

How Market Factors Could Shape Demand for Cleaner Gas

By Nikos Tsafos

Reducing methane emissions from fossil-fuel operations can help the world meet its climate goals. In its “Net Zero by 2050” scenario, the International Energy Agency (IEA) shows that methane emissions fall by 77 percent between 2020 and 2030, a reduction that would play a big role in limiting temperature increases.¹ How to achieve this reduction in emissions is a public-policy question of the first order. Reducing emissions in producing countries will be critical, but it is also important to examine the policy levers and market innovations that can help to mitigate emissions in gas consuming countries and shape demand for cleaner gas.

One idea gaining traction is to treat natural gas differently based on its methane intensity—the ratio of methane emissions to the volume of natural gas produced. This could be done by setting a threshold for intensity that gas must meet to enter a market or by linking the price to its emissions intensity. These policies could help to create a market for “differentiated” or “cleaner” gas. Together with regulations and technical innovations, such measures can ensure that gas produced, transported, and consumed has the lowest intensity possible. Public policy measures of this nature could accompany, and possibly accelerate, a market evolution in which buyers will gradually pay a premium for lower-carbon gas.

To treat gas differently, however, a diverse set of governments, companies, and other stakeholders would have to collaborate. This will require collective efforts by both producer and consumer countries, including domestic regulation and possibly import standards. So far, the policy ambition on methane has come from countries that account for just 40 percent of the world’s methane emissions from fossil fuel operations, but the policy landscape is evolving quickly.²

1 International Energy Agency, *World Energy Outlook 2021* (Paris: International Energy Agency, 2021), 38, <https://iea.blob.core.windows.net/assets/888004cf-1a38-4716-9e0c-3b0e3fdbf609/WorldEnergyOutlook2021.pdf>.

2 International Energy Agency, *Curtailling Methane Emissions from Fossil Fuel Operations: Pathways to a 75% cut by 2030* (Paris: International Energy Agency, October 2021), 19, <https://www.iea.org/reports/curtailling-methane-emissions-from-fossil-fuel-operations>.

The policy discourse tends to focus on high-profile initiatives such as the European Union’s methane strategy, but the European Union consumed just 12 percent of the world’s gas in 2020, and its demand has fallen in the past decade. Europe remains the primary destination for internationally traded pipeline gas but accounts for a small share of the liquefied natural gas (LNG) market: around 20 percent, on average, between 2011 and 2020. Europe also does not import any LNG from the Asia-Pacific region, which produced 36 percent of the world’s LNG in 2020. The European Union’s methane strategy is thus a positive step, but its global impact will be limited if other regions do not follow with their own policies to curb emissions.

This is especially true because, in 2020, two-thirds of the world’s gas was consumed in the country where it was produced. Gas is less of a global commodity than, for instance, oil (two-thirds of the world’s oil crossed a border in 2020). Therefore, efforts to reduce methane intensity of global gas must distinguish between gas that crosses borders and gas that is consumed at home.

Several aspects of the gas market will make it easier or harder for “differentiated gas” to take off and help to reduce methane emissions from the global gas industry. At the country level, the important considerations include the share of gas in the country’s energy mix; whether gas is used solely among big consumers (such as industry and power) or also in buildings and transported through distribution networks; the infrastructure for production, imports, exports, transportation, and consumption; the structure of the market; how prices are set; and the number of players involved.

A few other critical factors concern the nature of the global gas market. It is important to identify the big gas producers, consumers, importers, and exporters and to analyze where production and consumption are rising and falling. It is also crucial to consider the main trade corridors and the terms of trade for gas in different parts of the world.

Exploring these issues, this paper addresses two central questions: What aspects of the global gas market might facilitate the emergence of a market for cleaner gas, and what are the challenges that exist based on how this market is organized today?

Reliance on Natural Gas around the World

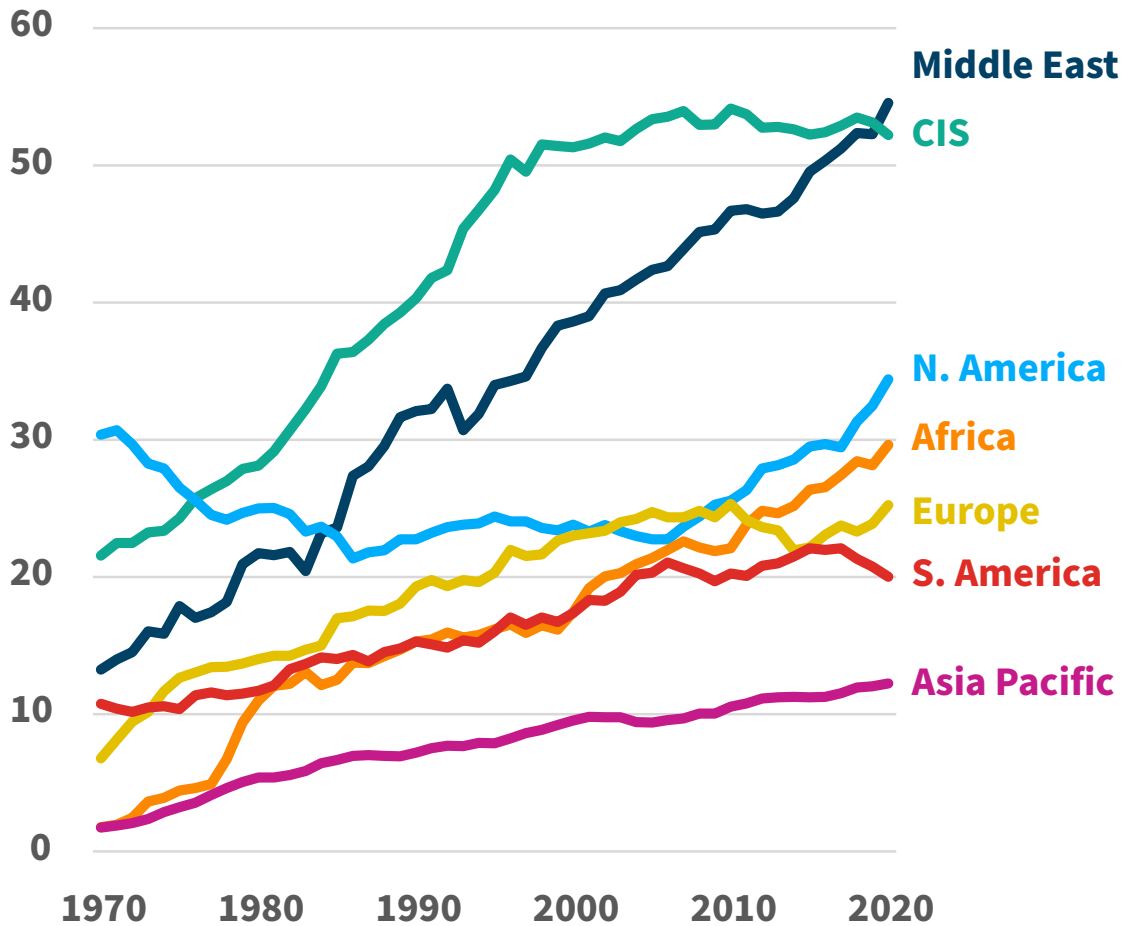
In 2020, almost a quarter of the world’s energy came from natural gas, a share that has risen steadily over the past half century.³ The regions that depend most on gas are the Commonwealth of Independent States (CIS) and the Middle East, where gas accounted for over half of primary energy in 2020. At the other extreme, in the Asia-Pacific region, gas made up just 12 percent of the energy mix in 2020. In between these extremes are, in descending order, North America (34 percent), Africa (30 percent), Europe (25 percent), and South America (20 percent).

The fate of gas differs across the world, too. In the CIS, the share of gas has been flat for two decades. In Europe and South America, the plateau has been more recent; gas made up roughly the same share of primary energy in 2010 as in 2020. In North America, gas is regaining a position it held in the 1970s as its market share grows. In the Middle East, Africa, and the Asia-Pacific, the share of gas is on a steady, persistent rise, albeit at vastly different levels.

3 Ibid.

Share of Primary Energy Met by **Natural Gas**

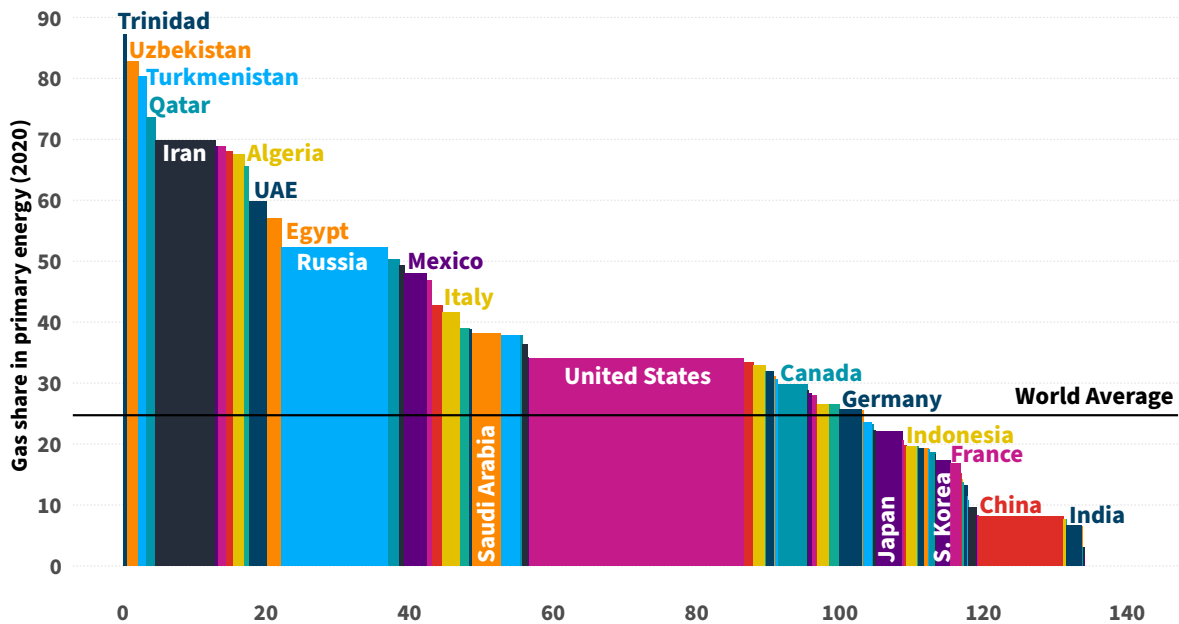
percent of primary energy



Source: Bp, *Statistical Review of World Energy 2021* (London: BP p.l.c., 2021), <https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>.

This global average can mask considerable country-level variation. There are several countries where gas accounted for over 50 percent of primary energy consumption—including the world’s second and fourth-largest gas consumers (Russia and Iran, respectively). A heavy dependence on natural gas is a useful proxy for several challenges related to curtailing methane emissions.

Natural Gas Consumption and Market Share by Country



Source: Based on data from Bp, *Statistical Review of World Energy 2021* (London: BP p.l.c., 2021), <https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>.

For one, the share of gas in primary energy can correlate to the scope and reach of gas in an energy system. The overlap is not exact, but a country that meets, for instance, 50 percent or more of its energy needs from gas likely uses gas not just in industry and electricity generation but also in buildings and even transportation. Countries with this diversified use of gas usually have more actors and consumers whose views on differentiated gas matter. A country with one major player could change course on differentiated gas if that one player changes its behavior; a market with more players will require a different strategy. Regulation might also be easier or harder to pass and enforce in a market depending on its size and complexity. Countries that use gas across the economy also typically have more gas infrastructure—which has implications for measuring and reducing methane emissions. In addition, a system that is heavily reliant on natural gas might have fewer developed alternatives and thus could be more risk-averse to any policies that might disrupt energy supply. These are all factors that could affect the growth and ultimate reach of differentiated gas in a particular market.

The Geography of Supply and Demand

In 2020, two-thirds of the world's gas was consumed in the country where it was produced.⁴ The rest crossed a border by pipeline or on a ship, transported as LNG. Most international trade still takes place by pipeline: pipeline exports totaled 756 billion cubic meters (bcm) in 2020, versus 488 bcm for LNG. However, the growth in the LNG market has been faster. In 2000, the LNG market accounted for 6 percent of total gas consumption, but that number has more than doubled to almost 13 percent in 2020.

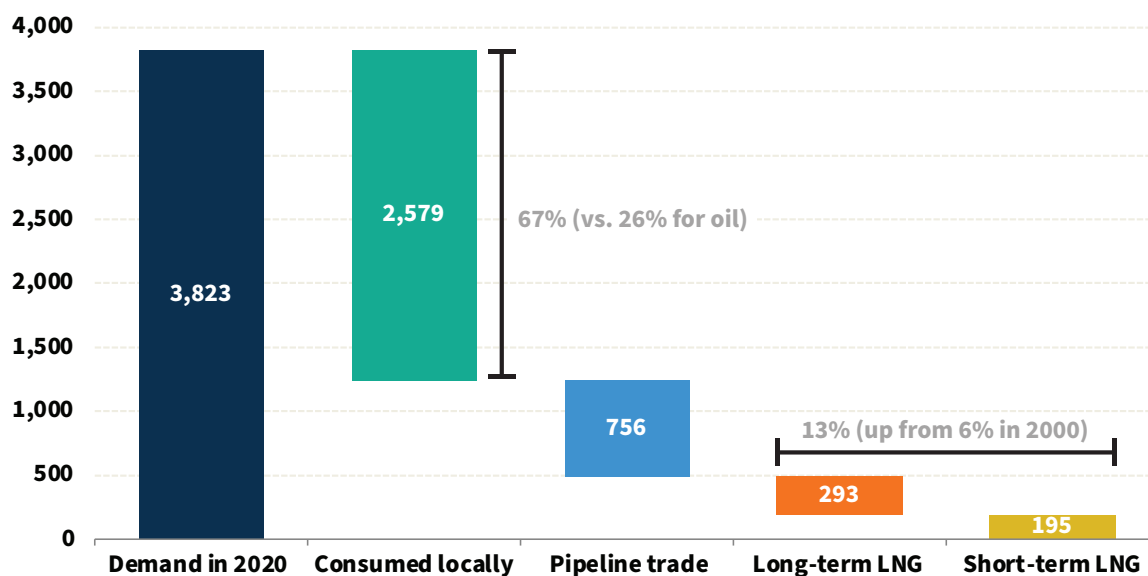
This geography has profound implications for thinking about methane emissions. Measures that target internationally traded gas will not automatically produce change in countries that do not trade with others. Of course, most countries are exposed to international trade in one way or another (Saudi Arabia is the only major gas

⁴ Ibid. This number is inferred by subtracting traded volumes from overall consumption.

consumer that neither imports nor exports natural gas). But trade is often a small part of a country's balance, and it might be with only one or two counterparties. Policies that affect traded gas can ripple through a system to impact gas that is only consumed locally—but such a process is neither automatic nor guaranteed.

Most Natural Gas **Never** Crosses a Border

billion cubic meters



Note: LNG is liquefied natural gas. Data for pipeline and LNG trade are taken from the bp *Statistical Review*; the split between long-term and short-term LNG comes from GIIGNL. The estimate for gas consumed locally is inferred as the difference between total consumption and international trade.

Source: Bp, *Statistical Review of World Energy 2021* (London: BP p.l.c., 2021), <https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>; International Group of Liquefied Natural Gas Importers, *The LNG Industry: GIIGNL Annual Report 2021* (Paris: International Group of Liquefied Natural Gas Importers, 2021), https://giignl.org/system/files/giignl_2021_annual_report_may4.pdf.

Several other factors show why it is important to focus on domestic consumption irrespective of trade. For example, China is a major producer in its own right; in 2020, it produced more gas than Qatar, Canada, Australia, Saudi Arabia, Norway, Algeria, Malaysia, Indonesia, and every other country except the United States, Russia, and Iran.⁵ Focusing on Chinese imports, in other words, could miss the significance of the country's own production.

The Middle East is another region where local and regional consumption should not be obscured by a singular focus on exports. In 2020, gas demand in the Middle East was 22 percent higher than in the European Union (EU-27) plus the United Kingdom. Moreover, gas demand in the region rose by 45 percent between 2010 and 2020, while it shrank by 14 percent in the European Union.⁶ By 2020, Saudi Arabia and Iran together consumed more gas than China. Emphasizing Middle Eastern exporters is important, but so is engagement with producers.

For example, between 2010 and 2020, the growth in U.S. gas demand (184 bcm) was almost as high as the growth in China (222 bcm). Iran and Saudi Arabia were the third and fourth-largest growth centers in terms of volume. Canada and Mexico were next—in fact, Mexico now consumes more gas than India,

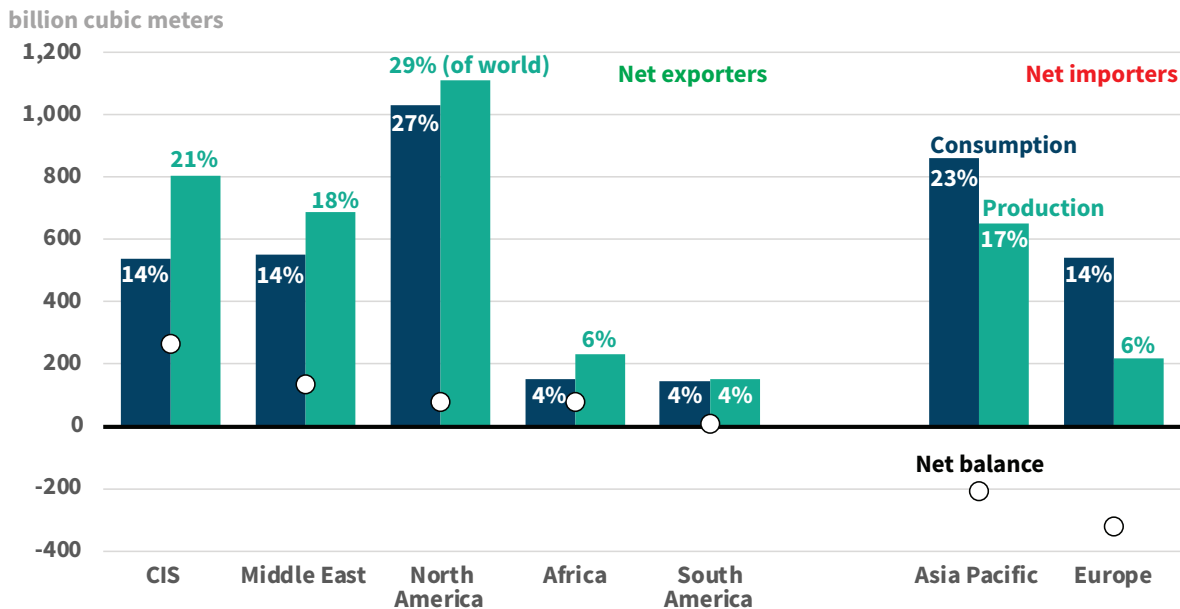
5 Ibid., 37.

6 Ibid., 38.

South Korea, Turkey, or the United Kingdom, and almost as much as Germany. Algeria, Egypt, Iraq, and Turkmenistan round up the list of top ten countries when it comes to absolute growth between 2010 and 2020. These markets do not usually spring to mind during conversations about differentiated gas—but this is where gas demand is growing.

Of course, the emphasis on domestic consumption should not obscure the international dimensions of the gas industry. The global gas system consists of five net exporting regions—the CIS, the Middle East, North America, Africa, and South America—shipping gas to two net importing regions—the Asia-Pacific and Europe. Most trade corridors exist to connect one of these surplus regions to one of the major deficit regions.

Natural Gas Production, Consumption, and Trade Balance by Region



Note: The balance refers simply to the difference between production and consumption and includes stock changes and other possible discrepancies.

Source: Bp, Statistical Review of World Energy 2021 (London: BP p.l.c., 2021), <https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>.

Over time, this trading system has become more complicated, especially when it comes to LNG. In 2005, 15 countries imported LNG, and 13 countries exported it; the trading system was simple. Over 90 percent of Europe’s LNG imports came from Algeria, Nigeria, Qatar, Egypt, and Libya. In Asia, only Japan, South Korea, Taiwan, and India imported LNG, around 80 percent of which came from Indonesia, Malaysia, Qatar, and Australia. In the Americas, the United States was still a major importer, largely dependent on Trinidad and Tobago, which alone supplied 70 percent of the LNG in the Americas in 2005.⁷

That system has grown in size and complexity. There were 20 countries that exported LNG in 2020 and 43 countries that received it.⁸ Trade routes have gotten longer, too: in 2020, 15 percent of Asia’s LNG imports came from either the Americas or Africa. A similar share of imports into Central and South America came

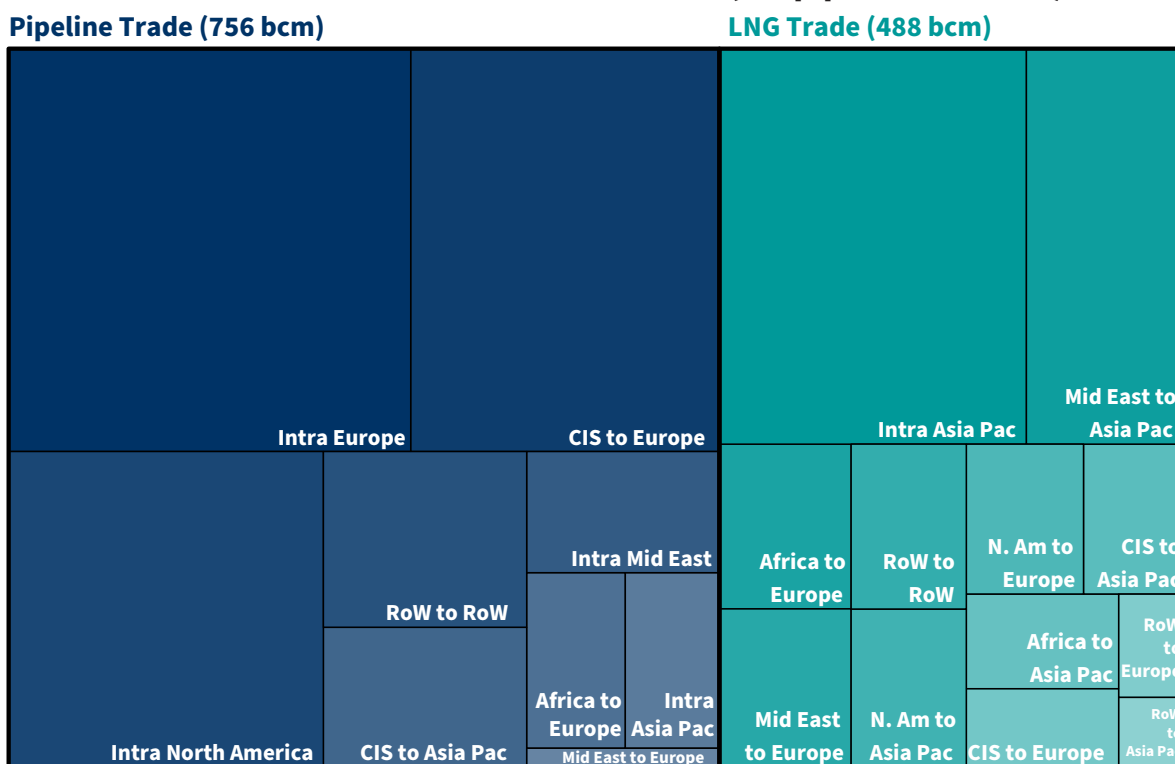
7 International Group of Liquefied Natural Gas Importers, *L'industrie du GNL/The LNG Industry 2005* (Paris: International Group of Liquefied Natural Gas Importers, 2006), https://giignl.org/sites/default/files/PUBLIC_AREA/Publications/gnl_2005.pdf.
 8 International Group of Liquefied Natural Gas Importers, *The LNG Industry: GIIGNL Annual Report 2021* (Paris: International Group of Liquefied Natural Gas Importers, 2021), https://giignl.org/system/files/giignl_2021_annual_report_may4.pdf.

from outside the region—including from the Middle East, Africa, and even Australia.⁹ And LNG from the United States has reached 36 countries between February 2016 and August 2021.¹⁰

With this complexity has also come a change in how gas changes hands. In the past, most gas was traded based on long-term contracts, with the price often linked to that of oil. By 2020, however, the market for short-term and spot transactions had grown to represent almost 40 percent of the total volume of LNG exported.¹¹ Meanwhile, the price of gas is increasingly linked to real-time fundamentals (rather than to oil) in what is called “gas-on-gas” competition.¹²

Even so, certain countries and trade routes continue to dominate. Five countries accounted for 58 percent of global exports in 2020: Russia, the United States, Qatar, Australia, and Norway. On the import side, 10 countries took in 58 percent of all the world’s gas imports (in order: China, Japan, Germany, the United States, Italy, Mexico, South Korea, the United Kingdom, Turkey, and France).¹³

Natural Gas Cross-Border Trade in 2020 (via pipeline and LNG)



Note: bcm is billion cubic meters. LNG is liquefied natural gas. RoW is rest of world.

Source: Bp, *Statistical Review of World Energy 2021* (London: BP p.l.c., 2021), <https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>.

9 Bp, *Statistical Review of World Energy 2021*.

10 U.S. Department of Energy, Office of Fossil Energy and Carbon Management, *LNG Monthly* (August 2021) (Washington, DC: U.S. Department of Energy, October 2021), <https://www.energy.gov/sites/default/files/2021-10/LNG%20Monthly%20August%202021.pdf>.

11 International Group of Liquefied Natural Gas Importers, *GIIGNL Annual Report 2021*.

12 International Gas Union, *Wholesale Gas Price Survey, 2021 Edition* (London: International Gas Union, July 2021), <https://www.igu.org/resources/global-wholesale-gas-price-survey-2021/>.

13 Bp, *Statistical Review of World Energy 2021*.

More importantly, there are key corridors along which gas moves in the world. When it comes to the pipeline trade, almost three-fourths of the world's exports end up either in Europe or are traded within North America. The pipeline trade in the rest of the world—in Asia, the Middle East, North Africa, South America, and the CIS—is marginal by comparison. For LNG, two corridors matter above all others: trade within the Asia-Pacific region and trade from the Middle East to the Asia-Pacific. The rest of the LNG trade is divided into several equally sized flows.

Creating a market for differentiated gas therefore requires recognizing that most gas never crosses a border. Strategies that leverage international trade should have some plausible lever to affect production and consumption contained within a country as well. When it comes to imports and exports, the system for pipeline and LNG trade has grown considerably in volume and complexity. However, most pipeline trade revolves around Europe or takes place within North America. Most LNG ends up in Asia, either from the Asia-Pacific region or from the Middle East. This structure means that significant strides can be made by focusing attention on a few key markets.

Conclusion

Developing a market for differentiated gas requires a strategy that addresses several important features of the global gas industry. This paper has highlighted a few.

First, the European Union is a significant player in the international gas market, especially in internationally traded pipeline gas, but its reach is not sufficiently broad to drive global change. The EU's market share in LNG is modest (between 11 and 20 percent over the past decade), it consumes only around 12 percent of the world's gas, and European gas demand is declining. Europe's methane strategy is an important step toward building stronger market demand for cleaner gas, but other countries—especially major producers—may be less willing to adopt such standards.

Second, two-thirds of the world's gas is consumed in the same country where it is produced, so a strategy focused only on internationally traded gas might not affect major pockets of production and consumption. Even an LNG-only strategy will not suffice; volumes traded via pipeline are still 50 percent greater than the volumes traded as LNG.

Third, there are major growth centers in unexpected places. The Asia-Pacific region is the center of gravity when it comes to energy markets. But much of the growth in Asia has come from China, the world's fourth-largest gas producer. Outside of China, growth in consumption has been more modest, mostly in higher-income economies such as South Korea, Australia, Taiwan, Singapore, and Japan. Other regions are important, too. From 2010 to 2020, the growth in demand from North America has been higher than China's; the Middle East is another growth market, as is North Africa.

Fourth, the system is becoming more complex—but big players still matter. More countries now import and export gas; routes are also becoming longer, with significant volumes shipped between regions; and transactions increasingly take place outside of long-term contracts. Even so, five exporters and ten importers accounted for almost 60 percent of exports and imports, respectively. So while the system is big, complex, and growing, it is still shaped by a handful of major players.

Finally, the structure of demand matters. Unlike coal (which is largely used in power generation) or oil (which is largely used in transportation), gas is a versatile fuel used across the entire energy system—in power, industry, buildings, and transportation. As such, the footprint of gas varies considerably from country to country. In some places, gas consumption is concentrated in just a few users, while in others, the gas

system spreads across thousands of miles of pipelines. Enlisting gas buyers in the effort to reduce methane emissions will require identifying the main actors and the footprint of the industry in each country.

Together, these observations sketch the outlines of a strategy for differentiated gas. The focus on big producers, consumers, importers, and exporters does matter, since the system is concentrated in their hands. But the list of major players goes beyond those that are often discussed in policy discourse. Regulating internationally traded gas will be an important vehicle for change, incentivizing gas producing countries and individual producers to regulate their methane emissions. In parallel, it is important to focus on reducing the methane intensity of gas produced and consumed within borders. Most of all, the structure of demand will shape what is possible—how many players are involved in a market, what role gas plays, and what its footprint is. Granularity is paramount. ■

Nikos Tsafos is the James R. Schlesinger Chair in Energy and Geopolitics with the Energy Security and Climate Change Program at the Center for Strategic and International Studies in Washington, D.C.

*The CSIS Energy Security and Climate Change Program has launched a multi-phase research initiative on **Engaging Global Gas Players on Methane** to analyze how the global gas system might evolve in a way that lowers methane emissions. CSIS will outline the structure of the global gas market, the drivers for individual companies, and the broader ecosystem that influences their climate and sustainability priorities. The research will also analyze regional patterns in the current and projected supply and demand for natural gas with a reduced methane emissions footprint and how new methane emissions data from satellites and other sources might influence the market.*

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