

Patterns and Risks of Oil and Gas Supply in the Belt and Road Region

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How to cite this paper: Yan, S. G., & Zhang, Z. K. (2024). Patterns and Risks of Oil and Gas Supply in the Belt and Road Region. *Open Journal of Social Sciences*, 12, 668-679.

<https://doi.org/10.4236/jss.2024.124045>

Received: March 19, 2024

Accepted: April 27, 2024

Published: April 30, 2024

Abstract

The Belt and Road Initiative (BRI) region covers the core of the energy economies of the world, connecting the major oil and gas resource consumption markets of the world and playing an important role in realizing global energy security. The paper analyzes the oil and gas supply pattern and states main risks and challenges of oil and gas supply in the BRI region, which include geopolitical conflict, non-traditional security factors and energy market volatility. Finally, the paper puts forward countermeasures and suggestions to improve the security of oil and gas supply in the BRI region, which could be summarized in promoting a New regional oil and gas governance, building a safe and resilient oil and gas supply network, and accelerating the financial markets development for oil and gas energy.

Keywords

Pattern, Risk, Oil and Gas Supply, Belt and Road

1. Introduction

The Belt and Road Initiative (BRI) is an international economic cooperation initiative that focuses on infrastructure development, strengthens all-round connectivity, and creates new drivers for world economic growth and a new platform for international economic cooperation (Chen et al., 2017; Harlan, 2021). The BRI region covers the Asian, European, Latin American, and African continents, including not only countries and region rich in oil and gas resources, such as Russia, West Asia and Central Asia, but also involving important global energy consumption countries, such as China, Indonesia, India and Russia. In 2020, the Belt and Road region had 138.9 billion tons of oil reserves, accounting for 59.2% of the global oil reserves, and 147.9 trillion cubic meters of natural gas, accounting for 78.6% of the global natural gas reserves (BP, 2021). The Belt and

Road (B&R) countries cover the core of the energy economies of the world, connecting the major oil and gas resource consumption markets of the world and playing an important role in realizing global energy security.

In the 21st century, international energy competition is becoming increasingly fierce, and the fluctuation of the global oil and gas energy market pattern has intensified. The BRI region connects global oil and gas energy consumption markets and plays an important role in realizing energy security, promoting energy transition and addressing global climate change. The outbreak of COVID-19 pandemic in 2020 triggered a deep adjustment in global energy markets, with the epidemic disrupting supply chains in energy-producing countries. In 2022, the Russia-Ukraine conflict led to the geopolitical conflict among Europe and Russia. The fierce conflict between Palestine and Israel broke out in October 2023 and affected the Middle East geopolitics, which led to the new challenge of oil and gas supply in the BRI region. This paper analyzed the situation of oil and gas supply in the BRI region. Following that, the paper stated main risks of oil and gas supply in the BRI region, which including geopolitical conflict, non-traditional security factors and energy market volatility. Finally, the paper put forward countermeasures and suggestions to improve the security of oil and gas supply in the BRI region.

2. Supply Situation of Oil and Gas Resources in the BRI Region

2.1. Oil Supply Pattern in the BRI Region

The countries along the “Belt and Road” have abundant reserves of oil resources. The oil production of the BRI region is mainly localized in the Middle East and the Commonwealth of Independent States (CIS), and occupies an important position in the global oil supply market. **Figure 1** shows the oil supply pattern of BRI region from 2015-2022, and the data is calculated from Statistical Review of World Energy (72nd ed.) (Energy Institute, 2023). As shown the figure, the oil supply of BRI region was 1356 million tons in 2018, reaching the phased peak from 2015 to 2022. The outbreak of COVID-19 has triggered a deep adjustment in the global energy market, which has disturbed the supply chains of energy producing countries (Apostolos et al., 2021). The total oil supply decreased to 1228 million tons in 2020, and achieved a decrease of 5.7 percent compared to 2019. As the Delta variant led to the intensification of the COVID pandemic in 2021, which restricted the supply chain of major oil and gas exporting countries along BRI region. The oil supply of the BRI region reached a phased depression of 1182 million tons, with the share of the global supply further declining to 57.4%. With the easing of the COVID pandemic and the sustained recovery of the global economy in 2022, the oil supply of the BRI region rebounded to reach 1291 million tons, with the share of global supply rising to 60.6%.

The oil supply of the BRI region mainly flows to three major region, including Asia-Pacific, Europe and North America. According to **Figure 1**, the crude oil supply pattern of the BRI region. The crude oil flowing to Europe and North

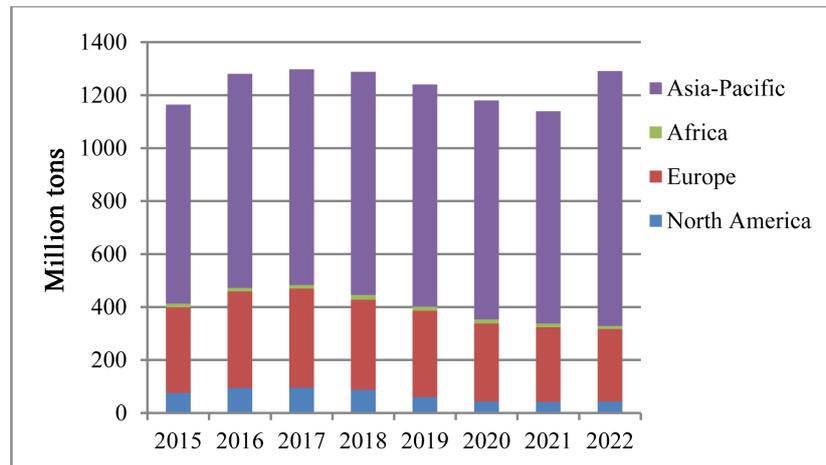


Figure 1. The crude oil supply of the BRI region.

America has shown a declining trend since 2017, while crude oil flowing to the Asia-Pacific region has shown an increasing trend. The USA's demand of crude oil from the BRI region, especially in the Middle East, showed a sharp decline. There was 76.2 million tons of crude oil was delivered to North America from the BRI region in 2015 and it peaked at 95.7 million tons in 2017. In 2017, President Trump issued "Promoting Energy Independence and Economic Growth", and increased development of fossil fuel resources as a key theme of his presidency. Since then it has declined further to 42.1 million tons in 2022, a decrease of 56% compared to 2017. The European Commission (EU) aims to be climate-neutral by 2050, which leading to the reducing demand of fossil energy. This objective is at the heart of the European Green Deal and the European Climate Law. Under this background, crude oil supply to Europe from the BRI region also peaked at 374 million tons in 2017. The outbreak of COVID-19 pandemic in 2020 triggered a deep reducing demand of oil supply from BRI region with 295 million tons in 2020 and 282 million tons in 2021 respectively. After the outbreak of the Russian-Ukrainian conflict in 2022, the EU set off several rounds of sanctions against Russia, banning the import of Russian oil and setting a ceiling on natural gas prices by the end of 2022. Europe turned to Middle Eastern countries, North America, and Central and South America to meet its oil import demand. Europe imported 94.3 million tons of oil from Middle Eastern, with an increase of 22.3% compared to that of 2021.

Entering the 21st century, energy consumption of the OECD has begun to show a slow decline trend into the post-industrialization era. Meanwhile the international status of the Asia-Pacific in the global oil and gas market has risen significantly. The crude oil supply to the Asia-Pacific was a total of 751 million tons in 2015, accounting for 61.8% of the total crude oil supply in the region. The oil supply to Asia-Pacific region reached a phased peak of 843 million tons in 2018, accounting for 62.4% of total crude oil supply. Since then, crude oil exports from countries along the BRI region to the Asia-Pacific have been declining slightly and reached a phased low of 801 million tons in 2021. As the USA

and the EU set off several rounds of sanctions against Russia's oil and gas resources in 2022, the Russian oil supply turned to the Asia-Pacific market. Therefore the crude oil supply to Asia-Pacific reached a record high of 963 million tons, accounting for 74.6% of the crude oil supply of the BRI region.

2.2. Pipeline Natural Gas Supply Pattern in the BRI Region

The pipeline gas supplying countries in the BRI region include Russia, Qatar, Kazakhstan, Turkmenistan, Indonesia and Malaysia. Since 2015, new natural gas pipelines in the Belt and Road region have been completed and put into operation. The Central Asia-China Line C project started operation with a capacity of 25 billion cubic meters (BCM)/year in 2015. The Iran-Iraq gas pipeline started exporting 25 million cubic meters a day of gas to Iraq through the 270-kilometer pipeline in 2017. In terms of total global exports, global pipeline gas exports increased from 704.1 billion cubic meters to 805.4 billion cubic meters during 2015-2022 with an increase of 14.4%. The pipeline gas exports in the BRI region increased from 317.1 billion cubic meters to 368.3 billion cubic meters with an increase of 16.1%.

The pipeline gas of the BRI region mainly flows to Asia-Pacific, Europe, CIS and the Middle East. **Figure 2** shows the pipeline gas supply pattern of the BRI region and the data is calculated from Statistical Review of World Energy (72nd ed.) (Energy Institute, 2023). According to **Figure 2**, the pipeline gas supply to the Asia-Pacific showed a trend of slow growth. The pipeline gas flow to the Asia-Pacific was 61.2 billion cubic meters in 2015, further reached 73.9 billion cubic meters in 2018. The pipeline gas supply experienced a slight decline in 2020 and rebounded to 78.2 billion cubic meters in 2022. The pipeline gas supply to Europe and Central Asia in the BRI region experienced significant fluctuations. The pipeline gas flowed to Europe was 175 billion cubic meters in 2015, and peaked at 210.6 billion cubic meters in 2018. Due to the COVID-19 pandemic and gas diversification, Europe has reduced its supply from the Russian. The pipeline gas flowed to Europe decreased to 195.6 billion cubic meters in 2021. In October

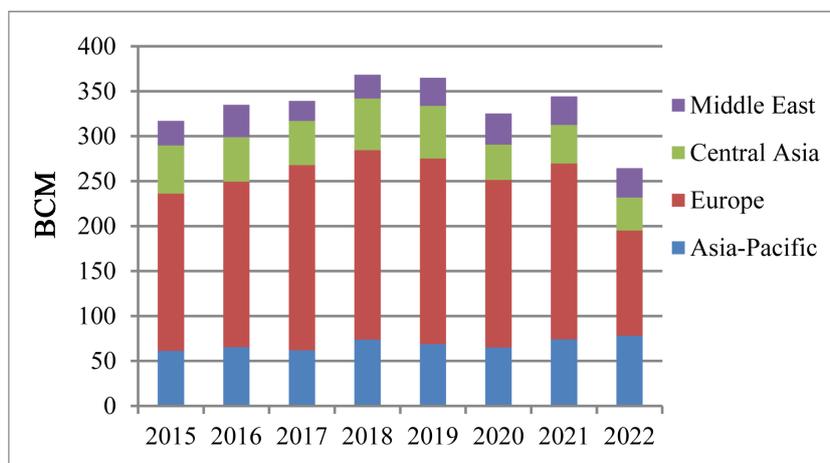


Figure 2. The pipeline gas supply of the BRI region.

2022, the Russian Nord Stream 1 and Nord Stream 2 gas pipelines suffered sabotage and leaked, disrupting the flow of natural gas between Russia and Europe. Russia's pipeline gas supply to Europe decreased significantly to 116.9 billion cubic meters in 2022, with a decline of 40.2% year-on-year. The supply to the Central Asia reached the peak of the range in 2019 with a supply of 58.6 billion cubic meters. Since then, Russia has drastically reduced gas supplies to Kazakhstan and Uzbekistan due to the economic downturn caused by COVID-19 pandemic. The pipeline gas flowed to Central Asia fallen to 39.4 billion cubic meters in 2020 and 36.9 billion cubic meters in 2022 respectively.

2.3. Liquefied Natural Gas Supply in the BRI Region

The liquefied natural gas (LNG) in the BRI region is mainly located in Russia, Qatar, Indonesia and Malaysia, and mainly supply to Asia-Pacific and Europe. Since 2015, LNG supply in the BRI region has maintained a tight balance. The Yamal LNG project in Russia operated in 2019 and brought an increment of 16.5 million tons/year. Therefore the LNG supply capacity lagged far behind the overall global LNG increase. In terms of global export volume, the global LNG export volume increased from 338.3 billion cubic meters to 516.2 billion cubic meters from 2015 to 2022, with an increase of 52.6%. The LNG export volume of the BRI region increased from 210 billion cubic meters to 240.8 billion cubic meters during the same period, with an increase of only 14.7%. **Figure 3** shows the LNG supply pattern of the BRI region, and the data is calculated from Statistical Review of World Energy(72nd ed.) (Energy Institute, 2023).

The LNG supply to the Asia-Pacific from the BRI region has experienced an increasing trend, while supply to Europe has experienced greater fluctuations from 2015 to 2022 as shown in Figure 3. LNG flows from the BRI region to the Asia-Pacific amounted to 177.1 billion cubic meters in 2015 and 187.2 billion cubic meters in 2018. The outbreak of COVID-19 pandemic led to a deep adjustment in the global economy and a downward trend in regional LNG supply. In 2022 the LNG supply of BRI region rebounded to 194.3 billion cubic meters, with a 2.7% increase compared to 2021. LNG supply to the Europe from the BRI

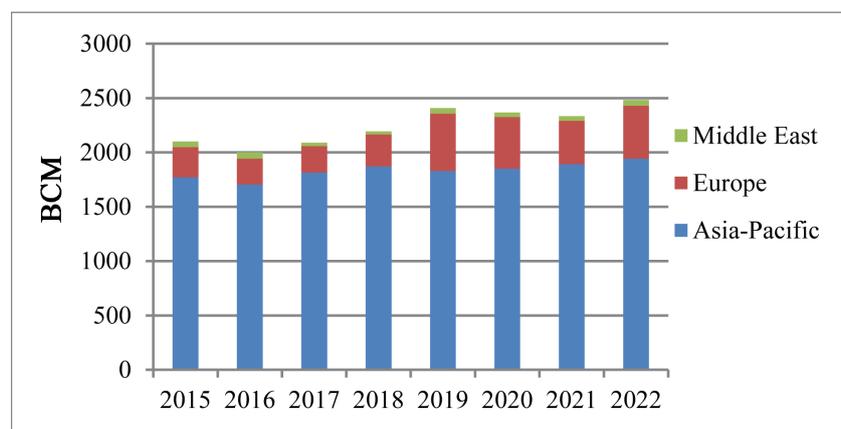


Figure 3. The LNG supply pattern of the BRI region.

region had a significant fluctuation trend. The LNG flowed to Europe was 27.8 billion cubic meters in 2015, and reached 52.7 billion cubic meters in 2019 with an increase of up to 72.3% compared to 2018. As a result of the outbreak of COVID-19 pandemic and the large entry of LNG from the USA into the European market, Europe reduced LNG supply from the RI region with 39.9 billion cubic meters in 2021. Since the outbreak of the Russian-Ukrainian conflict in 2022, the “Nord Stream 1” and “Nord Stream 2” natural gas pipelines stopped operating due to sabotage. In order to ensure the energy supply, Europe increased imports of LNG from Russia. In 2022, LNG imported by the Europe from Russia reached 48.6 billion cubic meters, which was 21.8% higher than in that of 2021.

3. Main Risks of the Oil and Gas Supply in the BRI Region

3.1. Geopolitical Conflict Risks in BRI Region

The energy geopolitics of BRI region covers three main aspects, including the regional distribution of oil and gas resources, the mutual competition and coordination among major countries based on oil and gas resources, and the impact of the international political landscape on oil and gas resources and their reconfiguration.

The Middle East is located in an important geographical and energy location, and has always been a key area for the world's major powers. In 2020, the Middle East's oil reserves were 113.2 billion tons, accounting for 48.3% of the global reserves, and natural gas reserves were 75.8 trillion cubic meters, accounting for 40.3% of the global reserves (BP, 2021). The Middle East region is prominently characterized by the region's descent into turbulence, imbalance and disorder, and the acceleration of the process of regional multi-polarization (Hoffmann, 2018). In 2015, the situation in the Middle East underwent historic changes. The extremist organization “Islamic State” (IS) emerged in the Middle East, and Iraq and Syria were actually fragmented (Yan et al., 2022). The nuclear issue of Iran and diplomatic dispute of Qatar have led to a deep adjustment in the pattern of the Middle East region. The Israeli-Palestinian conflict has intensified since March 2022, and tensions in the Palestinian-Israeli region have risen. In October 2023, a new round of large-scale conflict erupted between the Palestinian Hamas and Israel with Israel declaring war on Hamas again after 50 years. In December 2023, Yemen's Houthi forces attacked Israeli merchant ships passing through the Red Sea and blocked the Red Sea route in support of Hamas. As the world's four largest shipping companies, the blockade of the Red Sea has had a serious negative impact on the global oil and gas supply chain.

Russia's oil and gas resources occupy an important position in the world. In 2020, the proven oil reserve of Russia was 19.9 billion tons, accounting for 8.4% of the world's total reserves. Natural gas reserves of 56.6 trillion cubic meters, accounts for 30.1% of the world's total reserves. Russia-Ukraine conflict obviously changed the dynamics of the oil and other prominent markets (Pata et

al., 2023). Ukraine serves as a key transit country for oil and gas transportation between the EU and Russia. A number of pipelines connecting the EU and Russia with oil and gas resources, such as the “Friendship”, “Brotherhood” and “Union” pipelines, pass through Ukraine. After the Russian-Ukrainian conflict in 2022, financial sanctions against Russia initiated by the United States and Europe made it impossible for Russia to pay transit fees to the Ukrainian pipeline operator. In August 2022 the operation of the southern branch of the main oil pipeline “Friendship” (a pipeline that carries natural gas to Hungary, the Czech Republic, and Slovakia via Ukraine) came to a standstill. In October 2022, the Russian “Nord Stream 1” and “Nord Stream 2” gas pipelines suffered sabotage and leaked, disrupting the flow of natural gas between Russia and Western Europe. Since the outbreak of the Russian-Ukrainian conflict, the United States and EU have been actively involved and have provided significant military assistance to Ukraine, which has intensified the Russian-Ukrainian conflict. On the other hand, the USA has enacted and implemented sanctions and bans, focusing on weakening the Russia’s energy industry and banning energy exports to Russia. The EU has set off several rounds of sanctions against Russia, completely banning the import of Russian oil by the end of 2022 and capping the price of natural gas. The USA and EU have joined hands to increase sanctions against Russia in the energy area, further pushing up the prices of bulk energy products and thus exacerbating the uncertainty and financial risks of global oil and gas supply (Adekoya et al., 2022).

3.2. Non-Traditional Security Risk Factors

Entering the 21st century, non-traditional security factors such as climate change and COVID-19 pandemic have brought new challenges to the global economy and society. The supply of oil and gas energy has been seriously affected by non-traditional security factors, which bringing to the vulnerability of the stable supply of oil and gas resources.

Global warming has triggered widespread changes in the climate system and a marked increase in the frequency of extreme weather events. Climate change has become a serious challenge to all mankind in the 21st century (Voituriez et al., 2019; Quitzow & Thielges, 2020; Yu et al., 2022). The BRI region is one of the regions with the most frequent occurrence of meteorological disasters in the world, including heavy rainfall, floods, high temperatures, droughts and typhoons. The top ten countries in the Global Climate Risk Index for 2000-2019 include six countries along the BRI region, namely Myanmar, Bangladesh, the Philippines, Pakistan, Thailand and Nepal (Eckstein et al., 2021). In December 2020, United Nations secretary general Antonio Guterres warned that the world was heading for a “catastrophic” 3C of warming at the virtual Climate Ambition Summit, as he urged all the countries’ leaders to declare a state of climate emergency. The oil and gas system is vulnerable to a wide range of climate change impacts, including rising temperatures and heat waves, cold and snow events,

severe drought, intense rainfall, hurricanes. In July 2022, the Port of Fujairah in the United Arab Emirates, known as the largest oil hub in the Middle East, was experiencing operating difficulties in its crude oil storage facilities due to continuous intense rains. In August 2023, the Panama Canal, one of the world's most important energy supply routes, was seriously affected by drought and depletion of water. Panama Canal Authority had to restrict the daily number of ship transits due to the severe drought. Approximately half of liquefied petroleum gas transits needed to be rerouted and significant increased economic costs for affected parties (David et al., 2024).

As the COVID-19 spreading globally at the beginning of 2020, it led to an economic crisis which has changed the social behavior and reduced the industrial activity and the demand for power worldwide (Hauser et al., 2021) The COVID-19 pandemic forced BRI countries to adopt embargoes, tighten border controls, shrink production capacity of businesses and quarantine people in their homes, leading to prolonged disruptions in the oil and gas supply chain. In the production sector, the focus of epidemic prevention and control reduced the gathering of people, whereby a number of energy development and processing enterprises have been required to shut down in the event of a serious epidemic. The embargo measures affected market sentiment and increased investor concerns about tight energy supplies, which in turn drove up energy prices. Due to the lack of effective coordination between existing energy cooperation mechanisms, the COVID-19 has intensified turbulence of oil and gas market (Yousaf, 2021). In September 2021, the world is plunged into an energy crisis that has never been seen since the 1970s. Oil prices have risen to a three-year high, and natural gas prices in Asia and Europe are at the highest levels in history. Thus the COVID-19 pandemic affected the main links in the energy supply chain, such as production, transportation and inventory, resulting in vulnerability and volatility in the oil and gas supply of BRI region.

3.3. Oil and Gas Market Volatility Risks

The international energy market is composed of supply, demand and international price mechanism, and the oil pricing power is the core of the international energy market mechanism, and also the focus of the oil and energy arena. At present, the global energy financial market has formed the open and complex system covering oil and gas energy products. In the spot market, futures market and other trading markets, the futures, options and other financial instruments are extensively used for trading system.

Although the BRI region plays an important role in the world in terms of energy production and consumption, the prices of Western trading platforms represented by Europe and the United States have been taken as the pricing benchmark in energy trading. In terms of oil trade, the New York Mercantile Exchange (NYMEX), the International Petroleum Exchange of London (IPE) and the Dubai Mercantile Exchange (DME) have formed three major interna-

tional crude oil futures exchanges. The international crude oil pricing mechanism is determined by market supply and demand, and the price of Brent oil and American oil has become the dominant price of international oil market. Taking the natural gas market as an example, the price of natural gas in the Asian market is mainly based on the long-term agreement price linked to oil, so the price cannot reflect the relationship between the supply and demand of natural gas in the region (Yan et al., 2022). Without energy pricing power, BRI countries could only passively accept international energy price fluctuations, and it is difficult to resist market risks.

The COVID-19 and the Russia-Ukraine conflict have shocked the energy supply and directly contributed to a global energy crisis. The shocks lead to large fluctuations in energy prices, thereby increasing the uncertainty of the global energy market. In October 2021, IPE natural gas and steam coal prices raised to historical highs of 213 pence/therm and 230 US dollars/ton respectively due to the impacts of COVID-19, which were as high as 445% and 299% respectively over the same period in 2020. After the outbreak of the conflict between Russia and Ukraine in February 2022, the international crude oil price soared to US dollars 137/barrel in early March due to concerns about the escalation of Russian sanctions. The surge in global oil and gas prices has intensified the risk of efficient energy supply, and many countries such as Sri Lanka, Bangladesh, Lebanon and Romania have fallen into energy poverty. Therefore, it needs to build a BRI regional energy trading market so as to realize the optimal and efficient allocation of regional resources and price reflecting the supply and demand relationship.

4. Strategies to Enhance Oil and Gas Supply in the BRI Region

4.1. Promoting a New Regional Oil and Gas Governance

The BRI not only plays a very important leading role in promoting in-depth energy cooperation between China and the countries along the route, but also provides a platform to support energy cooperation between China and the region. Firstly, the Belt and Road Energy Partnership was established in April 2019 and already had 38 members and 5 observer states. The Belt and Road Energy Partnership Adheres to the principles of extensive consultation, joint contribution and shared benefits. Through the cooperation mechanism of the "Belt and Road" Energy Partnership, the B&R countries should further deepen mutually beneficial and win-win energy cooperation, and build a new energy cooperation network with closer ties and more effective cooperation. Meanwhile it should continue to improve the transparency and mutual trust of information and policies of all countries, which will help enhance the speaking right of the BRI region in global energy security governance.

Secondly, it should fully promote the equal rights, opportunities and rules of B&R countries in oil and gas energy cooperation, and promote the democratization and legalization of the rules of governance. The B&R countries need to dis-

cuss the multilateral cooperation agenda and emphasize the importance of identifying points of convergence of interests so as to define areas of cooperation and achieve common goals. Finally, it needs to strengthen energy policy communication, reduce barriers to trade in oil and gas resources, strengthen the protection of investment in oil and gas resources, and build a fairer and more open oil and gas energy market. The B&R countries should build coordination mechanisms covering energy markets, energy strategies and energy diplomacy and climate issues by more closely integrating energy policies of all countries.

4.2. Building a Safety and Resilient Oil and Gas Supply Network

Through the extensive influence of the BRI, the B&R countries should strengthen the mutually beneficial, win-win energy cooperation relations, and build a more closely connected and resilient oil and gas supply network. Firstly, it needs to promote the construction of resilient oil and gas production networks. China should actively explore new modes of cooperation in oil and gas production capacity and operation; actively promote major cooperation projects between major energy consumers such as China and India, and main energy producers including Saudi Arabia, Russia and Kazakhstan in oil and gas resource development. It should continue to push forward main consumers and producers in the BRI region to develop high-level refining and chemical integration, and strengthen the construction of oil and gas resource exploration, processing, transportation, sales and production networks.

Secondly, the B&R countries should accelerate the interconnection of oil and gas infrastructure networks. It needs speed up the construction of major energy infrastructure, such as the Central Asian natural gas pipeline, the Maritime Silk Road energy hub and the China-Russia East Route natural gas pipeline. To build extensive and multi-level oil and gas pipeline networks, the B&R countries should enhance cooperation in energy infrastructure connectivity, jointly promote the construction of cross-country and cross-regional energy corridors, and gradually form an oil and gas infrastructure network connecting the BRI region. Finally, the B&R countries should promote to develop an oil and gas emergency management network, negotiate the establishment of a regional oil and gas strategic reserve system, and build a coordination mechanism for emergency support. In case of energy crisis, oil and gas strategic reserve could be released into the market so as to mitigate the adverse effects caused by oil and gas price shocks and improve the strategic support capacity.

4.3. Accelerating Financial Market Development of Oil and Gas Energy

The construction of financial market for oil and gas energy is an important measure to ensure the supply of oil and gas energy, safeguard energy security and promote the sustainable development of economy in the BRI region. Firstly, it needs to promote the establishment of oil and gas-RMB settlement system in the region. The Middle East and the CIS along the B&R are both important oil

and gas resource supply region, and China is the main crude oil importer. In November 2021, China signed strategic cooperation agreements respectively with Iran and the United Arab Emirates, whereby China-Iran and China-Arab oil trades are settled in RMB instead of USD. In September 2022, Russia confirmed that gas supplies to China would be settled in Chinese Yuan. Under this situation, actively the RMB-denominated energy commodity futures market should be developed, and oil and gas resource countries along the route can invest their RMB holdings in the crude oil futures market.

Secondly, it needs to build a regional energy futures trading center. The BRI region is not only endowed with rich oil and gas resources, but also plays an important role in the global oil and gas supply. The oil and gas futures exchanges in four major region, including the Middle East, CIS, East Asia and ASEAN, would be established to form a diversified and open system of trading using futures, options and other financial instruments. Thus to speed up the integration of oil and gas futures exchanges in the region will help to form a pricing center for oil and gas resources in the BRI region and obtain independent pricing power. Finally, it needs to promote the construction of the B&R energy financial risk management system. The major oil and gas producing and consuming countries should cooperate with each other to formulate risk management norms, standards and rules so as to strengthen the supervision of energy finance and reduce the risks of energy investment and financing. On the other hand, the B&R energy and financial risk alert system should be established to prevent systemic risks and safeguard regional energy and financial security.

Acknowledgements

The research is supported by Fundamental Research Funds for the Central Universities (No. 3162022DGWJY08), and CFAU First-class Disciplinary Innovation Platform “Quantitative Research on Global Economic Governance”.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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