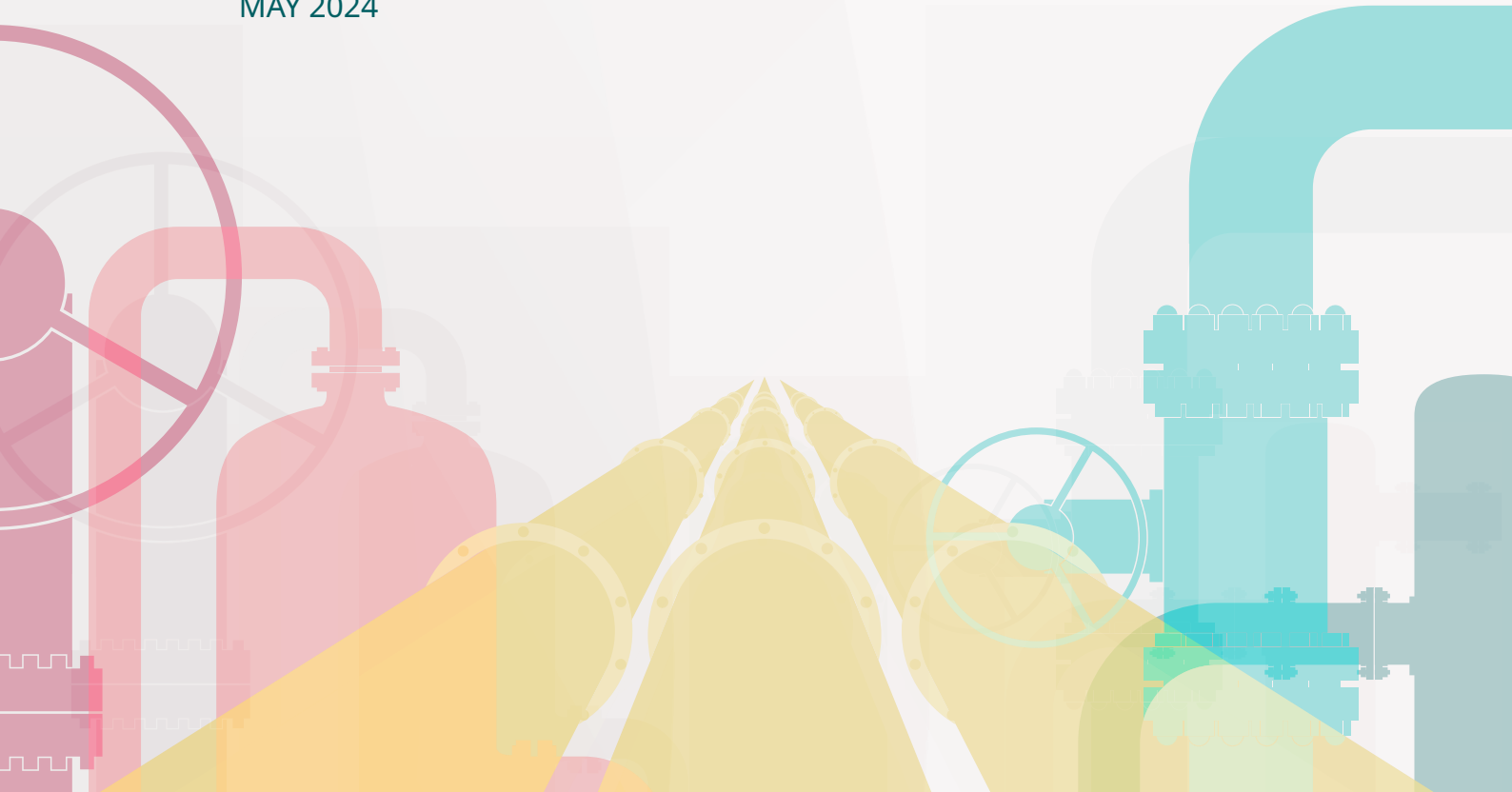


Primer

# The Use of Gas for Energy in Low- and Middle- Income Countries

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# Using this primer, you will explore questions including:

Q1

What are the main risks a country could face if it over-invests in domestic gas?

Q2

Should countries use gas as a “transition fuel” to renewables, or should they focus on growing renewables now?

Q3

Isn't switching to gas good for the environment since it is a relatively “green” fuel?

Q4

Should countries invest more in gas to achieve energy security?

Q5

What options does a country have to pay for its gas plans?

# Background

This primer summarizes some issues that gas-producing countries must address if they aim to use gas to meet their own energy needs. Any nation that extracts gas can either export it to buyers elsewhere or consume it at home—in power plants, cars and buses, household stoves and furnaces or industrial facilities. (Exporting gas comes with other risks and tradeoffs that are not covered here.)

Governments in around two dozen countries in Africa, Asia and Latin America want to build new pipelines, plants and other infrastructure to use some or all their gas reserves at home.

They see gas as key for meeting their economic and energy sector goals. (See box below.) But not everyone agrees that investing in domestic gas is the way to go. A range of voices, from grassroots activists and national and regional NGOs to international climate campaigners, argue that gas is too environmentally destructive and economically risky, and that countries should invest in renewables instead. Foreign investors meanwhile are showing less interest in domestic gas projects, and wealthy nations in North America and the European Union have pressured the development banks they own and influence to stop funding gas.

## Common goals that low- and middle-income countries have for domestic gas use:

1. Meet fast-rising electricity demand
2. Expand electricity access
3. Give more households cleaner cooking fuels
4. Achieve energy independence
5. Lower electricity sector costs
6. Replace other, dirtier fuels in the domestic energy mix
7. Keep the power grid stable as renewables grow
8. Provide fuel for industrialization and economic diversification
9. Attract new foreign investment
10. Create jobs

These divisions have made low- and middle-income country gas use into a flashpoint in the global energy transition—and especially on the question of whether the transition will be “just”. The countries with ambitions for gas accuse the wealthier ones of sending mixed messages and having double standards, especially when many of the wealthy countries stepped up their own hunts for gas after Russia fully invaded Ukraine. Meanwhile, the unmet energy needs in some lower-income gas producers are huge, especially in Africa, where the lowest-income, most vulnerable populations are often the last ones served.

Some lower- and middle-income countries will continue burning domestically produced and imported gas for years to come. But in the current debate, oversimplified arguments and political slogans obscure the risks these countries may face if they invest too much in gas, and the challenges of leaving fossil fuels behind. A different kind of debate is needed, one that focuses more on which energy sources can best meet a country’s needs at the least cost to its economy, people’s lives and the planet.

## Access to electricity in African gas-producing countries

Electricity access in Africa must triple by 2030 to meet demand, but countries aren’t keeping up. By 2030, almost nine out of every ten people living without electricity could be African, and half of the ten countries with the largest projected population growth are African fossil fuel producers. Fifteen African countries use gas for electricity, with most of the use concentrated in North Africa. A few of these have significantly expanded access to electricity, but mainly using hydropower, solar and wind—not gas. Meanwhile, two-thirds of schools and one in four health facilities in sub-Saharan Africa don’t have reliable electricity, which leads to lower rates of school attendance, literacy and graduation, and more preventable disease and death for millions.

# Questions and answers

## Question

# 1

What are the main risks a country could face if it over-invests in domestic gas?

The size and nature of the risks depend partly on how advanced a country's gas sector is. For example, risks can vary between:

- **Established gas producers** like Nigeria or Colombia, who already depend on gas for export earnings and/or have built domestic energy infrastructure that transports and burns gas.
- **Rapidly expanding gas producers** like Senegal or Mozambique, who already produce small amounts of gas and may start exporting and/or burning significant volumes of gas soon but have not built much infrastructure.
- **Prospective gas producers** like Tanzania or Lebanon, who may or may not produce small amounts of gas now but could end up dependent on gas in the longer term if their more speculative plans to extract large volumes succeed.

In general, though, new investments in domestic gas can be a bad choice for a country when:

- **Technical/technological, economic or political changes make it impossible to build the required pipelines, plants or other infrastructure.** Many such changes could take place elsewhere in the world and are beyond the gas-producing country's control, like shifting foreign policies and investor priorities. If a country's planned investments in gas fail, the main costs are likely to be lost opportunities—i.e., what else could the country have accomplished with the money, time and political capital it spent on gas, and how will its economy and citizens suffer as a result?
- **The plans have hidden costs for people and the economy down the road.** This can happen especially if they get "locked in" to using gas when other technologies like renewables would better serve the country's goals. Many factors can lock

a country into burning gas: policies, subsidies, political dysfunction, vested interests, and building costly domestic gas infrastructure like pipelines, power plants, gas-powered transport vehicles, or household gas connections. Different industries and gas infrastructure also have different lock-in risks and costs. These could include: strain on public budgets and local currency values, especially if new gas infrastructure and systems development projects are funded with public debt or need gas imports and subsidies; negative local environmental and social impacts from gas projects; threats to energy security (see Question 4); and higher prices for products made with gas, such as electricity, fertilizer, plastics and cement.

Countries that have already built significant domestic gas infrastructure cannot simply switch it off, and arguments about future risks can seem hypothetical when people need energy now. Still, as the world moves away from fossil fuels, pro-gas voices in and outside of government should explain to the public why gas is the best fuel to help their country reach its energy, economic and climate goals. They should also make fast, equitable, inclusive plans for eventually moving different sectors (such as power and transport) away from gas. At the same time, civil society actors, researchers and the media should ask hard questions about the risks of continued investment in gas, and whether other alternative technologies could deliver similar—or better—outcomes.

## Question

# 2

## Should countries use gas as a “transition fuel” to renewables, or should they focus on growing renewables now?

This isn't always an either-or choice. Under current technological conditions, most countries will need decades to switch to 100 percent renewable energy systems. Renewables also mainly make electricity,, and unlike gas cannot supply raw materials or heat plants that produce fertilizer, petrochemicals or cement. Some countries will therefore be unable to meet all their domestic energy needs with renewables alone. These constraints, and the fact that countries may have gas reserves and/or domestic gas infrastructure, have led some

governments to label gas a “transition fuel.” (See box on next page.) They argue that gas can be a short-term “bridge” to cleaner sources of electricity like solar and wind; an alternative to expensive battery storage at large solar and wind farms; a stop-gap measure while homes and vehicles are electrified; or a fuel for industry until more sustainable alternatives like hydrogen take off. But some studies have found maintain that gas tends to block other energy sources, slowing their growth and increasing the risks of “lock in.” (See Question 1.)



## Fossil fuel dependent economies leveraging gas as a transition fuel

The governments of Nigeria and Ghana have articulated plans to transition to net zero by 2060. Both countries plan to leverage gas to bridge their energy access gaps and bolster their domestic energy systems. In Africa 600 million people live without access to electricity and 890 million still cook with traditional fuels; most African countries therefore prioritize energy access by the “most accessible means.” The African Union and allied regional technical bodies and member states including Nigeria and Ghana acknowledge the need to transition their domestic energy systems to renewables; however, doing so will require financial and technical support they do not yet possess.

Adding more solar or wind power to a country's electrical grid can be challenging because both sources are variable, meaning they only produce electricity when the sun shines or the wind blows. Some government officials and industry players argue that unless countries invest more in gas power to backstop or balance renewables, the countries' electrical grids will be more likely to break down. They say this could particularly affect lower- and middle-income gas producers, where electrical grids already tend to be weak.

Others disagree, predicting for instance that African countries could quickly build new electricity systems around solar power with batteries for storage; that the actual need for backup gas power might be small or nonexistent; and that countries have cheaper, more effective and sustainable options for managing renewables' variability.

Most of these arguments are speculative, since solar and wind often produce less than 10 percent—or sometimes, not even 1 percent—of electricity in lower- and middle-income countries. Only more country-specific analysis will reveal the real-world challenges. In some cases, the higher initial capital costs of renewables compared to other energy sources account for their limited uptake.

In circumstances where a country has significant gas reserves and already established domestic gas infrastructure, gas may prove to be a more feasible option temporary for countries. Gas for power generation in that context could then arguably be a more reliable option. As technological advancements are made to address the intermittency issues, renewables will become more competitive.

## Question

## 3

## Isn't switching to gas good for the environment since it is a relatively "green" fuel?

The short answer is "maybe but not necessarily." On average, burning gas for electricity is not as polluting as fuels like coal or fuel oil, but this is not true in every case. Studies have also found that the world must halve its gas consumption by 2050 to avoid the worst climate outcomes and meet the Paris Agreement goal of keeping global warming within 1.5 degrees Celsius of pre-industrial levels.

In practice, a range of factors affect whether burning gas instead of some other fuel is better for the climate. These include how much extra gas the country will have to produce and/or import; the number of years the infrastructure involved will run; and how much methane operators of the infrastructure will release into the air. (Methane is a very potent greenhouse gas. Countries and companies chronically undercount it when they report their emissions.)

Some gas-producing countries also argue that new technologies like carbon capture, utilization and storage (CCUS) systems will allow them to keep burning gas while meeting climate goals. These technologies are still experimental, though, and while costs are coming down, it is not clear that they could be added to existing or new infrastructure without making energy prices too high.

Moreover, as countries like Nigeria and Ghana deepen their reliance on gas with greater investment in infrastructure pipelines, and power plants, commensurate environmental degradation increases pollution. This has the potential to harm the health of oil-producing communities. Furthermore, in countries where most gas is "associated" (meaning it is produced from the same wells as oil), gas expansion requires extracting more oil, defeating the perception that access to more gas translates to access to "greener" fuels.

Wealthier, higher-emitting countries in North America, Europe and Asia should wind down their gas use first and fastest. These countries still plan to consume much more gas than less-wealthy producers, and their decades-long reliance on fossil fuels has caused the climate emergency. Expanding gas use in countries with much smaller carbon footprints also may not add much to world emissions, and lower-income gas producers already experience some of the worst impacts of climate change, and are less ready to adapt. So far, though, countries have not agreed on how to wind down gas production and consumption in a way that is fair for everyone.



## Question

## 4

## Should countries invest more in gas to achieve energy security?

It is understandable that citizens and officials in a country with gas reserves would want to use them, especially if they currently rely on dirty, expensive imported fuels like coal, diesel or gasoline. Voices from countries including Colombia, Ghana, Lebanon, Mexico, Nigeria and Senegal are using the prospect of ending fossil fuel imports as a justification for boosting their own gas production and use. Some of the required infrastructure likely cannot be built, though, since investors aren't willing to fund it. (See Question 5.) Other gas extraction projects and infrastructure could become "stranded"—that is, economically unviable because they have lost their value or face other obstacles like changed regulations or problems accessing gas.

If a country cannot produce enough gas to run the domestic infrastructure it builds, or leaders decide to export the gas, this could lead to new fossil fuel imports, including gas, whether by pipeline from a neighboring country or in liquified form. (See box on next page.) Dependence on liquified natural gas (LNG) can leave people and businesses exposed to higher, more volatile prices, though, whether for the gas itself or for other goods like electricity, cement or plastics that are made with gas. A country could also face domestic energy shortages if foreign supplies of LNG suddenly run low.

This is particularly a risk if wealthier nations use their cash and diplomatic muscle to buy the gas first, as happened in parts of Asia during the 2022 energy crunch following the onset of Russia's illegal invasion of Ukraine.

Some countries additionally want to use gas to give lower-income people reliable access to cleaner cooking fuels. But like LNG, bottled fuels such as liquefied petroleum gas (LPG) can also be vulnerable to overseas price hikes when they are produced elsewhere. In the months after the Ukraine invasion, 30 million Africans could no longer afford imported LPG. Instead, most went back to cooking with firewood and other inefficient, polluting and dangerous fuels.

## Colombia's dilemma: A lot of infrastructure, not much gas

Colombia has been building up its domestic gas infrastructure since the 1990s, partly out of a desire for energy security. The results include 7,700 kilometers of pipelines, more than 620,000 vehicles that run on gas and household connections providing gas to 33 million people.

Now the country has a problem, though: its own gas is due to run out in seven years, but its gas infrastructure could keep running for decades. Onshore fracking could increase reserves, but the government has banned fracking because of its high social and economic costs. The national oil company meanwhile is exploring for gas offshore, but may not discover any.

The main option left is to dramatically increase gas imports, either by pipeline from neighboring Venezuela or shipped in as LNG. Buying Venezuelan gas is politically unpopular and has a troubled history. Importing more LNG is risky too, because it would be more expensive than Colombia's own gas and more exposed to volatile world gas prices. Rising prices, in turn, will likely force the government to spend more on subsidies and leave Colombians to pay more for electricity, cooking fuel and other commodities. Colombia lacks a backup plan if LNG supplies from the U.S., its main source of imports, run short.

Overall, it will be an unfortunate, perverse outcome if an ambitious drive for energy security leaves Colombia's industries, economy and people less well-off and less secure because leaders over-invested in gas.



## Question

## 5

## What options does a country have to pay for its gas plans?

There is not nearly enough investment capital to fund the new gas infrastructure some lower- and middle-income producers want to build. These countries cannot pay the large price tags themselves, and foreign investors are not willing to pay. This means that most planned projects are unlikely to move ahead. (See box on next page.)

Foreign funding for lower- and middle-income country gas projects tends to be small and elusive. Only a handful of large commercial banks lend money for them at all; interest from foreign private equity is scarce. This leaves international public lenders like multilateral development banks, but their average support for lower-income country domestic gas projects has been less than \$4 billion a year lately, and most of that money went to a single country (Mozambique). The scarcity of international public finance, in turn, makes it hard to secure funding at all. This is because private lenders only invest in lower- and middle-income country gas projects if public lenders commit first and assume the biggest risks. Investors also shy away from these projects because they could be bad for the climate and may also be bad business decisions.

Ultimately, the governments of the gas producing countries themselves could be forced to provide most of the capital for projects, either through their own budgets or state-owned companies. But will the debt be sustainable in such cases? Around half of all African countries already experiencing or at risk of debt distress, including established gas producers like Nigeria, Ghana and Egypt.

For now, the question of whether lenders and investors will finance gas as part of lower- and middle-income countries' energy transitions remains uncertain. The recently announced just energy transition partnership (JETP) involving Senegal could provide a partial answer, though the deal likely includes no funding for gas. A JETP is a high-level political agreement between group of wealthy, high-emitting international partner countries and a less-wealthy fossil fuel-producing country. It is supposed to be a vehicle for helping the producer make a faster, fairer transition away from extracting and burning fossil fuels in line with "just transition principles." The parties to a JETP should consider funding for gas under some limited circumstances, though such deals should mainly help renewables grow in faster, more equitable ways.

## New African domestic gas infrastructure investment: plans versus actual progress

Item	Total amount planned	Amount actually under construction
New gas power plants	USD 62 billion	USD 9.7 billion (16% of total)
New gas pipelines	USD 89 billion	USD 4 billion (4% of total)

Source: Global Energy Monitor

## Further reading

NRGI. [Framework for Countries Evaluating Gas-to-Power Pathways](#). 2022.

NRGI. [Just Energy Transition Partnerships for Gas-Producing Countries](#). 2022.

Oxford Institute for Energy Studies. [A New Global Gas Order?](#) 2023.

World Resources Institute. [A Path across the Rift](#). 2023.

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## About NRGi

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