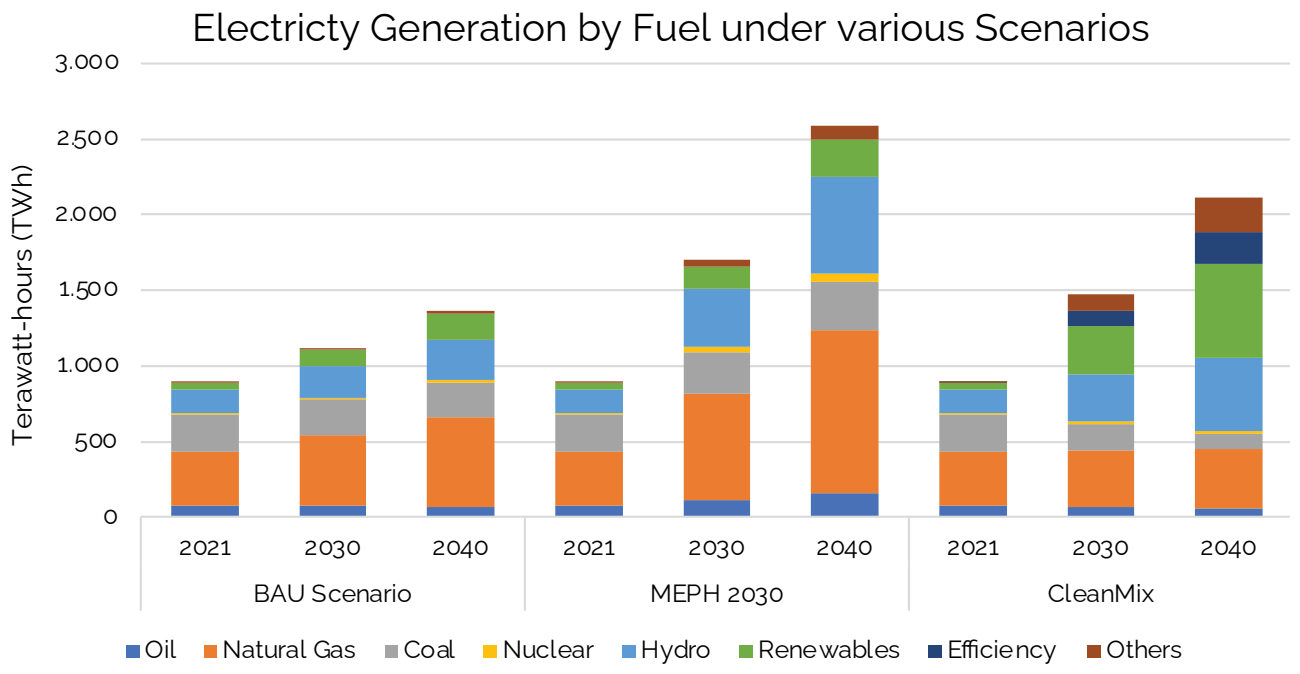
Given the rising uptake of greener technologies and efficiency measures to foster electricity access in Africa, electricity generation output is anticipated to rise by 135% to reach 2114TWh by 2040. This cleaner mix by 2040 is composed of an array of technologies, including modern renewables – majorly solar PV, wind and geothermal, which jointly account for about 30%, followed by hydro (29%), NG (19%), other emerging technologies (10%), energy efficiency mechanism (11%), while the remainder (8%) is to be provided by coal, oil and nuclear power plant, thereby making the proposed supply mix well diversified and less vulnerable to supply disruptions. Key countries such as South Africa, Morocco and Senegal are expected to champion the realisation of this lofty goal, considering their track records of pursuing energy storage and other emerging innovations to strengthen power system flexibility.





However, the generation capacity under this scenario is less than that of Scenario 2 (making energy poverty history by 2030), and the estimated output will not be enough to satisfy the electricity demands of the continent's rising population. As of 2021, less than 50% of Africa's populace had access to electricity – thereby underlining the crucial need to double existing capacity to attain 100% access by 2030 and beyond. With the growing transition to cleaner sources of electricity, Africa should take advantage of its huge RE potentials and energy efficiency measures alongside vastly endowered rare earth metals and minerals such as cobalt, copper, and platinum to step up its RE industries' growth. For example, about two-thirds (70%) of cobalt and platinum, key constituents used in batteries and hydrogen and hydrogen fuel cell production, are produced by South Africa and the Democratic Republic of Congo.

In summary, the continent can harness its enormous energy mineral resources, technological advancement coupled with apposite policies, planning, infrastructure, investment, institutions, and collaborations to meet its 2040 electricity needs forecasted to be almost three times 2021 levels. The summarised total electricity generation for each scenario is as shown in the figure below



MINERALS VALUE CHAINS AND RESOURCE-BASED INDUSTRIALISATION IN AFRICA

This section of the outlook covers

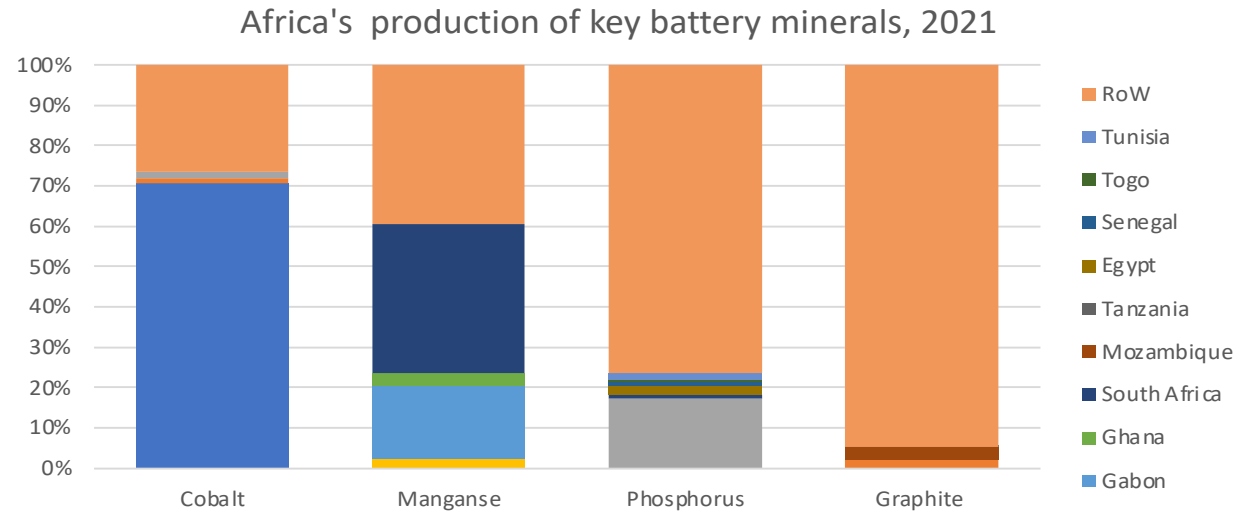
- Updated mapping of transition minerals in Africa, which are key to a global low-carbon future.
- Impact of the Russian-Ukraine war on critical minerals development on the continent.
- Addressing key investment constraints: regulatory and political risks, infrastructure risks, role of AfCFTA, among others.

5.1 Africa's battery metals downstream growth could unlock significant value

The demand for electric vehicles is fuelling the need for raw materials used in lithium-ion batteries. About nine metals are currently used in electric vehicle batteries across the various chemistries. These include lithium, nickel, cobalt, manganese, phosphorous, iron, graphite, aluminium and copper. Africa produces significant quantities of cobalt, manganese and phosphorous. This is in addition to the marginal production of lithium, copper, iron, and graphite.

Russia's invasion of Ukraine has triggered a swift response from countries, including the US, Japan, Australia and the EU.

The war, and the imposition of sanctions, will significantly impact the global metals supply chain and for far longer than initially expected. Guinea is a major producer of bauxite, which is refined into aluminium. In addition to this production, the continent hosts significant resources of these metals with enormous production potential in future.



Source: USGS

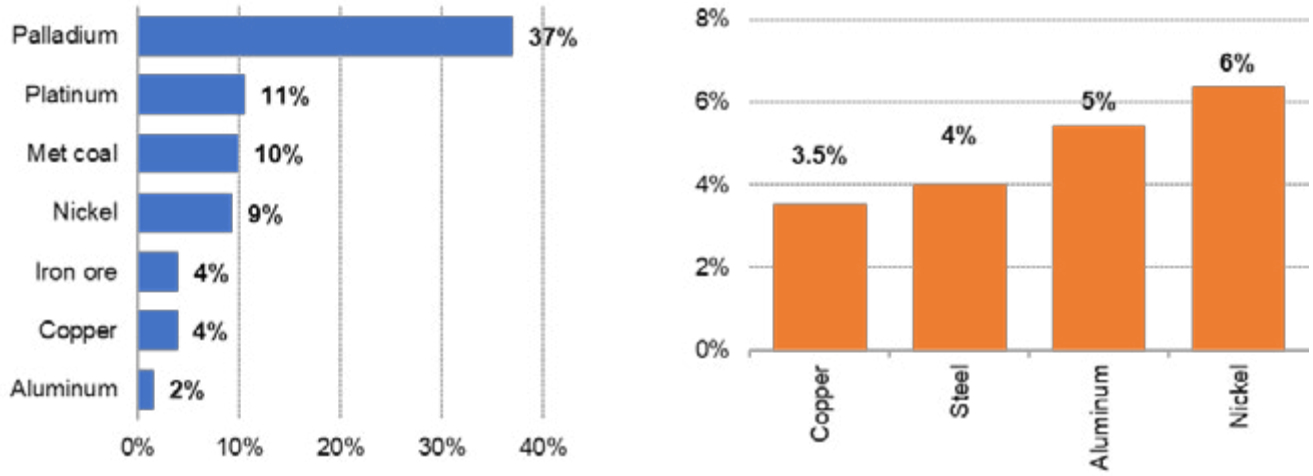
Despite the continent's enormous mineral potential, most of the metals extracted are exported to Europe and China for value creation. African countries could also benefit from value creation investments by developing the right market to support local demand for these metals, the right infrastructure to create an industrialisation ecosystem and the right capital markets to stimulate the much-needed investments across the battery value chain. In 2021, about 44% of two and three-wheelers sold worldwide were electric. These modes of transport are emerging as alternative forms of transport in major hubs such as Accra, Lagos and Nairobi. **African countries can focus on this part of the value chain to develop an electric vehicle value chain, ultimately creating the need for local batteries and, subsequently, local demand for battery metals.** A ready market incentivises the need for downstream value add investments.

Policy will be the key driver in creating this market for Africa. Rwanda and Ghana plan to phase out internal combustion engines in the future. Rwanda has taken a step further to incentivise the manufacturing of electric two-wheeler vehicles in the country and buses. **Rwanda and Kenya are the most likely countries to rollout electric two-wheelers at an accelerated rate due to government incentives,** stable electricity and emission reduction initiatives. South Africa produces 1% of global vehicle production, and it is the country's biggest manufacturing sector. In 2021, the country launched a Green Paper on Electric Vehicle to start looking into creating a domestic electric vehicle market for export. Moving downstream will help Africa unlock growth and developmental opportunities through the creation of jobs, infrastructure, and skilled labour, among others.

5.2 War in Ukraine to restructure the global critical metals supply chain in the long-term

Russia is a leading producer of critical metals such as nickel, copper, aluminium, iron ore and platinum group metals (PGM).

Russia's market share of critical metals at mine and the refinery level



Source: USGS

The war may be temporary, but it is likely to have long-lasting impacts that will reform automakers' supply chain dynamics, particularly in the electric vehicles sector. Countries have imposed import bans on Russian commodities and entities. In addition, companies have also enforced 'self-sanctions' through exits from the country or limiting access to their products in Russia. According to UN commodity trade data, Russia is a net exporter of aluminium, copper, pig iron, direct reduced iron (DRI), iron ore, and nickel. In addition, the country produces 37% of palladium and one-tenth and platinum. Both of these metals are predominantly used as catalytic converters in internal combustion engines (ICEs) to reduce emissions. Europe relies heavily on Russia's supply to meet its transport demand. Russia is also a leading producer of nickel. Overall, nickel supply from the country is about 9% of global production in 2021. For the high purity nickel used in battery manufacturing and stainless steel, Russia produces about 17% of global production. It also refines about 4% of global copper. Despite its low production, in 2021, the country supplied 25% of the European Union's copper demand, making Russia the second most important copper producer for the EU. Copper is key to the energy transition due to its role in

Table 3 Metals produced in Russia and African countries that can provide supply

Metal	Countries
Platinum Group Metals	South Africa, Zimbabwe
Nickel	South Africa and Madagascar
Copper	Zambia and the DRC
Iron ore	South Africa

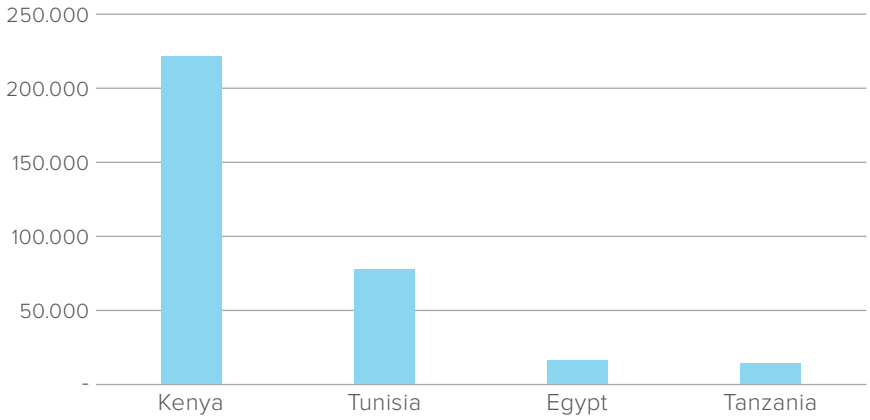
batteries, electric vehicles, solar and wind energy sources.

It must be noted that the United States and EU have not imposed any direct sanctions on Russian metals. However, **should this become a possible scenario due to the escalation of the current war, African countries could help other countries meet the shortfall in demand.** Already, some thermal coal miners are ramping up production due to renewed interest in coal from European power plants due to rising gas prices pushing countries to restart their coal plants.

The pandemic and the war in Ukraine will lead to accelerated investment in diversifying supply chains. Countries such as the United States aim to reduce their dependency on Russia and China. However, diversifying the mining supply chain is complex. New mines are capital intensive, require long pre-production periods and are risk investments due to complex geologies. Development capital will have to flow into Africa to help explore new resources and invest in the supporting infrastructure, which could help African countries create a substitute market for the EU and United States beyond Russia and China.

Steel and aluminium were the most imported metal products from Russia into Africa in 2021. Kenya imported about 221,175 tons of steel from Russia. As sanctions begin to affect Russia's ability to make international payments among others, this could impact steel imports in Africa in 2022 and beyond. Africa represents the last frontier for infrastructure development. Steel and aluminium will be critical metals that underpin the continent's energy and infrastructure growth. Investing in the domestic supply chain to meet local demand could help insulate the continent from such global shocks in future. However, structural constraints such as the lack of relatively cheaper and readily available electricity for industrial users and a coherent continental industrial policy are likely to hinder this.

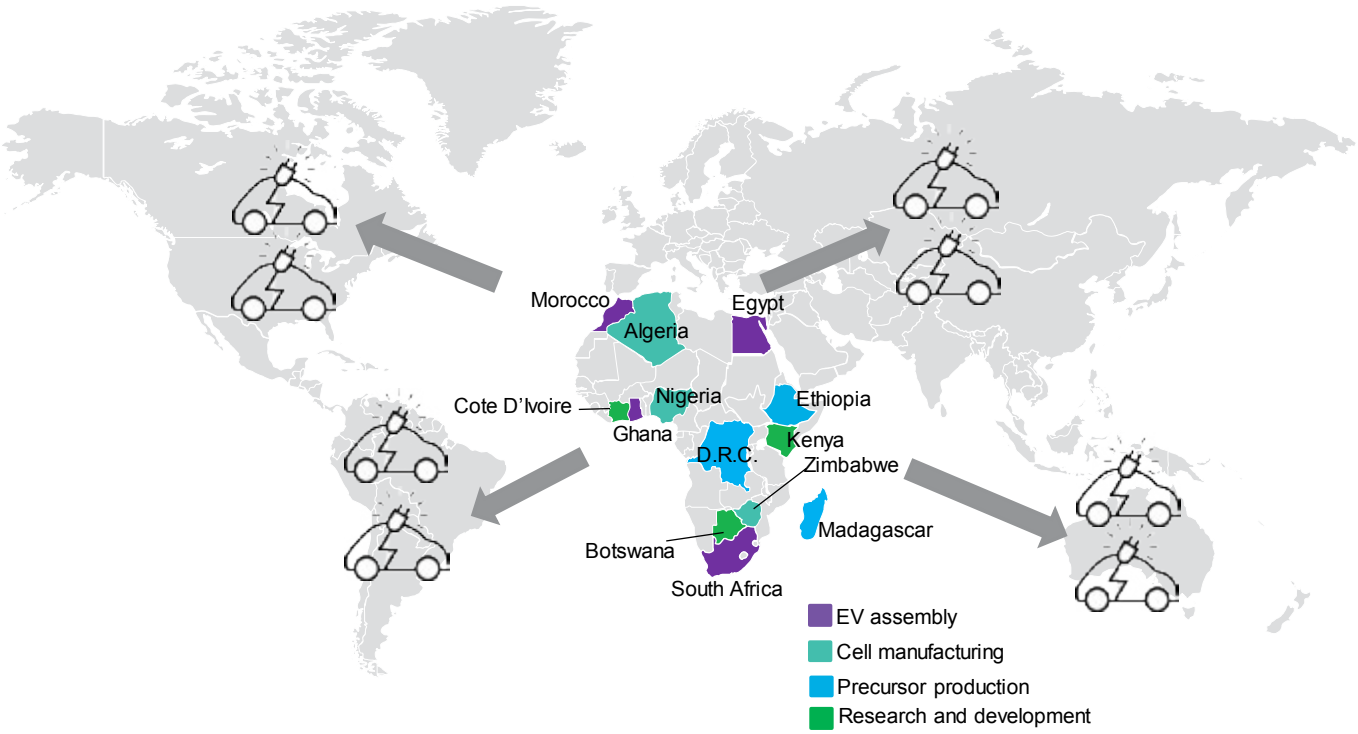
Steel products import from Russia in 2021 (tonnes)



5.3 AfCFTA will enable Africa to harness its critical minerals opportunity

The Africa continental free trade agreement (AfCFTA) has been ratified. It will create unique and significant market opportunities for African countries to leverage each other's resources to create a common market. The agreement has the potential to make Africa an electric vehicle powerhouse in the long term, according to a report by Bloomberg New Energy Finance published in 2021.

Figure 4 Leveraging AfCFTA to create Africa's EV manufacturing powerhouse



Source: BloombergNEF . Note: EV means electric vehicle.

According to the report, South Africa, Morocco and Ghana could use their auto policies to create a continental demand for electric vehicle production. On the other hand, Zimbabwe could use its rich mineral resources and proximity to South Africa and DRC to create a battery manufacturing opportunity. Kenya and Botswana could provide in-depth research and development opportunities by leveraging their lead-acid battery expertise and downstream manufacturing development responsibilities. AfCFTA will create a unified market that enables materials to move across borders seamlessly in a unified market.

For Africa to harness these opportunities, three main roadblocks need to be addressed:

- **Policy incentive:** Governments must first create a continental market for batteries through incentives, regulations and fiscal guarantees for local companies to develop their supply capacity.
- **Infrastructure investment:** A successful manufacturing industry will hinge on good roads, expanded ports, stable and affordable electricity and access to equipment. Public and private sector institutions must invest in these to make Africa's manufacturing push cost competitive.
- **Skilled labour:** Talent will be the key driver as Africa aims to be a manufacturing hub for both critical metals and its associated downstream opportunities. Converting iron ore to steel or bauxite to aluminium will require investment in fundamental research and breakthrough technologies that will enable the continent to compete with low-cost jurisdictions such as China.

African Energy Chamber

The State of African Energy

2023 Outlook

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