# Geopolitics and Gas-Transit Security Through Pipelines

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## 1 Introduction

The ownership, production, and transportation of energy became integral parts of global discussions about security, politics, economics, and finance after the oil crises of the 1970s. The first such crisis from October 1973 to March 1974, when Arab oil-producing countries except Iraq curtailed production and embargoed the sale of oil to countries that supported Israel during the Yom Kippur War, served as a wake-up call for Western political and strategic communities (Paust and Blaustein 1974). Ending the era of "cheap" energy and turning it into a geopolitical strategic tool (Licklider 1988; Yergin 2008). The embargo forced energy-hungry Western countries to implement policies to diversify their energy sources and their origins (Ediger and Berk 2018). Attention turned to (1) tapping national resources wherever possible, including hydrocarbons, nuclear, and alternative energies, to better coordinate consumer policies, and (2) securing the continuous flow of hydrocarbons from their origin. While the first aim led to the creation of the International Energy Agency in 1974 as the coordinating institution for consumer countries, the second aim led the USA to prepare contingency plans to intervene in oil-rich Middle Eastern states should a similar crisis reoccur (Kissinger 1982; Ikenberry 1986).

The second crisis, resulting from the shortage of supplies brought on by the Iranian Revolution, prompted the creation of the US Rapid Deployment Force (RDF) in 1979, which permitted swift intervention in regions beyond traditional NATO and US operational areas, including the Gulf region. President Carter then

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promulgated the Carter Doctrine in January 1980 after the Soviet Union invaded Afghanistan, explicitly stating that the USA would defend Gulf oil. The creation of US Central Command (CENTCOM) followed in 1983 (Ediger 2007). In addition to helping stabilize the Middle East, the RDF, and CENTCOM could secure the region's oil-transit routes, especially the Strait of Hormuz, the Bab-el-Mandeb, and the Suez Canal. The USA then used military force to protect the flow of oil from the Gulf during the 1984–1988 Tanker War as part of the Iran–Iraq War. These developments contributed to the emergence of International Political Economy as a subsection of International Relations discipline (for the development of IPE as an area of study and the effects of the oil shocks of 1970s, see Hancock and Vivoda 2014). The definition of security also expanded to include first economy, which encompasses energy, and then transit security issues (Baldwin 1997; Møller 2000).

Gerald Manners used the term "geography of energy" about half a century ago to refer to "the spatial characteristics of the production, transport and consumption of energy" (Chapman 1967). Nevertheless, academic discussion of energy transit and its geopolitics was slow to emerge. During the 1970s, the discipline of geography began studying energy issues, but lacked the framework for analyzing politics and security and thus made few insights (Odell 1980; Wilbanks 1985). The definition of security in the field of international relations expanded to include "energy security" in the late 1970s, but pipeline transit issues did not attract much attention, partly because global energy transfers were by seaborne tankers. The only detailed work was on Russian oil and natural gas transit to Western Europe during the Cold War (Adamson 1985; Jentleson 1986), which focused on the issue of dependence on a single energy source and supplier rather than pipeline security.

Pipelines, however, have a long history. First used in the 1850s to transport energy within national borders, cross-border pipelines were inaugurated in the Middle East in the 1930s–1950s. Regional politics and a preference for seaborne tankers, however, caused them to fall out of use by the 1980s, with the exception of the Kirkuk-Ceyhan Pipeline between Iraq and Turkey (Bowlus 2013). The dissolution of the Soviet Union then led to a scramble to build cross-border pipelines from the landlocked Caspian Basin and Central Asia to Europe in the 1990s. In this context, Lawal (2001, p. 94) studied the "new and rapidly increasing role of pipelines in transport geography," while political scientist Paul Stevens analyzed the performance of Arab cross-border pipelines and outlined factors shaping them across the globe (Stevens 2000, 2008). While the Caspian competition generated increased interest from an international relations perspective (Alam 2002; Aydın 2004; Bahgat 2005; Winrow 2007), sustained academic attention emerged only following the natural gas disputes between Russia and Ukraine in 2006 and 2009, which disrupted supplies to Europe (Lehmann 2017). International organizations and investment agencies also recognized the importance of geopolitics in energy-transit security thereafter (UNDP and World Bank 2003; European Commission 2014; Grubliauskas 2014; Energy Charter Secretariat 2015), but geographers still do not (Pasqualetti 2011).

The drive to use cleaner energies that can arrest the pace of global warming is now precipitating "changes in production, trade and transit, supply chain and

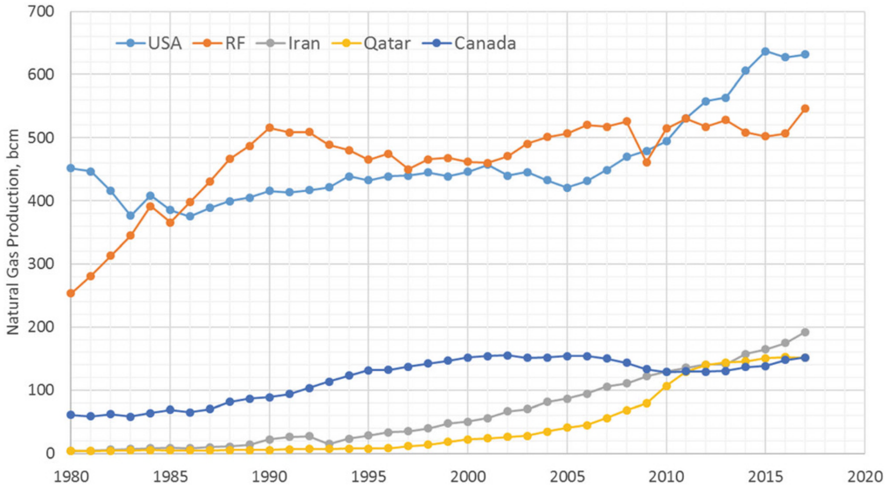


**Fig. 1** Main producers of natural gas (Data is from BP Statistical Review of World Energy 2018, https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf)

processing, and consumption will create new energy geography" (Scholl and Westphal 2017, p. 9). Amidst these changes, natural gas, as the cleanest fossil fuel, offers an interim solution to move from a fossil fuel-dominated energy system to a more sustainable one, but the growth in gas demand will increase the geopolitical competition to control resources and transit routes. The USA has led world gas production growth since 2005 (Fig. 1), reaching 511.1 billion cubic meters (bcm) in 2005 and 734.5 bcm in 2017 thanks to the shale gas revolution. Russian production, meanwhile, has remained relatively flat since 1990. The combined gas output from Iran, Qatar, and Canada roughly equals that of Russia.

Besides pipeline exports to Mexico and Canada, the USA relies on seaborne tankers to ship liquefied natural gas (LNG) around the world, whose safe transit is assured by the US navy. Russia is in the early stages of exporting LNG, but it will rely on pipelines for the lion's share of its gas exports to Europe and to China, if the Power of Siberia gas pipeline comes online in 2019 as expected.

Pipelines remain the most reliable, easy-to-secure, and economic means of transporting large volumes of gas (and oil) (Luten 1971; Leal-Arcas et al. 2015). Yet cross-border pipelines are also capital-intensive projects with high operational costs and they are exposed to complex political, environmental, commercial, and legal aspects (Leal-Arcas et al. 2015). Although gas pipelines are "poorly understood and the least appreciated mode of transport" by the general public, as they are "most often underground and invisible," they are vitally important to the economies and energy security of most nations (Liu 2003, p. 9; Di Castri 2014, p. 2).

In this chapter, we examine contemporary geopolitics and the security of energy transit by pipeline, focusing on the transit of gas to Europe as a case study. In recent decades, policymakers in Europe have come to believe that commercial factors drive gas markets and that by making Europe a more free market, the continent's dependence on Russian gas can be mitigated. New LNG supplies from the USA and its allies, moreover, can increasingly substitute for pipeline gas from Russia. This outlook, however, ignores the risk of geopolitics undermining Europe's energy-supply and energy-transit security. The role of Ukraine and Turkey in this context as essential land bridges across which Russian, Caspian, Middle East and eastern Mediterranean gas can transit is fundamental, and demands that EU policymakers prioritize geopolitics in shaping energy-security strategy.

This chapter first provides a framework for understanding energy security as it pertains to transit and then a brief historical and geographic overview of natural gas transit. It moves on to analyze European strategies for gas-supply security in the context of Ukraine and Turkey. It concludes by arguing that securing gas imports by pipeline will require a deeper appreciation of the geopolitics of transit and that consumers should not assess projects solely on market considerations. The dynamics of both geopolitics and gas-transit security have changed dramatically and require policymakers to consider novel approaches.

## 2 Energy-Transit Security

The concept of energy security has been an important topic in the fields of science and politics since the beginning of the twentieth century, when the transition from coal to oil began (Ediger and Bowlus 2019). Winston Churchill identified the diversity of oil suppliers and supply lanes as the main concern of his oil strategy as articulated to the British Parliament in 1913 (e.g., Yergin 2006; Luft and Korin 2009; Ediger and Bowlus 2019). Since this time, consumers have sought to avoid depending on a single market and/or fuel type. Moreover, "since economic and military power depended on oil-supply security, Western governments took military and hence security-related decisions to address this concern" (Ediger and Bowlus 2019). Based on a review of the secondary literature on security, Winzer (2012, p. 41) found that the common element among definitions of energy security is the absence of protection from or adaptability to threats that are caused by or have an impact on the energy-supply chain.

However, while "security" in traditional international relations literature refers to an essentially political aspect of security, i.e., the absence of an "existential threat to survival of a state" (Buzan et al. 1998, pp. 21–23), it has in time expanded to cover economic, societal, and environmental aspects (Møller 2000, pp. 7–13). In this sense, security came to encapsulate a wider meaning in terms of the "absence of threats" (Baldwin 1997) or even sometimes the "absence of fear" (Wolfers 1962).

The most commonly used definition of energy security is the one made by the International Energy Agency (IEA): "the uninterrupted availability of energy sources at an affordable price."[1] According to the IEA, energy security has many dimensions, such as long-term energy security, dealing mainly with timely investments, and short-term energy security, which focuses on whether the energy system can react promptly to sudden changes within the supply-demand balance. According to this definition, energy security has long been considered synonymous with supply security (Winzer 2011), especially in the oil import-dependent developed world after the oil crises of the 1970s (e.g., Austvik 2016). Still, the definition of energy security is "notorious for its vague and slippery nature" (Isbell 2007, p. 3) because "it is polysemic in nature" (Chester 2010, p. 893), essentially covering the so-called four "As"—i.e., availability, accessibility, affordability, and acceptability (Cherp and Jewell 2014). The definitions are also either "so narrow that they tell us little about comprehensive energy challenges" or "so broad that they lack precision and coherence" (Sovacool and Brown 2009, p. 5). In other words, it has different meanings in different countries and contexts, depending on development levels, economies, administrative systems, energy systems, investment capacities, legal and administrative systems, rates of demand increase, and levels of dependence on foreign sources, natural resources, geography, etc. (Yergin 2006; Isbell 2007; Chester 2010). The definition of energy security, therefore, can only become more operational when it is formulated for "a specific source and country" (Yafimava 2011, p. 14).

The last decade has witnessed considerable changes in the global energy system that have made governments more influential over energy geopolitics. For instance, China's unique government-to-government energy deals have disrupted the international liberal market and endangered the energy security of all nations (Victor and Yueh 2010). Changes in international political economy, therefore, require changes in how we define energy security (Sovacool 2012). As Yergin (2006, p. 69) argued, "the subject [of energy security] now needs to be rethought, for what has been the paradigm of energy security for the past three decades is too limited and must be expanded to include many new factors." He (p. 69–71) proposed the term "demand security" for energy-exporting countries, which seek to guarantee demand for their products because energy exports generate an overwhelming share of their government revenues. This definition covers the large producers in OPEC and Russia (Victor and Yueh 2010).

Most recently, Scholl and Westphal (2017) noted that energy security needs to be reimagined in the light of changes related to the low-carbon energy transition and energy geographies. New priorities are arresting global warming and air pollution, while ensuring economic growth and energy affordability, but the question remains: "Can the world have secure, reliable, and affordable supplies of energy while also transitioning to a low-carbon energy system?" (Sovacool 2012, p. 52 and references therein). According to him, even though the 1970s oil crises shifted consumption to non-fossil fuel sources, most countries are more energy-insecure than ever before.

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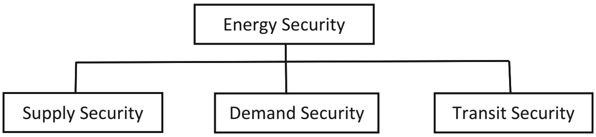
[1] https://www.iea.org/topics/energysecurity/whatisenergysecurity/

**Fig. 2** Energy Security




The natural gas dispute between Russia and Ukraine, first in 2006, then more prominently in 2009, again in 2012, and ongoing since 2014, opened a new era in energy security studies. Terms such as "transit state" (e.g., Sharples 2012; Calvert 2016), "transit country" (e.g., Wigen 2012; Weiner 2016), "transiter" (e.g., Sharples 2012), "transit route" (e.g., Wigen 2012), "energy-transit corridor" (e.g., Bilgin 2010; Wigen 2012; Weiner 2016), "energy-transit diversification" (e.g., Pirani et al. 2014), and "energy-transit system" (Leal-Arcas 2015), etc. began to be used more frequently. Yafimava (2011, p. 12, 17) further defined "gas transit security" as "the acceptable level of threat of supply and price disruption arising from risks associated with the transit of gas supplies." However, the Energy Charter (2015, p. 17) argued: "this is part of energy security of supply" and "it might be reasonable to say that there is no clear concept of energy transit security yet." European gas-supply security, meanwhile, continues to depend on a highly volatile political relationship between Russia and Ukraine (Graaf and Colgan 2017), with Turkey serving as an alternative for gas transit from the eastern Mediterranean, Caspian, Central Asia, and all-important Middle East (Wigen 2012).

In this study, we propose "energy-transit security" to be one of three important aspects of energy security alongside "energy-supply security" and "energy-demand security" (Fig. 2). In the transportation sector, "transit security" generally means security (e.g., Burges 2013), but in the energy sector, it also pertains to "freedom of energy transit" (Selivanova 2012, p. 397), being free from "terrorist attacks or navigation accidents in the oil industry that might block tanker passage" (Henry et al. 2012, p. 3), or from "terrorist attacks on energy infrastructure and facilities" (Weiss et al. 2012, p. 34). Francés (2011, p. 54) highlighted that the "security of energy supply not only has an objective dimension in terms of dependence, vulnerability, and connectivity, but also depends largely on relations between consumers, producers and transit countries." Energy-transit security in this article is similar to "gas-transit security," as discussed by Özdemir et al. (2015, p. 97), and "transit security," as discussed by Offenberg (2016, p. 1) and Scholl and Westphal (2017, p. 6).

We define energy-transit security as "maintaining a continuous flow of contracted amount of energy from producing to consuming countries in a reliable and sustainable manner." Within this framework, energy security is "uninterruptedly maintaining energy supply, demand, and transit in adequate quantity and quality at reasonable costs/prices in an environmentally friendly manner for sustainable energy production, consumption, and transportation" (see also Ediger 2007, 2011a, b).

Pipeline security occupies a special place within the concept of energy-transit security. As stationary objects with well-known routes, pipelines and their connected pumps and other related infrastructure are particularly vulnerable to terrorist attracts and criminal violations. Not only do political insecurities and terrorist activities along the route heighten security risks, but various cases of criminal operations, such as tapping into a laid pipeline with intent to steal the transported resource, also carry the risk of damaging pipelines. Even environmental groups pose a threat to the flow of hydrocarbons through pipelines. Therefore the term "critical infrastructure security,"[2] referring to prevention of serious incidents involving airports, highways, railroads hospitals, bridges, transport hubs, network communications, electricity grid, dams, power plants, seaports, oil refineries, and water systems nationally, could be extended to cross-border pipelines and related structures.

Moreover, as fixed structures, it is difficult to create alternatives to pipelines, especially if the transited resources are landlocked. As a result, cross-border pipelines can become a source of political bargaining, threat, and pressure, if the relationship between producer, transit, and consumer countries sours. With few exceptions, international regulations and thus enforcement stipulations govern choke points in and around international straits or canals. Seaborne tankers, moreover, can be re-routed (the same could be argued for much of road and railroad-based routes), whereas pipelines, once laid down, cannot. This creates, to say the least, economic and political vulnerabilities and can become a security issue.

Critical infrastructure including pipelines are also vulnerable to various cyber threats (Dancy and Dancy 2017), as seen by the *Stuxnet* worm attack on Iranian nuclear facilities that first appeared in 2010 and reportedly caused substantial damage to Iran's nuclear centrifuges (Zetter 2014). On a cross-border level, the Baku-Tbilisi-Ceyhan pipeline, which is heavily protected against physical terrorist attacks as it passes through security-sensitive areas in Georgia and Turkey, was blown up in 2008 due by a cyberattack, causing over 30,000 barrels of oil to be lost to spillage, more than $5 million per day in lost transport tariffs for Turkey, and almost $1 billion in lost export revenues for Azerbaijan (Dancy and Dancy 2017). In a similar case, a cyberattack in April 2018 has caused the temporary disruption of natural gas in four US natural gas pipelines (Krauss 2018). Finally, pipeline defects, corrosion, and other accidental damage present pipeline-safety problems, disrupt flows, and threaten energy-transit security.

## 3 Brief History of Oil and Gas Transit

The geopolitics of oil-transit security through pipelines can yield insights into what might happen in gas. Both hydrocarbons began as local commodities but grew into global ones quickly. Transnational pipelines from the oil-rich Middle East as well as seaborne choke points such as the Suez Canal became critical to Europe's oil-supply

[2]For an example of how states define and ensure their national critical infrastructure security, see the webpage of the US Department of Homeland Security: https://www.dhs.gov/what-critical-infrastructure

security. In 1956, 1967, 1970–1971, and 1973–1974, problems with oil-transit caused supply disruptions in Europe.

Though Azerbaijan was the world's first oil-producing region in the 1840s (Aliyev 1998), the oil industry, as we know, began in Pennsylvania in 1859 with the application of modern drilling techniques. From the beginning, transit limitations restricted the industry's growth, as drillers used oak barrels to deliver crude to refineries by horse and barge (Waldman 2017) until the first pipelines were built in 1862 (Waldman 2017). These early pipelines were built to transport oil short distances on land to refineries or coastal ports. For long distances, seaborne tankers were the only option, and oil shipment started across the Atlantic with the Elizabeth Watt in 1861 (Lawal 2001). Later, newly developed welding technology made leak-proof, high-pressure, large-diameter, seamless-steel pipelines possible (Liu 2003). With the application of rotary drilling techniques in 1901 and rolling cutter rock bit in 1909, oil production and refining progressed rapidly, especially after the introduction of high-pressure injection in 1913 and catalytic-cracking techniques in 1936 (Smil 2000). Major innovations in pipeline technology in the 1950s occurred alongside rising demand for oil for automobiles. Refineries began to be built near consumers rather than producers (Lawal 2001). Larger tankers were designed in the 1950s and 1960s as well as larger, longer pipelines, which allowed producers to meet consumer demand (Luten 1971). The movement of refrigerated natural gas by tankers, LNG, was also developed (Luten 1971; Smil 2000).

The USA had the longest pipeline network with 434,000 km in 1955 and 687,540 km in 1980, while the Soviet Union had the second longest with 144,000 km in 1983 (Lawal 2001). The Soviets, however, also built the *Druzbha* (Friendship) Pipeline in 1964, the world's longest oil pipeline (4000 km) to carry Soviet oil to Eastern Europe (Lawal 2001). The Druzbha system grew with the construction of parallel lines in the 1970s. Meanwhile, the competition between tankers and pipelines intensified as a result of political issues in the Middle East from the 1950s to 1970s (Bowlus 2013). Thus, tanker sizes doubled, and pipeline diameters grew to more than 50 cm in the 1980s (Smil 2000).

In the past, natural gas was often produced alongside oil by using similar technologies, but it was consumed locally, re-injected into oil fields to increase pressure, or flared (Siddayao 1997). It was introduced to world markets as a consumable energy resource much later than oil. While the USA was the first to use gas economically after World War II (Samsam Bakhtiari and Shahbudaghlou 1998), natural gas demand increased with the adoption of aircraft-derived turbines in power generation in the 1990s, creating a synergy between gas and the power sector (Jonchère 2001).

This new "power-generation revolution" coincided with the dissolution of the Soviet Union in 1991 and the opening of the Caspian basin to global producers (Aydın 2001). At this time, Russia was only exporting roughly 20% of its gas, of which 75% went through pipelines (Smil 2000). Most major pipelines were constructed either during or after World War II (Liu 2003) and most of the East-West gas trade was based on investments made during the Cold War (Austvik 2016). The largest and longest of the gas pipelines, 1.4 m in diameter and 4500 km in length, was built by the Soviet Union in 1981–1982 to carry Siberian gas to Western Europe (Smil 2000). The geographic spread of this Trans-Siberian Pipeline, a.k.a. Bratstvo (*Brotherhood*) pipeline, also had "a symbolic role in the spatial reproduction and 'rolling out' of Soviet power across Eastern and Central Europe" (Bouzarovski 2009, p. 455).

## 4 World Natural Gas Geography

Fossil fuels have dominated the global energy system since 1881, when the share of coal (49.6%) and oil (0.9%) exceeded wood in the total energy mix (Ediger 2011a, b). The share of fossil fuels, including gas, reached a high of 89.4% in 1973 and decreased, with some fluctuation, to 85.1% in 2017.

Among fossil fuels, hydrocarbons have dominated coal since 1959. Global hydrocarbon production slightly more than tripled during the last half century, from 2444.6 Mtoe in 1967 to 7777.8 Mtoe in 2017, but its share of total primary energy consumption declined from 66.4% 1973 to 57.6% in 2017 because of greater use of nuclear and renewable energies. During this period, oil lost 14.5% (from 48.7% to 34.2%), but gas gained 5.0% (from 18.4% to 23.4%). Also, the share of oil and gas within hydrocarbons was 72% and 28%, respectively, in 1973, and 59.4% and 40.6% in 2017. By applying simple linear regression analysis to past trends, oil and gas curves will cross around 2030.

Hydrocarbons have uneven distribution in reserves, production, and consumption (Table 1), which requires them to be traded internationally. In 2017, 61.7% of the 7108.6 Mtoe of the hydrocarbons produced were traded, 77% of which was oil and 27% gas. In 2017, 92,649 billion barrels of oil per day (bbopd) were produced and 67,592 bbopd exported, roughly 73% of the total. This share was 41.5% during the

**Table 1** Five major players in the oil and gas industry, 2017[a]

| | Oil | | | Natural Gas | | |
|---|---|---|---|---|---|---|
| Rank | Reserve | Production | Consumption | Reserve | Production | Consumption |
| 1 | Venezuela (17.9%) | USA (14.1%) | USA (19.8%) | Russia (18.1%) | USA (20.0%) | USA (20.1%) |
| 2 | S. Arabia (15.7%) | S. Arabia (12.9%) | EU (13.4%) | Iran (17.2%) | Russia (17.3%) | EU (12.7%) |
| 3 | Canada (10.0%) | Russia (12.2%) | China (13.2%) | Qatar (12.9%) | Iran (6.1%) | Russia (11.6%) |
| 4 | Iran (9.3%) | Iran (5.4%) | India (4.8%) | Turkmenistan (10.1%) | Qatar (4.8%) | China (6.6%) |
| 5 | Iraq (8.8%) | Canada (5.2%) | Japan (4.1%) | USA (4.5%) | Canada (4.8%) | Iran (5.8%) |
| Total | 61.7% | 49.8% | 55.3% | 62.8% | 53.0% | 56.8% |

[a]Data is from BP Statistical Review of World Energy 2018, https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf

**Table 2** Hydrocarbon net exports (export-import) of the major regions[a]

| MToe | Oil | Natural Gas | Hydrocarbons | |
|---|---|---|---|---|
| Middle East | 1106.0 | 101.6 | 1207.6 |  |
| Commonwealth of Independent States | 487.0 | 203.2 | 690.2 | |
| Africa | 218.7 | 72.9 | 291.6 | |
| South & Central America | 71.6 | 4.7 | 76.3 | |
| North America | −64.3 | 7.1 | −57.2 | |
| Europe | −535.0 | −247.8 | −782.8 | |
| Asia-Pacific | −1284.0 | −141.7 | −1425.7 | |

[a]Data is from BP Statistical Review of World Energy 2018, https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf

**Table 3** Gas flows by pipeline and as LNG

| Pipeline | | | | LNG | | | |
|---|---|---|---|---|---|---|---|
| Exporters | | Importers | | Exporters | | Importers | |
| Russia | 29.1% | Germany | 12.8% | Qatar | 26.3% | Japan | 29.0% |
| Norway | 14.7% | USA | 10.9% | Australia | 19.3% | China | 13.3% |
| Canada | 10.9% | Italy | 7.3% | Indonesia | 5.5% | S. Korea | 13.0% |
| Total Traded Volume: 740.7 bcm | | | | Total Traded Volume: 393.4 bcm | | | |

oil price collapse in 1986 and has been growing. On the other hand, only 30.5% of the 3551.6 bcm of gas produced was traded in 2017. This share has also been growing.

The major hydrocarbon exporting and importing regions are shown in Table 2. The major transit of hydrocarbons occurs: (1) from the Middle East to Asia Pacific, (2) from CIS to Europe, and (3) from South and Central America to North America. Oil and gas trade is usually made from neighboring countries by pipeline and from distant countries by tankers.

Similarly, pipelines or seaborne tankers transit gas (Table 3). In 2017, the total traded volume of gas was 1134.1 bcm, of which 62.1% was by pipelines (740.7 bcm) and 37.9% was LNG (393.4 bcm).

Europe imported 423.4 bcm of pipeline gas in 2017, which constituted 57.2% of the total pipeline gas trade. It met 47.3% of its gas demand from the neighboring countries (Norway 25.8%, Netherlands 10.2%, UK 2.6%, and other European countries 3.3%) and the rest from Russia (50.9%), Algeria (7.8%), Iran (2.1%), Azerbaijan (2.0%), and Libya (1.0%). North America imported 19.8% of the total traded pipeline gas. The USA imported 80.7 bcm (10.9%) from Canada, and exported 42.1 (5.7%) to Mexico and 24.0 bcm (3.2%) to Canada. The Asia-Pacific region imported 8.4% of total pipeline gas trade, with volumes coming largely from Turkmenistan (50.4%), Myanmar (18.2%), and Indonesia (12.7%). By volume, the largest importers were China with 39.4 bcm, Singapore 8.9 bcm, Thailand 8.2 bcm, Australia 5.8 bcm, and Malaysia 0.7 bcm. On the other hand, 393.4 bcm of the traded gas in 2017 was LNG, of which 72.1% was imported by Asia-Pacific (283.5 bcm).

Of this amount, 26.7% came from Australia, 24.5% from Qatar, 12.7% from Malaysia, 7.5% from Indonesia, and 5.4% from Russia. Japan was the largest LNG importer at 113.9 bcm, followed by China (52.6 bcm), South Korea (51.3 bcm), and India (25.7 bcm).

## 5 Pan-European Geo-Energy Space

The European Union consumed 1689.2 Mtoe of primary energy in 2017, constituting 12.5% of the world's energy consumption (BP 2018), third after China (3132 Mtoe) and the USA (2235 Mtoe). Its energy mix is composed of 75.9% fossil fuels (38.2% oil, 23.8% natural gas, and 13.9% coal), 11.1% nuclear, 4.0% hydro, and 9.0% other renewables. On the other hand, the EU's primary energy production (PEP) was only 709.4 Mtoe, of which 26.5% is nuclear, 21.5% renewables, 18.4% coal, 14.3% gas, 9.6% hydro, and 9.8% oil. Europe's PEP has been decreasing since 1996, while its primary energy consumption (PEC) has been decreasing only for the last decade. As a result, Europe's production as a share of its consumption has stabilized between 43% and 44% (Fig. 3). From 2006 to 2017, the EU's PEC decreased 10.2% from 1830 Mtoe to 1689.2 Mtoe, but its PEP decreased 13.3% from 825 Mtoe to 709.4 Mtoe. Domestic PEP met only 42.0% of the EU's demand, making the EU the largest net importer of primary energy in the world

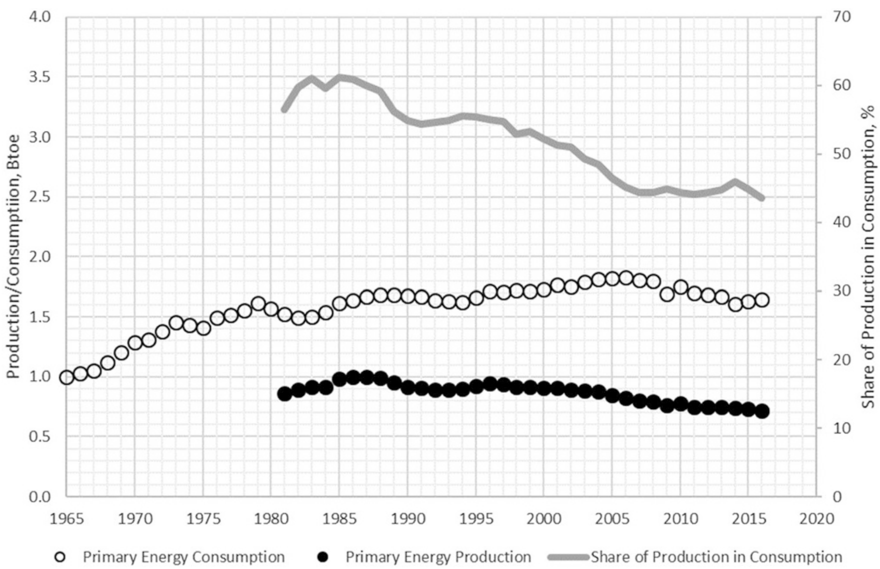



**Fig. 3** EU primary energy production, consumption, and shares (Data from BP, 2017) (Data is from BP Statistical Review of World Energy 2018, https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf)

(Eurostat 2018). The energy dependency rate of the EU-28 has also, it should be noted, exceeded 50.0% since 2004.

This situation is partly attributable to the exhaustion of domestic supplies (in the case of gas, the Netherlands) and producers considering the exploitation of limited resources uneconomical (Eurostat 2018). The EU external energy bill represented more than €1 billion per day in 2015 (around €400 billion in 2013) and more than a fifth of total EU imports. The EU imported more than €300 billion of its crude oil and oil products, of which one-third was from Russia. These figures suggest that the EU's import dependency will not decrease, and may well increase, in the near future (Eurostat 2018).

Nearly 80% of the EU's hydrocarbon imports are from its neighbors, Russia and Norway. Russia was still the main supplier of gas with a share of 40.6% of the total in the first quarter of 2018, and of oil with 28% of the total (Eurostat 2018). From 2005 to 2018, Norway was the second-largest supplier, and its share rose during this time. The share of the EU's gas supplies from Algeria declined by half from 2005 to 2018, whereas the share from Qatar rose almost fivefold. Worse than this, 90.1% of the EU-28's gas imports in 2018 came from Russia, Norway, or Algeria (Eurostat 2018). In 2017, total natural gas imports were 1134.1 bcm (65.3% pipeline and 34.7% LNG), consisting of 30.9% of global gas consumption (BP 2018). The European Commission (2014) recognized the EU's dependency on Russian energy in its communication to the European Parliament and the Council, entitled "European Energy Security Strategy":

> The most pressing energy security of supply issue is the strong dependence from a single external supplier. This is particularly true for gas, but also applies to electricity: six member states depend on Russia as a single external supplier for their entire gas imports and three of them use natural gas for more than a quarter of their total energy needs. In 2013, energy supplies from Russia accounted for 39% of EU natural gas imports or 27% of EU gas consumption; Russia exported 71% of its gas to Europe with the largest volumes to Germany and Italy.

The disruptions of gas supplies transiting through Ukraine during the winters of 2006 and 2009 brought the issue of energy-transit security sharply into focus (Leal-Arcas et al. 2015, p. 123). It was described as a "wake-up call" in the European Energy Security Strategy (European Commission 2014). Since 2009, the EU has strengthened its gas-supply security and reduced the number of countries that depend solely on Russia. It has also developed new pipeline strategies that aide oil and gas import-dependent members, especially those considered politically, economically, and socially unstable, and bypass transit countries such as Ukraine with offshore pipelines (Offenberg 2016). Russia, for its part, has tried to avoid binding agreements with the EU, cultivate bilateral relations with individual states, and improve energy relations with the EU by proposing multilateral agreements (Kononenko 2009).

The threats of energy security and the geopolitics of energy transit, however, were foreseen prior to 2006, in a 2004 report by the Clingendael International Energy Program for the Directorate-General for Mobility and Transport. The report asserted a direct relationship between the EU's security of supply and geopolitics: "the socioeconomic and political context of the system of energy supply has an impact in the degree to which oil or gas can be made available in sufficient quantities and at affordable prices" (Van der Linde 2004, p. 84). The report then studied two storylines: "M&I: Markets and Institutions" and "R&E: Regions and Empires." M&I represents "a continuation and intensification of markets (globalization) and the continued co-operation in the intra-national political and economic institutions" in the EU. R&E, on the other hand, refers to "the break-up of the world into integrated political and economic blocks with satellite regions that compete for markets and resources with other blocks." R stands for "regionalism" in the literature, while "empires" refer to a neorealist, state-security-centered competition for power (Walts 1979). The report maintained that the USA had already shifted from M&I to R&E, but that Russia and China seemed to be vacillating between the two approaches, while the EU was firmly entrenching in M&I. The EU, it argued, required a paradigm shift. Correlje and Van de Linde (2006, p. 532) concurred:

> The present world tends towards Regions and Empires and suggests that the EU may have to reorient its energy security policy. Energy policy must become an integral part of EU external trade and foreign relations and security policy. The EU should develop its own strategy, actively investing in dialogues with producer countries in the Persian Gulf and Africa and with Russia.

Mañé-Estrada (2006, p. 3781) also proposed, using the same approach, a new geographical area with a governance structure called "pan-European geo-energy space." She defined a block, by way of analogy with the classical vision of geopolitics as:

> A geographical space where a precise set of energy relationships take place, among different agents—producer states, enterprises and consumer governments—who are active within it and whose borders are wider than those of the present-day European Union—the current EuroMediterranean and the eastern EuroAsian territories.

She argued that the EU should "encourage the creation of an energy community in the wider European area, as a new way of understanding energy policies." Similarly, Francés (2011, pp. 54–55) suggested that the EU should apply the strategy of Europeanization of neighboring countries to the different energy corridors supplying Europe, but this strategy poses "serious difficulties at the political and institutional levels." In addition, bilateral agreements between producers and EU member states are usually criticized, such as the Nord Stream agreement between Germany and Russia.

Yet these studies have not changed EU energy policy because countries are most concerned about national energy interests and perceptions of Russia's motivations in bilateral relationships (Austvik 2016). Some Central and Eastern European states perceive energy security a priority for the EU's common foreign and security policy, but most prefer the M&I approach. In 2011, Jerzy Buzek, former President of the European Parliament, and Jacques Delors, former Commission President, criticized the excessive focus on the regulatory issues and called for a "politicization of EU energy policy." They proposed creating a European Energy Community with a stronger emphasis on the challenges of supply security (Buzek 2011). Nevertheless, neither the Commission nor its member states showed much interest (Austvik 2016).

Later, in 2014, former Prime Minister of Poland and later EU President, Donald Tusk proposed creating an Energy Union "to strengthen policy and expand goals and measures to meet security-of-gas supply concerns" (Austvik 2016, p. 372). Tusk argued that climate and environmental policy received too much attention in the EU's energy policy. Finally, Scholl and Westphal (2017, p. 9) noted that "infra-structure, the physical framework for energy regions, is rapidly developing and changing the energy landscape, requiring the EU to (re) position and adapt to new topographies and (potentially) an increasingly heterogeneous and competitive energy environment."

## 6 Two Main Energy-Transit Countries

The Middle East is the most important region for seaborne transit of gas because of its location between Europe, Africa, and Asia (Mills 2016). Ukraine and Turkey, on the other hand, are the two most important transit countries for natural gas pipelines coming from the eastern producing regions—the Caspian Basin, Russia, and the Middle East—to Europe (e.g., Raszewski 2013; Aktürk 2008; Leal-Arcas et al. 2015; Pirani et al. 2014; Scholl and Westphal 2017).

### *6.1 Ukraine*

Ukraine has been the historic node for the transit of Russian oil and gas to Europe, beginning in 1964 with the Druzhba oil pipeline. Thereafter, three major gas pipelines (Brotherhood, Soyuz, and Trans-Balkan) were constructed through Ukraine, making it essential to the Soviet Union's energy-demand and energy-transit security by the 1980s (Högselius 2012). The dissolution of the Soviet Union did not imperil these flows, even if gas production in Russia slacked during the 1990s. For a number of domestic political reasons, however, Ukraine began building ties with its non-Russian neighbors (Balmaceda 1998). Then, when Putin assumed power in 2000, it became clear that he would reassert Russia's dominance over its former satellite (Smolansky 2004). Russia had, in fact, already begun to strengthen its position in 1999 with the completion of the Yamal-Europe gas pipeline through Belarus, which bypassed Ukraine. The success of Russia's strategy to diversify its transit options was clear in the early 2000s (Hirschhausen et al. 2005) and laid the foundations for the strategies it would execute following the 2004–2005 Orange Revolution in Ukraine.

Russia's "loss" of Ukraine motivated it to reveal "Ukraine's unreliability and/or inability to provide for secure transit" (Westphal 2009, p. 12) and to build new pipelines—Nord Stream and South Stream—to diversify its pipeline exports to

Europe, its primary market (Henderson 2016). The EU and the USA began to devise ways to reduce Europe's dependence on Russian pipeline gas after 2006, but concrete action was not taken (Cohen 2006) until the 2009 disruption, which galvanized Europe to diversify its suppliers, reduce its demand, and introduce legislation, including the Third Energy Package in 2011, all to curtail Russia's dominant position and create a competitive marketplace (Kovacevic 2009; Henderson 2016). Russia, meanwhile, completed the Nord Stream pipeline by 2011, which could transit 30% of its European-bound imports. Both the EU and Russia have, then, partially addressed their common energy-transit problem in Ukraine, but the disruption of supplies during the run-up to presidential elections in Russia in February 2012 revealed that the problem was far from solved (Henderson and Heather 2012).

The outbreak of political and military conflict in Ukraine in 2014 only intensified EU concern about Russian gas. Meanwhile, the Third Energy Package has put the EU in a stronger position to negotiate its terms with Russia, as has the global surge in LNG supplies (Skalamera 2015). It succeeded in forcing Russia to redirect South Stream through Turkey, lest Russia allow third-party access. Since 2012, Russia has also been working to construct a second, parallel pipeline to Nord Stream, which would double the total capacity of the system from 55 bcma to 110 bcma. Germany started its own construction of the pipeline in May 2018 (EUObserver, 4 May 2018). Nord Stream II has divided Europe between the German-led M&I approach and the Central and Eastern European-favored R&E approach. The former sees more pipelines from Russia as a diversification of routes that enhances the EU's energy security, particularly as market mechanisms prevent Russia from monopolizing the use of any new pipelines. The latter, however, argues that more pipelines will only increase the overall volume of Russian gas in Europe and Russia's geopolitical leverage over the continent.

## *6.2 Turkey*

Turkey has steadily grown as a transit country for Middle East, Caucasian, and possibly eastern Mediterranean hydrocarbons heading to Europe, especially after the Caspian rush of the 1990s (Ruseckas 2000). Its cross-border transit pipelines to Europe now include the Kirkuk-Ceyhan pipeline (Iraqi oil), the Baku-Tbilisi-Ceyhan pipeline (Azeri oil), Baku-Tbilisi-Erzurum pipeline (Azeri gas), and the Trans-Anatolian pipeline or TANAP (Azeri gas) (Akdemir 2011). The first leg of the Turk Stream pipeline (Russian gas) was completed in November 2018, with first gas is expected in late 2019. It is unclear whether Turk Stream will transit Russian gas to southeastern Europe in the future and compete with TANAP.

Turkey is eager to expand its transit profile to increase its geopolitical prestige and earn transit fee revenues. Due to the highly concentrated nature of Turkey's suppliers of oil and gas from Middle East countries and Russia, respectively, Turkey would benefit from diversifying its source base from both pipelines and LNG (Arslan-

Ayaydin and Khagleeva 2014). As also correctly indicated by Pamir (2009, p. 260), "although Turkey's geography offers a very advantageous and unique potential to make it an energy bridge, energy policy errors over the last decades have limited this potential to a certain extent."

For nearly a decade, Turkey has talked of becoming an energy hub, for which it is geographically well suited, but lacks the requisite free market ethos, legal protections, and liquidity of supply (Roberts 2010). Turkey seeks to "exercise influence based on its strategic geopolitical position between an energy-hungry Europe and energy-rich regions to the east and south" (Scholl and Westphal 2017, p. 14). This requires a challenging, delicate set of compromises in Turkey's domestic and foreign affairs, not least because its gas demand has grown steadily over time. Unfortunately, neither the Strategic Plan (2010–2014) of the Ministry of Energy and Natural Resources (MENR 2014), nor the Ministry of Foreign Affairs (2014) and BOTAŞ, the state-owned oil and gas company, consider gas-transit security as factor in their strategies (Energy Charter 2015). Comments by the Minister of Energy in 2017 raised concerns of supply diversification and advocated the contradictory goals of switching from gas to coal and renewables, but also becoming a natural gas trading center (Rzayeva 2018). These goals are unattainable and at odds unless Turkey considers gas-transit security.

The EU understands Turkey's importance as a transit country but is weary of its volatile internal politics and those of its neighbors, notably in the Caucasus, Ukraine, Iraq, and Syria. The country's geography is suitable for gas transit to Europe, but the problem remains that the EU wants to implement energy *acquis* in supplier and transit countries via the Energy Community (Offenberg 2016). Although Turkey is not an Energy Community Contracting Party (Weiner 2016), Mañé-Estrada (2006, p. 3784) contends that within the hypothetical pan-European geo-energy space, Turkey is "the most valuable instrument of energy policy" because of its geography and the gas sector's importance, even if others doubt whether or not Turkey belongs to the same geopolitical space as the EU.

Russia has been cultivating Turkey as a partner in energy cooperation for some time, although it has historically been a Russian competitor for transporting gas to Europe (Kardaş 2012). TANAP can also become a conduit for gas from several other countries, most notably northern Iraq. Russia's annexation of Crimea in 2014 and the subsequent Western sanctions reinforced Turkey's position as a transit competitor to Russia (Tagliapietra 2014). However, after nine months of unforeseen difficulty in Russian–Turkish relations due to Turkey's shooting down of a Russian fighter for violating Turkish airspace over the Turkey–Syria border, Russia shifted its southern strategy in 2016, mended Turkish–Russian relations, and as a result of barriers created by EU regulations on South Stream, abandoned the pipeline and replaced it with Turk Stream to bypass Ukraine (Weiner 2016). By doing so, Russia drew Turkey into its orbit of gas-export pipelines to Europe and deepened Turkey's own dependence on Russian gas—Turkey's reliance on Russian gas is second only to Germany—and diminished its capacity to compete and offer diversified routes and sources of gas for Europe.

Turkey is now balancing its gas-transit policy among three strategies: aiding Russian gas flows to Europe through Turk Stream, growing LNG supplies from the USA and its allies, and serving as a transit state for new cross-border pipelines from the Levant, Persian Gulf, and Caspian to compete with Russia (Austvik and Rzayeva 2017). The primary factors shaping these strategies are geopolitical, not commercial: stabilizing Syria and Iraq, improving relations between Israel and its neighbors as well as Turkey, solving the Cyprus dispute in the Eastern Mediterranean, and navigating relations with Russia and the USA, among others.

## 7 Discussions and Conclusions

Energy markets change rapidly, and developments currently shaping the global availability and consumption of natural gas are wide-ranging. None is more important than the growth in global gas supplies from the USA and its allies including Australia, Canada, and Qatar, which will need to be transported by seaborne tankers as LNG over choke points and sea routes protected by the US navy. These supplies portend that Europe will increasingly substitute LNG for Russian pipeline gas while it transitions away from fossil fuels.

In addition to ample new supplies, there are reasons to believe that commercial factors will drive the construction and smooth operation of gas pipelines going forward, not least because both producers and consumers are committed to their success. This common reliance, or interdependence, was critical, for instance, in forging initial gas ties between the Soviet Union and Europe during the Cold War (Högselius 2012). Grigas (2017, pp. 276–278) believes that commercial factors, backed by "American leadership and preference for free energy trade," will ascend over strategic ones due to a new, more supple and flexible market with more diversified sources that fosters an "interconnectedness and interdependence between the importing or exporting state on the one hand and the global gas market on the other."

Yet the current buyer's market in gas can quickly turn into a seller's market, even if supplies are ample. What happens when prices rise and suppliers gain leverage over the market, like they did from 2006 to 2014? LNG may seem to offer a silver bullet for pipeline-dependency challenges, but it will remain meaningfully more expensive than pipeline gas. Cheap prices since 2014 have been a windfall for LNG's growth worldwide, but these could well rise again in light of the expected increase in demand.

More importantly, interdependence can cut both ways. If market forces ascend, interconnectedness will become less powerful. Fewer bilateral relationships will be underpinned by massive investments in gas-transit infrastructure, upon which the supplier relies for its gas-demand security and the consumer for its gas-supply security. This dynamic could produce more geopolitical volatility (Shaffer 2011). A more diverse set of transit routes can, moreover, undermine single routes that are functioning well. Transit states have incentives not to disrupt the flow of gas through pipelines because they gain foreign direct investment, transit fees, and gas-supply security if they are an off-taker from the pipeline (Stevens 2008), but they can still disrupt pipelines for political reasons. In general, the more pipeline options there are, the greater the possibility of a disruption in one of them. As we saw in Ukraine, and can envision in Turkey, an energy crossroads can become a roadblock.

North America has a certain interdependent logic undergirded by geography and the North American Free Trade Agreement. It also lacks geopolitical volatility. In this context, the M&I strategy for managing growing volumes of gas trade is suitable. But the rest of the world will need more cross-border pipelines to bring gas from and through geopolitically volatile parts of the world if gas is to grow and meet the needs of the low-carbon energy transition. Gas-transit security will therefore require close attention to geopolitics and policymakers to embrace the R&E strategy. Producers and consumers of gas alike must increasingly look to gas-transit security to protect their economic futures.

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