

China's Belt and Road Initiative and Saudi Vision 2030: A Review of the Partnership for Sustainability

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Key Points

This study reviews the comprehensive strategic partnership between Saudi Arabia and China and the interconnection between China's Belt and Road Initiative (BRI) and Saudi Vision 2030. These connections have significantly improved cooperation in trade, investment, energy and new technology development over the last seven years. Saudi Arabia can further its cooperation with China on the circular carbon economy (CCE) through both bilateral and multilateral frameworks.

At the bilateral level, the countries can prioritize investments in local renewable energy capacity and promote energy efficiency technologies and

financing schemes for the industrial sector. They can establish a public-private financing partnership for developing large-scale carbon capture and storage (CCS) projects. They can also pilot cross-border hydrogen trade and harmonizing standards to integrate their supply chains.

At the multilateral level, China and Saudi Arabia can work together to promote the CCE framework in the Belt and Road region. They can facilitate the use of hydrogen in BRI transport infrastructure projects, encourage the sharing of CCS knowledge and support power integration at the regional level.

Summary

Built upon mutual interests and complementary advantages, the relationship between Saudi Arabia and China has grown from marginal importance to become a comprehensive strategic partnership. The two countries have established bilateral and regional coordination mechanisms that aim to align China's Belt and Road Initiative (BRI) and Saudi Vision 2030. These mechanisms have significantly improved cooperation in trade, investment, energy and new technology development.

Since the BRI was launched in 2013, China's foreign direct investment (FDI) in Saudi Arabia has exhibited rapid growth in most years. This FDI fell in 2016 and 2017 owing to global oil market turbulence, the launch of Saudi economic reforms and regulatory changes affecting China's outward investments. However, Chinese investors remain very confident in Saudi Arabia. FDI flows from China to Saudi Arabia reached a record high of \$654 million in 2019.

Trade flows between China and Saudi Arabia have also grown. China's exports of industrial products to Saudi Arabia reached \$28 billion in 2020, an increase of 50% since 2013. Saudi Arabia's exports of crude oil to China grew from 364 million barrels in 2013 to 622 million barrels in 2020. Construction contracts between Chinese enterprises and Saudi Arabia grew even more rapidly. The total value of completed contracted projects by Chinese enterprises in Saudi Arabia from 2014 to 2019 was \$40 billion. This amount is twice the corresponding value for 2008 to 2013.

This growth in investment and trade connectivity reflects the fact that the scope of cooperation between Chinese and Saudi enterprises has expanded. This cooperation involves not only traditional infrastructure and utility construction but also new economic sectors, such as new energy

development and digital innovation. Additionally, Chinese enterprises have gradually become more involved in the Saudi petrochemicals market since 2016, although this growth has been relatively moderate compared with Saudi enterprises' activity in China.

New opportunities for Sino-Saudi cooperation are emerging as climate action becomes more important for global economic growth. In 2020, both countries took significant steps to combat carbon emissions. Saudi Arabia proposed a circular carbon economy framework to promote sustainable economic growth within the carbon management loop at the G-20 summit. China pledged to reach peak carbon emissions before 2030 and achieve carbon neutrality before 2060 at the United Nations General Assembly.

We therefore present some new areas and approaches for cooperation on carbon management between China and Saudi Arabia.

Prioritize investments in renewable energy: China is the world's largest investor in and producer of wind and solar energy. In developing its domestic market, China has built strengths throughout the supply chain. Saudi Arabia can leverage China's financial resources and technical expertise to achieve its ambitions regarding renewable energy development. China can help Saudi Arabia build local capacity for technology development, key equipment manufacturing, project construction and operations. The two countries can cooperate by sharing knowledge and policy practices, training local talent and transferring or developing new technologies. Such activities can be carried out within the BRI framework. The Asia Infrastructure Investment Bank, the Multilateral Cooperation Center for Development Finance Fund and the Silk Fund can be leveraged for these efforts.

Benefit from industrial energy efficiency: Energy efficiency initiatives and energy price reforms in Saudi Arabia have reduced the country's energy consumption and carbon emissions in recent years. Energy efficiency can play a larger role within the broader movement toward economic diversification and can strengthen business competitiveness. However, the policy framework and market reforms must be designed and implemented coherently to achieve these goals. Both China and Saudi Arabia have high energy consumption in their industrial sectors and, thus, energy efficiency is an opportunity for cooperation. Saudi Arabia can initiate and focus on identifying and promoting energy efficiency technologies with the greatest potential for Saudi industrial development. Energy prices remain a major barrier to investments in industrial energy efficiency. Building upon China's development of the largest energy service market worldwide, Saudi Arabia can work with China to pilot and demonstrate innovative energy efficiency financing schemes. These projects can serve to incubate energy efficiency service capacity in the Kingdom.

Facilitate carbon capture and storage (CCS) development at the largest possible scale: CCS has a clear role in hard-to-abate sectors. However, the deployment of CCS at the necessary rate and scale to achieve climate targets still faces immense technical and economic challenges. Both China and Saudi Arabia are still in the early stages of large-scale CCS project development. Sharing knowledge and experience regarding policy and regulatory frameworks for CCS is important to make progress in this area. Saudi Arabia can design and establish a public-private CCS financing partnership with China and international players.

It can also pilot a Sino-Saudi bilateral carbon trading scheme with the use of a new carbon storage unit.

Develop the hydrogen supply chain: Producing hydrogen using technologies that incorporate carbon capture and renewable energy can transform hydrogen into an enabler of a cleaner energy system. However, achieving the economic potential of hydrogen development requires reducing costs and investing heavily in new infrastructure. Saudi Arabia and Japan collaborated on a blue hydrogen pilot project that offers a replicable model for cooperation between Saudi Arabia and China. Additionally, Saudi Arabia can pursue joint efforts to harmonize standards for the large-scale deployment of green hydrogen. Saudi Arabia can also make its carbon accounting and verification methodologies more robust.

The BRI is entering a new phase in which attention has shifted to strengthening multilateral architecture and prioritizing green development projects. Thus, Saudi Arabia has an opportunity to expand its cooperation with China on the circular carbon economy within the Belt and Road region. This cooperation may take the form of several different activities. For example, both countries can promote the circular carbon economy framework. Investments and financial planning for BRI-related ports, highways and railway projects can account for the provision of hydrogen. The countries can support regional power integration, especially in the Gulf Cooperation Council, the Association of Southeast Asian Nations and Africa. Doing so can increase the power system's flexibility for high-ratio renewable energy development. Finally, China and Saudi Arabia can facilitate wider collaborative research and international knowledge sharing to reduce risk within the CCS supply chain.

Introduction

Sino-Saudi relations have developed based on mutual interests and complementary advantages. Over the past three decades, the bilateral relationship has transitioned from one of marginal importance for both countries to a comprehensive strategic partnership (Fulton 2020). This relationship is one of China's most important partnerships, with critical value of securing China's interests in the Middle East and North Africa (MENA) region. As one of the largest players in emerging markets, China also offers long-term value in Saudi Arabia's economic transition. The countries have growing business presences in each other's markets and an increasingly integrated supply chain. The relations have significantly benefited from bilateral policy frameworks aiming to align China's Belt and Road Initiative (BRI) with Saudi Arabia's Vision 2030.

Energy has been a cornerstone in this bilateral trade relationship, as oil is important to both countries' economic security. However, the growing attention on global climate change, the green energy transition and environmental issues are transforming business and economic operations. Saudi Arabia proposed a circular carbon economy (CCE) framework during its 2020 presidency of the G-20, a group of leading rich and developing nations. This framework offers new collaboration opportunities for China and Saudi Arabia within the carbon management loop, that is, reducing, reusing, recycling and removing carbon. Cross-border trade and supply chain cooperation for the large-scale deployment of hydrogen and carbon capture and storage (CCS) is particularly important. Achieving this cooperation can enable sustained economic growth in hard-to-abate sectors in both China and Saudi Arabia.

At the same time, the expansion and evolution of the BRI is shaping the global political economy in ways that may affect Sino-Saudi relations.

In the BRI's seven years of implementation, China has provided investment and financing worth \$1.38 trillion to over 2,500 projects in over 140 countries. Many of these projects have strengthened hard infrastructure with new roads, railways and ports and soft infrastructure with trade and investment agreements. These projects have even strengthened cultural ties with university scholarships and people-to-people exchanges (Hillman 2018).

However, China's steadily expanding presence within the Belt and Road region has also created controversy. The cooperation between China and Central and Eastern European countries within the BRI framework has caused concerns within the European Union (EU). Specifically, the EU worries that this initiative may undermine the EU's unity on policies toward China (European Parliament 2018). The BRI succeeding on China's terms is also seen as challenging the current global trade and financial system centered on the United States (U.S.). In this way, it may create risks to the supply chains for goods, international currency and technical standards (Hillman 2018). As the relations between China and U.S.-led alliances become more tense and divided, Sino-Saudi relations will become more sophisticated.

Progress of the BRI in Saudi Arabia

Aligning strategic priorities

China's BRI and Saudi Vision 2030 have natural synergies. The BRI's strategic goal is to improve infrastructural and logistical links and stimulate trade and investment activities. Saudi Vision 2030 aims to build a diversified economy that does not rely on petroleum. The implementation of the BRI in Saudi Arabia adds imperatives for infrastructure improvement and new industrial development. Such work is crucial for the Kingdom to become competitive as a global hub connecting Asia, Europe and Africa. The implementation of Saudi Vision 2030 provides immense opportunities for China to develop its trade and investment activities and upgrade its domestic industrial economy.

This alignment of economic strategies has stimulated the improvement of Sino-Saudi relations. During President Xi Jinping's visit to Riyadh in January 2016, the countries signed a memorandum of understanding to promote the BRI and industrial capacity cooperation. This visit elevated the Sino-Saudi bilateral relation to a comprehensive strategic partnership, the highest level in China's hierarchy of diplomatic relations. China views partner countries at this level as playing important international roles in both the political and economic realm. They are also seen as having high existing levels of cooperation and trust with Beijing (Struver 2017).

In general, more frequent high-level visits between Saudi Arabia and China have taken place since the BRI was announced in 2013. These visits demonstrate mutual interest in a deeper level of engagement. During a state visit of King Salman bin Abdulaziz to Beijing in March 2017, Saudi Arabia and China signed 21 BRI project cooperation agreements. These agreements had a total value of over \$65 billion. After Crown

Prince Mohammed bin Salman's visit to Beijing in 2019, Chinese was added as a third language in all educational stages in Saudi Arabia.

The establishment of bilateral coordination mechanisms has played an important role in aligning and integrating the implementation of the BRI and Saudi Vision 2030. Under Chinese Vice Premier Zhang Gaoli and Saudi Crown Prince Mohammad bin Salman, the Sino-Saudi High-Level Joint Committee (HLJC) was established in 2016. This committee is charged with discussing issues of strategic cooperation and making decisions (Chen and Han 2019). Six subcommittees have been established within the HLJC, and designated entities have been appointed to facilitate cooperation on BRI projects in specific areas. These areas include industrial and energy collaboration, trade and investment, culture, technology and tourism development.

In addition, new institutions have been created to enhance the capacity for overarching coordination. The Saudi Center for International Strategic Partnership, which reports directly to the Council of Economic and Development Affairs, was established in 2017. The China International Development Cooperation Agency, which reports directly to the State Council, was established in 2018. These two new agencies have broader diplomatic missions for their respective countries. However, their establishment and operation have improved coordination across governments and private entities to carry out BRI projects.

Not only bilateral frameworks but also regional cooperation platforms have improved Sino-Saudi cooperation. The China-Arab States Cooperation Forum (CASCF), established in 2004, is one of the most prominent platforms for advancing cooperation between China and Arab states. As of January 2021,

Progress of the BRI in Saudi Arabia

20 of the 22 Arab states have signed documents on cooperation with China regarding the BRI. Seven Arab states, namely, Egypt, Jordan, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates, are founding members of the Asian Infrastructure Investment Bank. This bank is a China-led multilateral institute for BRI project financing. CASCF's priorities, namely, infrastructure, the

whole industrial chain, energy and new technology development, are well aligned with the Sino-Saudi cooperation framework. It can generally facilitate regulatory convergence for trade and investment growth in the region, which supports Sino-Saudi cooperation. However, the BRI will expand industrial capacity cooperation in this region. If this expansion is not well planned in terms of product or market differentiation, it may lead to excess capacity. Thus, multilateral cooperation may increase competition between Saudi Arabia and other Arab states.

Increasing Investment and Trade

Saudi Arabia's outward direct investment (ODI) in China has remained around \$73 million on average from 2014 to 2019. This amount reflects a 60% reduction from the average level from 2008 to 2013 (MOFCOM 2021). However, Saudi Arabia's global ODI from 2014 to 2019 is almost double that from 2008 to 2013, reaching \$10 billion on average (UNCTADSTAT 2021). This contrast may reflect a shift in Saudi Arabia's outward investment strategy to focus more on high-tech and emerging sectors to diversify the domestic economy.

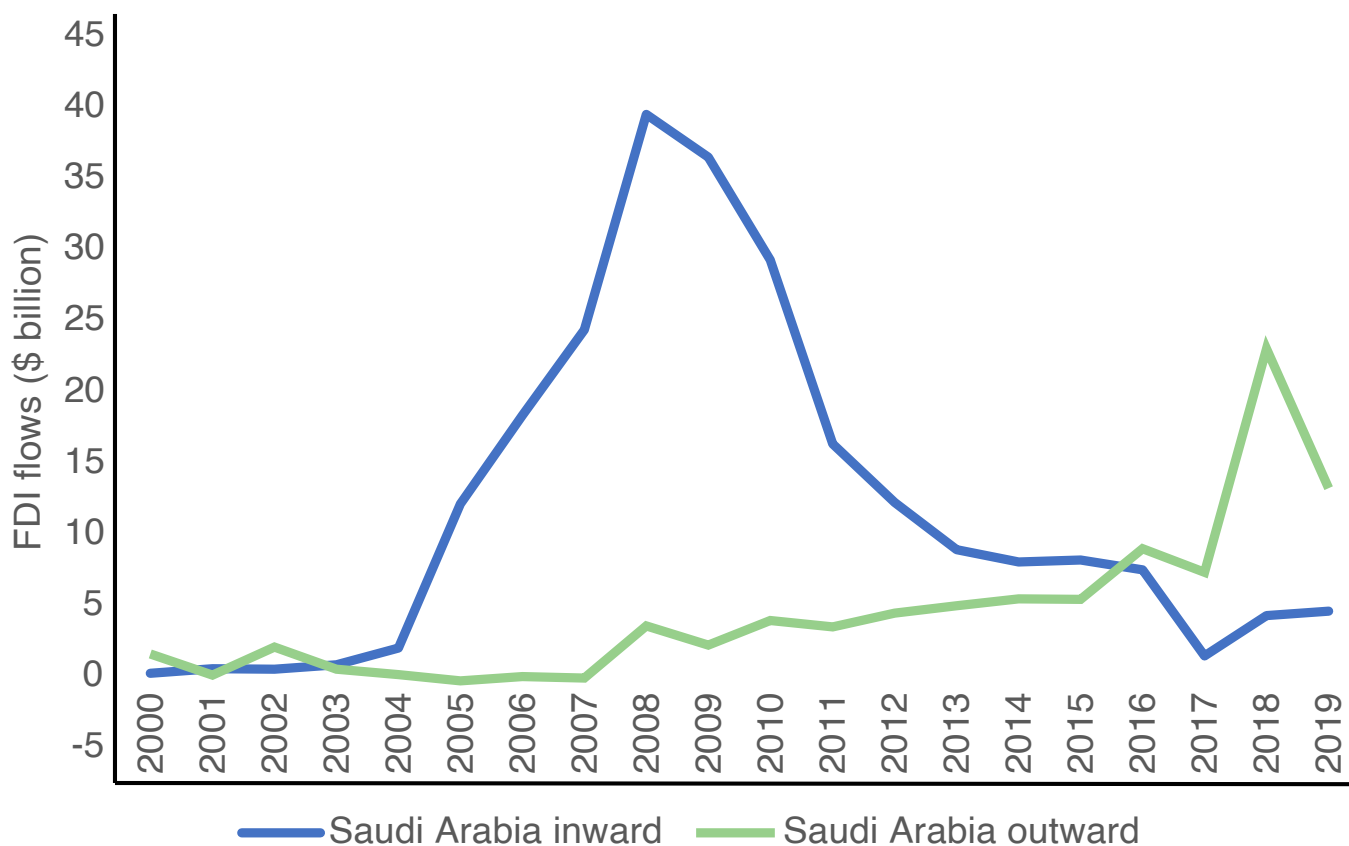
Additionally, the drop in investment from Saudi Arabia to China may be explained by changes in the petrochemical industry. Most of Saudi Arabia's investments over the past decade were made in this industry. However, foreign investors have consistently encountered challenges as China's petrochemical market has grown. Prior to 2015, China treated petroleum refining as a strategic national industry to be controlled by state-owned oil companies. Thus, a foreign investor could only hold a 50% stake in any investment (Hong et al. 2019). This lack of majority control tended to restrict the scale of foreign investment. After 2015, China gradually opened its markets for refining and downstream petrochemicals, facilitating foreign and private investments. However, excess production capacity and heavy pollution in China have increased concerns about investments in chemicals. The Chinese government has imposed stricter environmental regulations and tightened credit in the industry. Competition with local Chinese producers is also growing.

Foreign direct investment (FDI) flows to Saudi Arabia have fallen since the global financial crisis in 2008. Global FDI flows to West Asia more generally have fallen in most years since peaking at \$98 billion in 2008. However, investment in Saudi Arabia has fallen more sharply and for a longer period of time relative to neighboring economies. Falling oil prices and the lack of effective policies for attracting FDI in non-oil sectors were largely responsible for the decline in FDI flows to Saudi Arabia from 2011 to 2016, though political risks and security are general concerns in this region.

The social and economic reforms unveiled under Saudi Vision 2030 have improved the business environment in the Kingdom. These reforms include new regulations that permit total foreign ownership in several industries and the easing of investor licenses and visa regulations. New foreign companies obtaining licenses in the Kingdom mainly come from the industrial and manufacturing, logistics, retail, e-commerce and information and communication technology (ICT) sectors. Reforms have also digitized government services and lifted social and workforce restrictions on women. All of these changes have reversed the decline in FDI flows to Saudi Arabia starting in 2017 (Figure 1). Specifically, these flows increased by 7% in 2019 and 20% in 2020 relative to the previous year.

Increasing Investment and Trade

Figure 1. Saudi Arabia's global inward and outward direct investment.



Source: UNCTADSTAT (2021).

As a relatively new player, China's ODI flows to Saudi Arabia only became notable in 2006. However, they have grown very rapidly since then and especially after the BRI was launched. ODI flows from China to Saudi Arabia were 30% higher annually on average from 2014 to 2019 than from 2008 to 2013 (Figure 2). Chinese investment in Saudi Arabia fluctuated substantially in the period from 2016 to 2017. This movement was in line with perceived risk related to the oil price collapse and policy uncertainty associated with economic reforms in the Kingdom. Additionally, drastic regulatory restrictions on China's ODI flows in late 2016 to mitigate risks to the Chinese financial system were an important factor in these fluctuations. The brief decline in Chinese ODI flows to Saudi Arabia

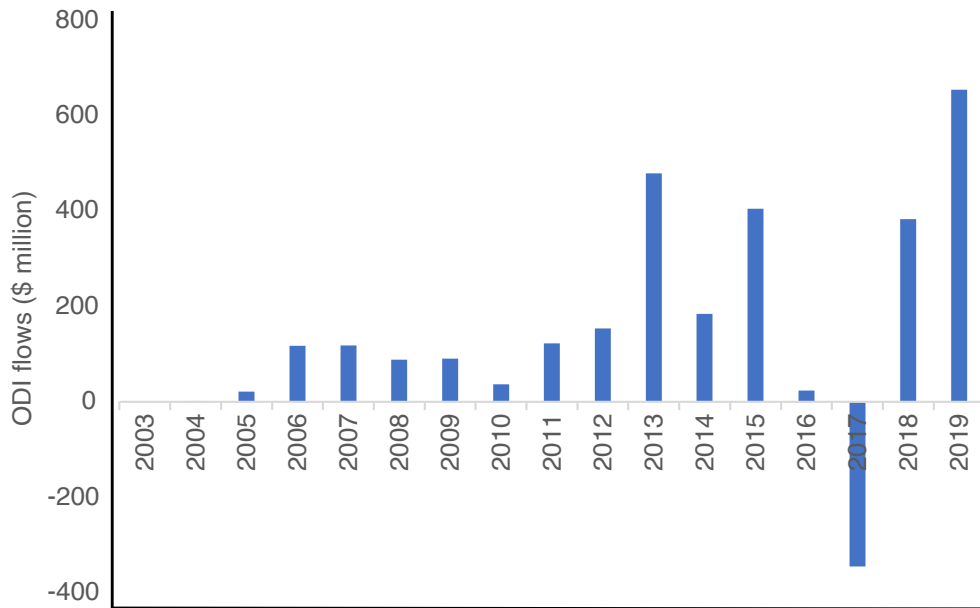
reversed since 2018, reaching a record high of \$654 million in 2019 (Figure 2).

Throughout this period, China has faced currency depreciation, corruption, domestic real estate bubbles and changing global investment and trade environments. China's outbound global investments have declined continuously since the 2016 regulatory changes. However, China seems to have relaxed restrictions on outbound capital for BRI-related transactions given the strategic importance of the BRI to China's economic transition. China's ODI flows to the Belt and Road region have grown steadily over the past six years (Figure 3).

This ODI includes several important projects. The Chinese Silk Road Fund (SRF), a state-owned investment fund for the BRI, has made large investments in renewable energy development in Saudi Arabia. Pan-Asia PET Resin (China) invested an estimated \$3.8 billion in a major project, signaling

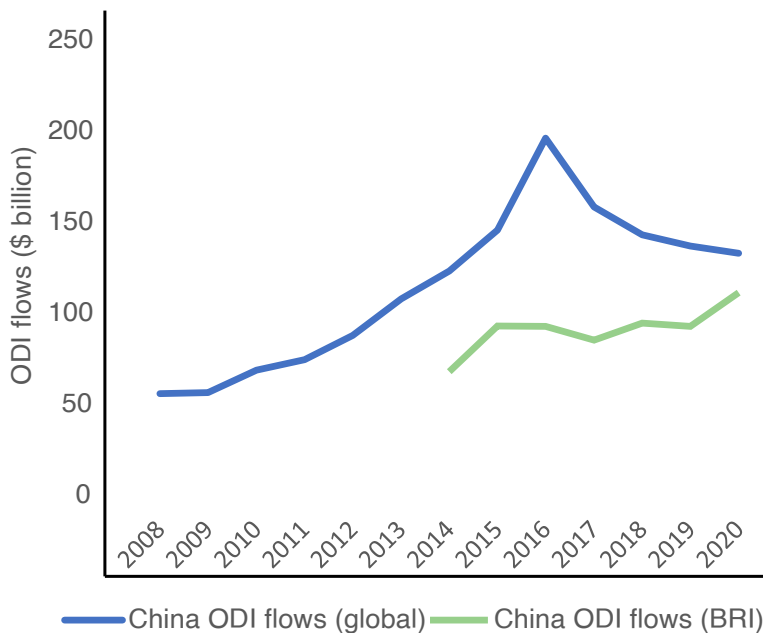
the operation of the first wholly Chinese-owned subsidiary in the Kingdom. This project is still working on building a complex for integrating the making of petrochemical and chemical fiber products in Jazan City.

Figure 2. China's ODI flows to Saudi Arabia.



Source: CEIC Data.

Figure 3. China's ODI flows (global and BRI).



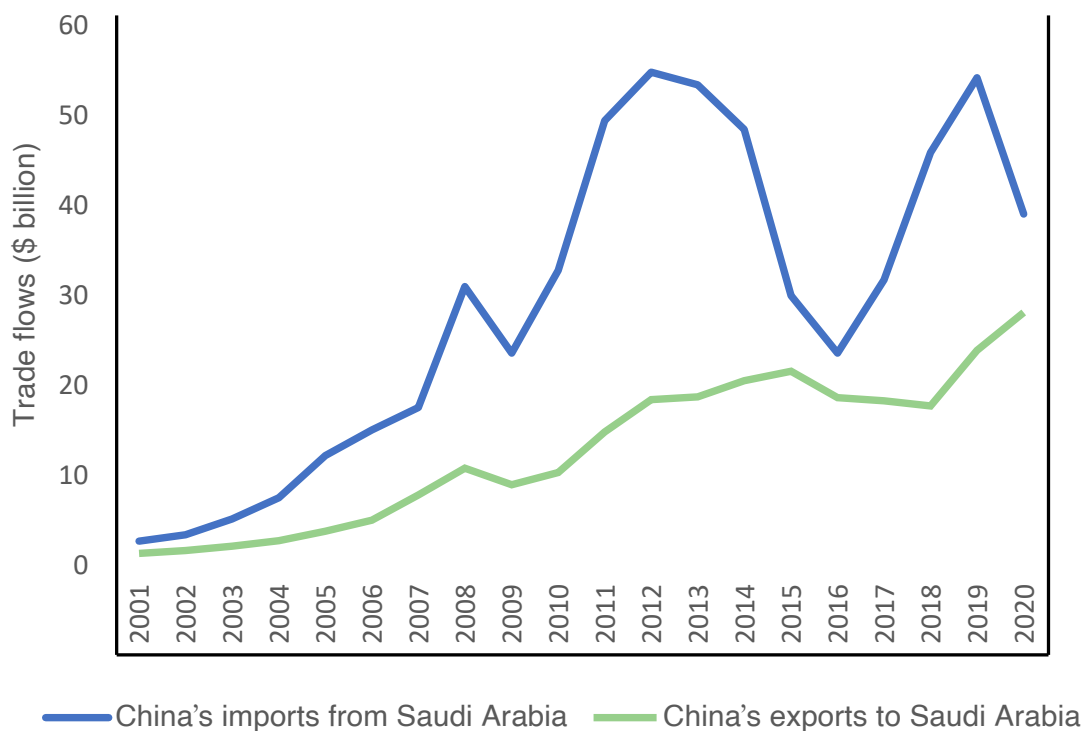
Source: CEIC Data.

Increasing Investment and Trade

Moreover, new investments in infrastructure and industries have increased trade connectivity between China and Saudi Arabia. Chinese commodity exports to Saudi Arabia are growing rapidly, especially after Chinese ODI flows reversed. In 2020, exports of Chinese products to Saudi Arabia reached \$28 billion, a 50% increase from 2013 (Figure 4). These exports comprise mainly industrial commodities, electrical equipment and machinery.

Saudi Arabia's trade dependence on China, measured as the share of intra-country trade in Saudi Arabia's total trade, increased from 13% in 2013 to 19% in 2019. Saudi Arabia's exports to China are still dominated by petroleum and petrochemical products. Oil exports from Saudi Arabia to China have grown from 364 million barrels in 2013 to 622 million barrels in 2020. Saudi Arabia was the largest oil exporter to China for most of the last decade, with Russia taking the top spot from 2016 to 2018.

Figure 3. Trade flows between China and Saudi Arabia.



Source: ITC (2021).

China's interconnection with Saudi Arabia goes beyond trade and ODI. The value of construction contracts awarded to Chinese companies in Saudi Arabia has far exceeded the value of Chinese ODI flows to Saudi Arabia. The value of completed contract projects by Chinese enterprises in Saudi Arabia totaled \$40 billion from 2014 to 2019, double that from 2008 to 2013. In 2019, Chinese enterprises received 163 construction project contracts in the Saudi market. These projects had a total value of \$11 billion, reflecting 70% growth from the previous year (MOFCOM and China International Project Contracting Association 2020). Among them, 40% were for energy and chemicals, 30% were for transport and real estate and nearly 20% were for utilities.

Although they have moved cautiously, Chinese financial institutions have gradually expanded their support for investment and trade activities related to BRI projects in Saudi Arabia. The Industrial and Commercial Bank of China established its first branch in Riyadh in 2015. The Bank of China received a license to open a branch in Saudi Arabia in January 2020. China Export & Credit Insurance Corporation, a major state-owned credit insurance provider in China, has expanded its business coverage in Saudi Arabia. It now provides export credit insurance, investment insurance, bond and guarantee business, debt and capital retrieval business and credit assessments, among others.

Given the progress over the six years since the BRI and Vision 2030 became interconnected, two issues merit further observation. The first is the use of the renminbi (RMB) in bilateral trade and investment. Wider use of the RMB is a natural response to the growing weight of China's investment and trade in the global economy. The International Monetary Fund (IMF) has included the RMB in its basket of special drawing rights currencies. China has signed bilateral currency swap arrangements with 36

foreign central banks. These developments, among others, provide evidence that China is gradually moving toward more open capital accounts.

However, the RMB's internationalization will be a long, challenging process. The Chinese government will continue to exercise control over presumably short-term investments through administrative and other measures. This control will tend to slow the progress of BRI projects. In 2018, China established RMB-based crude oil futures on the Shanghai Futures Exchange. Its aim was to form a regional price benchmark reflecting the demands of major oil-consuming countries in the Asia-Pacific region. However, it is unlikely to impact the current dollar-based crude oil trading system at this stage owing to the restrictions in Chinese financial markets. The lack of regulating capacity will create challenges as well.

The second notable issue is hurdles to private participation in infrastructure financing. Programs within Saudi Vision 2030 have clearly identified key sectors that offer great potential for employment, knowledge creation and economic diversification. Notable efforts have been made to enhance the Kingdom's institutions and legal frameworks. The Commercial Pledge Law was updated in April 2018, and the Bankruptcy Law became effective in August 2018. Additionally, the Tendering and Procurement Law was approved in July 2019, and the Competition Law came into effect in September 2019. All of these efforts have laid an important foundation for private participation in investments in new sectors. However, dedicated public-private partnership (PPP) laws and units to support contracting authorities and provide the necessary reassurance and predictability for investors are lacking. Without them, the risks associated with long-term investments and the unstable geopolitical situation in the region will impede FDI in large infrastructure projects.

Strengthening Business Presences

Saudi Arabia has already constructed public utility, transport, real estate, health care, retail and hospitality facilities under Saudi Vision 2030. This construction has created profound opportunities for businesses to invest and grow in the Kingdom. The largest Chinese engineering, procurement and construction (EPC) contractor in Saudi Arabia, PowerChina, received a \$3 billion contract in 2018 for a mega-shipyard project. This project, the King Salman International Complex project, is the largest cash settlement project this company has received from the foreign market since its establishment (Si 2018). The China Railway Construction Corporation lost around \$600 million on a \$1.77 billion contract for the design and construction of the Al Mashaaer Al Mugaddassah Metro Project in 2010 (CGGT 2014). However, it improved its financial, management and technical capacities for international projects and won the operation contract for the same project in 2018. The State Grid Corporation of China received a \$1.1 billion contract from the Saudi Electricity Company in December 2019. It is tasked with installing 10 million smart meters throughout the Kingdom. This project is the first step toward a global market for the Chinese smart grid business (Saudi Gulf Projects 2019).

The PPP model is still new to Saudi Arabia. Nevertheless, several PPP projects in the water, health and transport sectors reached commercial and financial closures in 2019. Additionally, more than 100 such projects are in the pipeline (MEED 2020). Chinese enterprises have gradually begun participating in PPP projects in the housing, healthcare, transport and renewables sectors. Power China's participation in the consortium led by ACWA Power for a utilities infrastructure project is particularly notable. This PPP project agreement includes the provision of renewable power, potable water, wastewater treatment, solid waste management and district cooling for phase one of the Red Sea Project.

Saudi Arabia's digital industries developed much more quickly than many had expected, especially during the COVID-19 pandemic. Saudi Arabia was ranked first in 2020 among the G-20 member states in digital competitiveness (European Center for Digital Competitiveness 2020). Saudi Arabia's long-term vision and comprehensive programs have quickly advanced digital infrastructure construction and ICT development in the Kingdom. The resulting new opportunities in the digital economy and new, innovative data-enabled services are very attractive to Chinese enterprises. Huawei, a Chinese company, is widely involved in 5G network construction, smart city solutions, artificial intelligence technology development and ICT talent incubation in the Kingdom. It has partnered with Saudi ICT companies, investment firms and energy companies. Among others, Alibaba Cloud, a Chinese company, has partnered with Saudi Telecom Company and the Saudi Arabian Oil Company (Saudi Aramco) to facilitate investments in cloud services.

Petrochemical industries play important roles in the economic transition plans of both China and Saudi Arabia. Saudi Aramco and Saudi Basic Industries Corporation (SABIC) have solidified their growing downstream presences in China through partnerships with state-owned enterprises (SOEs) and private firms. The number of planned and constructed petrochemical projects in Fujian, Yunan, Ningxia, Zhejiang and Liaoning provinces has grown in recent years. As a result, the total capital expenditures of Saudi-invested petrochemical projects in China will reach \$35 billion, with a total projected output of 21.7 million tonnes by 2025.

Chinese enterprises' participation in the Saudi petrochemicals market has gradually increased since 2016, although it remains relatively moderate compared with Saudi enterprises' participation in the Chinese market. The first refinery joint venture,

established by Saudi Aramco and Sinopec in Yanbu, began operating in January 2016. Pan-Asia PET Resin (China) plans to invest \$3.8 billion in a polyester manufacturing complex in Jazan. This complex will be the first Chinese wholly owned petrochemicals project in the Kingdom.

These developments demonstrate that Sino-Saudi cooperation at the business level is gradually extending into new economic sectors. The advantages of natural tourism resources and large investments in infrastructure and hospitality facilities in the Kingdom offer great potential for future business growth. The construction of a 5G-based digital infrastructure is creating opportunities in e-commerce, Industry 4.0 and digital banking. Developing a flexible financial system and a competitive logistics industry are likely to be the next focal areas for collaboration. The petrochemicals sector has long-term potential related to innovations and research capitalizing on the larger margins available in the markets for new, high-end products. Such products include electronic chemicals, high-end membranes and biodegradable materials (KAPSARC 2020a).

However, improving productivity to enable businesses to participate in these emerging sectors faces challenges from policy programs aiming to accelerate job creation. Diversifying economic growth and increasing job opportunities for the youth are both crucial for the Kingdom to achieve economic sustainability. The Saudi government has launched many such programs. On one hand, Nitaqat quota compliance and greater hiring fees for expat workers are meant to encourage demand for Saudi labor. On the other hand, training programs, an increased minimum wage and employment protections are intended to enhance the supply of Saudi labor. These programs have increased the proportion of Saudi workers but have created significant costs for firms, as evidenced by firms

closing or downsizing (Harvard Kennedy School 2019).

Developing a competitive and diversified private sector will be difficult unless Saudi workers' wage expectations are in line with their productivity (IMF 2021). A longer phase-in approach when implementing policies may help to mitigate some of the associated short-run costs. With this approach, businesses can adjust their capital investments to decrease the costs associated with employing Saudis instead of expatriates. More detailed studies are needed to help optimize the ongoing reforms and design new support programs to mitigate these transitional costs (Pack 2017).

Chinese SOEs are still the major players in BRI projects' investment and construction, although private enterprises have increased their participation. This outcome is understandable, as SOEs have a higher capacity for risk than private enterprises do owing to their greater scales of operations. Additionally, SOEs can leverage their networks and government institutions to obtain financing and technical resources (Galkin, Chen, and Ke 2019). This capacity can be important for infrastructure projects and capital-intensive sectors and may create opportunities for the private sector within various supply chains.

However, most Chinese SOEs are still in the early stages of overseas market development. Thus, staying competitive in this growing but challenging market requires major changes to their corporate governance. These changes may include decentralizing decision making in overseas subsidiaries and prioritizing local content strategies in overseas business plans. It is also crucial to extend partnerships with international players and improve risk control mechanisms as the environment changes.

Emerging Opportunities in the Circular Carbon Economy

A coalition of governments, cities and businesses is taking stronger actions to mitigate climate change. This shift has brought unprecedented changes to policy regulations, business strategies and investment flows. In particular, the EU, Japan, the Republic of Korea and more than 110 other countries have pledged carbon neutrality by 2050. Countries with ambitious carbon neutrality commitments represent over 65% of global carbon dioxide emissions and over 70% of the world economy (U.N. 2020).

During the 2020 G-20 summit, Saudi Arabia proposed a CCE framework to promote sustainable economic growth under carbon emissions constraints. This framework, endorsed by G-20 leadership in November 2020, comprises a holistic approach including reducing, reusing, recycling and removing carbon (KAPSARC 2020b).

- Reducing carbon by utilizing energy efficiency measures, renewables and nuclear power.
- Reusing carbon by capturing and converting it into feedstock for industrial production or injecting it into oil and gas reservoirs to increase productivity.
- Recycling carbon using bioenergy and natural carbon sinks in land use, forests and oceans.
- Removing carbon by capturing and storing it geologically or chemically.

During the UN General Assembly in 2020, China pledged to reach peak carbon emissions before 2030 and achieve carbon neutrality before 2060. In February 2021, China released guidelines for developing the green and low-carbon circular economy. According to these guidelines, China will strongly consider climate change in its future trade and overseas investment activities. It will also drive domestic green technology penetration as quickly as is feasible.

These new developments in Saudi Arabia and China present opportunities to extend their current industrial investment and trade cooperation to the development of the CCE.

Prioritizing the Construction of Local Capacity in Renewable Energy Investments

Renewable energy is integral to the long-term economic goals of Saudi Vision 2030. Among other reforms improving governmental efficiency and business transparency, the Saudi government has made significant progress in establishing an institutional and regulatory framework for renewable energy development. This framework clearly defines the roles of the authorities and offers a wide range of incentives to private investors. The Renewable Energy Resources Atlas can support project siting, design and research. A public database with information on more than 100 local companies that currently operate in the renewable energy sector was established. The purpose of this database is to facilitate private enterprises' participation in this sector and enable cooperation between local suppliers and international developers.

Energy Minister Prince Abdul Aziz bin Salman announced in 2020 that Saudi Arabia is planning to produce 50% of its electricity from renewable sources by 2030 (Saudi Gazette 2020). The plan includes developing more than 35 industrial parks for renewable power generation and producing the necessary equipment and technology for renewable energy production. Saudi Arabia may also be able to export green power to the wider MENA regional market. The integrated Gulf Cooperation Council (GCC) electricity grid can provide infrastructure support for doing so. The GCC Interconnection Authority is currently discussing extending the current GCC power pool to include Iraq, Jordan and Egypt (Aluwaisheg 2020).

This ambitious plan has generated a new wave of Chinese participation. The SRF, a Chinese state-owned fund specifically established for investing in BRI strategic projects, became a shareholder of ACWA in 2020. It holds a 49% stake in ACWA's renewable energy subsidiary. In the same year, Saudi Arabia's Public Investment Fund

increased its ownership stake in ACWA Power to 50%. ACWA Power's success as a leading developer, investor and operator in the Kingdom also stems from its widely established partnerships in power generation and desalinated water. It collaborates with numerous Chinese enterprises, including the Bank of China, Shanghai Electric, Huawei, Energy China, PowerChina and China Gezhouba Group Company. These collaborations have helped to strengthen its financial and technical capacity to capture the growing opportunities in MENA, Africa, Asia and Central Asia (ACWA Power 2019). The success of the construction and operation of the Sakaka solar project in Saudi Arabia is one example (Box 1).

Local factors are critical to the success of renewable energy development. China is the world's largest producer of wind and solar energy and the largest domestic and outbound investor in renewable energy. Seven of the top 10 solar panel manufacturers and six of the top 10 wind turbine makers by global market share were based in China in 2020. China has domestic incentives to invest in renewable energy throughout the supply chain, from technology development and production to large-scale deployment. These investments have led to spillovers in the BRI region.

The collaboration between Saudi Arabia and China can therefore deepen from developing the renewable energy market to establishing a renewable energy industry in the Kingdom. The countries can cooperate financially and technically in developing large-scale renewable energy plants. Additionally, they can share experience and knowledge on incentive policies for renewable energy development and provide training and technology transfers to build local capacity. Finally, they can conduct joint research and development for technologies and solutions tailored for local markets (KAPSARC 2020c).

Box 1: The Sakaka Solar Project in Saudi Arabia

The Sakaka Solar Farm is the first utility-scale renewable energy project in Saudi Arabia, with total investments of \$329 million for 300 megawatts of installed capacity. It is also the first in a series of procurement projects within the National Renewable Energy Program. This program is being executed by Saudi Arabia's Renewable Energy Project Development Office.

The ACWA Power consortium's bid led to a world record low tariff in 2018 of \$0.0234/kilowatthour for this project. The Saudi Power Procurement Company signed a 25-year power purchase agreement with the Sakaka Solar Energy Company. This company is a joint venture established by ACWA Power (70%) and Al Gihaz Holding (30%).

Several different companies are involved in this project. A consortium of Mahindra Susten and Chint Solar (Zhejiang) is responsible for the EPC of the solar farm. Mahindra Susten, a subsidiary of the Mahindra Group, is a solar EPC services company based in India. Chint Solar (Zhejiang) is a manufacturer of solar photovoltaic (PV) modules based in China. Huawei, a Chinese company, was awarded a contract to supply its FusionSolar 1500 Volt Smart PV Solution. It also supplies multiple maximum power point tracker string inverters for this project. The Daa Sakaka Operation and Maintenance Company, a subsidiary of First National Operations & Maintenance, was awarded the operation and maintenance contract.

ACWA announced the completion of this project and its connection to the national grid in December 2019. This project achieved a 100% local employment rate within its first year of operation. Youth from the Al Jouf region comprised 90% of its workforce. Additionally, the Sakaka PV independent power producer included over 30% of contractual local content during the construction and development phases.

Source: NS Energy (2019).

Benefiting From Energy Efficiency

In both China and Saudi Arabia, growing residential needs, expanding economic activities and dependence on energy-intensive industries have been major drivers of rising energy consumption.

In China, the progressive energy intensity reductions over the past decades are due to the development of higher value-added activities and continued energy efficiency improvements. The growth in value creation has outpaced the increase in energy consumption. At the same time, administrative requirements, technical support and financial investments in energy efficiency initiatives have continuously pushed overall energy consumption downward. Different approaches have been deployed in each stage of this process. In the initial stage, setting energy efficiency targets, promoting the use of energy-efficient technologies and developing energy efficiency standards have been critical. As government agencies and market players have increased their capacities, promoting the use of energy management systems and establishing market-oriented mechanisms have become more important. Examples of such mechanisms include the energy efficiency service market and carbon trading.

The situation in Saudi Arabia is somewhat different. Energy intensity has risen owing to the pivot into energy-intensive non-oil industries. The value added from economic activities has grown more slowly than energy consumption has. However, the improvement in energy intensity since 2010 suggests that increasing energy efficiency placed significant downward pressure on Saudi Arabia's strong energy consumption growth (Chen et al. 2018). The Saudi Energy Efficiency Center, established in 2010, has strengthened cross-department coordination and national efforts toward energy efficiency improvements. These efforts have been

rapidly expanded to developing energy performance standards for home appliances and enforcing thermal insulation in new buildings. Saudi Arabia has also established aspirational energy intensity targets for enterprises in the petrochemical, cement and steel industries. Furthermore, the energy price reforms starting in 2016 have incentivized energy efficiency.

In both countries, energy efficiency can play a larger role within the broader movements toward economic diversification and can improve business competitiveness. The Chinese experience shows that with proper policies, energy efficiency can encourage and develop a new market. This market consists of energy service companies, energy efficiency facilities and the energy information and management sector. Collaborations between Saudi Arabia and China can facilitate the exchange of best practices for energy efficiency policy frameworks, especially in the following areas (KAPSARC 2018):

- Supporting the application of energy efficiency technologies in energy-intensive enterprises through a combination of administrative, financial and technical measures.

- Supporting the development of high-value industries through full-fledged energy efficiency initiatives.

- Aligning local regulatory approaches with regional (i.e., GCC) and global standards to reduce the risks associated with foreign investments in the energy efficiency market.

Scaling Up CCS Deployment

The CCE encourages the productive use of carbon dioxide in fuels, chemicals and materials and provides carbon removal as an important technology for closing the loop. The need for the large-scale deployment of carbon capture, usage and storage (CCUS) in hard-to-abate sectors is clear. Currently, 21 commercial CCS facilities with a total capacity of 40 million tonnes of carbon dioxide per year are operating globally. Three more are under construction, 16 are in advanced development and approximately 20 more are in early development stages (Global CCS Institute 2020). The deployment of CCS at the necessary rate and scale to achieve climate targets still faces immense technical and economic challenges. Thus, governmental policy incentives and support from new regulations are still crucial.

Saudi Arabia has developed comprehensive plans to manage carbon emissions. SABIC ambitiously aims to reduce its greenhouse gas intensity by 25% and its material loss intensity by 50% by 2025 relative to a 2010 baseline. SABIC built the world's largest carbon capture and utilization plant, which began operation in 2015. In this project, 500,000 tonnes of carbon dioxide per year are captured from the production of ethylene glycol. This carbon is used to produce urea, methanol and liquefied carbon dioxide (SABIC 2021).

To test the feasibility of carbon storage for enhanced oil recovery, Saudi Aramco conducted the first demonstration project in the Uthmaniyah oil field. This project uses 800,000 tonnes of carbon dioxide per year captured from Hawiyah Gas Plant. Since the initial injection of carbon dioxide in 2015, the oil production rates of four wells have doubled. CCS technologies are also being tested for cars and trucks. The latest form of this technology can capture up to 25% of the carbon dioxide emitted from a vehicle's exhaust. Carbon dioxide conversion technology is also applied in the polypropylene

carbonate polyols product line. It provides valuable chemicals and materials for consumer and industrial adhesives, insulation, food packaging, sealants and elastomer applications (Aramco 2020).

China has also made significant progress in CCS through government-funded research and demonstration programs over the last decade. Of six operational CCS integrated demonstration projects, five are for enhanced oil recovery, which can capture a total of 760,000 tonnes of carbon dioxide every year. Construction of China's largest CCS project was completed in February 2021. Once operable, it will be able to capture 150,000 tonnes of carbon dioxide per year from a coal power plant in Shaanxi province. All of these projects have demonstrated the value of examining the technology's feasibility and determining the cost of using CCS (Yang, Heidug, and Cooke 2018). However, CCS can only help in realizing China's carbon neutral target when its technical feasibility and economic attractiveness improve through scaled deployment.

Sharing knowledge and experience regarding policy and regulatory frameworks is important to make progress in this area. Wider CCS deployment will also require specific standards for storage site selection, storage site characterization, environmental impact assessments and long-term liability. The incubation of a cross-border PPP for CCS financing is crucial to establish risk-sharing mechanisms for CCS-ready projects. In addition, jointly exploring the use of carbon storage units in a broader carbon trading system can impact the long-term sustainability of CCS deployment. A storage crediting approach can tag produced fossil fuels with storage credits equivalent to some or all of the carbon embodied within the fuel (Zakkour and Heidug 2019). Pricing carbon storage units can therefore provide additional incentives to commercialize and deploy CCS at a large scale.

Integrating the Hydrogen Supply Chain

Hydrogen has received unprecedented attention in recent years. Several countries, including Australia, Germany, Japan, South Korea and the Netherlands, have released hydrogen strategies at the national level. Hydrogen can enable a cleaner energy system if hydrogen production is shifted to specific technologies. Such technologies should incorporate carbon capture, water electrolysis powered by low-carbon electricity and other low-carbon options (e.g., biomass or thermochemical water splitting) (IEA 2020).

Energy transition, including a gradual shift from fossil fuels to hydrogen-based, low-carbon energy sources, is at the core of Saudi Arabia's economic diversification strategies. The cost competitiveness of renewable energy development in the Kingdom creates advantages for the production and export of green hydrogen. In August 2020, Saudi Arabia announced the launch of a green hydrogen production project in Neom powered by four gigawatts of renewable energy. This \$5 billion investment plan is a major step in making Neom an important global center for renewable energy and green hydrogen. In September 2020, Saudi Aramco delivered its first shipment of blue hydrogen to Japan for use in zero-carbon power generation. This shipment consisted of 40 tonnes of high-grade ammonia. This pilot project presents a crucial opportunity for Saudi Arabia to introduce hydrocarbons as a reliable and affordable source of low-carbon hydrogen and ammonia. This source can be made available for global needs.

China is the world's largest producer of hydrogen. In 2019, it was responsible for more than 21 million of the 70 million tonnes produced globally. More than 10 provinces in China have announced their own hydrogen industry development plans (DRC 2021). Hydrogen industry clusters that integrate technological development with local market incubation have been emerging in five

regions. However, most hydrogen in China is currently produced via industry byproducts and coal gasification. Developing green hydrogen and promoting the use of CCUS in fossil-fuel-based hydrogen are crucial for achieving China's carbon neutrality target.

A white paper on China's hydrogen and fuel cell industry predicts that transport will account for 40% of the 60 million tonnes of total hydrogen demand by 2050. Industry use will account for 56% of this total. By then, five million fuel cell vehicles will be operating, and 10,000 hydrogen filling stations will be constructed (China Hydrogen Alliance 2019). Energy efficiency improvements for oil-based vehicles were completely eliminated from the New Energy Vehicle Development Plan (2021-2035) released by the State Council in November 2020. Instead, national efforts have been vigorously focused on developing electric and fuel-cell vehicle technologies and the related infrastructure.

Achieving the economic potential of hydrogen development for a low carbon future requires overcoming several key challenges. The overall prospects for cost reduction are promising only when the technologies can be deployed at scale. The efficiency and cost of electrolysis largely determines the cost of green hydrogen, whereas carbon capture technology influences the cost of blue hydrogen (Alatawi and Darandary 2020). The storage and transport of hydrogen consumes significant energy. Building infrastructure for the use of hydrogen in the industry and transport sectors is also capital-intensive.

Cooperation between China and Saudi Arabia can accelerate the deployment of hydrogen at scale and facilitate international trade in hydrogen. The blue hydrogen pilot project, a collaboration between Saudi Arabia and Japan, offers a replicable model for cooperation between Saudi Arabia and China.

Integrating the Hydrogen Supply Chain

Joint efforts between the two countries may include increasing supply chain integration to reduce costs. They can also harmonize standards

for the large-scale deployment of green hydrogen and improve the robustness of carbon accounting and verification methods for carbon savings.

Conclusion

The BRI has begun a new phase in which attention has shifted to strengthening multilateralism. This shift is partly because of growing international concerns about environmental impacts, debt sustainability and project transparency. It is also driven by China's ambition for greater global leadership, especially at a time when traditional hegemony is slow or stagnant. The Asia Infrastructure Investment Bank (AIIB) has been an institutional success, demonstrating Chinese multilateralism on BRI projects. The Multilateral Cooperation Center for Development Finance (MCCDF) is the third multilateral institution initiated by China after the New Development Bank and the AIIB. Its establishment and operationalization signals China's continued efforts to increase multilateralism.

This commitment to multilateralism does not just relate to diversifying funding resources and increasing levels of coordination. It also means integrating environmental, social and governance (ESG) considerations into business practices and adopting international norms and standards for BRI financing, investment and project activities. At the second BRI forum, President Xi pledged to make the BRI clean, green and sustainable. Since then, the Chinese central government has issued a series of guidelines for green BRI development. These guidelines are only the beginning of a recalibration and adjustment process. In the future, ensuring ESG sustainability in BRI investments and projects will be critical for measuring the initiative's success. Doing so will affect BRI partner economies in terms of investments and production, especially in combating global climate change and promoting the green energy transition.

Saudi Arabia is well positioned to strengthen its cooperation with China. Through this cooperation, it can move the world from a conceptual understanding of the CCE to reshaping investment and development activities for decarbonization. The bilateral platform established under the Sino-Saudi HLJC for the BRI and energy-related cooperation has the appropriate legitimacy to initiate and deepen cooperation on the CCE. Saudi Arabia is also a founding member of the AIIB and MCCDF funds under the BRI partnership. Through these funds, it can extend its connections with potential partners within the Belt and Road region.

At the bilateral level, cooperation can focus on conducting joint research on policy incentives, financial instruments and regulatory frameworks for large-scale deployments of hydrogen and CCUS. Both countries can also jointly develop standards to ensure environmental sustainability and carbon accounting for cross-border trade and supply chain integration.

At the multilateral level, both countries can work together to promote the CCE framework within the Belt and Road region. This promotion may include, for example, considering the provision of hydrogen during investment and financing planning for BRI-related ports, highways and railway projects. They can support regional power integration, especially in the GCC, the Association of Southeast Asian Nations and Africa. Doing so can increase the power system's flexibility for high-ratio renewable energy development. China and Saudi Arabia can also facilitate wider collaborative research and international knowledge sharing to reduce risk within the CCS supply chain.

References

ACWA Power. 2019. "ACWA Power Signs Strategic Agreements with Three Chinese Entities During the Second Belt and Road Forum." April 29. Accessed February 22, 2021. <https://www.acwapower.com/news/acwa-power-signs-strategic-agreements-with-three-chinese-entities-during-the-second-belt-and-road-forum/>.

Alatawi, Hatem, and Abdulelah Darandary. 2020. "The Saudi Move into Hydrogen: A Paradigm Shift." KAPSARC Instant Insight, December 22. <https://www.kapsarc.org/research/publications/the-saudi-move-into-hydrogen-a-paradigm-shift/#:~:text=Saudi%20Arabia%20is%20moving%20ahead,from%20Saudi%20Arabia%20to%20Japan.>

Aluwaisheg, Abdel Aziz. 2020. "The Benefits of Saudi Arabia's Renewable Energy Push." *Arab News*, June 29. Accessed February 22, 2021. <https://www.arabnews.com/node/1697306>.

Aramco. 2020. "Carbon Capture, Utilization & Storage." Accessed February 21, 2021. <https://www.aramco.com/en/making-a-difference/planet/carbon-capture-utilization-and-storage>.

Chen, Dongmei, Guanyun Fu, Nicholas Howarth, Alessandro Lanza, and Padu S. Padmanabhan. 2018. "Toward Economic Prosperity Through Industrial Energy Productivity Improvement." KAPSARC Discussion Paper. <https://doi.org/10.30573/ks--2018-dp28>

Chen, Dongmei, and Wenke Han. 2019. "Deepening Cooperation Between Saudi Arabia and China." KAPSARC Discussion Paper. <https://doi.org/10.30573/ks--2019-dp53>

China Going Global Think Tank (CGGT). 2014. "Lessons from China Railway Construction Corporation (CRRC)'s Failed Light Rail Project in Mecca, Saudi Arabia." CGGT, March 14. Accessed February 20, 2021. <http://www.cggthinktank.com/2014-03-14/100071557.html>

China Hydrogen Alliance. 2019. "China Hydrogen and Fuel Cell Industry White Paper." Accessed February 23, 2021. <http://www.h2cn.org/Uploads/File/2019/07/25/u5d396adeac15e.pdf> .

Development Research Center (DRC). 2021. "Fastening the Development of Hydrogen Industry for Achieving Carbon Neutrality Target." DRC, January 19. Accessed February 23, 2021. <https://www.drc.gov.cn/DocView.aspx?chnid=379&leafid=1338&docid=2902509> .

European Center for Digital Competitiveness. 2020. "Digital Riser Report 2020." https://digital-competitiveness.eu/wp-content/uploads/ESCP03_Digital-Riser-Ranking_2020-09-14-1.pdf .

European Parliament. 2018. "China, the 16+1 Format and the EU." [https://www.europarl.europa.eu/RegData/etudes/BRIE/2018/625173/EPRS_BRI\(2018\)625173_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2018/625173/EPRS_BRI(2018)625173_EN.pdf) .

Fulton, Jonathan. 2020. "Strangers to Strategic Partners: Thirty Years of Sino-Saudi Relations." Atlantic Council, August. <https://www.atlanticcouncil.org/in-depth-research-reports/report/strangers-to-strategic-partners-thirty-years-of-sino-saudi-relations/>

Galkin, Philip, Dongmei Chen, and Junyang Ke. 2019. "China's Energy Investment Through the Lens of the Belt and Road Initiative." KAPSARC Discussion Paper. <https://doi.org/10.30573/ks--2019-dp83>

- Global Carbon Capture and Storage (CCS) Institute. 2020. "Remove: Carbon Capture and Storage." Accessed February 23, 2021. <https://www.cceguide.org/guide/>.
- Harvard Kennedy School. 2019. "The Labor Market in Saudi Arabia: Background, Areas of Progress and Insights for the Future." Accessed February 20, 2021. https://epod.cid.harvard.edu/sites/default/files/2019-08/EPD_Report_Digital.pdf.
- Hillman, Jonathan E. 2018. "China's Belt and Road Initiative: Five Years Later." CSIS Testimony. Accessed February 20, 2021. <https://www.csis.org/analysis/chinas-belt-and-road-initiative-five-years-later-0>.
- Hong, Sheng, Yifan Jie, Xiaosong Li, and Nathan Liu. 2019. "China's Chemical Industry: New Strategies for a New Era." McKinsey Insight. <https://www.echemi.com/cms/34610.html>
- International Energy Agency (IEA). 2020. "Cross-cutting: Hydrogen." <https://www.cceguide.org/guide/>.
- International Monetary Fund (IMF). 2021. "Economic Prospects and Policy Challenges for the GCC Countries." IMF, October 25.
- International Trade Center (ITC). 2021. "Trade Map." Accessed February 25, 2021. <https://www.trademap.org/Index.aspx>.
- KAPSARC. 2018. "Fostering Joint Leadership on Energy Productivity Transitions in Saudi Arabia and China." KAPSARC Workshop Brief. <https://doi.org/10.30573/ks--2018-wb18>
- . 2020a. "The Future of the Petrochemicals Industry and Sino-Saudi Cooperation." KAPSARC Workshop Brief. <https://doi.org/10.30573/ks--2020-wb12>
- . 2020b. "CCE Guide Overview: A Guide to the Circular Carbon Economy (CCE)." Accessed February 21, 2021. <https://www.cceguide.org/guide/>.
- . 2020c. "Policy and Economic Frameworks to Deepen Sino-Saudi Cooperation." KAPSARC Workshop Brief. <https://doi.org/10.30573/ks--2020-wb04>
- MEED. 2020. "PPP Progress for Saudi Arabia." MEED, August 25. Accessed February 22, 2021. <https://www.meed.com/saudi-ppp-and-privatisation-progress-and-prospects> .
- Ministry of Commerce, People's Republic of China (MOFCOM). 2021. "Data Base." Accessed February 22, 2021. <http://opendata.mofcom.gov.cn/front/data?s=3>.
- Ministry of Commerce, People's Republic of China (MOFCOM) and China International Project Contracting Association. 2020. "Annual Report on China International Project Contracting 2018-2019." <http://images.mofcom.gov.cn/fec/202005/20200509174729295.pdf>
- NS Energy. 2019. "Sakaka Solar Project." Accessed February 22, 2021. <https://www.nsenergybusiness.com/projects/sakaka-solar-project/>
- Pack, Jennifer R. 2017. "Can Hiring Quotas Work? The Effect of the Nitaqat Program on the Saudi Private Sector." *American Economic Journal: Economic Policy* 9(2):316–47. <https://doi.org/10.1257/pol.20150271>
- Saudi Basic Industries Corporation (SABIC). 2021. "Creating the World's Largest Carbon Capture and Utilization Plant." Accessed February 24, 2021. <https://www.sabic.com/en/newsandmedia/stories/our-world/creating-the-worlds-largest-carbon-capture-and-utilization-plant>.

References

- Saudi Gazette*. 2020. "Saudi Arabia Aims to Produce World's Lowest-cost Electricity." June 27. Accessed February 22, 2021. <https://saudigazette.com.sa/article/594786>.
- Saudi Gulf Projects. 2019. "Saudi Electricity Company Awards \$2.5 Billion Smart Meters Project." December 16. Accessed February 22, 2021. <https://www.saudigulfprojects.com/2019/12/saudi-electricity-company-awards-2-5-billion-smart-meters-project/>.
- Si, Katherine. 2018. "PowerChina Wins \$3bn Construction Project for Saudi Mega-yard." *Seatrade Maritime News*, November 30. Accessed February 20, 2021. <https://www.seatrade-maritime.com/asia/powerchina-wins-3bn-construction-project-saudi-mega-yard>.
- Struver, Georg. 2017. "China's Partnership Diplomacy: International Alignment Based on Interests or Ideology." *The Chinese Journal of International Politics* 10:31–65. <https://doi.org/10.1093/cjip/pow015>
- United Nations (U.N.). 2020. "The Race to Zero Emissions, and Why the World Depends on It." United Nations, December 2. Accessed February 22, 2021. <https://news.un.org/en/story/2020/12/1078612>.
- UNCTADSTAT. 2021. "Data Center." Accessed February 25, 2021. https://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?sCS_ChosenLang=en .
- Yang, Xiaoliang, Wolfgang Heidug, and Douglas Cooke. 2018. "Policy Lessons From China's CCS Experience." KAPSARC Discussion Paper. <https://doi.org/10.30573/ks--2017-dp37>
- Zakkour, Paul, and Wolfgang Heidug. 2019. "A Mechanism for CCS in the Post-Paris Era: Piloting Results-Based Finance and Supply Side Policy Under Article 6." KAPSARC Discussion Paper. <https://doi.org/10.30573/ks--2019-dp52>

Notes

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