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Coal industrial supply chain network: Mongolian capabilities across the Asian market

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Abstract. World Coal market experiences rapid changes nowadays: phasing out coal and switching to gas and renewables source of primary energy. Countries of Asia are also pursuing strategies of sustainable environmental development and seeking for new sources of energies. But energy transition will not occur in several years, this transition requires decades of investment and technology development. Up to that time coal will remain main source of energy, especially for China and other South-Eastern Asian countries. Mongolia is a landlocked country with high dependence from mining sector and this trend will likely to continue for at least a decade to diversify economy. Since that time, Mongolia needs to reidentify its strategies for fast changing Asian market. Major concern of domestic coal sector is to benefit from coal export and determine opportunities for coal sector development. This study will be a reliable source for policymakers and coal exporters.

Keywords. coal, international trade, market simulation, scenario analysis

Introduction

Issue statement

Coal power has faced pressure in recent years. Coal is being replaced by gas, new air quality standards are being introduced, public campaigns are being held in support of a complete phase-out of coal, and renewable energy is getting cheaper [1]. Nevertheless, in the past two years, the demand for coal in the world has grown. The trend has changed at the expense of Southeast Asia, confirms the International Energy Agency [2].

Developed economies are actively rejecting coal and switching to renewable energy sources. Nevertheless, consumption of coal has significantly grown across Asian countries. According to Wood Mackenzie thermal consumption report, coal consumption in Asia Pacific region is expected to reach its peak in 2027 [3]. CNBC reports that despite growth of green energy supply, demand of coal combustion energy will remain main source of energy, at least in Asia Pacific region [4].

Asian countries are characterized by stable economic development, demographic growth and active formation of the middle class. The largest consumer of thermal coal - China - intends to reduce the use of this resource by 3% by 2023 [5]. However, China will continue to play an important role in thermal coal consumption as it invests heavily in coal projects in other

countries. The demand for thermal coal in Southeast Asian countries is on the upward trend, agreed in International Energy Agency [2].

Chinese authorities recently released decision to ban Australian coking and thermal coal, but at the same time removed import restrictions from numerous countries, including priority for Mongolia, Indonesia and Russia [6]. As of 2020, top coal trade partners of China are Australia, Russia, Mongolia and Philippines. Growth of Mongolian coal import was facilitated by “green corridor” initiative by China-Mongolia joint agreement, which is short-term opportunity for Mongolia [7].

As Asia Pacific region, including China and India pursues economic growth, energy demand is increasing correspondingly. As World energy trend is to switch to renewables, Asian countries also tend to increase supply of primary energy from renewable sources, however, coal demand is expected to increase primarily in South-East Asia up to 2030 [8]. This uncertainty leads to question, whether Mongolia will be coal exporting country in the future and what strategy shall pursue Mongolia in order to catch up with regional market trends.

Purpose

Therefore, aim of this study will be identification of key regional market trends and determine whether Mongolia has opportunity in fast changing coal market.

Following objectives are set within that purpose: (1) determine key regional coal supply and demand trends; (2) determine market opportunities and threats; (3) determine prospects of Mongolia in Asian coal market; and (4) suggest policy implications

Importance of study

The review and analysis generated as a result of compiling indicators in the coal industry in comparison to other competitor countries, based on data from primary sources, will offer a significant benefit to professional organizations studying the basic criteria and prognostic indicators for coal markets, to forecast, and to develop strategies.

Data processing methods

This paper will be based on documental, statistical analysis methods. Documental analysis based on review and synthesis of reliable secondary information sources. Market analysis was performed in following directions: (1) long term coal supply and demand trend was determined for 2025, 2030, 2035 and 2040 years; (2) coal price forecast for Australian and South African base.

Key Trends In Regional Market

Overview of coal demand trends

Coal demand in China expected to remain generally stable for 2019–2030-time interval with peak consumption around 2025 and ending at 2030 around 85 Mtce (-3%). The power sector adds around 45 Mtce to demand by 2030 [9]. About 60 Mtce will come from fuel conversion (coal-to-gas and coal-to-liquids) and nearly 15 Mtce from chemical feedstock production. This growth is offset by reductions in demand of around 50 Mtce in the buildings sector and nearly 110 Mtce in industry, particularly iron and steel production, driven by policies to phase out inefficient industrial technologies [10].

Electricity demand growth declines only slightly against pre-crisis projections over the coming decade, anticipating that China’s economic recovery measures will quickly return the economy to pre-crisis growth patterns [11]. If China’s stimulus plans focus on fostering continued renewable growth, the power sector in China may see demand for coal fall sooner

than current estimates of around 2025 [12]. In this sector, as in the economy as a whole, much will depend on the detail of China’s forthcoming 14th Five-Year Plan and how this might be shaped by China’s new target of carbon neutrality by 2060 [13].

There is some uncertainty about whether China’s coal phase-out plans in end-use sectors might be relaxed in the short term in light of concerns around fuel security and the disruption of global supply chains during the pandemic [14]. Yet, low natural gas prices and continuing efforts to deregulate and boost strategic reserves during the low-price period could strengthen the case for standing firm on coal-to-gas switching policies [15].

In lower coal demand scenario, there will be likely more rapid actions to phase out coal and expand Clean Winter Heating plan in China [16]. As for higher demand scenarios following measures are expected: (1) Industrial end-use sectors demand rises as a result of stimulus measures; (2) Steel and cement production revised up; (3) Policies to preserve the role of coal in power generation and chemical conversion (coal-to-gas and liquids).

China in particular is central to uncertainties affecting future coal demand because it accounts for 56% of global coal use in 2030 [17]. China has been progressively phasing out coal in recent years, but concerns about dependence on oil and gas imports or about employment could lead to a slowing of phase-out plans [18]. Conversely, concerns about emissions or air quality could speed them up.

Figure 1. Asia Pacific Coal demand trend

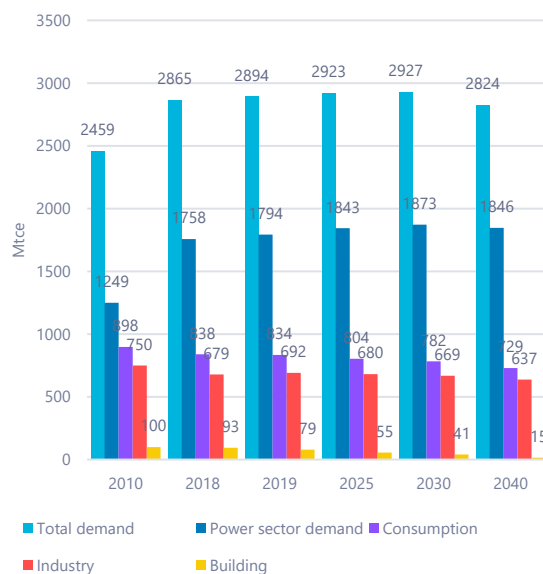
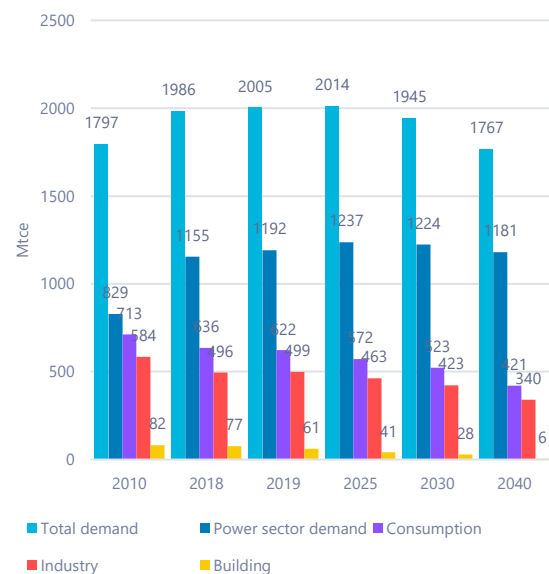


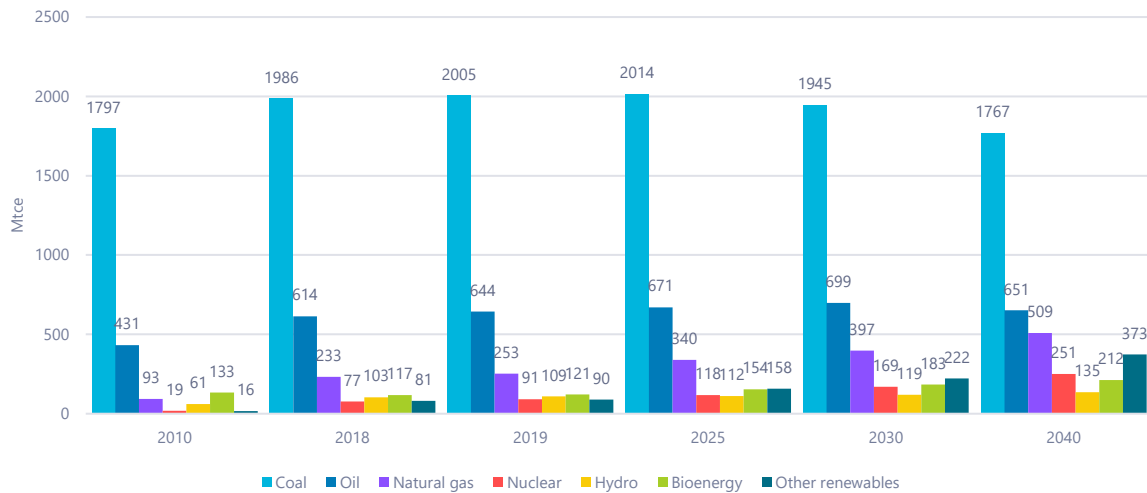
Figure 2. China Coal demand trend



Source: [19]

Asia Pacific region total coal demand is likely to decrease compared with total World consumption [20]. Whereas 47 percent of total coal energy demand accounts for Asia Pacific region, this number expected to decrease down to 36 percent from total world coal demand. As for China, its coal energy demand account for 61 percent of whole region with consequent decrease down to 45 percent in 2040.

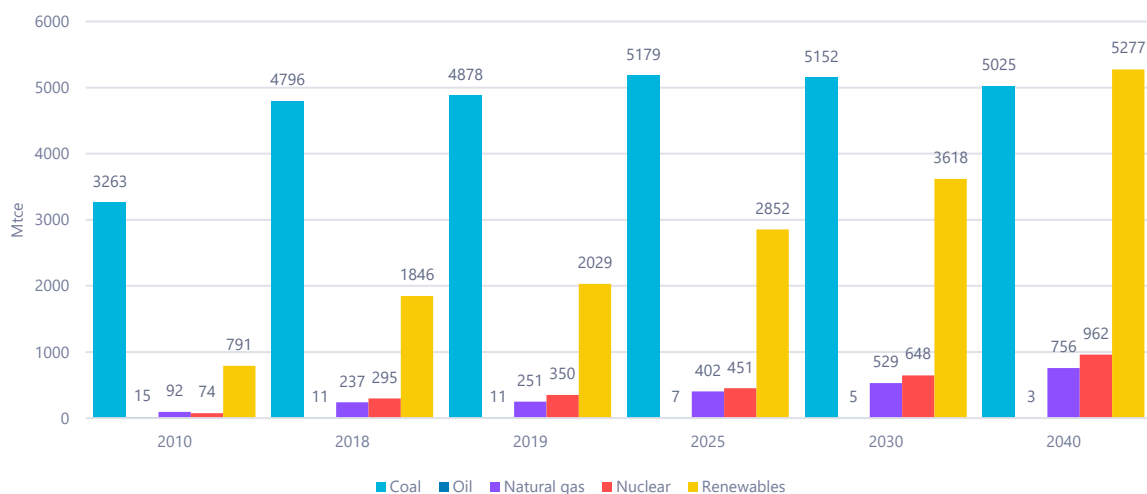
Figure 3. Structure of Asia Pacific energy demand



Source: [19]

Total share of coal energy in Asia Pacific energy balance accounts for 61 percent in 2019, and expected to decrease down to 53 percent in 2030 and 45 percent in 2040.

Figure 4. Structure of China energy demand



Source: [19]

Total share of coal energy in Asia Pacific energy balance accounts for 62 percent in 2019, and expected to decrease down to 52 percent in 2030 and 42 percent in 2040. It can be seen that China will rely more on renewable green sources of energy in 2040.

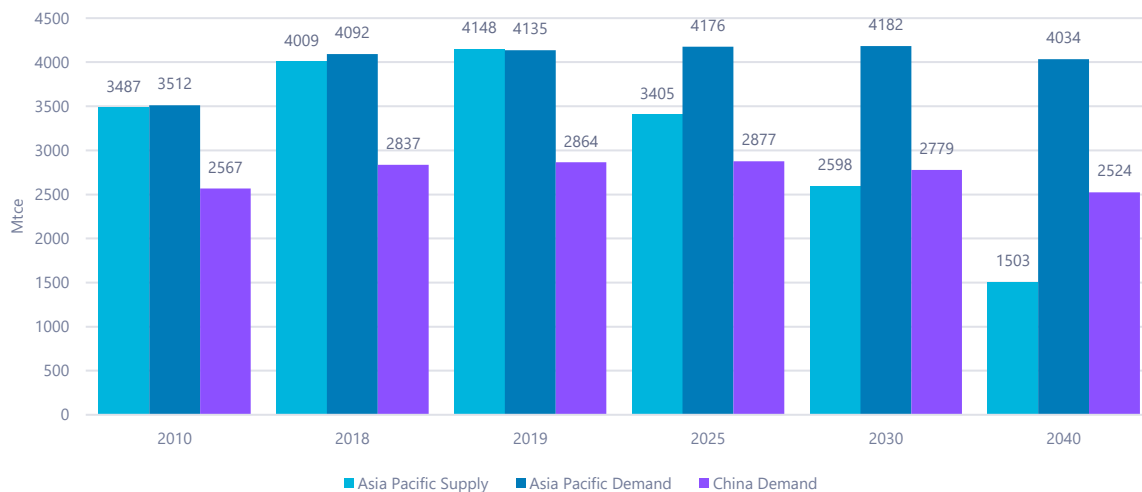
Experts foresee that China will be one of the major developing economies to expect growth in net electricity demand in 2020 compared with 2019 [21]. While stringent restrictions on activity and mobility led to a drop in electricity demand in the first-quarter 2020, the limited spread of Covid-19 in China combined with a rapid industry-led recovery is expected to push electricity demand above 2019 levels by the end of 2020 [22]. Industry continues to be the main source of electricity demand in China, accounting for half of this growth in demand to 2025, the majority of which is needed to power electric motor systems in light industry such as manufacturing and to a lesser extent in heavy industries such as steel, aluminum and cement. Stimulus measures in China to date focus on infrastructure and industrial development, with

firms benefiting from wider availability of credit, and this helps fuel an increase in electricity demand for heavy industry of 260 TWh through to 2030 [23]. The average efficiency level of electric motors in industry improves from IE12 in 2019 to IE3 in 2030, with efficiency improvements across the industry sector saving around 500 TWh annually by 2030. Net growth of China's coal demands slows after 2025 [24].

Overview of coal supply trends

The coal industry entered 2020 with most indicators trending downwards. The boost from a cycle of growing demand and higher prices in 2016-18 dissipated in 2019 with a large drop in coal-fired power generation [19]. Prices were on the decline, although still at levels that were profitable for most producers. Moreover, there were gathering clouds over the future in the shape of ambitious climate policies, restrictions on finance for coal-related projects, increasing concerns from investors and shareholders, and stronger public opposition not only to new projects but also to existing ones [25]. Competition from ever cheaper renewables and lower gas prices were also putting pressure on coal's position in electricity markets [26].

Figure 5. Asia Pacific coal supply and demand equilibrium



Source: [19]

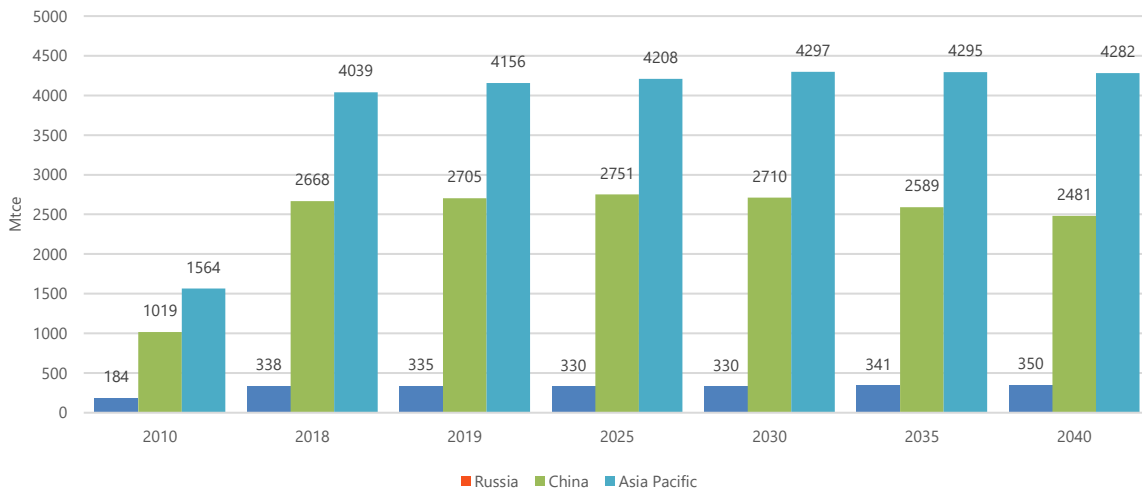
In China, the environmental factors that have tempered coal use sit alongside increasing worries about dependence on imported fuels. By far, coal remains the largest domestic fossil fuel resource in China, as well as the largest single component of its energy mix, and import dependency concerns tend to reinforce its position.

China continues to be the largest coal producer over the projection period but, after a slight increase in the 2020s with gradual decline in output [22]. Authorities in China have been actively engaged in a programme of restructuring that has seen the closure of small, less efficient mines, but the expansion of capacity in the west of China has more than offset these closures [27].

Russia has some of the lowest mining costs in the world, but output has to be transported over long distances from coal mining regions to ports. Transport costs are diluted by subsidies, but the share of transport in delivered costs is still higher than for most other producers [28]. Russia has been investing in new mining capacity and infrastructure with a view to expanding exports to Asia. In our projections, coal production increases slightly from 338 Mtce in 2018 to 350 Mtce in 2040, while exports rise from 166 Mtce to around 220 Mtce [19].

China's net import of coal is projected to peak in the next few years and then to decline substantially. By the mid-2020s, China is overtaken by India as the world's largest coal importer [19]. However, there are uncertainties over how the supply-demand balance in Asia plays out. Among exporters, Australia and Russia could take advantage of any new export opportunities, as Indonesian exports decline.

Figure 6. Coal production in Asia Pacific region (Mongolian's competitors)



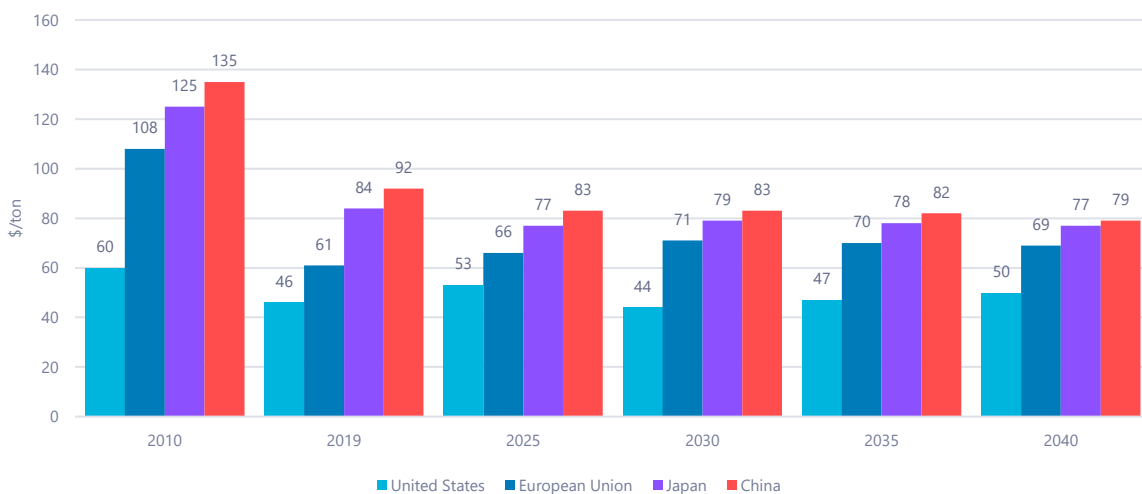
Source: [19]

China plans to decrease its dependence on coal primary energy and decrease its production due to tremendous impact on ecology [29]. Major coal production growth in region is accounted for Indonesia, Philippines, Australia. Major consumers of coal in this region is likely to be India and Vietnam.

Carbon price

Coal price is likely to go down until 2025 with consequent steady decline. Due to changes in strategies in supply side of coal and environmental concerns, profitability of coal producers likely to decrease with amid decline of investments in that sector. It can be seen that production of coal will remain generally stable compared with 2020 but prices will decline, thus profitability will likely to remain constant, if will not decrease [30].

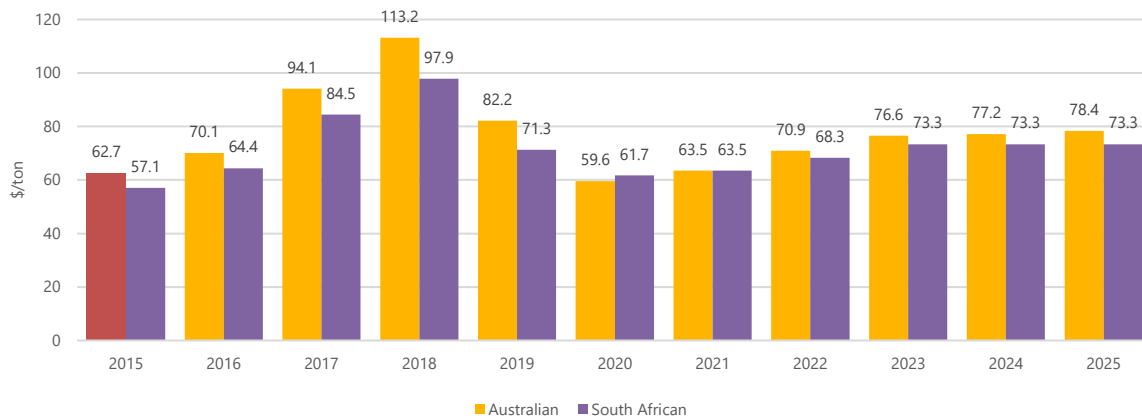
Figure 7. Price forecast for coal by countries



Source: [31], authors additional calculation

World coking coal prices were highest in 2008, with peaks in 2011 and 2018. As of 2019, the price of coal has reached \$ 80, and is expected to rise further, according to some international organizations. (Fitch, 2018)

Figure 8. Price forecast up to 2025



Source: [31], authors additional calculation

Prospects for Mongolian coal sector

Market factor analysis

Opportunities for Mongolia

- Consumption of coking coal in China is expected to reach 630 million tons in 2021, up from 592 million tons compared with 2020. From this, 75 million tons will be imported. The country's coal consumption, metallurgy, steel and construction materials are projected to grow by 2-2.5 percent this year, which means that China's coal market will be relatively stable and reasonably optimistic.
- In relation with Mongolia's accession to the Asia-Pacific Trade Agreement on September 29, 2020, China has decided to reduce the tax on coal imports from Mongolia by 50 percent from January 1, 2021. The coal import tax related to this decision has been reduced from 5% to 2.5% this year. This opens up great opportunities for Mongolian coal exporters.
- Due to the above circumstances, the supply of coking coal in China has declined. On the other hand, China's industrial and steel sectors have continued to grow, and demand for coking coal remains high. This has led to market imbalances. Due to the above basic conditions, the price of coking coal has increased.

External threats

- Russia will supply 6 million tons of coking coal to China in 2020. As of today, Russia, Canada, Mozambique and Indonesia are among the countries with the highest potential to fill the Australian coal trade gap. Mongolian coal, on the other hand, has little change to replace Australian coal.
- As Mongolia's coal exports slowed due to Covid-19, Australia and Russia increased their coal exports to the Chinese coking coal market. For example, Russia has managed to increase coal exports by 3%. In the first quarter of the year, when Mongolia's coal exports came to a standstill, Russia's total coal exports continued to rise.
- Russia's coal industry is growing rapidly, infrastructure and concentrators are growing year by year, and in the last 20 years it has expanded its position in the world coal market by 3.5 times. The country plans to increase domestic coal production by 448-530 million tons per year by 2024 and by 485-668 million tons per year by 2035.

Scenario analysis

China's demand for coking coal is heavily dependent on the steel industry. Therefore, the demand for coal is projected in three scenarios that reflect the development of the steel industry. See the table below for results.

Table 1. Chinese coking coal demand and imports

Steal production	2006	2010	2011	2019	2020	2025	2030	2035
Scenario 1	422,660	626,959	689,655	673,921	640,892	579,315	510,432	473,281
Scenario 2	422,660	626,959	689,655	689,655	689,655	689,655	689,655	689,655
Scenario 3	422,660	626,959	689,655	746,288	776,514	738,457	702,266	667,848
Coking coal demand	2006	2010	2011	2019	2020	2025	2030	2035
Scenario 1	408,130	527,100	583,930	565,913	534,663	483,795	429,648	398,889
Scenario 2	408,130	527,100	583,930	577,481	569,808	561,724	553,632	545,442
Scenario 3	408,130	527,100	583,930	651,812	701,692	660,754	622,497	586,669
Coking coal import	2006	2010	2011	2019	2020	2025	2030	2035
Scenario 1	4,662	47,269	44,658	56,591	53,466	45,961	38,668	31,911
Scenario 2	4,662	47,269	44,658	57,748	56,981	46,172	55,363	54,544
Scenario 3	4,662	47,269	44,658	67,788	76,484	69,379	62,782	56,907

Note: Scenario 1: Steel production continues to decline; Scenario 2: Steel production will continue to grow; Scenario 3: Steel production will decline after 2021.

The table below shows Mongolia's export forecast and its share in Chinese imports. By 2025, the maximum export will reach 42 million tons, and in the second scenario the maximum export will be 42.6 million tons in 2025. Under the third option, exports will reach 46.8 million tons in 2025. These numbers are calculated for washed or enriched coal and will be higher by 30 percent for unprocessed raw coal.

Table 2. Mongolian export scenario analysis

Scenario	Indicator	2019	2020	2025	2030	2035
Scenario 1	China's coking coal import	69,954	66,114	70,020	66,019	56,840
	Mongolia's coking coal export	30,150	35,834	42,012	46,214	45,472
	Weight	43.10%	54.20%	60.00%	70.00%	80.00%
Scenario 2	China's coking coal import	71,108	70,116	56,772	61,377	65,005
	Mongolia's coking coal export	30,150	36,180	42,579	49,101	55,254
	Weight	42.40%	51.60%	75.00%	80.00%	85.00%
	China's coking coal import	78,109	87,968	78,060	76,957	79,896

Scenario 3	Mongolia's coking coal export	30,150	38,090	46,836	61,566	55,927
	Weight	38.60 %	43.30 %	60.00 %	80.00 %	70.00 %

Conclusion

General conclusion

The coal industry of the People's Republic of China ends the decade by maintaining stable growth rates and increasing the profitability of industrial enterprises. Together with the medium-term perspective, a significant role in ensuring the energy balance of the Chinese economy will play a role in the import of coal, which opens up additional opportunities for Russian exporters.

Systematic analysis of the results of the study allows to make a conclusion that the development of exports is very important for the further development of the Mongolian economy. The further development of Mongolia's coal energy depends on the possibility of increasing the volumes of exploration work, the development of transport and production infrastructure, the development of domestic and foreign markets. Being landlocked country, Mongolia highly dependent from its neighbors. Given that Russia has its own coal mine in Eastern Siberia, our major opportunity for coal sector growth is China. Since, there is no gateway to sea, only possibility for domestic sector is to trade with China. Energy sector around the World is changing rapidly and by 2040, coal market is expected to shrink tremendously, that's why Mongolia is required to use that short time window to gain maximum profit in competition with forthcoming highly competitive renewable energy sources.

Recommendations and policy suggestions

The following recommendations are given to future researchers:

- There are many different opportunities for coal processing technologies: coking coal production, extraction of gaseous and liquid fuels from coal, activated carbon, etc. Therefore, it is possible to introduce these new technologies in Mongolia study their feasibility.
- As the world pursues a policy of phasing out coal, Mongolia could explore the possibility of producing, using or exporting renewable energy.
- As China pursues a policy of rejecting coal and developing natural gas and renewable energy, it is possible to explore opportunities for cooperation in the production of gaseous fuels from coal.

References

- [1] IRENA, "Renewables Increasingly Beat Even Cheapest Coal Competitors on Cost," 2020. [Online]. Available: <https://www.irena.org/newsroom/pressreleases/2020/Jun/Renewables-Increasingly-Beat-Even-Cheapest-Coal-Competitors-on-Cost>. [Accessed 05 03 2021].
- [2] IEA, "Electricity Market Report - December 2020," International Energy Agency, 2020.
- [3] Wood Mackenzie, "Renewables in most of Asia Pacific to be cheaper than coal power by 2030," 2020. [Online]. Available: <https://www.woodmac.com/press-releases/renewables-in-most-of-asia-pacific-to-be-cheaper-than-coal-power-by-2030/>. [Accessed 04 03 2021].
- [4] CNBC, "China's shift from coal helped push natural gas prices to a peak, Eurasia Group says," 2021. [Online]. Available: <https://www.cnbc.com/2021/01/19/natural-gas-prices-in-asia-may-have-peaked-after-recent-highs-eurasia.html>. [Accessed 06 03 2021].

- [5] World Bank, "Global Economic Prospects, January 2019: Darkening Skies," World Bank, Washington, DC, 2019.
- [6] "China's ban on Australian coal forces trade flows to realign: Russell," 2021. [Online]. Available: <https://www.reuters.com/article/column-russell-coal-asia-idUSL1N2JN0B4>. [Accessed 05 03 2021].
- [7] IEA, "<https://www.iea-coal.org/mongolias-coal-exports-to-china-growing/>," Clean Coal Centre, 3 September 2020. [Online]. Available: <https://www.iea-coal.org/mongolias-coal-exports-to-china-growing/>. [Accessed 05 March 2021].
- [8] IMF, "Regional Economic Outlook Update: Middle East and Central Asia," International Monetary Fund, Washington, DC, 2020.
- [9] Y. Li, Y. Wei and Z. Dong, "Will China Achieve Its Ambitious Goal?—Forecasting the CO₂ Emission Intensity of China towards 2030," *Energies*, vol. 13, no. 2924, pp. 1-23, 2020.
- [10] H. Zhang, L. Shen, S. Zhong and A. Elshkaki, "Economic Structure Transformation and Low-Carbon Development in Energy-Rich Cities: The Case of the Contiguous Area of Shanxi and Shaanxi Provinces, and Inner Mongolia Autonomous Region of China," *Sustainability*, vol. 12, pp. 1-14, 2020.
- [11] F. Guang and L. Wen, "Growth pattern changes in China's energy consumption," *Environmental Science and Pollution Research*, vol. 27, p. 28360–28373, 2020.
- [12] J. Chen, Y. Guo and H. Su, "Empirical analysis of energy consumption transfer in China's national economy from the perspective of production and demand," *Environmental Science and Pollution Research*, vol. 33, 2021.
- [13] Shi Yi, "China's 14th Five Year Plan sends mixed messages on climate ambitions," *Dialogo Chino*, 10 March 2021. [Online]. Available: <https://dialogochino.net/en/climate-energy/41252-chinas-14th-five-year-plan-sends-mixed-messages-on-short-term-climate-plans/>. [Accessed 15 March 2021].
- [14] G. Baiyu, "Does coal still have a role in China's decarbonising power market?," *China Dialogue*, 8 January 2021. [Online]. Available: <https://chinadialogue.net/en/energy/does-coal-still-have-a-role-in-chinas-decarbonising-power-market/>. [Accessed 5 March 2021].
- [15] S. Zhou, M. Duan and Z. Yuan, "Peak CO₂ emission in the region dominated by coal use and heavy chemical industries: A case study of Dezhou city in China," *Frontiers in Energy*, vol. 14, pp. 740-758, 2020.
- [16] L. Zhu, H. Liao and B. Hou, "The status of household heating in northern China: a field survey in towns and villages," *Environmental Science and Pollution Research*, vol. 27, p. 16145–16158, 2020.
- [17] F. Wang, X. Liu and D. Reiner, "Impacts of energy intensity target constraint on elasticity of substitution between production factors in China," *Energy Efficiency*, vol. 14, no. 34, pp. 1465-1485, 2021.
- A. Zhou, J. Hu and K. Wang, "Carbon emission assessment and control measures for coal mining in China," *Environmental Earth Sciences*, vol. 79, no. 461, 2020.
- [18] World Bank, "World Development Indicators," World Bank, Geneva, 2021.
- [19] H. Akimoto, T. Nagashima and H. Tanimoto, "An empirical approach toward the SLCP reduction targets in Asia for the mid-term climate change mitigation," *Progress in Earth and Planetary Science*, vol. 7, no. 73, 2020.
- [20] D. Gielen, F. Boshell and D. Saygin, "The role of renewable energy in the global energy transformation," *Energy Strategy Review*, vol. 24, pp. 38-50, 2019.
- [21] IEA, "Global Energy Review 2020," International Energy Agency, 2020.

- [22] M. Morgül Tumbaz and M. İpek, "Energy Demand Forecasting: Avoiding Multi-collinearity," *Arabian Journal for Science and Engineering*, vol. 46, pp. 1663-1675, 2021.
- [23] X. Pan, H. Xu and Y. Lu, "Long-term forecasting of industrial CO₂ emissions in 31 provinces of China," *Environmental Science and Pollution Research*, vol. 27, pp. 5168-5191, 2020.
- [24] J. Li, Y. Tian and X. Yan, "Approach and potential of replacing oil and natural gas with coal in China," *Frontiers in Energy*, vol. 14, pp. 419-431, 2020.
- [25] T. Zhu, R. Wang and N. Yi, "CO₂ and SO₂ emission characteristics of the whole process industry chain of coal processing and utilization in China," *International Journal of Coal Science & Technology*, vol. 7, pp. 19-25, 2020.
- [26] Argus Media, "China's Shanxi steps up small coal mine closures," 03 June 2020. [Online]. Available: <https://www.argusmedia.com/en/news/2110956-chinas-shanxi-steps-up-small-coal-mine-closures#:~:text=China's%20coal%2Dproducing%20heartland%20of,safety%20standards%20within%20the%20industry.&text=The%20Shanxi%20government%20also%20plans,the%20end%20of%20thi>. [Accessed 10 March 2020].
- [27] J. Pepe, "The "Eastern Polygon" of the Trans-Siberian rail line: a critical factor for assessing Russia's strategy toward Eurasia and the Asia-Pacific," *Asia Europe Journal*, vol. 18, pp. 305-324, 2020.
- [28] H. Gui, H. Qiu and Z. Chen, "An overview of surface water hazards in China coal mines and disaster-causing mechanism," *Arabian Journal of Geosciences*, vol. 13, p. 67, 2020.
- [29] W. Wu and B. Lin, "Reducing Overcapacity in China's Coal Industry: A Real Option Approach," *Computational Economics*, vol. 55, pp. 1073-1093, 2020.
- [30] IMF, "World Economic Outlook Database," International Monetary Fund, Washington, DC, 2021.
- [31] V. Liew, "Which Lag Selection Criteria Should We Employ?," *Economics Bulletin*, vol. 3, no. 33, pp. 1-9, 2014.