JUST ENERGY TRANSITIONS AND NATURAL GAS IN AFRICA: BALANCING CLIMATE ACTION AND STRUCTURAL TRANSFORMATION

THE AFRICAN CLIMATE FOUNDATION

Discussion paper
August 2022

TABLE OF CONTENTS

Key messages....3

Introduction....4

Setting the scene: the natural gas landscape in Africa....7

Drivers of future demand for African gas producers....11

Economic development and energy transitions in Africa....19

Key considerations for decision makers....25

Concluding thoughts....28

Data sources....28

KEY MESSAGES

- The African continent is host to significant natural gas resources with substantial new discoveries having been made in the past decade.

- Short- to medium-term changes in global liquified natural gas (LNG) markets as a result of Russia's invasion of Ukraine will give way to the longer-term dynamics, in particular global energy transitions, that will make investments in new gas infrastructure much riskier and returns on those investments more uncertain.

- Investments in gas to power will become less competitive as the cost of renewable energy (RE) alternatives continue to drop.

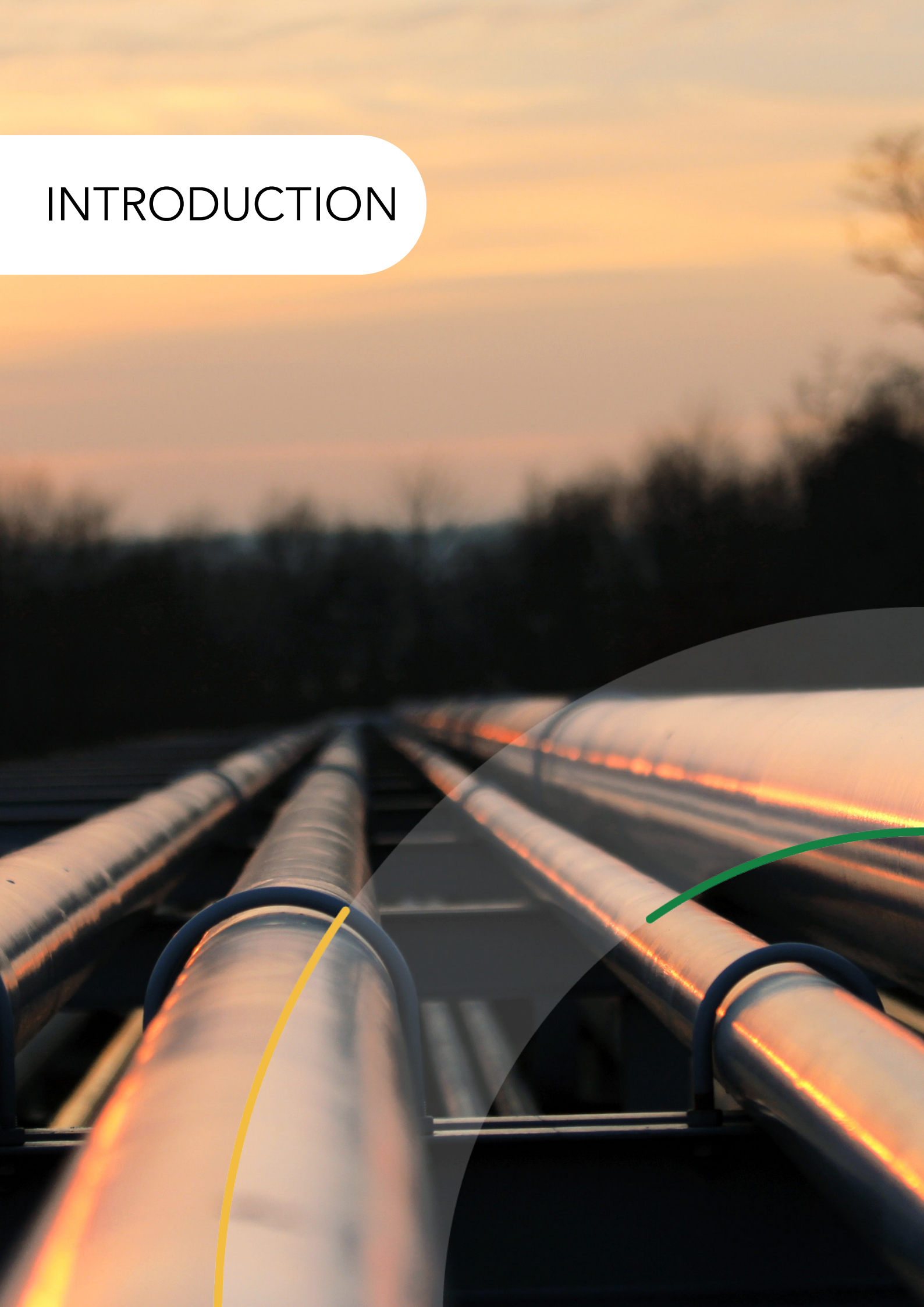
- The economic viability of investments in gas infrastructure by individual countries will be influenced by several factors:

    - Available reserves, timelines for infrastructure development and infrastructure pay-back periods
    - Ability to balance trade-offs between exports and domestic utilisation
    - Impact of global energy transitions on gas demand
    - Impact of climate mitigation commitments on the trade competitiveness of fossil-fuel-dependent economies
    - Technology availability and maturity
    - Competitiveness of different technologies, with a link to energy prices
    - Access to finance and apportionment of risk between producer states and international oil companies (IOCs)
    - Other global drivers

- Given the medium- to long-term risk of new gas investments for African producers, attention should instead be given to the opportunities presented by RE, not only for electrification, but also to support local industrialisation and economic diversification.

- The case for RE will, however, rest on the availability of climate finance, coupled with support from governments and private investors, all of which need to be dramatically scaled up to ensure large-scale roll out of these technologies.

INTRODUCTION



Africa is increasingly being viewed as an important player in the natural gas sector, with over 40 percent of global gas discoveries between 2011 and 2018 made on the continent. Mozambique and Tanzania alone accounted for 24 percent of global discoveries over this period. For mature LNG producers, like Algeria, Nigeria and Egypt, gas represents a significant source of foreign revenue and an important resource to meet growing domestic energy needs. Other countries in the exploratory or infrastructure development phase of gas extraction, processing, export and utilisation see gas as an opportunity to deliver energy security and support economic development.

The economic viability of existing gas infrastructure and new gas investments is, however, subject to great uncertainty as the global shift to clean energy gains traction. Climate scientists have warned that to avoid the worst impacts of climate change, average global warming will need to remain at 1.5°C or below. This will necessitate a global transition to a low-carbon economy where global carbon-dioxide (CO2) emissions reach net zero by 2050, and other greenhouse-gas (GHG) emissions reach net zero about two decades later.

While natural gas has been positioned as a low-carbon option relative to coal, gas extraction, processing, transport, combustion and utilisation in industrial processes give rise to GHGs, including methane and carbon dioxide. New methods for tracking leakages across the value chain have begun to raise red flags around the GHG intensity of natural gas. In fact, most scenario models suggest that achieving net zero will require a substantial decline in gas utilisation. In scenarios that account for continued gas utilisation, this is coupled with mitigation technologies to reduce emissions, many of which are expensive and/or unproven.

Despite this, extensive investment in fossil-fuel infrastructure continues, with financial flows largely originating from developed countries. The war in Ukraine, for example, has seen a flurry of European interest in securing additional gas supplies from African markets to meet Europe's domestic energy needs. This raises important contradictions that cannot be ignored. It also raises key questions about equity: why are African resources being used to secure Europe's energy supply when so many Africans lack access to energy?

For African countries, there is no question that decisions about their future energy mix and industrialisation and growth strategies must prioritise the broader socio-economic development needs of their people. Given the historic and continued contribution of developed countries to GHG emissions, the onus must be on them to rapidly mitigate emissions. But in prioritising their socio-economic needs, African countries cannot lose sight of the global transition currently underway and the inevitable implications that this will have on the sustainability of their investments. It is against this background that this discussion paper has been prepared by the African Climate Foundation.

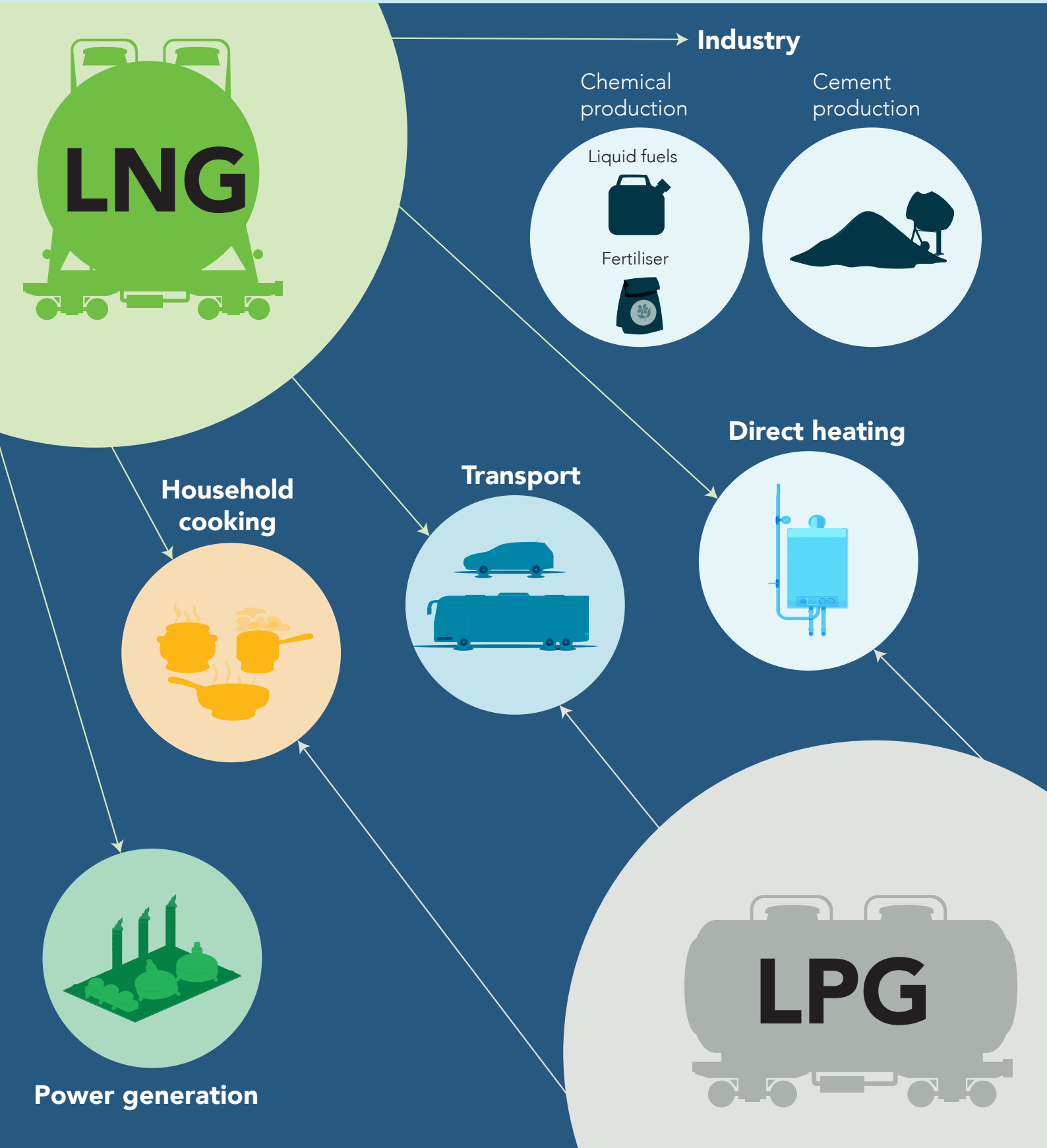
The Just Energy Transition (JET) in the context of this discussion paper

The JET refers broadly to the systemic transition towards sustainable, low-carbon energy in such a way as to ensure the protection of society, the safeguarding of jobs and the environment, and the promotion of economic resilience. While not covered explicitly in this discussion paper, the JET is implicit in a number of the arguments presented in this document.

Liquefied natural gas (LNG) versus Liquified petroleum gas (LPG)

The term "gas" in the context of energy carriers is often used generically without defining the source of the gas. Petroleum gas is produced during the refining of crude oil in petroleum refineries. Typical uses include heating, cooking and as a fuel for vehicles. Natural gas is extracted from gas fields. Uses include electricity generation, industrial processing, heating, cooking and transport. Both gases are liquefied to improve the efficiency of storage and transport.

The uses of LNG and LPG



SETTING THE SCENE: THE NATURAL GAS LANDSCAPE IN AFRICA

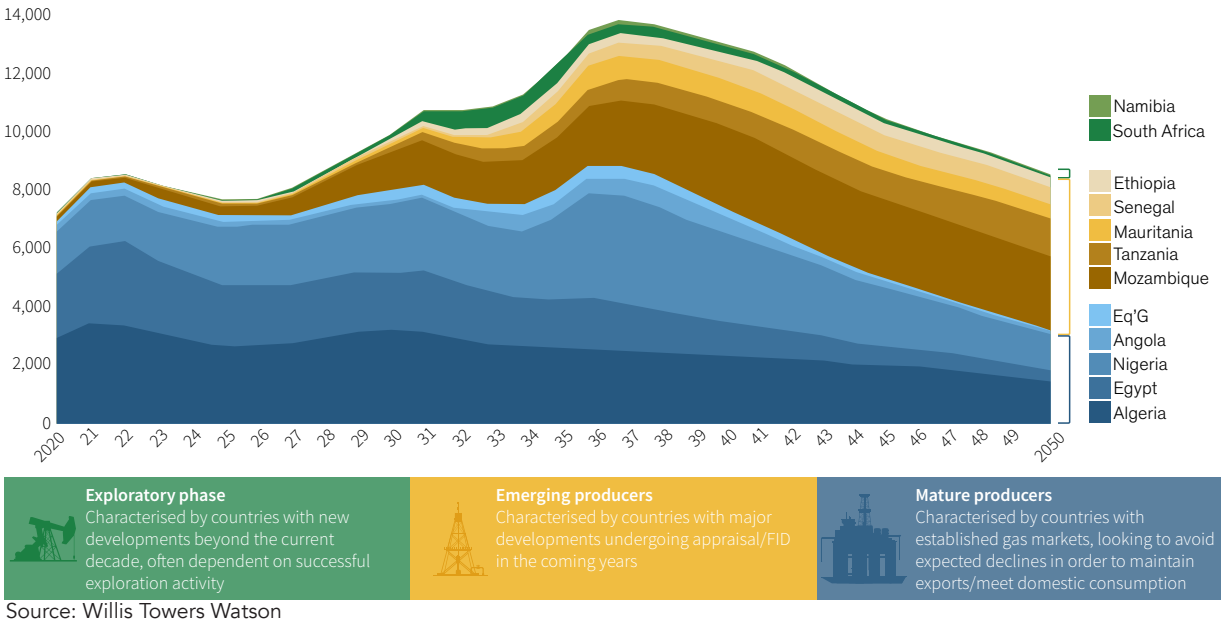
No single story can be told about Africa's natural gas sector. Countries with gas resources on the continent differ in terms of maturity of markets, levels of economic development, socio-economic needs and geopolitical and geoeconomic interests and relations. While the risks of gas dependence must therefore be assessed on a country-by-country basis, some level of aggregation is useful to identify common themes, challenges and opportunities.

Broadly speaking, countries with gas resources in Africa can be divided into **mature** producers, those that have established infrastructure and markets; **emerging** producers, those with projects undergoing appraisal or final investment decision (FID) in the coming years; and countries in the **exploratory** phase. Figure 1 shows the volume of gas that could be produced based on discovered reserves in select countries. It does not include the economic viability of developing these resources nor the impact of future drivers, including responses to climate change, both of which are discussed further in this paper.

The majority of gas currently produced by countries in Africa is destined for export markets. Pipeline transport accounts for the majority of exports from North Africa with four pipelines connecting North Africa with European markets, one from Libya and three from Algeria (See Figure 2). Various other pipelines to Europe are either in the planning stage or currently stalled. The remainder of producers and markets are connected via ocean transport, either through fixed distribution terminals or mobile small-scale floating storage and regasification units (FSRUs). Around 56 percent of African LNG exports go to Europe and a further 37 percent are sent to the Asia Pacific, with India, China and Japan being key export markets for African LNG within the region. Nigeria's largest European export markets have historically been Spain and France, with exports to China, India and Japan increasing over the past five years.

Gas is also utilised in domestic and regional markets. The size of domestic markets varies widely between countries and regions. Factors that determine the extent of domestic utilisation include availability of infrastructure, price dynamics, the existence of industrial and power generation off-takers and the overall makeup of the energy mix in countries. Gas for domestic markets is typically sold at subsidised or fixed price rates, which often artificially makes it appear cost competitive with alternatives. With a few exceptions, gas utilisation on domestic markets has largely been for power generation, transport and residential applications, but has not led to significant downstream industrialisation benefits. As shown in Figure 2, many of the mature producers have an internal pipeline network to serve domestic (and sometimes regional) markets.

Figure 1: Available gas production for select countries



Source: Willis Towers Watson

Gas resources and producers are spread across the entire continent:

- **North Africa,** and particularly Algeria, Egypt and Libya, account for 53 percent of the continent's proven reserves, have mature gas-production infrastructure and consume and export large quantities of gas.

- In **West Africa**, Nigeria has Africa's largest gas reserves. Ghana has had small amounts of gas production, mostly associated gas from its offshore oilfields. It also has non-associated gas, which could allow it to reach 280,000 million British thermal units (MMBTu) per day production capacity in the next few years. Countries such as Senegal, Mauritania and Côte d'Ivoire are emerging players that are in the process of developing their resources. Senegal and Mauritania have made major discoveries in their shared deep waters.

- **East Africa** has significant natural gas resources. The Rovuma Basin in Mozambique, which contains more than 100 trillion cubic feet (tcf) of gas, was discovered in 2010. In 2014 the Tanzanian government announced the discovery of about 57 tcf of gas. These discoveries have resulted in a gas boom in East Africa and have raised expectations of significant revenue flows from LNG exports in these countries.

- In **Central Africa,** the Republic of Congo holds 10.1 tcf of proven natural gas reserves.

- In **Southern Africa,** South Africa has recently discovered about 60 tcf of gas offshore, while Namibia has relatively small reserves in the Kudu gas fields.

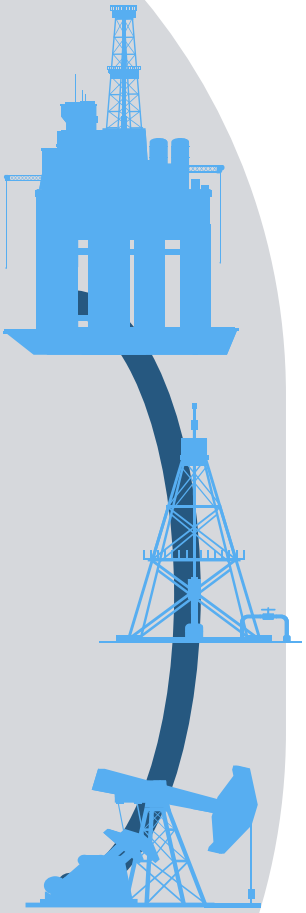
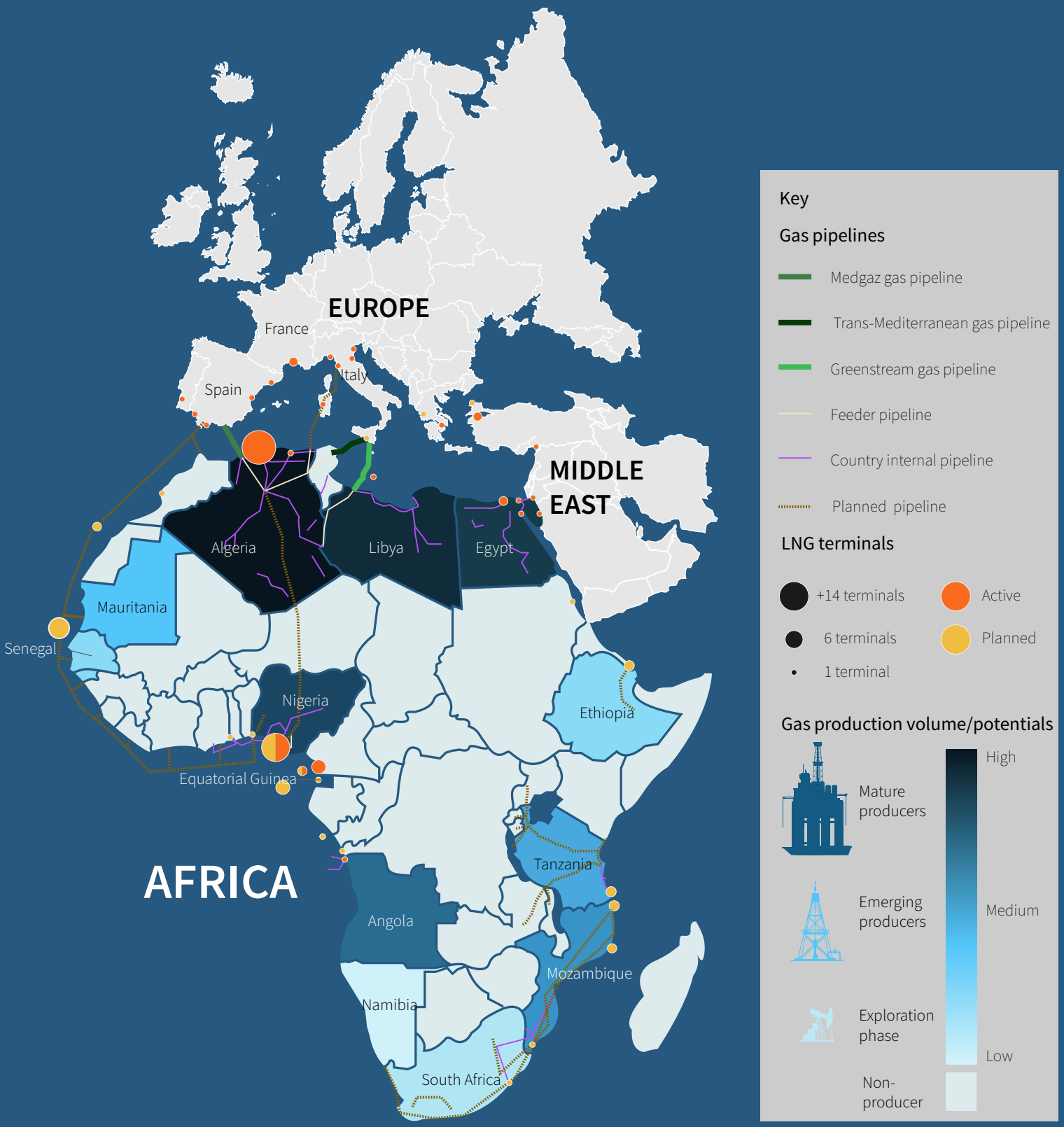


Figure 2: Gas production, pipelines and infrastructure in Africa



DRIVERS OF FUTURE DEMAND FOR AFRICAN GAS PRODUCERS

Climate change targets

One of the most important determinants of future gas demand is the scale and pace of the global response to climate change. In April 2022, the Intergovernmental Panel on Climate Change's (IPCC) Working Group III Sixth Assessment Report (AR6) on climate mitigation was released. It finds that limiting warming to 1.5°C, with no or minimal overshoot, necessitates a decline of between 20 percent and 60 percent (with a median of 45 percent) in global gas use by 2050 compared to 2019 values. By 2050, almost all electricity will need to be supplied from zero- or low-carbon sources, such as renewable energy or fossil fuels with carbon capture, utilisation and storage (CCUS). Further reductions would be required in gas demand by 2100. The International Energy Agency's (IEA) Net Zero Emissions (NZE) scenario comes to a similar conclusion. It suggests that although gas utilisation will increase until 2030, a 55 percent reduction is required by 2050 against 2020 levels to achieve the 1.5°C target.

Scenario exercises identify multiple pathways that could achieve the temperature target, each of which describes a different rate of decline in and ultimate utilisation of fossil fuels. The rate of decline is as important as the ultimate targets achieved, due to the cumulative impacts of GHGs in the atmosphere. Which trajectories ultimately play out will be determined by policy positions taken by governments, the response of the private sector and the availability and affordability of low-emissions technologies, among other factors.

While it is difficult to predict how quickly global markets will respond to climate mitigation needs, what is clear is that future fossil-fuel markets are and will continue to be plagued by increasing uncertainty. Decisions to invest in new or additional gas extraction today are ultimately a gamble that demand will continue to exist when assets come online, for the duration of those assets' life cycles, and that additional assets will not result in oversupply in global markets.

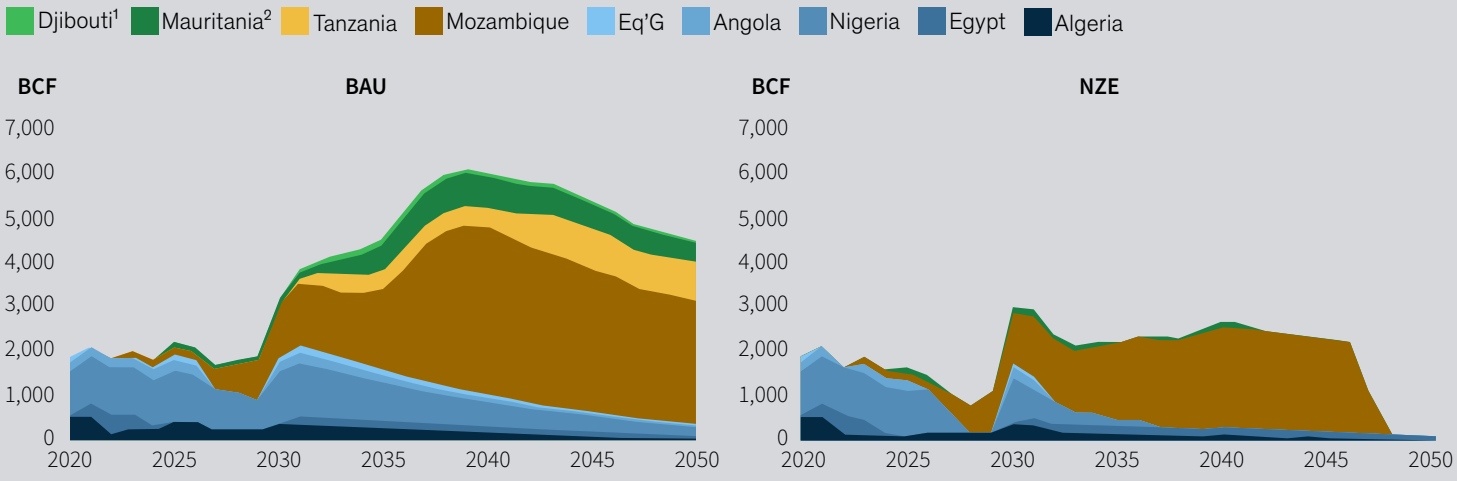
Example: Projected impact of different climate scenarios on the economic viability of infrastructure investments

Willis Towers Watson (WTW) has developed proprietary models on climate responses and gas futures, and its implications for infrastructure investments in various locations. Modelling by WTW of the value of African natural gas under different scenarios for energy transitions shows that gas resources overall and LNG projects, in particular, lose significant value in a Well Below 2°C (WB2C) scenario (one where climate action is consistent with the Paris Agreement) and are largely value destructive in a Net Zero scenario by 2050 (NZE) outcome.

In Tanzania and Mozambique, for example, the study finds that under a NZE scenario, investments in new gas infrastructure in both countries will be value-destructive as a whole, regardless of the fiscal terms negotiated. In a WB2C scenario, investors in Tanzania will only be able to ensure viable investments if new terms surrounding government profit sharing are negotiated. In Mozambique, projects could be viable, provided that no delays are encountered and that none of the projects are indexed against oil prices.

Figure 3 below shows, for each country analysed, the volume of LNG exports that would be competitive under forecasted global LNG demand and prices in the Business as Usual (BAU) and NZE scenarios. In a NZE scenario, by the end of this decade, a significant number of existing LNG assets could become uncompetitive in global markets. Among emerging producers, only Mozambique could develop a set of assets that may be cost competitive. However, as the more detailed analysis for Mozambique reveals, even these would fall comfortably short of meeting typical investment return requirements for companies.

Figure 3: Volume of LNG exports that could be competitive for select countries in a Business as Usual and a Net Zero by 2050 scenario



[1] The commerciality of LNG terminals exporting Ethiopian gas.
[2] Includes Senegalese gas production that will be exported via Mauritanian LNG terminals.
Source: Willis Towers Watson

Global energy transitions

Over the past decade or so, powerful countries and blocs have been positioning themselves for future market share of clean energy technologies. While these countries ready their domestic markets for the transition, access to rare earth supplies are being secured and clean technology manufacturing capabilities developed. At the same time, policy reforms are starting to pave the way for new global trade rules that will cement market dominance for these first movers.

Europe, Africa's key export destination, is a prime example. It has set itself ambitious medium- and long-term emission reduction targets that will see it continue to rely on gas in the short term as it shifts its economies to renewable energy and green hydrogen. In response to the war in Ukraine, the REPowerEU Plan, announced in March 2022, has paved the way for an accelerated phase out of Russian fossil fuels through increased LNG imports from Africa and elsewhere. This will allow it to meet its short-term domestic needs while it develops the infrastructure necessary for a clean transition by the end of the decade.

At the same time, a Carbon Border Adjustment Mechanism (CBAM) is gradually being phased in as part of the European Union's (UN) Green Deal. The CBAM will have important implications for the competitiveness of exports from fossil-fuel dependent countries. Initially the CBAM will cover emissions from production processes with additional import tariffs levied on a select number of goods at high risk of carbon leakage, including iron and steel, cement, fertiliser, aluminium and electricity generation. Once an initial transition period is over, the CBAM is expected to extend across the entire value chain, potentially accounting for levels of fugitive emissions from LNG production too. This will see fossil-fuel dependent countries like Algeria, Egypt, Morocco, South Africa and Mozambique lose competitiveness in European markets.

This raises important questions for those African gas producers that Europe is eyeing to fill the Russian gas gap. Put crudely, African countries may end up providing a stop gap to support Europe's short-term needs while it sets the stage for policies like the CBAM that will ultimately end up penalising these countries once it transitions.

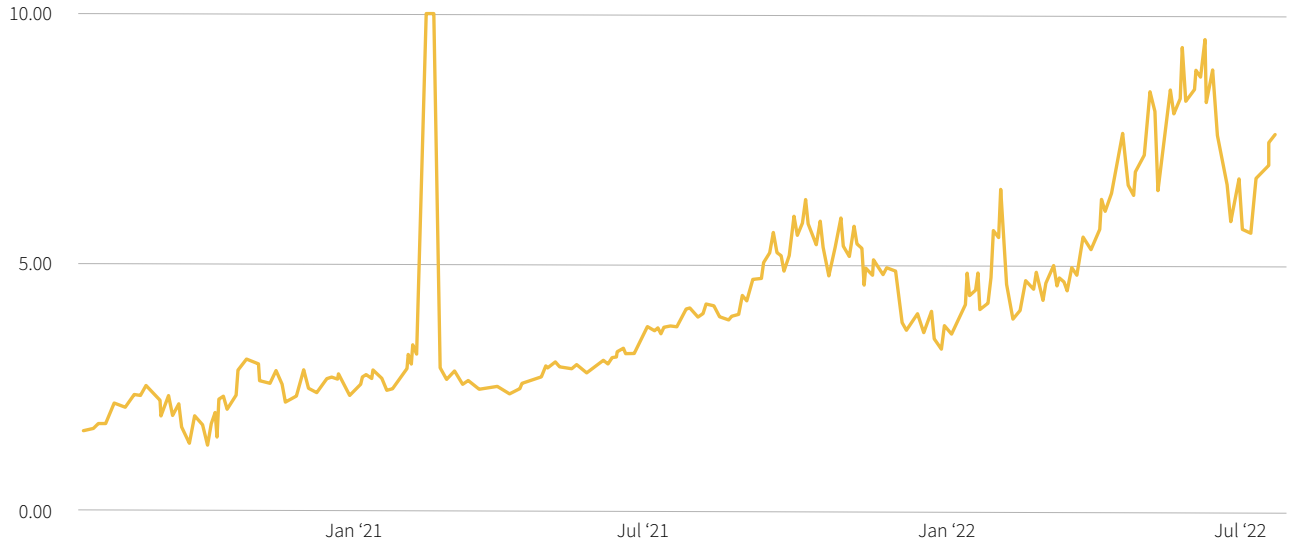
Given project-development lead times, pressure to fast track production to meet Europe's demand may see some countries pursue projects that will only come online once the EU's LNG demand declines. Other markets, in particular South and Southeast Asia, may absorb some of this supply as gas begins replacing coal over the medium to long term. However, China's trajectory is expected to play an important role in this regard, given its dominance in the region. While currently the largest importer of LNG, projections suggest that after five years of sustained demand, imports may slow due to higher domestic supplies and pipeline imports. At the same time, China has committed to carbon neutrality by 2060 and, like the EU, is positioning itself as a global leader in the clean energy future. The greening of the Belt and Road Initiative will see growing Chinese investments in clean energy in other countries in the region that may further dampen demand for LNG imports.

LNG pricing

Another important factor determining future gas demand, which is partially linked to global climate action but also to geopolitical considerations and production by countries outside the African continent, is the evolution of LNG prices. LNG has traditionally been traded in long-term supply contracts (20 to 25 years) with fixed prices indexed against oil. In recent years, growing volumes of gas have been traded on a spot basis, which has increased price volatility. For example, prior to the war in Ukraine, slowing demand growth in China and Europe and a boom in gas output from the US all contributed to lower LNG spot prices in Europe and Asia, as well as lower wholesale gas prices (set by LNG exports) in the US. Since the war in Ukraine, LNG prices have once again reached levels last seen in around 2010 (see

Figure 4), following the Fukushima nuclear disaster that led to an unprecedented boom in global LNG spot prices. It is anticipated that these levels will remain for a few years before prices revert to trajectories expected before the conflict. In response to high spot prices and security of supply concerns, Asian countries and indeed some European countries are again seeking out longer-term contracts (for around ten to 15 years). This is also partially being driven by the financing needs for infrastructure expansion. While high LNG prices today are appealing for producers, the question for countries seeking to ramp up production is whether their investments can withstand spot market volatility in ten to 15 years when contracts expire or if they have viable prospects to secure new long term offtake agreements in an increasingly competitive global market where many countries and regions have already begun to transition.

Figure 4: Natural gas spot prices (Henry Hub)
$ per million British thermal units



Source: Natural Gas Intelligence
Note: Henry Hub prices reported for February 16 and 17, 2021 exceed the published range, averaging $16.96MMBtu, respectively.

The impact of the Ukraine war on LNG demand in Europe

Russia's invasion of Ukraine in February 2022 has created a global shift across multiple sectors worldwide. The war has resulted in a far more urgent move to transform Europe's energy system and has significantly increased the demand for LNG sourcing from other parts of the world. Prior to the war, Europe was looking to reduce reliance on Russian fossil fuels over a ten-year period but is now looking to accelerate that timeline to five years. The increased demand from countries such as Nigeria, Algeria, Mozambique and Egypt, which are already well-established LNG suppliers, puts significant strain on the existing infrastructure. The accelerated timeline also throws into relief the struggles that these and other countries may face with issues such as demand projections and delivery timelines, long payback periods and the lengthy lag between new projects coming online to satisfy Europe's demand and revenue generation for the state.

Future domestic demand

Growing domestic demand could buffer African countries to some extent from the external transition risk emanating from falling global demand and volatile prices. Domestic utilisation will, however, depend on the existence or future construction of pipelines and other distribution infrastructure, and the existence or creation of anchor tenants or off-takers. These could include gas to power generation, fertiliser and other chemicals production, liquid fuels and methanol production and cement plants.

A common challenge in meeting domestic demand will be the commercialisation of enough gas reserves to reduce the impact of domestic demand growth on export potential and export revenues. This applies to both existing and new producers. Some mature producers are already experiencing challenges in balancing declining gas reserves and growing domestic demand with the contribution of export revenues to their economies.

For emerging producers, determining the correct level of subsidisation to stimulate and maintain domestic demand and create long-term absorption capacity will be a challenge. In Tanzania, for example, a 2016 proposal to develop a domestic fertiliser plant using local LNG as feedstock was stalled because of disagreements around preferential pricing (with off-takers looking for discounted gas prices to make fertiliser production profitable).

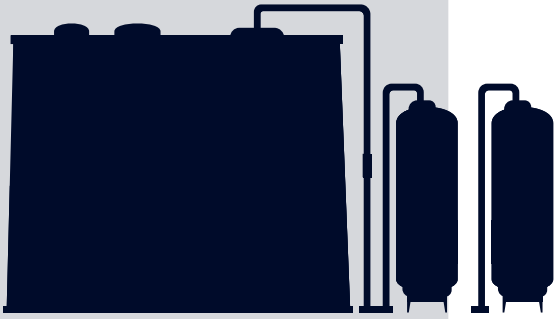
Addressing these tensions between exports and local demand will require new or updated legislation to govern future domestic demand. Some countries, such as Mozambique, are already imposing Domestic Supply Obligations (DSOs) to help support domestic utilisation. However, these DSOs are often not met due to a lack of effective enforcement mechanisms.

Furthermore, because DSOs are placed on exporting assets, they can end up eroding the viability of LNG developments and increase the transition risks for these assets. This begs the question: can local gas resources realistically be used to support domestic energy needs if the economics favour exports and, if so, how do countries with limited financial resources and low levels of capacity incentivise international oil companies (IOC) to support domestication when exports is ultimately where their interests lie?

Apart from creating the local absorption capacity and achieving the correct balance between domestic utilisation and exports, countries pursuing gas domestication will need to think carefully about how to mitigate the longer-term transition risks of domestic gas dependency too. Punitive tariffs on carbon-intensive products will become an increasing reality as developed countries start implementing their own transition plans.

Example: Balancing gas exports and domestic use in Algeria

Since the war in Ukraine, the challenge of balancing gas exports and domestic demand in Algeria has become particularly pertinent. While this is not a new challenge, the rush for alternative gas supplies for Europe has brought this to the fore. Algeria, which is one of the world's top ten gas producers, relies heavily on hydrocarbons for export revenue (accounting for over 90 percent of export revenues). It is well integrated into North African and European pipeline networks, and good trade relationships with key importers in Europe and North Africa allow prices to remain above marginal breakeven costs. At the same time, lucrative pipeline exports have allowed Algeria to maintain a low subsidised domestic price, which in turn is fuelling strong growth in domestic demand. In fact, between 2008 and 2018 domestic gas use in Algeria grew by 70 percent. By 2019 natural gas accounted for around 98 percent of power-sector fuel use. But declining or stagnating production in mature gas fields coupled with insufficient upstream investment and increased demand have led to multiple gas balance challenges. While increased investments in upstream activities have been announced, no significant new capacity is expected to come online in the coming years. With continued growth in domestic demand and new demand from European countries, Algeria effectively has two short-term options: constrain exports to meet domestic demand, thereby deteriorating the current account trade balance, or constrain domestic demand to service exports, which raises important questions about local energy needs being sacrificed in favour of European markets.



There are a number of key uncertainties around future demand for African gas:

- The speed of transitions towards meeting 1.5°C targets in Europe, Asia and elsewhere, and the long lead times and long payback periods for new gas infrastructure: Although a faster global transition poses a greater risk for gas and other fossil-fuel producers, risks exist regardless of the speed of the transition given the size of investments for gas infrastructure and capital lock in.

- Europe's move away from Russian gas towards alternative LNG sources, and the success with which LNG demand in Europe is reduced, relative to new infrastructure development timelines.

- The trajectory of China's demand, given its emissions-reduction targets.

- International LNG price variability and contract restructuring to address current supply shortages following the war in Ukraine and subsequent high spot prices.

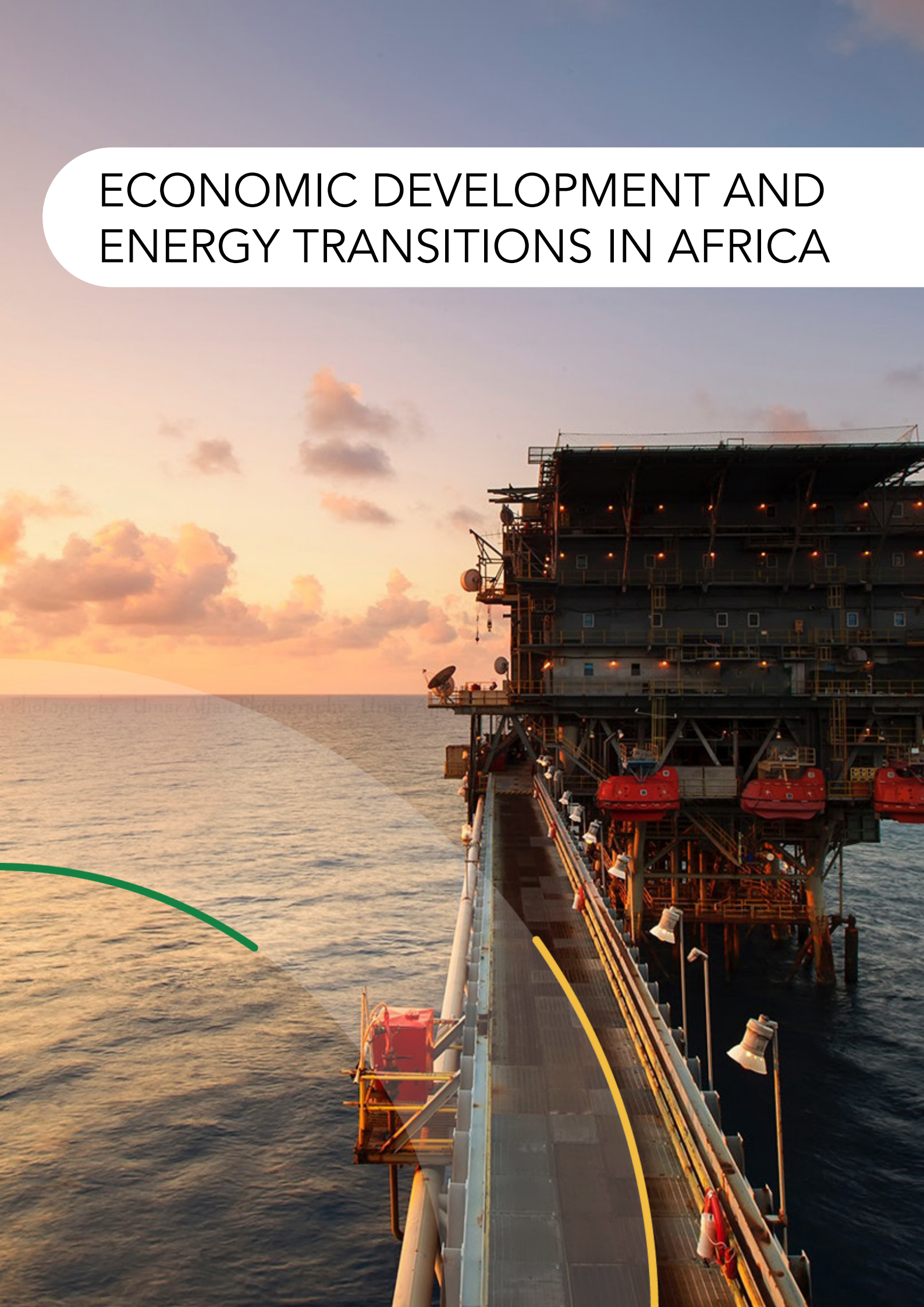
- Domestic absorption capacity and the existence of pipelines and other infrastructure, including anchor off-take facilities such as gas to power plants and industrial facilities. This will in part be determined by:

    - Regulations to support domestic gas markets in mature producers, which could protect the gas industry in countries to some extent from the external transition risk emanating from falling global LNG demand.

    - Policies to support growth of domestic gas markets in emerging producers, which could result in an overinvestment in infrastructure that may become stranded.

- The extent to which renewable energy alternatives are pursued in preference to gas infrastructure.

ECONOMIC DEVELOPMENT AND ENERGY TRANSITIONS IN AFRICA



The extraction, processing and export of gas is currently an important foreign revenue stream for mature African gas producers. While exports could continue to generate revenues in the short to medium term, significant risks also exist of stranded infrastructure assets if global gas markets and/or prices decline. Under the IEA's NZE scenario, even most existing terminals in Africa find their capacity stranded from the mid 2030s, depending on their competitive positioning in the global supply curve. Modelling by Willis Towers Watson comes to a similar conclusion. In its NZE scenario, 72 percent of all existing LNG export volumes are stranded compared to its BAU scenario. The risk to emerging- and exploratory-phase countries whose infrastructure is yet to come online is even higher.

Domestic pricing relative to the international LNG price will impact the extent to which domestic markets support the growth and sustainability of the gas industry, industrial diversification and the economy more broadly. In a number of countries, it has been suggested that domestic gas prices, which are currently regulated and/or subsidised, may need to increase faster than normal under current regulatory frameworks to make investment in marginal fields and/or the capturing of flared gas pay off. Alternatively, government subsidies may need to rise. An increasing domestic gas price will have implications for energy access and economic growth, and increased subsidies will divert scarce resources away from meeting other socio-economic and development needs.

Examples: Current and future contribution of exports and domestic sales to countries' economies

Overall, fossil fuels represent 40 percent of total African exports. Nigeria, Angola and Algeria currently all rely significantly on hydrocarbon exports (including both oil and gas).

The value of gas in Nigeria is expected to grow significantly over the next 20 years, provided that LNG export capacity also increases and more domestic orientated gas fields are commercialised. In Nigeria, a potential 58 percent of the present value of revenues between 2021 and 2050 could come from the LNG export value chain. Domestic gas revenues could, however, outstrip LNG export revenues from 2040 onwards, if currently uncommercialised gas is brought into the market. In contrast, in Angola there seems to be little indication that a domestic industry will grow enough to utilise reserves available for domestic consumption in the short term and contribute meaningfully to financial flows, with some projections suggesting that domestic demand will only pick up in the mid-2030s.

Given transition projections and projections of asset viability from the 2030s onwards, many of the timelines above make investments in gas subject to great uncertainty. Even if domestic markets pick up by the 2030s, domestic value chains will face external risks (beyond the country's control) such as rapid declines in the costs of alternatives and punitive trade barriers on fossil-fuel intensive products.

In terms of meeting domestic energy needs, global cost trends in RE technologies, notably solar and wind energy, have dropped dramatically in recent years, as evident in Figure 5 below. In many parts of the world, electricity generation from solar photovoltaics and onshore wind have become competitive with, or in some cases cheaper than, coal, gas and nuclear power. Carbon Tracker suggests that new solar and onshore wind farms with battery storage are already competitive in Europe and the United States and will be cheaper to run than most gas plants by 2030. Declining prices and improving technologies in the area of battery storage have been critically important in the advancement of RE penetration, given the ability to overcome intermittency.

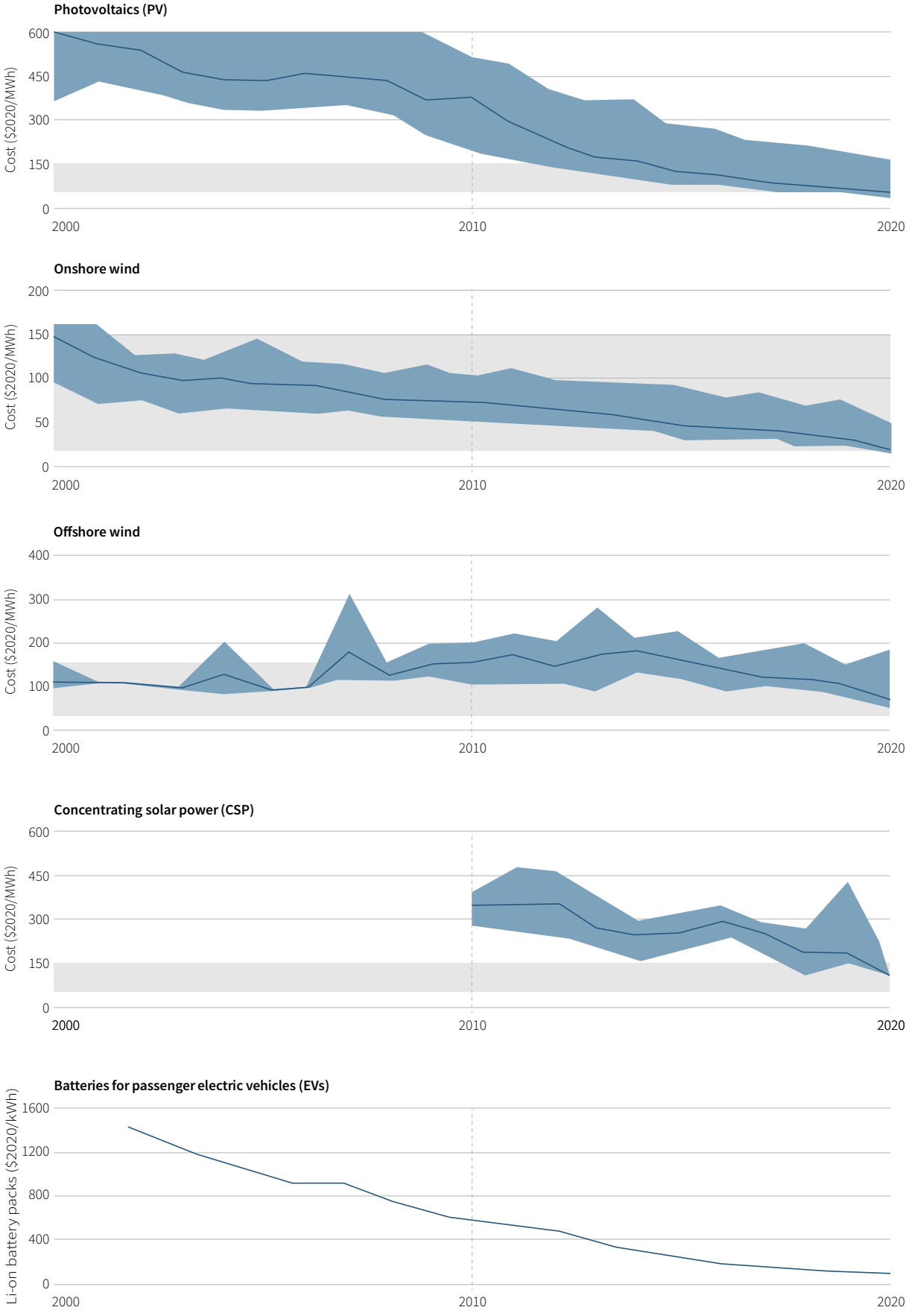
While the global costs of RE are dropping, it must be noted that the comparative costs of RE have not been modelled for most of Africa. Such modelling is critical because it supports governments in energy planning and informs investment decisions. For those countries seriously looking to mitigate transition risks and strategically position themselves for future market share in a low-carbon world, understanding the cost of alternatives will be imperative. Nevertheless, the continued cost reduction in renewables globally is indicative for African markets looking forward.

In many African countries where the lack of adequate distribution and transmission infrastructure currently impedes energy access, renewables are very well suited to rapidly support electrification. They are also well suited in countries dependent on fossil-fuel imports, freeing up fiscal space to focus on other socio-economic objectives. For countries dependent on revenues from gas exports, investment in renewable energy can help to free up existing production for export revenues while they build the industrial capabilities for renewable energy localisation and green hydrogen – much like European countries are now doing.

Renewable energy deployment also holds significant short- and longer-term development potential if integrated into countries' and regions' industrial and development plans. With a vast critical mineral base, African countries have immense potential to capture value in green energy technology manufacturing. Those powerful countries and blocs currently positioning themselves for future market share of clean energy technologies rely on Africa's critical mineral base to support their transitions. With the right policy frameworks and regional integration and cooperation, placing conditionalities on critical mineral extraction that supports beneficiation, technology transfer and the localisation of green energy manufacturing would foster new industries, diversify economies, unlock job creation and support electrification.

Green hydrogen, which is produced using renewables, also provides a strategic opportunity for diversification, particularly for African countries with good ports and/or existing LNG pipeline infrastructure. With the demand for green hydrogen set to grow globally, strategically it would make sense to prioritise developing green hydrogen capacity as a by-product of renewable energy deployment plans, as well as investing in repurposing existing gas infrastructure for green hydrogen transport over investing in additional gas capacity. This would allow gas-dependent economies to make up for revenues lost due to declining natural gas exports while building important links with renewable electricity generation. Domestically, green hydrogen could support diversification in the transport sector (e-mobility) and reduce fossil-fuel dependency in industry – mitigating punitive tariffs on carbon-intensive goods that will impede trade competitiveness going forward.

Figure 5: Falling global costs of renewable energy technologies since 2000



Source: IPCC AR6

There are a number of opportunities associated with RE in the African context:

- With the highest technical RE potential in the world, including high solar insolation and wind energy potential, the continent has significant renewable resources available to support its domestic energy needs.
- Renewable technologies can be deployed much faster than fossil-fuel-based power plants and are well suited for distributed applications that address the transmission and distribution infrastructure constraints faced in many countries.
- Integrating RE into diesel-based microgrids that are common across Africa offers substantial cost savings.
- RE can have a positive impact on balance of payments by allowing net importers of fossil fuels and/or final energy carriers to reduce energy imports, and allowing existing energy exporting countries to maximise revenues from fossil-fuel exports in the short term as they transition their economies.
- Diversification of Africa's energy mix, particularly in oil- and gas-dependent economies, will support economic diversification if RE developments are integrated with industrial development, the revitalisation of urban economies, the expansion of service economies, the electrification of mobility and the improvement of social welfare through improved air quality and water security.
- RE can trigger additional economic benefits, such as job creation and socio-economic development, particularly in rural areas.
- Other investments in the green economy, including climate adaptation, conservation agriculture, public transport and energy-efficient building retrofits, provide up to 25 times more jobs than those created by fossil fuels.
- RE alternatives not only provide a long-term solution to Africa's energy needs but can support countries' short- and long-term development objectives by positioning them now for future market share in the green technology value chain – if integrated into industrial strategies that leverage Africa's market potential (energy access needs), critical mineral base and important regional initiatives, like the African Continental Free Trade Area.

Addressing barriers to RE roll out in Africa

Although the average costs of renewables have dropped globally, finance to support RE infrastructure development is not uniformly available. The latest IPCC report suggests that current financial flows will need to grow seven-fold to support the African continent's mitigation needs. Furthermore, the costs of capital to build infrastructure are often higher in developing economies, and the economics of renewable electricity generation vary widely depending on technology options employed, the cost of finance, alternative energy prices, the location of demand centres and existing infrastructure. These observations have the potential to constrain RE growth on the continent. Climate finance solutions that are highly concessionary, and grants rather than loans, are required to speed up deployment of RE and will need to be coupled with private investment.

One model to de-risk investments in clean energy that is gaining traction is South Africa's Just Energy Transition Transaction. By marrying domestic energy needs with the global goals of the Paris Agreement and a 1.5°C pathway, South Africa was able to appeal to the interests of climate finance by providing a mechanism through which to convert their NDC into clear investment pathways. This culminated in a pledge for $8.5 billion by the EU, United Kingdom, United States, France and Germany to support South Africa's Just Energy Transition (the Just Energy Transition Partnership) at COP26. While only a fraction of South Africa's transition costs, the $8.5 billion, if successfully translated into a finance package on fair terms, will help to de-risk further investments in South Africa's clean energy sector and can provide a model for other countries seeking to attract RE investments on scale.

KEY CONSIDERATIONS FOR DECISION MAKERS

Infrastructure development timelines and payback periods

The existence of, and/or additional investment requirements for, gas extraction and transportation will be an important determinant of the economic viability of new or extended gas exploitation in a particular country. Timelines for the development of gas extraction and pipeline infrastructure are long, with even longer pay-back periods. Projects that have reached final investment decisions usually take around four years to come online, while those currently at the proposal stage often take up to ten years. Payback periods for LNG projects can span 15 years, with contracts often accompanied by 20-year take-or-pay clauses.

The expected decline in EU demand towards 2030, and net-zero targets for 2050, mean that new assets for export purposes may not be in use long enough for returns on investments to materialise, unless new markets such as those in Asia and profitable domestic markets, can be realised. Growing uncertainty around the rate and extent of climate transition and its impact on global gas demand, gas prices and the availability of finance, means that the risk of stranded production and utilisation infrastructure is increasing, with new producers who still need to build both export and domestic infrastructure particularly vulnerable. Recognising this, IOCs are now increasingly pushing risks onto countries, making production rights and participation dependent on countries' willingness to shoulder the longer-term risks.

Domestic gas utilisation infrastructure, such as gas to power plants, can be built more quickly, although payback periods are still long and could be risky to countries given the preferential pricing and government incentives often required to make them feasible, as well as the falling costs of alternatives that may make them obsolete. Although the shift to gas infrastructure that is more flexible in application and location – such as floating storage and regasification units (FSRUs) and small, modular and flexible electricity generation plants – offer lower risk profiles, prohibitive trade barriers, like the Carbon Boarder Adjustment Mechanisms on carbon-intensive economies, will have longer-term economic implications for countries irrespective of the flexibility of their gas infrastructure.

Technology availability and maturity

Scenarios that include a continued case for gas for power generation and industrial processes in a low-carbon world make ongoing utilisations of gas contingent on mitigation technologies, including CCUS. However, CCUS is expensive and global uptake has been far slower than what is required to meaningfully offset emissions from fossil fuels. With high levels of uncertainty around the penetration of CCUS globally, the likelihood of CCUS playing a role in mitigating emissions from gas on the continent are low. If it does play a role, it will significantly increase the costs of production and gas utilisation. On the other hand, various other technology options are available to support energy access and economic development objectives that hold much lower risks. RE technologies, for example, can support electrification as well as generate hydrogen for industrial feedstocks and export markets. With dramatic drops in the costs of battery storage technologies, intermittency of supply is becoming less of a challenge.

Availability of finance

Availability of finance is key to infrastructure development, for both gas and renewables. Historically, finance for gas infrastructure development in Africa has come from IOCs seeking out new opportunities, as well as international finance, development agencies and sovereign debt mechanisms. While many IOCs have articulated positions that suggest that climate mitigation is being considered in ongoing oil exploration and production, investments in new fossil-fuel infrastructure have continued at an alarming rate. Various authors have suggested that instead of complete decarbonisation, a process of hedging (mitigating risk through diversification) is being pursued. Not surprisingly then, gas projects now account for half of the revenues of many of the major IOCs. At the same time, pressure on major oil and gas companies to address their carbon footprints, as well as the obvious implications of the transition on their investments, has resulted in IOCs looking for mechanisms to de-risk projects. This increasingly involves pushing risks onto governments.

Looking beyond IOCs, other investors that play an important role in supporting energy infrastructure development on the continent are increasingly taking climate change into account in their investment decisions. Increased pressure for climate-aligned investments is likely to make access to financing for fossil-fuel infrastructure more difficult and expensive as investors trade off the benefits of short-term revenues from export sales against longer-term risks. For African governments that recognise the risk of continued fossil-fuel dependency, the shift in the risk appetite for fossil fuels by the international investment community creates opportunities for them to attract increased support for RE scale up. However, the costs of scaling renewables will largely depend on the cost of finance. Identifying innovative guarantee schemes, perhaps through climate finance, and establishing robust procurement mechanisms will enable countries to attract more RE finance on scale.

Example: Support for gas infrastructure in Africa

Various companies have historically shown interest in developing the extensive Rovuma gas fields off the coast of northern Mozambique, including TotalEnergies from France, ExxonMobil listed in the United States, the Italian company Eni and the China National Petroleum Corporation (CNPC). The development has, however, been challenged by political unrest in the region, which started in 2017 and resulted in companies halting investments. By 2022 there were indications that they were interested in returning, provided the political situation could be stabilised.

Two LNG projects are in the appraisal stage in Djibouti. The first project consists of two trains that are receiving funding from China's POLY-GCL Petroleum Investments to liquify gas piped via Chinese-financed infrastructure from Ethiopia. The second is an FLNG terminal. The POLY-GCL projects appear to be uneconomic on present terms, while the FLNG project benefits from more competitive economics and could begin exporting in 2030. A global low-carbon energy transition will only hurt the economics and will require China to provide additional support to get projects off the ground.

CONCLUDING THOUGHTS

This discussion paper has explored the arguments that underpin the oft-cited position that ongoing exploitation of Africa's natural gas reserves will address Africa's energy needs and provide foreign revenues to support local economic development. It concludes that the risk of new investments in the sector in the medium to long term outweigh the short-term benefits that may accrue from export markets. It argues that instead of pursuing new gas extraction and infrastructure, attention should be given to the opportunities presented by renewables, not only for electrification, but also to support local industrialisation and economic diversification. However, it also acknowledges that the case for renewables rests on climate finance, coupled with support from governments and private investors, all of which need to be dramatically scaled to ensure large-scale roll out of these technologies.

DATA SOURCES

In formulating this discussion paper, the ACF drew on a number of data sources, including a larger report commissioned by the ACF, written by Jesse Salah Ovadia and work done by Willis Towers Watson for ACF. These reports include the references for much of the data and analysis used in the compilation of this brief.

In addition, further studies drawn on include:

BP's Statistical Review of World Energy 2021, available at https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html; the European Commission's REPowerEU available at https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/repowereu-affordable-secure-and-sustainable-energy-europe_en; Research by E3G into the future of EU gas demand and the implications for LNG exporting countries in Africa, written by Euan Graham, Lisa Fischer and Kamila Godzinska; Information from Global Energy Monitor available at https://globalenergymonitor.org; IRENA's Renewable Energy Market Analysis: Africa and its regions, available at https://www.irena.org/publications/2022/Jan/Renewable-Energy-Market-Analysis-Africa; a report written by Ouki, M in 2019 from the Oxford Institute for Energy Studies titled *Algerian Gas in Transition: Domestic Transformation and Changing Gas Export Potential*, available at https://www.oxfordenergy.org/wpcms/wp-content/uploads/2019/10/Algerian-Gas-in-Transition-NG-151.pdf; and the Working Group III contribution to the Intergovernmental Panel on Climate Change's (IPCC) 6th Assessment report, available at https://www.ipcc.ch/report/sixth-assessment-report-working-group-3/.

THE
AFRICAN
CLIMATE
FOUNDATION