REPORT

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SENEGAL AS AN LNG EXPORTER?

Stranded asset risks in the transition

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SUMMARY

Since the discovery of large offshore oil and gas reserves in 2014, Senegal has set its hopes on revenues from fossil fuel exports to help fund its plans to become an emerging economy by 2035. In pursuit of this goal, Senegal is actively seeking investors to help it to continue to develop its offshore oil and gas reserves, with plans for LNG production and export infrastructure, as well as domestic and downstream use of fossil gas applications.

Globally, the role of fossil gas and LNG is rapidly shrinking due to its adverse climate impact and the rapid expansion of renewable energy. The global transition to renewable energy is evident, with renewables becoming increasingly competitive for power generation. Fossil gas and LNG have significant climate impacts, particularly in upstream and midstream value chain stages. According to the IEA, the "Golden Age of Gas" is over, no new oil and fossil gas reserve development is needed in a net-zero-compatible future, and fossil gas infrastructure investments increasingly runs risks of stranding.

The declining demand for LNG in Europe and globally casts doubt on the business case for the upfront costs of Senegal's LNG export infrastructure. Europe's gas demand is rapidly declining as renewable deployment accelerates and traditionally gas-dependent sectors are increasingly electrified. Gas demand in the Asia Pacific may peak later than in Europe, but the cost competitiveness of incumbent producers and exporters of fossil gas means that the market space for Senegalese LNG exports is highly constrained. Senegalese LNG exports are unlikely to be profitable in the Paris-aligned scenarios and are also increasingly at risk in current policy scenarios.

Development of the associated extraction and export infrastructure comes at a high cost, not only in up-front capital but also in terms of the social and environmental costs. This entails, among others, existential threats, particularly to Senegal's fishing communities which represent a significant amount of economic activity and are important for Senegal's food security.

Senegal's oil and gas reserve development plans stand at a critical juncture, as they appear to be in conflict with the country's Just Energy Transition Partnership (JETP) goals. In the face of declining global demand for fossil gas, but equipped with ample renewable energy potential, Senegal may wish to consider its large oil and gas production plans, both for domestic use and export.

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01 INTRODUCTION

Since the discovery of oil and gas deposits off the coast of Senegal in 2014, the country has come to see their exploitation as an important source of future revenue to fund its ascendancy to become a middle-income country by 2035 (Diaby, 2023). Key to these plans, Senegal is looking to produce and export liquified natural gas (LNG), with a plan to start exporting LNG in 2024. New projections that peak fossil fuel demand will happen this decade (Birol, 2023) cast doubt on the business case for developing Senegal's gas reserves and the associated LNG export infrastructure.

While the first stage of the Greater Tortue Ahmeyim (GTA) gas field off the coast of Senegal and Mauritania, is relatively advanced, the development of other fields is either delayed for cost-reasons or more generally an open question. Senegal has found at least rhetorical support for its gas reserve development. Following the Russian invasion in Ukraine and the stop of Russian gas supply, Germany's Chancellor Olaf Scholz has shown interest in supporting Senegal's development of fossil gas resources in the hope to draw on the country's LNG supply (Hoffmann and Abd Ali, 2022). In doing so, Scholz put into question Germany's commitment to "end new direct public support for the international unabated fossil fuel energy sector" signed at COP26 in Glasgow (UK COP26 Presidency, 2021), which also increasingly makes little sense considering the large projected overcapacity of LNG import capacity in Germany (Höhne, Marquardt and Fekete, 2023) and Europe (IEEFA, 2023).

Meanwhile, Senegal signed a Just Energy Transition Partnership (JETP) with France, Germany, the UK, and Canada (Senegal and International Partner Group, 2023). These European countries and Canada have pledged around EUR 2.5 billion of new and additional finance to support the rollout of renewable energy in Senegal to reach 40% by 2030 (Lo, 2023). Building up renewable energy capacity in Senegal makes perfect sense, given the country's rich endowment in renewable resources (Kachi et al., 2023), but questions remain about how well these plans will go together with the country's intention to become one of Africa's leading gas exporters.

The "Golden Age of Gas" is ending, as renewables are increasingly more competitive for power generation and gas-fired heating is becoming less and less attractive with the falling costs of heat pumps for space heating (Birol, 2023). The fossil industry may be misjudging the market (Sheppard, 2023), as indicated by a record level of new oil and gas projects currently planned or under development (Global Energy Monitor, 2023b). The mistaken projections made by OPEC in the past (Zero Carbon Analytics, 2023), are now likely to be similarly proven wrong for gas. In a world where demand for fossil gas is decreasing but gas development grows, Senegal's fossil-fuelled economic growth agenda is at risk. At the same time, the development of its fossil fuel reserves is likely to have significant negative impacts on local communities and ecosystems with particular consequences for, the Senegalese fishing industry. Considering the increasingly questionable business case for oil and gas development and the high costs both in terms of export investment and local impacts, Senegal may wish to reconsider the role of fossil fuel revenues in its development aspirations.

>> 02 SENEGAL'S GAS RESERVES AND PRODUCTION PLANS

Since 2014, Senegal has discovered several offshore oil / gas reserves **(see → Figure 1)**. Despite delays, cost overruns, and the loss of BP in a major project, the country is still actively advancing further fossil fuel exploration, both offshore and onshore. Senegal is also planning complementary infrastructure and downstream gas industry support projects under its Gas Master Plan, including plans at various stages for liquified petroleum gas storage facilities, gas pipelines, fuelling stations, fertilizer plants, gas-to-power facilities and ammonia / urea plants (Energy Capital & Power, 2023).

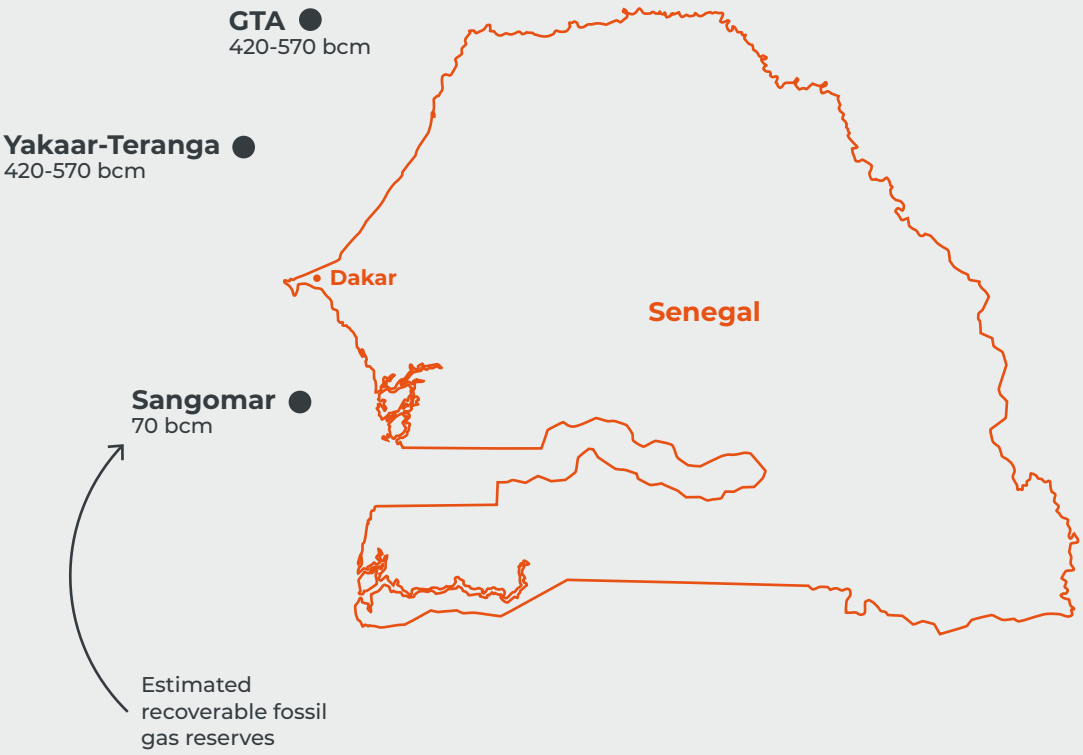


Figure 1
Senegal's fossil gas reserves: project overview

Project	Owner/Operator	LNG Production	CAPEX	Off-take contract
GTA	BP, Kosmos Energy, PETROSEN, SMH	**Phase 1:** 3.2 bcm/year **Phase 2:** 4.3 bcm/year	**Phase 1:** USD 5.3 billion	BP takes off 100% of produced gas in phase 1
Yakaar-Teranga	Kosmos Energy, PETROSEN (after BP exit)	NA	**Phase 1:** ≈USD 2-3 billion	NA
Sangomar	Woodside Energy, PETROSEN	NA	**Phase 1:** USD 4.2 billion **Phase 2:** USD 2.5 billion	NA

Note: Ministry of Petroleum and Energies (2022) and Offshore Technology (2023a).

The Greater Tortue Ahmeyin (GTA) project **(see → Figure 1)**, operated by British Petroleum (BP) (operator with 56% share) and co-developed by Senegal's state-owned PETROSEN (10%), Société Mauritanienne des Hydrocarbures (SMH) (7%), and Kosmos Energy (27%), has estimated recoverable fossil gas reserves of between approximately 420 and 570 billion cubic meters (bcm) (Energy Capital & Power, 2023). Resources are split 50/50 between Senegal and Mauritania. Although royalties paid to Senegal and Mauritania are unclear, in developing countries average oil royalty rates are around 16% of revenues (Krauss, 2021). The gas will be extracted from ultra deepwater subsea wells at 2,850 m water depth, about 125 km off the shore of the Senegal/Mauritanian border, pre-treated at a floating production storage and offloading (FPSO) facility (approximately 40 km off the shore), and subsequently transported to a floating LNG export and storage facility (approximately 10 km off the shore) (BP, 2021). BP expects the GTA Phase 1 to provide about 3.2 bcm of LNG per year, as well as around 0.7 bcm for local markets in Senegal and Mauritania (Energy Capital & Power, 2023). BP has signed a sales and purchase agreement (SPA) to offtake all LNG from the troubled initial phase (EIU, 2020), which has been beset with delays and cost overruns with a critical subsea contractor quitting in September 2023 (Esau, 2023). BP and their partners are currently planning a second phase (GTA Phase 2), with the potential to add another 4.3 bcm of LNG per year by 2027-2028 (Energy Capital & Power, 2023; Offshore Engineer Digital, 2023).

The Yakaar-Teranga project, in which BP formerly had a 60% share was planned to be co-developed by PETROSEN (10%) and Kosmos Energy (30%), also holds estimated gas reserves of about 420 to 570 bcm (Ministry of Petroleum and Energies, 2022; Offshore Technology, 2023b). The gas will also be extracted from ultra deepwater subsea wells at about 2,560 m water depth, approximately 60 km northwest of Dakar (Ministry of Petroleum and Energies, 2022). Phase 1 of the project is expected to produce about 1.6 bcm from 2024 until it is expected to reach its economic limit in 2053 (Ministry of Petroleum and Energies, 2022; Offshore Technology, 2023b). Further phases are in the planning, with a focus on the development of associated domestic refineries (Ministry of Petroleum and Energies, 2022). After disagreements on market destinations and as a potential sign for other international investors, BP forfeited its share without any compensation in November 2023, leaving Senegal to look for a new international partner to take a 34% stake in the production phase (Hoije, 2023).

The Sangomar project, operated by Woodside Energy Group (>75% share) and co-developed by PETROSEN, is primarily a conventional oil production project and holds about 70 bcm of recoverable gas reserves. It also draws on ultra deepwater subsea wells at a depth of about 1180 m, located about 90 km southwest of Dakar (Ministry of Petroleum and Energies, 2022; Offshore Technology, 2023b). The project also envisions the development of a floating production storage and offloading (FPSO) facility, which will be located about 100 km south of Dakar (MODEC, 2023). The facility is designed to process 1.3 bcm of gas per year (Energy, 2023), but while

the Senegalese government expected to start oil production in 2023, Woodside ran into unexpected higher costs and has delayed first production and export to mid-2024 (Nair, 2023). Considering the unexpected higher costs, analysts find that Woodside is likely to suffer a loss on its investment in the Sangomar project compared with a negative net present value for the company (ACCR, 2023).

Especially considering the cost overruns and recent exit of BP from the Yakaar-Teranga project, Senegal is seeking significant investment to advance the development of its oil and gas exploration, as well as midstream and downstream industries (Ministry of Petroleum and Energies, 2022). This includes refinancing of PETROSEN's interest share in de-risked projects of about USD 930 billion, financing for planned oil and gas projects of up to USD 1.1 billion, financing for gas-to-power projects of about USD 500 million, as well as financing for downstream projects of more than USD 2.2 billion. The profitability of Senegal's gas development and these investment opportunities depend on the role of gas in export markets and – to a far lesser extent - domestically. Already beset with delays and cost overruns with further challenges possible, as the role of fossil fuels falls in an increasingly decarbonising world, gas and LNG assets in Senegal run a heightened risk of stranding, i.e., they become obsolete before the end of their economic life and the cost of developing them will not be recouped. This has important consequences for investors, for the country and its development agenda.

03 THE ROLE OF GAS AND LNG TO 2050

Fossil gas is a fossil fuel with serious climate impacts all along its full value chain. Despite producing fewer GHGs at the point of combustion than coal, fugitive methane emissions at the point of extraction or during transportation are likely to negate any overall climate benefit from its use (Howarth, 2023). It is clear that fossil gas and LNG production and use must decline for the global energy system to become Paris-aligned. The IEA states clearly that “no new oil and natural gas fields are needed in the net zero pathway, and supplies become increasingly concentrated in a small number of low-cost producers” (IEA, 2021), as well as that “no new long-lead time upstream oil and gas projects are needed” (IEA, 2023c). From a global climate perspective, the addition of LNG exports from Senegal further adds to global excess capacity undermining global climate goals.

3.1 FOSSIL GAS DEMAND TO 2050

Oil and gas producers such as ExxonMobil, BP, or the Gas Exporting Countries Forum (GECF) continue to predict increasing gas demand up until 2050 **(see → Figure 2)**. Clearly, the scenarios they are anticipating are not Paris-aligned but expect a sustained reliance on fossil fuels that will likely render a climate collapse unstoppable (or they assume unrealistic commercial rollout of carbon capture and storage technology). The role of fossil gas needs to decrease faster than it currently does for us to keep the Paris temperature targets in reach. IEA's global Net Zero Emissions (NZE) scenario **(see → Figure 2)** describes a continuous reduction of demand for fossil gas.

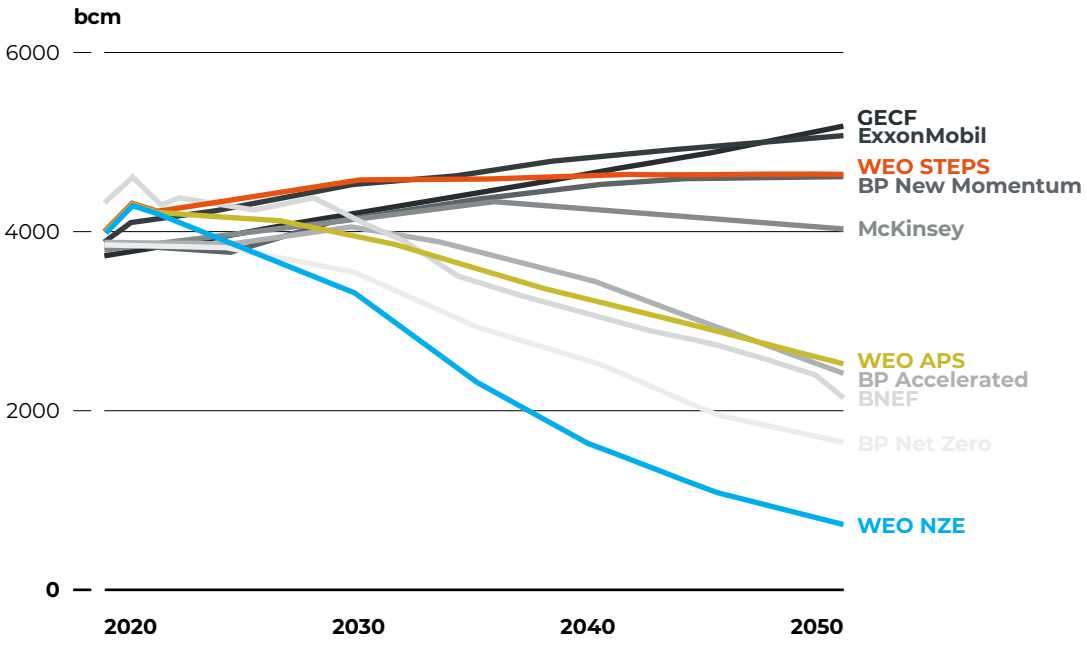


Figure 2
Fossil gas demand scenarios

Note: Based on IEA (2023e), McKinsey (2021), GECF (2022), BP (2023), BNEF (2022), ExxonMobil (2023).

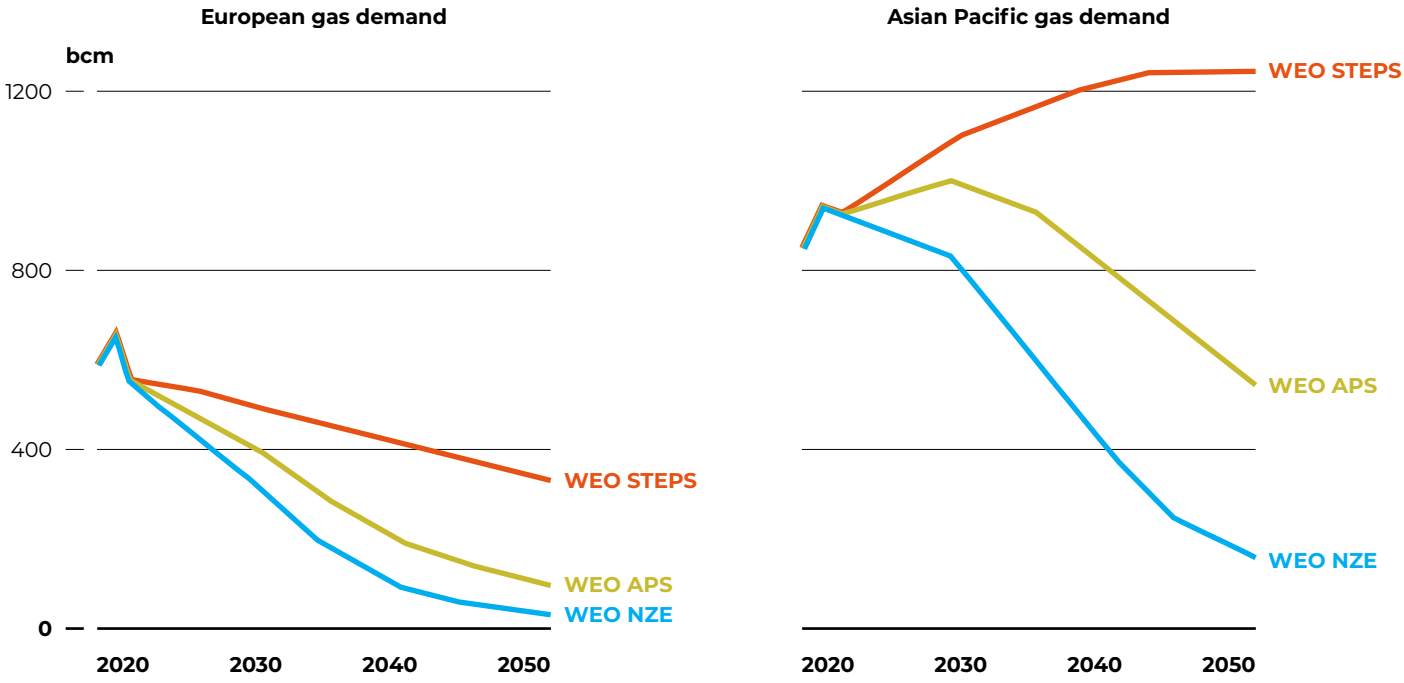
Even in the IEA's State Policies (STEPS) scenario, which tries to capture the current trajectory of the energy system, shows the momentum driving clean energy transitions has grown to the extent that it is expected that global fossil gas demand will peak before 2030 (IEA, 2023e). After a decade of remarkable expansion (IEA, 2023b), the growth in worldwide fossil gas demand is anticipated to decelerate in the upcoming years. This is primarily due to a decline in consumption in established markets, especially in Europe and North America. The increased adoption of renewable energy sources, energy efficiency efforts, and electrification of end uses, are among the principal factors contributing to the diminishing demand for fossil gas in these regions (Zeniewski, Molnar and Hugues, 2023).

For Senegal, demand for fossil gas in Europe and the Asia Pacific are specifically important, given that these offtakers are expected to represent key markets for Senegal's LNG exports. While Europe's energy crisis has resulted in a temporary scramble for new gas (and especially LNG) imports in the last two years, the demand destruction in the European energy system is clear. The European Union has put in place a legislative package that aims to align the bloc's emission trajectory with a climate neutral pathway. For fossil gas, this means a 30% reduction in demand by 2030 versus 2019 levels (Hanoteaux and Kondarev, 2023). The WEO's Net Zero Emission (NZE) scenario for Paris-compatible fossil gas demand in Europe **(see → Figure 3)** models a significantly faster reduction of about 43% by 2030 versus 2019 levels. A reduction of fossil gas demand of up to 52% by 2030 could be achieved through the implementation of the EU's REPowerEU plan with emphasis on clean measures (Hanoteaux and Kondarev, 2023).

As mature markets around the globe, representing nearly half of the world's gas consumption, witness decreasing demand, fossil gas consumption will be concentrated in still expanding Asian markets. For these markets, Senegal's geographic location poses disadvantages in the form of increased transport costs – especially compared to other gas exporters. China, in particular, is projected to account for nearly half of the total global gas demand growth between 2022 and 2026 (IEA, 2023a). This surge in demand in China is driven by its need for gas in various sectors, including industrial production, the power sector, and urban areas. However, both the WEO's Announced Pledges (APS) and Net Zero Emissions (NZE) fossil gas scenarios describe a clear contraction of demand for the region, from 2030 in the APS and 2023 in the NZE **(see → Figure 3)**.

Figure 3

IEA's WEO scenarios for European and Asian Pacific fossil gas demand



Note: Estimated, see → Annex for details.

3.2 LNG DEMAND TO 2050

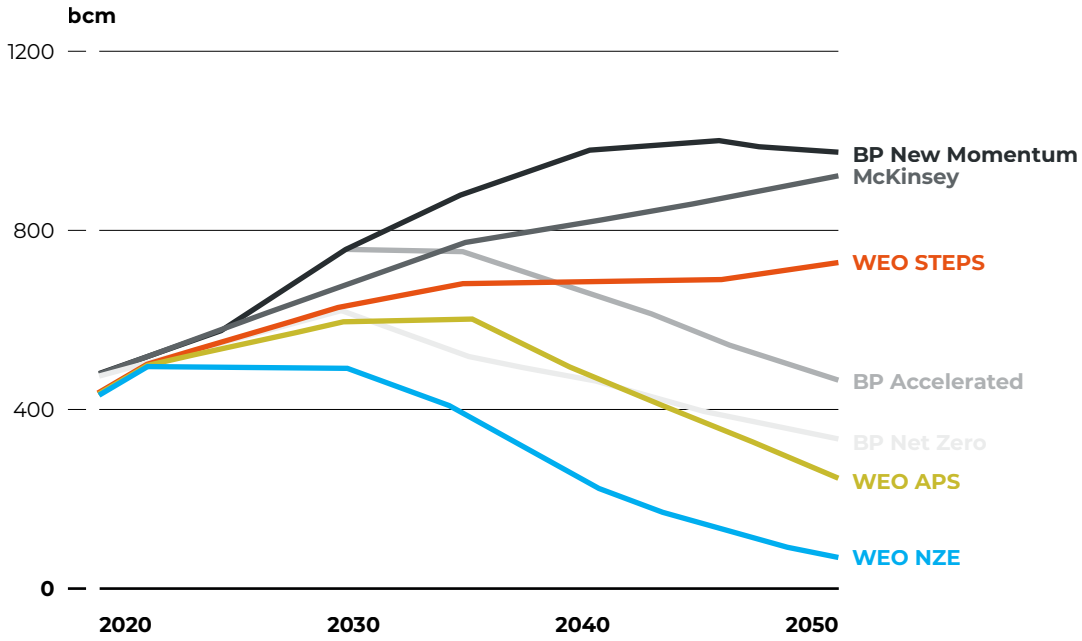
Gas can be transported either via pipeline as a gas, or as a liquid on ships (LNG). These transport alternatives have different costs, and therefore the overall market demand for gas does not directly correspond to demand for LNG. Considering the large distance between Senegal and potential export markets, Senegal will only be able to export its gas via more cost intensive LNG.

There is evidence that the share of LNG in total fossil gas demand is likely to increase in the near term (IEA and KEEI, 2019). With less certain demand patterns, gas importers are less and less willing to lock themselves into the long-term contracts implied by pipelines and favour the shorter term and more flexible LNG. Especially Asian markets are increasingly looking to diversify their suppliers to exploit arbitrage opportunities leading to increased competition among LNG producers.

Although the World Energy Outlook does not provide LNG demand scenarios, we derive corresponding Stated Policy (STEPS), Announced Pledges (APS), and Net Zero Emissions (NZE) pathways using global average shares of LNG in total fossil gas demand **(see → Annex for details)**. The estimated NZE pathway, the only Paris-aligned pathway displayed in **→ Figure 4**, describes a clear decline in demand for LNG down to about 76 bcm in 2050. This stands in marked contrast to the non-Paris compatible pathways modelled by BP (BP, 2023) and McKinsey (McKinsey, 2021) **(see → Figure 3)**.

Figure 4

LNG demand as described in several studies

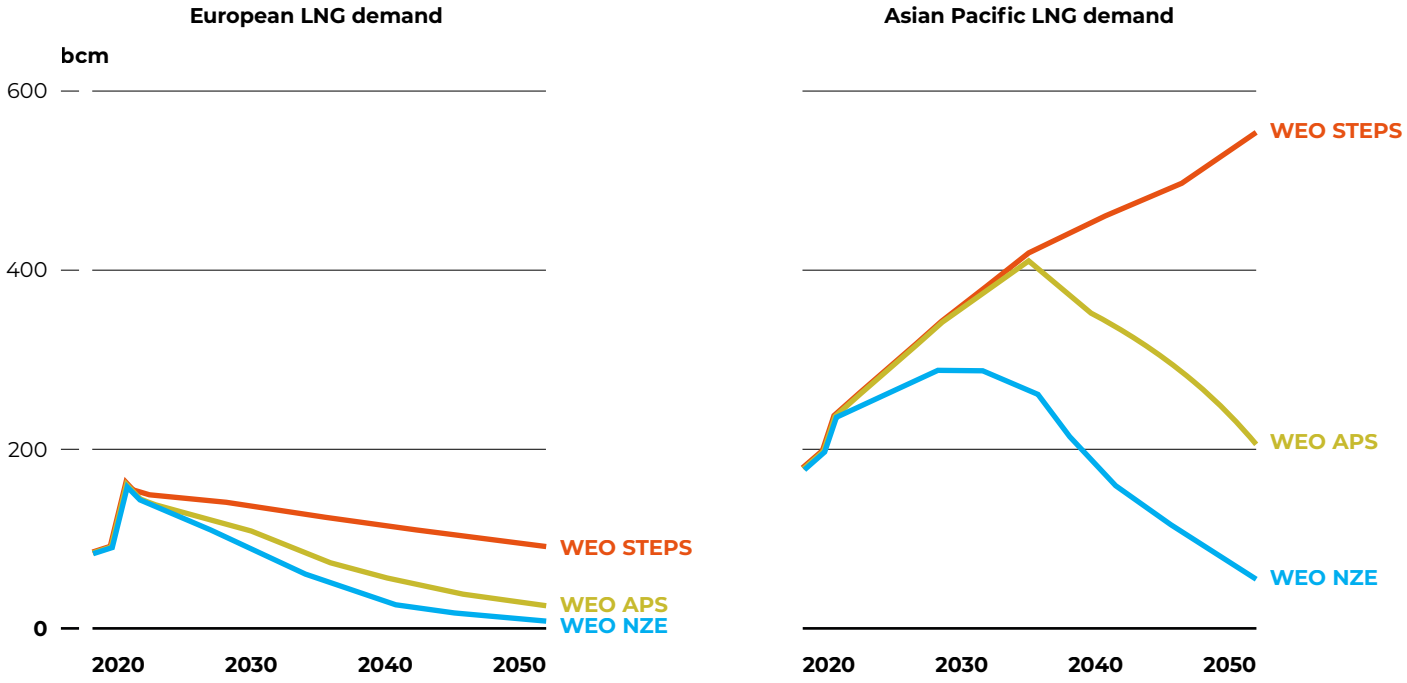


Note: Based on IEA (2023e), McKinsey (2021), BP (2023).

While the IEA's WEO does not provide pathways for LNG demand for Europe or Asia Pacific, we derive Stated Policies (STEPS), Announced Pledges (APS), and Net Zero Emissions (NZE) scenarios **(see → Figure 5)** by making assumptions on the share of LNG imports as part of the respective region's total fossil gas demand **(see → Annex for more details)**. In the Paris-compatible Net Zero Emissions scenario, demand for LNG in Europe must fall by more than 20% between 2022 and 2030, and by around 90% by 2050. Similarly, Net Zero Emissions-compatible demand for LNG in Asia Pacific would need to fall by more than 20% between 2022 and 2030, and by around 75% by 2050.

Figure 5

Estimated scenarios for European and Asian Pacific LNG demand

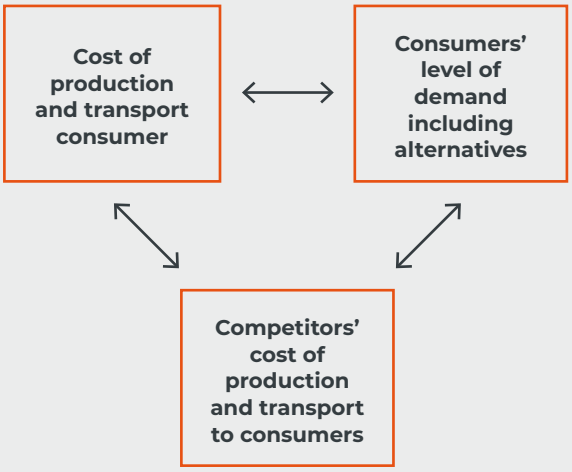


Note: Estimated, see → Annex for details.

04 THE BUSINESS CASE FOR LNG EXPORTS IN SENEGAL

In a world with falling demand for fossil gas, the business case for export-oriented LNG production is increasingly put into question. As demand declines, whether LNG exports from a given country are profitable primarily depends on the relative cost competitiveness of an LNG export project, as well as the prevailing LNG market price determined by competitors' cost of production and transport and consumers' level of demand including fuel switch opportunities (Steuer, 2019).

Figure 6
Interplay of production, competition, and demand factors



The cost competitiveness of an LNG project is a function of the overall cost of production and transport from a given site (the location of hydrocarbon reserves is a driving factor in this regard), the capital cost of the liquefaction plant, and the cost of transport to the end gas consumer. Information about revenue and cost structures of LNG projects is seldom public and subject to a number of assumptions, but we provide an overview of estimates based on literature to understand whether Senegal is likely to be able to competitively produce and market its fossil gas on global LNG markets.

4.1 BREAK EVEN COSTS VERSUS A FALLING GAS PRICE

Early project developer estimates the Free on Board (FOB)[1] LNG cost for the GTA field to be around USD 5.65 (inflation adjusted 2022 USD), in the mid-field of a sample of international representative LNG projects **(see → Figure 7)**. Considering transport costs and the cost overruns in the Senegalese projects, these estimates are likely to be conservatively low.

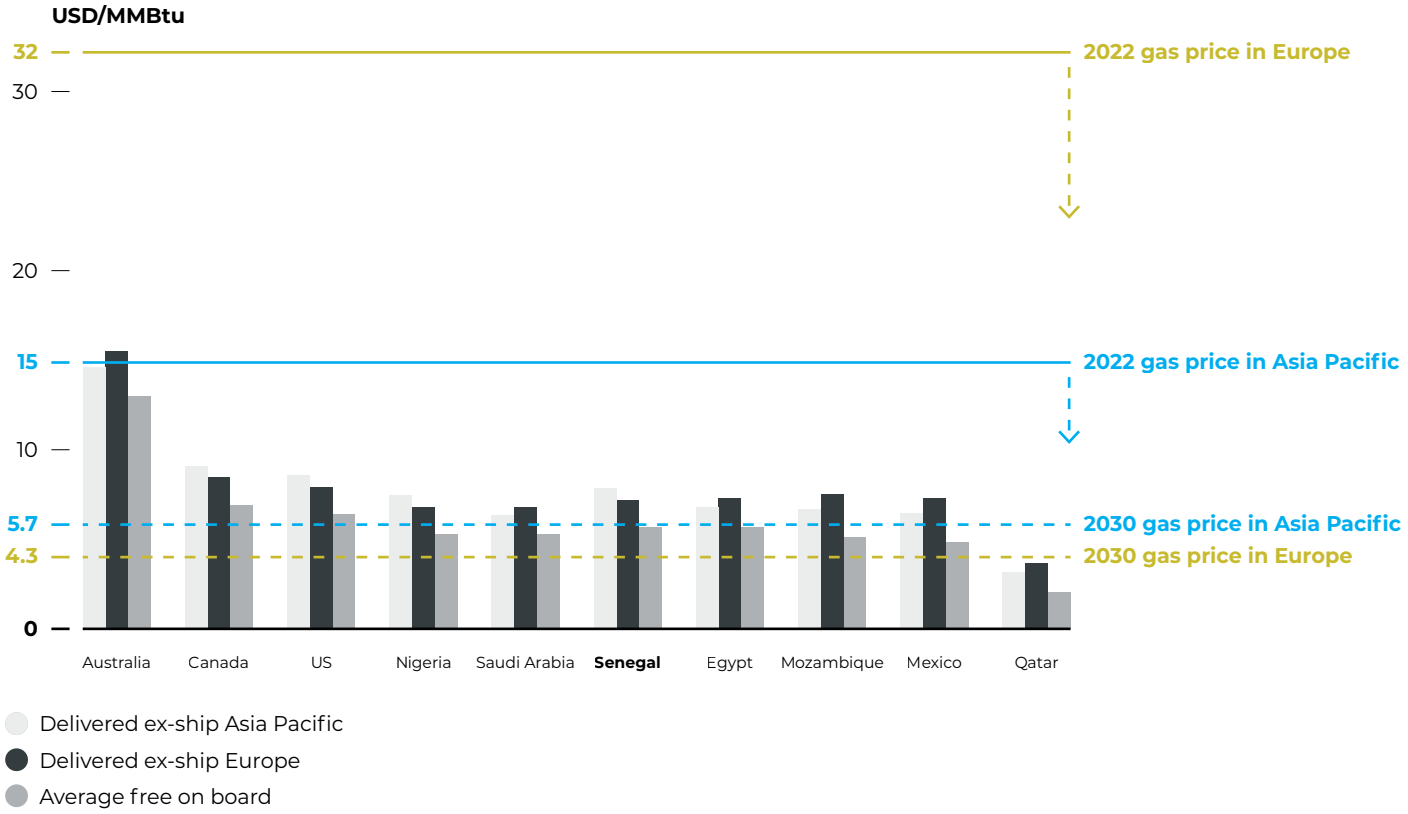
There is a danger that gas export proponents are basing their expectations for global gas prices on recent history. In 2022, gas prices in the EU stood at record highs at about 32 USD/MMBtu (IEA, 2023c), as a direct result of pipeline supplies from Russia being cut off after the explosion of Nordstream 1 in September 2022. We estimate an average gas price in Asia Pacific of about 15 USD/MMBtu for 2022. However, if demand for LNG declines on a pathway consistent with the Paris Agreement's climate objectives, gas prices are likely to fall in both markets amid excess (and growing) supply of LNG. The IEA estimate gas prices of around 4.3 USD/MMBtu in Europe and 5.7 USD/MMBtu in Asia Pacific in 2030 (IEA, 2023c), a markedly downward trend. Progressively, more and more LNG producers, including Senegalese producers, will find these prices insufficient to cover their production and transport costs, especially in direct competition with more competitive LNG producers (e.g. Qatar) (IEA, 2023d).

Because of various delays including in the wake of the COVID-19 pandemic, Senegal will likely not start exporting its LNG until at least mid-2024 (Hurst, 2023). Long-term offtake contracts can mitigate LNG price risks for Senegal (Africa Energy Chamber, 2022). So far, however, Senegal was only able to secure offtake contracts for GTA Phase 1 for a term of 20 years. It is unclear whether Senegal will be able to secure long-term contracts for upcoming phases of GTA and its other LNG export developments, as already today there is evidence that interest from international offtakers is waning. As mentioned, BP has already forfeited its stake in the Yakaar-Teranga gas field. In the absence of sustained financial support and contractual agreements for gas offtake, there is a looming risk of Senegalese gas assets becoming stranded (Global Energy Monitor, 2022).

1 Free on Board (FOB) costs mean fossil gas production, liquefaction, and loading costs. The sum of FOB cost plus shipping cost is the delivered ex-ship (DES).

Figure 7

LNG project breakeven cost comparison, Free on Board and Delivered Ex-Ship



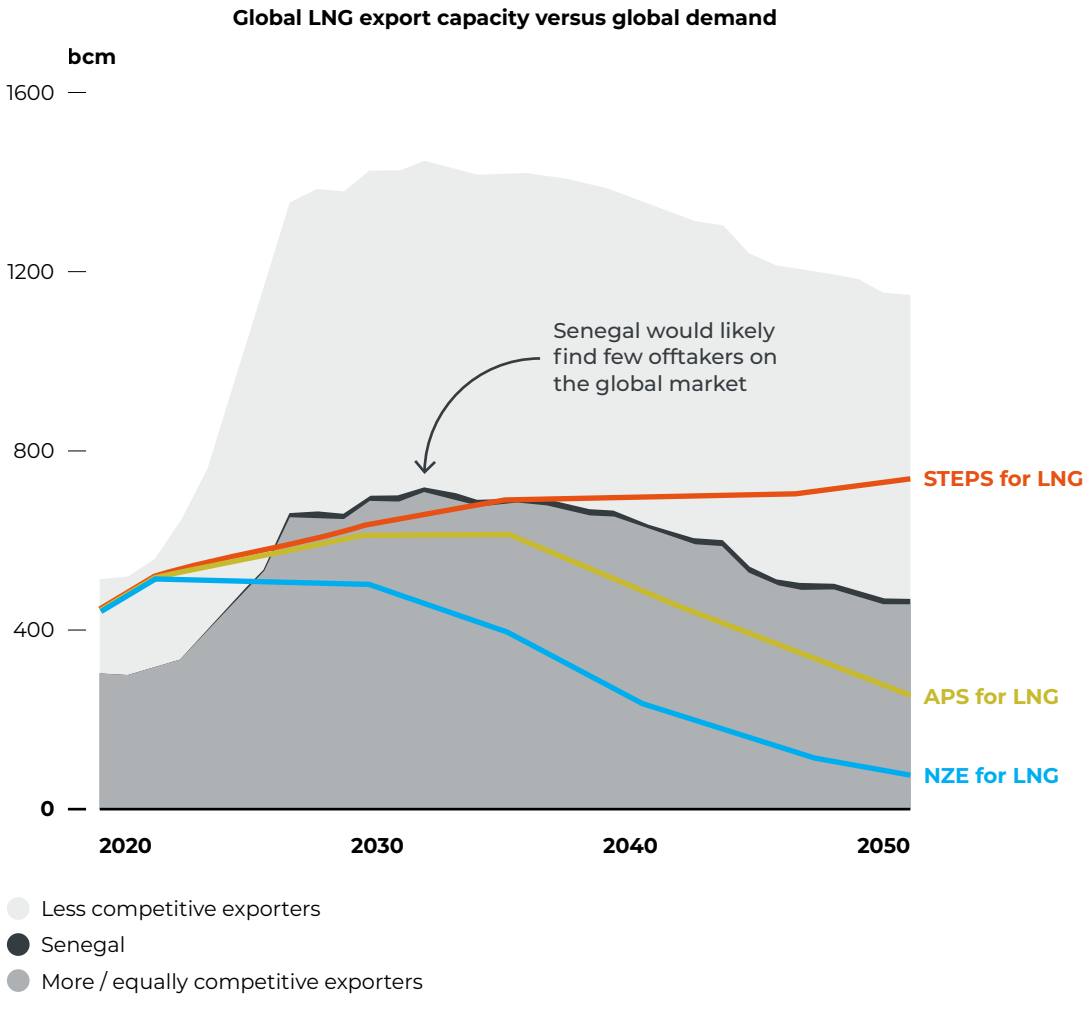
4.2 NEGLIGIBLE MARKET SPACE FOR SENEGALESE LNG

Current global investment levels in the oil and gas sector is nearly twice as high as what is needed to align with the objectives of the IEA's Net Zero Emissions scenario by 2030 (IEA, 2023e). This indicates that oil and gas producers expect no threat to their business model, i.e. they do not expect increased climate policy measures in global markets, and instead are willing to run the risk of not recouping their fossil fuel infrastructure investments. Global investment levels are however self-cannibalising, and with expected increased renewable build-out, only the lowest cost producers of oil and gas will be able to export profitably under most scenarios.

Given that fossil gas demand is projected to peak by 2030 in all scenarios outlined in the IEA's WEO, there is generally limited room for expansion in either pipeline or LNG trade beyond that point (IEA, 2023e). Yet, liquification capacities are rapidly expanding worldwide. In 2022, there is approximately 618 bcm[2] of annual

liquefaction capacity in operation, with potentially up to 920 bcm to be added by 2030. → **Figure 8** shows operational and planned LNG export capacities stacked in order of break-even points. While the estimated costs for Senegalese LNG capacity may be relatively cost-competitive, → **Figure 8** shows that the country competes with a looming number of even more competitive exporters for global LNG demand. Already under the estimated global Announced Policies (APS) scenario for LNG, Senegal would likely find few offtakers on the global market for its LNG exports, but the market space is even tighter under the Net Zero Emissions (NZE) scenario. **The rapid expected build-up of oversupply of LNG in the mid-2020s will render many projects currently under construction unnecessary and potentially unprofitable.**

Zooming in on key export markets for Senegal, highlights even more extreme oversupply risks. For the European market, Senegal faces fierce competition from highly cost-competitive producers such as Norway, but also in the Middle East, as well as North America. While taking the long distance from its target markets and the associated transport costs into consideration Senegal will have a hard



Note: Estimated, see → Annex for details.

Figure 8

LNG export capacity and estimated LNG demand scenarios

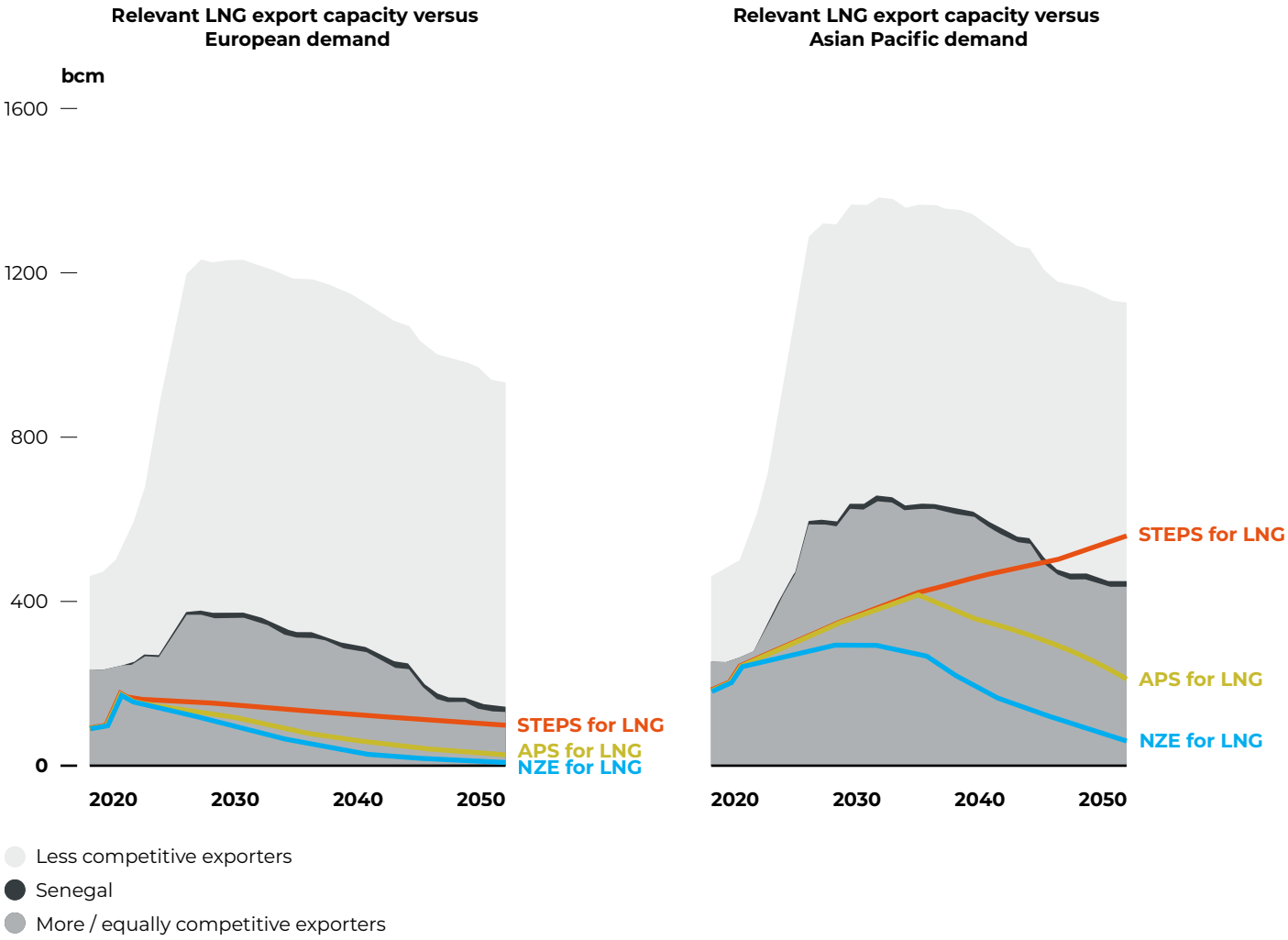
[2] The IEA's WEO reports 635 bcm of capacity for the year 2022. Drawing on the Global Energy Monitor's Global Gas Infrastructure Tracker, we estimate a total LNG export capacity of 618 bcm for the year 2022.

time competing with LNG suppliers, especially from specifically the Middle East. The estimated Stated Policies (STEPS), Announced Pledges (APS) and Net Zero Emissions (NZE) scenarios for European LNG demand offer barely any to no market space for Senegalese LNG exports, specifically from the mid-20s onwards **(see → Figure 9)**.

While Asian Pacific demand for LNG is more durable, notably because of continued growth in energy demand, Senegal's geographic location puts it at a disadvantage to serve these markets. Under none of the LNG demand pathways for Asia Pacific derived from the WEO, Senegal will be able to competitively market its LNG exports in the region **(see → Figure 9)**. With increased climate change and water shortages in the Panama canal, the Suez canal is likely to become increasingly congested, adding to Senegal's disadvantage in terms of transport times and costs (Shiryaevskaya, 2023).

Figure 9

Europe's and Asia Pacific's LNG demand scenarios and projected LNG export capacity



05 RISK OF FALSE HOPES

Not only in a Paris-aligned world, but also in a world where countries follow through on their already announced pledges, Senegalese LNG exports will likely struggle to find international offtakers at price levels that justify the upfront investment cost of the extraction and export infrastructure. These scenarios are however subject to high levels of uncertainty, and demand for LNG could turn out to be higher than modelled undermining global climate objectives. The opposite is however also possible and global ambition may increase, as has historically been the case - further depressing LNG demand even if it is at levels that are insufficient to limit global warming to 1.5C.

The Senegalese government hopes that LNG export revenues will play an important role in financing its development agenda, but these hopes may be inflated for various reasons both prior to exporting LNG and subsequently (IMF, 2019). A number of studies have examined the potential revenue and governance of proceeds including the Natural Resources Governance Institute and the International Monetary Fund. The IMF does not take the risk of stranded assets into account but warns that "there are many pitfalls to avoid, both prior to production (pre-resource curse) and post-production (resource curse)" (IMF, 2019). If these risks are not well managed, in the worst case, the oil and gas discoveries and the investments in infrastructure necessary to develop them even cause more economic harm than benefit. Four stylised scenarios are possible **(see → Figure 10)**.

To understand where Senegal may be heading, we first look at the resource rents that the country can expect. According to the IMF, initially, "in the pre-production period, investment related imports are likely to be large leading to a current account deficit" – which is estimated to amount to almost 11% in 2021. Because of delays in part related to COVID-19 some of these investments were delayed, but it is still likely that the associated investments put a strain on the current account. These investments can only be justified with a prolonged period of high revenues and good governance in terms of revenue management.

The IMF expects that once production starts, the current account will improve as investment falls and exports start, but repatriation of profits by international companies is likely to mute any large impact and will not lead to large current account surplus. Hydrocarbons, despite their importance, are projected to constitute no more than 5 percent of Senegal's GDP. With the assumption of continued global demand for Senegalese oil and gas (which has not been updated to take account of global climate policies), revenues from fossil fuel exports are expected to average only about 1.5 percent of GDP over a 25-year period, with a peak of around 3 percent of GDP when production peaks in 2030 (IMF, 2019). Even in the absence of rapid global decarbonisation and a corresponding fall in global LNG demand, relying on these revenues to play a significant role in financing the government's development plans appears highly optimistic even if revenues are managed well.

Figure 10

Possible scenarios of how resource rents can impact Senegal's economy

This is even more so the case considering the negative environmental and social impacts particularly with regard to coastal fishing communities and the public health hazards of oil and gas infrastructure.

Fishing plays an important role in the Senegalese economy contributing up to 3.2% of GDP and 10.2% of exports (USDA, 2022). In terms of GDP, this may be underestimated considering the semi-informal nature of artisanal fishing, which provides an estimated 80% of the catch. Local fisheries are further an important factor in Senegalese food security contributing more than 70% of animal protein intake in the country (USDA, 2022). The sector is already confronted with overfishing, marine pollution (Harris, 2020), and the impacts of climate change including ocean acidification, and costal erosion (Breeden, 2018). Local accounts say that oil and gas infrastructure is already having an impact on fishing communities as the fish are attracted to the bright lights on the extraction platforms in areas where fishers are not allowed to follow (Bassey, 2017; Thiam, 2023). Globally, communities near oil and gas platforms suffer from higher incidents of negative health impacts from asthma, eczema to cancer (James, Jia and Kedia, 2012). Fossil fuel extraction therefore poses significant economic, social, and environmental risks for local communities and notably a food security risk to the broader Senegalese population with an uncertain benefit in terms of future oil and gas revenues.

Given the uncertain future of future oil and gas revenue, good management and good governance means not making government revenue and spending plans dependent on it. According to a recent report by Carbon Tracker, the volatile global market for fossil fuels risks creating conflict and instability particularly for countries facing large revenue shortfalls from declining global demand for fossil fuels (Prince, 2023).

06 SENEGAL'S DOMESTIC FOSSIL FUELS IN THE CONTEXT OF ITS JETP

In June 2023, Senegal signed a political declaration with France, Germany, the United Kingdom, Canada, and the European Union establishing a Just Energy Transition Partnership "aimed at supporting and accelerating Senegal's drive towards clean energy that will enable inclusive and resilient development". As part of the agreement, international partners agreed that together with multilateral development banks they would mobilise 2.5 billion Euros for an initial period of 3-5 years from 2023 through a variety of support tools.

Given its comparatively large fossil gas resources and comparatively small domestic market, Senegal plans to export most of its fossil gas reserves as LNG. Indeed their development does not make sense without international demand. According to Ouki (2020), potential gas demand in Mauritania and Senegal combined would be a mere 2.1-2-6 bcm in 2030 even with heavy reliance on gas – a small fraction of even only the GTA field. Ouki (2020) goes on to conclude that this limited local demand potential is insufficient to justify their development without LNG export monetisation. If, as models project, global demand declines, domestic demand does not provide sufficient justification for oil and gas development especially considering the potential alternatives that Senegal has at its disposal. In theory, Senegal could use its cheap domestic gas reserves to speed up phasing out heavy fuel oil and coal, which currently represent the country's primary energy sources. In practice, however, this runs a high risk of locking in unnecessarily higher emissions, would likely undermine the achievement of its NDC, and would be a missed opportunity to take advantage of the opportunity of international support in scaling existing renewable development success to meet rapidly growing energy demand at lower cost (Kachi et al., 2023).

07 CONCLUSION

The market space for Senegalese LNG exports will likely be limited. While cited prices for the country's new and planned LNG export projects indicate that Senegalese LNG could be relatively cost-competitive vis-à-vis other international representative projects, growth in fossil gas and LNG demand has already peaked in many mature markets. This is a bad omen for the Senegalese LNG export business as growth is only expected in some emerging Asian economies and in the Middle East which either have their own sources of fossil gas or are better served by cheaper competing producers.

Given its geographic proximity, Senegal's closest major export market is Europe. Demand in Europe, however, is also both oversupplied and on a downward trend. The European climate commitments, rapid renewable expansion, growing maturity of heat pumps as an alternative, and other efficiency measures are key drivers. Senegal will unlikely be able to compete with incumbent and more cost-competitive providers of LNG in the European market, such as Qatar and the US. Gas demand in the Asia Pacific may peak later than in Europe, but the cost competitiveness of incumbent producers and exporters of fossil gas means that the market space for Senegalese LNG exports is highly constrained. Further investments in Senegalese export infrastructure are at a high risk of asset stranding.

Revenues from the export of hydrocarbons are rather small and will most likely not unlock significant development gains. While the new oil and gas fields represent significant reservoirs for the country, expected revenues are unlikely to make a large contribution to GDP in a sustained way. Given the large import content, multiplier effects are likely low.

Senegal has taken initial steps to ensure the appropriate management of potential future revenues. By channelling parts of the revenues through the Fonds Souverain d'Investissements Stratégiques (FONSIS), Senegal aims to distribute its resource rents in a more sustainable way. Concerns regarding revenue management prevail, however, excessive expectations faced with the volatility of international fossil fuel markets risks importing conflict, instability, and disappointment.

The development of Senegal's oil and gas for domestic use runs a high risk of slowing down the country's energy transition. Fossil gas is not a transition fuel for Senegal but would likely lock in emissions-intensive power generation technology for the medium- to long term, thereby competing with renewables. This may undermine achievement of its NDC and represent a missed opportunity to take advantage of the international support for a transition towards renewables in the context of the recently signed JETP.

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ANNEX: METHODOLOGY AND ASSUMPTIONS

The following describes in detail the methodology used to estimate the LNG supply and demand scenarios as discussed in this report, as well as underlying assumptions and data source. It is important to note that presented estimates are not forecasts. Uncertainty around both demand and supply mean that findings can help illustrate general trends but are also subject to error.

Fossil Gas Demand (→ Section 3.1):

We compile several fossil gas demand scenarios from different sources. The WEO Total Final Consumption scenarios (Stated Policies, Announced Pledges, as well as Net Zero Emissions) are most relevant for this analysis, while other gas demand scenarios are provided rather for illustrative purposes (given that they often come from oil and gas companies).

We break down the WEO pathways to the European and Asian Pacific level by applying respective shares of total fossil gas demand as part of global fossil gas demand, derived from IEA's WEO.

LNG Demand (→ Section 3.2):

The WEO does not provide Stated Policies, Announced Pledges, as well as Net Zero Emissions scenarios for LNG consumption. To derive synthetic LNG pathways compatible with the WEO's Total Final Consumption scenarios, we draw on estimates of the share of LNG as part of global fossil gas consumption derived from WEO. We assume the Stated Policies and Announced Pledges LNG shares respectively to derive Stated Policies and Announced Pledges LNG scenarios. We assume the Announced Pledges LNG shares to derive the Net Zero Emissions LNG scenario.

McKinsey (2021) and BP (2023) provide higher estimates for the share of LNG as part of global fossil gas consumption. We note that this can only be seen as a rough estimation of LNG-specific WEO scenarios, given that application of a global average.

Table 1
LNG share of total global gas consumption

Source	Scenario	2020	2030	2040	2050
WEO	Stated Policies	8%	15%	15%	16%
WEO	Announced Pledges	8%	15%	15%	10%
McKinsey	Global Gas Outlook 2050	13%	16%	20%	23%
BP	Accelerated Share LNG	12%	19%	20%	20%
BP	Net Zero Share LNG	12%	18%	19%	21%
BP	New Momentum Share LNG	12%	18%	22%	21%

We break down the WEO pathways to the European level by applying Europe's share of LNG imports as part of Europe's total fossil gas demand. To do this, we first derive the share of fossil gas consumption in Europe (including UK) met through imports, as well as the share of LNG as part of these imports, for the years 2021-2023 using data from IEA's WEO and Buegel's European Natural Gas Imports database. For the years beyond 2023, we assume that the share of LNG in the European total gas consumption remains constant at 27% (about the expected level for 2023 but below technical capacity (European Commission, 2022)), therefore assuming that Europe's elevated reliance on LNG to substitute pipeline gas from Eurasia becomes the new normal. The Rystad Energy and the American Petroleum Institute (2022) assumes an even stronger shift to LNG.

Table 2
LNG share of total European gas consumption

Scenario	2020	2021	2022	2023
Share of Gas Demand met through LNG (%)	14%	14%	28%	27%

We break down the WEO pathways to the Asian Pacific level by applying the share of global fossil gas demand from Asia Pacific (taken from the WEO) to the global LNG demand scenarios derived as above. This is a relatively cruder proxy of Asia Pacific specific LNG scenarios.

Break-even cost assessment (→ Section 4.1):

We derive LNG production costs (free on board (FOB)) in major exporting countries through desk research and express values in 2022 USD. We draw on LNG shipping cost estimates and shipping distances from basins to markets from Steuer (2019) to derive delivered ex-ship (DES) costs. We draw on 2030 gas price estimates from IEA's WEO.

Market space analysis (→ Section 4.2):

We illustratively derive and estimate for the market space for Senegalese LNG exports by comparing LNG export capacity projections and Europe-, as well as Asia Pacific-specific LNG demand scenarios. We draw on LNG export capacity projections provided by the Global Energy Monitor's (2023a) Global Gas Infrastructure Tracker. We assume an average infrastructure lifetime of 35 years. Different exporters' LNG export capacity is stacked in order of FOB costs for the global level and DES costs for the European and Asia Pacific analysis. For exporters where FOB or DES costs could not be obtained (because break even cost estimates are missing), weighted average values are used and confirmed with estimates from the WEO.

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